MVE, INC.
ENGINEERS / SURVEYORS
1903 lelaray street, suite 200
colorado springs, co 80909
719.635.5736

Final Drainage Report

Hannah Ridge at Feathergrass Filing No. 3

April 20, 2017

Final Drainage Report

for

Hannah Ridge at Feathergrass Filing No. 3

Project No. 60970-F3

April 20, 2017

prepared for

Feathergrass Investments, LLC
4715 North Chestnut Street
Colorado Springs, CO 80907
719.593.8367

prepared by

MVE, Inc.
1903 Lelaray Street, Suite 200
Colorado Springs, CO 80909
719.635.5736

60970 HR Fil. No. 3 Final Drainage Report.odt

Statements and Acknowledgments

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.

David R. Gorman, P.E. Colorado No. 31672 Date
For and on Behalf of MVE, Inc.

Developer's Statement

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

Kenneth P. Driscoll, Manager Date
Feathergrass Investments, LLC
4715 North Chestnut Street
Colorado Springs, CO 80907

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

Contents

Final Drainage Report

The purpose of this Final Drainage Report is to identify drainage patterns and quantities within and affecting the proposed Hannah Ridge at Feathergrass Filing No. 3. The development project is part of a phased residential development with approved Master Development Drainage Plan, Preliminary Drainage Report and Preliminary Plan documents on file. This report also addresses aspects of all phases (subdivision filings) of the project in order to present the drainage information in the context of the total project. The report will "identify specific solutions to problems on-site and off-site resulting from the proposed project.[1] The report and included maps present results of hydrologic and drainage facilities analyses. The report will discuss the recommended drainage improvements to the site and identify drainage requirements relative to the proposed project. This report has been prepared and submitted in accordance with the requirements of the El Paso County Final Plat approval process. An Appendix is included with this report with pertinent calculations and graphs used in the facility design and drainage analyses.

1 General Location and Description

1.1 Location

The proposed Hannah Ridge at Feathergrass Filing No. 3 site is located within the south one-half of Section 32, Township 13 South, Range 65 west of the 6th principal meridian in unincorporated El Paso County, Colorado. The site is situated on the north side of Constitution Avenue, west of Akers Drive and east of the old Rock Island Railroad right-of-way (a trail owned by the City of Colorado Springs). The proposed site is currently known as Tract FF, Hannah Ridge at Feathergrass Filing No. 1. A **Vicinity Map** is included in the **Appendix**.

Tract F, Hannah Ridge at Feathergrass Filing No. 1 (HRAFG Fil No. 1) recorded in June 2014, is adjacent along the east side of the site. Tract F is a drainage and greenway tract zoned PUD. The development of the 39 residential lots in Filing No. 2, located east of Tract F, is recently completed with streets, utilities and landscaping. Tract E HRAFG Fil No. 1 (a future park, zoned PUD) lies to the northeast of the site, Tract LL HRAFG Fil No. 1 (a future single family residential site zoned PUD) is adjacent to the northwest of the site. Tract GG HRAFG Fil No. 1 (a future single family residential site zoned PUD) lies to the west of the site and Tract BB HRAFG Fil No. 1 (a future multi-family residential site zoned RM-30) is adjacent to the south. The subject property and surrounding tracts were originally platted as the Industrial (M) zoned Akers Acres before being replatted into Hannah Ridge at Feathergrass Filing No. 1.

1.2 Description of Property

The entire Hannah Ridge at Feathergrass Filing No. 1 subdivision contained 117.81± acres. The Filing No. 1 plat included tracts for future multi-family residential, single family residential and commercial development in accordance with approved zoning and the Preliminary Plan for the site. Hannah Ridge at Feathergrass Filing No. 3 is the third phase of single family residential lots and streets which will be replatted from the 8.31± acres of the existing Tract FF.

1 DCM, 4-6.

The ground cover, which is in good condition, consists of native grasses, sparse brush and a few trees. A portion of the Filing No. 3 site has been disturbed as necessary for the construction of Filing No. 2. The existing site topography slopes to the east and south with grades that range from 1% to 8%. The existing flow path of the Sand Creek tributary that runs from north to south through the overall Hannah Ridge at Feathergrass property is located within the proposed Hannah Ridge at Feathergrass Filing No. 3 site. Once the tributary flows reach Constitution Avenue from the north, a channel/ditch cut along the north side of Constitution Avenue conveys the tributary flows to the east. Contributing on-site runoff joins the tributary flows, which are directed through the new double 10'w x 6' high Hannah Ridge Drive culvert. The flows continue east to the existing culvert crossing of Constitution Avenue, just west of Akers Drive.

Soils in this particular site as well as the entire surrounding Hannah Ridge at Feathergrass development are generally conducive for land development with some localized areas of unsuitability which shall be addressed in the site grading and drainage treatments for the proposed subdivision. These conditions are fully discussed in the project Soil, Geology and Geologic Hazard Studies and updates prepared by Entech Engineering.[2] [3] According to the National Resource Conservation Service, the dominant soil in the immediate area of the Hannah Ridge at Feathergrass Filing No. 3 site is Blakeland loamy sand (map unit 8), The Blakeland loamy sand is typically deep and somewhat excessively drained. Permeability is rapid, surface runoff is slow, and the hazard of erosion is moderate. Blakeland loamy sand is classified as being part of Hydrologic Soil Group A. The soil has good potential for urban development, but is prone to water and wind erosion if protective vegetation is removed and not mitigated by proper erosion control practices.[4] [5] A portion of the **Soil Map** and data tables from the National Cooperative Soil Survey are included in the **Appendix.**

Major drainageways through the site include the previously mentioned sub-tributary (Tributary 6) to the east fork of Sand Creek which flows into the north side of the overall Hannah Ridge property by way of an existing concrete box culvert in the old rail road embankment. The drainageway runs north to south through the site and then east along the north side of Constitution Avenue to an existing concrete box culvert crossing Constitution Avenue just west of Akers Drive. Existing Hannah Ridge Filing No. 1 and 2 are located east of this tributary. Another drainageway enters the Hannah Ridge property from the west and joins Tributary 6 along the north side of Constitution Avenue. The flows from this drainageway are conveyed by Constitution Avenue surface, a reinforced concrete pipe (RCP) located along the north side of Constitution Avenue and a old railway bridge opening on the west edge of the site.

2 Drainage Basins and Sub-Basins

2.1 Major Basin Descriptions

The Hannah Ridge at Feathergrass Filing No. 3 site is located in the Sand Creek Major Drainage Basin (FOFO4000) on the east side of Colorado Springs, which contains properties in both City of Colorado Springs and unincorporated El Paso County jurisdictions. The basin is a studied basin with an approved and operative Drainage Basin Planning Study (DBPS). The Basin stretches for approximately 17 miles on the east side of Colorado Springs and drains from northeast to southwest into Fountain Creek at a point just north of the crossing of Interstate 25 and US Highway 85-87. The site is located in the southeastern portion of the Sand Creek Major Drainage Basin on a tributary with approximately 1.07 square miles of drainage area upstream of the site. A copy of a portion of the ***"Drainage Area Identification Study"***[6] **map**, showing the site location within the Basin is included in the **Appendix**.

2 Soils Rep 1
3 Soils Rep 2
4 WSS El Paso County Area, Colorado.
5 OSD
6 Drain. Area Ident. Study

The Drainage Basin Planning Study for the Sand Creek Major Drainage Basin was completed in 1996 by Kiowa Engineering Corporation.[7] The site is contained within sub-basin 12, located just upstream of Design Point No, 8, as indicated in the 1996 report. Riprap channel improvements and channel check structures are called out in the DBPS for this sub-basin. Copies of the DBPS **Drainage Planning Study Map** and pertinent pages of the DBPS **Preliminary Design Plans** showing the site location within the basin as well as the DBPS planned improvements in the subject reach are included in the **Appendix**. A portion of the major channel is located within this site and proposed improvements for a potion of the major drainage system are to be constructed as part of Hannah Ridge at Feathergrass Filing No. 3.

Kiowa Engineering also prepared a report titled "Hydrology Analysis, East Fork Sand Creek, Tributary 6", having revision date of January 18, 2007.[8] The report served to amend the DBPS and was reviewed and accepted by El Paso County Development Services during the same time frame as the Preliminary Plan approval of the Hannah Ridge at Feathergrass project. The amendment specified that the existing 7'x7' railroad culvert crossing, located approximately 1/2 mile north of Constitution Avenue is to remain in place. Said DBPS amendment indicates that the existing ponding area on the upstream side of the railroad embankment is to remain in the current and future drainage conditions, thereby reducing the resultant developed flows through the properties downstream of the embankment, including the flows through the tributary in Hannah Ridge, the Hannah Ridge Drive culvert and the Constitution Ave / Akers Drive culvert downstream of the site. The 2007 DBPS Amendment Maps and hydrologic calculations are included in the **Appendix** to this report for easy reference.

Maintenance on the existing 7'x7' railroad (Rock Island Trail) box culvert will be performed in accordance with the prior BOCC conditions of approval of the Preliminary Plan. Maintenance of the box culvert will be completed with the improvements of Hannah Ridge at Feathergrass Filing No. 3.

The current Flood Insurance Study of the region includes Flood Insurance Rate Maps (FIRMs), effective March 17, 1997. [9] [10] The project site is included in Community Panel Numbers 08041C0752 F and 08041C0756 F of the FIRMs for El Paso County, Colorado. The Flood boundaries for the subject Tributary 6 of the East Fork of Sand Creek, as shown on the FIRM, was most recently revised by Letter of Map Revision (LOMR) on March 24, 2004 and September 24, 2008.[11] [12] According to the LOMR, the nearest Federal Emergency Management Agency (FEMA) designated floodplain boundary is approximately 1400 feet south of the project site, near Palmer Park Boulevard. No part of the site is shown to be included in a 100-year flood hazard area as determined by FEMA. The project site and surrounding property is Zone X, being "Areas of 500 year flood; Areas of100-year flood with average depths of less than 1 foot with drainage areas less than 1 square mile; and Areas protected by levees from the 100-year flood". A portion of the current **FEMA Flood Insurance Rate Maps** as well as maps modified by the recent LOMR's with the site delineated is included in the **Appendix.**

The construction of the Constitution Avenue at Akers Drive Concrete Box Culvert Extension project for the Tributary 6 flows downstream of Constitution Avenue was completed in 2013. The box culvert extension was designed and constructed as detailed in the approved "Drainage Report, Constitution Avenue at Akers Drive Box Culvert Extension" dated August 15, 2011 by M.V.E., Inc.[13] The design of the box culvert extension considered developed flows from the Hannah Ridge at Feathergrass site as determined in the 2007 DBPS amendment.

The construction of the Hannah Ridge Drive Concrete Box Culvert for the Tributary 6 flows along Constitution Avenue was completed in 2016. This box culvert was designed and constructed as detailed in the approved "Drainage Report for Hannah Ridge at Feathergrass Filing No. 2", dated

Specify and quantify type of maintenance required

7 1996 DBPS
8 2007 DBPS Amend
9 FIS
10 FIRM, Map No. 08041C0756 F
11 LOMR 2004
12 LOMR 2008
13 CBC Rep

This is up to the County Engineer to approve. You need to make your case.

September 21, 2015 by M.V.E., Inc.[14] The design of the box culvert extension considered developed flows from the Hannah Ridge at Feathergrass site as determined in the 2007 DBPS amendment.

The owner of the Wilshire Development, located south of the box culvert extension project site, is obligated to construct the channelization of Tributary 6 to it's confluence with the East Fork Sand Creek before proceeding with any more subdivision filings within Wilshire. In the preparation of the Master Development Drainage Report for the Hannah Ridge at Feathergrass development, which was prepared in 2007 and updated in 2013, it was anticipated that the channelization would be completed during the first half of the residential development of Hannah Ridge at Feathergrass, consisting of approximately 38 acres located north of Hunter Jumper Drive and south of Winslow Park Drive. The subdivision phasing of Hannah Ridge changed from 2007 to 2013 so that 2007 Phase 1 is equal to the 2013 Phases 1, 2, 3 & 4. The approved Master Development Drainage Report analyzed the Tributary 6 drainageway downstream of Constitution Avenue and found that the development of the initial 38 acres of Hannah Ridge at Feathergrass to have negligible affects on the existing drainageway without detention.[15] Therefore, the Development of Hannah Ridge at Feathergrass Filings 1 and 2 with no on-site detention will not damage the downstream drainageway. The need for on-site detention in the remaining phases will be determined in the Final Drainage Reports for the future phases. Once the downstream Wilshire channel improvements are completed, any concerns over developed flow erosion and velocities in the tributary will be eliminated. The analysis completed as part of the MDDP for Hannah Ridge is included in this drainage report for easy reference.

and all other necessary improvements down to Sand Creek.

2.2 Sub-Basin Description

2.2.1 Existing Drainage Patterns (On-Site)

The northern and central portion of the total existing Hannah Ridge at Feathergrass site drains to the center from both the east and west sides, and then southerly in the tributary to East Fork Sand Creek which flows from north to south through site. The off-site tributary discharges enter from the previously mentioned existing 7'x7' culvert under the old Rock Island Railroad grade that bounds the property on the west and north. The southern portion of the site drains southerly and easterly from the old Rock Island Railroad that bounds the property on the west. The site drains into a ditch running along the north side of Constitution Avenue right-of-way. This ditch also collects the existing 42" and 60" pipe storm water discharge at the southeastern corner of the proposed Hannah Ridge Preliminary Plan. This storm sewer system was designed and constructed in 1992 by El Paso County Department of public works to collect and route existing flows from the western side of the old Rock Island Railroad. A sump area was constructed to capture existing and future developed flows from this area. An **Existing Drainage Map** is included and shows existing basin delineations.

The 8.31 acre Filing No. 3 site is contained in existing sub-basins A7 and A9 which drain south towards Constitution Avenue. The existing site sheet flows into the tributary channel and exit the Filing No. 3 site to the south into existing Tract BB.

2.2.2 Off-Site Drainage Flow Patterns

Off-site drainage flows enter the total Hannah Ridge at Feathergrass site from both the north and from the west. The hydrologic analyses used in the drainage design of the proposed subdivision considered the projected Future Land Use Conditions of the upstream sub-basins and not existing conditions.

The northern entry point is at the existing 7'x7' concrete box crossing of the north railroad embankment. The drainage sub-basin draining to the existing 7x7 box is the northern 425 acre portion of the East Fork Sand Creek Tributary 6 watershed extending from the Rock Island Railroad Right-of-Way, north to Barnes Road. A complete description of this northern upstream watershed, along with the Land Use Map used in the hydrologic analyses are contained in Kiowa Engineering's 2007 Hydrology Analysis Report, which is hereby referenced and made a part of this report.[16] The sub-basin contains a mixture of land uses including areas of undeveloped Open Space, medium

---

14 HR 2 FDR
15 MDDP
16 2007 DBPS Amend

from ___ to ___ cfs...

density Single-Family Residential, medium-high density Single-Family Residential and Industrial / Commercial. Flows originating in this basin travel from north to south in streets, storm drains and drainageways to the railroad embankment. Flow rates are attenuated by ponding on the upstream side of the embankment as controlled by the existing 7'x7' concrete culvert before entering the site.

Flows also enter site from the westerly 105 acre sub-basin made up of medium density Single-Family Residential property. These flows are conveyed east towards the site in a Combination of Constitution Avenue Street flow, flow in an existing 36"/42" pipe system along the north side of Constitution Avenue and overland flow entering through the trellis opening in the westerly railroad emankment (trail). Flows continue south and east through Hannah Ridge at Feathergrass site to the existing double 12'x6' Constitution Avenue culvert, which was recently extended to the south. The culvert delivers the flows to the tributary drainageway south of Constitution Avenue. The flows continue to flow south to East Fork of Sand Creek approximately 6500 feet south of the project site.

Considering the 8.31 acre site of Hannah Ridge at Feathergrass Filing No. 3, existing Tract F is located along the east side, which drains south into Tract BB. No flows enter the site from the east. The western part of existing sub-basin A7 drains easterly in to the site to the tributary drainageway, which conveys the flows to the south. The site also accepts the tributary flows entering from the north. All site stormwater flows exit to the south into Tract BB and are directed to the existing ditch along the north side of Constitution Avenue.

^ = provide all cfs values

3 Drainage Design Criteria

3.1 Development Criteria Reference

This Final Drainage Report for Hannah Ridge at Feathergrass Filing No. 3 has been prepared according to the report guidelines presented in the latest edition of *City of Colorado Springs/El Paso County Drainage Criteria Manual* (DCM)[17]. The on-site (local) hydrologic analysis is based on a collection of data from the DCM, the NCSS Web Soil Survey[18], a topographic survey of the site prepared by the M.V.E., Inc., proposed site layout from the approved Preliminary Plan, property boundary information provided by M.V.E., Inc. and proposed grading and drainage system layout developed by MVE, Inc. and Classic Consulting Inc. Runoff flow data used in the preparation of the main drainage way (Tributary 6) facility design is in accordance with the hydrology presented in the 1996 DBPS as modified by the 2007 Hydrology Analysis Report. The Hydrologic Basin Map with sub-basin boundaries, design point locations and discharges from the 2007 Hydrology Analysis Report is included in the **Appendix** to this report for convenient reference.

3.2 Previous Drainage Studies

The Sand Creek Major Drainage Basin DBPS and subsequent Hydrology Analysis Report for Tributary 6 has already been discussed at length. These reports present runoff flow rates for the main drainageway (Tributary 6) through the site, that result from Developed Conditions in the subject drainage basin. These flows are used in the design and hydraulic analysis of the proposed major drainage way through the site.

Both a Master Development Drainage Report for the entire Hannah Ridge at Feathergrass and a Preliminary Drainage Report for the residential phases of the development were prepared by M.V.E., Inc. during the approval process of the PUD Plan and Preliminary Plan.[19] [20] These reports present preliminary drainage information for on-site sub-basins within the development. The preliminary information is updated, revised and expanded in this current drainage study and report.

The Final Drainage Report for Hannah Ridge at Feathergrass Filing No. 1 was prepared by M.V.E., Inc. and dated January 31, 2014.[21] The report addressed drainage for 45 residential lots in Filing No.

17 DCM Section 4.3 and Section 4.4
18 WSS
19 MDDP
20 PDR HR PH1-3
21 HR 1 FDR

(This outdated methodology may have resulted in overestimated historic flows.)

1 and contains the drainage plan for the entire Hannah Ridge development. No storm drain facilities were constructed as part of Hannah Ridge at Feathergrass Filing No. 1.

3.3 Hydrologic Criteria

Flow rates at all design points in the subdivision with contributing areas greater than 100 acres are calculated using SCS hydrologic flow computation method in accordance with El Paso County criteria. Flow rates at all design points having contributing areas less than 100 acres are calculated using the Rational Method. Flow rates were calculated for 5-year, 10-year and 100-year rainfall recurrence intervals on the main drainageway and 5-year and 100-year events for the local drainage system.

The SCS method main drainage way (offsite) hydrology flows are taken from the previously mentioned 1996 and 2007 Kiowa reports. Flow rate values were produced for both the present existing condition of the watershed and ultimate developed conditions. SCS hydrograph data for the 5-year and 100-year rainfall recurrence intervals was produced using the U.S. Army Corps of Engineers Hydrologic Engineering Center Hydrograph Modeling package (HEC-1).[22] The computer model runs are included in the **Appendix** of this report for convenience. The model utilized NOAA Rainfall Frequency data of 3.0" and 4.4" of total 24-hour precipitation depth for the 5-year and 100-year rainfall events, respectively. The SCS Type IIa rainfall distribution was used to produce the storm rainfall hydrographs. Runoff hydrographs were computed using Curve number ratings developed according to County criteria and according to existing and proposed land uses for areas in the watershed. Times of Concentration (Tc) values for basin runoff was developed using the 'Overland Flow Equation' Page 5-11 in the DCM, and the channel flow component of the Tc was computed using Manning's equation under conveyance-full conditions.

Additional Data used in the study includes soils data from the NRCS Web Soil Survey[23], Colorado Springs Utilities FIMS topographic mapping, SGS Topographic Mapping and site survey data and mapping by M.V.E., Inc.[24] [25] [26]

The Rational Method utilized 'Time Intensity-Frequency Curves' Figure 5-1 in the DCM to obtain the design rainfall values. The 'Overland Flow Equation' Page 5-11, and Manning's equation with estimated depths were used in time of concentration calculation. Table 5-1 'Recommended Average Runoff Coefficients and Percent Impervious' was utilized as a guide in estimating runoff coefficient values.

3.4 Hydraulic Criteria

The hydraulic design and analysis for the facilities in this Final Drainage Report including storm drain inlets, pipes, culverts, channels and streets have been prepared according to the provisions of the *City of Colorado Springs/El Paso County Drainage Criteria Manual* (DCM)[27]. Hydraulic properties and performance of parts of the drainage system were determined using the U.S. Army Corps of Engineers Hydraulic Engineering Center River Analysis System (HEC-RAS) modeling Package.[28] Geometric data for the model cross sections were obtained from the M.V.E., Inc. topographic mapping in combination with proposed site construction drawings. Manning's roughness coefficient values for various drainage system components are in accordance with El Paso County criteria for the particular design materials.

Storm drainage inlet and piping analyses was performed with Autodesk Storm and Sanitary Analysis 2012 computer program.[29] System profiles and output is included in the **Appendix**. Culvert calculations were performed with the use of the "HY-8" computer application developed by the

22 HEC-1
23 WSS
24 USGS
25 FIMS
26 MVE Topo
27 DCM Section 4.3 and Section 4.4
28 HEC-RAS
29 ADSS

Federal Highway Administration.[30] In some cases, culvert calculations were also verified for comparable results with the use of HEC-RAS's "Special Culvert" routines.

The "Rational Formula-based FAA", Section 3.2.3 of the *Urban Drainage and Flood Control District Drainage Criteria Manual, Volume 2* (UDFCD), method was used for water quality and detention storage calculations with "Recommended Percentage imperviousness Values", Table 5-1 in the DCM, used to determine the site imperviousness. These sizing calculations along with the hydraulic performance of outlet structures and drain pipes, and routing of inflow hydrographs through storage volumes and outlet structures, were performed using the detention design spreadsheet, "UD-Detention_v2.2", developed by the Urban Drainage and Flood Control District.[31]

4 Drainage Facility Design

4.1 General Concept

The proposed Hannah Ridge at Feathergrass Filing No. 3 project will consist of 39 single family lots with average lot size of 6,036 square feet. The overall single family residential development also includes park space, landscape open space and natural open space areas. There are multi-family and commercial parcels south of the single family residential development along Constitution Avenue. These parcels will be developed in accordance with future separate Preliminary Plans and Final Drainage Reports. Access to Filing No. 3 will be from the westerly extensions of existing Hunter Jumper Drive and existing Winslow Park Drive. The proposed roads will be paved county streets within 50 and 60 foot of rights-of-way.

The entire Hannah Ridge at Feathergrass residential development is continuing to be platted and constructed in phases. The drainage infrastructure will also be constructed in phases to accommodate the existing and developed drainage as the project progresses. This Phase 3 includes a large diameter storm drain pipe in existing Tract F, smaller diameter storm drain pipes in the street rights-of-way, storm drain inlets, and permanent water quality facility.

The intent of the drainage concept presented in this Final Drainage Report is to accept and route the off-site basin discharges through the site, while conveying the on-site developed major and minor storm flows safely through the site and downstream, maintaining adequate flow capacity in the surface streets, storm drain system and channels and providing overflow routing for storms greater than the major (100-year) events in accordance with El Paso County drainage criteria.

Considering the overall Hannah Ridge at Feathergrass development, the proposed conditions will route local storm water flows over the site in sheet flow, shallow concentrated flow and stream flow, depending on the existing topography and the contributing flow areas. These flows will be routed to the streets. The five year frequency storm water flows in excess of street carrying capacities will be collected and routed to the main tributary channel/pipe. Curb & gutter will be constructed on the streets and route storm water flows to storm water inlets. An underground storm drain system will be installed in the right of ways and easements to deliver street flow to the main drainage ways. The Sand Creek Tributary through the site will be improved with channel grading, bed and bank stabilization, culverts and drainage pipe. Grading operations will be done in order to improve drainage conditions and to direct runoff to desired locations. Overlot grading will be necessary for subdivision development.

Runoff from off-site and on-site will be contained in the central north-south drainageway through the site in a combination of improved open channel and storm drain conduits that leads to the existing drainage channel on the north side of Constitution Avenue. Off-site flows from the west and flows from the southwestern part of the proposed development will also continue to flow to the existing drainage channel on the north side of Constitution Avenue to the existing double 12'x6', culvert crossing of Constitution Avenue. The existing channel along Constitution Avenue will not be

30 HY-8
31 UDFCD

improved until the development of the multi-family and commercial properties along Constitution Avenue occurs.

It is intended that the drainage system be owned and maintained by El Paso County in concert with the public transportation infrastructure through the mechanism of Public Right of Way and Public Drainage Easements through the site as it develops. Access over, across and adjacent to the proposed storm drainage system components will be provided. The private water quality facilities will be owned and maintained by the Communities at Feathergrass Homeowners Association.

There are no irrigation facilities that would become an encumbrance to the drainage ways or facilities. The site will have water mains and sewer mains located in the streets. Some proposed water mains will have local lowerings installed to avoid possible conflicts with storm drain laterals. All sanitary sewer crossings of the drainage system will be in streets. The sanitary sewer mains will tend to be constructed much lower than the proposed storm drain and drainage system. No encumbrances due to utilities are anticipated.

The existing drainage conditions and the proposed drainage concept are described in more detail below. Input data and results for all calculations are included in the **Appendix**. Drainage maps for the hydrology and drainageway hydraulics are also included in the **Appendix**.

4.2 Specific Details

4.2.1 Existing Hydrologic Conditions

The off-site drainage area north of the site, Basin OSA 1 (Basin No.'s 1, 2 & 5 on 2007 DBPS Amendment map) contains 425 acres draining to Tributary 6, East Fork of Sand Creek. The Tributary runoff enters the property through the old railroad embankment by way of an existing 7'x7' concrete box culvert. Discharges of Q_{10} = 360 cfs and Q_{100} = 886 cfs flow to the culvert. Flows are detained behind the embankment before entering the property so that the peak discharges flowing through are Q_{10} = 351 cfs and Q_{100} = 627 cfs. The existing 7'x7' culvert is to permanently remain in place per the 2007 DBPS Amendment.

Basins OSA2 (1.9 acres) and OSC1 (3.4 acres) comprise off-site area from the railroad embankment to the northern property boundary. The discharges generated by OSA2 are Q_5 = 2 cfs and Q_{100} = 5 cfs, which enters on-site Basin A4. The discharges generated by OSC1 are Q_5 = 5 cfs and Q_{100} = 11 cfs, which also enters on-site Basin A4 and continues to the south. Off-site Basin OSA3 (0.3 acres) is the west side of Akers Drive which drains onto the site at Electronic Drive with discharges of Q_5 = 1 cfs and Q_{100} = 2 cfs. The off-site flows on the east side of Akers Drive drains south down the street, towards Constitution Avenue and are collected in Akers Drive and directed to Tributary 6, just upstream of the Constitution Avenue CBC.

Existing Basin A4 is 38.1 acres in area and generates flows of Q_5 = 31 cfs and Q_{100} = 71 cfs. Basin A4 accepts flows from off-site Basin OSA1 on the north, OSA2 on the northeast, OSC1 on the northwest and OSA3 on the east. The combined flows travel overland to the central portion of the basin joining the flows in the tributary to East Fork of Sand Creek, traveling south to enter Basin A7 with combined flow rates of Q_{10} = 351 cfs and Q_{100} = 627 cfs.

Existing off-site drainage basins OSF1, OSF2 and OSF3, west of the site, drain easterly onto the site, into existing Basin A7. Basin OSF1 (Basin No. 3 on the 2007 DBPS Amendment Map), contains 105 acres draining towards the site from the west. Basin OSF1 discharges are discussed in detail below. Existing Basins OSF2 and OSF3 are the off-site area from the railroad embankment to the northern property boundary along the west side. Basin OSF2 (4.9 acres) delivers flows of Q_5 = 4 cfs and Q_{100} = 10 cfs to the west edge of Basin A7. Basin OSF3 (0.5 acres) generates flows of Q_5 = 1 cfs and Q_{100} = 2 cfs.

The DBPS amendment indicates total peak discharges generated by Basin OSF1 are Q_{10} = 130 cfs and Q_{100} = 283 cfs. These discharges are actually distributed among pipe flows in the Constitution Avenue storm drain system, overland flow through the trellis opening at Rock Island Trail, overland flow at the trail intersection with Constitution Avenue, and street flows in Constitution. Off-site drainage basins were delineated with the aid of previous drainage studies, including calculations by El Paso County utilized for the design of the Constitution Avenue storm drain system. Basin flows were calculated to determine runoff from different portions of Basin OSF1. There are no records available that indicate how much storm runoff is captured by the storm drain system. Every inlet and pipe in the entire existing storm drain system was not analyzed, but a reasonable estimate was made of the flows captured by the storm drain system and thereby the flow distribution, as explained below.

The off-site basin flowing to the intersection of Constitution Avenue and Canada Drive, containing residential area, produces discharges of Q_5 = 121 cfs and Q_{100} = 230 cfs. These flows reach the intersection both in the storm drain system and the streets connected to Constitution Avenue. To determine the amount of flows in the pipe system during both 5 year and 100 year rainfall events, the assumption was made that the system is flowing under pressure with the hydraulic grade line at rim elevation of the existing manhole at Constitution Avenue and Canada Drive. The assumption is reasonable since the section of storm drain at this location is limiting due to size, slope and depth. The resulting captured flow in the 36" CMP of 57 cfs is about 25% of the total 100 year discharge and about 47% of the total 5 year flow at this location. Since the upstream storm drain inlets would generally have been designed to capture at least half of the available storm flows, it would seem that the pipe is at already at maximum capacity during both 5 year and 100 year events at this point. However, additional capacity opens up further downstream of the system as discussed below. All remaining 5-year and 100 year flows not contained within the pipe continue east in Constitution Avenue. Additional flows are collected by inlets in Constitution Avenue about 750 feet west of the Hannah Ridge property line. At this point, the existing 42" CMP carries Q_5 = 66 cfs and Q_{100} = 85 cfs towards the east (max capacity of system without flooding). In the existing condition, pipe flows of Q_5 = 66 cfs and Q_{100} = 85 cfs are maintained easterly until the manhole intersection with 48" and 60" connections opposite Shawnee Drive. Developed discharges from proposed Living Waters will enter the system just downstream of manhole near the southwest corner of the Hannah Ridge site. There is ample capacity for the Living Waters discharges in the system at this point. An additional capacity of 72 cfs is also available in the pipe system downstream of the manhole. Also, an additional 100 cfs is available downstream of the Shawnee Drive Manhole.

The existing 60" RCP discharges into the open ditch located along the north side of Constitution Avenue approximately 650 west of Hannah Ridge Drive at the southeast corner of Bas A7 (discussed below) where the Tributary 6 drainageway changes course from south to east. Flows in the pipe are Q_5 = 87 cfs and Q_{100} = 126 cfs. The combined flows at the confluence at is point are Q_{10} = 393 cfs and Q_{100} = 831 cfs.

would any of this flow enter the site?

The northeast portion of Basin OSF1, containing residential and open areas drains to the trellis opening and into the site. Flows from Allens Park Drive are discharged from a storm drain outfall just west of the trellis opening and additional overland flows from Basin OSF1, OSF2 and OSF3 join the outfall. Considering the development of Living Waters and the flows that will be directed into the pipe system, the calculated discharges at the trellis opening are Q_5 = 19 cfs and Q_{100} = 41 cfs. Flows remaining in Constitution Avenue, flowing east, are Q_5 = 39 cfs and Q_{100} = 121 cfs. It appears that the existing condition of Constitution Avenue, with these calculated flows do not meet either 5-year or 100-year street drainage criteria. The allowable street flows on the north side of Constitution Avenue are Q_5 = 14 cfs and Q_{100} = 37 cfs (64 cfs and 108 cfs actual) and the allowable street flows on the south side of Constitution Avenue are Q_5 = 14 cfs and Q_{100} = 38 cfs (0 cfs and 65 cfs actual). This is an existing off-site condition. The development of Hannah Ridge does not contribute to or exacerbate this condition. Calculations and exhibits for the off-site basin flows and main trunk storm drain are contained in the Appendix. These flows continue easterly and join the previously mentioned runoff flowing from the north in existing Basins A7 and A9.

Storm Runoff from Basins A7 & A9 drain overland southeasterly towards Constitution Avenue and flow in the existing earthen channel along the north side of Constitution Avenue to the existing double 12'x6' Concrete Box Culvert (CBC). Existing Basin A7 (30.2 acres) produces runoff quantities of Q_5 = 19 cfs and Q_{100} = 45 cfs while Basin A9 (33.6 acres) produces Q_5 = 20 cfs and Q_{100} = 47 cfs. Basin A16, on the east side of Akers Drive, drains south to Constitution Avenue and then westerly along Constitution Avenue to enter the double 12'x6' CBC. Runoff from existing Basin A16 (18.0 acres) has peak rates of Q_5 = 12 cfs and Q_{100} = 26 cfs.

Hannah Ridge at Feathergrass Filing No. 3 is located within existing sub-basins A7 and A9. The proportional flow rates for only the 8.31 acres that comprise the site are Q_5 = 5 cfs and Q_{100} = 12 cfs. These flows are combined with the total A7 and A9 flows which drain south.

Basin OSA8 (16.2 acres), on the east side of Akers Drive, drains south onto the eastern section of the property with peak discharges of Q_5 = 40 cfs and Q_{100} = 78 cfs. Off-site basins OSA11 and OSA12 contain portions of Constitution Avenue. These basins drain to the existing double 12' x 6' CBC under Constitution Avenue.

The portion of Basins OSA8 and A16 discharges flowing in and being intercepted by the existing 15' and 10' curb inlets on the east side of Akers Drive and 10' inlet on the west side of Akers Drive was calculated in the design drainage memo for Akers Drive prepared by M.V.E., Inc. at the time of Akers Drive construction.[32] The east side of Akers Dive carries flows of Q_5 = 9.2 cfs and Q_{100} = 19.2 cfs. The two existing Akers Drive inlets on the east side of the street capture the entire 9.2 cfs in the 5-year event. The inlets collect 16.1 cfs in the 100-year rainfall event, leaving 3.1 cfs to continue westerly in Constitution Avenue. The discharges flowing south, on the west side of Akers Drive, at the Constitution Avenue intersection are Q_5 = 3.6 cfs and Q_{100} = 6.8 cfs. The existing 10' curb inlet collects 3.3 cfs in the 5-year rainfall event while 0.3 cfs flows by to Constitution Avenue. In the 100-year event, 4.8 cfs is captured and 2.0 cfs flows by. All the by-passed flows travel to the low spot located just east of the double 12'x6' culvert and are collected in sump condition at an existing 5' curb inlet which drains directly into the culvert and flows south.

The **Existing Drainage Map** depicts the existing topographic mapping, drainage basin delineations, drainage patterns, existing streets, drainage facilities, and runoff quantities with a data table including drainage areas and flow rates.

4.2.2 Proposed Hydrologic Conditions

The surrounding off-site drainage basins will continue to drain to the site as in existing conditions. However, where the potential for off-site development exists, flow rates entering the property are adjusted to the developed condition. The 2007 DBPS Amendment takes into account the developed conditions of the entire Tributary 6 basin including the Hannah Ridge site and the drainage basins upstream and downstream of the site. These DBPS flow rates are utilized in this report for the main channel design.

The overall Hannah Ridge at Feathergrass site is divided into several developed drainage basins for analysis and design of the drainage system as indicated on the attached **Developed Drainage Map**. Specific drainage details are discussed according to the planned platting and construction phases. Developed runoff quantities and facilities are presented below.

Phase 1 – The first 45 residential lots were platted with Hannah Ridge at Feathergrass Filing No. 1. The lots, streets and utilities associated with the previous subdivision filing are now constructed and complete. The eastern portions of Winslow Park and Hunter Jumper Drives, both connecting to Akers Drive were constructed along with the southern section of Equine Court and all of Farrier Court. Storm flows from Basins D1 (2.07 acres), D2 (1.19 acres), D3 (0.26 acres), D4 (2.22 acres), D5 (0.74 acres) and D6 (1.31 acres) all drain to the southwest and deliver flows to Design Point 15 at the corner of Equine Court and Hunter Jumper Drive. Cross pans were constructed at the intersection of Farrier Court and Equine Court and the intersection of Hunter Jumper Drive and Equine Court. Peak flow rates on the north side of Hunter Jumper Drive at Design Point 15 are Q_5 = 19.2 cfs and Q_{100} = 38.0 cfs. The 5 year and 100 year flows are contained within the street at this location in accordance with the County's street flow criteria. Drainage Basin D9 (0.85 acres) drains west on the south side of Hunter Jumper Drive. Developed flows of Q_5 = 1.9 cfs and Q_{100} = 3.8 cfs are contained in the south curb of Hunter Jumper Drive. No storm drain facilities were constructed as part of Filing No. 1. The runoff was directed to a temporary silt basin southwest of the Filing No. 1 site (Tract CC) and then to the Constitution Avenue drainageway, south of the site. Permanent water quality facilities will be provided for the initial 45 lots by a sand filter basin to be constructed in Phase 2 at the location of the temporary silt basin. Temporary swales leading from the westerly end of Phase 1 Hunter Jumper Drive curb currently direct the flows southwest to the temporary silt basin.

If this is not done yet, it needs to be.

32 AKers Drain Memo

recently constructed?

Phase 2 – Hannah Ridge at Feathergrass Filing No. 2 was platted with 39 residential lots. Both Hunter Jumper Drive and Winslow Park Drive were extended from Filing No. 1 to the west edge of Filing No. 2. Proposed Hannah Ridge Drive was constructed from Constitution Avenue north to Winslow Park Drive. Basin D7 (3.95 acres) contains the east edge of Filing No. 2 from Hunter Jumper Drive to Winslow Park Drive. The basin drains west to Hannah Ridge Drive and then south towards Hunter Jumper Drive with peak discharges of Q_5 = 8.9 cfs and Q_{100} = 17.8 cfs. Storm flows from developed Basins D1-D6, previously mentioned Design Point 15, travels west on the north side of Hunter Jumper Drive to the north east corner of Hannah Ridge Drive and Hunter Jumper Drive at Design Point 16, where they combine with Basin D7 flows. The combined discharges at DP 16 are Q_5 = 26.6 cfs and Q_{100} = 52.8 cfs. A 10' CDOT Type R Inlet collects a portion of the Basin D7 discharges from Hannah Ridge Drive at DP 16. This inlet collects 7.7 cfs during the 5-yr rainfall event and 11.7 cfs during the 100-yr. The remainder continues south in Hannah Ridge Drive to Basin D11. A second inlet at DP16, located on Hunter Jumper Drive, collects a portion of the flows from Basins D1-D6. The 15' inlet collect 12.0 cfs / 16.8 cfs during the 5-yr and 100-yr events, respectively. The remainder turns south and travels south in Hannah Ridge Drive, joining bypass flows from Basin D7, to a low point in Hannah Ridge Drive (DP 17). Basin D11 (1.30 acres) drains west to Hannah Ridge Drive, joining the bypass flows from DP 16. A 15' sump inlet at the low point of DP 17 collects all the runoff on the east side of Hannah Ridge Drive for the 5-yr and 100-yr rainfall events. Basin D11 contains a permanent Sand Filter Water Quality Basin, treating runoff from Filing No. 1 and Filing No. 2.

existing?

The storm drain system conveys the flows from inlets to the proposed culvert crossing of Hannah Ridge Drive at Constitution Avenue (DP 28). The ultimate developed flow rates of the main drainageway at DP 28 is Q_5 = 428 cfs and Q_{100} = 991 cfs, which is passed under Hannah Ridge Drive in the proposed double 10'w x 6'h Concrete Box Culvert (CBC). Filing No. 2 included the construction of the Hannah Ridge Drive CBC which transitions to the existing drainage way channel upstream and downstream of the box. The channel improvements to the drainageway itself will be accomplished in later commercial phases of the Hannah Ridge development.

Drainage Basin D8 (3.06 acres) drains east to Hannah Ridge Drive and then south to Hunter Jumper Drive with peak discharges of Q_5 = 6.8 cfs and Q_{100} = 13.4 cfs. These flows continue south in Hannah Ridge Drive to the low point at DP 18. Basin D10 (0.37), located on the south side of Hunter Jumper Drive, drains east to Hannah Ridge Drive and then south in Hannah Ridge to the low point at DP18, joining flows from Basin D8. The combined peak discharges at DP 18 are Q_5 = 8.7 cfs and Q_{100} = 18.1 cfs. A 10' sump inlet collects all the flows from the 5-yr and 100-yr rainfall events and the storm drain system conveys the flows to the existing Hannah Ridge Drive CBC constructed with Phase 2.

west?

"

Basin B7, in Winslow Park Drive, accepts flows from the east end of the street which was constructed in Filing No. 1 and located in Basin B5. The ultimate developed condition will contribute developed flows to Winslow Park Drive from the north. However, in the interim condition, the street continues to accept undeveloped discharges from the north. The combined flows of B5 and B7 flow east in the street to a new 15' Type R Sump Inlet on the north side of the street being constructed with Phase 3. The runoff is directed to a new 90' RCP storm drain flowing south through existing Tract F being constructed with the Phase 3 improvements. Permanent water quality treatment for stormwater generated by these sub-basins Is being constructed in Phase 3.

where?

Basin E6 (1.80 acres) is located on the west side of Filing No. 2 and contains proposed Half Chaps Court. The basin drains south to the cul-de-sac bulb where a 5' sump inlet collects all storm discharges of Q_5 = 4.5 cfs and Q_{100} = 9.0 cfs at DP 21. These flows will be piped to the new 90" RCP storm drain pipe to be constructed with Phase 3.

Phase 3 – The next 39 residential lots will be platted with this Hannah Ridge at Feathergrass Filing No. 3. Both Hunter Jumper Drive and Winslow Park Drive will be extended from Filing No. 2 to the west edge of Filing No. 3. Grand Prix Court and Horsemanship Court will be constructed north to south between Hunter Jumper and Winslow Park Drives. Basin B7 (0.72 acres), in Winslow Park Drive, accepts flows from the east end of the street which was constructed in Filing No. 1 and located in Basin B5. The ultimate developed condition will contribute developed flows to Winslow

where is WQCV?

Park Drive from the north. However, in the interim condition, the street will continue to accept undeveloped discharges from the north. The combined flows of B5 and B7 flow east in the street to a new 15' Type R Sump Inlet on the north side of the street (DP 7), located at the east edge of Filing No. 3. The collected runoff is directed to a new 90" RCP storm drain flowing south through existing Tract F which will be constructed with the Phase 3. The ultimate peak discharge at DP 7, including future developed discharges from the north side of Winslow Park Drive is Q_5 = 20.4 cfs and Q_{100} = 40.1 cfs. Basin B8 (0.14 acres), located on the south side of Winslow Park Drive, drains east to Basin E6 at existing Half Chaps Court with developed peak discharges of Q_5 = 0.5 cfs and Q_{100} = 1.0 cfs. These flows then travel south on the west side of Half Chaps Court to the cul-de-sac bulb where the existing 5' sump inlet constructed in Phase 2 will collect the total storm discharges of Q_5 = 4.5 cfs and Q_{100} = 9.0 cfs at DP 21. These flows will be piped to the new 90" RCP storm drain pipe to be constructed with Phase 3 in an extended 18" RC Pipe. The previously mentioned 90" RC Pipe will collect all the flows of the Tributary 6 on the north side of Winslow Park Drive (DP 14). The ultimate peak discharge entering the pipe are Q_5 = 360 cfs and Q_{100} = 640 cfs. These flows continue south in the pipe and are joined by other previously mentioned flows from DP 7 and DP 21.

Basin E2 (2.80 acres) contains the west edge of Filing No. 3 from Hunter Jumper Drive to Winslow Park Drive. The basin drains east to Grand Prix Court and then south towards Hunter Jumper Drive with peak discharges of Q_5 = 6.7 cfs and Q_{100} = 13.3 cfs. The flows travel east, across Grand Prix Court to join additional flows in Basin E3. Basin E3 (0.97 acres), located on the east side of Grand Prix Court, drains south to Hunter Jumper Drive. The basin generates runoff discharges of Q_5 = 2.5 cfs and Q_{100} = 5.0 cfs. These flows join the Basin E2 flows from the west. In the interim condition, undeveloped discharges from the east will also join these flows. However, the ultimate condition will combine developed discharges from Basins E1, E2 and E3 at DP 19 with peak discharges of Q_5 = 11.9 cfs and Q_{100} = 23.7 cfs. A portion of these flows will be collected in a new 15' Type R Inlet at the northeast corner of Grand Prix Court and Hunter Jumper Drive. This inlet collects 8.4 cfs during the 5-yr rainfall event and 11.9 cfs during the 100-yr. The remainder continues east in Hunter Jumper Drive to Basin E4. A proposed 24"/30" RC Pipe will convey these flows to the east and connect to the proposed 90" RC pipe. Any bypass flows will continue east in the street. Proposed Basin E4 (2.74 acres) contains the lots west of Horsemanship Court. This basin drains east to the street and then south to Hunter Jumper Drive with developed peak discharges of Q_5 = 6.7 cfs and Q_{100} = 13.3 cfs. The flows travel east, across Horsemanship Court to join additional flows in Basin E5. Basin E5 (0.90 acres) is located on the east side of Horsemanship Court. The basin drains south to the Hunter Jumper Drive with peak discharges of Q_5 = 2.3 cfs and Q_{100} = 4.7 cfs. These flows join the flows from Basins E1, E2, E3, and E4 and continue east to Basin E7. The combined discharges of Basins E1, E2, E3, E4, E5, E7 at DP 20 are Q_5 = 23.4 cfs and Q_{100} = 48.4 cfs. These flows are collected in a proposed 15' sump inlet on the north side of Hunter Jumper Drive. The collected flows are conveyed in a new 30' RC Pipe to the new 90" RCP storm drain pipe in Base E7. Basin E7 (2.33 acres) is located along the east side of Filing No. 3 and contains rear lots along proposed Horsemanship Court and existing Tract F. Tract F is an Open Space and Drainage tract which will contain the proposed 90" pipe and a permanent Sand Filter Basin, located just north of Hunter Jumper Drive. The basin drains south in Tract F with peak discharges of Q_5 = 3.3 cfs and Q_{100} = 8.1 cfs which enter the proposed Sand Filter Basin and then are collected in a proposed Type C inlet connecting to the new 30" RCP storm drain system in Hunter Jumper Drive. Basin E8 (0.65 acres) contains the south side of Hunter Jumper Drive. The basin drains east to a low point near Basin E7 with peak discharges of Q_5 = 1.8 cfs and Q_{100} = 3.6 cfs. A proposed sump 5' Type R inlet will collect the flows which are conveyed to the 30" RC Pipe in Hunter Jumper Drive and then to the proposed 90" RC Pipe.

how and how much?

The 2-year flows in the Hunter Jumper Drive storm drain system are extracted by a separate pipe and directed to the new Sand Filter Basin on the south side of the street in Tract BB. Any overflows in the sand filter basin are collected in an outlet box and redirected back to the 90" RC pipe. The 90" RC Pipe continues south towards the Constitution Avenue drainage ditch and will terminate at a concrete headwall with wingwalls. The existing 60" RC Pipe located along the north side of Constitution Avenue will be extended in order to connect to the same headwall. The combined main channel flows travel east to the existing Hannah Ridge Drive double box culvert and on to the east as described above.

Phases 4 through 8 – The detailed drainage information for Phases 4-8 residential development will be provided with updated drainage reports as they are platted.

4.3 Downstream Facilities

The existing 42"/60" RC pipe system along the north side of Constitution Avenue will be utilized for the connection of some of the proposed storm drain system in the multi-family Tracts AA and BB, which will undergo development in the future. Those tracts will have their own storm detention and water quality facilities. The hydraulic grade line will be maintained in a safe level as the County designed said system to capture developed flows from these areas as requested by the property owner.

The existing earthen channel along the north side of Constitution is adequate to carry existing and developed discharges to the existing culvert crossing of Constitution Avenue with a capacity of 2,316 cfs. The capacity of the existing double 12'x6' CBC at Constitution Avenue is adequate to carry the developed discharges from the site. The culvert has a capacity of 1,234 cfs with headwater up to the top of the concrete head wall. The calculated discharge at the culvert entrance is Q10 = 457 cfs and Q100 = 1076 cfs.

The existing drainage way downstream of Constitution Avenue was examined, considering three development conditions: Hannah Ridge Pre-Development with current upstream basin development, Hannah Ridge Phases 1 – 4 only and total Hannah Ridge build-out. The downstream drainage way consists of three distinct reaches from Constitution Avenue to the Confluence with the East Fork of Sand Creek. The channel downstream of Constitution (DP 8) to a point near the hypothetical extension of Palmer Park Boulevard (DP 6) is deep and narrow with steep side slopes. The channel from DP 6 to a future extension of River Walk Parkway (DP 7) contains a wide ponding area and sediment basin. Storm flows pass through the reach if the ponding area is filled. The downstream analysis considered no detention effects due to this reach. From DP 7 to the confluence with East Fork Sand Creek (DP 8a), the existing drainage way is wide and shallow with a less well defined flow path. This reach is an undeveloped open area and the existing characteristically wide flow path poses no dangers to structures or development. Discharge quantities were determined by modification of the Amended DBPS HEC-1 runs to reflect existing conditions with no Hannah Ridge development, development of only Phases 1 - 4 of Hannah Ridge, and Hannah Ridge fully developed. Hydrologic analyses for the downstream section is presented in the Appendix and the maps from the DBPS amendment, marked up with the existing flows are included in the map pocket.

Downstream Drainage Way Discharges			
Location	Hannah Ridge Pre - Development Q100 (cfs)	Hannah Ridge Phases 1 – 4 Only Q100 (cfs)	Hannah Ridge Phases 1 – 8 (Total) Q100 (cfs)
(8) Constitution Ave	856	876	1041
(6) Extension of Palmer Park Blvd	1004	1030	1261
(7) Extension of River Walk Pkwy	1151	1180	1433
(8a) Confl. w/ E. Fork Sand Creek	1497	1523	1869

provide Q5
flows also

A basic hydraulic analysis was performed on the downstream reach to determine the adequacy of the existing drainage way in the existing condition and with Hannah Ridge development. Channel cross sections were taken with the use of recent existing topographic mapping obtained from Merrick & Co. as used in their design of the proposed Wilshire Channel. Results indicate that the downstream drainage way is adequate to deliver the existing and Hannah Ridge developed flow safely to East fork Sand Creek. The Hannah Ridge development will present no adverse effects on the existing downstream reach as the effects on the hydraulic properties are are minimal and the existing drainage way is adequate to pass the developed flows. The construction of Phase 1, by itself, creates negligible downstream impacts. Calculations are attached in the Appendix of this report. Any mitigation for potential erosion and water quality effects of the Hannah Ridge will be addressed in the Final Plat and Final Drainage Report stage of the various phases of Hannah Ridge.

The proposed downstream Wilshire channel (by others) will have a capacity of at least 1,380 cfs, well above the calculated discharge of Q100 = 1076 cfs at the downstream end of the project. The downstream drainage system appears to have adequate capacity to carry the flows from the proposed project. The flows from the proposed project will be less than those planned for in the original DBPS due the change from Industrial to residential and commercial development and also due to the accounting for the natural detention provided on the upstream side of the railway embankment.

5 Opinion of Probable Cost for Drainage Facilities

The concrete box culverts and large diameter RC Pipe conveyance indicated by the drainage plan for the Tributary 6 main drainageway are not planned in the operative DBPS. However, these improvements are a functional substitute for the rip rap channel lining and check structure which are called for in the DBPS. Therefore, the cost of constructed drainage improvements for the Tributary 6 main drainageway are reimbursable up to the cost of the rip rap lining and check structures shown in the DBPS. These costs will generate credits which will be used to pay Drainage Fees due at the time of future subdivision platting in the Sand Creek basin.

The costs for the DBPS Authorized Improvements are estimated in the table below:

this subdivision

Hannah Ridge at Feathergrass DBPS Improvements Costs (Reimbursable)				
Item	**Quantity**	**Unit**	**Unit Cost**	**Cost**
Rip Rap Channel (20' BW, 4' H) L= 1350' (DBPS Sht. EF-23, EF-25)	6599	CY	$98	$646,702
Concrete Check for 20' BW channel Number = 2 (DBPS Sht. EF-23, EF-25)	6	CY	$312	$1,872
Rip Rap Channel (15' BW, 2' H) L= 840' (DBPS Sht. EF-23, EF-24)	2520	CY	$98	$246,960
Concrete Check for 15' BW channel Number = 1 (DBPS Sht. EF-24)	3	CY	$312	$936
Rip Rap Channel (30' BW, 4' H) L= 2430' (DBPS Sht. EF-21, EF-23)	14460	CY	$98	$1,417,080

Concrete Check for 30' BW channel Number = 3 (DBPS Sht. 21, 23)	12	CY	$312	$3,744
Rip Rap Channel (10' BW, 2' H) L= 660' (DBPS Sht. EF-22)	1613	CY	$98	$158,074
Concrete Check for 10' BW channel Number = 2 (DBPS Sht. EF-22)	4	CY	$312	$1,248
GRAND TOTAL				**$2,476,616**

Are these costs inflated?

As a component of the Tributary 6 main drainageway improvements, the proposed 90" storm drain system with associated end treatments is eligible to generate Drainage Credits up to the amount of improvements indicated in the DBPS. Costs for reimbursable drainage improvement items in Hannah Ridge Filing No. 3 are listed in the table below:

Hannah Ridge at Feathergrass Filing 3 Drainage Improvement Costs (Reimbursable)				
Item	**Quantity**	**Unit**	**Unit Cost**	**Cost**
Concrete Box Culvert (10x6)	59	LF	$480.00	$28,320
90" Reinforced Concrete Pipe	1000	LF	$383.00	$383,000
60' Reinforced Concrete Pipe	360	LF	$216.00	$77,760
End Treatment- Headwall	1	EA	$3,185.00	$3,185
End Treatment- Wingwall	4	EA	$2,740.00	$10,960
End Treatment - Cutoff Wall	1	EA	$300.00	$300
Rip Rap Channel, d50 Size 6"- 24"	882	CY	$98.00	$86,436
GRAND TOTAL				**$589,961**

Costs for the non-reimbursable drainage improvements for Hannah Ridge Filing No. 3 are listed in the table below:

Hannah Ridge at Feathergrass Filing 3 Drainage Costs (Non-Reimbursable)				
Item	**Quantity**	**Unit**	**Unit Cost**	**Cost**
18" Reinforced Concrete Pipe	223	LF	$69.00	$15,387
24" Reinforced Concrete Pipe	352	LF	$84.00	$29,568
30" Reinforced Concrete Pipe	90	LF	$94.00	$8,460
18" HDPE Pipe	122	LF	$58.00	$7,076
Flared End Section (FES) HDPE	1	EA	$205.00	$205
Curb Inlet (Type R) L=5', Depth<5'	1	EA	$3,791.00	$3,791
Curb Inlet (Type R) L =15', Depth<5'	2	EA	$7,923.00	$15,846
Curb Inlet (Type R) L =15', 5'-10' Depth	2	EA	$8,000.00	$16,000
Grated Inlet (Type C), < 5' deep	2	EA	$3,270.00	$6,540
Storm MH, Box Base, Depth < 15 feet	3	EA	$8,592.00	$8,592
Perm Water Quality Sand Filter Basin	1	EA	$18,000.00	$18,000
GRAND TOTAL				**$129,465.00**

6 Drainage and Bridge Fees

The site is located in the Sand Creek Major Drainage Basin. Development in this basin carries Drainage Fees of $16,270.00 per impervious acre and Bridge Fees of $4,929.00 per impervious acre. The Drainage and Bridge Fees for the subdivision are calculated below:

<u>**Hannah Ridge at Feathergrass Filing No. 3**</u>

<u>**Drainage Fees:**</u>

Drainage Fees = Platted Area x %imperviousness x $16,270.00

Drainage Fees = 8.31 Ac x 0.38 x $16,270.00 = **$51,377.41**

At least 0.53 (per ECM Appendix L). This filing is only lots and streets. (54.6 per pond calcs?)

These Drainage Fees will be paid by the Developer in the form of cash or credits which may be available at the time of recording of Hannah Ridge Filing No. 3.

<u>**Bridge Fees:**</u>

Bridge Fees = Platted Area x %imperviousness x $4,929.00

Bridge Fees = 8.31 Ac x 0.38 x $4,929.00 = **$15,564.80**

These Bridge Fees will be paid by the Developer at the recording of Hannah Ridge at Feathergrass

Filing No. 3.

7 Conclusion

This Final Drainage Report presents a drainage concept for the proposed subdivision. The subdivision development will function to route and convey the offsite and onsite storm runoff with the site grading and drainage facilities to be provided as part of the development. The proposed project with associated improvements will not, with respect to stormwater runoff, negatively impact the adjacent properties and downstream drainage facilities.

References

City of Colorado Springs/El Paso County Drainage Criteria Manual. City of Colorado Springs, Department of Public Works, Engineering Division; HDR Infrastructure, Inc.; El Paso County, Department of Public Works, Engineering Division (Colorado Springs: City of Colorado Springs, Revised November 1991).

Official Soil Series Descriptions. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture ("Available online at http://soils.usda.gov/technical/classification/osd/index.html", accessed May 18, 2013).

Web Soil Survey. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture ("Available online at http://websoilsurvey.nrcs.usda.gov/", accessed May 18, 2013).

Soil, Geology and Geologic Hazard Study, Hannah Ridge Filing No. 2, Constitution Avenue and Akers Drive, El Paso County, Colorado. Entech Engineering, Inc. (Colorado Springs, CO: , Rev. June 11, 2007).

Soil, Geology and Geologic Hazard Study, Hannah Ridge Filing No. 1, Constitution Avenue and Shawnee Drive, El Pso County, Colorado. Entech Engineering, Inc. (Colorado Springs, Coloraodo: , Rev June 13, 2005).

Drainage Area Identification Study. Muller Engineering Company, Inc. (Lakewood, CO: , 1986).

Sand Creek Drainage Basin Planning Study, Preliminary Design Report. Kiowa Engineering Corporation Inc. (Colorado Springs, Colorado: , March 1996).

Hydrology Analysis, East Fork Sand Creek, Tributary 6, El Paso County, Colorado. Kiowa Engineering Corporation (Colorado Springs Colorado: , January 18, 2007).

Letter of Map Revision Case No. 08-08-0630P. Federal Emergency Management Agency (Washington D.C.: FEMA, September 24, 2008).

Letter of Map Revision, Case No. 03-08-0619P. Federal Emergency Management Agency (Washington D.C.: FEMA, November 24, 2003).

Flood Insurance Rate Map. Federal Emergency Management Agency, National Flood Insurance Program (Washington D.C.: FEMA, March 17, 1997).

Flood Insurance Study for El Paso County, Colorado and incorporated Areas. Federal Emergency Management Agency (Washington D.C.: FEMA, March 17, 1997).

Constitution Avenue at Akers Drive Box Culvert Extension. M.V.E., Inc. (Colorado Springs, Colorado: , August 15, 2011).

Final Drainage Report for Hannah Ridge at Feathergrass Filing No. 2. M.V.E., Inc. (Colorado

Springs, CO: , September 21, 2015).

Hannah Ridge Master Drainage Development Plan. M.V.E., Inc. (El Paso County, Colorado: , November 15, 2007).

NCSS Web Soil Survey. United States Department of Agriculture, Natural Resources Conservation Service ("http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx", accessed May 1, 2008).

Hannah Ridge Phases 1 through 3 Preliminary Drainage Report. M.V.E., Inc. (El Paso County, Colorado: , November 15, 2007).

Final Drainage Report Hannah Ridge at Feathergrass Filing No. 1. M.V.E., Inc. (Colorado Springs, CO: , January 31, 2014).

HEC-1 Flood Hydrograph Package. U.S. Army Corps of Engineers Hydrologic Engineering Center (Davis, California: , Version 4.1 June 1998).

Aerial Topographic Mapping & Ground Survey Data. M.V.E., Inc. (Colorado Springs, Colorado: , December 23, 2004).

FIMS Topographic Mapping. Colorado Springs Utilities Facilities Information Management System (Colorado Springs, Colorado: , 1989).

Elsmere and Falcon NW Quadrangles, 7.5 Minute Series Topographic Map. U.S. Geological Survey (Reston, Virginia: , 1961, Revised 1994).

HEC-RAS River Analysis System Computer Modeling Software. U.S. Army Corps of Engineers Hydrologic Engineering Center (Davis, California: , Version 4.1.0 January 2010).

HY-8. Federal Highway Administration; Aquaveo, LLC & Environmental Modeling Research Laboratory (Washington D.C.: , Version 7.2 July 20, 2009).

Autodesk Storm and Sanitary Analysis Computer Program. Autodesk, Inc. (: , 2012).

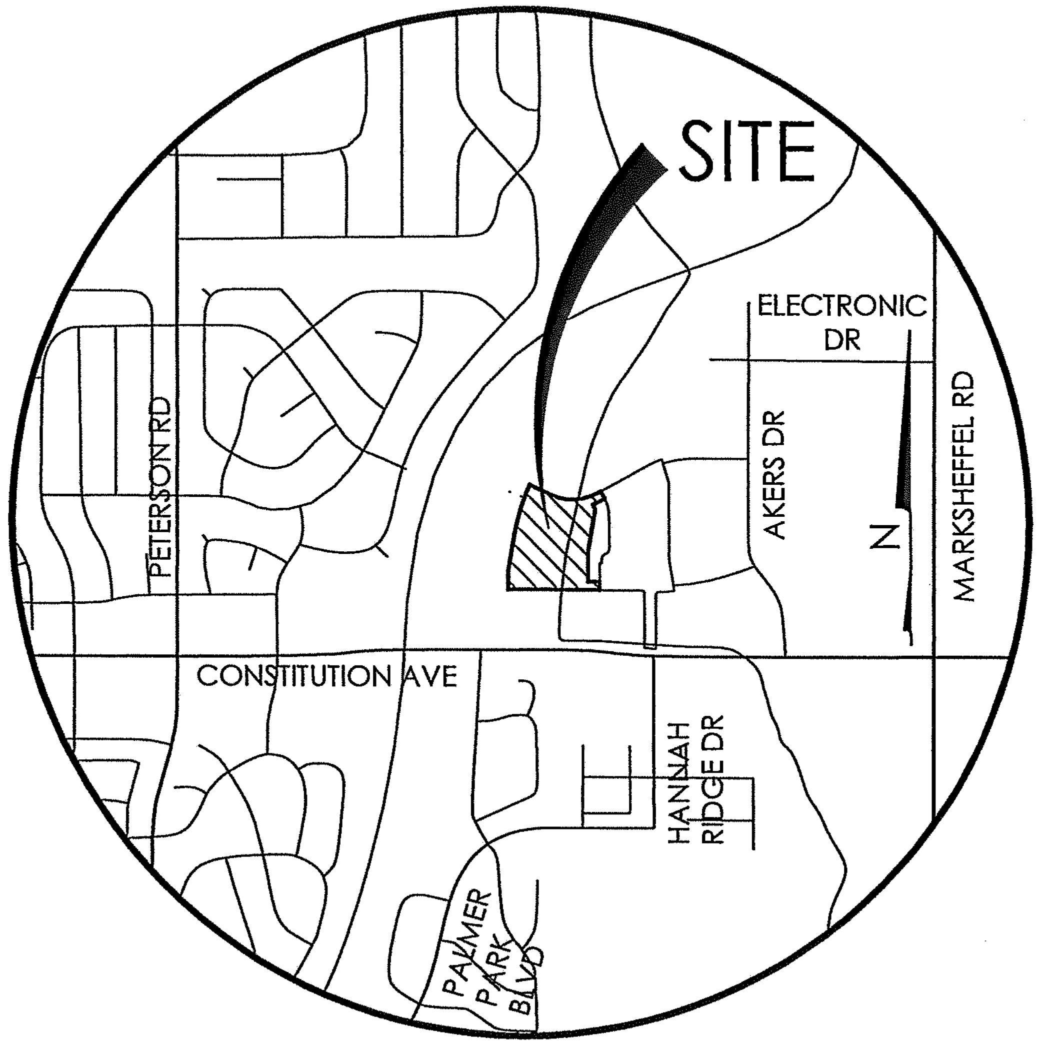
Detention Design Spreadsheet. Urban Drainage and Flood Control District ("http://www.udfcd.org/downloads/software/UD-Detention_v2.2.xls", accessed January 2010).

Akers Drive Design Drainage Memo. M.V.E., Inc. (Colorado Springs, CO: , 2006).

Appendices

8 General Maps and Supporting Data

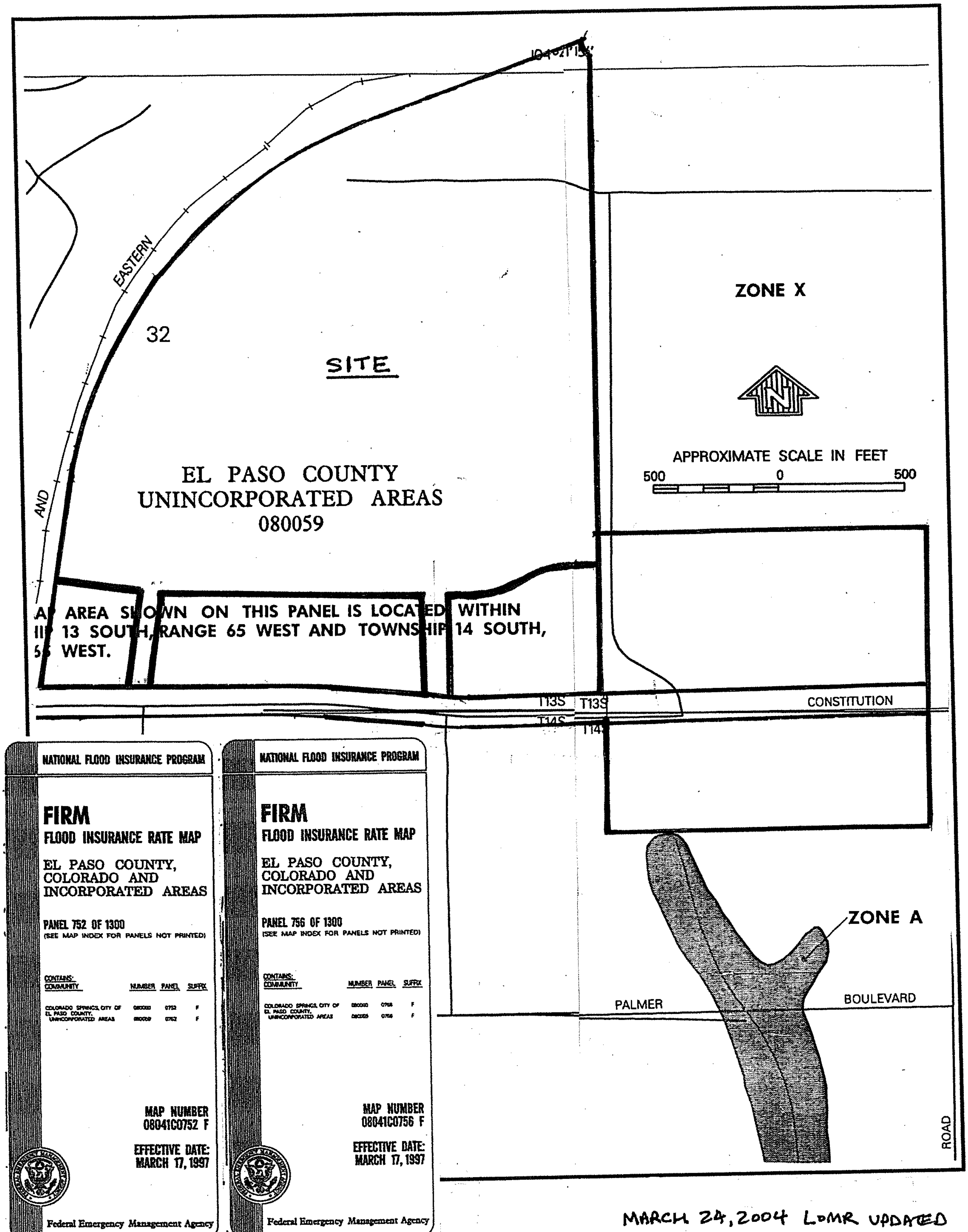
Vicinity Map
Portions of Flood Insurance Rate Map and LOMR Maps
Portion of Drainage Area Identification Study Map
Portion of Exhibit 1 of 1996 Sand Creek Drainage Planning Study
Hydrologic Soil Group Mapping
1996 Sand Creek Drainage Planning Study Preliminary Design Plan



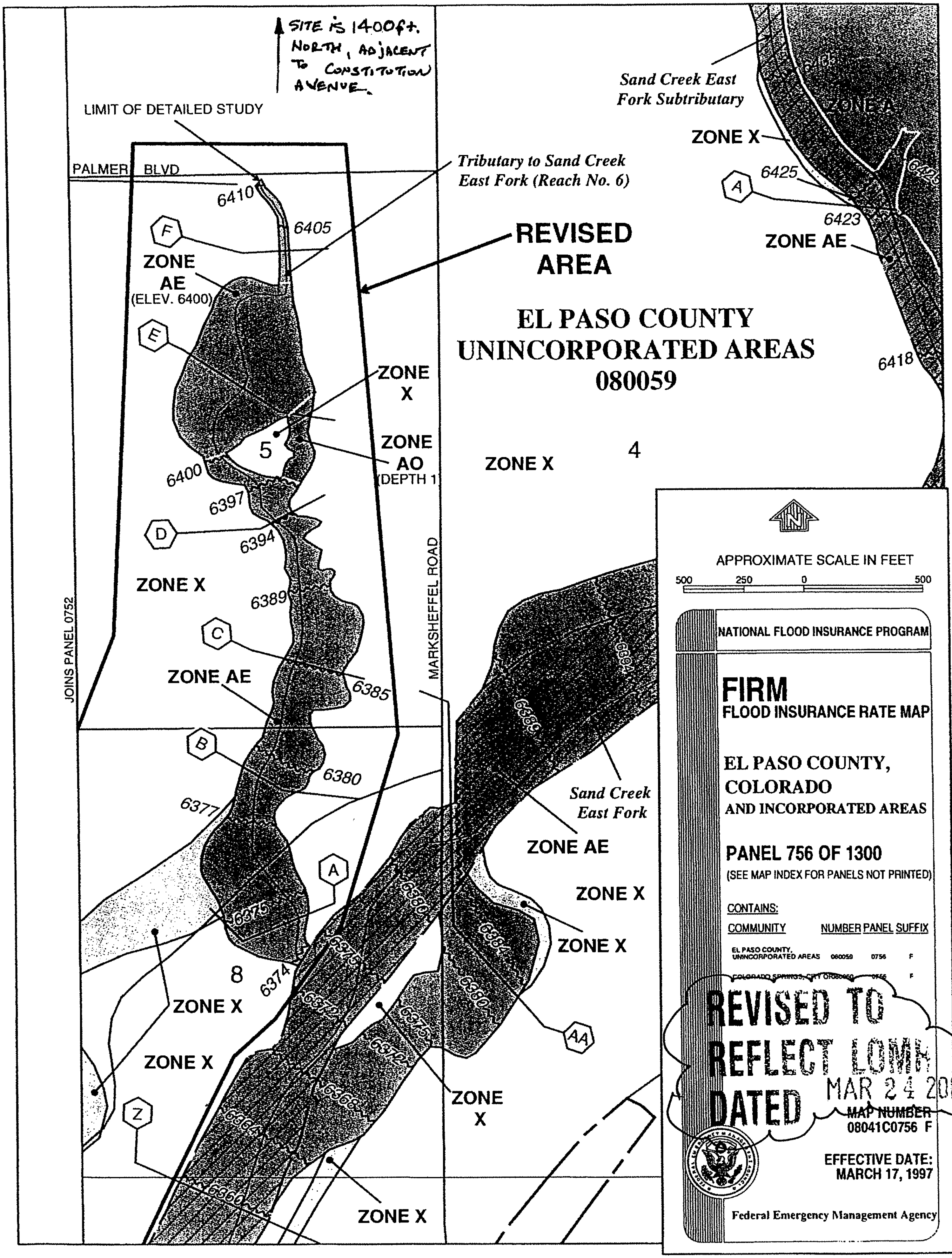
VICINITY MAP

NTS

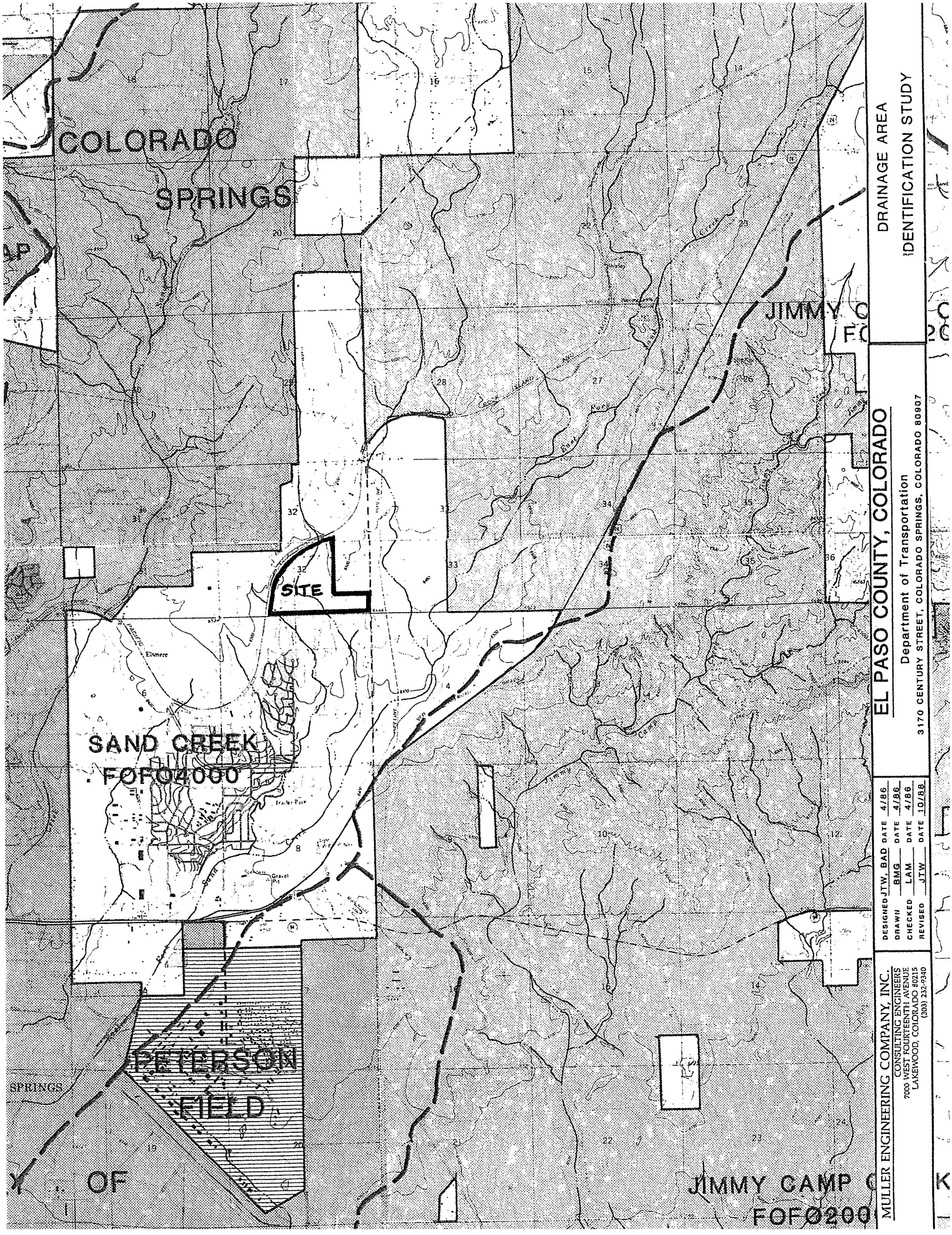
Z:\60970_Base Dwg\60970-PPVicinity-F3.dwg, 5/1/17 3:54:01 AM, DRG



MARCH 24, 2004 LOMR UPDATED ZONE A HAZARD AREA SHOWN ON THIS MAP.



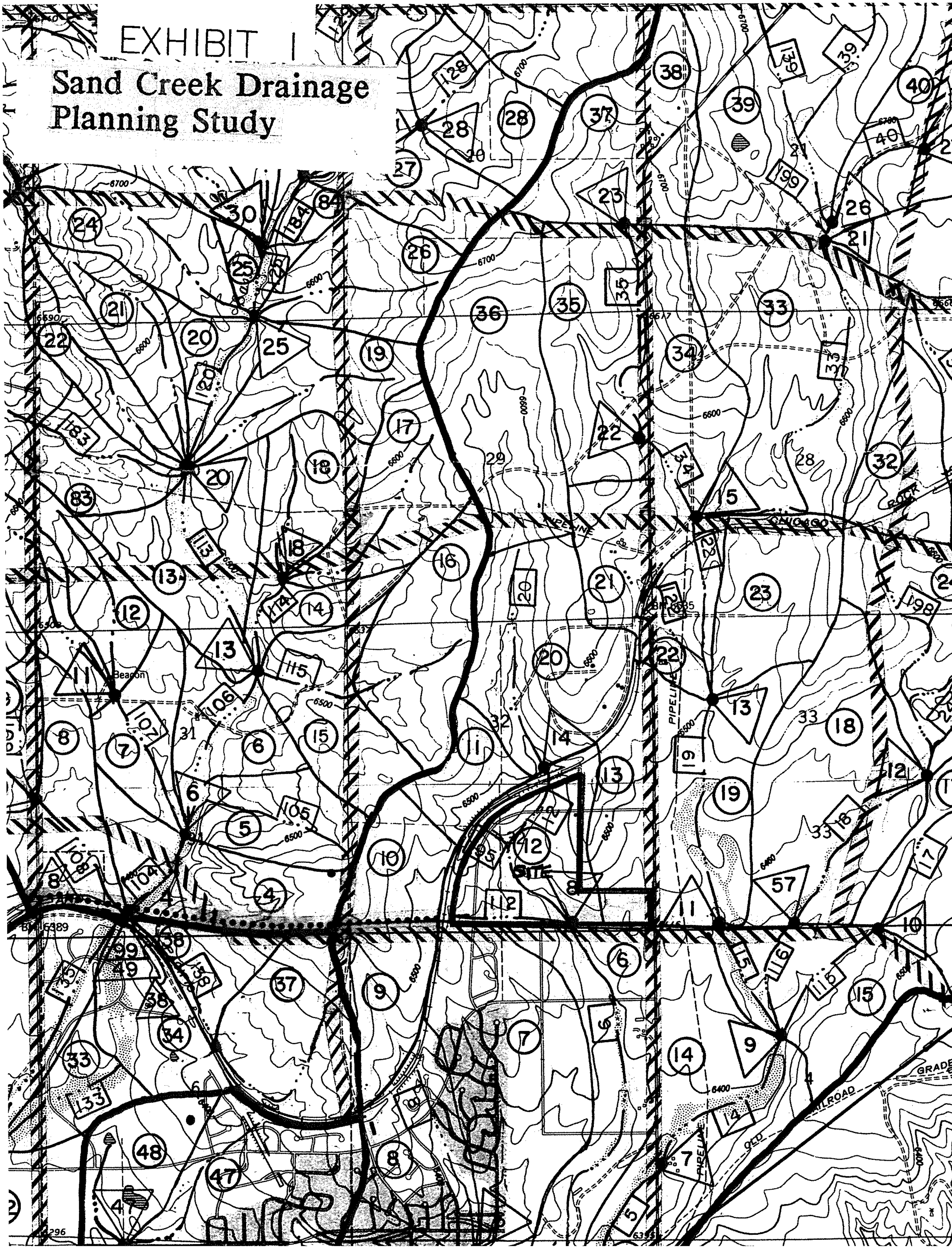
SITE IS 1400 ft. NORTH, ADJACENT TO CONSTITUTION AVENUE
LIMIT OF DETAILED STUDY
PALMER BLVD
Tributary to Sand Creek East Fork (Reach No. 6)
Sand Creek East Fork Subtributary
ZONE A
ZONE X
ZONE AE
REVISED AREA
ZONE AE (ELEV. 6400)
EL PASO COUNTY UNINCORPORATED AREAS 080059
ZONE X
ZONE AO (DEPTH 1)
MARKSHEFFEL ROAD
JOINS PANEL 0752
Sand Creek East Fork
ZONE AE
ZONE X
APPROXIMATE SCALE IN FEET
500 250 0 500
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS
PANEL 756 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
EL PASO COUNTY, UNINCORPORATED AREAS 080059 0756 F
REVISED TO REFLECT LOMR DATED MAR 24 2004
MAP NUMBER 08041C0756 F
EFFECTIVE DATE: MARCH 17, 1997
Federal Emergency Management Agency



COLORADO
SPRINGS
SITE
SAND CREEK
FOFO4000
JIMMY CAMP CREEK
FOFO200
PETERSON
FIELD
OF
SPRINGS
Elsmere
Gravel Pit
DRAINAGE AREA
IDENTIFICATION STUDY
EL PASO COUNTY, COLORADO
Department of Transportation
3170 CENTURY STREET, COLORADO SPRINGS, COLORADO 80907
DESIGNED JTW, BAD DATE 4/86
DRAWN BMG DATE 4/86
CHECKED LAM DATE 4/86
REVISED JTW DATE 10/88
MULLER ENGINEERING COMPANY, INC.
CONSULTING ENGINEERS
7000 WEST FOURTEENTH AVENUE
LAKEWOOD, COLORADO 80215
(303) 232-9340

EXHIBIT 1

Sand Creek Drainage Planning Study



Hydrologic Soil Group—El Paso County Area, Colorado
(Hannah Ridge at Feathergrass)

Map Scale: 1:5,640 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 14, Sep 23, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 15, 2011—Jun 17, 2014

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	103.8	100.0%
Totals for Area of Interest			**103.8**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Map—El Paso County Area, Colorado
(Hannah Ridge at Feathergrass)

Map Scale: 1:5,640 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 250, 500, 1000, 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 14, Sep 23, 2016

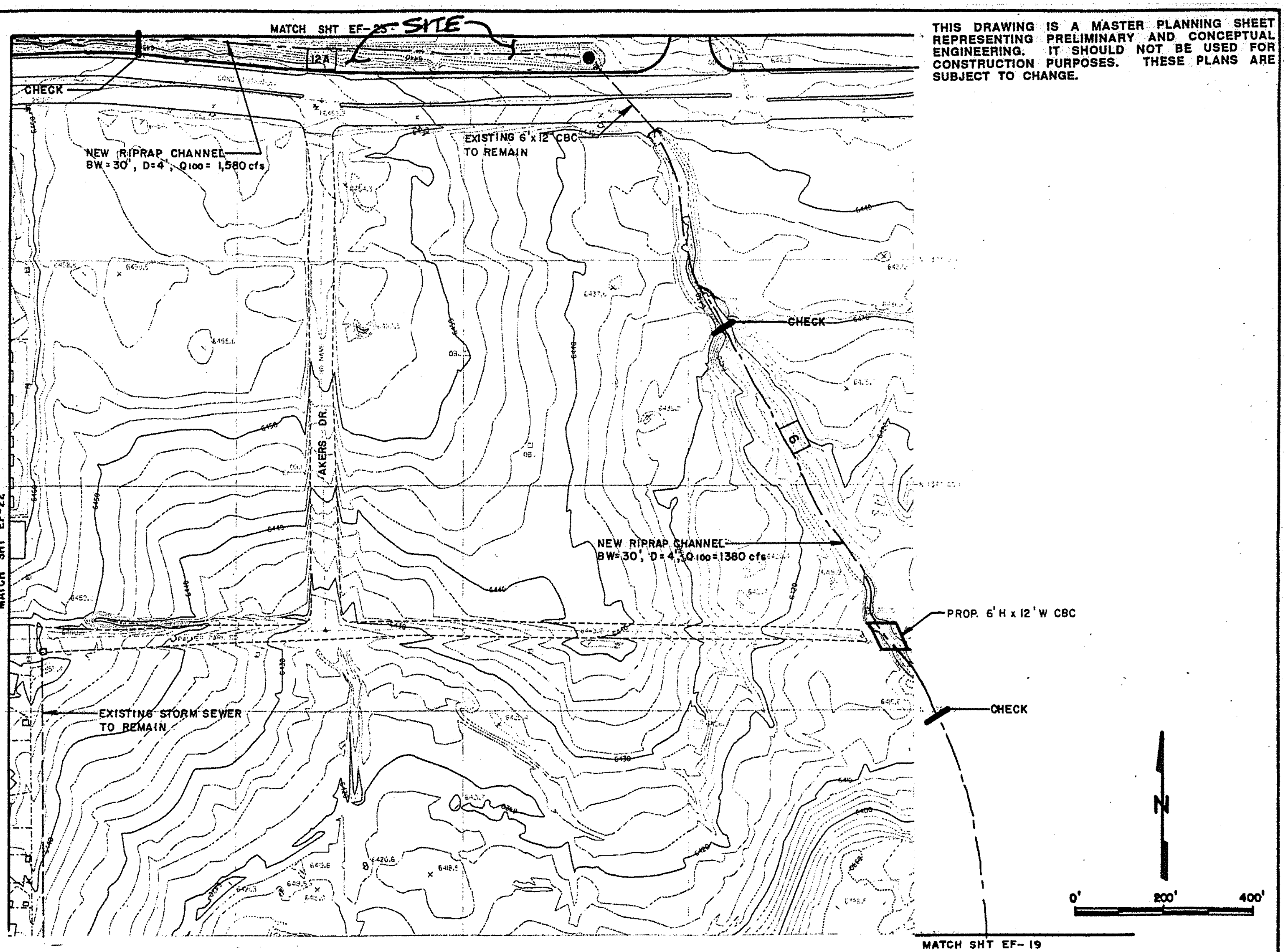
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 15, 2011—Jun 17, 2014

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.

Map Unit Legend

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
8	Blakeland loamy sand, 1 to 9 percent slopes	103.8	100.0%
Totals for Area of Interest		**103.8**	**100.0%**



THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRELIMINARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES. THESE PLANS ARE SUBJECT TO CHANGE.

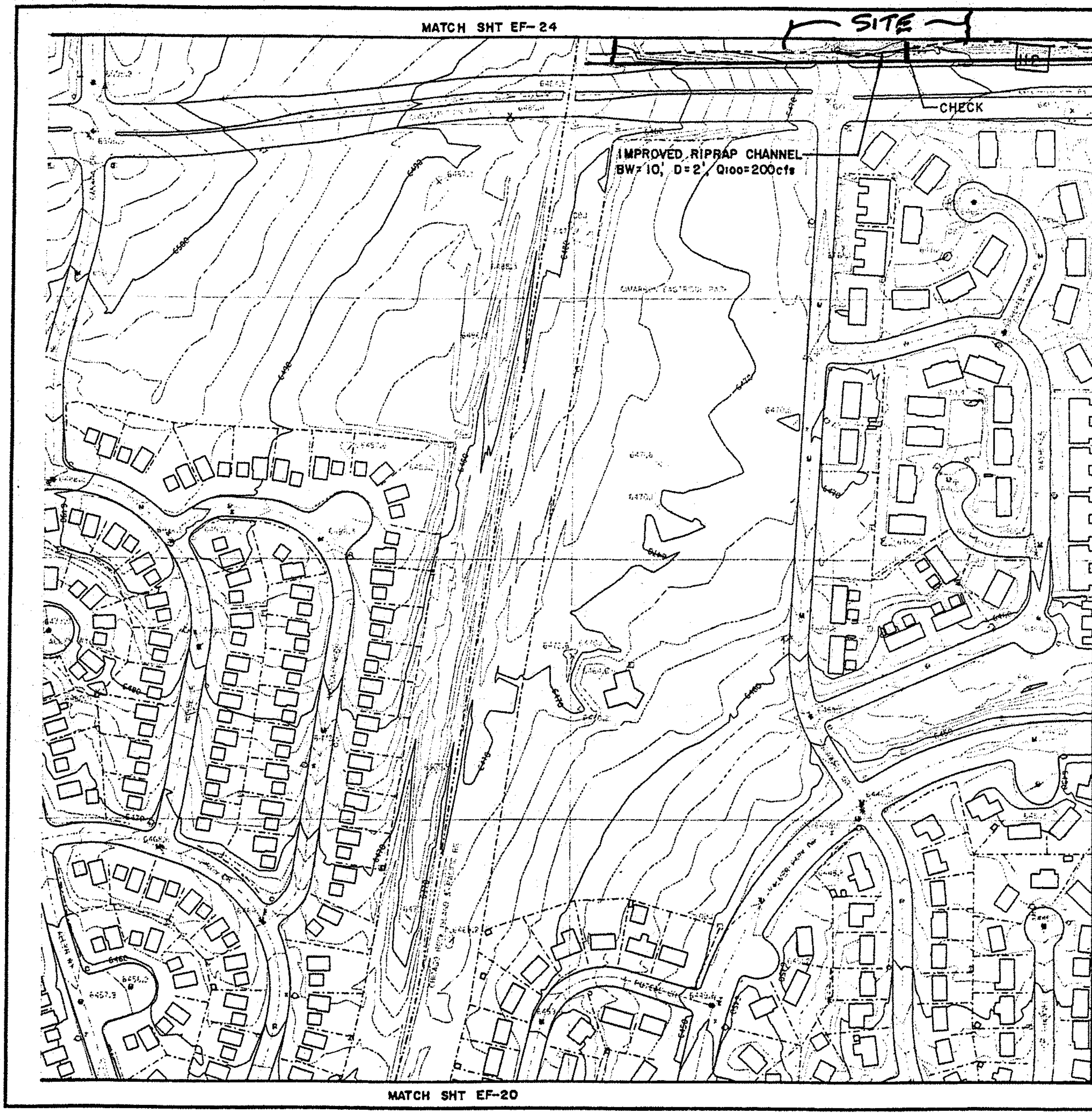
Kiowa Engineering Corporation
419 W. Bijou Street
Colorado Springs, Colorado
80905-1308

SAND CREEK DRAINAGE
BASIN PLANNING STUDY

PRELIMINARY DESIGN PLANS

Project No	
Date:	
Design:	
Drawn:	
Check.	
Revisions:	

EF-21



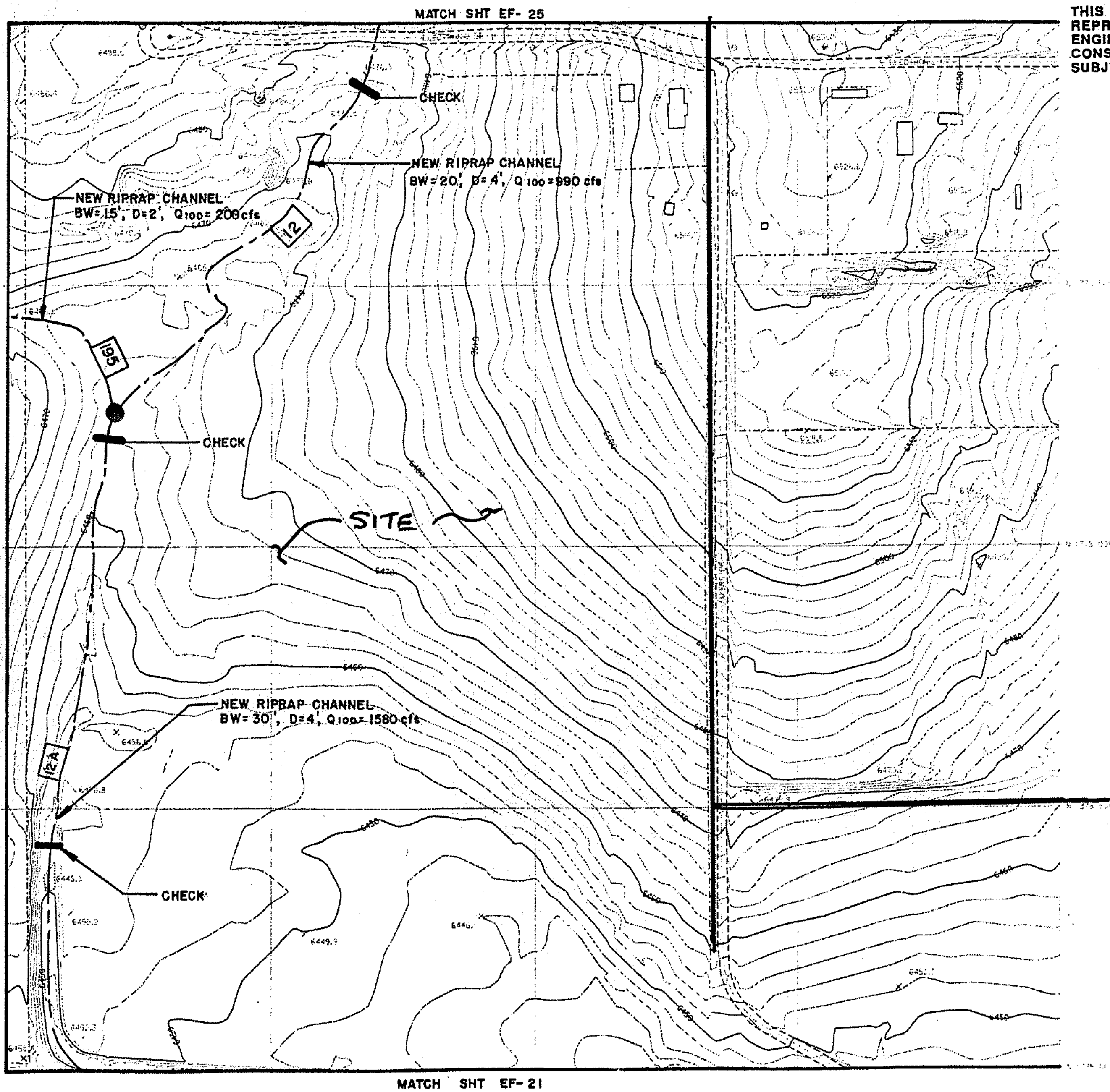
THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRELIMINARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES. THESE PLANS ARE SUBJECT TO CHANGE.

Kiowa Engineering Corporation
419 W. Bijou Street
Colorado Springs, Colorado
80905-1308

SAND CREEK DRAINAGE BASIN PLANNING STUDY
PRELIMINARY DESIGN PLANS

Project No	
Date:	
Design:	
Drawn:	
Check.	
Revisions:	

EF-22



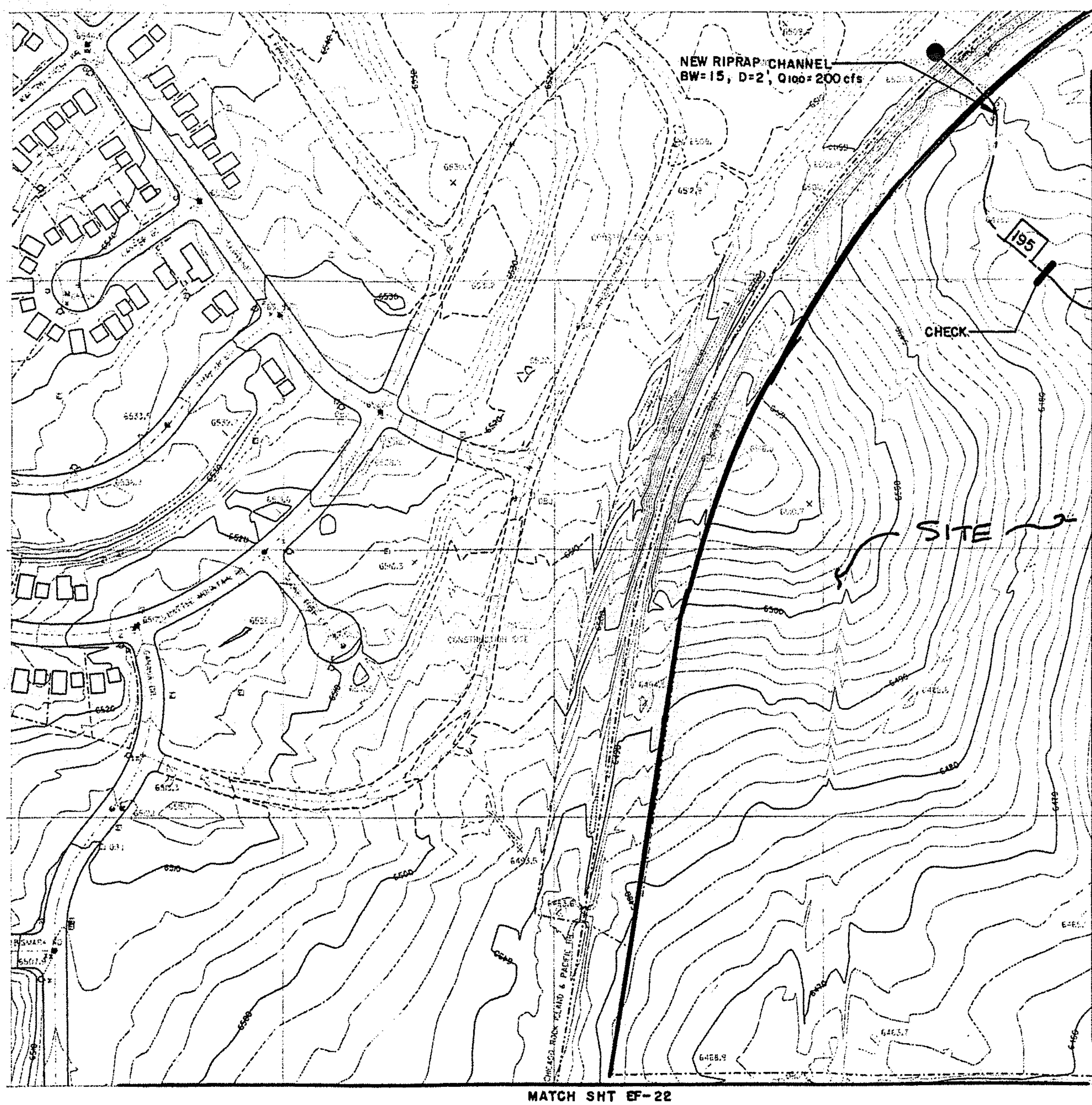
THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRELIMINARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES. THESE PLANS ARE SUBJECT TO CHANGE.

Kiowa Engineering Corporation
419 W. Bijou Street
Colorado Springs, Colorado
80905-1308

SAND CREEK DRAINAGE
BASIN PLANNING STUDY
PRELIMINARY DESIGN PLANS

Project No	
Date:	
Design:	
Drawn:	
Check.	
Revisions:	

EF-23



THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRELIMINARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES. THESE PLANS ARE SUBJECT TO CHANGE.

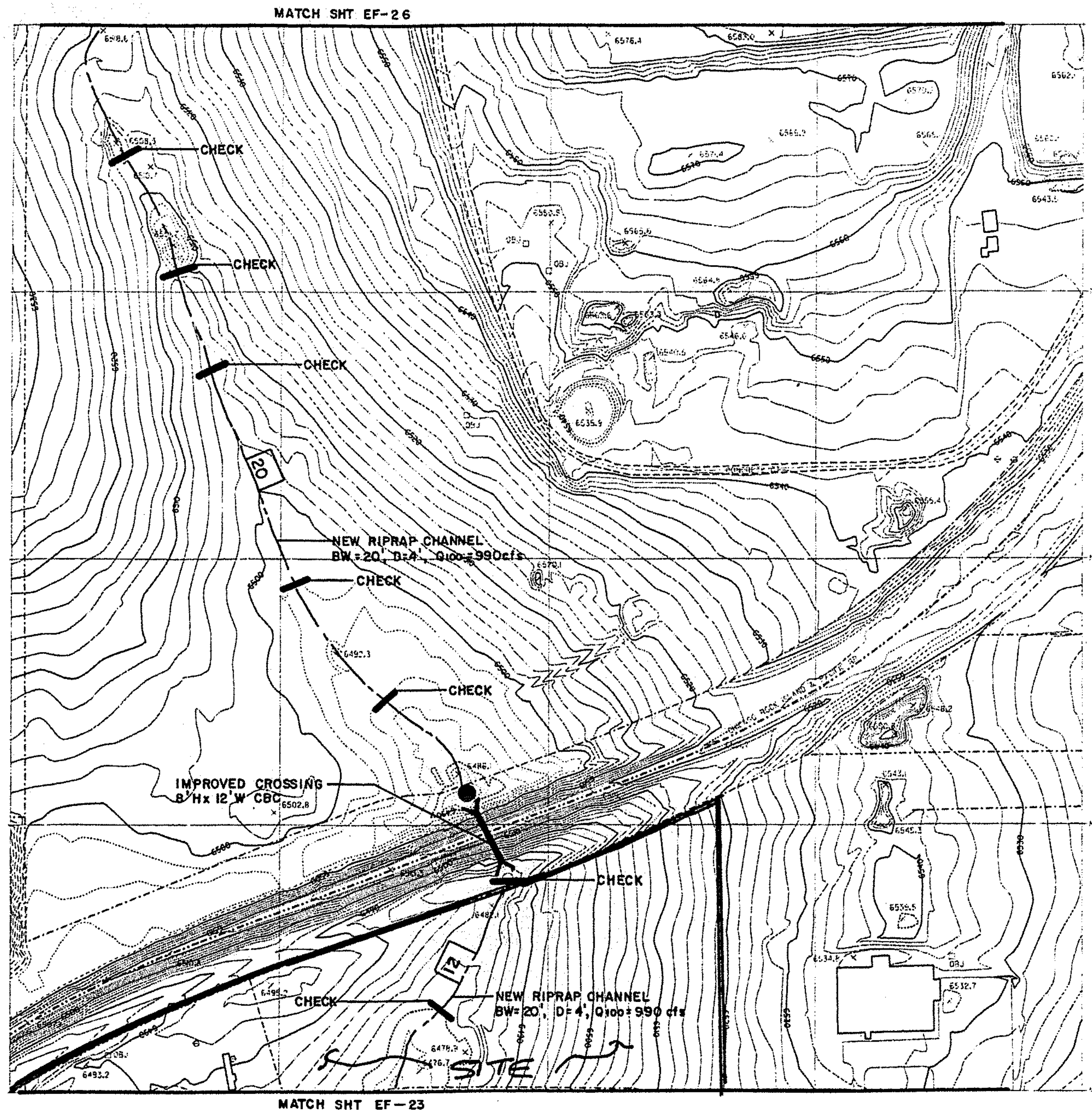
Kiowa Engineering Corporation
419 W. Bijou Street
Colorado Springs, Colorado
80905-1308

SAND CREEK DRAINAGE BASIN PLANNING STUDY

PRELIMINARY DESIGN PLANS

Project No	
Date:	
Design:	
Drawn:	
Check:	
Revisions:	

EF-24



THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRELIMINARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES. THESE PLANS ARE SUBJECT TO CHANGE.

Kiowa Engineering Corporation
419 W. Bijou Street
Colorado Springs, Colorado
80905-1308

SAND CREEK DRAINAGE BASIN PLANNING STUDY
PRELIMINARY DESIGN PLANS

Project No	
Date:	
Design:	
Drawn:	
Check:	
Revisions:	

EF-25

HYDROLOGIC ANALYSES

Hydrologic Analysis
Rational Method Local Drainage

M.V.E., Inc. 8/2/2013
Project No.: 60970
Project: Hannah Ridge at Feathergrass

Shouldn't this be type A?

ON-SITE RUNOFF COEFFICIENTS

Hydrologic Soil Group: B
Soil and Cover Condition: Fair

Existing Basin Conditions

Basin: OSA2

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	1.87	0.25	0.35
Gravel	0.07	0.80	0.85
Composite	1.94	0.27	0.37

Basin: OSA3

Surface Type	Area (Ac)	C_5	C_{100} / CN
Pavement and Roofs	0.23	0.90	0.95
Lawns	0.03	0.25	0.35
Composite	0.26	0.83	0.88

Basin: OSC1

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	3.34	0.25	0.35
Gravel	0.09	0.80	0.85
Composite	3.43	0.26	0.36

Basin: A4

Surface Type	Area (Ac)	C_5	C_{100} / CN
Industrial - Light	5.90	0.70	0.80
Range	32.20	0.25	0.35
Composite	38.10	0.32	0.42

Basin: OSA2-A4

Surface Type	Area (Ac)	C_5	C_{100} / CN
OSA2	1.94	0.27	0.37
OSA3	0.26	0.83	0.88
OSC1	3.43	0.26	0.36
A4	38.10	0.32	0.42
Composite	43.73	0.32	0.42

Basin: OSF2

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.50	0.60	0.70
Gravel	0.12	0.80	0.85
Range	4.26	0.25	0.35
Composite	4.88	0.30	0.40

Basin: OSF3

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	0.52	0.25	0.35
Composite	0.52	0.25	0.35

Basin: A7

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	30.20	0.25	0.35
Composite	30.20	0.25	0.35

Basin: OSB1

Surface Type	Area (Ac)	C_5	C_{100} / CN
Pavement and Roofs	0.57	0.90	0.95
Lawns	0.06	0.25	0.35
Composite	0.63	0.84	0.89

Basin: A9

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	33.60	0.25	0.35
Composite	33.60	0.25	0.35

Basin: OSA8

Surface Type	Area (Ac)	C_5	C_{100} / CN
Industrial - Light	16.20	0.70	0.80
Composite	16.20	0.70	0.80

Basin: A16

Surface Type	Area (Ac)	C_5	C_{100} / CN
Pavement and Roofs	1.38	0.90	0.95
Range	16.62	0.25	0.35
Composite	18.00	0.30	0.40

Basin: OSA11

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	0.37	0.25	0.35
Pavement and Roofs	3.34	0.90	0.95
Composite	3.71	0.84	0.89

Basin: OSA12

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	0.21	0.25	0.35
Pavement and Roofs	1.46	0.90	0.95
Composite	1.67	0.82	0.87

M.V.E., Inc. 8/10/2013
Project No.: 60970
Project: Hannah Ridge at Feathergrass - Final
'(Multi-Family & Commercial Parcels Undeveloped)

ON-SITE RUNOFF COEFFICIENTS

Hydrologic Soil Group: B
Soil and Cover Condition: Fair

Developed Basin Conditions

Basin: OSA2

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	1.87	0.25	0.35
Gravel	0.07	0.80	0.85
Composite	1.94	0.27	0.37

Basin: A1

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.83	0.60	0.70
Lawns	0.79	0.25	0.35
Composite	2.62	0.49	0.59

Basin: A2

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.03	0.60	0.70
Composite	1.03	0.60	0.70

Basin: OSA3

Surface Type	Area (Ac)	C_5	C_{100} / CN
Pavement and Roofs	0.23	0.90	0.95
Lawns	0.03	0.25	0.35
Composite	0.26	0.83	0.88

Basin: A3

Surface Type	Area (Ac)	C_5	C_{100} / CN
Pavement and Roofs	0.23	0.90	0.95
Lawns	0.07	0.25	0.35
Composite	0.30	0.75	0.81

Basin: A4

Surface Type	Area (Ac)	C_5	C_{100} / CN
Pavement and Roofs	0.13	0.90	0.95
Lawns	0.02	0.25	0.35
Composite	0.15	0.81	0.87

Basin: A5

Surface Type	Area (Ac)	C_5	C_{100} / CN
Pavement and Roofs	0.14	0.90	0.95
Lawns	0.05	0.25	0.35
Composite	0.19	0.73	0.79

Basin: A6

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.87	0.60	0.70
Range	3.07	0.25	0.35
Composite	3.94	0.33	0.43

Basin: B1

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	2.04	0.60	0.70
Lawns	0.48	0.25	0.35
Composite	2.52	0.53	0.63

Basin: B2

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.09	0.60	0.70
Composite	1.09	0.60	0.70

Basin: B3

Surface Type	Area (Ac)	C_5	C_{100} / CN
Pavement and Roofs	0.21	0.90	0.95
Lawns	0.12	0.25	0.35
Composite	0.33	0.66	0.73

Basin: B4

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	2.01	0.60	0.70
Composite	2.01	0.60	0.70

Basin: OSB1

Surface Type	Area (Ac)	C_5	C_{100} / CN
Pavement and Roofs	0.57	0.90	0.95
Lawns	0.06	0.25	0.35
Composite	0.63	0.84	0.89

Basin: B5

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.22	0.60	0.70
Pavement and Roofs	0.19	0.90	0.95
Lawns	0.11	0.25	0.35
Composite	0.52	0.64	0.72

Basin: B6

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.08	0.60	0.70
Composite	1.08	0.60	0.70

Basin: B7

Surface Type	Area (Ac)	C_5	C_{100} / CN
Pavement and Roofs	0.54	0.90	0.95
Lawns	0.18	0.25	0.35
Composite	0.72	0.74	0.80

Basin: B8

Surface Type	Area (Ac)	C_5	C_{100} / CN
Pavement and Roofs	0.11	0.90	0.95
Lawns	0.04	0.25	0.35
Composite	0.14	0.74	0.80

Basin: B9

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.60	0.60	0.70
Parks, golf courses, etc.	4.61	0.30	0.55
Composite	6.21	0.38	0.59

Basin: OSC1

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	3.34	0.25	0.35
Gravel	0.09	0.80	0.85
Composite	3.43	0.26	0.36

Basin: C1

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	5.13	0.60	0.70
Composite	5.13	0.60	0.70

Basin: C2

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.84	0.60	0.70
Composite	0.84	0.60	0.70

Basin: C3

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.02	0.60	0.70
Composite	1.02	0.60	0.70

Basin: C4

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.44	0.60	0.70
Composite	1.44	0.60	0.70

Basin: C5

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	2.56	0.60	0.70
Composite	2.56	0.60	0.70

Basin: C6

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.73	0.60	0.70
Composite	0.73	0.60	0.70

Basin: C7

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.84	0.60	0.70
Composite	0.84	0.60	0.70

Basin: C8

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.71	0.60	0.70
Composite	0.71	0.60	0.70

Basin: C9

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	2.44	0.60	0.70
Composite	2.44	0.60	0.70

Basin: C10

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.80	0.60	0.70
Parks, golf courses, etc.	0.70	0.30	0.55
Composite	2.50	0.52	0.66

Basin: C11

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	2.15	0.60	0.70
Composite	2.15	0.60	0.70

Basin: C12

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.47	0.60	0.70
Composite	1.47	0.60	0.70

Basin: D1

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	2.07	0.60	0.70
Composite	2.07	0.60	0.70

Basin: D2

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.19	0.60	0.70
Composite	1.19	0.60	0.70

Basin: D3

Surface Type	Area (Ac)	C_5	C_{100} / CN
Pavement and Roofs	0.20	0.90	0.95
Lawns	0.06	0.25	0.35
Composite	0.26	0.75	0.81

Basin: D4

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	2.22	0.60	0.70
Composite	2.22	0.60	0.70

Basin: D5

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.24	0.60	0.70
Pavement and Roofs	0.24	0.90	0.95
Lawns	0.26	0.25	0.35
Composite	0.74	0.57	0.66

Basin: D6

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.31	0.60	0.70
Composite	1.31	0.60	0.70

Basin: D7

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	3.95	0.60	0.70
Composite	3.95	0.60	0.70

Basin: D8

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	3.06	0.60	0.70
Composite	3.06	0.60	0.70

Basin: D9

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	0.52	0.25	0.35
Pavement and Roofs	0.33	0.90	0.95
Composite	0.85	0.50	0.58

Basin: D10

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.37	0.60	0.70
Composite	0.37	0.60	0.70

Basin: D11

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	1.05	0.25	0.35
Pavement and Roofs	0.25	0.90	0.95
Composite	1.30	0.38	0.47

Basin: D12

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	0.20	0.25	0.35
Pavement and Roofs	0.32	0.90	0.95
Composite	0.52	0.65	0.72

Basin: E1

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.23	0.60	0.70
Composite	1.23	0.60	0.70

Basin: E2

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	2.80	0.60	0.70
Composite	2.80	0.60	0.70

Basin: E3

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.97	0.60	0.70
Composite	0.97	0.60	0.70

Basin: E4

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	2.74	0.60	0.70
Composite	2.74	0.60	0.70

Basin: E5

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.90	0.60	0.70
Composite	0.90	0.60	0.70

Basin: E6

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.80	0.60	0.70
Composite	1.80	0.60	0.70

Basin: E7

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.00	0.60	0.70
Parks, golf courses, etc.	1.33	0.30	0.55
Composite	2.33	0.43	0.61

Basin: E8

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.65	0.60	0.70
Composite	0.65	0.60	0.70

Basin: E9

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	8.63	0.25	0.35
Composite	8.63	0.25	0.35

Basin: OSF3

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	0.52	0.25	0.35
Composite	0.52	0.25	0.35

Basin: F1

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	2.41	0.60	0.70
Composite	2.41	0.60	0.70

Basin: F2

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	1.26	0.60	0.70
Composite	1.26	0.60	0.70

Basin: F3

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	3.21	0.60	0.70
Composite	3.21	0.60	0.70

Basin: F4

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.32	0.60	0.70
Composite	0.32	0.60	0.70

Basin: OSF2

Surface Type	Area (Ac)	C_5	C_{100} / CN
Residential - 1/8 Acre	0.50	0.60	0.70
Gravel	0.12	0.80	0.85
Range	4.26	0.25	0.35
Composite	4.88	0.30	0.40

Basin: F5

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	3.67	0.25	0.35
Composite	3.67	0.25	0.35

Basin: G1

Surface Type	Area (Ac)	C_5	C_{100} / CN
Range	6.18	0.25	0.35
Composite	6.18	0.25	0.35

Highlight or circle the areas of concern with this filing.

60970 Hannah Ridge at Feathergrass
August 12, 2013

Drainage Basin Percent Impervious Calculations - Mult-Family & Commercial Parcels Undeveloped

Componant % Impervious / Basin	0% Open Range (Ac)	0% Open Lawn (Ac)	80% Gravel Road (Ac)	95% Pavement & Roof (Ac)	65% 1/8 Ac Resid. (Ac)	75% Mult-Fam Resid. (Ac)	95% Commer. (Ac)	7% Park (Ac)	Total Acres (Ac)	Composite % Imp. (%)
OSA2	1.87		0.07						1.94	2.9%
A1		0.79			1.83				2.62	45.4%
A2					1.03				1.03	65.0%
OSA3		0.03		0.23					0.26	84.0%
A3		0.07		0.23					0.30	72.8%
A4		0.02		0.13					0.15	82.3%
A5		0.05		0.14					0.19	70.0%
A1-A5	0.00	0.96	0.00	0.73	2.86	0.00	0.00		4.55	56.1%
A6	3.07				0.87				3.94	14.4%
OSA2,A6	4.94	0.00	0.07	0.00	0.87	0.00	0.00		5.88	10.6%
B1		0.48			2.04				2.52	52.6%
B2					1.09				1.09	65.0%
B3		0.12		0.21					0.33	60.5%
B4					2.01				2.01	65.0%
OSB1		0.06		0.57					0.63	86.0%
B5		0.11		0.19	0.22				0.52	62.2%
B6					1.08				1.08	65.0%
B7		0.18		0.54					0.72	71.3%
B8		0.04		0.11					0.15	69.7%
B1-B8	0.00	0.99	0.00	1.62	6.44	0.00	0.00	0.00	9.05	63.3%
B9					1.60			4.61	6.21	21.9%
OSC1	3.34		0.09						3.43	2.1%
C1					5.13				5.13	65.0%
C2					0.84				0.84	65.0%
C3					1.02				1.02	65.0%
C4					1.44				1.44	65.0%
C5					2.56				2.56	65.0%
C6					0.73				0.73	65.0%
C7					0.84				0.84	65.0%
C8					0.71				0.71	65.0%
C9					2.44				2.44	65.0%
C10					1.80			0.70	2.50	48.8%
C11					2.15				2.15	65.0%
C12					1.47				1.47	65.0%
OSC1-C12	3.34	0.00	0.09	0.00	21.13	0.00	0.00	0.70	25.26	54.9%
D1					2.07				2.07	65.0%
D2					1.19				1.19	65.0%
D3		0.06		0.20					0.26	73.1%
D4					2.22				2.22	65.0%
D5		0.26		0.24	0.24				0.74	51.9%
D6					1.31				1.31	65.0%
D7					3.95				3.95	65.0%
D1-D7	0.00	0.32	0.00	0.44	10.98	0.00	0.00	0.00	11.74	64.4%
D8					3.06				3.06	65.0%
D9	0.52			0.33					0.85	36.9%
D10					0.37				0.37	65.0%
D11	1.05			0.25					1.30	18.3%
D1-D7, D9,D11	1.57	0.32	0.00	1.02	10.98	0.00	0.00	0.00	13.89	58.4%
D12	0.20			0.32					0.52	58.5%
D8,D10,D12	0.20	0.00	0.00	0.32	3.43	0.00	0.00	0.00	3.95	64.1%

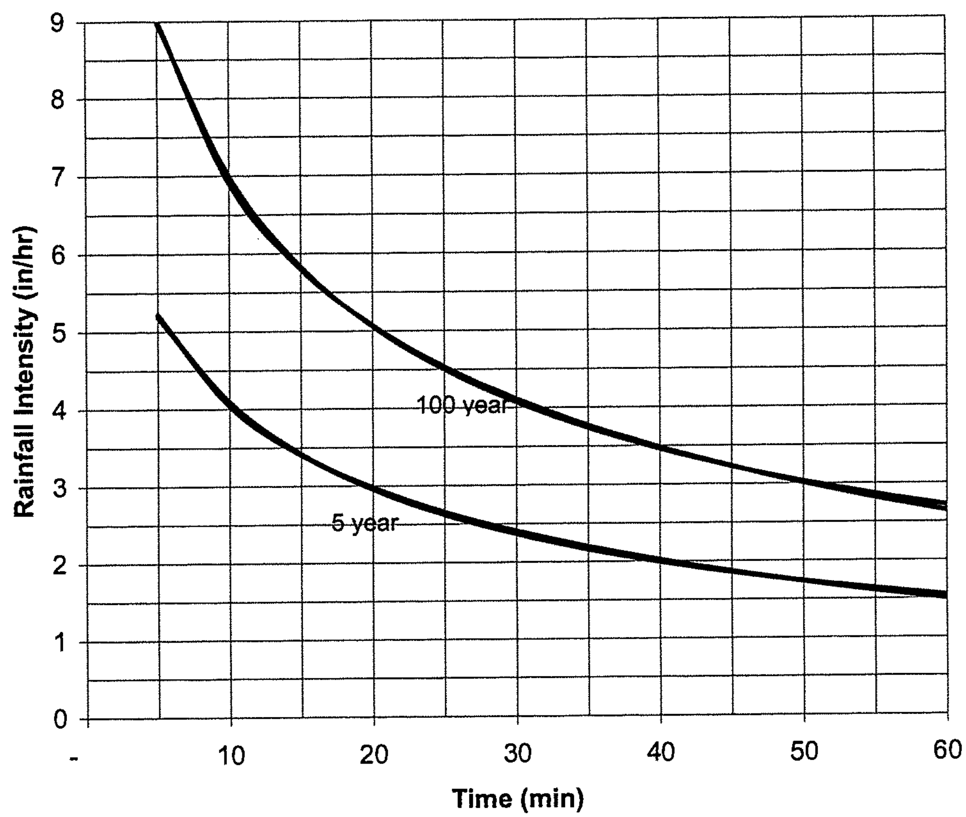
Basin	Open Range (Ac)	Open Lawn (Ac)	Gravel Road (Ac)	Pavement & Roof (Ac)	1/8 Ac Resid. (Ac)	Mult-Fam Resid. (Ac)	Commer. (Ac)	Park (Ac)	Total Acres (Ac)	Composite % Imp. (%)
D1-D12	1.77	0.32	0.00	1.34	14.41	0.00	0.00	0.00	17.84	59.6%
E1					1.23				1.23	65.0%
E2					2.80				2.80	65.0%
E3					0.97				0.97	65.0%
E4					2.74				2.74	65.0%
E5					0.90				0.90	65.0%
E1-E5	0.00	0.00	0.00	0.00	8.64	0.00	0.00	0.00	8.64	65.0%
E6					1.80				1.80	65.0%
E7		1.33			1.00				2.33	27.9%
E6-E7		1.33			2.80				4.13	44.1%
E8					0.65				0.65	65.0%
E1-E5,E8	0.00	0.00	0.00	0.00	9.29	0.00	0.00	0.00	9.29	65.0%
EI-E8	0.00	2.66	0.00	0.00	23.53	0.00	0.00	0.00	26.19	58.4%
E9	8.63								8.63	0.0%
E1-E9	8.63	2.66	0.00	0.00	23.53	0.00	0.00	0.00	34.82	43.9%
OSF3	0.52								0.52	0.0%
F1					2.41				2.41	65.0%
F2					1.26				1.26	65.0%
F3					3.21				3.21	65.0%
F4					0.32				0.32	65.0%
F5	3.67								3.67	0.0%
F1-F5	4.19	0.00	0.00	0.00	7.20	0.00	0.00	0.00	11.39	41.1%
G1	6.18								6.18	0.0%

RAINFALL INTENSITY ESTIMATES FROM TIME OF CONCENTRATION

Time of Cont. T_c (min)	From Graph: 5 Year Intensity i_5 (in/hr)	From Graph: 100 Year Intensity i_{100} (in/hr)	Calculated: 5 Year Intensity i_5 (in/hr)	Calculated: 100 Year Intensity i_{100} (in/hr)
5	5.21	9.00	5.19	8.97
10	4.04	6.90	4.09	6.99
15	3.40	5.80	3.41	5.83
20	2.97	5.07	2.96	5.05
25	2.65	4.53	2.62	4.49
30	2.40	4.11	2.36	4.07
35	2.19	3.77	2.16	3.73
40	2.02	3.48	1.99	3.45
45	1.86	3.23	1.85	3.22
50	1.73	3.01	1.73	3.03
55	1.61	2.81	1.63	2.86
60	1.50	2.64	1.54	2.71

$i = a\,(b + D)^{-n}$

		5 Year	100 Year
	a =	34	44.4
	b =	8	6
	n =	0.733	0.667
	D =	T_c	



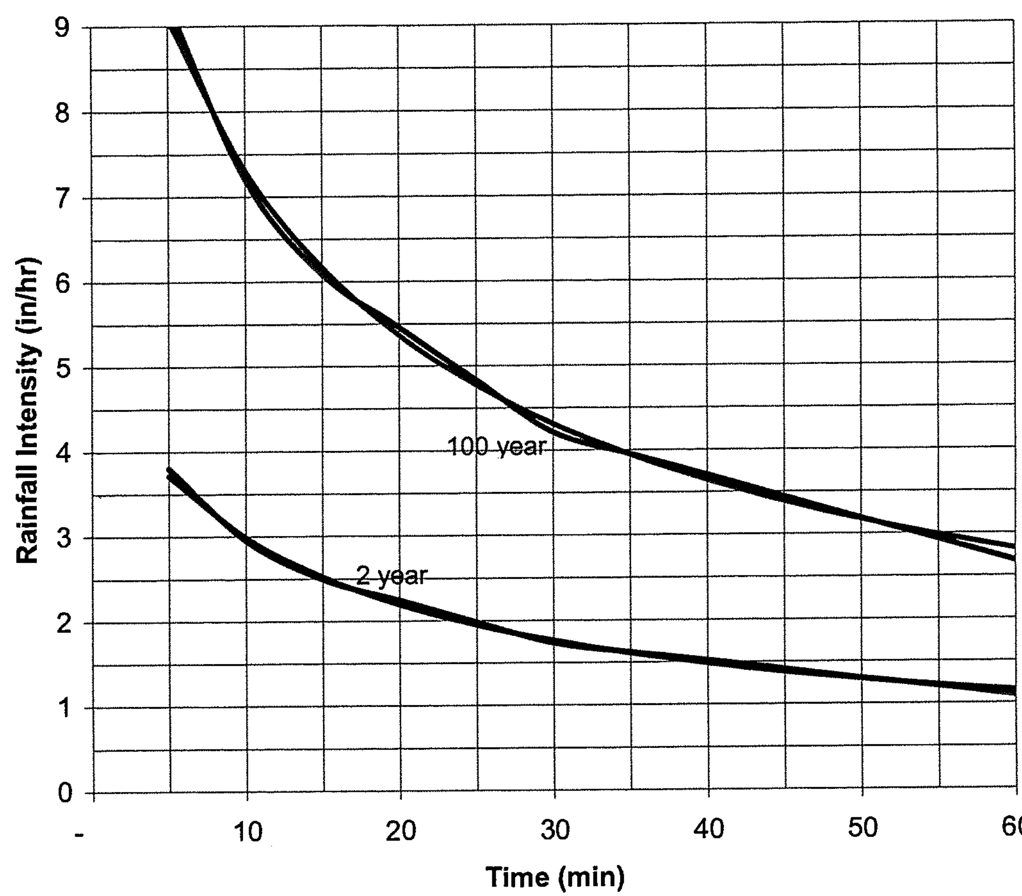
Interim Release October 12, 1994, Rainfall Intensity Curves
City of Colorado Springs Drainage Criteria Manual

RAINFALL INTENSITY ESTIMATES FROM TIME OF CONCENTRATION

Time of Cont. T_c (min)	From Table: 2 Year Intensity i_5 (in/hr)	From Table: 100 Year Intensity i_{100} (in/hr)	Calculated: 2 Year Intensity i_5 (in/hr)	Calculated: 100 Year Intensity i_{100} (in/hr)
5	3.80	9.28	3.71	9.09
10	2.95	7.20	2.98	7.30
15	2.49	6.08	2.52	6.16
20	2.24	5.46	2.19	5.37
25	1.98	4.83	1.95	4.77
30	1.73	4.21	1.76	4.31
35	1.62	3.95	1.61	3.94
40	1.52	3.70	1.49	3.64
45	1.41	3.44	1.38	3.38
50	1.30	3.18	1.29	3.17
55	1.20	2.93	1.22	2.98
60	1.09	2.67	1.15	2.82

$i = a*P1/(b + D)^n$

		2 Year	100 Year
	a =	26.65	26.65
	b =	10	10
	n =	0.76	0.76
	D =	T_c	



Updated Storm Intensity Curves Memo, November 18, 2002, Derived from
Rainfall Atlas III for Colorado
City of Colorado Springs Drainage Criteria Manual

Highlight or circle the areas of concern with this filing.

M.V.E., Inc. 8/2/2013
Project No.: 60970 Project: Hannah Ridge at Feathergrass

EXISTING CONDITIONS - CHANNEL CHARACTERISTICS

Channel Type	Channel #VALUE! Number	Surface Pipe or Curb Type	Dimensions			Manning Rough. n
Overland	0	–				–
Triangular	1	Weeds	Side Slope (H:V) = 3	Side Slope (H:V) = 3	Maximum Depth (ft) = 3	0.060
Trapezoidal	2	Weeds	Side Slopes (H:V) = 3	Base Width (ft) = 20	Maximum Depth (ft) = 5	0.060
Curb/Road	3	Type 3	Road Cross Slope = 2%	FL to Crown (ft) = 13		0.016
Circular	4	RCP	Diameter (in) = 48			0.013

EXISTING CONDITIONS - TIMES OF CONCENTRATION & DISCHARGES

Basin Label	Channel Type or Basin	Cont. Area A_c (Ac)	5 Year Coef. C_5	100 Yr Coef or Curve No C_{100} or CN	Manning Rough. n	Length L (ft)	Elevation Change (ft)	Average Slope S	Channel Flow* Q (cfs)	Flow Depth d (ft)	Flow Area A (ft^2)	Flow Velocity v (ft/s)	Time of Cont** T_c (min)	Total Time T_c (min)	5 Year Intensity i_5 (in/hr)	100 Year Intensity i_{100} (in/hr)	5 Year Discharge Q_5 (cfs)	100 Year Discharge Q_{100} (cfs)
OSA2	0	1.9	0.27	0.37	–	110	14	0.127	–	–	–	–	7.0	–	–	–	–	–
OSA2	1	1.9	0.27	0.37	0.060	350	23	0.066	5.72	0.77	1.76	3.24	1.8	8.8	4.29	7.35	2.2	5.2
OSA3	0	0.3	0.83	0.88	–	25	1	0.024	–	–	–	–	1.9	–	–	–	–	–
OSA3	3	0.3	0.83	0.88	0.016	265	5	0.020	2.06	0.20	0.79	2.60	1.7	5.0	5.19	8.97	1.1	2.1
OSC1	0	3.4	0.26	0.36	–	100	26	0.260	–	–	–	–	5.3	5.3	5.09	8.79	4.6	11.0
A4	0	38.1	0.32	0.42	–	800	46	0.058	–	–	–	–	23.2	–	–	–	–	–
A4	1	38.1	0.32	0.42	0.060	101	4	0.040	74.83	2.21	14.67	5.10	0.3	–	–	–	–	–
A4	2	38.1	0.32	0.42	0.060	400	6	0.015	74.83	1.10	25.51	2.93	2.3	25.8	2.58	4.42	31.4	70.7
OSA2-A4	A4	38.1	0.32	0.42	–	200	0	–	–	–	–	–	25.8	–	–	–	–	–
OSA2-A4	2	43.7	0.32	0.42	0.060	0	0	0.010	85.38	1.33	31.85	2.68	0.0	25.8	2.58	4.42	35.7	80.6
OSF2	0	4.9	0.30	0.40	–	290	13	0.045	–	–	–	–	15.5	–	–	–	–	–
OSF2	1	4.9	0.30	0.40	0.060	1,170	19	0.016	11.13	1.28	4.91	2.27	8.6	24.1	2.67	4.58	3.9	8.9
OSF3	0	0.5	0.25	0.35	–	50	16	0.320	–	–	–	–	3.6	5.0	5.19	8.97	0.7	1.6
OSF2+OSF3	OSF2	4.9	0.30	0.40	–	–	–	–	–	–	–	–	24.1	–	–	–	–	–
OSF2+OSF3	1	5.4	0.29	0.39	0.060	0	0	0.010	12.17	1.45	6.29	1.93	0.0	24.1	2.67	4.58	4.3	9.7
A7	0	30.2	0.25	0.35	–	563	37	0.066	–	–	–	–	20.3	–	–	–	–	–
A7	1	30.2	0.25	0.35	0.060	385	22	0.057	53.06	1.81	9.88	5.37	1.2	–	–	–	–	–
A7	2	30.2	0.25	0.35	0.060	934	10	0.011	53.06	0.99	22.73	2.33	6.7	28.1	2.45	4.22	18.5	44.6
OSB1	0	0.6	0.84	0.89	–	25	1	0.024	–	–	–	–	1.8	–	–	–	–	–
OSB1	3	0.6	0.84	0.89	0.016	670	11	0.016	5.06	0.28	1.67	3.03	3.7	5.5	5.04	8.70	2.7	4.9
A9	0	33.6	0.25	0.35	–	800	48	0.060	–	–	–	–	24.9	–	–	–	–	–
A9	1	33.6	0.25	0.35	0.060	273	16	0.059	52.98	1.80	9.77	5.42	0.8	–	–	–	–	–
A9	1	33.6	0.25	0.35	0.060	820	10	0.012	52.98	2.42	17.61	3.01	4.5	–	–	–	–	–
A9	2	33.6	0.25	0.35	0.060	250	2	0.008	52.98	1.08	24.99	2.12	2.0	32.2	2.27	3.91	19.0	45.9
OSB1+A9	A9	33.6	0.25	0.35	–	–	–	–	–	–	–	–	32.2	–	–	–	–	–
OSB1+A9	2	34.2	0.26	0.36	0.060	0	0	0.010	55.51	1.04	23.95	2.32	0.0	32.2	2.27	3.91	20.2	48.1
OSA8	0	16.2	0.70	0.80	–	665	20	0.030	–	–	–	–	13.4	–	–	–	–	–
OSA8	1	16.2	0.70	0.80	0.060	151	4	0.026	79.59	2.44	17.86	4.46	0.6	14.0	3.53	6.02	40.0	78.1
A16	0	18.0	0.30	0.40	–	650	14	0.022	–	–	–	–	29.6	–	–	–	–	–
A16	1	18.0	0.30	0.40	0.060	657	3	0.005	29.20	2.33	16.28	1.79	6.1	35.7	2.13	3.69	11.5	26.3
OSA8+A16	OSA8	16.2	0.70	0.80	–	–	–	–	–	–	–	–	14.0	–	–	–	–	–
OSA8+A16	1	34.2	0.49	0.59	0.060	620	14	0.022	123.36	2.98	26.71	4.62	2.2	–	–	–	–	–
OSA8+A16	1	34.2	0.49	0.59	0.060	500	3	0.005	123.36	3.93	46.37	2.66	3.1	19.3	3.01	5.14	50.3	103.3

M.V.E., Inc. 8/2/2013
Project No.: 60970 Project: Hannah Ridge at Feathergrass

EXISTING CONDITIONS - CHANNEL CHARACTERISTICS

Channel Type	Channel #VALUE! Number	Surface Pipe or Curb Type	Dimensions			Manning Rough. n
Overland	0	--				--
Triangular	1	Weeds	Side Slope (H:V) = 3	Side Slope (H:V) = 3	Maximum Depth (ft) = 3	0.060
Trapezoidal	2	Weeds	Side Slopes (H:V) = 3	Base Width (ft) = 20	Maximum Depth (ft) = 5	0.060
Curb/Road	3	Type 3	Road Cross Slope = 2%	FL to Crown (ft) = 13		0.016
Circular	4	RCP	Diameter (in) = 48			0.013

EXISTING CONDITIONS - TIMES OF CONCENTRATION & DISCHARGES

Basin Label	Channel Type or Basin	Cont. Area A_c (Ac)	5 Year Coef. C_5	100 Yr Coef or Curve No C_{100} or CN	Manning Rough. n	Length L (ft)	Elevation Change (ft)	Average Slope S	Channel Flow* Q (cfs)	Flow Depth d (ft)	Flow Area A (ft^2)	Flow Velocity v (ft/s)	Time of Cont** T_c (min)	Total Time T_c (min)	5 Year Intensity i_5 (in/hr)	100 Year Intensity i_{100} (in/hr)	5 Year Discharge Q_5 (cfs)	100 Year Discharge Q_{100} (cfs)
OSA11	0	3.7	0.84	0.89	--	300	11	0.037	--	--	--	--	5.6	--	--	--	--	--
OSA11	3	3.7	0.84	0.89	0.016	347	13	0.037	28.61	0.44	4.50	6.36	0.9	--	--	--	--	--
OSA11	3	3.7	0.84	0.89	0.016	268	3	0.011	28.61	0.55	7.09	4.04	1.1	7.6	4.54	7.78	14.1	25.7
OSA12	0	1.7	0.82	0.87	--	164	2	0.012	--	--	--	--	6.3	--	--	--	--	--
OSA12	3	1.7	0.82	0.87	0.016	1,015	5	0.005	12.15	0.47	5.07	2.40	7.1	13.4	3.60	6.15	4.9	9.0

*Estimated using an initial 100 year intensity based on the corresponding Overland Time of Concentration.
**Overland Time of Concentration, $T_c = 1.87\ (1.1 - C_5)\ L^{0.5}\ S^{-0.33}$
Channel Time of Concentration calculated using average flow velocities from Manning's formula.

M.V.E., Inc.
Project No.: 60970

8/10/2013
Project: Hannah Ridge at Feathergrass - Final
(Multi-Family & Commercial Parcels Undeveloped)

DEVELOPED CONDITIONS - CHANNEL CHARACTERISTICS

Channel Type	Channel Type Number	Surface Pipe or Curb Type	Dimensions			Manning Rough. n
Overland	0	--				--
Triangular	1	Weeds	Side Slope (H:V) = 3	Side Slope (H:V) = 3	Max Depth (ft) = 3	0.060
Trapezoidal	2	Weeds	Side Slopes (H:V) = 3	Base Width (ft) = 20	Max Depth (ft) = 5	0.060
Curb/Road	3	Type 3	Road Cross Slope = 2%	FL to Crown (ft) = 13		0.016
Circular	4	RCP	Diameter (in) = 48			0.013

DEVELOPED CONDITIONS - TIMES OF CONCENTRATION & DISCHARGES

Basin Label	Channel Type or Basin	Cont. Area A_c (Ac)	5 Year Coef. C_5	100 Yr Coef or Curve No C_{100} or CN	Manning Rough. n	Length L (ft)	Elev Change (ft)	Average Slope S	Channel Flow* Q (cfs)	Flow Depth d (ft)	Flow Area A (ft^2)	Flow Velocity v (ft/s)	Time of Cont** T_c (min)	Total Time T_c (min)	5 Year Intensity I_5 (in/hr)	100 Year Intensity I_{100} (in/hr)	5 Year Discharge Q_5 (cfs)	100 Year Discharge Q_{100} (cfs)
OSA2	0	1.9	0.27	0.37	--	110	14	0.127	--	--	--	--	7.0	--	--	--	--	--
OSA2	1	1.9	0.27	0.37	0.060	350	23	0.066	5.72	0.77	1.8	3.2	1.8	8.8	4.29	7.35	2.2	5.2
A1	0	2.6	0.49	0.59	--	70	1	0.020	--	--	--	--	7.5	--	--	--	--	--
A1	3	2.6	0.49	0.59	0.016	660	10	0.015	12.16	0.39	3.3	3.7	3.0	10.5	4.00	6.83	5.2	10.6
A2	0	1.0	0.60	0.70	--	60	1	0.020	--	--	--	--	5.8	--	--	--	--	--
A2	3	1.0	0.60	0.70	0.016	660	10	0.015	6.18	0.30	2.0	3.1	3.6	9.3	4.20	7.19	2.6	5.2
A1+A2	A1	2.6	0.49	0.59	--	--	--	--	--	--	--	--	10.5	--	--	--	--	--
A1+A2	3	3.7	0.52	0.62	0.016	1	0	0.010	17.80	0.48	5.2	3.4	0.0	10.6	4.00	6.83	7.6	15.6
OSA3	0	0.3	0.83	0.88	--	25	1	0.024	--	--	--	--	1.9	--	--	--	--	--
OSA3	3	0.3	0.83	0.88	0.016	265	5	0.020	2.06	0.20	0.8	2.6	1.7	5.0	5.19	8.97	1.1	2.1
A3	0	0.3	0.75	0.81	--	40	1	0.020	--	--	--	--	3.3	--	--	--	--	--
A3	3	0.3	0.75	0.81	0.016	375	22	0.059	2.19	0.17	0.5	4.0	1.6	5.0	5.19	8.97	1.2	2.2
OSA3+A3	OSA3	0.3	0.83	0.88	--	--	--	--	--	--	--	--	5.0	--	--	--	--	--
OSA3+A3	3	0.6	0.78	0.84	0.016	420	25	0.059	4.25	0.21	0.9	4.7	1.5	6.5	4.79	8.24	2.1	3.9
A1+A2+OSA3+A3	A1+A2	3.7	0.52	0.62	--	--	--	--	--	--	--	--	10.6	--	--	--	--	--
A1+A2+OSA3+A3	3	4.2	0.56	0.65	0.016	0	0	0.025	21.48	0.43	4.2	5.1	0.0	10.6	4.00	6.83	9.4	18.8
A4	0	0.2	0.81	0.87	--	36	1	0.022	--	--	--	--	2.5	--	--	--	--	--
A4	3	0.2	0.81	0.87	0.016	135	3	0.022	1.17	0.16	0.5	2.4	0.9	5.0	5.19	8.97	0.6	1.2
A1+A2+OSA3+A3+A4	A1+A2+OSA3+A3	4.2	0.56	0.65	--	--	--	--	--	--	--	--	10.6	--	--	--	--	--
A1+A2+OSA3+A3+A4	3	4.4	0.57	0.68	0.016	170	4	0.022	22.50	0.45	4.6	4.9	0.6	11.1	3.91	6.68	9.7	19.2
A5	0	0.2	0.73	0.79	--	36	1	0.022	--	--	--	--	3.2	--	--	--	--	--
A5	3	0.2	0.73	0.79	0.016	135	3	0.022	1.35	0.17	0.6	2.5	0.9	5.0	5.19	8.97	0.7	1.3
A6	0	3.9	0.33	0.43	--	235	13	0.055	--	--	--	--	12.6	--	--	--	--	--
A6	2	3.9	0.33	0.43	0.060	220	2	0.009	10.64	0.40	8.6	1.2	3.0	15.5	3.36	5.73	4.3	9.6
OSA2+A6	A6	3.9	0.33	0.43	--	--	--	--	--	--	--	--	15.5	--	--	--	--	--
OSA2+A6	2	5.9	0.31	0.41	0.060	0	0	0.250	15.15	0.19	3.8	4.0	0.0	15.6	3.36	5.73	6.1	13.7
B1	0	2.5	0.53	0.63	--	65	1	0.020	--	--	--	--	6.8	--	--	--	--	--
B1	3	2.5	0.53	0.63	0.016	125	3	0.020	12.94	0.37	3.1	4.1	0.5	--	--	--	--	--
B1	3	2.5	0.53	0.63	0.016	500	20	0.040	12.94	0.33	2.4	5.3	1.6	8.9	4.29	7.34	5.8	11.7
B2	0	1.1	0.60	0.70	--	80	2	0.020	--	--	--	--	6.7	--	--	--	--	--
B2	3	1.1	0.60	0.70	0.016	170	3	0.020	6.23	0.29	1.8	3.4	0.8	--	--	--	--	--
B2	3	1.1	0.60	0.70	0.016	460	19	0.040	6.23	0.26	1.4	4.5	1.7	9.2	4.23	7.23	2.8	5.5
B1+B2	B2	1.1	0.60	0.70	--	--	--	--	--	--	--	--	9.2	--	--	--	--	--
B1+B2	3	3.6	0.55	0.65	0.016	0	0	0.250	19.27	0.28	1.6	11.8	0.0	9.2	4.23	7.23	8.4	17.1
B3	0	0.3	0.66	0.73	--	40	1	0.020	--	--	--	--	4.1	--	--	--	--	--
B3	3	0.3	0.66	0.73	0.016	370	22	0.059	2.17	0.17	0.5	4.0	1.5	5.6	5.01	8.63	1.1	2.1
B4	0	2.0	0.60	0.70	--	110	2	0.020	--	--	--	--	7.8	--	--	--	--	--
B4	3	2.0	0.60	0.70	0.016	630	10	0.015	10.85	0.37	3.0	3.6	2.9	10.7	3.97	6.78	4.8	9.5
B3+B4	B4	2.0	0.60	0.70	--	--	--	--	--	--	--	--	10.7	--	--	--	--	--
B3+B4	3	2.3	0.81	0.70	0.016	0	0	0.250	12.71	0.24	1.2	10.6	0.0	10.7	3.97	6.78	5.7	11.2
B1+B2+B3+B4	B3+B4	2.3	0.61	0.70	--	--	--	--	--	--	--	--	10.7	--	--	--	--	--
B1+B2+B3+B4	3	6.0	0.58	0.67	0.016	0	0	0.250	30.90	0.33	2.3	13.2	0.0	10.7	3.97	6.78	13.6	27.2
OSB1	0	0.6	0.84	0.89	--	25	1	0.024	--	--	--	--	1.8	--	--	--	--	--
OSB1	3	0.6	0.84	0.89	0.016	670	11	0.016	5.06	0.28	1.7	3.0	3.7	5.5	5.04	8.70	2.7	4.9
B5	0	0.5	0.64	0.72	--	110	3	0.027	--	--	--	--	6.5	--	--	--	--	--
B5	3	0.5	0.64	0.72	0.016	100	4	0.040	3.07	0.20	0.8	3.7	0.4	7.0	4.67	8.03	1.5	3.0
OSB1+B5	B5	0.5	0.64	0.72	--	--	--	--	--	--	--	--	7.0	--	--	--	--	--
OSB1+B5	3	1.2	0.75	0.81	0.016	0	0	0.250	7.69	0.20	0.8	9.4	0.0	7.0	4.67	8.03	4.0	7.5
B1+B2+B3+B4+OSB1+B5	B1+B2+B3+B4	6.0	0.58	0.67	--	--	--	--	--	--	--	--	10.7	--	--	--	--	--
B1+B2+B3+B4+OSB1+B5	3	7.1	0.60	0.70	0.016	0	0	0.250	38.11	0.35	2.7	13.9	0.0	10.7	3.97	6.78	17.0	33.5

Highlight or circle the areas of concern with this filing.

Basin Label	Channel Type or Basin	Cont. Area A_c (Ac)	5 Year Coef. C_5	100 Yr Coef or Curve No C_{100} or CN	Manning Rough. n	Length L (ft)	Elev Change (ft)	Average Slope S	Channel Flow* Q (cfs)	Flow Depth d (ft)	Flow Area A (ft^2)	Flow Velocity v (ft/s)	Time of Cont** T_c (min)	Total Time T_c (min)	5 Year Intensity I_5 (in/hr)	100 Year Intensity I_{100} (in/hr)	5 Year Discharge Q_5 (cfs)	100 Year Discharge Q_{100} (cfs)
B6	0	1.1	0.60	0.70	--	60	1	0.020	--	--	--	--	5.8	--	--	--	--	--
B6	3	1.1	0.60	0.70	0.016	580	9	0.015	6.48	0.31	2.1	3.1	3.1	8.8	4.29	7.35	2.8	5.6
B1+B2+B3+B4+OSB1+B5+B6	B1+B2+B3+B4+OSB1+B5	7.1	0.60	0.70	--	--	--		--	--	--	--	10.7	--	--	--	--	--
B1+B2+B3+B4+OSB1+B5+B6	3	8.2	0.60	0.70	0.016	30	1	0.040	43.94	0.51	6.1	7.2	0.1	10.8	3.96	6.76	19.5	38.5
B7	0	0.7	0.74	0.80	--	40	1	0.020	--	--	--	--	3.4	--	--	--	--	--
B7	3	0.7	0.74	0.80	0.016	635	22	0.035	5.18	0.25	1.3	4.0	2.6	6.0	4.91	8.45	2.6	4.9
B1+B2+B3+B4+OSB1+B5+B6+B7	B1+B2+B3+B4+OSB1+B5+B6	8.2	0.60	0.70	--	--	--		--	--	--	--	10.8	--	--	--	--	--
B1+B2+B3+B4+OSB1+B5+B6+B7	3	8.9	0.61	0.71	0.016	635	22	0.035	48.38	0.54	6.9	7.0	1.5	12.3	3.74	6.38	20.4	40.1
B8	0	0.1	0.74	0.80	--	40	1	0.020	--	--	--	--	3.4	--	--	--	--	--
B8	3	0.1	0.74	0.80	0.016	160	3	0.020	1.01	0.16	0.5	2.2	1.2	5.0	5.19	8.97	0.5	1.0
B9	0	6.2	0.38	0.59	--	300	6	0.020	--	--	--	--	18.6	--	--	--	--	--
B9	2	8.2	0.38	0.59	0.060	270	4	0.015	19.16	0.50	10.6	1.8	2.5	21.1	2.87	4.91	6.7	18.0
OSC1	0	3.4	0.26	0.36	--	100	26	0.260	--	--	--	--	5.3	5.3	5.09	8.79	4.6	11.0
C1	0	5.1	0.60	0.70	--	110	2	0.015	--	--	--	--	8.7	--	--	--	--	--
C1	3	5.1	0.60	0.70	0.016	915	13	0.015	26.59	0.51	6.08	4.37	3.5	12.2	3.76	6.42	11.6	23.1
OSC1+C1	C1	5.1	0.60	0.70	--	--	--	--	--	--	--	--	12.2	--	--	--	--	--
OSC1+C1	3	8.6	0.47	0.57	0.016	0	0	0.250	35.81	0.34	2.61	13.71	0.0	12.2	3.78	6.42	15.0	31.1
C2	0	0.8	0.60	0.70	--	40	1	0.015	--	--	--	--	5.2	--	--	--	--	--
C2	3	0.8	0.60	0.70	0.016	550	12	0.022	5.22	0.27	1.54	3.40	2.7	7.9	4.48	7.68	2.3	4.5
C3	0	1.0	0.60	0.70	--	60	1	0.015	--	--	--	--	6.3	--	--	--	--	--
C3	3	1.0	0.60	0.70	0.016	600	9	0.015	5.93	0.30	1.95	3.05	3.3	9.6	4.15	7.10	2.5	5.1
C4	0	1.4	0.60	0.70	--	165	3	0.020	--	--	--	--	9.6	--	--	--	--	--
C4	3	1.4	0.60	0.70	0.016	290	16	0.055	7.18	0.26	1.38	5.21	0.9	10.5	4.01	6.85	3.5	6.9
C5	0	2.6	0.60	0.70	--	165	7	0.042	--	--	--	--	7.5	--	--	--	--	--
C5	3	2.6	0.60	0.70	0.016	495	7	0.015	14.05	0.41	3.76	3.73	2.2	9.7	4.14	7.09	6.4	12.7
C6	0	0.7	0.60	0.70	--	65	1	0.015	--	--	--	--	6.5	--	--	--	--	--
C6	3	0.7	0.60	0.70	0.016	420	23	0.055	4.20	0.21	0.92	4.56	1.5	8.1	4.44	7.81	1.9	3.9
C7	0	0.8	0.60	0.70	--	60	1	0.015	--	--	--	--	6.3	--	--	--	--	--
C7	3	0.8	0.60	0.70	0.016	500	8	0.015	4.89	0.28	1.67	2.93	2.8	9.2	4.23	7.24	2.1	4.3
C8	0	0.7	0.60	0.70	--	65	1	0.015	--	--	--	--	6.5	--	--	--	--	--
C8	3	0.7	0.60	0.70	0.016	365	10	0.027	4.08	0.24	1.17	3.48	1.7	8.3	4.40	7.53	1.9	3.7
C9	0	2.4	0.60	0.70	--	115	2	0.015	--	--	--	--	8.8	--	--	--	--	--
C9	3	2.4	0.60	0.70	0.016	200	3	0.015	12.56	0.39	3.42	3.67	0.9	--	--	--	--	--
C9	3	2.4	0.60	0.70	0.016	485	13	0.027	12.56	0.35	2.75	4.57	1.8	11.5	3.85	6.58	5.6	11.2
C10	0	2.5	0.52	0.66	--	300	16	0.053	--	--	--	--	10.9	--	--	--	--	--
C10	3	2.5	0.52	0.66	0.016	265	11	0.040	11.09	0.31	2.16	5.13	0.9	11.7	3.82	6.52	4.9	10.7
C11	0	2.2	0.60	0.70	--	165	4	0.024	--	--	--	--	9.0	--	--	--	--	--
C11	3	2.2	0.60	0.70	0.016	430	7	0.015	10.99	0.37	3.09	3.56	2.0	11.0	3.93	6.71	5.1	10.1
C12	0	1.5	0.60	0.70	--	60	1	0.015	--	--	--	--	6.3	--	--	--	--	--
C12	3	1.5	0.60	0.70	0.016	600	9	0.015	8.55	0.34	2.56	3.34	3.0	9.3	4.20	7.19	3.7	7.4
C2+C4	C4	1.4	0.60	0.70	--	--	--	--	--	--	--	--	10.5	--	--	--	--	--
C2+C4	3	2.3	0.60	0.70	0.016	0	0	0.250	11.36	0.23	1.10	10.32	0.0	10.5	4.01	6.85	5.5	10.9
C3+C5	C5	2.6	0.60	0.70	--	--	--	--	--	--	--	--	9.7	--	--	--	--	--
C3+C5	3	3.6	0.60	0.70	0.016	0	0	0.250	19.65	0.28	1.86	11.81	0.0	9.7	4.14	7.09	8.9	17.8
C6+C10	C10	2.5	0.52	0.66	--	--	--	--	--	--	--	--	11.7	--	--	--	--	--
C6+C10	3	3.2	0.53	0.67	0.016	0	0	0.250	14.53	0.25	1.33	10.96	0.0	11.7	3.82	6.52	6.6	14.1
C8+C9	C9	2.4	0.60	0.70	--	--	--	--	--	--	--	--	11.5	--	--	--	--	--
C8+C9	3	3.2	0.60	0.70	0.016	0	0	0.250	16.22	0.26	1.44	11.27	0.0	11.5	3.85	6.58	7.3	14.5
C7+C11	C11	2.2	0.60	0.70	--	--	--	--	--	--	--	--	11.0	--	--	--	--	--
C7+C11	3	3.0	0.60	0.70	0.016	0	0	0.250	15.29	0.26	1.38	11.10	0.0	11.0	3.93	6.71	7.1	14.1
C8+C9+C7+C11	C8+C9	3.2	0.60	0.70	--	--	--	--	--	--	--	--	11.5	--	--	--	--	--
C8+C9+C7+C11	3	6.1	0.60	0.70	0.016	475	7	0.015	31.61	0.54	6.78	4.66	1.7	13.2	3.63	6.19	13.4	26.6
D1	0	2.1	0.60	0.70	--	90	2	0.020	--	--	--	--	7.1	--	--	--	--	--
D1	3	2.1	0.60	0.70	0.016	630	31	0.050	11.59	0.31	2.06	5.64	1.9	8.9	4.28	7.32	5.3	10.6
D2	0	1.2	0.60	0.70	--	75	2	0.020	--	--	--	--	6.4	--	--	--	--	--
D2	3	1.2	0.60	0.70	0.016	685	34	0.050	6.88	0.26	1.39	4.96	2.3	8.7	4.31	7.38	3.1	6.1
D1+D2	D1	2.1	0.60	0.70	--	--	--	--	--	--	--	--	8.9	--	--	--	--	--
D1+D2	3	3.3	0.60	0.70	0.016	0	0	0.250	16.26	0.27	1.57	11.60	0.0	8.9	4.28	7.32	8.4	16.7
D3	0	0.3	0.75	0.81	--	40	1	0.020	--	--	--	--	3.3	--	--	--	--	--
D3	3	0.3	0.75	0.81	0.016	320	20	0.063	1.90	0.16	0.48	3.94	1.4	5.0	5.19	8.97	1.0	1.9
D4	0	2.2	0.60	0.70	--	100	2	0.020	--	--	--	--	7.4	--	--	--	--	--
D4	3	2.2	0.60	0.70	0.016	545	22	0.040	12.20	0.32	2.31	5.29	1.7	--	--	--	--	--
D4	3	2.2	0.60	0.70	0.016	195	4	0.020	12.20	0.37	3.00	4.06	0.8	10.0	4.09	7.00	5.5	10.9
D3+D4	D4	2.2	0.60	0.70	--	--	--	--	--	--	--	--	10.0	--	--	--	--	--
D3+D4	3	2.5	0.62	0.71	0.016	0	0	0.250	13.65	0.25	1.28	10.83	0.0	10.0	4.09	7.00	6.3	12.4
D1+D2+D3+D4	D3+D4	2.5	0.62	0.71	--	--	--	--	--	--	--	--	10.0	--	--	--	--	--

Highlight or circle the areas of concern with this filing.

Basin Label	Channel Type or Basin	Cont. Area A_c (Ac)	5 Year Coef. C_5	100 Yr Coef or Curve No C_{100} or CN	Manning Rough. n	Length L (ft)	Elev Change (ft)	Average Slope S	Channel Flow* Q (cfs)	Flow Depth d (ft)	Flow Area A (ft²)	Flow Velocity v (ft/s)	Time of Cont** T_c (min)	Total Time T_c (min)	5 Year Intensity I_5 (in/hr)	100 Year Intensity I_{100} (in/hr)	5 Year Discharge Q_5 (cfs)	100 Year Discharge Q_{100} (cfs)
D1+D2+D3+D4	3	5.7	0.61	0.71	0.016	0	0	0.250	31.76	0.33	2.39	13.31	0.0	10.0	4.09	7.00	14.3	28.3
D5	0	0.7	0.57	0.66	–	140	6	0.043	–	–	–	–	7.2	–	–	–	–	–
D5	3	0.7	0.57	0.66	0.016	310	13	0.040	3.87	0.22	0.97	3.98	1.3	8.5	4.36	7.46	1.9	3.6
D1+D2+D3+D4+D5	D1+D2+D3+D4	5.7	0.61	0.71	–	–	–	–	–	–	–	–	10.0	–	–	–	–	–
D1+D2+D3+D4+D5	3	6.5	0.60	0.70	0.016	0	0	0.250	35.58	0.34	2.60	13.69	0.0	10.0	4.09	7.00	16.0	31.7
D6	0	1.3	0.60	0.70	–	60	1	0.013	–	–	–	–	8.6	–	–	–	–	–
D6	3	1.3	0.60	0.70	0.016	535	22	0.040	7.52	0.27	1.60	4.69	1.9	–	–	–	–	–
D6	3	1.3	0.60	0.70	0.016	210	4	0.020	7.52	0.31	2.07	3.63	1.0	9.5	4.18	7.15	3.3	6.6
D1+D2+D3+D4+D5+D6	D1+D2+D3+D4+D5	6.5	0.60	0.70	–	–	–	–	–	–	–	–	10.0	–	–	–	–	–
D1+D2+D3+D4+D5+D6	3	7.8	0.60	0.70	0.016	35	1	0.040	42.78	0.51	5.94	7.20	0.1	10.0	4.08	6.97	19.2	38.0
D7	0	4.0	0.60	0.70	–	140	2	0.015	–	–	–	–	9.7	–	–	–	–	–
D7	3	4.0	0.60	0.70	0.016	475	19	0.040	19.58	0.38	3.32	5.90	1.3	–	–	–	–	–
D7	3	4.0	0.60	0.70	0.016	270	4	0.015	19.58	0.46	4.80	4.08	1.1	12.1	3.77	6.43	8.9	17.8
D1+D2+D3+D4+D5+D6+D7	D7	4.0	0.60	0.70	–	–	–	–	–	–	–	–	12.1	–	–	–	–	–
D1+D2+D3+D4+D5+D6+D7	3	11.7	0.60	0.70	0.016	0	0	0.250	58.18	0.41	3.76	15.47	0.0	12.1	3.77	6.43	26.6	52.8
D9	0	0.9	0.50	0.58	–	40	1	0.020	–	–	–	–	5.6	–	–	–	–	–
D9	3	0.9	0.50	0.58	0.016	585	20	0.034	4.28	0.23	1.12	3.83	2.5	8.2	4.42	7.58	1.9	3.8
D1+D2+D3+D4+D5+D6+D9	D1+D2+D3+D4+D5+D6	7.8	0.60	0.70	–	–	–	–	–	–	–	–	10.0	–	–	–	–	–
D1+D2+D3+D4+D5+D6+D9	3	8.6	0.59	0.69	0.016	300	11	0.036	46.67	0.53	6.60	7.07	0.7	10.7	3.97	6.78	20.3	40.3
D1+D2+D3+D4+D5+D6+D7+D9	D1+D2+D3+D4+D5+D6+D7	11.7	0.60	0.70	–	–	–	–	–	–	–	–	12.1	–	–	–	–	–
D1+D2+D3+D4+D5+D6+D7+D9	3	12.6	0.59	0.69	0.016	0	0	0.250	61.69	0.42	3.93	15.69	0.0	12.1	3.77	6.43	28.2	56.0
D8	0	3.1	0.60	0.70	–	120	1	0.010	–	–	–	–	10.2	–	–	–	–	–
D8	3	3.1	0.60	0.70	0.016	450	18	0.040	14.81	0.35	2.68	5.53	1.4	–	–	–	–	–
D8	3	3.1	0.60	0.70	0.016	270	4	0.015	14.81	0.41	3.89	3.81	1.2	12.8	3.68	6.28	6.8	13.4
D10	0	0.4	0.60	0.70	–	32	1	0.020	–	–	–	–	4.2	–	–	–	–	–
D10	3	0.4	0.60	0.70	0.016	330	7	0.020	2.33	0.21	0.87	2.68	2.1	6.2	4.85	8.35	1.1	2.2
D8+D10	D8	3.1	0.60	0.70	–	–	–	–	–	–	–	–	12.8	–	–	–	–	–
D8+D10	3	3.4	0.60	0.70	0.016	0	0	0.250	16.61	0.26	1.47	11.33	0.0	12.8	3.68	6.28	7.6	15.1
D11	0	1.3	0.38	0.47	–	210	4	0.019	–	–	–	–	15.9	–	–	–	–	–
D11	3	1.3	0.38	0.47	0.016	95	1	0.015	3.43	0.25	1.30	2.64	0.6	16.5	3.26	5.57	1.6	3.4
D1+D2+D3+D4+D5+D6+D9+D11	D1+D2+D3+D4+D5+D6+D9	8.6	0.59	0.69	–	–	–	–	–	–	–	–	10.7	–	–	–	–	–
D1+D2+D3+D4+D5+D6+D9+D11	3	9.9	0.56	0.66	0.016	130	2	0.015	51.42	0.64	9.77	5.27	0.4	11.2	3.90	6.67	21.9	43.7
D1+D2+D3+D4+D5+D6+D7+D9+D11	D1+D2+D3+D4+D5+D6+D7+D9	12.6	0.59	0.69	–	–	–	–	–	–	–	–	12.1	–	–	–	–	–
D1+D2+D3+D4+D5+D6+D7+D9+D11	3	13.9	0.57	0.67	0.016	140	2	0.015	65.98	0.71	11.89	5.55	0.4	12.5	3.71	6.33	29.6	59.0
D12	0	0.5	0.65	0.72	–	85	3	0.035	–	–	–	–	5.1	–	–	–	–	–
D12	3	0.5	0.65	0.72	0.016	130	2	0.015	3.33	0.24	1.25	2.67	0.8	5.9	4.93	8.50	1.7	3.2
D8+D10+D12	D8+D10	3.4	0.60	0.70	–	–	–	–	–	–	–	–	12.8	–	–	–	–	–
D8+D10+D12	3	4.0	0.61	0.70	0.016	130	2	0.015	19.19	0.45	4.66	4.12	0.5	13.3	3.61	6.16	8.7	17.1
E1	0	1.2	0.60	0.70	–	65	1	0.015	–	–	–	–	6.5	–	–	–	–	–
E1	3	1.2	0.60	0.70	0.016	615	11	0.018	7.08	0.31	2.08	3.40	3.0	9.6	4.16	7.12	3.1	6.1
E2	0	2.8	0.60	0.70	–	130	3	0.020	–	–	–	–	8.5	–	–	–	–	–
E2	3	2.8	0.60	0.70	0.016	580	11	0.020	14.63	0.39	3.47	4.22	2.3	10.8	3.96	6.77	6.7	13.3
E1+E2	E2	2.8	0.60	0.70	–	–	–	–	–	–	–	–	10.8	–	–	–	–	–
E1+E2	3	4.0	0.60	0.70	0.016	0	0	0.250	21.06	0.29	1.75	12.02	0.0	10.8	3.96	6.77	9.6	19.1
E3	0	1.0	0.60	0.70	–	60	1	0.015	–	–	–	–	6.3	–	–	–	–	–
E3	3	1.0	0.60	0.70	0.016	515	10	0.020	5.64	0.28	1.68	3.37	2.6	8.9	4.28	7.33	2.5	5.0
E1+E2+E3	E1+E2	4.0	0.60	0.70	–	–	–	–	–	–	–	–	10.8	–	–	–	–	–
E1+E2+E3	3	5.0	0.60	0.70	0.016	0	0	0.250	26.13	0.31	2.06	12.68	0.0	10.8	3.96	6.77	11.9	23.7
E4	0	2.7	0.60	0.70	–	125	3	0.020	–	–	–	–	8.3	–	–	–	–	–
E4	3	2.7	0.60	0.70	0.016	500	11	0.023	14.43	0.38	3.24	4.45	1.9	10.2	4.06	6.93	6.7	13.3
E1+E2+E3+E4	E1+E2+E3	5.0	0.60	0.70	–	–	–	–	–	–	–	–	10.8	–	–	–	–	–
E1+E2+E3+E4	3	7.7	0.60	0.70	0.016	295	8	0.025	40.45	0.54	6.75	5.99	0.8	11.6	3.84	6.56	17.8	35.5
E5	0	0.9	0.60	0.70	–	60	1	0.015	–	–	–	–	6.3	–	–	–	–	–
E5	3	0.9	0.60	0.70	0.016	460	11	0.023	5.24	0.27	1.50	3.50	2.2	8.5	4.35	7.45	2.3	4.7
E1+E2+E3+E4+E5	E1+E2+E3+E4	7.7	0.60	0.70	–	–	–	–	–	–	–	–	11.6	–	–	–	–	–
E1+E2+E3+E4+E5	3	6.6	0.60	0.70	0.016	0	0	0.250	45.16	0.37	3.11	14.52	0.0	11.6	3.84	6.56	19.9	39.7
E6	0	1.8	0.60	0.70	–	105	3	0.029	–	–	–	–	6.8	–	–	–	–	–
E6	3	1.8	0.60	0.70	0.016	575	8	0.015	10.23	0.36	2.96	3.45	2.8	9.5	4.16	7.12	4.5	9.0
E7	0	2.3	0.43	0.61	–	200	4	0.020	–	–	–	–	14.1	–	–	–	–	–
E7	3	2.3	0.43	0.61	0.016	365	7	0.019	8.58	0.33	2.34	3.66	1.7	15.8	3.33	5.69	3.3	8.1
E4+E5	E4	2.7	0.60	0.70	–	–	–	–	–	–	–	–	10.2	–	–	–	–	–
E4+E5	3	3.6	0.60	0.70	0.016	0	0	0.250	19.17	0.28	1.63	11.74	0.0	10.2	4.06	6.93	8.9	17.7
E4+E5+E7	E4+E5	3.6	0.60	0.70	–	–	–	–	–	–	–	–	10.2	–	–	–	–	–
E4+E5+E7	3	6.0	0.53	0.67	0.016	100	3	0.025	29.94	0.49	5.42	5.52	0.3	10.5	4.01	6.85	12.8	27.2
E1+E2+E3+E4+E5+E7	E1+E2+E3+E4+E5	8.6	0.60	0.70	–	–	–	–	–	–	–	–	11.6	–	–	–	–	–
E1+E2+E3+E4+E5+E7	3	11.0	0.56	0.68	0.016	100	1	0.010	55.85	0.72	12.21	4.57	0.4	12.0	3.79	6.47	23.4	48.4

Basin Label	Channel Type or Basin	Cont. Area A_c (Ac)	5 Year Coef. C_5	100 Yr Coef or Curve No C_{100} or CN	Manning Rough. n	Length L (ft)	Elev Change (ft)	Average Slope S	Channel Flow* Q (cfs)	Flow Depth d (ft)	Flow Area A (ft^2)	Flow Velocity v (ft/s)	Time of Cont** T_c (min)	Total Time T_c (min)	5 Year Intensity I_5 (in/hr)	100 Year Intensity I_{100} (in/hr)	5 Year Discharge Q_5 (cfs)	100 Year Discharge Q_{100} (cfs)
E8	0	0.7	0.60	0.70	--	40	1	0.030	--	--	--	--	4.1	--	--	--	--	--
E8	3	0.7	0.60	0.70	0.016	610	16	0.025	4.10	0.24	1.21	3.39	3.0	7.1	4.65	7.98	1.8	3.6
E9	0	8.6	0.25	0.35	--	300	6	0.020	--	--	--	--	21.9	--	--	--	--	--
E9	3	8.6	0.25	0.35	0.016	550	12	0.022	14.56	0.38	3.32	4.38	2.1	--	--	--	--	--
E9	4	8.6	0.25	0.35	0.013	170	2	0.010	14.56	0.86	1.98	7.35	0.4	24.4	2.66	4.56	5.7	13.8
OSF3	0	0.5	0.25	0.35	--	50	16	0.320	--	--	--	--	3.6	5.0	5.19	8.97	0.7	1.6
F1	0	2.4	0.60	0.70	--	110	2	0.020	--	--	--	--	7.8	--	--	--	--	--
F1	3	2.4	0.60	0.70	0.016	765	13	0.018	13.01	0.38	3.31	3.93	3.2	11.0	3.92	6.70	5.7	11.3
OSF3+F1	F1	2.4	0.60	0.70	--	--	--	--	--	--	--	--	11.0	--	--	--	--	--
OSF3+F1	3	2.9	0.54	0.64	0.016	0	0	0.250	14.41	0.25	1.32	10.94	0.0	11.0	3.92	6.70	6.2	12.5
F2	0	1.3	0.60	0.70	--	60	1	0.015	--	--	--	--	6.3	--	--	--	--	--
F2	3	1.3	0.60	0.70	0.016	670	12	0.018	7.33	0.31	2.14	3.43	3.3	9.6	4.16	7.11	3.1	6.3
F3	0	3.2	0.60	0.70	--	140	4	0.025	--	--	--	--	8.2	--	--	--	--	--
F3	3	3.2	0.60	0.70	0.016	695	13	0.018	17.02	0.42	4.01	4.24	2.7	10.9	3.94	6.73	7.6	15.1
F2+F3	F3	3.2	0.60	0.70	--	--	--	--	--	--	--	--	10.9	--	--	--	--	--
F2+F3	3	4.5	0.60	0.70	0.016	0	0	0.250	23.70	0.30	1.92	12.37	0.0	10.9	3.94	6.73	10.6	21.1
OSF3+F1+F2+F3	OSF3+F1	2.9	0.54	0.64	--	--	--	--	--	--	--	--	11.0	--	--	--	--	--
OSF3+F1+F2+F3	3	7.4	0.58	0.68	0.016	260	7	0.025	38.53	0.53	6.55	5.88	0.7	11.8	3.81	6.51	16.2	32.5
F4	0	0.3	0.60	0.70	--	40	1	0.020	--	--	--	--	4.7	--	--	--	--	--
F4	3	0.3	0.60	0.70	0.016	220	6	0.027	2.02	0.19	0.69	2.93	1.3	6.0	4.92	8.48	0.9	1.9
OSF2	0	4.9	0.30	0.40	--	290	13	0.045	--	--	--	--	15.5	--	--	--	--	--
OSF2	3	4.9	0.30	0.40	0.016	1,170	19	0.016	11.13	0.37	3.03	3.67	5.3	20.9	2.89	4.95	4.2	9.6
F5	0	3.7	0.25	0.35	--	300	6	0.020	--	--	--	--	21.9	--	--	--	--	--
F5	3	3.7	0.25	0.35	0.016	65	3	0.046	6.19	0.25	1.32	4.70	0.2	--	--	--	--	--
F5	3	3.7	0.25	0.35	0.016	205	5	0.024	6.19	0.28	1.67	3.70	0.9	23.1	2.74	4.69	2.5	6.0
OSF2+F5	OSF2	4.9	0.30	0.40	--	--	--	--	--	--	--	--	20.9	--	--	--	--	--
OSF2+F5	1	8.6	0.28	0.38	0.060	310	3	0.010	18.49	1.70	8.72	2.12	2.4	--	--	--	--	--
OSF2+F5	4	8.6	0.28	0.38	0.013	380	4	0.010	18.49	0.97	2.35	7.88	0.8	24.1	2.67	4.58	6.4	14.8
OSF3+F1+F2+F3+F5	OSF3+F1+F2+F3	7.4	0.58	0.68	--	--	--	--	--	--	--	--	11.8	--	--	--	--	--
OSF3+F1+F2+F3+F5	3	11.1	0.47	0.57	0.016	260	8	0.031	48.44	0.56	7.20	6.73	0.6	12.4	3.72	6.36	19.3	39.9
OSF2+OSF3+F1+F2+F3+F5	OSF2	4.9	0.30	0.40	--	--	--	--	--	--	--	--	20.9	--	--	--	--	--
OSF2+OSF3+F1+F2+F3+F5	1	16.0	0.42	0.52	0.060	310	3	0.010	47.13	2.42	17.59	2.68	1.9	--	--	--	--	--
OSF2+OSF3+F1+F2+F3+F5	4	16.0	0.42	0.52	0.013	380	4	0.010	47.13	1.57	4.59	10.26	0.6	23.4	2.72	4.66	18.0	38.3
G1	0	6.2	0.25	0.35	--	300	11	0.037	--	--	--	--	17.9	--	--	--	--	--
G1	3	6.2	0.25	0.35	0.016	90	3	0.033	11.55	0.33	2.38	4.85	0.3	--	--	--	--	--
G1	4	6.2	0.25	0.35	0.013	80	18	0.225	11.55	0.36	0.56	20.46	0.1	18.3	3.09	5.29	4.8	11.4

*Estimated using an initial 100 year intensity based on the corresponding Overland Time of Concentration.

**Overland Time of Concentration, $T_c = 1.87\,(1.1 - C_5)\,L^{0.5}\,S^{-0.33}$

Channel Time of Concentration calculated using average flow velocities from Manning's formula.

Highlight or circle the areas of concern with this filing.

M.V.E., Inc.
Project No.: 60970

8/17/2013
Project: Hannah Ridge at Feathergrass - Final
(Multi-Family & Commercial Parcels Undeveloped)
2-year for water quality

DEVELOPED CONDITIONS - CHANNEL CHARACTERISTICS

Channel Type	Channel Type Number	Surface Pipe or Curb Type	Dimensions			Manning Rough. n
Overland	0	--				--
Triangular	1	Weeds	Side Slope (H:V) = 3	Side Slope (H:V) = 3	Max Depth (ft) = 3	0.060
Trapezoidal	2	Weeds	Side Slopes (H:V) = 3	Base Width (ft) = 20	Max Depth (ft) = 5	0.060
Curb/Road	3	Type 3	Road Cross Slope = 2%	FL to Crown (ft) = 13		0.016
Circular	4	RCP	Diameter (in) = 48			0.013

DEVELOPED CONDITIONS - TIMES OF CONCENTRATION & DISCHARGES

Basin Label	Channel Type or Basin	Cont. Area A_c (Ac)	2 Year Coef. C_2	100 Yr Coef or Curve No C_{100} or CN	Manning Rough. n	Length L (ft)	Elev Change (ft)	Average Slope S	Channel Flow* Q (cfs)	Flow Depth d (ft)	Flow Area A (ft^2)	Flow Velocity v (ft/s)	Time of Cont** T_c (min)	Total Time T_c (min)	2 Year Intensity I_5 (in/hr)	2 Year Discharge Q2 (cfs)
OSA2	0	1.9	0.27	0.37	--	110	14	0.127	--	--	--	--	7.0	--	--	--
OSA2	1	1.9	0.27	0.37	0.060	350	23	0.066	2.21	0.54	0.9	2.6	2.3	9.3	3.06	1.6
A1	0	2.6	0.49	0.59	--	70	1	0.020	--	--	--	--	7.5	--	--	--
A1	3	2.6	0.49	0.59	0.016	660	10	0.015	4.71	0.28	1.6	2.9	3.8	11.3	2.84	3.7
A2	0	1.0	0.60	0.70	--	60	1	0.020	--	--	--	--	5.8	--	--	--
A2	3	1.0	0.60	0.70	0.016	660	10	0.015	2.36	0.22	1.0	2.4	4.5	10.3	2.95	1.8
A1+A2	A1	2.6	0.49	0.59	--	--	--	--	--	--	--	--	11.3	--	--	--
A1+A2	3	3.7	0.52	0.62	0.016	1	0	0.010	6.89	0.34	2.5	2.7	0.0	11.4	2.84	5.4
OSA3	0	0.3	0.83	0.88	--	25	1	0.024	--	--	--	--	1.9	--	--	--
OSA3	3	0.3	0.83	0.88	0.016	265	5	0.020	2.06	0.20	0.8	2.6	1.7	5.0	3.71	0.8
A3	0	0.3	0.75	0.81	--	40	1	0.020	--	--	--	--	3.3	--	--	--
A3	3	0.3	0.75	0.81	0.016	375	22	0.059	2.19	0.17	0.5	4.0	1.6	5.0	3.71	0.8
OSA3+A3	OSA3	0.3	0.83	0.88	--	--	--	--	--	--	--	--	5.0	--	--	--
OSA3+A3	3	0.8	0.78	0.84	0.016	420	25	0.059	4.25	0.21	0.9	4.7	1.5	6.5	3.45	1.5
A1+A2+OSA3+A3	A1+A2	3.7	0.52	0.62	--	--	--	--	--	--	--	--	11.4	--	--	--
A1+A2+OSA3+A3	3	4.2	0.56	0.65	0.016	0	0	0.025	8.31	0.31	2.1	4.0	0.0	11.4	2.84	6.7
A4	0	0.2	0.61	0.87	--	36	1	0.022	--	--	--	--	2.5	--	--	--
A4	3	0.2	0.81	0.87	0.016	135	3	0.022	1.17	0.16	0.5	2.4	0.9	5.0	3.71	0.5
A1+A2+OSA3+A3+A4	A1+A2+OSA3+A3	4.2	0.56	0.65	--	--	--	--	--	--	--	--	11.4	--	--	--
A1+A2+OSA3+A3+A4	3	4.4	0.57	0.66	0.016	170	4	0.022	8.71	0.32	2.2	3.9	0.7	12.1	2.76	6.8
A5	0	0.2	0.73	0.79	--	36	1	0.022	--	--	--	--	3.2	--	--	--
A5	3	0.2	0.73	0.79	0.016	135	3	0.022	1.35	0.17	0.55	2.45	0.9	5.0	3.71	0.5
A1+A2+OSA3+A3+A4+A5	A1+A2+OSA3+A3+A4	4.4	0.57	0.66	--	--	--	--	--	--	--	--	12.1	--	--	--
A1+A2+OSA3+A3+A4+A5	4	4.6	0.57	0.67	0.013	8	0	0.010	9.16	0.68	1.43	6.42	0.0	12.1	2.76	7.2
A6	0	3.9	0.33	0.43	--	235	13	0.055	--	--	--	--	12.6	--	--	--
A6	2	3.9	0.33	0.43	0.060	220	2	0.009	4.20	0.23	4.8	0.9	4.2	16.8	2.39	3.1
OSA2+A6	A6	3.9	0.33	0.43	--	--	--	--	--	--	--	--	16.8	--	--	--
OSA2+A6	2	5.9	0.31	0.41	0.060	0	0	0.250	5.98	0.11	2.2	2.8	0.0	16.8	2.39	4.3
B1	0	2.5	0.53	0.63	--	65	1	0.020	--	--	--	--	6.8	--	--	--
B1	3	2.5	0.53	0.63	0.016	125	3	0.020	4.98	0.27	1.5	3.3	0.6	--	--	--
B1	3	2.5	0.53	0.63	0.016	500	20	0.040	4.98	0.24	1.2	4.2	2.0	9.4	3.05	4.1
B2	0	1.1	0.60	0.70	--	80	2	0.020	--	--	--	--	6.7	--	--	--
B2	3	1.1	0.60	0.70	0.016	170	3	0.020	2.40	0.21	0.9	2.7	1.0	--	--	--
B2	3	1.1	0.60	0.70	0.016	460	19	0.040	2.40	0.18	0.7	3.5	2.2	9.9	3.00	2.0
B1+B2	B2	1.1	0.60	0.70	--	--	--	--	--	--	--	--	9.9	--	--	--
B1+B2	3	3.6	0.55	0.65	0.016	0	0	0.250	7.41	0.20	0.8	9.3	0.0	9.9	3.00	6.0
B3	0	0.3	0.66	0.73	--	40	1	0.020	--	--	--	--	4.1	--	--	--
B3	3	0.3	0.66	0.73	0.016	370	22	0.059	2.17	0.17	0.5	4.0	1.5	5.6	3.59	0.8
B4	0	2.0	0.60	0.70	--	110	2	0.020	--	--	--	--	7.8	--	--	--
B4	3	2.0	0.60	0.70	0.016	630	10	0.015	4.20	0.26	1.5	2.8	3.7	11.5	2.82	3.4
B3+B4	B4	2.0	0.60	0.70	--	--	--	--	--	--	--	--	11.5	--	--	--
B3+B4	3	2.3	0.61	0.70	0.016	0	0	0.250	4.93	0.17	0.6	8.4	0.0	11.5	2.82	4.0
B1+B2+B3+B4	B3+B4	2.3	0.61	0.70	--	--	--	--	--	--	--	--	11.5	--	--	--
B1+B2+B3+B4	3	6.0	0.58	0.67	0.016	0	0	0.250	11.97	0.23	1.1	10.4	0.0	11.5	2.82	9.7
OSB1	0	0.6	0.84	0.89	--	25	1	0.024	--	--	--	--	1.8	--	--	--
OSB1	3	0.6	0.84	0.89	0.016	670	11	0.016	5.06	0.28	1.7	3.0	3.7	5.5	3.61	1.9
B5	0	0.5	0.64	0.72	--	110	3	0.027	--	--	--	--	6.5	--	--	--
B5	3	0.5	0.64	0.72	0.016	100	4	0.040	1.16	0.15	0.4	3.0	0.6	7.1	3.36	1.1
OSB1+B5	B5	0.5	0.64	0.72	--	--	--	--	--	--	--	--	7.1	--	--	--
OSB1+B5	3	1.2	0.75	0.81	0.016	0	0	0.250	2.96	0.15	0.4	7.4	0.0	7.1	3.36	2.9

Highlight or circle the areas of concern with this filing.

Basin Label	Channel Type or Basin	Cont. Area A_c (Ac)	2 Year Coef. C_2	100 Yr Coef or Curve No C_{100} or CN	Manning Rough. n	Length L (ft)	Elev Change (ft)	Average Slope S	Channel Flow* Q (cfs)	Flow Depth d (ft)	Flow Area A (ft^2)	Flow Velocity v (ft/s)	Time of Cont** T_c (min)	Total Time T_c (min)	2 Year Intensity I_5 (in/hr)	2 Year Discharge Q2 (cfs)	
B1+B2+B3+B4+OSB1+B5	B1+B2+B3+B4	6.0	0.58	0.67	-	-	-	-	-	-	-	-	11.5	-	-	-	-
B1+B2+B3+B4+OSB1+B5	3	7.1	0.60	0.70	0.016	0	0	0.250	14.77	0.25	1.3	11.0	0.0	11.5	2.82	12.1	-
B6	0	1.1	0.60	0.70	-	60	1	0.020	-	-	-	-	5.8	-	-	-	-
B6	3	1.1	0.60	0.70	0.016	580	9	0.015	2.48	0.22	1.0	2.5	3.9	9.7	3.02	2.0	-
B1+B2+B3+B4+OSB1+B5+B6	B1+B2+B3+B4+OSB1+B5	7.1	0.60	0.70	-	-	-	-	-	-	-	-	11.5	-	-	-	-
B1+B2+B3+B4+OSB1+B5+B6	3	8.2	0.60	0.70	0.016	30	1	0.040	17.03	0.37	3.0	5.7	0.1	11.6	2.81	13.9	-
B7	0	0.7	0.74	0.80	-	40	1	0.020	-	-	-	-	3.4	-	-	-	-
B7	3	0.7	0.74	0.80	0.016	635	22	0.035	5.18	0.25	1.3	4.0	2.6	6.0	3.53	1.9	-
B1+B2+B3+B4+OSB1+B5+B6+B7	B1+B2+B3+B4+OSB1+B5+B6	8.2	0.60	0.70	-	-	-	-	-	-	-	-	11.6	-	-	-	-
B1+B2+B3+B4+OSB1+B5+B6+B7	3	8.9	0.61	0.71	0.016	635	22	0.035	18.75	0.39	3.4	5.6	1.9	13.5	2.64	14.4	-
B8	0	0.1	0.74	0.80	-	40	1	0.020	-	-	-	-	3.4	-	-	-	-
B8	3	0.1	0.74	0.80	0.016	160	3	0.020	1.01	0.16	0.46	2.20	1.2	5.0	3.71	0.4	-
B1+B2+B3+B4+OSB1+B5+B6+B7+B8	B1+B2+B3+B4+OSB1+B5+B6+B7	8.9	0.61	0.71	-	-	-	-	-	-	-	-	13.5	-	-	-	-
B1+B2+B3+B4+OSB1+B5+B6+B7+B8	4	9.0	0.82	0.71	0.013	8	0	0.010	19.08	0.98	2.40	7.95	0.0	13.5	2.63	14.7	-
B9	0	6.2	0.38	0.59	-	300	8	0.020	-	-	-	-	18.6	-	-	-	-
B9	2	6.2	0.38	0.59	0.060	270	4	0.015	7.61	0.29	6.0	1.3	3.5	22.2	2.08	4.9	-
OSC1	0	3.4	0.26	0.36	-	100	26	0.260	-	-	-	-	5.3	5.3	3.65	3.3	-
C1	0	5.1	0.60	0.70	-	110	2	0.015	-	-	-	-	8.7	-	-	-	-
C1	3	5.1	0.60	0.70	0.016	915	13	0.015	10.35	0.37	2.99	3.46	4.4	13.1	2.67	8.2	-
OSC1+C1	C1	5.1	0.60	0.70	-	-	-	-	-	-	-	-	13.1	-	-	-	-
OSC1+C1	3	8.6	0.47	0.57	0.016	0	0	0.250	13.94	0.25	1.28	10.85	0.0	13.1	2.67	10.7	-
C2	0	0.8	0.60	0.70	-	40	1	0.015	-	-	-	-	5.2	-	-	-	-
C2	3	0.8	0.60	0.70	0.016	550	12	0.022	1.98	0.19	0.74	2.68	3.4	8.6	3.15	1.6	-
C3	0	1.0	0.60	0.70	-	60	1	0.015	-	-	-	-	6.3	-	-	-	-
C3	3	1.0	0.60	0.70	0.016	600	9	0.015	2.28	0.21	0.95	2.41	4.2	10.5	2.93	1.8	-
C4	0	1.4	0.60	0.70	-	165	3	0.020	-	-	-	-	9.6	-	-	-	-
C4	3	1.4	0.60	0.70	0.016	290	16	0.055	2.80	0.18	0.68	4.13	1.2	10.7	2.90	2.5	-
C5	0	2.6	0.60	0.70	-	165	7	0.042	-	-	-	-	7.5	-	-	-	-
C5	3	2.6	0.60	0.70	0.016	495	7	0.015	5.43	0.29	1.84	2.95	2.8	10.3	2.95	4.5	-
C6	0	0.7	0.60	0.70	-	65	1	0.015	-	-	-	-	6.5	-	-	-	-
C6	3	0.7	0.60	0.70	0.016	420	23	0.055	1.61	0.15	0.45	3.60	1.9	8.5	3.17	1.4	-
C7	0	0.8	0.60	0.70	-	60	1	0.015	-	-	-	-	6.3	-	-	-	-
C7	3	0.8	0.60	0.70	0.016	500	8	0.015	1.88	0.20	0.81	2.32	3.6	9.9	2.99	1.5	-
C8	0	0.7	0.60	0.70	-	65	1	0.015	-	-	-	-	6.5	-	-	-	-
C8	3	0.7	0.60	0.70	0.016	365	10	0.027	1.57	0.17	0.57	2.76	2.2	8.7	3.13	1.3	-
C9	0	2.4	0.60	0.70	-	115	2	0.015	-	-	-	-	8.8	-	-	-	-
C9	3	2.4	0.60	0.70	0.016	200	3	0.015	4.89	0.28	1.68	2.91	1.1	-	-	-	-
C9	3	2.4	0.60	0.70	0.016	485	13	0.027	4.89	0.25	1.35	3.61	2.2	12.2	2.75	4.0	-
C10	0	2.5	0.52	0.66	-	300	16	0.053	-	-	-	-	10.9	-	-	-	-
C10	3	2.5	0.52	0.66	0.016	265	11	0.040	4.35	0.23	1.07	4.07	1.1	12.0	2.78	3.6	-
C11	0	2.2	0.60	0.70	-	165	4	0.024	-	-	-	-	9.0	-	-	-	-
C11	3	2.2	0.60	0.70	0.016	430	7	0.015	4.29	0.27	1.52	2.82	2.5	11.5	2.82	3.6	-
C12	0	1.5	0.60	0.70	-	60	1	0.015	-	-	-	-	8.3	-	-	-	-
C12	3	1.5	0.60	0.70	0.016	600	9	0.015	3.28	0.24	1.25	2.63	3.8	10.1	2.97	2.6	-
C2+C4	C4	1.4	0.60	0.70	-	-	-	-	-	-	-	-	10.7	-	-	-	-
C2+C4	3	2.3	0.60	0.70	0.016	0	0	0.250	4.44	0.17	0.54	8.19	0.0	10.7	2.90	4.0	-
C3+C5	C5	2.6	0.60	0.70	-	-	-	-	-	-	-	-	10.3	-	-	-	-
C3+C5	3	3.6	0.60	0.70	0.016	0	0	0.250	7.60	0.20	0.81	9.34	0.0	10.3	2.95	6.3	-
C2+C4+C3+C5	C2+C4	2.3	0.60	0.70	-	-	-	-	-	-	-	-	10.7	-	-	-	-
C2+C4+C3+C5	4	5.9	0.60	0.70	0.013	28	0	0.010	11.41	0.76	1.67	6.84	0.1	10.8	2.89	10.2	-
OSC1+C1+C2+C4+C3+C5	OSC1+C1	8.6	0.47	0.57	-	-	-	-	-	-	-	-	13.1	-	-	-	-
OSC1+C1+C2+C4+C3+C5	4	14.4	0.52	0.62	0.013	230	2	0.010	25.76	1.15	2.97	8.67	0.4	13.5	2.64	19.8	-
C6+C10	C10	2.5	0.52	0.66	-	-	-	-	-	-	-	-	12.0	-	-	-	-
C6+C10	3	3.2	0.53	0.67	0.016	0	0	0.250	5.70	0.18	0.65	8.71	0.0	12.0	2.78	4.8	-
C8+C9	C9	2.4	0.60	0.70	-	-	-	-	-	-	-	-	12.2	-	-	-	-
C8+C9	3	3.2	0.60	0.70	0.016	0	0	0.250	6.32	0.19	0.71	8.93	0.0	12.2	2.75	5.2	-
C7+C11	C11	2.2	0.60	0.70	-	-	-	-	-	-	-	-	11.5	-	-	-	-
C7+C11	3	3.0	0.60	0.70	0.016	0	0	0.250	5.96	0.18	0.68	8.80	0.0	11.5	2.82	5.1	-
C8+C9+C7+C11	C8+C9	3.2	0.60	0.70	-	-	-	-	-	-	-	-	12.2	-	-	-	-
C8+C9+C7+C11	3	6.1	0.60	0.70	0.016	475	7	0.015	12.31	0.39	3.34	3.69	2.1	14.3	2.57	9.5	-
C6+C10+C8+C9+C7+C11	C8+C9+C7+C11	6.1	0.60	0.70	-	-	-	-	-	-	-	-	14.3	-	-	-	-
C6+C10+C8+C9+C7+C11	3	9.4	0.58	0.69	0.016	0	0	0.010	18.49	0.48	5.33	3.47	0.0	14.3	2.57	13.9	-
OSC1+C1+C2+C4+C3+C5+C6+C10+C8+C9+C7+C11	C6+C10+C8+C9+C7+C11	9.4	0.58	0.69	-	-	-	-	-	-	-	-	14.3	-	-	-	-
OSC1+C1+C2+C4+C3+C5+C6+C10+C8+C9+C7+C11	3	23.8	0.54	0.65	0.016	0	0	0.010	44.10	0.66	10.23	4.31	0.0	14.3	2.57	33.1	-
)SC1+C1+C2+C4+C3+C5+C6+C10+C8+C9+C7+C11+C1	SC1+C1+C2+C4+C3+C5+C6+C10+C8+C9+C7+C'	23.8	0.54	0.65	-	-	-	-	-	-	-	-	14.3	-	-	-	-
)SC1+C1+C2+C4+C3+C5+C6+C10+C8+C9+C7+C11+C1	4	25.3	0.55	0.65	0.013	62	1	0.010	47.05	1.57	4.59	10.25	0.1	14.4	2.56	35.3	-

Highlight or circle the areas of concern with this filing.

Basin Label	Channel Type or Basin	Cont. Area A_c (Ac)	2 Year Coef. C_2	100 Yr Coef or Curve No C_{100} or CN	Manning Rough. n	Length L (ft)	Elev Change (ft)	Average Slope S	Channel Flow* Q (cfs)	Flow Depth d (ft)	Flow Area A (ft^2)	Flow Velocity v (ft/s)	Time of Cont** T_c (min)	Total Time T_c (min)	2 Year Intensity I_5 (in/hr)	2 Year Discharge Q2 (cfs)
D1	0	2.1	0.60	0.70	–	90	2	0.020	–	–	–	–	7.1	–	–	–
D1	3	2.1	0.60	0.70	0.016	630	31	0.050	4.47	0.22	1.00	4.45	2.4	9.4	3.05	3.8
D2	0	1.2	0.60	0.70	–	75	2	0.020	–	–	–	–	6.4	–	–	–
D2	3	1.2	0.60	0.70	0.016	685	34	0.050	2.64	0.18	0.67	3.92	2.9	9.4	3.06	2.2
D1+D2	D1	2.1	0.60	0.70	–	–	–	–	–	–	–	–	9.4	–	–	–
D1+D2	3	3.3	0.60	0.70	0.016	0	0	0.250	7.04	0.20	0.77	9.17	0.0	9.4	3.05	6.0
D3	0	0.3	0.75	0.81	–	40	1	0.020	–	–	–	–	3.3	–	–	–
D3	3	0.3	0.75	0.81	0.016	320	20	0.063	1.90	0.16	0.48	3.94	1.4	5.0	3.71	0.7
D4	0	2.2	0.60	0.70	–	100	2	0.020	–	–	–	–	7.4	–	–	–
D4	3	2.2	0.60	0.70	0.016	545	22	0.040	4.72	0.23	1.13	4.18	2.2	–	–	–
D4	3	2.2	0.60	0.70	0.016	195	4	0.020	4.72	0.26	1.47	3.21	1.0	10.6	2.91	3.9
D3+D4	D4	2.2	0.60	0.70	–	–	–	–	–	–	–	–	10.6	–	–	–
D3+D4	3	2.5	0.62	0.71	0.016	0	0	0.250	5.36	0.18	0.63	8.58	0.0	10.6	2.91	4.4
D1+D2+D3+D4	D3+D4	2.5	0.62	0.71	–	–	–	–	–	–	–	–	10.6	–	–	–
D1+D2+D3+D4	3	5.7	0.61	0.71	0.016	0	0	0.250	12.28	0.24	1.17	10.52	0.0	10.6	2.91	10.1
D5	0	0.7	0.57	0.66	–	140	6	0.043	–	–	–	–	7.2	–	–	–
D5	3	0.7	0.57	0.66	0.016	310	13	0.040	1.49	0.16	0.47	3.15	1.6	8.8	3.12	1.3
D1+D2+D3+D4+D5	D1+D2+D3+D4	5.7	0.61	0.71	–	–	–	–	–	–	–	–	10.6	–	–	–
D1+D2+D3+D4+D5	3	6.5	0.60	0.70	0.016	0	0	0.250	13.76	0.25	1.27	10.82	0.0	10.6	2.91	11.4
D6	0	1.3	0.60	0.70	–	60	1	0.013	–	–	–	–	6.6	–	–	–
D6	3	1.3	0.60	0.70	0.016	535	22	0.040	2.89	0.20	0.78	3.70	2.4	–	–	–
D6	3	1.3	0.60	0.70	0.016	210	4	0.020	2.89	0.22	1.01	2.87	1.2	10.2	2.96	2.3
D1+D2+D3+D4+D5+D6	D1+D2+D3+D4+D5	6.5	0.60	0.70	–	–	–	–	–	–	–	–	10.6	–	–	–
D1+D2+D3+D4+D5+D6	3	7.8	0.60	0.70	0.016	35	1	0.040	16.54	0.36	2.91	5.68	0.1	10.7	2.90	13.6
D7	0	4.0	0.60	0.70	–	140	2	0.015	–	–	–	–	9.7	–	–	–
D7	3	4.0	0.60	0.70	0.016	475	19	0.040	7.66	0.28	1.64	4.68	1.7	–	–	–
D7	3	4.0	0.60	0.70	0.016	270	4	0.015	7.66	0.33	2.37	3.23	1.4	12.8	2.70	6.4
D1+D2+D3+D4+D5+D6+D7	D7	4.0	0.60	0.70	–	–	–	–	–	–	–	–	12.8	–	–	–
D1+D2+D3+D4+D5+D6+D7	3	11.7	0.60	0.70	0.016	0	0	0.250	22.75	0.29	1.86	12.25	0.0	12.8	2.70	19.1
D9	0	0.9	0.50	0.58	–	40	1	0.020	–	–	–	–	5.6	–	–	–
D9	3	0.9	0.50	0.58	0.016	585	20	0.034	1.63	0.17	0.54	3.02	3.2	8.8	3.12	1.3
D1+D2+D3+D4+D5+D6+D9	D1+D2+D3+D4+D5+D6	7.8	0.60	0.70	–	–	–	–	–	–	–	–	10.7	–	–	–
D1+D2+D3+D4+D5+D6+D9	3	8.6	0.59	0.69	0.016	300	11	0.036	18.05	0.38	3.23	5.58	0.9	11.6	2.81	14.4
D1+D2+D3+D4+D5+D6+D7+D9	D1+D2+D3+D4+D5+D6+D7	11.7	0.60	0.70	–	–	–	–	–	–	–	–	12.8	–	–	–
D1+D2+D3+D4+D5+D6+D7+D9	3	12.6	0.59	0.69	0.016	0	0	0.250	24.12	0.30	1.94	12.43	0.0	12.8	2.70	20.2
D8	0	3.1	0.60	0.70	–	120	1	0.010	–	–	–	–	10.2	–	–	–
D8	3	3.1	0.60	0.70	0.016	450	18	0.040	5.80	0.25	1.32	4.38	1.7	–	–	–
D8	3	3.1	0.60	0.70	0.016	270	4	0.015	5.60	0.30	1.92	3.02	1.5	13.4	2.64	4.9
D10	0	0.4	0.60	0.70	–	32	1	0.020	–	–	–	–	4.2	–	–	–
D10	3	0.4	0.60	0.70	0.016	330	7	0.020	2.33	0.21	0.87	2.68	2.1	6.2	3.49	0.8
D8+D10	D8	3.1	0.60	0.70	–	–	–	–	–	–	–	–	13.4	–	–	–
D8+D10	3	3.4	0.60	0.70	0.016	0	0	0.250	6.51	0.19	0.72	8.99	0.0	13.4	2.64	5.4
D11	0	1.3	0.38	0.47	–	210	4	0.019	–	–	–	–	15.9	–	–	–
D11	3	1.3	0.38	0.47	0.016	95	1	0.015	1.36	0.18	0.65	2.10	0.8	16.6	2.40	1.2
D1+D2+D3+D4+D5+D6+D9+D11	D1+D2+D3+D4+D5+D6+D9	8.6	0.59	0.69	–	–	–	–	–	–	–	–	11.6	–	–	–
D1+D2+D3+D4+D5+D6+D9+D11	3	9.9	0.56	0.66	0.016	130	2	0.015	19.88	0.46	4.78	4.16	0.5	12.1	2.76	15.5
D1+D2+D3+D4+D5+D6+D7+D9+D11	D1+D2+D3+D4+D5+D6+D7+D9	12.6	0.59	0.69	–	–	–	–	–	–	–	–	12.8	–	–	–
D1+D2+D3+D4+D5+D6+D7+D9+D11	3	13.9	0.57	0.67	0.016	140	2	0.015	25.79	0.50	5.87	4.39	0.5	13.3	2.65	21.2
D12	0	0.5	0.65	0.72	–	85	3	0.035	–	–	–	–	5.1	–	–	–
D12	3	0.5	0.65	0.72	0.016	130	2	0.015	1.27	0.18	0.60	2.10	1.0	6.1	3.51	1.2
D8+D10+D12	D8+D10	3.4	0.60	0.70	–	–	–	–	–	–	–	–	13.4	–	–	–
D8+D10+D12	3	4.0	0.61	0.70	0.016	130	2	0.015	7.52	0.32	2.30	3.26	0.7	14.1	2.59	6.2
)1+D2+D3+D4+D5+D6+D7+D9+D11+D8+D10+D1.	D8+D10+D12	4.0	0.61	0.70	–	–	–	–	–	–	–	–	14.1	–	–	–
)1+D2+D3+D4+D5+D6+D7+D9+D11+D8+D10+D1.	4	17.8	0.58	0.68	0.013	42	0	0.005	32.77	1.54	4.46	7.34	0.1	14.2	2.58	26.7
E1	0	1.2	0.60	0.70	–	65	1	0.015	–	–	–	–	6.5	–	–	–
E1	3	1.2	0.60	0.70	0.016	615	11	0.018	2.72	0.22	1.01	2.68	3.8	10.4	2.94	2.2
E2	0	2.8	0.60	0.70	–	130	3	0.020	–	–	–	–	8.5	–	–	–
E2	3	2.8	0.60	0.70	0.016	580	11	0.020	5.69	0.28	1.70	3.34	2.9	11.4	2.83	4.8
E1+E2	E2	2.8	0.60	0.70	–	–	–	–	–	–	–	–	11.4	–	–	–
E1+E2	3	4.0	0.60	0.70	0.016	0	0	0.250	8.19	0.21	0.86	9.52	0.0	11.4	2.83	6.9
E3	0	1.0	0.60	0.70	–	60	1	0.015	–	–	–	–	6.3	–	–	–
E3	3	1.0	0.60	0.70	0.016	515	10	0.020	2.17	0.20	0.82	2.66	3.2	9.6	3.03	1.8
E1+E2+E3	E1+E2	4.0	0.60	0.70	–	–	–	–	–	–	–	–	11.4	–	–	–
E1+E2+E3	3	5.0	0.60	0.70	0.016	0	0	0.250	10.16	0.22	1.01	10.04	0.0	11.4	2.83	8.5
E4	0	2.7	0.60	0.70	–	125	3	0.020	–	–	–	–	8.3	–	–	–
E4	3	2.7	0.60	0.70	0.016	500	11	0.023	5.61	0.27	1.59	3.52	2.4	10.7	2.91	4.8

Highlight or circle the areas of concern with this filing.

Basin Label	Channel Type or Basin	Cont. Area A_c (Ac)	2 Year Coef. C_2	100 Yr Coef or Curve No C_{100} or CN	Manning Rough. n	Length L (ft)	Elev Change (ft)	Average Slope S	Channel Flow* Q (cfs)	Flow Depth d (ft)	Flow Area A (ft^2)	Flow Velocity v (ft/s)	Time of Cont** T_c (min)	Total Time T_c (min)	2 Year Intensity I_5 (in/hr)	2 Year Discharge Q2 (cfs)
E1+E2+E3+E4	E1+E2+E3	5.0	0.60	0.70	–	–	–	–	–	–	–	–	11.4	–	–	–
E1+E2+E3+E4	3	7.7	0.60	0.70	0.016	295	8	0.025	15.73	0.38	3.32	4.73	1.0	12.4	2.73	12.7
E5	0	0.9	0.60	0.70	–	60	1	0.015	–	–	–	–	6.3	–	–	–
E5	3	0.9	0.60	0.70	0.016	460	11	0.023	2.01	0.19	0.73	2.76	2.8	9.1	3.09	1.7
E1+E2+E3+E4+E5	E1+E2+E3+E4	7.7	0.60	0.70	–	–	–	–	–	–	–	–	12.4	–	–	–
E1+E2+E3+E4+E5	3	8.6	0.60	0.70	0.016	0	0	0.250	17.56	0.27	1.53	11.49	0.0	12.4	2.73	14.2
E6	0	1.8	0.60	0.70	–	105	3	0.029	–	–	–	–	6.8	–	–	–
E6	3	1.8	0.60	0.70	0.016	575	8	0.015	3.94	0.26	1.45	2.73	3.5	10.3	2.95	3.2
E7	0	2.3	0.43	0.61	–	200	4	0.020	–	–	–	–	14.1	–	–	–
E7	3	2.3	0.43	0.61	0.016	365	7	0.019	3.40	0.24	1.17	2.91	2.1	16.2	2.43	2.4
E6+E7	E7	2.3	0.43	0.61	–	–	–	–	–	–	–	–	16.2	–	–	–
E6+E7	3	4.1	0.50	0.65	0.016	0	0	0.019	6.38	0.29	1.88	3.39	0.0	16.2	2.43	5.0
E4+E5	E4	2.7	0.60	0.70	–	–	–	–	–	–	–	–	10.7	–	–	–
E4+E5	3	3.6	0.60	0.70	0.016	0	0	0.250	7.45	0.20	0.80	9.30	0.0	10.7	2.91	6.3
E4+E5+E7	E4+E5	3.6	0.60	0.70	–	–	–	–	–	–	–	–	10.7	–	–	–
E4+E5+E7	3	6.0	0.53	0.67	0.016	100	3	0.025	11.64	0.35	2.67	4.37	0.4	11.1	2.87	9.1
E1+E2+E3+E4+E5+E7	E1+E2+E3+E4+E5	8.6	0.60	0.70	–	–	–	–	–	–	–	–	12.4	–	–	–
E1+E2+E3+E4+E5+E7	3	11.0	0.56	0.68	0.016	100	1	0.010	21.72	0.51	6.01	3.61	0.5	12.9	2.69	16.6
E8	0	0.7	0.60	0.70	–	40	1	0.030	–	–	–	–	4.1	–	–	–
E8	3	0.7	0.60	0.70	0.016	610	16	0.025	4.10	0.24	1.21	3.39	3.0	7.1	3.36	1.3
E1+E2+E3+E4+E5+E8	E1+E2+E3+E4+E5	8.6	0.60	0.70	–	–	–	–	–	–	–	–	12.4	–	–	–
E1+E2+E3+E4+E5+E8	4	9.3	0.60	0.70	0.013	50	1	0.010	18.88	0.98	2.38	7.93	0.1	12.5	2.72	15.2
E9	0	8.6	0.25	0.35	–	300	6	0.020	–	–	–	–	21.9	–	–	–
E9	3	8.6	0.25	0.35	0.016	550	12	0.022	5.79	0.28	1.66	3.49	2.6	–	–	–
E9	4	8.6	0.25	0.35	0.013	170	2	0.010	5.79	0.55	1.03	5.60	0.5	25.0	1.95	4.2
OSF3	0	0.5	0.25	0.35	–	50	16	0.320	–	–	–	–	3.6	5.0	3.71	0.5
F1	0	2.4	0.60	0.70	–	110	2	0.020	–	–	–	–	7.8	–	–	–
F1	3	2.4	0.60	0.70	0.016	765	13	0.018	5.04	0.28	1.62	3.10	4.1	11.9	2.78	4.0
OSF3+F1	F1	2.4	0.60	0.70	–	–	–	–	–	–	–	–	11.9	–	–	–
OSF3+F1	3	2.9	0.54	0.64	0.016	0	0	0.250	5.58	0.18	0.64	8.66	0.0	11.9	2.78	4.4
F2	0	1.3	0.60	0.70	–	60	1	0.015	–	–	–	–	6.3	–	–	–
F2	3	1.3	0.60	0.70	0.016	670	12	0.018	2.81	0.22	1.04	2.71	4.1	10.5	2.93	2.2
F3	0	3.2	0.60	0.70	–	140	4	0.025	–	–	–	–	8.2	–	–	–
F3	3	3.2	0.60	0.70	0.016	695	13	0.018	6.61	0.30	1.97	3.35	3.5	11.6	2.81	5.4
F2+F3	F3	3.2	0.60	0.70	–	–	–	–	–	–	–	–	11.6	–	–	–
F2+F3	3	4.5	0.60	0.70	0.016	0	0	0.250	9.20	0.21	0.94	9.79	0.0	11.6	2.81	7.5
OSF3+F1+F2+F3	OSF3+F1	2.9	0.54	0.64	–	–	–	–	–	–	–	–	11.9	–	–	–
OSF3+F1+F2+F3	3	7.4	0.58	0.68	0.016	260	7	0.025	14.93	0.38	3.22	4.64	0.9	12.8	2.69	11.5
F4	0	0.3	0.60	0.70	–	40	1	0.020	–	–	–	–	4.7	–	–	–
F4	3	0.3	0.60	0.70	0.016	220	6	0.027	2.02	0.19	0.69	2.93	1.3	6.0	3.54	0.7
OSF2	0	4.9	0.30	0.40	–	290	13	0.045	–	–	–	–	15.5	–	–	–
OSF2	3	4.9	0.30	0.40	0.016	1,170	19	0.016	4.41	0.27	1.51	2.92	6.7	22.2	2.07	3.0
F5	0	3.7	0.25	0.35	–	300	6	0.020	–	–	–	–	21.9	–	–	–
F5	3	3.7	0.25	0.35	0.016	65	3	0.046	2.46	0.18	0.66	3.74	0.3	–	–	–
F5	3	3.7	0.25	0.35	0.016	205	5	0.024	2.46	0.20	0.84	2.94	1.2	23.4	2.02	1.9
OSF2+F5	OSF2	4.9	0.30	0.40	–	–	–	–	–	–	–	–	22.2	–	–	–
OSF2+F5	1	8.6	0.28	0.38	0.060	310	3	0.010	7.33	1.21	4.36	1.68	3.1	–	–	–
OSF2+F5	4	8.6	0.28	0.38	0.013	380	4	0.010	7.33	0.61	1.22	6.00	1.1	26.3	1.89	4.5
OSF3+F1+F2+F3+F5	OSF3+F1+F2+F3	7.4	0.58	0.68	–	–	–	–	–	–	–	–	12.8	–	–	–
OSF3+F1+F2+F3+F5	3	11.1	0.47	0.57	0.016	260	8	0.031	18.77	0.40	3.53	5.31	0.8	13.7	2.62	13.6
OSF3+F1+F2+F3+F5+F4	OSF3+F1+F2+F3+F5	11.1	0.47	0.57	–	–	–	–	–	–	–	–	13.7	–	–	–
OSF3+F1+F2+F3+F5+F4	4	11.4	0.47	0.57	0.013	35	0	0.010	19.44	0.99	2.43	8.00	0.1	13.7	2.62	14.0
OSF2+OSF3+F1+F2+F3+F5	OSF2	4.9	0.30	0.40	–	–	–	–	–	–	–	–	22.2	–	–	–
OSF2+OSF3+F1+F2+F3+F5	1	16.0	0.42	0.52	0.060	310	3	0.010	18.68	1.71	8.79	2.13	2.4	–	–	–
OSF2+OSF3+F1+F2+F3+F5	4	16.0	0.42	0.52	0.013	380	4	0.010	18.68	0.97	2.36	7.90	0.8	25.5	1.93	12.8
G1	0	6.2	0.25	0.35	–	300	11	0.037	–	–	–	–	17.9	–	–	–
G1	3	6.2	0.25	0.35	0.016	90	3	0.033	4.59	0.24	1.19	3.86	0.4	–	–	–
G1	4	6.2	0.25	0.35	0.013	80	18	0.225	4.59	0.23	0.30	15.47	0.1	18.4	2.28	3.5

*Estimated using an initial 100 year intensity based on the corresponding Overland Time of Concentration.

**Overland Time of Concentration, $T_c = 1.87\ (1.1 - C_5)\ L^{0.5}\ S^{-0.33}$

Channel Time of Concentration calculated using average flow velocities from Manning's formula.

Hydrologic Analysis
HEC-1

Main Line Tributary 6
Existing Condition Input/Output Data (Kiowa Eng)

This is an excessive amount of information. Please provide just the applicable pages (including the first page), summarize in the report and reference MDDP and DBPS.

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN   1998               *
*           VERSION 4.1                *
*                                      *
*  RUN DATE    04SEP07  TIME  11:53:45 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*        609 SECOND STREET             *
*     DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104              *
*                                      *
****************************************
```

```
X     X  XXXXXXX   XXXXX         X
X     X  X        X     X       XX
X     X  X        X              X
XXXXXXX  XXXX     X      XXXXX   X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

— Full Reach Existing Condition with Undeveloped Hannah Ridge —
Kiowa Engineering 9/[illegible]/07 — Not Considered / Included in DBPS Amendment

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1

```
                                    HEC-1 INPUT                                              PAGE  1

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1         ID            East Fork Subtributary hydrology  PN:  06040
  2         ID            Existing devel   condition with storage at RR Embankment
  3         ID            Sand Creek DBPS Hydrology update
  4         ID            Existing culvert under RR in-place and no blockage
  5         ID            10- and 100 Year, 24 hr Type IIA  Storm  FN efstd.dat
            *DIAGRAM
  6         IT      5      0        0      300
  7         IO      5      0
  8         JR   PREC    .68      1.0

  9         KK      5
 10         KM      RUNOFF - Sub-basin 5
 11         BA    .20
 12         IN     15
```

```
13          PB     4.4
14          PC  0.0000  0.0005  0.0015  0.0030  0.0045  0.0060  0.0080  0.0100  0.0120  0.0143
15          PC  0.0165  0.0188  0.0210  0.0233  0.0255  0.0278  0.0320  0.0390  0.0460  0.0530
16          PC  0.0600  0.0750  0.1000  0.4000  0.7000  0.7250  0.7500  0.7650  0.7800  0.7900
17          PC  0.8000  0.8100  0.8200  0.8250  0.8300  0.8350  0.8400  0.8450  0.8500  0.8550
18          PC  0.8600  0.8638  0.8675  0.8713  0.8750  0.8788  0.8825  0.8863  0.8900  0.8938
19          PC  0.8975  0.9013  0.9050  0.9083  0.9115  0.9148  0.9180  0.9210  0.9240  0.9270
20          PC  0.9300  0.9325  0.9350  0.9375  0.9400  0.9425  0.9450  0.9475  0.9500  0.9525
21          PC  0.9550  0.9575  0.9600  0.9625  0.9650  0.9675  0.9700  0.9725  0.9750  0.9775
22          PC  0.9800  0.9813  0.9825  0.9838  0.9850  0.9863  0.9875  0.9888  0.9900  0.9913
23          PC  0.9925  0.9938  0.9950  0.9963  0.9975  0.9988  1.0000
24          LS       0      75
25          UD    0.14

26          KK   RT-5A
27          KM        ROUTE FLOW from SUB-BASIN 5 TO RT-5A
28          RD    1050    0.01    .013             TRAP      30      20

29          KK    RT-5
30          KM        ROUTE FLOW FROM RT-5A TO DP-1
31          RD    1100   .0133    .035             TRAP       5      10

32          KK       1
33          KM        RUNOFF - Sub-basin 1
34          BA     .14
35          LS       0    76.3
36          UD    0.14

37          KK    DP-1
38          KM  COMBINE FLOW FROM RT-5 AND SUB-BASIN 1
39          HC       2

40          KK    RT-1
41          KM        ROUTE FLOW from DESIGN POINT DP-1 TO DP-14
42          RD    4400    .016   0.035             TRAP      20      10
```

1

HEC-1 INPUT


```
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

43          KK       2
44          KM        RUNOFF - Sub-basin 2
45          BA    .325
46          LS       0    71.8
47          UD    0.19

48          KK   DP-14
49          KM  COMBINE RUNOFF FROM RT-1 AND SUB-BASIN 2
50          HC       2

51          KK   DB-14
52          KM        ROUTE FLOW FROM DP 14 THROUGH DETENTION BASIN
```

```
  53          RS      1    ELEV     83
  54          SQ      0      75    325    480    575    675    775    850
  55          SE     83      86     90     92     94     96     98    100
  56          SV      0      .4     .8    1.7    4.6    8.9   17.6   31.6

  57          KK   RT-2B
  58          KM          ROUTE FLOW FROM DB14 TO DP-4A
  59          RD   2650    .005   .025          TRAP     16      4

  60          KK      3
  61          KM        RUNOFF FROM SUB-BASIN 3
  62          BA   .164
  63          LS      0    74.9
  64          UD    .12

  65          KK   RT-3A
  66          KM        ROUTE RUNOFF FROM SB 3 TO RT-3
  67          RD   1300     .02   .013          CIRC    3.5

  68          KK   RT-3
  69          KM        ROUTE RUNOFF FROM RT-3A TO DP 4A
  70          RD    500     .02   .013          CIRC      5

H.R. SITE
  71          KK      4
  72          KM        RUNOFF FROM SUB-BASIN 4
  73          BA   .147
  74          LS      0      69
  75          UD   .144

  76          KK   DP-4A
  77          KM        COMBINE RUNOFF FROM RT-3, RT-2B AND SB 4
  78          HC      3

  79          KK   RT-2A
  80          KM        ROUTE RUNOFF FROM DP 4A TO DP 8
  81          RD   1200    .007   .035          TRAP     30      3
1                                  HEC-1 INPUT                                  PAGE 3

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

H.R. SITE
  82          KK     12
  83          KM        RUNOFF FROM SUB-BASIN 12
  84          BA   .053
  85          LS      0      69
  86          UD   .058

H.R. SITE
  87          KK     13
  88          KM        RUNOFF FROM SUB-BASIN 13
  89          BA   .047
  90          LS      0      69
  91          UD    .06
```

```
  92        KK    DP-8
  93        KM       COMBINE RUNOFF FROM RT-2A SUB-BASIN 12 AND SUB-BASIN 13
  94        HC       3

  95        KK   RT-6A
  96        KM      ROUTE RUNOFF FROM DP 8 TO RT6
  97        RD     600     .02     .03           TRAP       2       3

  98        KK    RT6
  99        KM      ROUTE RUNOFF FROM RT-6A TO DP 6
 100        RD    1000    .007    .035           TRAP      30       3

 101        KK       6
 102        KM      RUNOFF FROM SUB-BASIN 6
 103        BA     .12
 104        LS       0      83
 105        UD     .14

 106        KK   DP -6
 107        KM      COMBINE RINOFF FROM SUB-BASIN 6 AND RT-6
 108        HC       2

 109        KK    RT-7
 110        KM      ROUTE RUNOFF FROM DP 6 TO DP 7
 111        RD    3050    .007     .03           TRAP      45       3

 112        KK       7
 113        KM      RUNOFF FROM SUB-BASIN 7
 114        BA     .17
 115        LS       0      70
 116        UD     .26

 117        KK    DP-7
 118        KM      COMBINE RUNOFF FROM SUB-BASIN 7 AND RT-7
 119        HC       2

 120        KK    RT-8
 121        KM      ROUTE RUNOFF FROM DP-7 TO DP-8A
 122        RD    6800    .007    .035           TRAP      45       3
1                                        HEC-1 INPUT                                         PAGE  4

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 123        KK       9
 124        KM      RUNOFF FROM SUB-BASIN 9
 125        BA     .14
 126        LS       0    75.4
 127        UD     .34

 128        KK      11
```

```
129          KM        RUNOFF FROM SUB-BASIN 11
130          BA    .146
131          LS       0      78
132          UD    .135

133          KK    DB11
134          KM      ROUTE RUNOFF FROM SB 11 THROUGH EXISTING NORTHCREST DETENTION BASIN
135          RS       1    ELEV  6436.5
136          SQ       0      45      48      52      55      57      60
137          SE  6436.5  6441.5    6442    6444    6446    6448    6450
138          SV       0      .1     .15       2    4.93    8.56    12.8

139          KK   RT11A
140          KM      ROUTE DISCHARGE FROM NORTHCREST DB TO RT11B
141          RD.   2100     .02    .025            CIRC       3

142          KK   RT11B
143          KM      ROUTE RT11A TO DP 10
144          RD     700     .02    .035            TRAP      10       3

145          KK      10
146          KM      RUNOFF FROM SUB-BASIN 10
147          BA     .07
148          LS       0    79.7
149          UD     .22

150          KK    DP10
151          KM      COMBINE RUNOFF FROM SUB-BASIN 10 AND RT11B
152          HC       2

153          KK    DP-9
154          KM      COMBINE RUNOFF FROM SB 9 AND DP 10
155          HC       2

156          KK    RT-9
157          KM      ROUTE RUNOFF FROM DP 9 TO DP 8A
158          RD    2650     .01    .035            TRAP      15       3

159          KK       8
160          KM      RUNOFF FROM SUB-BASIN 8
161          BA     .19
162          LS       0      70
163          UD     .26
1
                                   HEC-1 INPUT                                          PAGE  5

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

164          KK   DP-8A
165          KM      COMBINE RUNOFFF ROM SUB-BASIN 8, RT-9 AND RT-8
166          HC       3
167          ZZ
```

```
 79      RT-2A
           .
 82        .          12
           .           .
 87        .           .          13
           .           .           .
 92       DP-8.........................
           V
           V
 95      RT-6A
           V
           V
 98       RT6
           .
101        .          6
           .           .
106      DP -6.........
           V
           V
109      RT-7
           .
112        .          7
           .           .
117      DP-7..........
           V
           V
120      RT-8
           .
123        .          9
           .           .
128        .           .          11
           .           .           V
133        .           .          DB11
           .           .           V
139        .           .          RT11A
           .           .           V
142        .           .          RT11B
           .           .           .
145        .           .           .          10
```

```
150          .          .          .          .
             .          .          DP10...........
             .          .          .
             .          .          .
153          .        DP-9...........
             .          V
             .          V
156          .        RT-9
             .          .
             .          .
159          .          .          8
             .          .          .
             .          .          .
164        DP-8A.........................

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************
*                                        *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *
*             JUN   1998                 *
*            VERSION 4.1                 *
*                                        *
*  RUN DATE   04SEP07  TIME  11:53:45    *
*                                        *
******************************************

******************************************
*                                        *
*     U.S. ARMY CORPS OF ENGINEERS       *
*     HYDROLOGIC ENGINEERING CENTER      *
*           609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616         *
*            (916) 756-1104              *
*                                        *
******************************************

                        East Fork Subtributary hydrology  PN:  06040
                        Existing devel   condition with storage at RR Embankment
                        Sand Creek DBPS Hydrology update
                        Existing culvert under RR in-place and no blockage
                        10- and 100 Year, 24 hr Type IIA  Storm  FN efstd.dat

 7 IO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

  IT           HYDROGRAPH TIME DATA
                      NMIN           5  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      2    0  ENDING DATE
                    NDTIME        0055  ENDING TIME
                     ICENT          19  CENTURY MARK

                COMPUTATION INTERVAL     .08 HOURS
```

```
                    TOTAL TIME BASE   24.92 HOURS

        ENGLISH UNITS
             DRAINAGE AREA            SQUARE MILES
             PRECIPITATION DEPTH      INCHES
             LENGTH, ELEVATION        FEET
             FLOW                     CUBIC FEET PER SECOND
             STORAGE VOLUME           ACRE-FEET
             SURFACE AREA             ACRES
             TEMPERATURE              DEGREES FAHRENHEIT

  JP          MULTI-PLAN OPTION
                    NPLAN               1  NUMBER OF PLANS

  JR          MULTI-RATIO OPTION
                 RATIOS OF PRECIPITATION
                  .68      1.00
1
```

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .68	 RATIO 2 1.00
HYDROGRAPH AT						
+	5	.20	1	FLOW	154.	326.
				TIME	6.08	6.00
ROUTED TO						
+	RT-5A	.20	1	FLOW	151.	322.
				TIME	6.08	6.08
ROUTED TO						
+	RT-5	.20	1	FLOW	142.	313.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	1	.14	1	FLOW	117.	242.
				TIME	6.08	6.00
2 COMBINED AT						
+	DP-1	.34	1	FLOW	255.	551.
				TIME	6.08	6.08
ROUTED TO						
+	RT-1	.34	1	FLOW	245.	518.
				TIME	6.25	6.25

```
 HYDROGRAPH AT
+                    2        .32     1    FLOW          181.       429.
                                           TIME          6.08       6.08
  2 COMBINED AT
+                 DP-14       .66     1    FLOW          360.       886.
                                           TIME          6.25       6.17
 ROUTED TO
+                 DB-14       .66     1    FLOW          351.       627.
                                           TIME          6.25       6.33
                                     ** PEAK STAGES IN FEET **
                                      1    STAGE        90.33      95.05
                                           TIME          6.25       6.33
 ROUTED TO
+                 RT-2B       .66     1    FLOW          340.       624.
                                           TIME          6.33       6.42
 HYDROGRAPH AT
+                    3        .16     1    FLOW          130.       283.
                                           TIME          6.00       6.00
 ROUTED TO
+                 RT-3A       .16     1    FLOW          126.       273.
                                           TIME          6.08       6.00
 ROUTED TO
+                 RT-3        .16     1    FLOW          126.       270.
                                           TIME          6.08       6.00
 HYDROGRAPH AT
+                    4        .15     1    FLOW           74.       183.
                                           TIME          6.08       6.08
  3 COMBINED AT
+                 DP-4A       .98     1    FLOW          393.       831.
                                           TIME          6.33       6.08
 ROUTED TO
+                 RT-2A       .98     1    FLOW          384.       824.
                                           TIME          6.42       6.17
 HYDROGRAPH AT
+                   12        .05     1    FLOW           37.        85.
                                           TIME          6.00       6.00
 HYDROGRAPH AT
+                   13        .05     1    FLOW           32.        75.
                                           TIME          6.00       6.00
```

3 COMBINED AT							
+	DP-8	1.08	1	FLOW	392.	856.	← EXISTING CONDITION
				TIME	6.42	6.17	CONSTITUTION CULVERT
ROUTED TO							
+	RT-6A	1.08	1	FLOW	390.	852.	
				TIME	6.42	6.17	
ROUTED TO							
+	RT6	1.08	1	FLOW	385.	835.	
				TIME	6.42	6.17	
HYDROGRAPH AT							
+	6	.12	1	FLOW	144.	269.	
				TIME	6.00	6.00	
2 COMBINED AT							
+	DP -6	1.20	1	FLOW	410.	1004.	
				TIME	6.42	6.17	
ROUTED TO							
+	RT-7	1.20	1	FLOW	402.	993.	
				TIME	6.50	6.25	
HYDROGRAPH AT							
+	7	.17	1	FLOW	69.	174.	
				TIME	6.17	6.17	
2 COMBINED AT							
+	DP-7	1.37	1	FLOW	429.	1151.	
				TIME	6.50	6.17	
ROUTED TO							
+	RT-8	1.37	1	FLOW	444.	1144.	
				TIME	6.50	6.42	
HYDROGRAPH AT							
+	9	.14	1	FLOW	72.	159.	
				TIME	6.25	6.17	
HYDROGRAPH AT							
+	11	.15	1	FLOW	134.	275.	
				TIME	6.08	6.00	
ROUTED TO							
+	DB11	.15	1	FLOW	52.	56.	
				TIME	6.25	6.33	
			**	PEAK STAGES IN FEET **			
			1	STAGE	6443.93	6446.82	
				TIME	6.25	6.33	

```
 ROUTED TO
+               RT11A       .15      1   FLOW        52.      56.
                                         TIME       6.33     6.42

 ROUTED TO
+               RT11B       .15      1   FLOW        52.      56.
                                         TIME       6.33     6.50

 HYDROGRAPH AT
+                  10       .07      1   FLOW        61.     122.
                                         TIME       6.08     6.08

  2 COMBINED AT
+                DP10       .22      1   FLOW       110.     175.
                                         TIME       6.08     6.08

  2 COMBINED AT
+                DP-9       .36      1   FLOW       177.     325.
                                         TIME       6.17     6.17

 ROUTED TO
+                RT-9       .36      1   FLOW       174.     321.
                                         TIME       6.25     6.25

 HYDROGRAPH AT
+                   8       .19      1   FLOW        77.     194.
                                         TIME       6.17     6.17

  3 COMBINED AT
+               DP-8A      1.91      1   FLOW       609.    1497.
1                                        TIME       6.50     6.42

*** NORMAL END OF HEC-1 ***
```

Hydrologic Analysis
HEC-1

Main Line Tributary 6
DBPS Developed Condition Input/Output Data (Kiowa Eng)

```
1*****************************************                    ***************************************
 *                                       *                    *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998                *                    *   HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                    *         609 SECOND STREET           *
 *                                       *                    *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   24MAY13  TIME  15:09:53   *                    *          (916) 756-1104             *
 *                                       *                    *                                     *
*****************************************                    ***************************************


                    X     X  XXXXXXX   XXXXX          X
                    X     X  X        X     X        XX
                    X     X  X        X               X
                    XXXXXXX  XXXX     X       XXXXX   X
                    X     X  X        X               X
                    X     X  X        X     X         X
                    X     X  XXXXXXX   XXXXX         XXX


         THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

         THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
         THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
         NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
         DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
         KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                      HEC-1 INPUT                                          PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

           1           ID        East Fork Subtributary Hydrology PN:  60970
           2           ID        Future developed condition (onsite and offsite) with storage at RR Emban
           3           ID        Existing RR culvert in place and no blockage.
           4           ID        5 yr, 10 yr and 100 Year, 24 hr Typoe IIA Storm  FN efscdv.dat
                       *DIAGRAM
           5           IT       5       0       0     300
           6           IO       5       0
           7           JR    PREC     .59     .68     1.0

           8           KK       5
           9           KM        RUNOFF - Sub-basin 5
          10           BA     .20
          11           IN      15
          12           PB     4.4
          13           PC  0.0000  0.0005  0.0015  0.0030  0.0045  0.0060  0.0080  0.0100  0.0120  0.0143
          14           PC  0.0165  0.0188  0.0210  0.0233  0.0255  0.0278  0.0320  0.0390  0.0460  0.0530
          15           PC  0.0600  0.0750  0.1000  0.4000  0.7000  0.7250  0.7500  0.7650  0.7800  0.7900
```

```
 16         PC  0.8000  0.8100  0.8200  0.8250  0.8300  0.8350  0.8400  0.8450  0.8500  0.8550
 17         PC  0.8600  0.8638  0.8675  0.8713  0.8750  0.8788  0.8825  0.8863  0.8900  0.8938
 18         PC  0.8975  0.9013  0.9050  0.9083  0.9115  0.9148  0.9180  0.9210  0.9240  0.9270
 19         PC  0.9300  0.9325  0.9350  0.9375  0.9400  0.9425  0.9450  0.9475  0.9500  0.9525
 20         PC  0.9550  0.9575  0.9600  0.9625  0.9650  0.9675  0.9700  0.9725  0.9750  0.9775
 21         PC  0.9800  0.9813  0.9825  0.9838  0.9850  0.9863  0.9875  0.9888  0.9900  0.9913
 22         PC  0.9925  0.9938  0.9950  0.9963  0.9975  0.9988  1.0000
 23         LS       0      75
 24         UD    0.14

 25         KK   RT-5A
 26         KM        ROUTE FLOW from SUB-BASIN 5 TO RT-5A
 27         RD    1050    0.01    .013            TRAP      30      20

 28         KK    RT-5
 29         KM        ROUTE FLOW FROM RT-5A TP DP-1
 30         RD    1100   .0133    .035            TRAP       5      10

 31         KK       1
 32         KM        RUNOFF - Sub-basin 1
 33         BA     .14
 34         LS       0    76.3
 35         UD    0.14

 36         KK    DP-1
 37         KM        COMBINE FLOW FROM RT-5 AND SUB-BASIN 1
 38         HC       2

 39         KK    RT-1
 40         KM        ROUTE FLOW from DESIGN POINT DP-1 TO DP-14
 41         RD    4400   0.016    .035            TRAP      20      10

 42         KK       2
 43         KM        RUNOFF - Sub-basin 2
 44         BA    .325
 45         LS       0    73.6
 46         UD    0.19
1                                      HEC-1 INPUT                                          PAGE  2

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 47         KK   DP-14
 48         KM        COMBINE FLOW FROM RT-1 AND SUB-BASIN 2
 49         HC       2

 50         KK   DB-14
 51         KM        ROUTE FLOW from DESIGN POINT DP-14 THROUGH DETENTION BASIN
 52         RS       1    ELEV      83
 53         SQ       0      75     325     480     575     675     775     850
 54         SE      83      86      90      92      94      96      98     100
 55         SV       0      .4      .8     1.7     4.6     8.9    17.6    31.6

 56         KK   RT-2B
 57         KM        ROUTE FLOW from DESIGN POINT DB-14 TO DP-4A
```

```
 58           RD   2650    .005    .025            TRAP      16        4

 59           KK      3
 60           KM        RUNOFF FROM SUB-BASIN 3
 61           BA    .164
 62           LS      0    74.9
 63           UD   0.12

 64           KK   RT-3A
 65           KM        ROUTE RUNOFF FROM SB-3 TO RT-3
 66           RD   1300     .02    .013            CIRC     3.5

 67           KK    RT-3
 68           KM        ROUTE RUNOFF FROM RT-3A TO DP 4A
 69           RD    500     .02    .013            CIRC       5

 70           KK      4
 71           KM        RUNOFF FROM SUB-BASIN 4
 72           BA    .147
 73           LS      0    83.5
 74           UD  0.144

 75           KK   DP-4A
 76           KM        COMBINE RUNOFF FROM RT-3, RT-2B AND SB 4
 77           HC      3

 78           KK   RT-2A
 79           KM        ROUTE RUNOFF FROM DP 4A TO DP 8
 80           RD   1200    .007    .035            TRAP      30        3

 81           KK     12
 82           KM        RUNOFF FROM SUB-BASIN 12
 83           BA    .053
 84           LS      0      92
 85           UD  0.058
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 86           KK     13
 87           KM        RUNOFF FROM SUB-BASIN 13
 88           BA    .047
 89           LS      0    88.5
 90           UD   0.06

 91           KK    DP-8
 92           KM        COMBINE RUNOFF FROM RT-2A SUB-BASIN 12 AND SUB-BASIN 13
 93           HC      3

 94           KK   RT-6A
 95           KM        ROUTE RUNOFF FROM DP 8 TO RT 6
 96           RD    600     .02     .03            TRAP       2        3

 97           KK    RT-6
```

```
 98           KM        ROUTE RUNOFF FROM RT-6A TO DP 6
 99           RD    1000    .007    .035            TRAP      30       3

100           KK       6
101           KM        RUNOFF FROM SUB-BASIN 6
102           BA     .12
103           LS       0      83
104           UD    0.14

105           KK    DP-6
106           KM        COMBINE RUNOFF FROM RT-2A SUB-BASIN 6 AND RT-6
107           HC       2

108           KK    RT-7
109           KM        ROUTE RUNOFF FROM DP 6 TO DP 7
110           RD    3050    .007     .03            TRAP      45       3

111           KK       7
112           KM        RUNOFF FROM SUB-BASIN 7
113           BA     .17
114           LS       0    78.3
115           UD    0.26

116           KK    DP-7
117           KM        COMBINE RUNOFF FROM SUB-BASIN 7 AND RT-7
118           HC       2

119           KK    RT-8
120           KM        ROUTE RUNOFF FROM DP-7 TO DP-8A
121           RD    6800    .007    .035            TRAP      45       3

122           KK       9
123           KM        RUNOFF FROM SUB-BASIN 9
124           BA     .14
125           LS       0    75.4
126           UD    0.34
1                                  HEC-1 INPUT                                                    PAGE  4

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


127           KK      11
128           KM        RUNOFF FROM SUB-BASIN 11
129           BA    .146
130           LS       0      78
131           UD   0.135

132           KK    DB11
133           KM        ROUTE FLOW from SB 11 THROUGH EXISTING NORTHCREST DETENTION BASIN
134           RS       1    ELEV  6436.5
135           SQ       0      45      48      52      55      57      60
136           SE  6436.5  6441.5    6442    6444    6446    6448    6450
137           SV       0      .1     .15       2    4.93    8.56    12.8

138           KK   RT11A
```

```
139          KM        ROUTE DISCHARGE FROM NORTHCREST DB TO RT-11B
140          RD    2100      .02     .025              CIRC       3

141          KK   RT11B
142          KM        ROUTE RT11A TO DP 10
143          RD     700      .02     .035              TRAP      10       3

144          KK      10
145          KM        RUNOFF FROM SUB-BASIN 10
146          BA     .07
147          LS       0     79.7
148          UD     .22

149          KK    DP10
150          KM        COMBINE RUNOFF FROM SUB-BASIN 10 AND RT11B
151          HC       2

152          KK    DP-9
153          KM        COMBINE RUNOFF FROM SB 9 AND DP 10
154          HC       2

155          KK    RT-9
156          KM        ROUTE RUNOFF FROM DP 9 TO DP 8A
157          RD    2650      .01     .035              TRAP      15       3

158          KK       8
159          KM        RUNOFF FROM SUB-BASIN 8
160          BA     .19
161          LS       0     83.5
162          UD     .26

163          KK   DP-8A
164          KM        COMBINE RUNOFF FROM SUB-BASIN 8, RT-9 AND RT-8
165          HC       3
166          ZZ
```

```
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE    (V) ROUTING         (--->) DIVERSION OR PUMP FLOW

   NO.    (.) CONNECTOR       (<---) RETURN OF DIVERTED OR PUMPED FLOW

    8          5
               V
               V
   25       RT-5A
               V
               V
   28        RT-5
               .
               .
   31          .           1
               .           .
               .           .
   36        DP-1............
```

```
              V
              V
 39        RT-1
              .
              .
 42           .           2
              .           .
              .           .
 47       DP-14............
              V
              V
 50       DB-14
              V
              V
 56       RT-2B
              .
              .
 59           .           3
              .           V
              .           V
 64           .       RT-3A
              .           V
              .           V
 67           .        RT-3
              .           .
              .           .
 70           .           .            4
              .           .            .
              .           .            .
 75       DP-4A.........................
              V
              V
 78       RT-2A
              .
              .
 81           .          12
              .           .
              .           .
 86           .           .           13
              .           .            .
              .           .            .
 91        DP-8.........................
              V
              V
 94       RT-6A
              V
              V
 97        RT-6
              .
              .
100           .           6
              .           .
              .           .
105        DP-6............
              V
```

```
                V
  108        RT-7
                .
                .
  111           .           7
                .           .
                .           .
  116        DP-7............
                V
                V
  119        RT-8
                .
                .
  122           .           9
                .           .
                .           .
  127           .           .          11
                .           .           V
                .           .           V
  132           .           .        DB11
                .           .           V
                .           .           V
  138           .           .       RT11A
                .           .           V
                .           .           V
  141           .           .       RT11B
                .           .           .
                .           .           .
  144           .           .           .          10
                .           .           .           .
                .           .           .           .
  149           .           .        DP10............
                .           .           .
                .           .           .
  152           .        DP-9............
                .           V
                .           V
  155           .        RT-9
                .           .
                .           .
  158           .           .           8
                .           .           .
                .           .           .
  163       DP-8A........................

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN   1998                *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   24MAY13  TIME  15:09:53   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
                         East Fork Subtributary Hydrology PN:  60970
                         Future developed condition (onsite and offsite) with storage at RR Emban
                         Existing RR culvert in place and no blockage.
                         5 yr, 10 yr and 100 Year, 24 hr Typoe IIA Storm  FN efscdv.dat

 6 IO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT         HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE     1    0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     2    0  ENDING DATE
                   NDTIME       0055  ENDING TIME
                    ICENT         19  CENTURY MARK

               COMPUTATION INTERVAL     .08 HOURS
                    TOTAL TIME BASE   24.92 HOURS

         ENGLISH UNITS
              DRAINAGE AREA          SQUARE MILES
              PRECIPITATION DEPTH    INCHES
              LENGTH, ELEVATION      FEET
              FLOW                   CUBIC FEET PER SECOND
              STORAGE VOLUME         ACRE-FEET
              SURFACE AREA           ACRES
              TEMPERATURE            DEGREES FAHRENHEIT

   JP         MULTI-PLAN OPTION
                    NPLAN          1  NUMBER OF PLANS

   JR         MULTI-RATIO OPTION
                  RATIOS OF PRECIPITATION
                   .59       .68      1.00
1

              PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                                TIME TO PEAK IN HOURS


                                                              RATIOS APPLIED TO PRECIPITATION
 OPERATION        STATION     AREA    PLAN              RATIO 1  RATIO 2  RATIO 3
                                                            .59      .68     1.00

 HYDROGRAPH AT
+                        5      .20     1    FLOW          112.     154.     326.
```

				TIME	6.08	6.08	6.00
ROUTED TO							
+	RT-5A	.20	1	FLOW	108.	151.	322.
				TIME	6.08	6.08	6.08
ROUTED TO							
+	RT-5	.20	1	FLOW	104.	142.	313.
				TIME	6.17	6.17	6.08
HYDROGRAPH AT							
+	1	.14	1	FLOW	86.	117.	242.
				TIME	6.08	6.08	6.00
2 COMBINED AT							
+	DP-1	.34	1	FLOW	180.	255.	551.
				TIME	6.08	6.08	6.08
ROUTED TO							
+	RT-1	.34	1	FLOW	170.	245.	518.
				TIME	6.33	6.25	6.25
HYDROGRAPH AT							
+	2	.32	1	FLOW	145.	207.	467.
				TIME	6.08	6.08	6.08
2 COMBINED AT							
+	DP-14 (IN)	.66	1	FLOW	261.	374.	915.
				TIME	6.25	6.25	6.17
ROUTED TO							
+	DB-14 (OUT)	.66	1	FLOW	250.	360.	640.
				TIME	6.25	6.25	6.33
			** PEAK STAGES IN FEET **				
			1	STAGE	88.80	90.45	95.31
				TIME	6.25	6.25	6.33
ROUTED TO							
+	RT-2B	.66	1	FLOW	245.	352.	636.
				TIME	6.42	6.33	6.42
HYDROGRAPH AT							
+	3	.16	1	FLOW	93.	130.	283.
				TIME	6.00	6.00	6.00
ROUTED TO							
+	RT-3A	.16	1	FLOW	92.	126.	273.
				TIME	6.08	6.08	6.00
ROUTED TO							
+	RT-3	.16	1	FLOW	91.	126.	270.
				TIME	6.08	6.08	6.00
HYDROGRAPH AT							

+	4	.15	1	FLOW	139.	179.	333.
				TIME	6.08	6.00	6.00
3 COMBINED AT							
+	DP-4A	.98	1	FLOW	289.	428.	991.
				TIME	6.42	6.33	6.08
ROUTED TO							
+	RT-2A	.98	1	FLOW	288.	425.	948.
				TIME	6.42	6.33	6.17
HYDROGRAPH AT							
+	12	.05	1	FLOW	90.	107.	168.
				TIME	6.00	6.00	6.00
HYDROGRAPH AT							
+	13	.05	1	FLOW	70.	85.	139.
				TIME	6.00	6.00	6.00
3 COMBINED AT							
+	DP-8	1.08	1	FLOW	342.	457.	1076.
				TIME	6.00	6.00	6.08
ROUTED TO							
+	RT-6A	1.08	1	FLOW	328.	448.	1069.
				TIME	6.00	6.08	6.08
ROUTED TO							
+	RT-6	1.08	1	FLOW	326.	447.	1044.
				TIME	6.08	6.08	6.08
HYDROGRAPH AT							
+	6	.12	1	FLOW	111.	144.	269.
				TIME	6.00	6.00	6.00
2 COMBINED AT							
+	DP-6	1.20	1	FLOW	437.	588.	1299.
				TIME	6.08	6.08	6.08
ROUTED TO							
+	RT-7	1.20	1	FLOW	419.	570.	1296.
				TIME	6.17	6.17	6.17
HYDROGRAPH AT							
+	7	.17	1	FLOW	92.	125.	255.
				TIME	6.17	6.17	6.17
2 COMBINED AT							
+	DP-7	1.37	1	FLOW	511.	695.	1551.
				TIME	6.17	6.17	6.17
ROUTED TO							
+	RT-8	1.37	1	FLOW	552.	685.	1481.
				TIME	6.42	6.42	6.42

```
 HYDROGRAPH AT
+                    9        .14      1   FLOW          51.       72.      159.
                                            TIME        6.25      6.25      6.17

 HYDROGRAPH AT
+                   11        .15      1   FLOW         101.      134.      275.
                                            TIME        6.08      6.08      6.00

 ROUTED TO
+                 DB11        .15      1   FLOW          50.       52.       56.
                                            TIME        6.25      6.25      6.33

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     6442.94   6443.93   6446.82
                                            TIME        6.25      6.25      6.33

 ROUTED TO
+                RT11A        .15      1   FLOW          50.       52.       56.
                                            TIME        6.25      6.33      6.42

 ROUTED TO
+                RT11B        .15      1   FLOW          50.       52.       56.
                                            TIME        6.33      6.33      6.50

 HYDROGRAPH AT
+                   10        .07      1   FLOW          45.       61.      122.
                                            TIME        6.08      6.08      6.08

  2 COMBINED AT
+                 DP10        .22      1   FLOW          94.      110.      175.
                                            TIME        6.08      6.08      6.08

  2 COMBINED AT
+                 DP-9        .36      1   FLOW         141.      177.      325.
                                            TIME        6.17      6.17      6.17

 ROUTED TO
+                 RT-9        .36      1   FLOW         138.      174.      321.
                                            TIME        6.25      6.25      6.25

 HYDROGRAPH AT
+                    8        .19      1   FLOW         145.      187.      353.
                                            TIME        6.17      6.17      6.08

  3 COMBINED AT
+                DP-8A       1.91      1   FLOW         746.      925.     2088.
                                            TIME        6.42      6.42      6.25
1
                                            SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                            INTERPOLATED TO
                                                                         COMPUTATION INTERVAL
            ISTAQ     ELEMENT       DT        PEAK    TIME TO      VOLUME        DT        PEAK     TIME TO      VOLUME
                                                        PEAK                                         PEAK
```

```
                          (MIN)     (CFS)     (MIN)      (IN)     (MIN)     (CFS)     (MIN)       (IN)

        FOR PLAN = 1  RATIO=  .00
           RT-5A  MANE         1.50    109.23    367.50       .71      5.00    108.42    365.00        .71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7544E+01 EXCESS= .0000E+00 OUTFLOW= .7545E+01 BASIN STORAGE= .5138E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
           RT-5A  MANE         1.50    151.07    366.00       .96      5.00    150.98    365.00        .95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1019E+02 EXCESS= .0000E+00 OUTFLOW= .1019E+02 BASIN STORAGE= .5059E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
           RT-5A  MANE         1.50    328.58    363.00      1.97      5.00    321.98    365.00       1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2104E+02 EXCESS= .0000E+00 OUTFLOW= .2104E+02 BASIN STORAGE= .6052E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
            RT-5  MANE         1.50    105.93    369.00       .71      5.00    103.89    370.00        .71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7528E+01 EXCESS= .0000E+00 OUTFLOW= .7529E+01 BASIN STORAGE= .7025E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
            RT-5  MANE         1.50    146.74    369.00       .95      5.00    141.81    370.00        .95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1017E+02 EXCESS= .0000E+00 OUTFLOW= .1017E+02 BASIN STORAGE= .8435E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
            RT-5  MANE         1.75    315.19    365.75      1.97      5.00    313.31    365.00       1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2105E+02 EXCESS= .0000E+00 OUTFLOW= .2105E+02 BASIN STORAGE= .8784E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
            RT-1  MANE         1.75    174.38    378.00       .73      5.00    170.47    380.00        .73

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1326E+02 EXCESS= .0000E+00 OUTFLOW= .1327E+02 BASIN STORAGE= .2881E-01 PERCENT ERROR=   -.3

        FOR PLAN = 1  RATIO=  .00
            RT-1  MANE         1.50    245.21    376.50       .98      5.00    244.80    375.00        .98
```

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1782E+02 EXCESS= .0000E+00 OUTFLOW= .1783E+02 BASIN STORAGE= .2754E-01 PERCENT ERROR=   -.2

         FOR PLAN = 1  RATIO=  .00
            RT-1  MANE         1.75    536.45    372.75      2.01      5.00    517.96    375.00        2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3648E+02 EXCESS= .0000E+00 OUTFLOW= .3650E+02 BASIN STORAGE= .2421E-01 PERCENT ERROR=   -.1

         FOR PLAN = 1  RATIO=  .00
            RT-2B MANE         2.50    248.00    382.50       .69      5.00    245.46    385.00         .69

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2450E+02 EXCESS= .0000E+00 OUTFLOW= .2447E+02 BASIN STORAGE= .7525E-01 PERCENT ERROR=   -.2

         FOR PLAN = 1  RATIO=  .00
            RT-2B MANE         2.00    353.55    382.00       .93      5.00    351.80    380.00         .93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3306E+02 EXCESS= .0000E+00 OUTFLOW= .3303E+02 BASIN STORAGE= .8008E-01 PERCENT ERROR=   -.1

         FOR PLAN = 1  RATIO=  .00
            RT-2B MANE         2.50    636.78    382.50      1.94      5.00    636.50    385.00        1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6890E+02 EXCESS= .0000E+00 OUTFLOW= .6886E+02 BASIN STORAGE= .8742E-01 PERCENT ERROR=   -.1

         FOR PLAN = 1  RATIO=  .00
            RT-3A MANE         1.20     92.74    362.80       .70      5.00     91.66    365.00         .70

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6146E+01 EXCESS= .0000E+00 OUTFLOW= .6146E+01 BASIN STORAGE= .1237E-03 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
            RT-3A MANE         1.12    129.77    361.43       .95      5.00    125.98    365.00         .95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8311E+01 EXCESS= .0000E+00 OUTFLOW= .8311E+01 BASIN STORAGE= .1261E-03 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
            RT-3A MANE          .96    280.84    361.31      1.96      5.00    273.25    360.00        1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1718E+02 EXCESS= .0000E+00 OUTFLOW= .1718E+02 BASIN STORAGE= .1142E-03 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
            RT-3  MANE          .44     91.22    365.19       .70      5.00     91.11    365.00         .70
```

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .6157E+01 EXCESS= .0000E+00 OUTFLOW= .6157E+01 BASIN STORAGE= .4146E-04 PERCENT ERROR=     .0

          FOR PLAN = 1  RATIO=  .00
              RT-3  MANE          .41    125.68    365.07       .95      5.00    125.65    365.00         .95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8322E+01 EXCESS= .0000E+00 OUTFLOW= .8322E+01 BASIN STORAGE= .4276E-04 PERCENT ERROR=     .0

          FOR PLAN = 1  RATIO=  .00
              RT-3  MANE          .35    272.79    360.61      1.97      5.00    269.51    360.00        1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1720E+02 EXCESS= .0000E+00 OUTFLOW= .1720E+02 BASIN STORAGE= .4307E-04 PERCENT ERROR=     .0

          FOR PLAN = 1  RATIO=  .00
             RT-2A  MANE         3.00    288.22    384.00       .76      5.00    287.68    385.00         .76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3973E+02 EXCESS= .0000E+00 OUTFLOW= .3971E+02 BASIN STORAGE= .6249E-01 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
             RT-2A  MANE         2.50    425.15    382.50      1.02      5.00    425.12    380.00        1.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5290E+02 EXCESS= .0000E+00 OUTFLOW= .5288E+02 BASIN STORAGE= .6696E-01 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
             RT-2A  MANE         2.25    966.02    369.00      2.06      5.00    947.73    370.00        2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1071E+03 EXCESS= .0000E+00 OUTFLOW= .1071E+03 BASIN STORAGE= .8568E-01 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
             RT-6A  MANE          .92    339.89    361.13       .85      5.00    328.21    360.00         .85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4851E+02 EXCESS= .0000E+00 OUTFLOW= .4851E+02 BASIN STORAGE= .1062E-01 PERCENT ERROR=     .0

          FOR PLAN = 1  RATIO=  .00
             RT-6A  MANE          .86    456.57    361.77      1.11      5.00    448.27    365.00        1.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6360E+02 EXCESS= .0000E+00 OUTFLOW= .6359E+02 BASIN STORAGE= .1153E-01 PERCENT ERROR=     .0

          FOR PLAN = 1  RATIO=  .00
             RT-6A  MANE          .69   1071.81    365.88      2.18      5.00   1068.96    365.00        2.18
```

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1248E+03 EXCESS= .0000E+00 OUTFLOW= .1248E+03 BASIN STORAGE= .1585E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
              RT-6  MANE          2.99    326.72    364.84       .84      5.00    326.16    365.00        .85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4851E+02 EXCESS= .0000E+00 OUTFLOW= .4849E+02 BASIN STORAGE= .6083E-01 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              RT-6  MANE          2.69    449.24    365.99      1.11      5.00    446.90    365.00       1.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6363E+02 EXCESS= .0000E+00 OUTFLOW= .6361E+02 BASIN STORAGE= .6514E-01 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              RT-6  MANE          2.01   1060.53    367.02      2.18      5.00   1043.87    365.00       2.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1249E+03 EXCESS= .0000E+00 OUTFLOW= .1249E+03 BASIN STORAGE= .8613E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
              RT-7  MANE          3.50    426.87    371.00       .87      5.00    418.79    370.00        .87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5573E+02 EXCESS= .0000E+00 OUTFLOW= .5568E+02 BASIN STORAGE= .2361E+00 PERCENT ERROR=   -.3

          FOR PLAN = 1  RATIO=  .00
              RT-7  MANE          4.00    577.91    372.00      1.14      5.00    570.28    370.00       1.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7282E+02 EXCESS= .0000E+00 OUTFLOW= .7278E+02 BASIN STORAGE= .2639E+00 PERCENT ERROR=   -.3

          FOR PLAN = 1  RATIO=  .00
              RT-7  MANE          5.00   1296.24    370.00      2.22      5.00   1296.24    370.00       2.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1417E+03 EXCESS= .0000E+00 OUTFLOW= .1418E+03 BASIN STORAGE= .3395E+00 PERCENT ERROR=   -.3

          FOR PLAN = 1  RATIO=  .00
              RT-8  MANE          4.00    573.35    384.00       .87      5.00    552.28    385.00        .87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6351E+02 EXCESS= .0000E+00 OUTFLOW= .6349E+02 BASIN STORAGE= .8941E+00 PERCENT ERROR=  -1.4

          FOR PLAN = 1  RATIO=  .00
```

```
       RT-8  MANE        4.50    751.72    382.50      1.14      5.00    684.93    385.00         1.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8318E+02 EXCESS= .0000E+00 OUTFLOW= .8316E+02 BASIN STORAGE= .9610E+00 PERCENT ERROR=  -1.1

    FOR PLAN = 1  RATIO=  .00
       RT-8  MANE        5.00   1480.72    385.00      2.23      5.00   1480.72    385.00         2.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1620E+03 EXCESS= .0000E+00 OUTFLOW= .1622E+03 BASIN STORAGE= .1221E+01 PERCENT ERROR=   -.8

    FOR PLAN = 1  RATIO=  .00
      RT11A  MANE        2.00     49.90    376.00       .85      5.00     49.87    375.00          .85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6626E+01 EXCESS= .0000E+00 OUTFLOW= .6625E+01 BASIN STORAGE= .3639E-03 PERCENT ERROR=    .0

    FOR PLAN = 1  RATIO=  .00
      RT11A  MANE        2.25     51.80    380.25      1.12      5.00     51.80    380.00         1.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8741E+01 EXCESS= .0000E+00 OUTFLOW= .8741E+01 BASIN STORAGE= .3212E-03 PERCENT ERROR=    .0

    FOR PLAN = 1  RATIO=  .00
      RT11A  MANE        2.50     55.83    382.50      2.21      5.00     55.80    385.00         2.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1721E+02 EXCESS= .0000E+00 OUTFLOW= .1721E+02 BASIN STORAGE= .3866E-03 PERCENT ERROR=    .0

    FOR PLAN = 1  RATIO=  .00
      RT11B  MANE        1.50     49.87    378.00       .85      5.00     49.82    380.00          .85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6630E+01 EXCESS= .0000E+00 OUTFLOW= .6630E+01 BASIN STORAGE= .4771E-03 PERCENT ERROR=    .0

    FOR PLAN = 1  RATIO=  .00
      RT11B  MANE        2.20     51.77    380.31      1.12      5.00     51.76    380.00         1.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8741E+01 EXCESS= .0000E+00 OUTFLOW= .8743E+01 BASIN STORAGE= .5229E-03 PERCENT ERROR=    .0

    FOR PLAN = 1  RATIO=  .00
      RT11B  MANE        2.15     55.79    387.13      2.21      5.00     55.78    390.00         2.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1723E+02 EXCESS= .0000E+00 OUTFLOW= .1723E+02 BASIN STORAGE= .5436E-03 PERCENT ERROR=    .0
```

```
          FOR PLAN = 1  RATIO=  .00
              RT-9  MANE         2.00    139.40    376.00       .82      5.00    137.56    375.00         .82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1554E+02 EXCESS= .0000E+00 OUTFLOW= .1554E+02 BASIN STORAGE= .1911E-01 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              RT-9  MANE         2.50    175.27    377.50      1.09      5.00    174.16    375.00        1.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2060E+02 EXCESS= .0000E+00 OUTFLOW= .2061E+02 BASIN STORAGE= .1982E-01 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              RT-9  MANE         2.00    321.57    374.00      2.16      5.00    320.77    375.00        2.16

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4096E+02 EXCESS= .0000E+00 OUTFLOW= .4095E+02 BASIN STORAGE= .2611E-01 PERCENT ERROR=   -.1


*** NORMAL END OF HEC-1 ***
```

Hydrologic and Hydraulic Calculations
West Offsite Basins

M.V.E., Inc. 11/15/2007
Project No.: 60754
Project: Hannah Ridge Final Drainage Report

ON-SITE RUNOFF COEFFICIENTS

Hydrologic Soil Group: A
Soil and Cover Condition: Fair

Specific Basin Conditions

Basin: A7a

Surface Type	Area (Ac)	C_5	C_{100}
Lawns	3.40	0.25	0.35
Composite	3.40	0.25	0.35

Basin: OSA5a

Surface Type	Area (Ac)	C_5	C_{100}
Pavement and Roofs	-	0.90	0.95
Gravel	0.20	0.80	0.85
Lawns	5.30	0.25	0.35
Composite	5.50	0.27	0.37

Basin: OSA5b

Surface Type	Area (Ac)	C_5	C_{100}
Pavement and Roofs	0.04	0.90	0.95
Gravel	0.05	0.80	0.85
Lawns	2.82	0.25	0.35
Composite	2.90	0.27	0.37

Basin: OSA5d

Surface Type	Area (Ac)	C_5	C_{100}
Pavement and Roofs	5.44	0.90	0.95
Gravel	0.00	0.80	0.85
Lawns	4.36	0.25	0.35
Composite	9.80	0.61	0.68

Basin: OSB1

Surface Type	Area (Ac)	C_5	C_{100}
Pavement and Roofs	1.38	0.90	0.95
Lawns	0.12	0.25	0.35
Composite	1.50	0.85	0.90

Basin: OSB2

Surface Type	Area (Ac)	C_5	C_{100}
Pavement and Roofs	1.26	0.90	0.95
Lawns	0.34	0.25	0.35
Composite	1.60	0.76	0.82

M.V.E., Inc.
Project No.: 60754 60754

11/15/2007
Project: Hannah Ridge Final Drainage Report

EXISTING CONDITIONS - TIMES OF CONCENTRATION & DISCHARGES

Basin Label	Channel Type or Basin	Cont. Area A_c (Ac)	5 Year Coef. C_5	100 Yr Coef or Curve No C_{100} or CN	Manning Rough. n	Length L (ft)	Elevation Change (ft)	Average Slope S	Channel Flow* Q (cfs)	Flow Depth d (ft)	Flow Area A (ft^2)	Flow Velocity v (ft/s)	Time of Cont** T_c (min)	Total Time T_c (min)	5 Year Intensity i_5 (in/hr)	100 Year Intensity i_{100} (in/hr)	5 Year Discharge Q_5 (cfs)	100 Year Discharge Q_{100} (cfs)
A7a	0	3.4	0.25	0.35	–	151	8	0.056	–	–	–	–	11.1	–	–	–	–	–
A7a	1	3.4	0.25	0.35	0.060	1,356	41	0.031	8.35	0.28	7.11	1.17	19.3	30.3	2.41	4.29	2.0	5.1
OSA5a	0	5.5	0.27	0.37	–	106	11	0.102	–	–	–	–	7.4	–	–	–	–	–
OSA5a	1	5.5	0.27	0.37	0.060	1,260	20	0.016	16.42	0.41	15.07	1.09	19.3	26.7	2.59	4.60	3.8	9.3
OSA5b	0	2.9	0.27	0.37	–	25	6	0.250	–	–	–	–	2.7	–	–	–	–	–
OSA5b	1.2	2.9	0.27	0.37	0.060	889	31	0.035	9.54	0.89	3.59	2.65	5.6	8.3	4.39	7.82	3.4	8.3
OSA5a+OSA5b	OSA5a	5.5	0.27	0.37	–	–	–	–	–	–	–	–	26.7	–	–	–	–	–
OSA5a+OSA5b	1.2	8.4	0.27	0.37	0.060	100	1	0.010	25.01	1.62	11.79	2.12	0.8	27.5	2.54	4.53	5.7	14.0
OSA5c	0	10.7[1]	0.48[2]	0.55[2]	–	300	6	0.020	–	–	–	–	15.9	–	–	–	–	–
OSA5c	4.2	10.7[1]	0.48[2]	0.55[2]	0.013	150	1	0.009	35.32	1.84	3.86	9.15	0.3	16.2	3.34	5.95	17.2[3]	35.0[4]
OSA5a+OSA5b+OSA5c	OSA5a+OSA5b	8.4	0.27	0.37	–	–	–	–	–	–	–	–	27.5	–	–	–	–	–
OSA5a+OSA5b+OSA5c	1.2	19.1	0.39	0.47	0.080	1	0	0.010	72.73	2.42	26.25	2.77	0.0	27.5	2.54	4.53	18.8	40.6
A7a+OSA5a+OSA5b+OSA5c	A7a	3.4	0.25	0.35	–	–	–	–	–	–	–	–	30.3	–	–	–	–	–
A7a+OSA5a+OSA5b+OSA5c	1	22.5	0.37	0.45	0.060	1	0	0.031	71.32	0.63	35.55	2.01	0.0	30.3	2.41	4.29	19.8	43.5
OSA5d[5]	0	9.8	0.61	0.68	–	228	6	0.026	–	–	–	–	10.0	–	–	–	–	–
OSA5d[5]	1.3	9.8	0.61	0.68	0.060	838	18	0.021	48.82	1.38	17.22	2.83	4.9	–	–	–	–	–
OSA5d[5]	4.2	9.8	0.61	0.68	0.013	230	5	0.022	48.82	1.70	3.55	13.74	0.3	15.2	3.44	6.12	20.6	41.0
OSA5e[6]		71.9	0.63	0.71	–	–	–	–	–	–	–	–	25.2	25.2	2.67	4.50	120.9[7]	229.8
OSB1	3	1.5	0.85	0.90	0.016	636	13	0.020	6.42	0.35	1.84	3.48	3.0	5.0	5.10	9.09	6.5	12.3
OSB2	3	1.6	0.76	0.82	0.016	797	26	0.033	6.25	0.32	1.50	4.18	3.2	5.0	5.10	9.09	6.2	12.0
OSC1[8]		5.9	0.35	0.57	–	–	–	–	–	–	–	–	18.8	18.8	3.11	5.30	6.4[9]	17.8

*Estimated using an initial 100 year intensity based on the corresponding Overland Time of Concentration.

**Overland Time of Concentration, $T_c = 1.67\ (1.1 - C_5)\ L^{0.5}\ S^{-0.33}$

Channel Time of Concentration calculated using average flow velocities from Manning's formula.

[1]This contributing area (A_C) is the total area draining to the existing 30" RCP storm drain near the southeast corner of Basin OSA5c as reported in the *Final Drainage Report Northcrest Filing No. 2 Phases 3, 4, and 5.* In that report, this area is made up of sub-basins 8, 9, 10, 11, and OS-1.

[2]These coefficients (C_5 and C_{100}) were derived from contributing area (A_C) and peak flow (Q) values as reported in the *Final Drainage Report Northcrest Filing No. 2 Phases 3, 4, and 5* and from a time of concentration (TC) based on existing conditions.

[3]This 5-year peak flow rate (Q_5) is extrapolated from the 10-year and 100-year peak flow rates (Q_{10} and Q_{100}) flowing through the exisiting 30" RCP storm drain near the southeast corner of Basin OSA5c as reported in the *Final Drainage Report Northcrest Filing No. 2 Phases 3, 4, and 5*.

[4]This 100-year peak flow rate (Q_{100}) is the 100-year peak flow rate flowing through the exisiting 30" RCP storm drain near the southeast corner of Basin OSA5c as reported in the *Final Drainage Report Northcrest Filing No. 2 Phases 3, 4, and 5*.

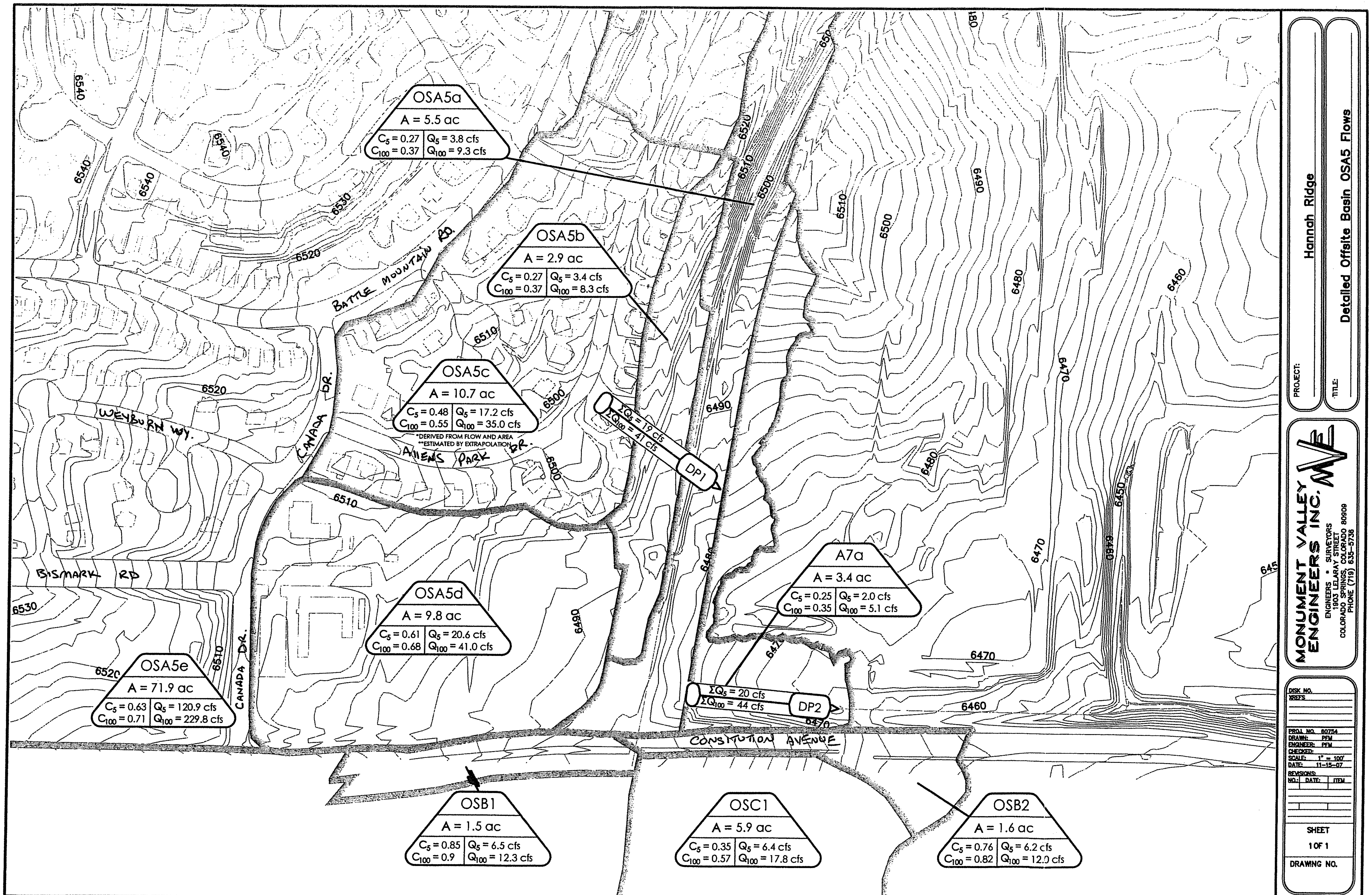
[5]All Basin OSA5d data is based on the proposed Living Waters PUD, designed by HMS Group, that at the time of this report was in the review process.

[6]All Basin ASA5e data is as reported in the hydrology analysis conducted by El Paso County for the desing of the storm drain extension just north of and parallel to Constitution Avenue and just east of the old CRI&P RR ROW. In that analysis conducted by El Paso County, this basin is identified as Basin A.

[7]This 5-year peak flow rate (Q_5) is estimated by using the 10-year coeffleient reported in the hydrology analysis conducted by El Paso County together with a 5-year intensity.

[8]All Basin OSC1 data is as reported in the hydrology analysis conducted by El Paso County. In that analysis conducted by El Paso County, this basin is identified as Basin C.

[9]This 5-year peak flow rate (Q_5) is estimated by using the 10-year coeffleient reported in the hydrology analysis conducted by El Paso County together with a 5-year intensity.



\\Kahuna\c\Land Projects\60754\dwg\60754Drainage Offsite.dwg, 11/15/2007 7:48:55 PM, KONICA

Existing

BASIN	DESIGN POINT	AREA (ACRES)	LENGTH (FT.)	HEIGHT (FT.)	T_c (MIN.)	I_{10} (IN./HR.)	I_{100} (IN./HR.)	DEVELOPMENT TYPE	C_{10}	C_{100}	Q_{10} (cfs)	Q_{100} (cfs)
A	1	71.93	— SEE	Hydrology sheets	25.23	3.0	4.5	46% Undev. 54% Residential 1/6 Ac	0.40	0.51	86.32	165.01
B_1		31.60										
B_2		13.63										
$B_1 + B_2$		45.23	700' Overland 1160' channel	28'-26.6 52' 9.9	32.5	2.6	3.9	All Undeveloped	0.25	0.35	29.4	61.7
C		5.88	550 Overland	30'	18.79	3.45	5.3	80% Parkland 20% Multi. Family	0.35	0.57	7.10	17.76
D		11.40	600' Overland 880' Channel	25' 20'	30.50	2.7	4.1	All Undeveloped	0.25	0.35	7.69	16.40
					Future	Development						
A	1	71.93	See	hydrology sheets	26.[illegible]	3.0	4.5	46% Business Park 54% Residential	0.63	0.71	135.95	229.82
$B_1 + B_2$		45.23	400 overland 1460' channel	20' 60'	17.62	3.70	5.55	45% Residential 25% Bus. Park 30% LT. Ind	0.63	0.72	105.43	180.74
C		5.88	As	Above	18.79	3.45	5.3	80% Parkland 20% Multifamily	0.35	0.57	7.10	17.76
D		11.40	400 overland 1080 channel	17' 22'	16.18	3.80	5.70	All Light Industrial	0.70	0.80	30.32	51.98

HYDROLOGIC COMPUTATION DATA
RATIONAL METHOD FOR SUB BASINS

PROJECT: Channel Engineering [illegible]
Constitution Ave & Shannon Dr.

BY: R.C. [illegible] DATE: [illegible]

PAGE ___ OF PAGES 2

22-142 100 SHEETS
22-144 200 SHEETS

BASIN	DESIGN POINT	AREA (ACRES)	LENGTH (FT.)	HEIGHT (FT.)	T_c (MIN.)	I_{10} (IN./HR.)	I_{100} (IN./HR.)	DEVELOPMENT TYPE	C_{10}	C_{100}	Q_{10} (cfs)	Q_{100} (cfs)
					Existing							
A	1	71.93	See Sheets	Hydrology 1&2	25.23	3.0	4.5	See Pg 1 of 1	0.40	0.5[illegible]	86.3	165.1
A, B1, B2	2	117.16	See	Pg 1 of 1	32.5	2.6	3.9	"	0.34	0.45	103.6	205.6
A, B1, B2, C	3	123.04	"	"	34.45	2.5	3.8	"	0.34	0.46	104.6	215.1
A, B1, B2, C, D	4	134.40	"	"	41.40	2.2	3.4	"	0.33	0.45	97.6	205.6
					Future	Developed						
A	1	71.93	See Hydrology Sheets	1&2	25.23	3.0	4.5	"	0.63	0.71	135.9	229.8
A, B1, B2	2	117.16	See	Page 1 of 1	26.44	2.9	4.4	"	0.63	0.71	214.1	366.0
A, B1, B2, C	3	123.04	"	"	28.39	2.8	4.2	"	0.62	0.71	213.6	366.9
A, B1, B2, C, D	4	134.40	"	"	35.31	2.4	3.7	"	0.62	0.72	200.0	358.0

HYDROLOGIC COMPUTATION DATA
RATIONAL METHOD

PROJECT: Channel Erosion North of Constitution Ave and Chambers Dr.
BY: [illegible] DATE: 3/91

PAGE 2 OF PAGES 2

BASIN	DESIGN POINT	AREA ACRE	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW 10 YR qp	100 YR
EXISTING CONDITIONS													
A	1	71.93	.1124			25.23 .421	615	B	SEE SUBBASIN CALCS.	74.94	.96/1.97	66.4	136.2
A,B	2	117.16	.1831			32.5 .542	545	A-B B-A		64.93	.51/1.27	50.9	126.7
A-C	3	123.04	.1923			34.45 .574	530	C-B B-A A-B		66.89	.59/1.39	60.1	141.7
A-D	4	134.4	.210			41.40 .690	480	A-B B-A C-B D-A		64.12	.48/1.22	48.4	123.0
FUTURE CONDITIONS													
A	1	71.93	.1124			25.23 .421	615			85.52	1.62/2.87	112.0	198.4
A,B	2	117.16	.1831			26.44 .441	600			85.47	1.61/2.86	176.9	314.2
A-C	3	123.04	.1923			28.39 .473	580			84.53	1.55/2.77	172.9	308.9
A-D	4	134.4	.210			35.34 .589	525			84.85	1.58/2.81	174.2	309.8
FUTURE A,B EX B2	2	117.16	.1831			26.49 .441	600			80.96	1.32/2.47	145.0	271.4
FUTURE A,B, EX B2,C	3	123.04	.1923			28.39 .473	580			80.23	1.27/2.40	141.6	267.7
FUTURE A,B, EX B2 CD	4	134.4	.210			35.34 .589	525			77.61	1.11/2.18	122.9	240.3

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ:

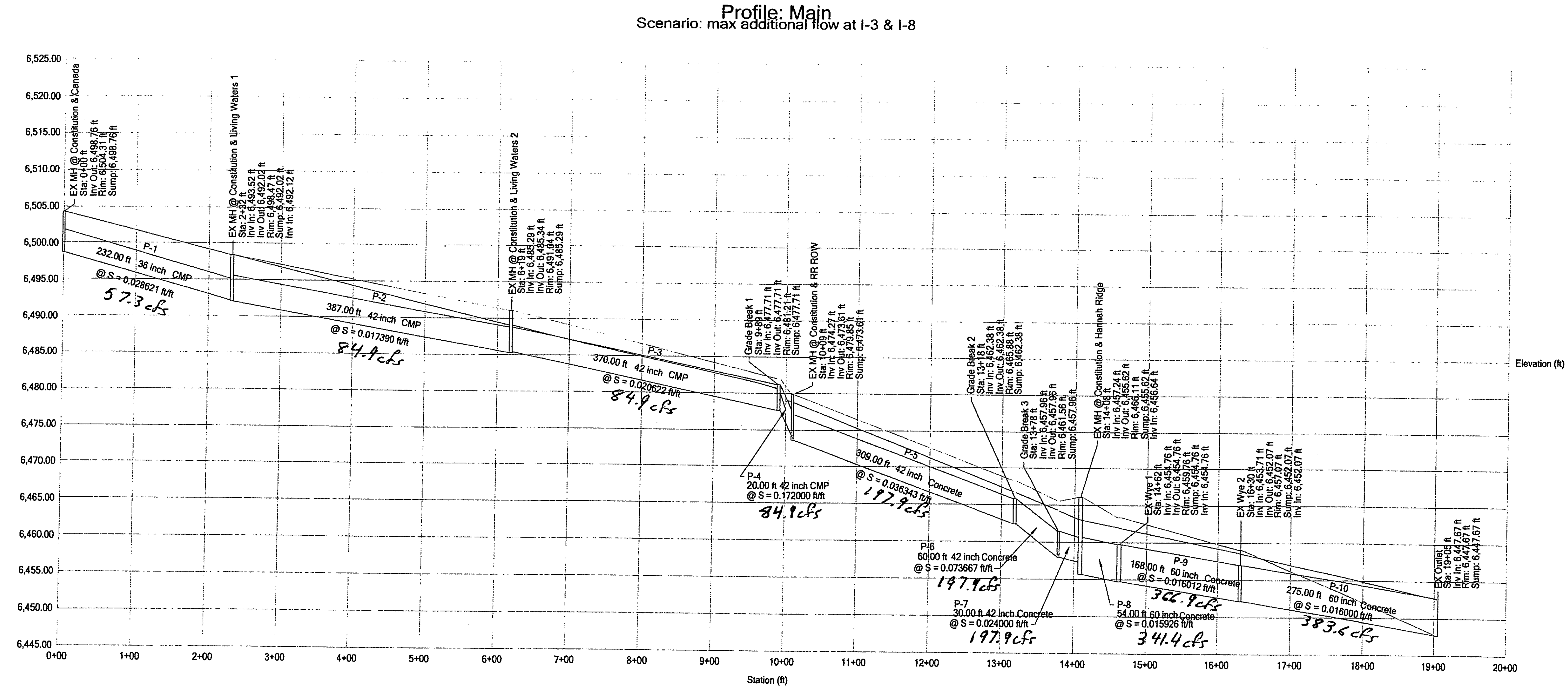
By: ABM
Date: 3/29

$Q_{10} = 3.0''$ $Q_{100} = 4.4''$
49 – A – FAIR PAST. B – PARK 61
69 – B – FAIR PAST. B – MULTI 85
88 – B – LIGHT IND. B – BUS PK 92

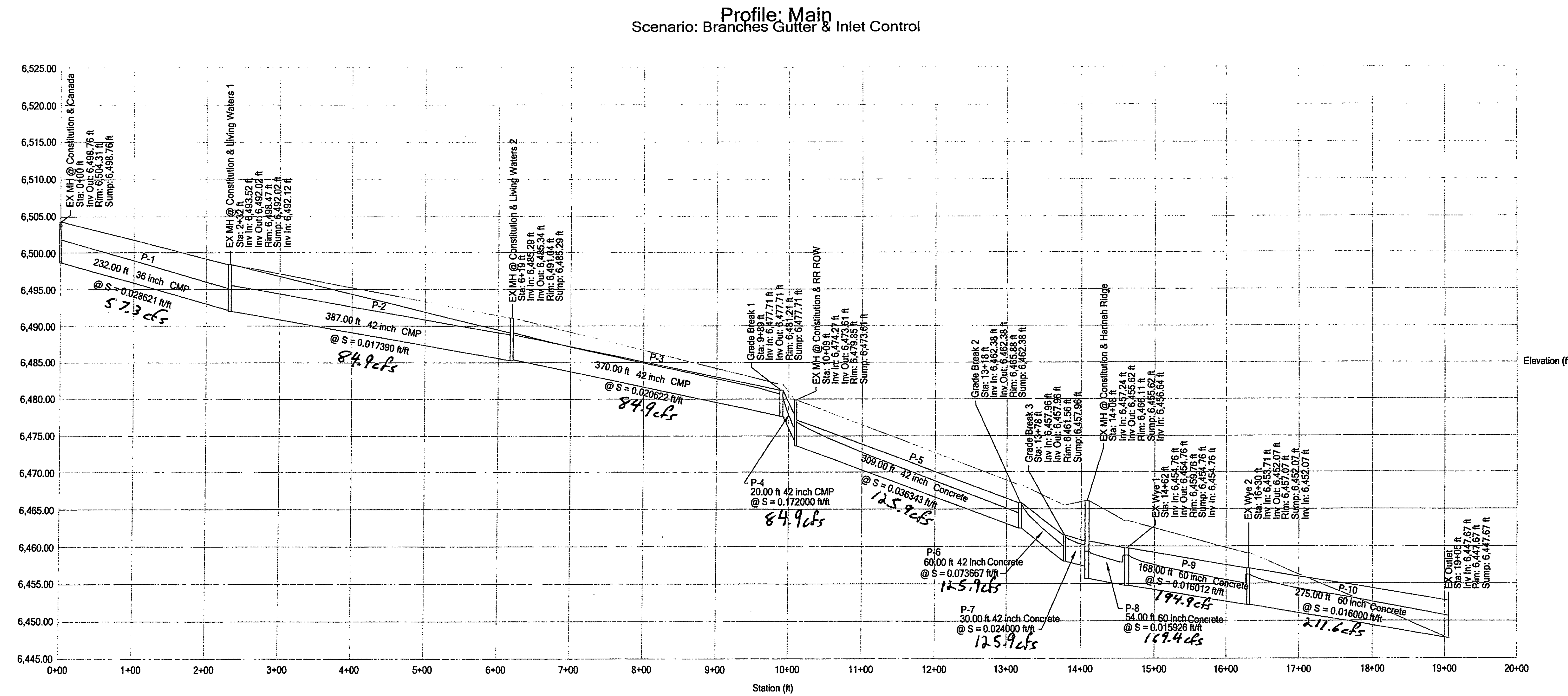
Page
of
Pages

Profile

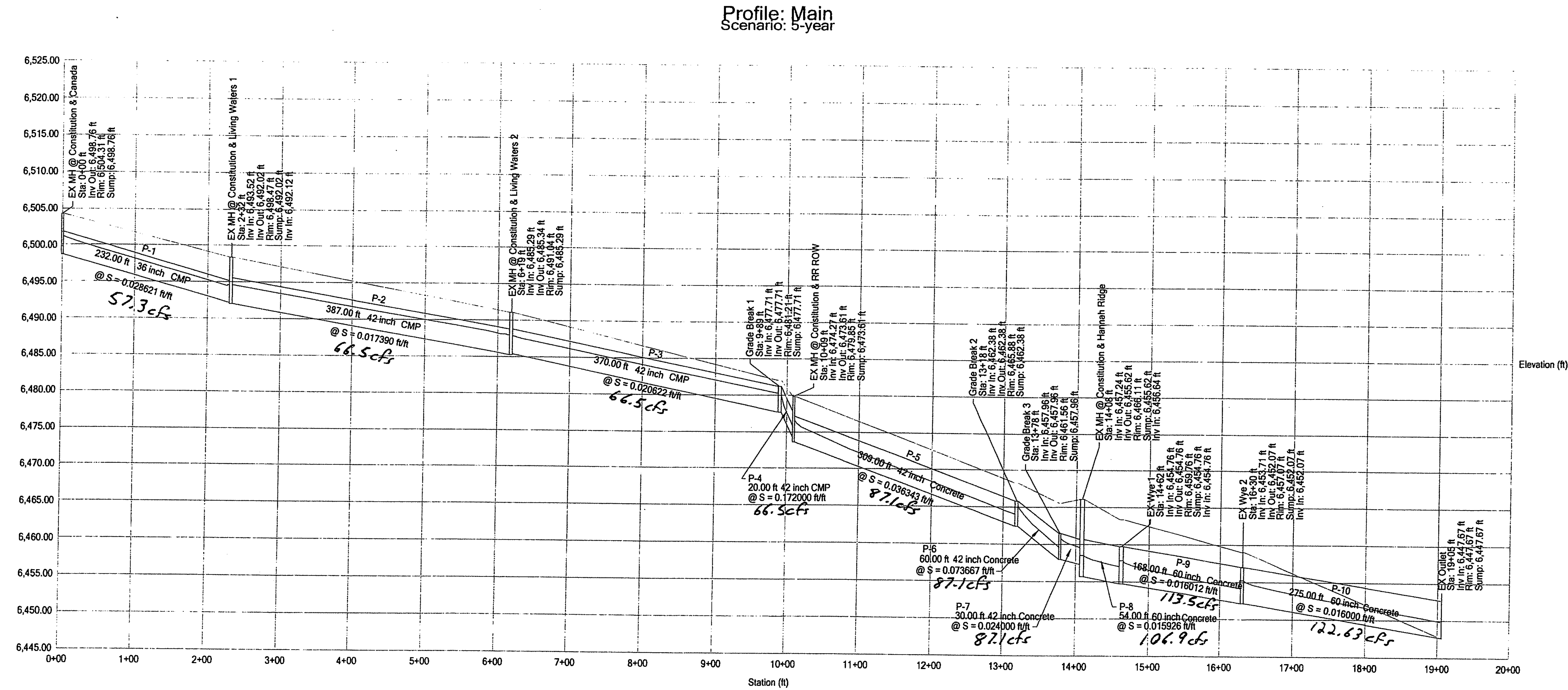
Scenario: max additional flow at I-3 & I-8

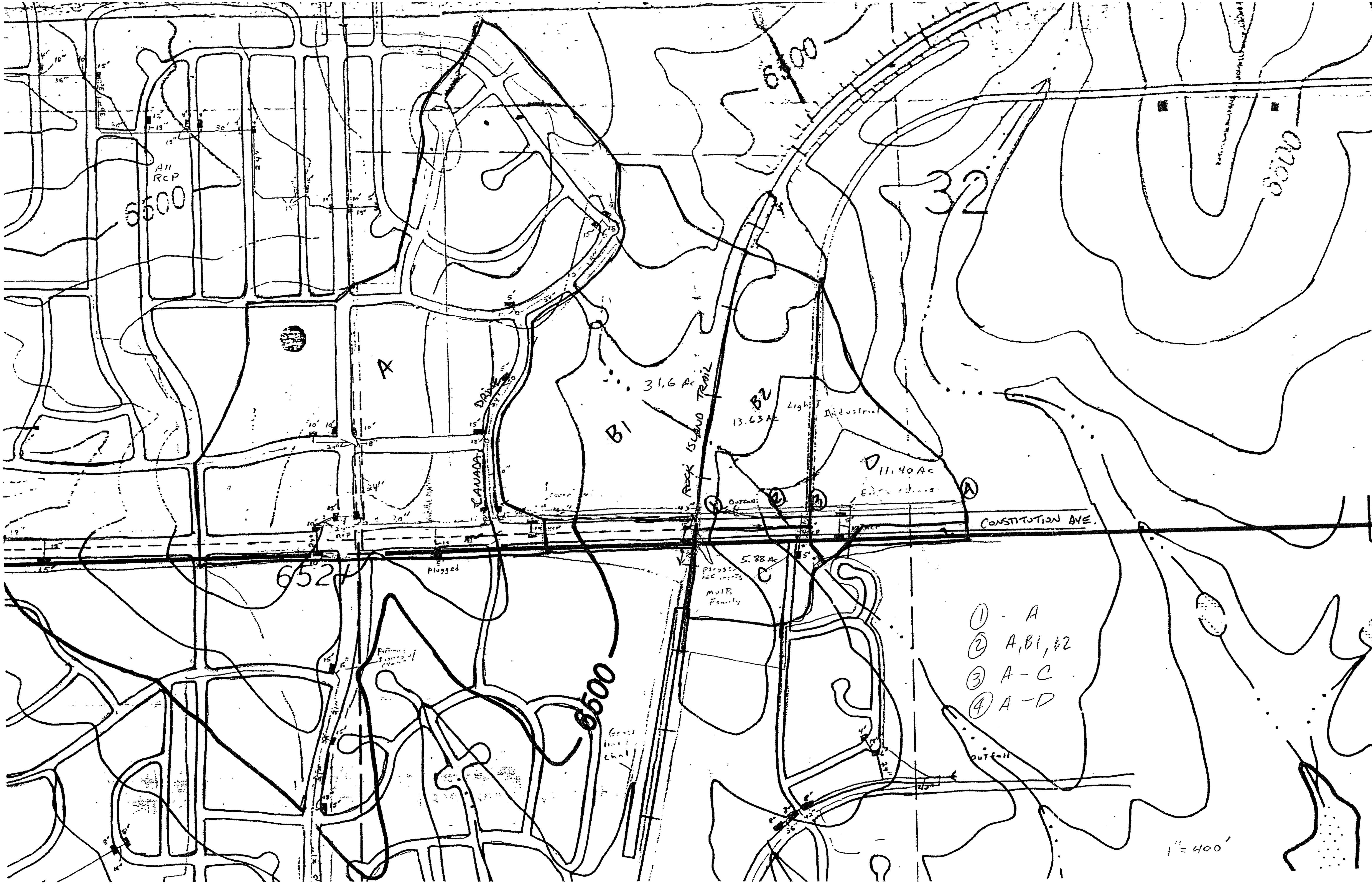


Profile
Scenario: Branches Gutter & Inlet Control



Profile
Scenario: 5-year




6500
All RCP
A
B1
31.6 Ac
B2
13.63 Ac
Light Industrial
D 11.40 Ac
ROCK ISLAND TRAIL
CANADA DRIVE
CONSTITUTION AVE.
5.88 Ac
C
Multi Family
Plugged
6520
6500
32
1 - A
2 A, B1, B2
3 A - C
4 A - D
Outfall
1" = 400'

Project No.: 60970
Project Name: Hannah Ridge at Feathergrass
Date: 6/21/2013

Street Flow Capacity Calculations (1/2 Street)

Street Name	Station	Street Data ROW Width Wr (ft)	FL-Crown Distance Tc (ft)	Street Cr Slope Sx (ft/ft)	Street Lg Slope So (ft/ft)	Curb Type	Note	Drainage Basin	Basin Q5 (cfs)	Basin Q100 (cfs)	Contrib Basin Area (%)	Gutter Width Tg (ft)	Curb Height Hc (ft)	Section Res Factor n	Gutter Cr Slope Sg (ft/ft)	Slope Sb (ft/ft)	FL Depth to Crown (ft)	5-yr FL Depth d (ft)	5-year Capacity Qcap (cfs)	5-year Actual Flow (cfs)		5-year Flow to Crown (cfs)	5-year Crown Spillover (cfs)	100-yr FL Depth d (ft)	100-year Capacity Qcap (cfs)	100-year Actual Flow (cfs)	
Breeches Way	PVC 1+59.16 L	50	14	0.020	0.020	VERT		C2	2.3	4.5	100%	2.0	0.50	0.016	0.083	0.020	0.41	0.50	**17.3**	2.3	OK	8.1	0.0	0.72	**49.9**	4.5	OK
Breeches Way	PVC 1+59.16 R	50	14	0.020	0.020	VERT		C3	2.5	5.1	100%	2.0	0.50	0.016	0.083	0.020	0.41	0.50	**17.3**	2.5	OK	8.1	0.0	0.72	**49.9**	5.1	OK
Breeches Way	PVC 2+69.72 L	50	14	0.020	0.040	VERT		C2,C4	5.5	10.9	48%	2.0	0.50	0.016	0.083	0.020	0.41	0.50	**24.5**	2.6	OK	11.5	0.0	0.72	**70.5**	5.2	OK
Breeches Way	PVC 2+69.72 R	50	14	0.020	0.040	VERT		C3,C5	8.9	17.8	52%	2.0	0.50	0.016	0.083	0.020	0.41	0.50	**24.5**	4.6	OK	11.5	0.0	0.72	**70.5**	9.3	OK
Breeches Way	PVC 4+15.43 L	50	17	0.020	0.020	VERT		C6	1.9	3.9	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	**16.9**	1.9	OK	13.0	0.0	0.66	**42.3**	3.9	OK
Breeches Way	PVC 4+15.43 R	50	17	0.020	0.020	VERT		C7	2.1	4.3	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	**16.9**	2.1	OK	13.0	0.0	0.66	**42.3**	4.3	OK
Breeches Way	PVC 5+34.89 L	50	17	0.020	0.030	VERT		C6,C10	6.6	14.1	31%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	**20.8**	2.0	OK	15.9	0.0	0.66	**51.8**	4.4	OK
Breeches Way	PVC 5+34.89 R	50	17	0.020	0.030	VERT		C7,C11	7.3	14.5	37%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	**20.8**	2.7	OK	15.9	0.0	0.66	**51.8**	5.4	OK
Breeches Way	PVT 5+84.89 L	50	17	0.020	0.020	VERT		C10	4.9	10.7	89%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	**16.9**	4.4	OK	13.0	0.0	0.66	**42.3**	9.5	OK
Breeches Way	PVT 5+84.89 R	50	17	0.020	0.020	VERT		C7,C8,C9,C13	13.4	26.6	95%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	**16.9**	12.7	OK	13.0	0.0	0.66	**42.3**	25.3	OK
Grand Prix	PC 1+53.88 L	50	17	0.020	0.021	RAMP		E3	2.5	5.0	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**13.4**	2.5	OK	13.4	N/A	0.66	**43.6**	5.0	OK
Grand Prix	PC 1+53.88 R	50	17	0.020	0.021	RAMP		E2	6.7	13.3	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**13.4**	6.7	OK	13.4	N/A	0.66	**43.6**	13.3	OK
Grand Prix	PVC 13+48.64 L	50	17	0.020	0.015	RAMP		C7,C8,C9,C11	13.4	26.6	82%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**11.2**	11.0	OK	11.2	N/A	0.66	**36.6**	21.8	OK
Grand Prix	PVC 13+48.64 R	50	17	0.020	0.015	RAMP		C12	3.7	7.4	71%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**11.2**	2.6	OK	11.2	N/A	0.66	**36.6**	5.3	OK
Grand Prix	PVT 14+91.64 L	50	17	0.020	0.040	RAMP		C10	4.9	10.7	89%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**18.4**	4.4	OK	18.4	N/A	0.66	**59.8**	9.5	OK
Grand Prix	PVT 14+91.64 R	50	17	0.020	0.040	RAMP		C12	3.7	7.4	29%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**18.4**	1.1	OK	18.4	N/A	0.66	**59.8**	2.1	OK
Dapples Court	PVT 1+54.50 L	50	14	0.020	0.040	RAMP		B1	5.8	11.7	100%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	**11.5**	5.8	OK	11.5	N/A	0.72	**70.5**	11.7	OK
Dapples Court	PVT 1+54.50 R	50	14	0.020	0.040	RAMP		B2	2.8	5.5	100%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	**11.5**	2.8	OK	11.5	N/A	0.72	**70.5**	5.5	OK
Dapples Court	PVT 6+29.63 L	50	14	0.020	0.020	RAMP		B1	5.8	11.7	21%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	**8.1**	1.2	OK	8.1	N/A	0.72	**49.9**	2.5	OK
Dapples Court	PVT 6+29.63 R	50	14	0.020	0.020	RAMP		B2	2.8	5.5	32%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	**8.1**	0.9	OK	8.1	N/A	0.72	**49.9**	1.8	OK
Equine Court	PC 1+46.00 L	50	17	0.020	0.020	RAMP		D6	3.3	6.6	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**13.0**	3.3	OK	13.0	N/A	0.66	**42.3**	6.6	OK
Equine Court	PC 1+46.00 R	50	17	0.020	0.020	VERT		D1,D2,D3,D4	14.3	28.3	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	**16.9**	14.3	OK	13.0	1.3	0.66	**42.3**	28.3	OK
Equine Court	PVT 3+04.95 L	50	17	0.020	0.040	RAMP		D6	2.8	5.6	76%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**18.4**	2.1	OK	18.4	N/A	0.66	**59.8**	4.3	OK
Equine Court	PVT 3+04.95 R	50	17	0.020	0.040	RAMP		D1,D2,D3,D4	2.8	5.6	96%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**18.4**	2.7	OK	18.4	N/A	0.66	**59.8**	5.4	OK
Equine Court	PC 9+56.53 L	50	17	0.020	0.015	RAMP		B6	2.8	1.4	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**11.2**	2.8	OK	11.2	N/A	0.66	**36.6**	1.4	OK
Equine Court	PC 9+56.53 R	50	17	0.020	0.015	VERT		B1,B2,B3,B4	13.6	27.2	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	**14.7**	13.6	OK	11.2	2.4	0.66	**36.6**	27.2	OK
Equine Court	PC 16+58.82 L	50	14	0.020	0.015	RAMP		A2	2.6	5.2	100%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	**7.1**	2.6	OK	7.1	N/A	0.72	**43.2**	5.2	OK
Equine Court	PC 16+58.82 R	50	14	0.020	0.015	RAMP		A1	5.2	10.6	100%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	**7.1**	5.2	OK	7.1	N/A	0.72	**43.2**	10.6	OK
Farrier Court	PVT 1+49.50 L	50	14	0.020	0.050	RAMP		D1	5.3	10.6	100%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	**12.9**	5.3	OK	12.9	N/A	0.72	**78.9**	10.6	OK
Farrier Court	PVT 1+49.50 R	50	14	0.020	0.050	RAMP		D2	3.1	6.1	100%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	**12.9**	3.1	OK	12.9	N/A	0.72	**78.9**	6.1	OK
Half Chaps Court	PC 4+84.69 L	50	14	0.020	0.010	RAMP		E6	4.5	9.0	84%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	**5.8**	3.8	OK	5.8	N/A	0.72	**35.3**	7.6	OK
Half Chaps Court	PC 4+84.69 R	50	14	0.020	0.015	RAMP		E6	4.5	9.0	16%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	**7.1**	0.7	OK	7.1	N/A	0.72	**43.2**	1.4	OK
Hannah Ridge Drive	PVC 2+42.90 L	80	26	0.020	0.040	VERT	Center Median	D12	1.6	3.4	58%	2.0	0.50	0.016	0.083	0.020	0.65	0.50	**16.0**	0.9	OK	16.0	0.0	0.78	**104.0**	2.0	OK
Hannah Ridge Drive	PVC 2+42.90 R	80	26	0.020	0.040	VERT	Center Median	D11	1.7	3.2	41%	2.0	0.50	0.016	0.083	0.020	0.65	0.50	**16.0**	0.7	OK	16.0	0.0	0.78	**104.0**	1.3	OK
Hannah Ridge Drive	PVT 4+12.90 L	60	17	0.020	0.015	VERT	Center Median	D8,D10,D12	8.7	17.1	93%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	**14.7**	8.1	OK	11.2	0.0	0.76	**54.3**	15.9	OK
Hannah Ridge Drive	PVT 4+12.90 L	60	17	0.020	0.015	VERT	need u/s Inlet	D1-D7,D9,D11	29.6	59.0	96%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	**14.7**	28.4	X	11.2	17.2	0.76	**54.3**	56.6	X
Hannah Ridge Drive	PC 5+75.00 L	60	17	0.020	0.015	RAMP		D8	6.8	13.4	81%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**11.2**	5.5	OK	11.2	N/A	0.76	**54.3**	10.9	OK
Hannah Ridge Drive	PC 5+75.00 R	60	17	0.020	0.015	RAMP		D7	8.9	17.8	91%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**11.2**	8.1	OK	11.2	N/A	0.76	**54.3**	16.2	OK
Hannah Ridge Drive	PVT 8+47.03 L	60	17	0.020	0.040	RAMP		D8	6.8	13.4	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**18.4**	6.8	OK	18.4	N/A	0.76	**88.7**	13.4	OK
Hannah Ridge Drive	PVT 8+47.03 R	60	17	0.020	0.040	RAMP		D7	8.9	17.8	62%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**18.4**	5.5	OK	18.4	N/A	0.76	**88.7**	11.0	OK
Horsemanship Court	PC 1+40.00 L	50	17	0.020	0.023	RAMP		E5	2.3	4.7	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**14.0**	2.3	OK	14.0	N/A	0.66	**45.6**	4.7	OK
Horsemanship Court	PC 1+40.00 R	50	17	0.020	0.023	RAMP		E4	6.7	13.3	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	**14.0**	6.7	OK	14.0	N/A	0.66	**45.6**	13.3	OK
Hunter Jumper Drive	PC 3+18.00 L	60	20	0.020	0.025	VERT		F2,F3	10.6	21.1	34%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**17.3**	3.6	OK	17.3	0.0	0.70	**57.5**	7.2	OK
Hunter Jumper Drive	PC 3+18.00 R	60	20	0.020	0.025	VERT		OF3,F1	6.2	12.5	100%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**17.3**	6.2	OK	17.3	0.0	0.70	**57.5**	12.5	OK
Hunter Jumper Drive	PC 5+89.38 L	60	20	0.020	0.028	VERT		E1,E2	9.6	19.1	37%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**18.5**	3.6	OK	18.5	0.0	0.70	**61.4**	7.1	OK
Hunter Jumper Drive	PC 5+89.38 R	60	20	0.020	0.028	VERT		E8	1.8	3.6	31%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**18.5**	0.6	OK	18.5	0.0	0.70	**61.4**	1.1	OK
Hunter Jumper Drive	PC 6+63.38 L	60	20	0.020	0.028	VERT		E1,E2,E3	11.9	23.7	100%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**18.5**	11.9	OK	18.5	0.0	0.70	**61.4**	23.7	OK
Hunter Jumper Drive	PC 6+63.38 R	60	20	0.020	0.025	VERT		E8	1.8	3.6	35%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**17.5**	0.6	OK	17.5	0.0	0.70	**58.1**	1.3	OK
Hunter Jumper Drive	PC 8+84.38 L	60	20	0.020	0.025	VERT		E1,E2,E3,E4	17.8	35.5	69%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**17.5**	12.3	OK	17.5	0.0	0.70	**58.1**	24.5	OK
Hunter Jumper Drive	PC 8+84.38 R	60	20	0.020	0.025	VERT		E8	1.8	3.6	74%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**17.5**	1.3	OK	17.5	0.0	0.70	**58.1**	2.7	OK
Hunter Jumper Drive	PVC 9+51.84 L	60	20	0.020	0.025	VERT	need u/s Inlet	E1,E2,E3,E4,E5	19.9	39.7	100%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**17.5**	19.9	X	17.5	0.0	0.70	**58.1**	39.7	OK
Hunter Jumper Drive	PVC 9+51.84 R	60	20	0.020	0.025	VERT		E8	1.8	3.6	77%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**17.5**	1.4	OK	17.5	0.0	0.70	**58.1**	2.8	OK
Hunter Jumper Drive	PC 14+53.18 L	60	20	0.020	0.020	VERT		D8	6.8	13.4	20%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**15.7**	1.4	OK	15.7	0.0	0.70	**52.0**	2.7	OK
Hunter Jumper Drive	PC 14+53.18 R	60	20	0.020	0.020	VERT		D10	1.1	2.2	100%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**15.7**	1.1	OK	15.7	0.0	0.70	**52.0**	2.2	OK
Hunter Jumper Drive	PVC 15+23.86 L	60	20	0.020	0.015	VERT	need u/s Inlet	D1,D2,D3,D4,D5,D6	19.2	38.0	100%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**13.6**	19.2	X	13.6	0.0	0.70	**45.0**	38.0	OK
Hunter Jumper Drive	PVC 15+23.86 R	60	20	0.020	0.015	VERT		D9	1.9	3.8	100%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**13.6**	1.9	OK	13.6	0.0	0.70	**45.0**	3.8	OK
Hunter Jumper Drive	PVT 16+03.86 L	60	20	0.020	0.040	VERT		D1,D2,D3,D4,D5,D6	19.2	38.0	100%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**22.2**	19.2	OK	22.2	0.0	0.70	**73.5**	38.0	OK
Hunter Jumper Drive	PVT 16+03.86 R	60	20	0.020	0.040	VERT		D9	1.9	3.8	85%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	**22.2**	1.6	OK	22.2	0.0	0.70	**73.5**	3.2	OK

Street Flow Capacity Calculations (1/2 Street)

Street Name	Station	Street Data: ROW Width Wr (ft)	FL-Crown Distance Tc (ft)	Street Cr Slope Sx (ft/ft)	Street Lg Slope So (ft/ft)	Curb Type	Note	Drainage Basin	Basin Q5 (cfs)	Basin Q100 (cfs)	Contrib Basin Area (%)	Gutter Width Tg (ft)	Curb Height Hc (ft)	Section Res Factor n	Gutter Cr Slope Sg (ft/ft)	Slope Sb (ft/ft)	FL Depth to Crown (ft)	5-yr FL Depth d (ft)	5-year Capacity Qcap (cfs)	5-year Actual Flow (cfs)		5-year Flow to Crown (cfs)	5-year Crown Spillover (cfs)	100-yr FL Depth d (ft)	100-year Capacity Qcap (cfs)	100-year Actual Flow (cfs)	
Hunter Jumper Drive	PC 17+76.34 L	60	20	0.020	0.040	VERT		D1,D2,D3,D4,D5,D6	19.2	38.0	100%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	22.2	19.2	OK	22.2	0.0	0.70	73.5	38.0	OK
Hunter Jumper Drive	PC 17+76.34 R	60	20	0.020	0.040	VERT		D9	1.9	3.8	53%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	22.2	1.0	OK	22.2	0.0	0.70	73.5	2.0	OK
Hunter Jumper Drive	PC 18+53.45 L	60	20	0.020	0.040	VERT		D5	1.9	3.6	100%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	22.2	1.9	OK	22.2	0.0	0.70	73.5	3.6	OK
Hunter Jumper Drive	PC 18+53.45 R	60	20	0.020	0.040	VERT		D9	1.9	3.8	40%	2.0	0.50	0.016	0.083	0.020	0.53	0.50	22.2	0.8	OK	22.2	0.0	0.70	73.5	1.5	OK
Pony Club Lane	PC 1+40.00 L	50	17	0.020	0.018	RAMP		OSF3,F1	6.2	12.5	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	12.2	6.2	OK	12.2	N/A	0.66	39.9	12.5	OK
Pony Club Lane	PC 1+40.00 R	50	17	0.020	0.018	RAMP		F3	7.6	15.1	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	12.2	7.6	OK	12.2	N/A	0.66	39.9	15.1	OK
Pony Club Lane	PVC 18+11.57 L	50	17	0.020	0.015	RAMP		OSC1,C1	15.0	31.1	59%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	11.2	8.9	OK	11.2	N/A	0.66	36.6	18.3	OK
Pony Club Lane	PVC 18+11.58 R	50	17	0.020	0.015	RAMP		C3	2.5	5.1	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	11.2	2.5	OK	11.2	N/A	0.66	36.6	5.1	OK
Pony Club Lane	PVT 19+11.57 L	50	17	0.020	0.015	RAMP		OSC1,C1	15.0	31.1	41%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	11.2	6.2	OK	11.2	N/A	0.66	36.6	12.8	OK
Pony Club Lane	PVT 19+11.57 R	50	17	0.020	0.015	RAMP		C2	2.3	4.5	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	11.2	2.3	OK	11.2	N/A	0.66	36.6	4.5	OK
Pony Club Lane	PVT 23+02.70 L	50	17	0.020	0.040	RAMP		OSC1,C1	15.0	31.1	4%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	18.4	0.6	OK	18.4	N/A	0.66	59.8	1.2	OK
Pony Club Lane	PVT 23+02.70 R	50	17	0.020	0.040	RAMP		C2	2.3	4.5	29%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	18.4	0.7	OK	18.4	N/A	0.66	59.8	1.3	OK
Show Hunter Way	PC 3+17.91 L	50	14	0.020	0.028	RAMP		C5	6.4	12.7	9%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	9.6	0.6	OK	9.6	N/A	0.72	58.6	1.1	OK
Show Hunter Way	PC 3+17.91 R	50	14	0.020	0.028	RAMP		C9	5.6	11.2	49%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	9.6	2.7	OK	9.6	N/A	0.72	58.6	5.5	OK
Show Hunter Way	PC 5+73.48 L	50	14	0.020	0.028	RAMP		C11	5.1	10.1	11%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	9.6	0.6	OK	9.6	N/A	0.72	58.6	1.1	OK
Show Hunter Way	PC 5+73.48 R	50	14	0.020	0.028	RAMP		C9	5.6	11.2	80%	2.0	0.50	0.016	0.083	0.020	0.41	0.41	9.6	4.5	OK	9.6	N/A	0.72	58.6	9.0	OK
Shawnee Drive	PVC 1+84.00 L	60	17	0.020	0.040	VERT		F5	2.5	6.0	40%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	1.0	OK	18.4	0.0	0.76	88.7	2.4	OK
Shawnee Drive	PVC 1+84.00 R	60	17	0.020	0.040	VERT		F4	0.9	1.9	31%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	0.3	OK	18.4	0.0	0.76	88.7	0.6	OK
Shawnee Drive	PVT 2+83.66 L	60	17	0.020	0.036	VERT		OSF3,F1,F2,F3,F5	19.3	39.9	87%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	22.7	16.8	OK	17.4	0.0	0.76	83.9	34.7	OK
Shawnee Drive	PVT 2+83.66 R	60	17	0.020	0.036	VERT		F4	0.9	1.9	69%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	22.7	0.6	OK	17.4	0.0	0.76	83.9	1.3	OK
Shawnee Drive	PC 4+58.91 L	60	17	0.020	0.017	VERT	need u/s Inlet	OSF3,F1,F2,F3	16.2	32.5	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	15.6	16.2	X	12.0	4.2	0.76	57.8	32.5	OK
Shawnee Drive	PC 4+58.91 R	60	17	0.020	0.017	VERT		F4	0.9	1.9	5%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	15.6	0.0	OK	12.0	0.0	0.76	57.8	0.1	OK
Shawnee Drive	PC 5+38.91 L	60	17	0.020	0.017	RAMP		F3	7.6	15.1	8%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	12.0	0.6	OK	12.0	N/A	0.76	57.8	1.2	OK
Shawnee Drive	PC 5+38.91 R	60	17	0.020	0.017	RAMP		E1	3.1	6.1	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	12.0	3.1	OK	12.0	N/A	0.76	57.8	6.1	OK
Under Saddle Street	PVC 6+28.10 L	50	17	0.020	0.015	RAMP		C5	6.4	12.7	90%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	11.2	5.8	OK	11.2	N/A	0.66	36.6	11.4	OK
Under Saddle Street	PVC 6+28.10 R	50	17	0.020	0.015	RAMP		C7	2.1	4.3	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	11.2	2.1	OK	11.2	N/A	0.66	36.6	4.3	OK
Under Saddle Street	PC 6+94.11 L	50	17	0.020	0.017	RAMP		C4	3.5	6.9	61%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	12.0	2.1	OK	12.0	N/A	0.66	39.0	4.2	OK
Under Saddle Street	PC 6+94.11 R	50	17	0.020	0.017	RAMP		C6	1.9	3.9	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	12.0	1.9	OK	12.0	N/A	0.66	39.0	3.9	OK
Under Saddle Street	PVT 8+28.10 L	60	17	0.020	0.080	RAMP		C4	3.5	6.9	40%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	20.0	1.4	OK	26.0	N/A	0.76	125.4	2.8	OK
Under Saddle Street	PVT 8+28.10 R	60	17	0.020	0.080	RAMP		C6	1.9	3.9	64%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	20.0	1.2	OK	26.0	N/A	0.76	125.4	2.5	OK
Under Saddle Street	PVT 9+88.49 L	60	17	0.020	0.040	RAMP		C4	3.5	6.9	5%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	18.4	0.2	OK	18.4	N/A	0.76	88.7	0.3	OK
Under Saddle Street	PVT 9+88.49 R	60	17	0.020	0.040	RAMP		C6	1.9	3.9	30%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	18.4	0.6	OK	18.4	N/A	0.76	88.7	1.2	OK
Under Saddle Street	PVT 12+94.53 L	60	17	0.020	0.040	VERT		OSA3,A1,A2,A3,A4	9.7	19.2	98%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	9.5	OK	18.4	0.0	0.76	88.7	18.8	OK
Under Saddle Street	PVT 12+94.53 R	60	17	0.020	0.040	VERT		A5	0.7	1.3	26%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	0.2	OK	18.4	0.0	0.76	88.7	0.3	OK
Under Saddle Street	PC 13+91.38 L	60	17	0.020	0.040	VERT		OSA3,A3	2.1	3.9	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	2.1	OK	18.4	0.0	0.76	88.7	3.9	OK
Under Saddle Street	PC 13+91.38 R	60	17	0.020	0.040	VERT		B3	1.1	2.1	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	1.1	OK	18.4	0.0	0.76	88.7	2.1	OK
Under Saddle Street	PVT 16+11.60 L	60	17	0.020	0.080	VERT		OSA3,A3	2.1	3.9	60%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	33.9	1.3	OK	26.0	0.0	0.76	125.4	2.3	OK
Under Saddle Street	PVT 16+11.60 R	60	17	0.020	0.080	VERT		B3	1.1	2.1	50%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	33.9	0.6	OK	26.0	0.0	0.76	125.4	1.1	OK
Winslow Park Drive	PC 5+73.56 L	60	17	0.020	0.029	RAMP		C8	1.9	3.7	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.47	15.6	1.9	OK	15.6	N/A	0.76	75.1	3.7	OK
Winslow Park Drive	PC 5+73.56 R	60	17	0.020	0.029	VERT		E2	6.7	13.3	9%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	20.3	0.6	OK	15.6	0.0	0.76	75.1	1.2	OK
Winslow Park Drive	PC 8+03.40 L	60	17	0.020	0.035	VERT		B7	2.6	4.9	17%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	22.4	0.4	OK	17.2	0.0	0.76	83.0	0.8	OK
Winslow Park Drive	PC 8+03.40 R	60	17	0.020	0.035	VERT		E4	6.7	13.3	9%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	22.4	0.6	OK	17.2	0.0	0.76	83.0	1.2	OK
Winslow Park Drive	PVC 8+94.86 L	60	17	0.020	0.035	VERT		B7	2.6	4.9	25%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	22.4	0.7	OK	17.2	0.0	0.76	83.0	1.2	OK
Winslow Park Drive	PVC 8+94.86 R	60	17	0.020	0.035	VERT		B8	0.5	1.0	21%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	22.4	0.1	OK	17.2	0.0	0.76	83.0	0.2	OK
Winslow Park Drive	PVC 9+68.37 L	60	17	0.020	0.020	VERT		B7	2.6	4.9	33%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	16.9	0.9	OK	13.0	0.0	0.76	62.7	1.6	OK
Winslow Park Drive	PVC 9+68.37 R	60	17	0.020	0.020	VERT		B8	0.5	1.0	64%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	16.9	0.3	OK	13.0	0.0	0.76	62.7	0.6	OK
Winslow Park Drive	PC 11+00.52 L	60	17	0.020	0.021	VERT	need u/s Inlet	OSB1,B1-B7	20.4	40.1	96%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	17.2	19.6	X	13.2	6.4	0.76	63.8	38.5	OK
Winslow Park Drive	PC 11+00.52 R	60	17	0.020	0.021	VERT		E6	4.5	9.0	13%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	17.2	0.6	OK	13.2	0.0	0.76	63.8	1.2	OK
Winslow Park Drive	PVT 11+68.37 L	60	17	0.020	0.040	VERT		OSB1,B1-B7	20.4	40.1	95%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	19.4	OK	18.4	1.0	0.76	88.7	38.1	OK
Winslow Park Drive	PVT 11+68.37 R	60	17	0.020	0.040	VERT		E6	4.5	9.0	8%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	0.4	OK	18.4	0.0	0.76	88.7	0.7	OK
Winslow Park Drive	PC 13+69.36 L	60	17	0.020	0.040	VERT		OSB1,B1-B7	20.4	40.1	94%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	19.2	OK	18.4	0.8	0.76	88.7	37.7	OK
Winslow Park Drive	PC 13+69.36 R	60	17	0.020	0.040	VERT		D7	8.9	17.8	10%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	0.9	OK	18.4	0.0	0.76	88.7	1.8	OK
Winslow Park Drive	PC 16+47.11 L	60	17	0.020	0.040	VERT		OSB1,B1-B6	19.5	38.5	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	19.5	OK	18.4	1.1	0.76	88.7	38.5	OK
Winslow Park Drive	PC 16+47.11 R	60	17	0.020	0.040	VERT		D7	8.9	17.8	1%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	0.1	OK	18.4	0.0	0.76	88.7	0.2	OK
Winslow Park Drive	PC 17+21.29 L	60	17	0.020	0.040	VERT		OSB1,B5	4.0	7.5	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	4.0	OK	18.4	0.0	0.76	88.7	7.5	OK
Winslow Park Drive	PC 17+21.29 R	60	17	0.020	0.040	VERT		D3	1.0	1.9	100%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	24.0	1.0	OK	18.4	0.0	0.76	88.7	1.9	OK
Winslow Park Drive	PVT 18+85.20 L	60	17	0.020	0.080	VERT		OSB1,B5	4.0	7.5	70%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	33.9	2.8	OK	26.0	0.0	0.76	125.4	5.3	OK
Winslow Park Drive	PVT 18+85.20 R	60	17	0.020	0.080	VERT		D3	1.0	1.9	42%	2.0	0.50	0.016	0.083	0.020	0.47	0.50	33.9	0.4	OK	26.0	0.0	0.76	125.4	0.8	OK

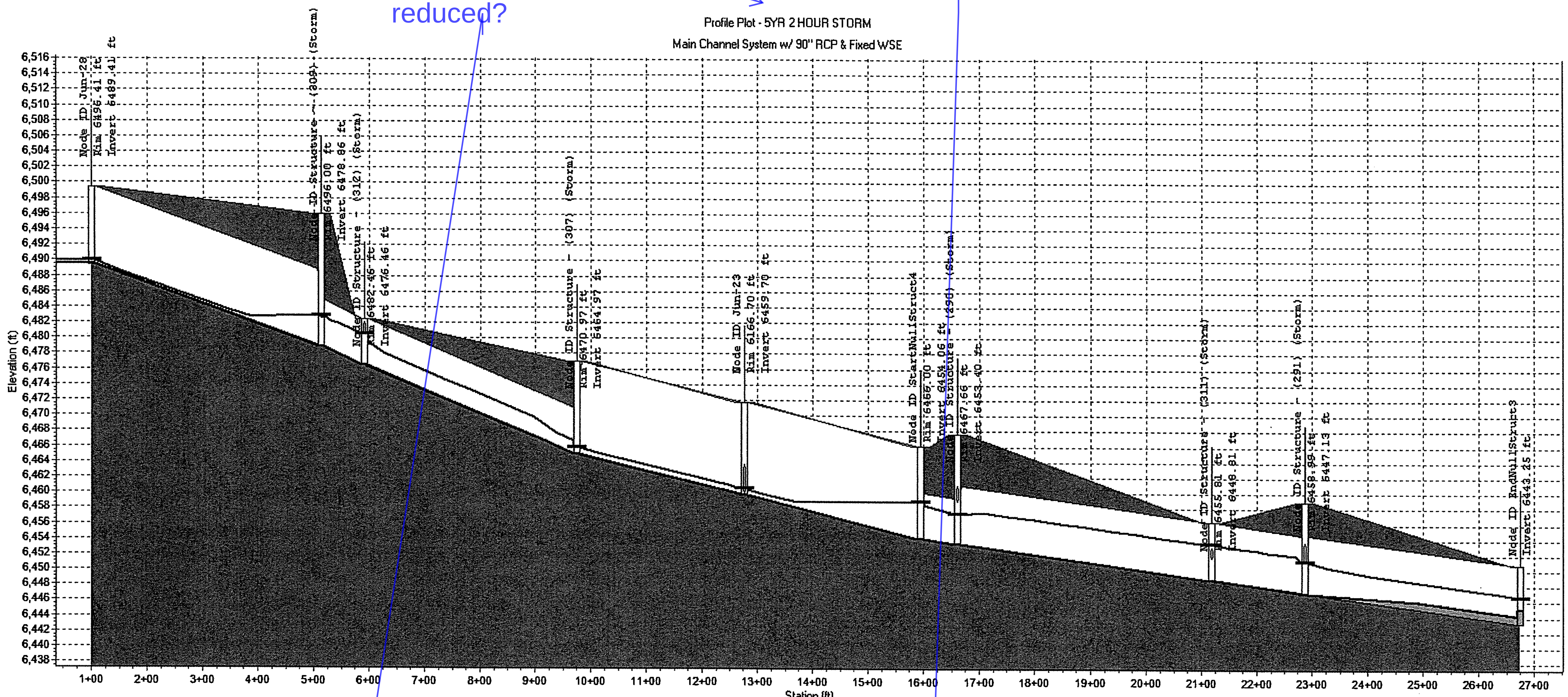
Why is this diameter reduced?

label - what is this?

Why is this diameter reduced?

Profile Plot - 5YR 2 HOUR STORM

Main Channel System w/ 90" RCP & Fixed WSE

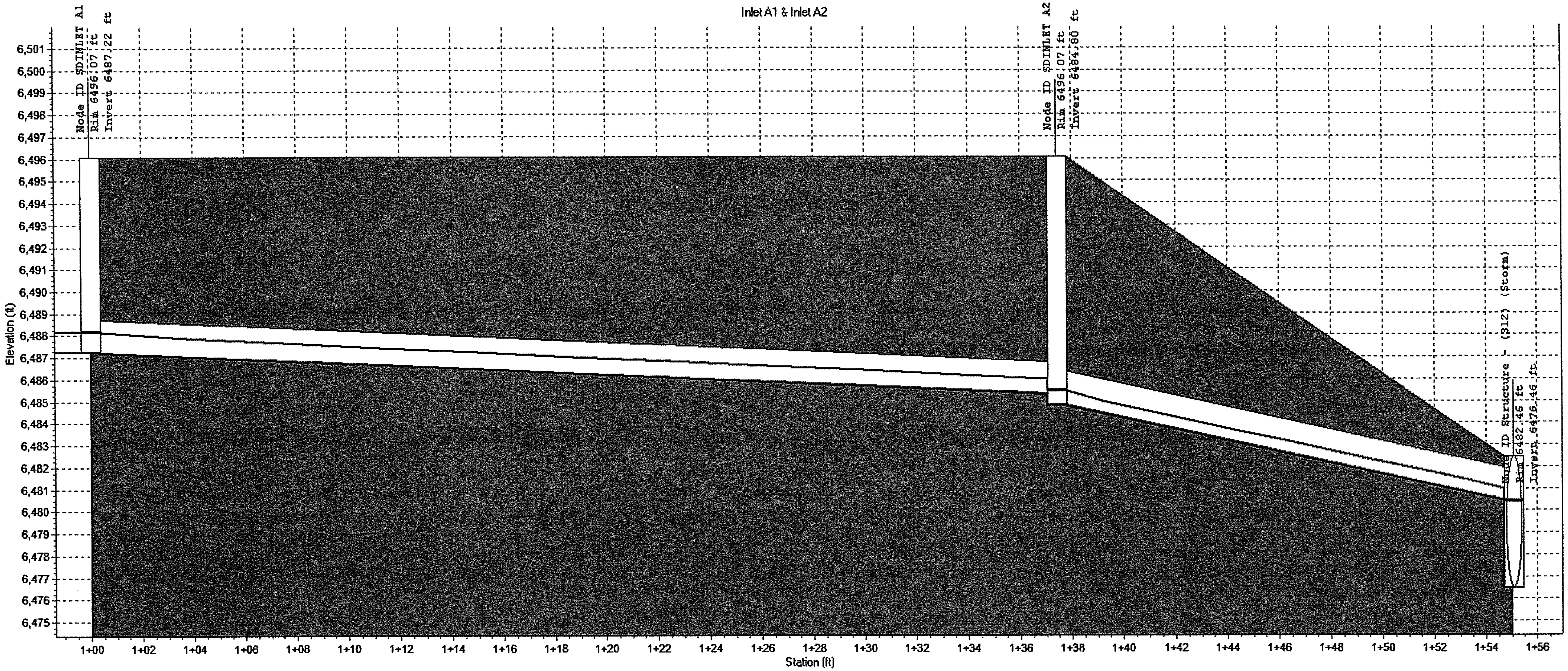


Node ID:	Jun-28	Structure - (309) (Storm)	Structure - (312) (Storm)	Structure - (307) (Storm)	Jun-23	StartNullStruct4	Structure - (290) (Storm)	Structure - (311) (Storm)	Structure - (291) (Storm)	EndNullStruct3
Rim (ft):	6496.41	6496.00	6482.46	6470.97	6166.70	6466.00	6467.66	6455.81	6458.99	
Invert (ft):	6489.41	6478.86	6476.46	6464.97	6459.70	6454.06	6453.40	6448.81	6447.13	6443.25
Min Pipe Cover (ft):	0.00	7.14	0.00	0.00	0.00	0.00		0.00	4.35	
Max HGL (ft):	6489.94	6482.79	6480.39	6465.86	6460.61	6458.80	6457.31	6453.44	6451.22	6446.65

Link ID:	Link-90	{Storm}.Pipe - (254) (1) (Storm)	Link-62	Link-03	Link-69	{Storm}.Pipe - (249) (Storm)	{Storm}.Pipe - (248) (Storm)	{Storm}.Pipe - (248) (2) (Storm)	Link-60
Length (ft):	411.82	79.19	383.83	300.76	319.11	66.12	458.42	167.50	388.34
Dia (in):	120.00	72.00	72.00	144.00	144.00	72.00	90.00	90.00	90.00
Slope (ft/ft):	0.0256	0.0303	0.0299	0.0175	0.0177	0.0100	0.0100	0.0100	0.0100
Up Invert (ft):	6489.41	6478.86	6476.46	6464.97	6459.70	6454.06	6453.40	6448.81	6447.13
Dn Invert (ft):	6478.86	6476.46	6464.97	6459.70	6454.06	6453.40	6448.81	6447.14	6443.25
Max Q (cfs):	257.38	251.25	251.24	251.23	274.79	270.47	272.27	273.23	280.60
Max Vel (ft/s):	5.05	5.32	8.68	5.17	3.49	6.26	10.51	10.36	12.71
Max Depth (ft):	2.22	3.93	2.41	0.89	2.82	4.32	4.27	4.36	3.75

Profile Plot - 5YR 2 HOUR STORM

Inlet A1 & Inlet A2

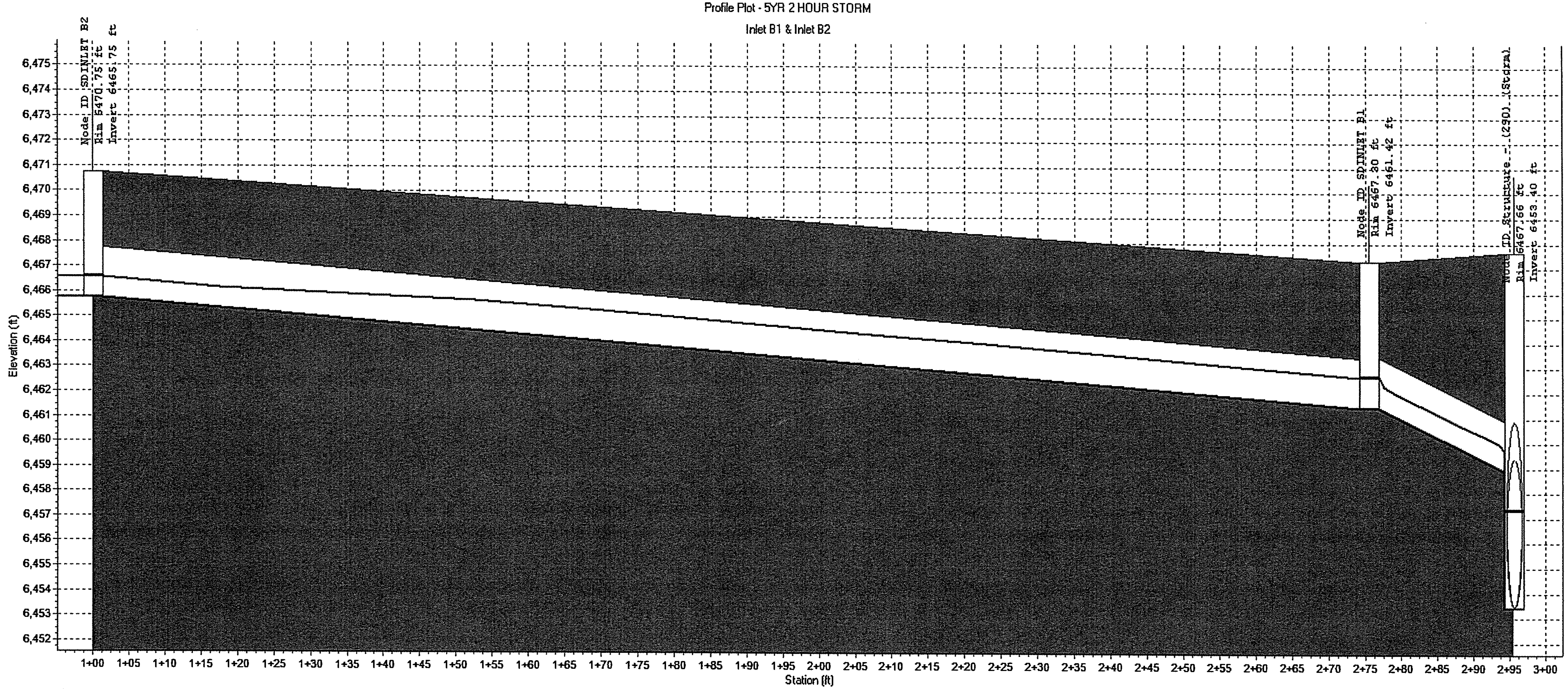


Node ID:	SDINLET A1	SDINLET A2	
Rim (ft):	6496.07	6496.07	6482.46
Invert (ft):	6487.22	6484.80	6476.46
Min Pipe Cover (ft):			0.00
Max HGL (ft):	6488.17	6485.46	6480.39

Link ID:	{Storm}.Pipe - (226) (Storm)	Link-88
Length (ft):	37.41	17.67
Dia (in):	18.00	18.00
Slope (ft/ft):	0.0513	0.2456
Up Invert (ft):	6487.22	6484.80
Dn Invert (ft):	6485.30	6480.46
Max Q (cfs):	9.22	9.22
Max Vel (ft/s):	9.64	15.36
Max Depth (ft):	0.80	0.56

Profile Plot - 5YR 2 HOUR STORM

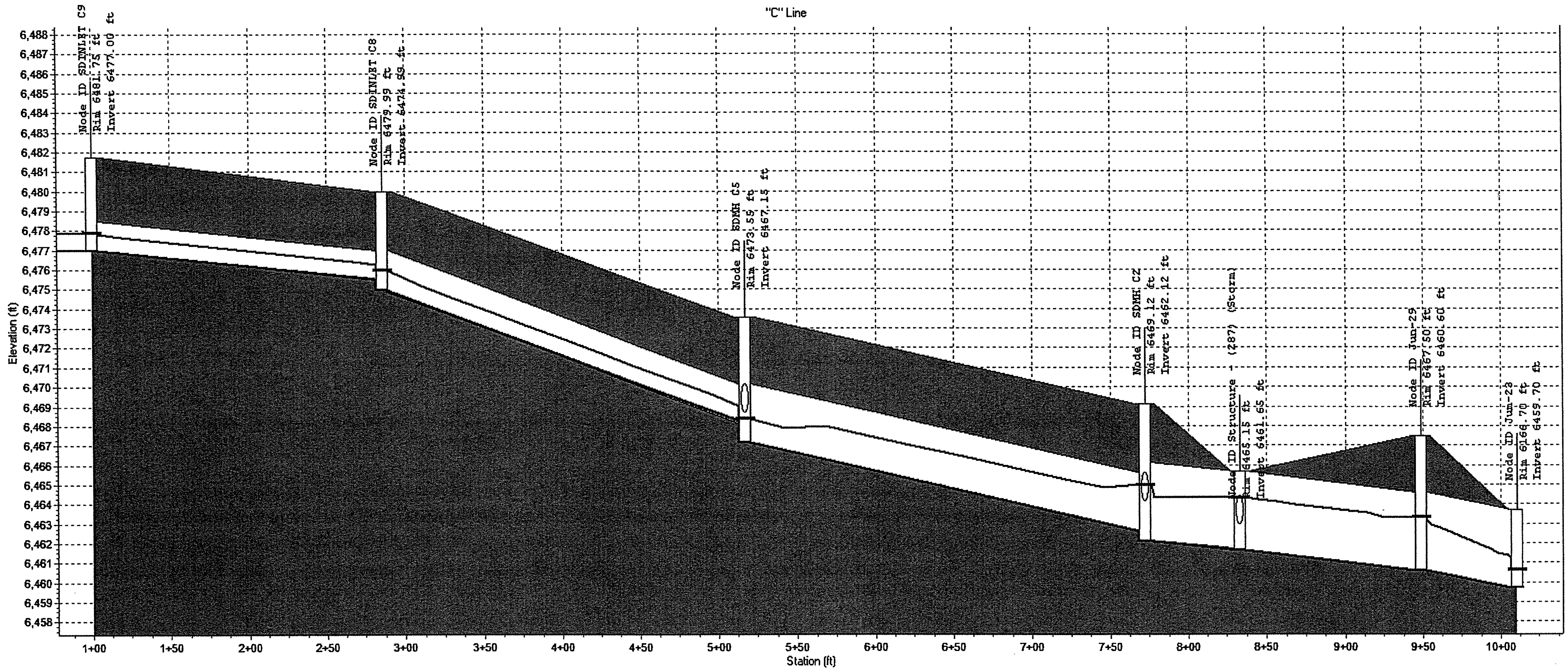
Inlet B1 & Inlet B2



Node ID:	SDINLET B2	SDINLET B1	
Rim (ft):	6470.75	6467.30	6467.66
Invert (ft):	6465.75	6461.42	6453.40
Min Pipe Cover (ft):			
Max HGL (ft):	6466.55	6462.64	6457.31
Link ID:	Link-51	Link-06	
Length (ft):	175.54	19.91	
Dia (in):	24.00	24.00	
Slope (ft/ft):	0.0247	0.1267	
Up Invert (ft):	6465.75	6461.42	
Dn Invert (ft):	6461.42	6458.90	
Max Q (cfs):	9.86	18.45	
Max Vel (ft/s):	7.25	12.38	
Max Depth (ft):	1.00	0.96	

Profile Plot - 5YR 2 HOUR STORM

"C" Line

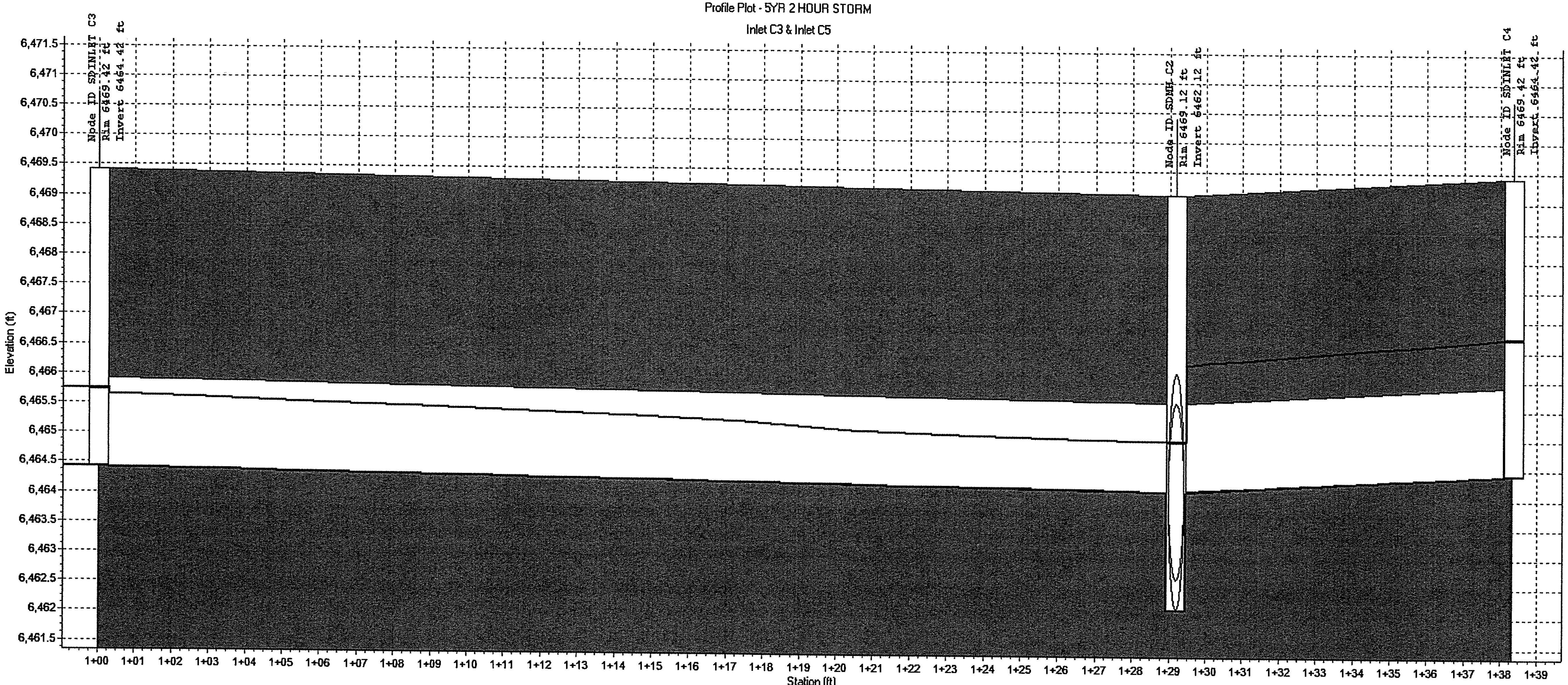


Node ID:	SDINLET C9	SDINLET C8	SDMH C5	SDMH C2	Structure - (287) (Storm)	Jun-29	Jun-23
Rim (ft):	6481.75	6479.99	6473.55	6469.12	6465.15	6467.50	6166.70
Invert (ft):	6477.00	6474.99	6467.15	6462.12	6461.65	6460.60	6459.70
Min Pipe Cover (ft):			3.39	3.00	0.00	2.90	0.00
Max HGL (ft):	6477.89	6475.97	6468.34	6464.97	6464.30	6463.30	6460.61

Link ID:	Link-18	{Storm}.Pipe - (221) (Storm)	Link-92	Link-93	Link-79	Link-94
Length (ft):	185.35	231.25	255.28	61.10	115.73	61.37
Dia (in):	18.00	24.00	36.00	48.00	48.00	48.00
Slope (ft/ft):	0.0081	0.0296	0.0177	-0.0077	0.0091	0.0147
Up Invert (ft):	6477.00	6474.99	6467.15	6461.65	6461.65	6460.60
Dn Invert (ft):	6475.49	6468.15	6462.62	6462.12	6460.60	6459.70
Max Q (cfs):	4.83	14.67	25.63	43.46	46.05	46.10
Max Vel (ft/s):	4.62	10.46	6.37	4.72	5.86	10.57
Max Depth (ft):	0.86	0.92	1.77	2.75	2.40	1.52

Profile Plot - 5YR 2 HOUR STORM

Inlet C3 & Inlet C5

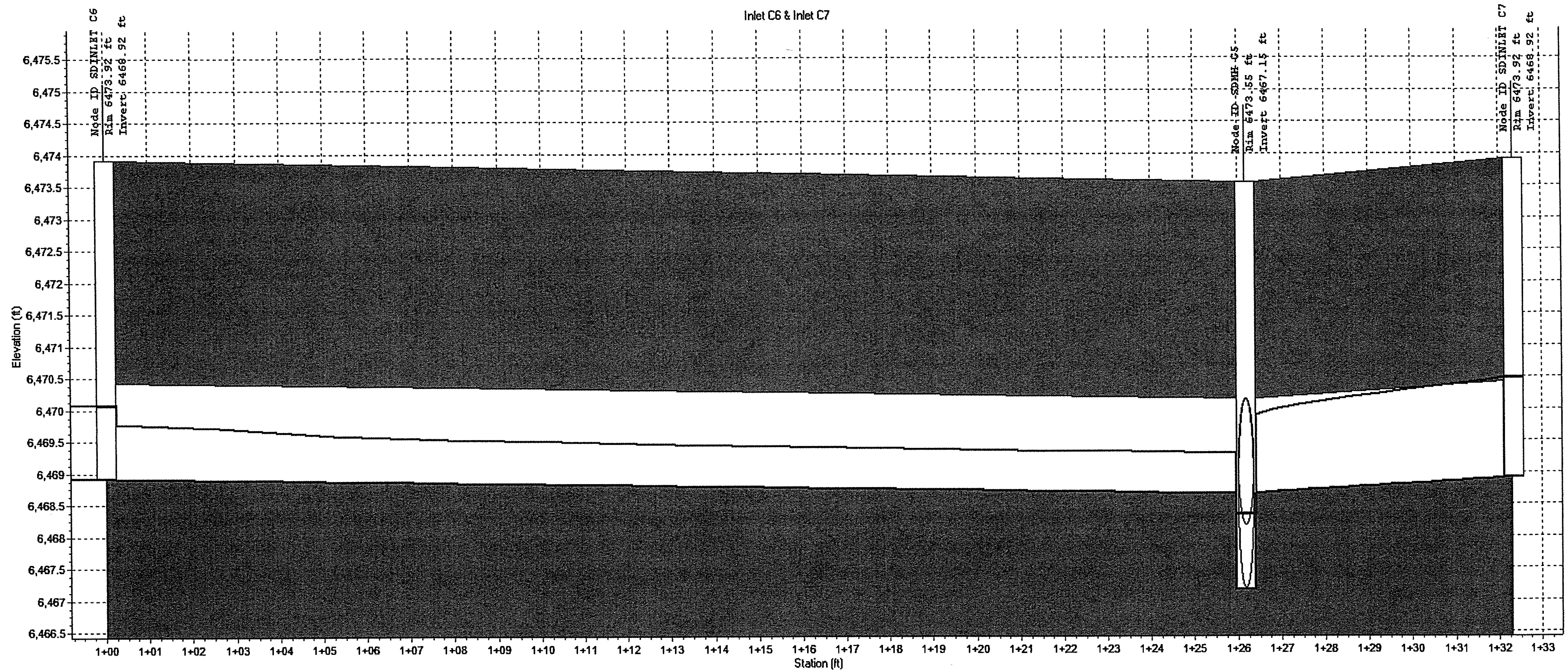


Node ID:	SDINLET C3	SDMH C2	SDINLET C4
Rim (ft):	6469.42	6469.12	6469.42
Invert (ft):	6464.42	6462.12	6464.42
Min Pipe Cover (ft):		3.00	
Max HGL (ft):	6465.74	6464.97	6466.73

Link ID:	{Storm}.Pipe - (225) (Storm)	{Storm}.Pipe - (224) (Storm)
Length (ft):	29.17	9.17
Dia (in):	18.00	18.00
Slope (ft/ft):	0.0103	0.0327
Up Invert (ft):	6464.42	6464.42
Dn Invert (ft):	6464.12	6464.12
Max Q (cfs):	6.56	12.18
Max Vel (ft/s):	4.79	8.12
Max Depth (ft):	1.09	1.19

Profile Plot - 5YR 2 HOUR STORM

Inlet C6 & Inlet C7

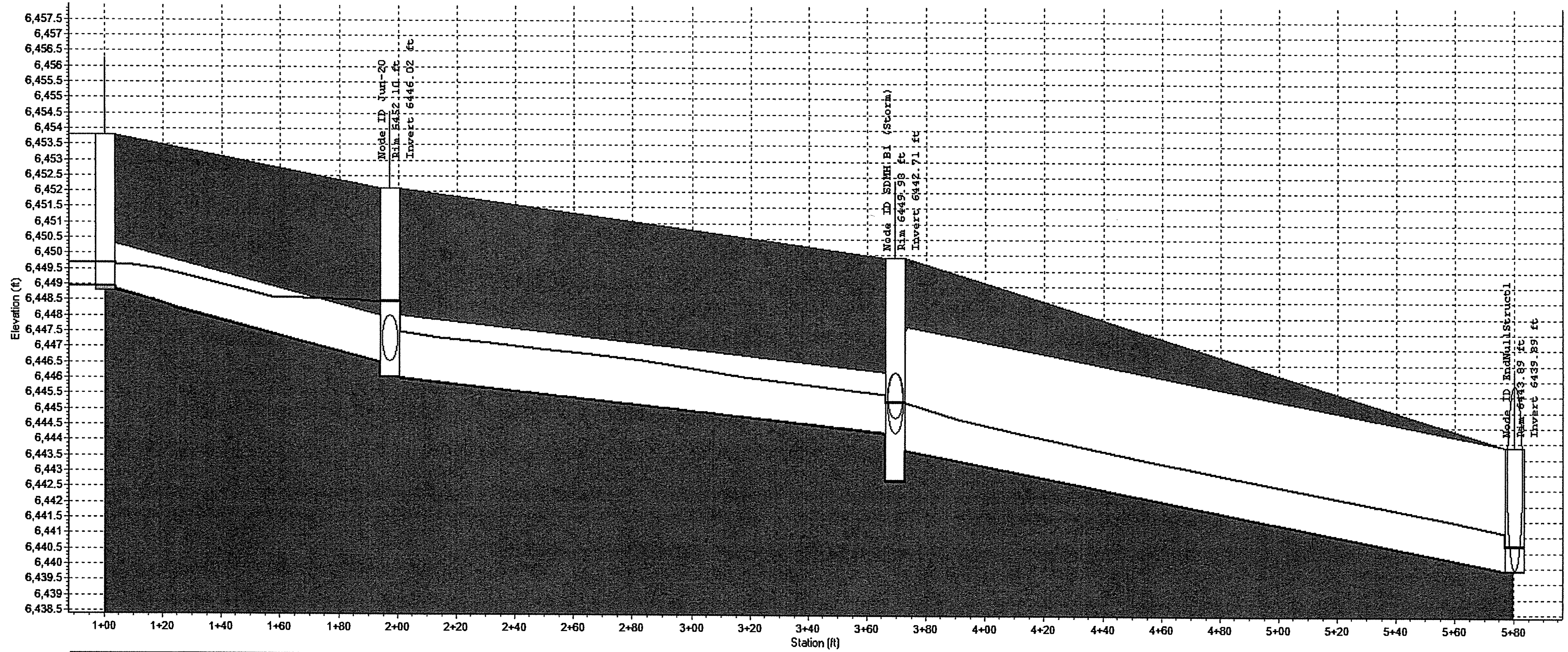


Node ID:	SDINLET C6	SDMH C5	SDINLET C7
Rim (ft):	6473.92	6473.55	6473.92
Invert (ft):	6468.92	6467.15	6468.92
Min Pipe Cover (ft):		3.39	
Max HGL (ft):	6470.07	6468.34	6470.49

Link ID:	{Storm}.Pipe - (223) (Storm)	{Storm}.Pipe - (222) (Storm)
Length (ft):	26.17	6.16
Dia (in):	18.00	18.00
Slope (ft/ft):	0.0099	0.0422
Up Invert (ft):	6468.92	6468.92
Dn Invert (ft):	6468.66	6468.66
Max Q (cfs):	5.48	8.89
Max Vel (ft/s):	4.58	6.49
Max Depth (ft):	0.96	1.09

Profile Plot - 5YR 2 HOUR STORM

"D" Line

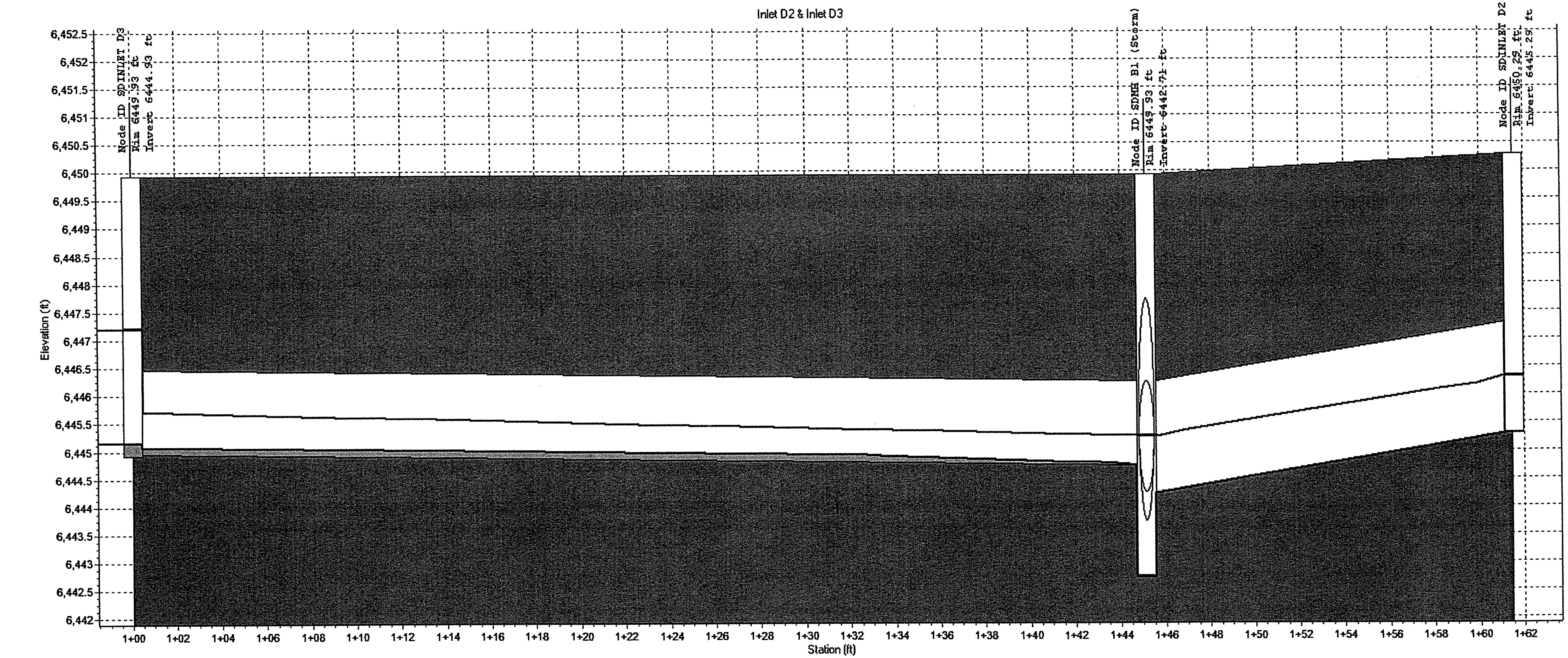


Node ID:	SDINLET D6	Jun-20	SDMH B1 (Storm)	EndNullStruct1
Rim (ft):	6453.80	6452.10	6449.93	6443.89
Invert (ft):	6448.81	6446.02	6442.71	6439.89
Min Pipe Cover (ft):		4.08	2.22	0.00
Max HGL (ft):	6449.69	6449.42	6445.25	6440.69

Link ID:	Link-48	Link-73	{Storm}.Pipe - (174) (Storm)
Length (ft):	96.99	172.48	210.73
Dia (in):	18.00	24.00	48.00
Slope (ft/ft):	0.0236	0.0104	0.0181
Up Invert (ft):	6448.81	6446.02	6443.71
Dn Invert (ft):	6446.52	6444.23	6439.89
Max Q (cfs):	7.71	18.71	37.23
Max Vel (ft/s):	6.70	6.37	12.25
Max Depth (ft):	1.19	1.77	1.17

Profile Plot - 5YR 2 HOUR STORM

Inlet D2 & Inlet D3

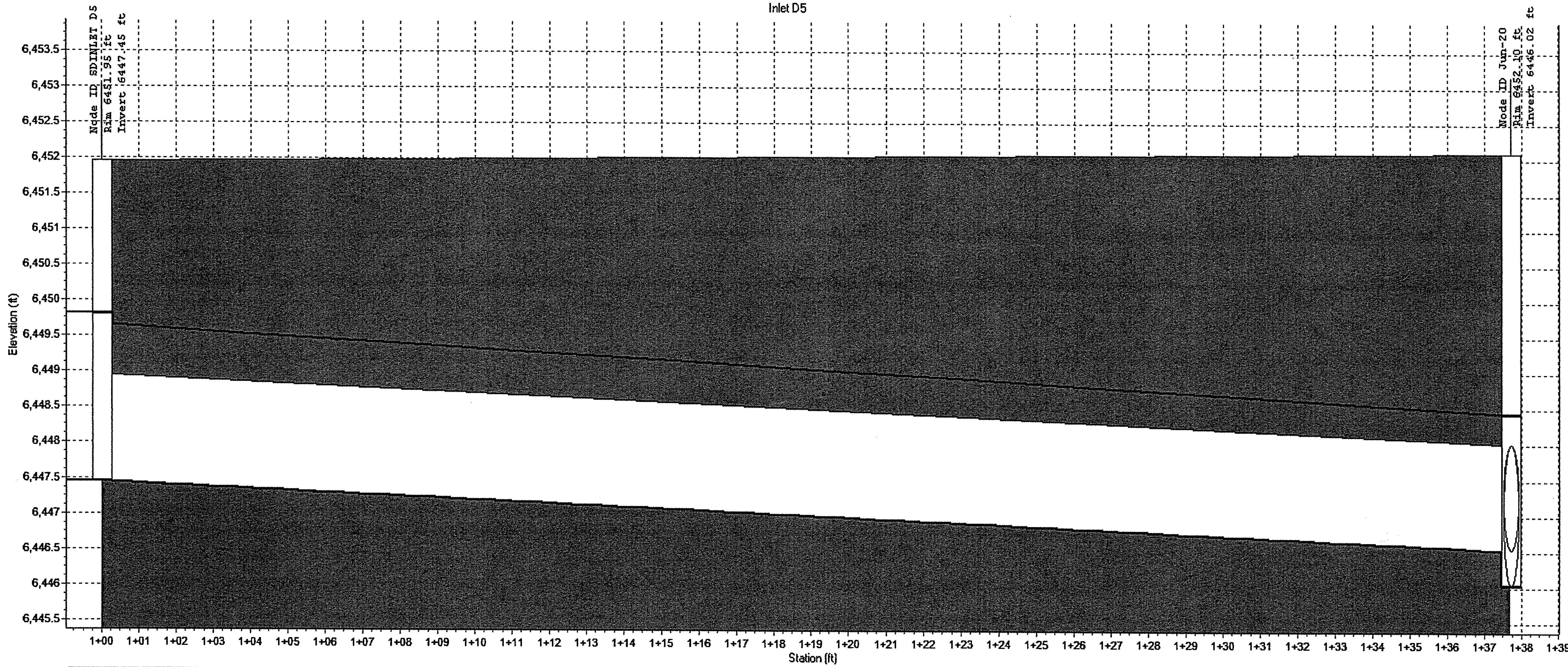


Node ID:	SDINLET D3	SDMH B1 (Storm)	SDINLET D2
Rim (ft):	6449.93	6449.93	6450.29
Invert (ft):	6444.93	6442.71	6445.29
Min Pipe Cover (ft):		2.22	
Max HGL (ft):	6447.20	6445.25	6446.32

Link ID:	{Storm}.Pipe - (171) (Storm)	{Storm}.Pipe - (172) (Storm)
Length (ft):	45.12	16.39
Dia (in):	18.00	24.00
Slope (ft/ft):	0.0051	0.0645
Up Invert (ft):	6444.96	6445.29
Dn Invert (ft):	6444.73	6444.23
Max Q (cfs):	9.79	10.37
Max Vel (ft/s):	5.83	6.38
Max Depth (ft):	1.35	1.03

Profile Plot - 5YR 2 HOUR STORM

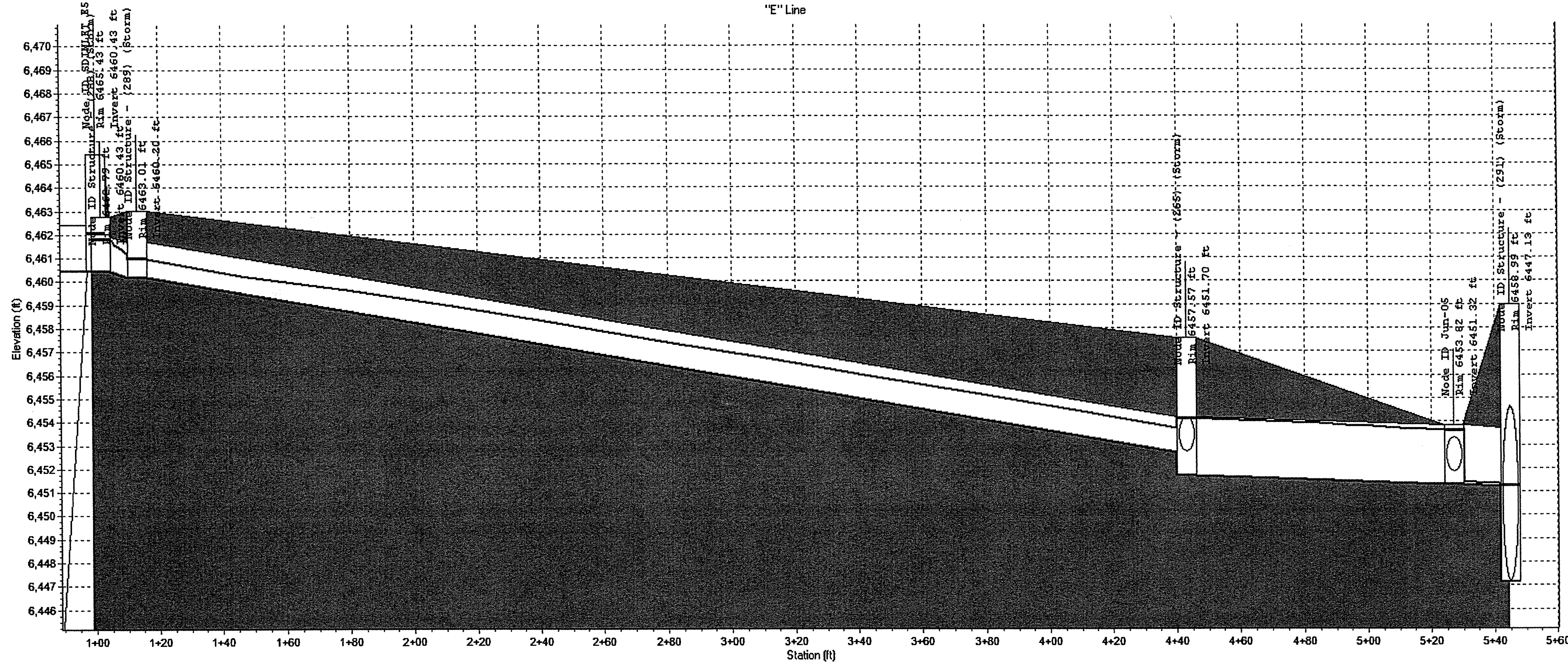
Inlet D5



Node ID:	SDINLET D5	Jun-20
Rim (ft):	6451.95	6452.10
Invert (ft):	6447.45	6446.02
Min Pipe Cover (ft):		4.08
Max HGL (ft):	6449.81	6449.42
Link ID:	Link-87	
Length (ft):	37.71	
Dia (in):	18.00	
Slope (ft/ft):	0.0247	
Up Invert (ft):	6447.45	
Dn Invert (ft):	6446.52	
Max Q (cfs):	12.00	
Max Vel (ft/s):	7.02	
Max Depth (ft):	1.50	

Profile Plot - 5YR 2 HOUR STORM

"E" Line

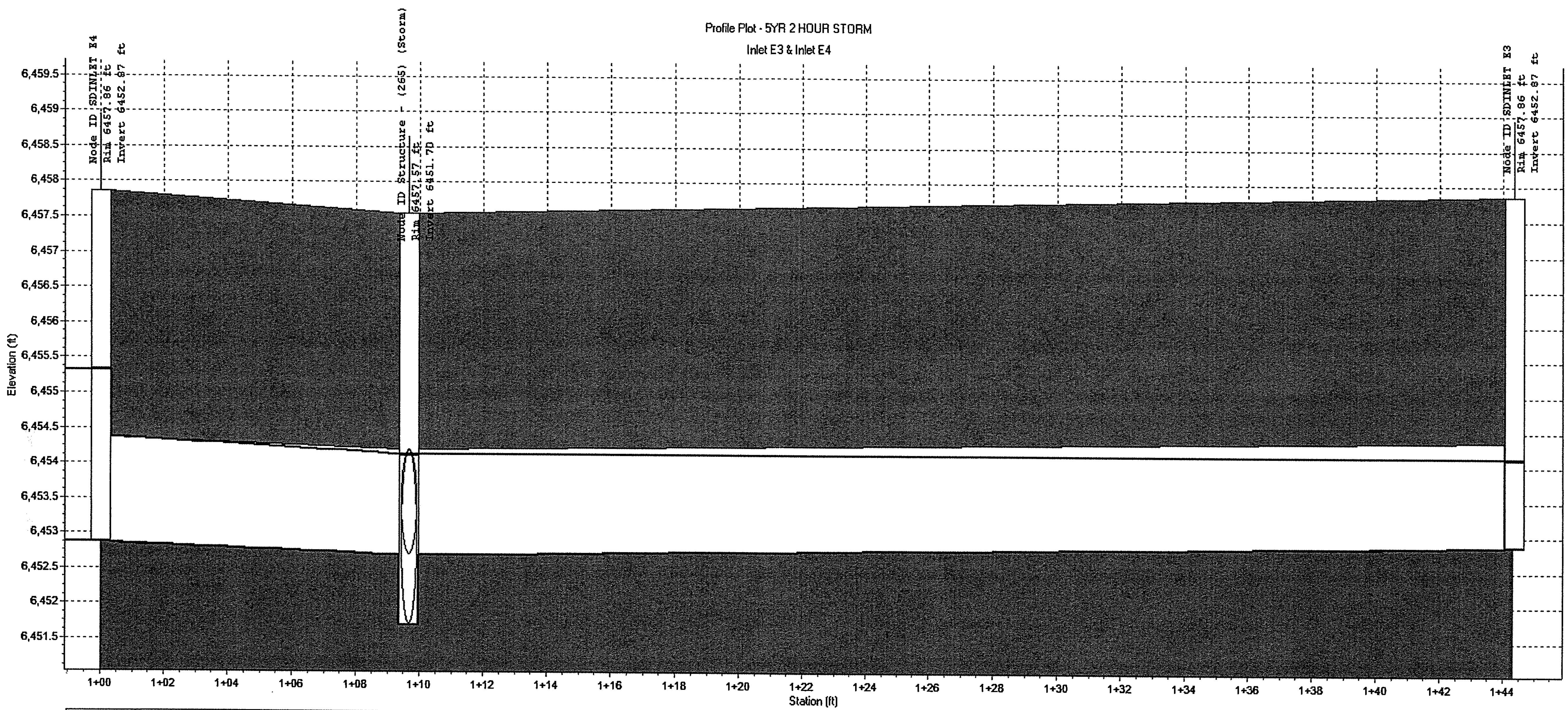


Node ID:	SDINLET E5 Structure - (289) (Storm)	Structure - (265) (Storm)	Jun-05	
Rim (ft):	6465.43 6462.43 6463.01	6457.57	6453.82	6458.99
Invert (ft):	6460.43 6460.43 6460.20	6451.70	6451.32	6447.13
Min Pipe Cover (ft):	0 36 1.31	3.37	0.00	4.35
Max HGL (ft):	6462.10 6461.80 6460.97	6454.12	6453.61	6451.22

Link ID:		{Storm}.Pipe - (110) (Storm)	{Storm}.Pipe - (201) (2) (Storm)	Link-14	
Length (ft):	1.51 11.54	329.65	84.29	17.74	
Dia (in):	24.00 18.00	18.00	30.00	30.00	
Slope (ft/ft):	0.0000 0.0200	0.0228	0.0045	0.0056	
Up Invert (ft):	6460 6460.43	6460.20	6451.70	6451.32	
Dn Invert (ft):	6460 6460.20	6452.70	6451.32	6451.22	
Max Q (cfs):	8.36 8.35	8.29	20.64	22.94	
Max Vel (ft/s):	3.34 6.20	7.83	4.31	5.59	
Max Depth (ft):	1.49 1.07	1.10	2.36	1.95	

Profile Plot - 5YR 2 HOUR STORM

Inlet E3 & Inlet E4

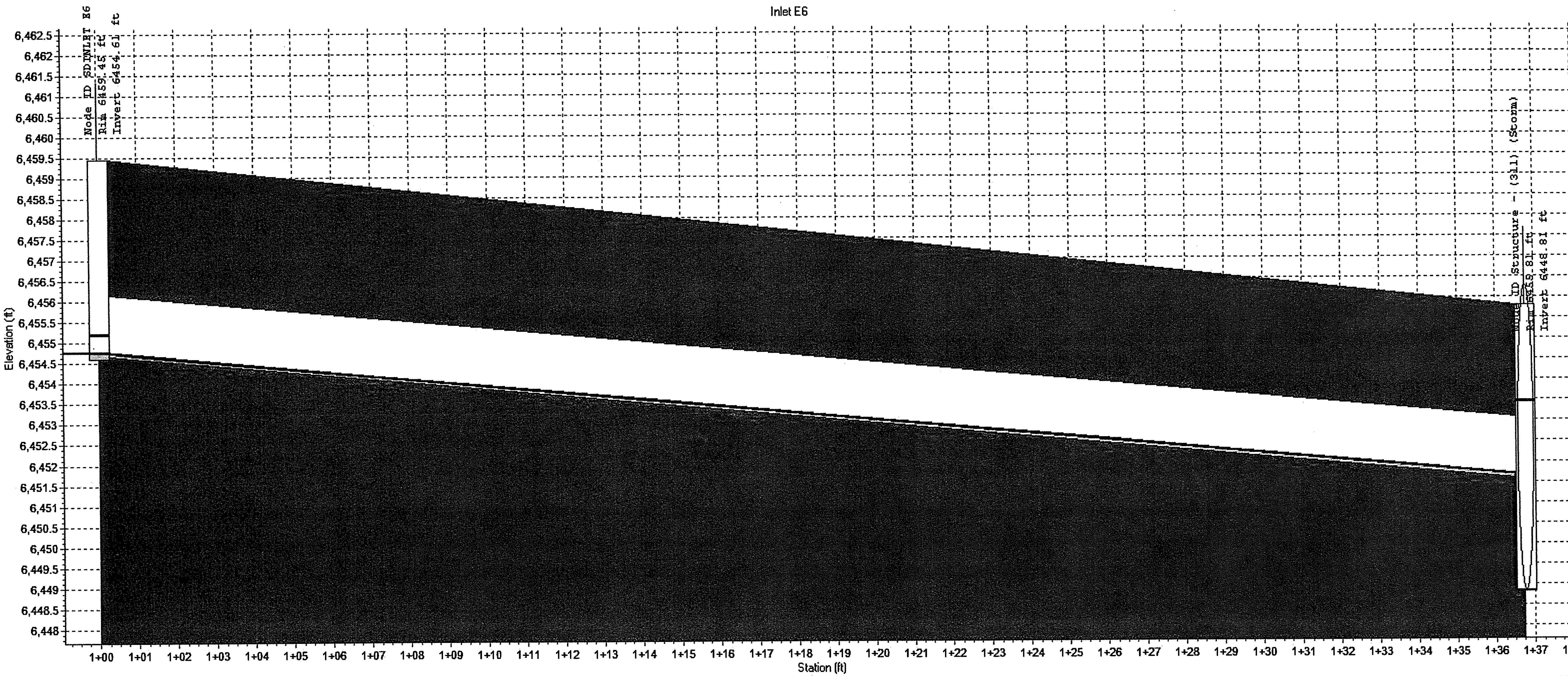


Node ID:	SDINLET E4	Structure - (265) (Storm)	SDINLET E3
Rim (ft):	6457.86	6457.57	6457.86
Invert (ft):	6452.87	6451.70	6452.87
Min Pipe Cover (ft):		3.37	
Max HGL (ft):	6455.32	6454.12	6454.13

Link ID:	{Storm}.Pipe - (197) (Storm)	{Storm}.Pipe - (198) (Storm)
Length (ft):	9.66	34.67
Dia (in):	18.00	18.00
Slope (ft/ft):	0.0176	0.0049
Up Invert (ft):	6452.87	6452.87
Dn Invert (ft):	6452.70	6452.70
Max Q (cfs):	12.89	1.72
Max Vel (ft/s):	7.35	2.63
Max Depth (ft):	1.46	1.34

Profile Plot - 5YR 2 HOUR STORM

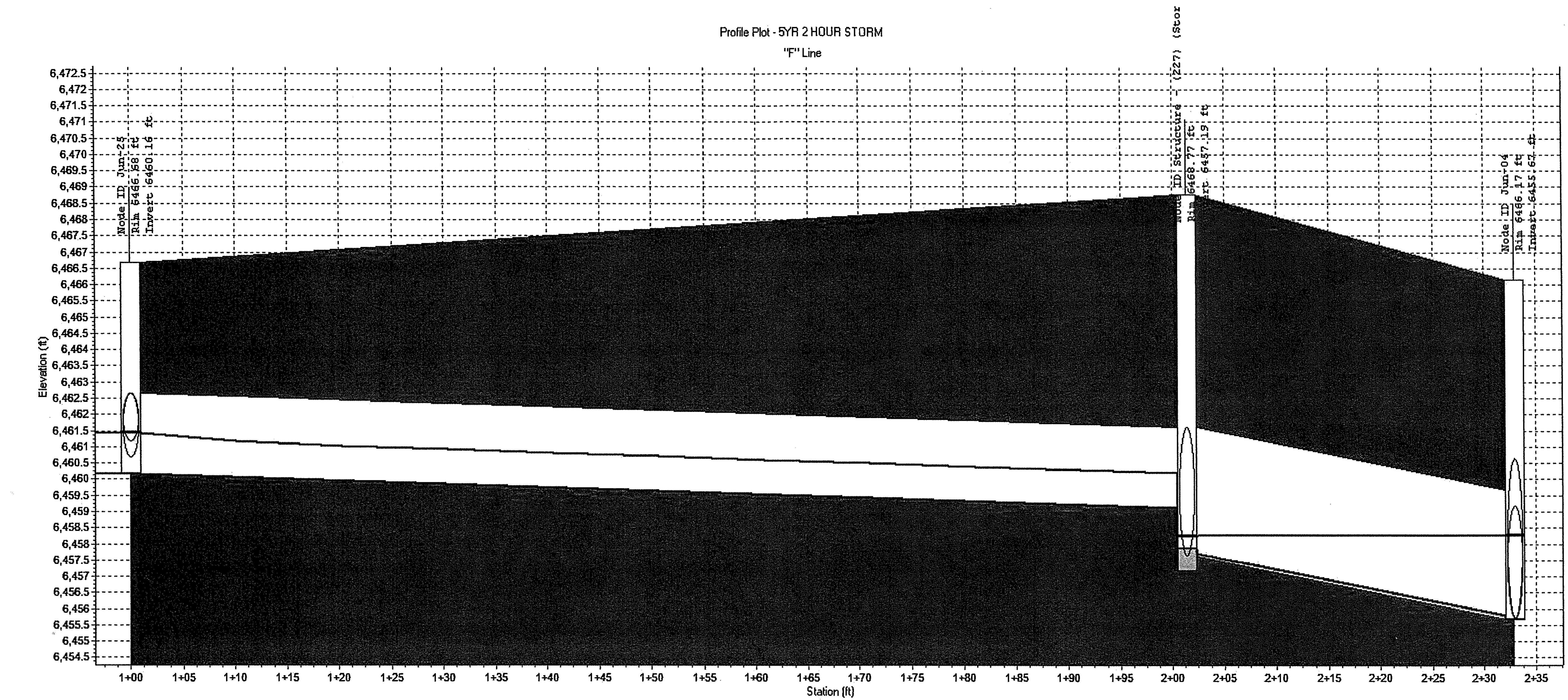
Inlet E6



Node ID:	SDINLET E6	
Rim (ft):	6459.45	6455.81
Invert (ft):	6454.61	6448.81
Min Pipe Cover (ft):		0.00
Max HGL (ft):	6455.18	6453.44
Link ID:	{Storm}.Pipe - (255) (Storm)	
Length (ft):	36.75	
Dia (in):	18.00	
Slope (ft/ft):	0.0835	
Up Invert (ft):	6454.65	
Dn Invert (ft):	6451.58	
Max Q (cfs):	5.17	
Max Vel (ft/s):	10.74	
Max Depth (ft):	0.90	

Profile Plot - 5YR 2 HOUR STORM

"F" Line

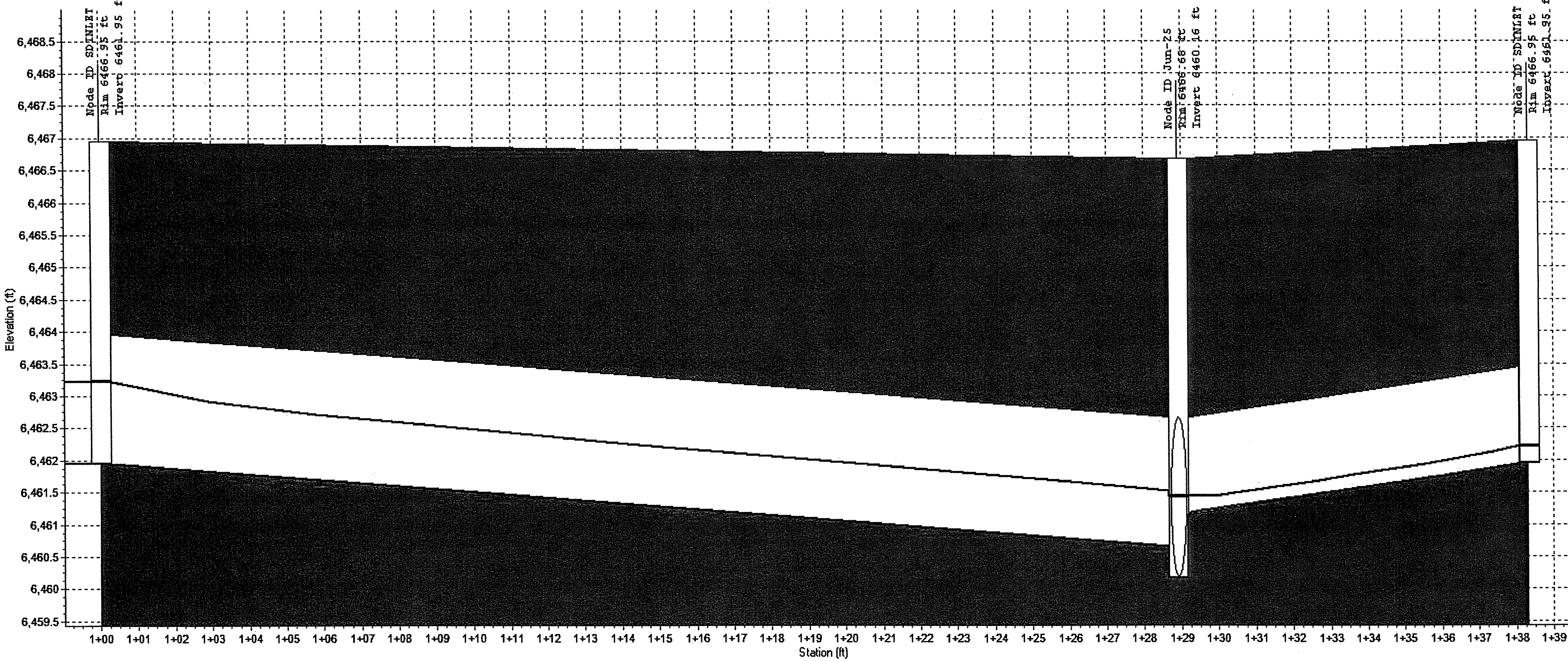


Node ID:	Jun-25	Structure - (227) (Storm)	Jun-04
Rim (ft):	6466.68	6468.77	6466.17
Invert (ft):	6460.16	6457.19	6455.67
Min Pipe Cover (ft):	4.02	7.16	5.50
Max HGL (ft):	6461.43	6458.23	6458.27

Link ID:	Link-75	Link-11
Length (ft):	101.31	31.68
Dia (in):	30.00	48.00
Slope (ft/ft):	0.0104	0.0612
Up Invert (ft):	6460.16	6457.61
Dn Invert (ft):	6459.11	6455.67
Max Q (cfs):	13.32	13.95
Max Vel (ft/s):	5.98	6.63
Max Depth (ft):	1.16	1.61

Profile Plot - 5YR 2 HOUR STORM

Inlet F3 & Inlet F4

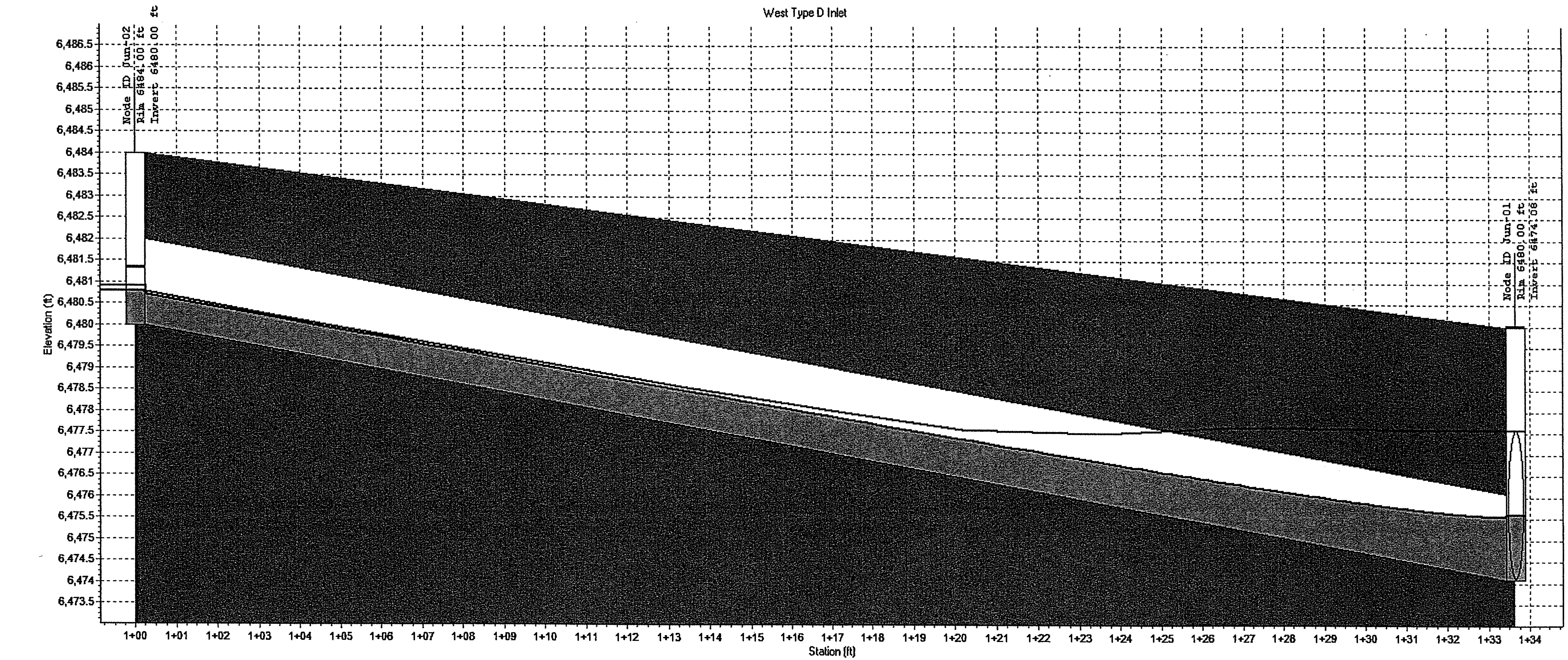


Node ID:	SDINLET F4	Jun-25	SDINLET F3
Rim (ft):	6466.95	6466.68	6466.95
Invert (ft):	6461.95	6460.16	6461.95
Min Pipe Cover (ft):		4.02	
Max HGL (ft):	6463.23	6461.43	6462.22

Link ID:	Link-77	Link-76
Length (ft):	28.90	9.43
Dia (in):	24.00	18.00
Slope (ft/ft):	0.0446	0.0838
Up Invert (ft):	6461.95	6461.95
Dn Invert (ft):	6460.66	6461.16
Max Q (cfs):	13.41	0.92
Max Vel (ft/s):	8.22	5.39
Max Depth (ft):	1.03	0.23

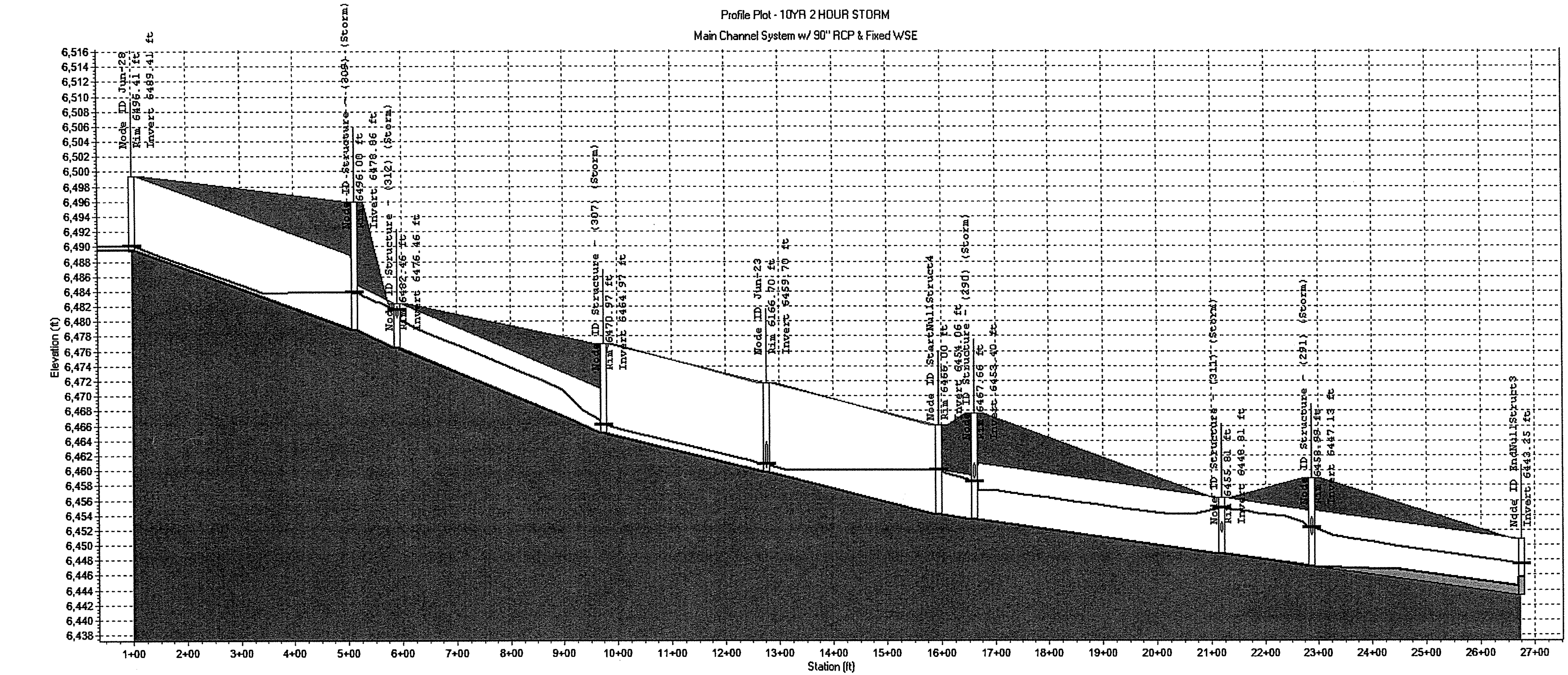
Profile Plot - 5YR 2 HOUR STORM

West Type D Inlet



Node ID:	Jun-02	Jun-01
Rim (ft):	6484.00	6480.00
Invert (ft):	6480.00	6474.08
Min Pipe Cover (ft):	2.00	2.42
Max HGL (ft):	6481.34	6480.00

Link ID:	Link-09
Length (ft):	33.62
Dia (in):	24.00
Slope (ft/ft):	0.1761
Up Invert (ft):	6480.00
Dn Invert (ft):	6474.08
Max Q (cfs):	23.30
Max Vel (ft/s):	13.47
Max Depth (ft):	1.67

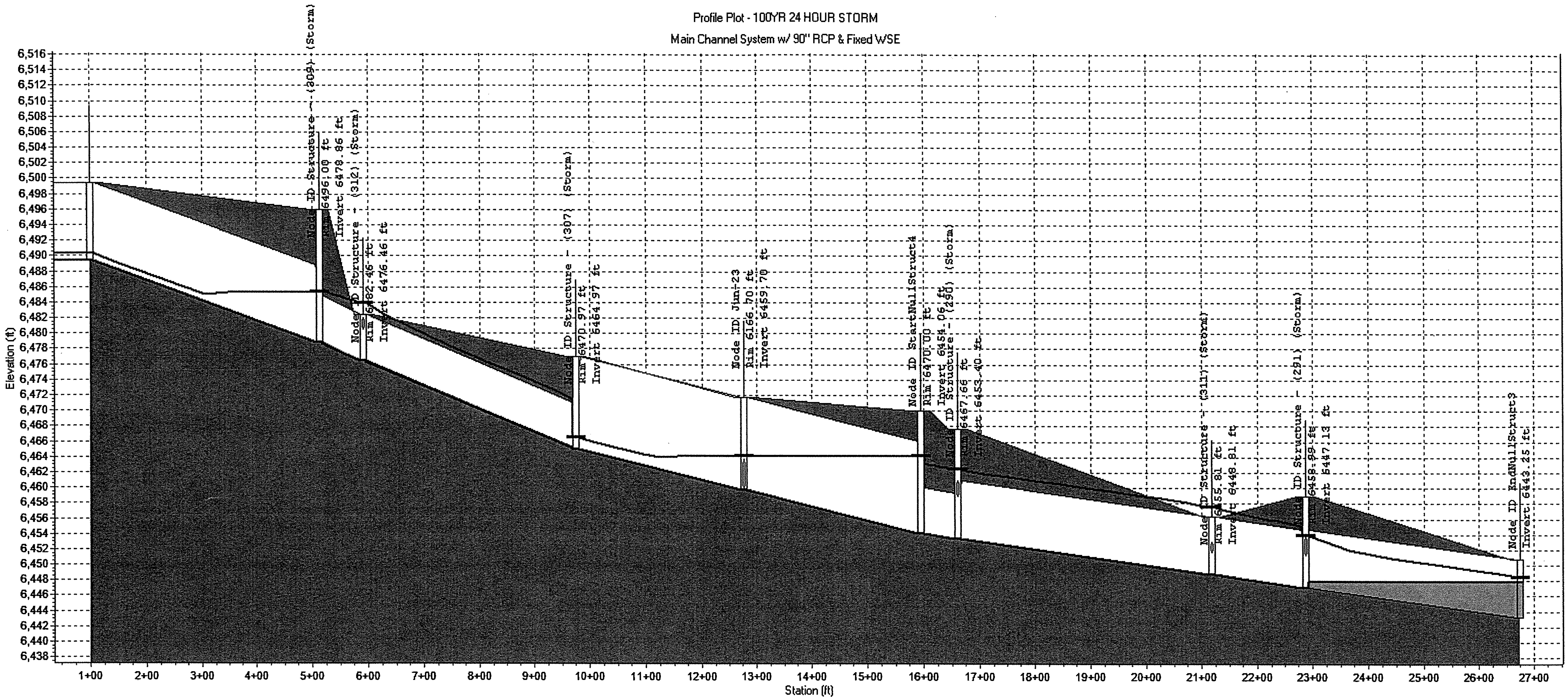


Node ID:	Jun-28	Structure - (309) (Storm)	Structure - (312) (Storm)	Structure - (307) (Storm)	Jun-23	StartNullStruct4	Structure - (290) (Storm)	Structure - (311) (Storm)	Structure - (291) (Storm)	EndNullStruct3
Rim (ft):	6496.41	6496.00	6482.46	6470.97	6166.70	6466.00	6467.66	6455.81	6458.99	
Invert (ft):	6489.41	6478.86	6476.46	6464.97	6459.70	6454.06	6453.40	6448.81	6447.13	6443.25
Min Pipe Cover (ft):	0.00	7.14	0.00	0.00	0.00	0.00		0.00		
Max HGL (ft):	6490.07	6483.92	6481.52	6466.08	6460.81	6460.08	6458.44	6454.95	6452.30	6447.41

Link ID:	Link-90	{Storm}.Pipe - (254) (1) (Storm)	Link-62	Link-03	Link-69	{Storm}.Pipe - (249) (Storm)	{Storm}.Pipe - (248) (Storm)	{Storm}.Pipe - (248) (2) (Storm)	Link-60
Length (ft):	411.82	79.19	383.83	300.76	319.11	66.12	458.42	167.50	388.34
Dia (in):	120.00	72.00	72.00	144.00	144.00	72.00	90.00	90.00	90.00
Slope (ft/ft):	0.0256	0.0303	0.0299	0.0175	0.0177	0.0100	0.0100	0.0100	0.0100
Up Invert (ft):	6489.41	6478.86	6476.46	6464.97	6459.70	6454.06	6453.40	6448.81	6447.13
Dn Invert (ft):	6478.86	6476.46	6464.97	6459.70	6454.06	6453.40	6448.81	6447.14	6443.25
Max Q (cfs):	374.23	361.54	361.53	361.51	388.10	383.67	385.95	386.80	394.72
Max Vel (ft/s):	5.78	5.95	9.76	5.86	3.83	6.96	10.95	10.90	13.66
Max Depth (ft):	2.85	5.06	3.09	1.10	3.56	5.52	5.59	5.65	4.67

Profile Plot - 100YR 24 HOUR STORM

Main Channel System w/ 90" RCP & Fixed WSE



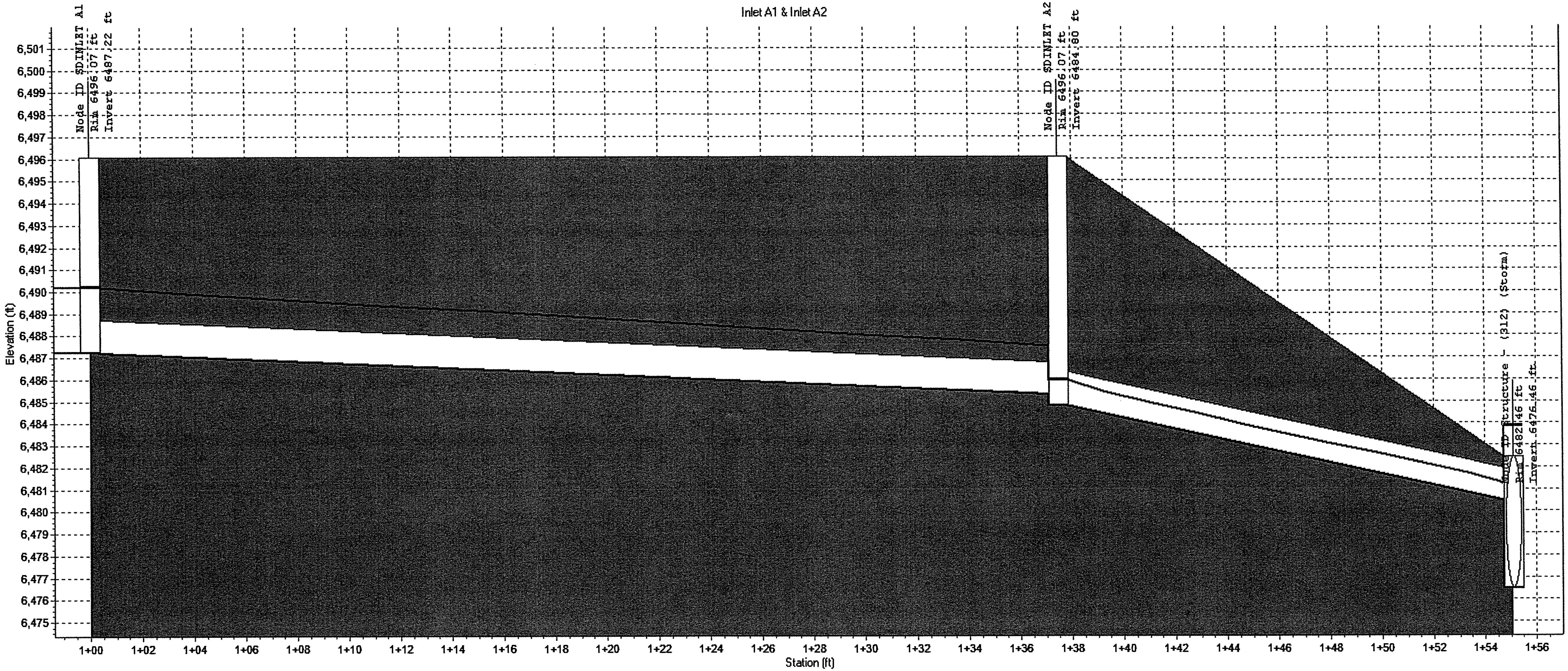
Node ID:	Jun-28	Structure - (309) (Storm)	Structure - (312) (Storm)	Structure - (307) (Storm)	Jun-23	StartNullStruct4	Structure - (290) (Storm)	Structure - (311) (Storm)	Structure - (291) (Storm)	EndNullStruct3
Rim (ft):	6496.41	6496.00	6482.46	6470.97	6166.70	6470.00	6467.66	6455.81	6458.99	
Invert (ft):	6489.41	6478.86	6476.46	6464.97	6459.70	6454.06	6453.40	6448.81	6447.13	6443.25
Min Pipe Cover (ft):	0.00	7.14	0.00	0.00	0.00	3.94	6.77	0.00	4.35	
Max HGL (ft):	6490.31	6485.37	6483.85	6466.47	6464.08	6464.10	6462.35	6457.52	6453.89	6448.39

Link ID:	Link-90	{Storm}.Pipe - (254) (1) (Storm)	Link-62	Link-03	Link-69	{Storm}.Pipe - (249) (Storm)	{Storm}.Pipe - (248) (Storm)	{Storm}.Pipe - (248) (2) (Storm)	Link-60
Length (ft):	411.82	79.19	383.83	300.76	319.11	66.12	458.42	167.50	388.34
Dia (in):	120.00	72.00	72.00	144.00	144.00	72.00	90.00	90.00	90.00
Slope (ft/ft):	0.0256	0.0303	0.0299	0.0175	0.0177	0.0100	0.0100	0.0100	0.0100
Up Invert (ft):	6489.41	6478.86	6476.46	6464.97	6459.70	6454.06	6453.40	6448.81	6447.13
Dn Invert (ft):	6478.86	6476.46	6464.97	6459.70	6454.06	6453.40	6448.81	6447.14	6443.25
Max Q (cfs):	639.47	623.67	623.67	623.65	603.20	540.58	540.55	541.16	541.22
Max Vel (ft/s):	1.89	8.66	13.91	7.08	2.41	9.01	12.24	12.49	14.41
[illegible]	3.70	6.00	3.75	2.90	7.19	6.00	7.50	7.13	5.95

Autodesk Storm and Sanitary Analysis

Profile Plot - 100YR 24 HOUR STORM

Inlet A1 & Inlet A2



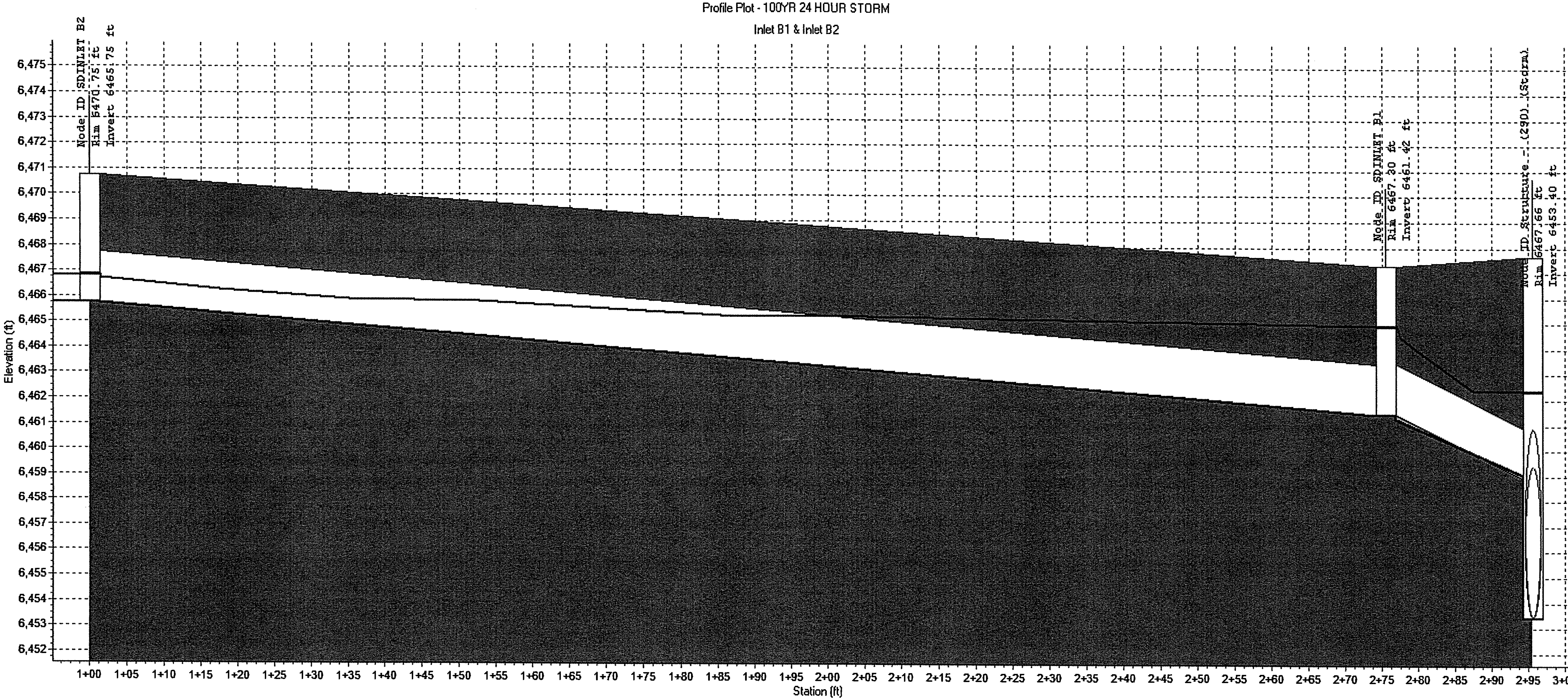
Node ID:	SDINLET A1	SDINLET A2	
Rim (ft):	6496.07	6496.07	6482.46
Invert (ft):	6487.22	6484.80	6476.46
Min Pipe Cover (ft):			0.00
Max HGL (ft):	6490.18	6485.94	6483.85

Link ID:		{Storm}.Pipe - (226) (Storm)	Link-88	
Length (ft):		37.42	17.67	
Dia (in):		18.00	18.00	
Slope (ft/ft):		0.0513	0.2456	
Up Invert (ft):		6487.22	6484.80	
Dn Invert (ft):		6485.30	6480.46	
Max Q (cfs):		18.55	18.54	
Max Vel (ft/s):		11.81	16.64	
[illegible]		1.25	0.90	

Autodesk Storm and Sanitary Analysis

Profile Plot - 100YR 24 HOUR STORM

Inlet B1 & Inlet B2



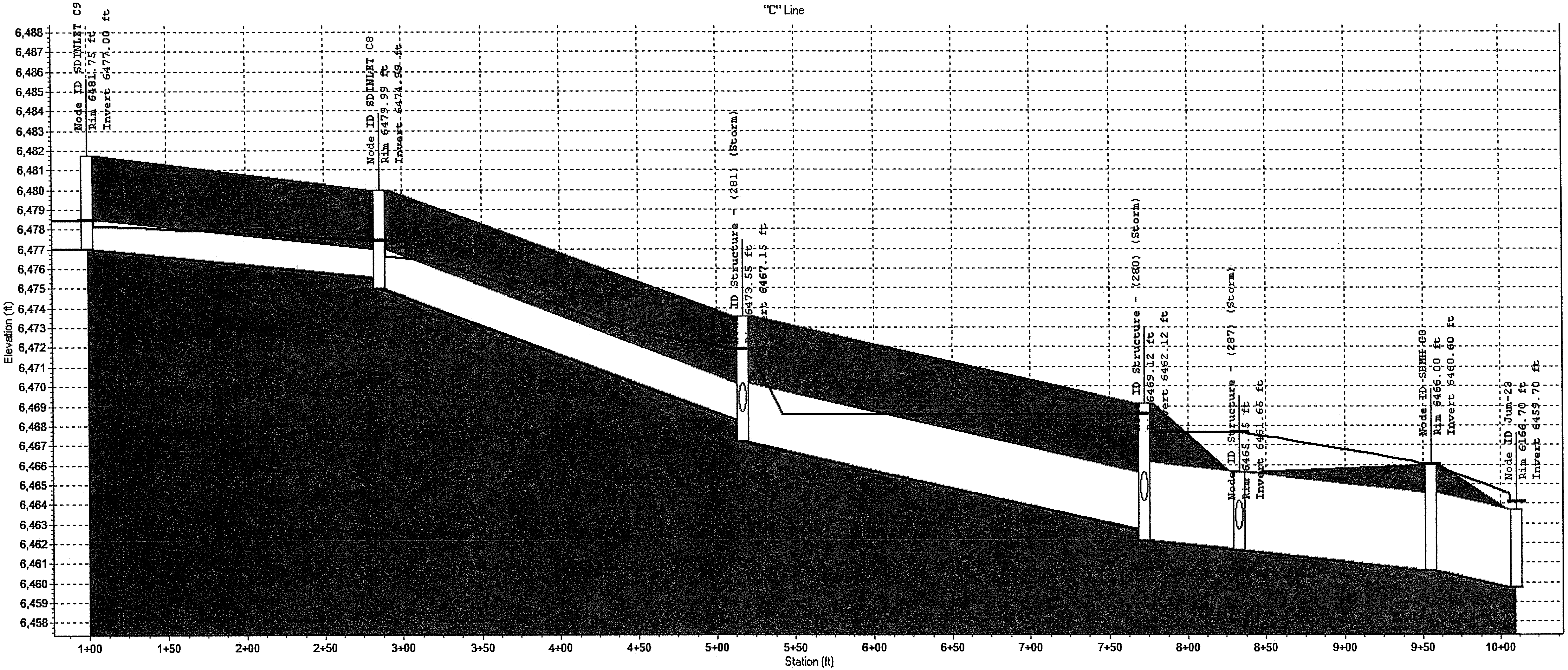
Node ID:	SDINLET B2	SDINLET B1	
Rim (ft):	6470.75	6467.30	6467.66
Invert (ft):	6465.75	6461.42	6453.40
Min Pipe Cover (ft):			6.77
Max HGL (ft):	6466.79	6464.91	6462.35

Link ID:	Link-51	Link-06
Length (ft):	175.54	19.91
Dia (in):	24.00	24.00
Slope (ft/ft):	0.0247	0.1267
Up Invert (ft):	6465.75	6461.42
Dn Invert (ft):	6461.42	6458.90
Max Q (cfs):	14.04	39.37
Max Vel (ft/s):	7.10	15.04
[illegible]	1.52	1.53

Autodesk Storm and Sanitary Analysis

Profile Plot - 100YR 24 HOUR STORM

"C" Line

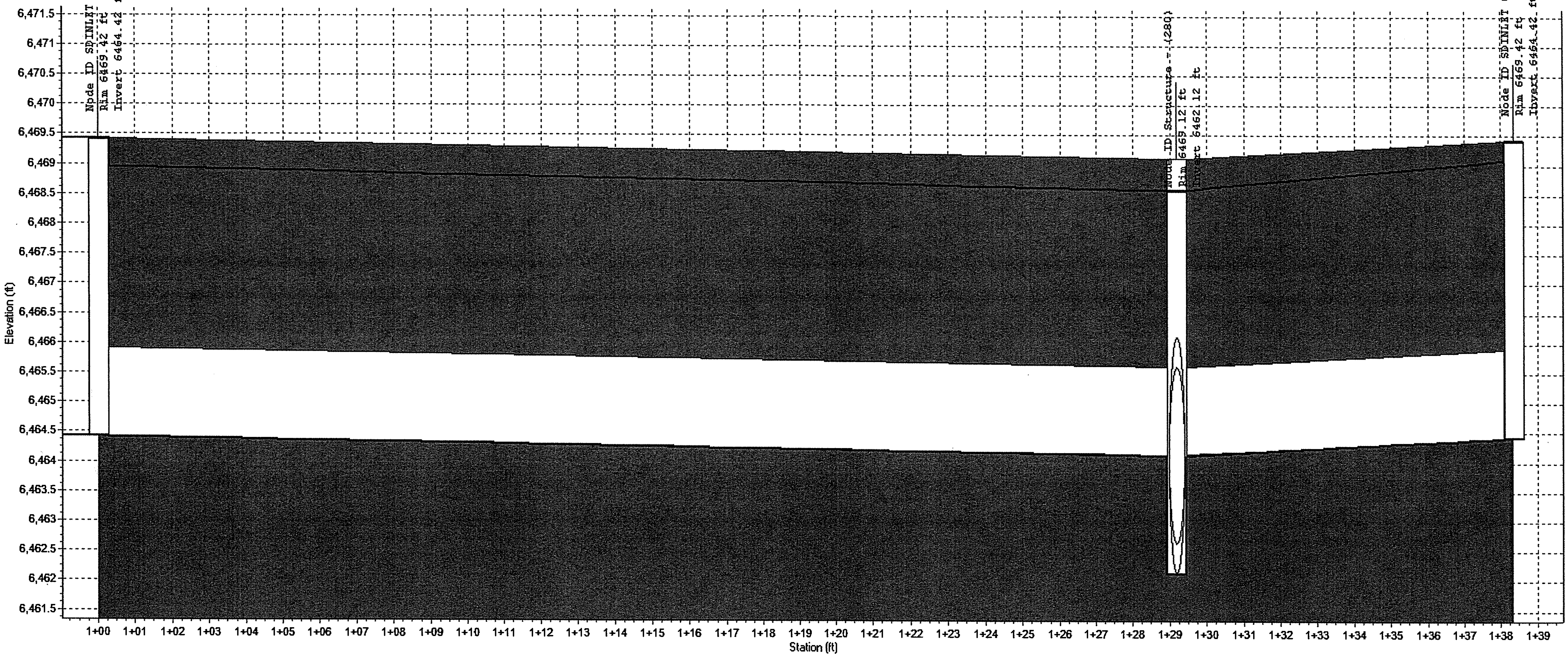


Node ID:	SDINLET C9	SDINLET C8	Structure - (281) (Storm)	Structure - (280) (Storm)	Structure - (287) (Storm)	SDMH C0	Jun-23
Rim (ft):	6481.75	6479.99	6473.55	6469.12	6465.15	6466.00	6166.70
Invert (ft):	6477.00	6474.99	6467.15	6462.12	6461.65	6460.60	6459.70
Min Pipe Cover (ft):			3.39	3.00	0.00	1.40	0.00
Max HGL (ft):	6478.46	6477.41	6472.89	6469.11	6468.63	6466.00	6464.08

Link ID:	Link-18	{Storm}.Pipe - (221) (Storm)	Link-93	Link-92	Link-79	Link-94
Length (ft):	185.35	231.25	255.28	61.10	121.93	55.17
Dia (in):	18.00	24.00	36.00	48.00	48.00	48.00
Slope (ft/ft):	0.0081	0.0296	-0.0177	-0.0077	0.0081	0.0163
Up Invert (ft):	6477.00	6474.99	6462.62	6461.65	6461.59	6460.60
Dn Invert (ft):	6475.49	6468.15	6467.15	6462.12	6460.60	6459.70
Max Q (cfs):	7.30	30.22	51.75	71.04	77.24	70.94
Autodesk Storm and Sanitary Analysis	4.91	11.41	7.32	5.65	6.15	9.83
Max Depth (ft):	1.48	2.00	3.00	4.00	4.00	3.74

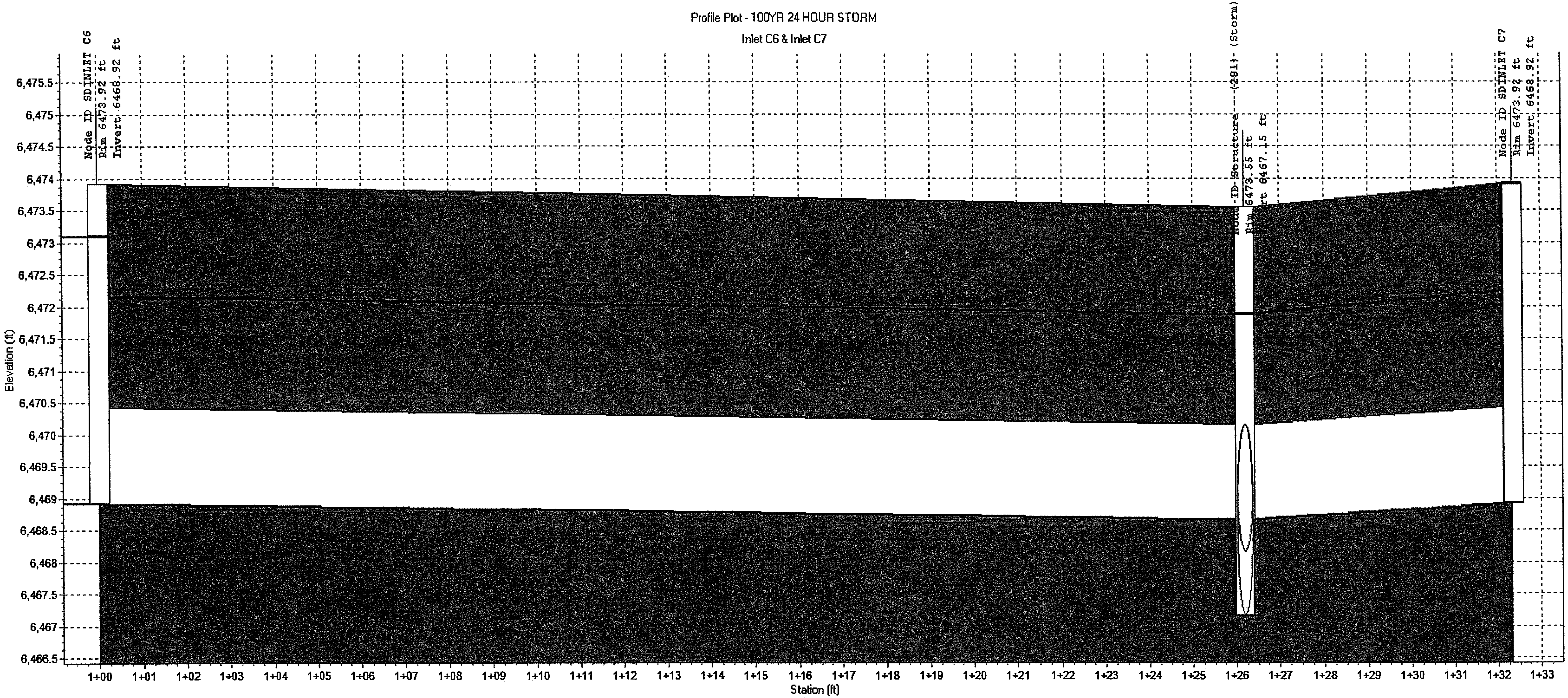
Profile Plot - 100YR 24 HOUR STORM

Inlet C3 & Inlet C4



Node ID:	SDINLET C3	Structure - (280) (Storm)	SDINLET C4
Rim (ft):	6469.42	6469.12	6469.42
Invert (ft):	6464.42	6462.12	6464.42
Min Pipe Cover (ft):		3.00	
Max HGL (ft):	6469.42	6469.11	6469.42
Link ID:	{Storm}.Pipe - (225) (Storm)	{Storm}.Pipe - (224) (Storm)	
Length (ft):	29.17	9.17	
Dia (in):	18.00	18.00	
Slope (ft/ft):	0.0103	0.0327	
Up Invert (ft):	6464.42	6464.42	
Dn Invert (ft):	6464.12	6464.12	
Max Q (cfs):	10.74	16.87	
Max Vel (ft/s):	6.08	9.54	
	1.50	1.50	

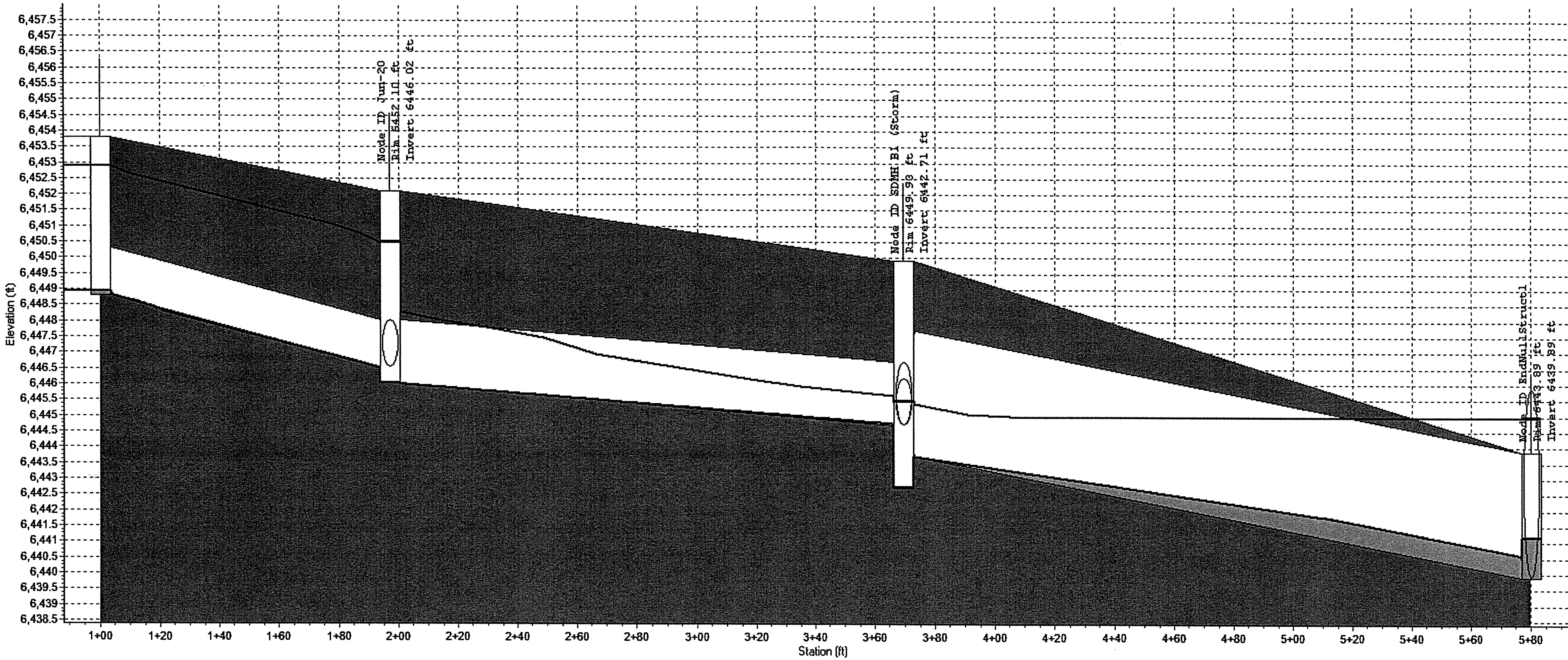
Autodesk Storm and Sanitary Analysis



Node ID:	SDINLET C6		Structure - (281) (Storm)	SDINLET C7
Rim (ft):	6473.92		6473.55	6473.92
Invert (ft):	6468.92		6467.15	6468.92
Min Pipe Cover (ft):			3.39	
Max HGL (ft):	6473.10		6472.89	6473.92
Link ID:		{Storm}.Pipe - (223) (Storm)	{Storm}.Pipe - (222) (Storm)	
Length (ft):		26.17	6.16	
Dia (in):		18.00	18.00	
Slope (ft/ft):		0.0099	0.0422	
Up Invert (ft):		6468.92	6468.92	
Dn Invert (ft):		6468.66	6468.66	
Max Q (cfs):		11.13	17.35	
Autodesk Storm and Sanitary Analysis		6.30	9.82	
Max Depth (ft):		1.50	1.50	

Profile Plot - 100YR 24 HOUR STORM

"D" Line



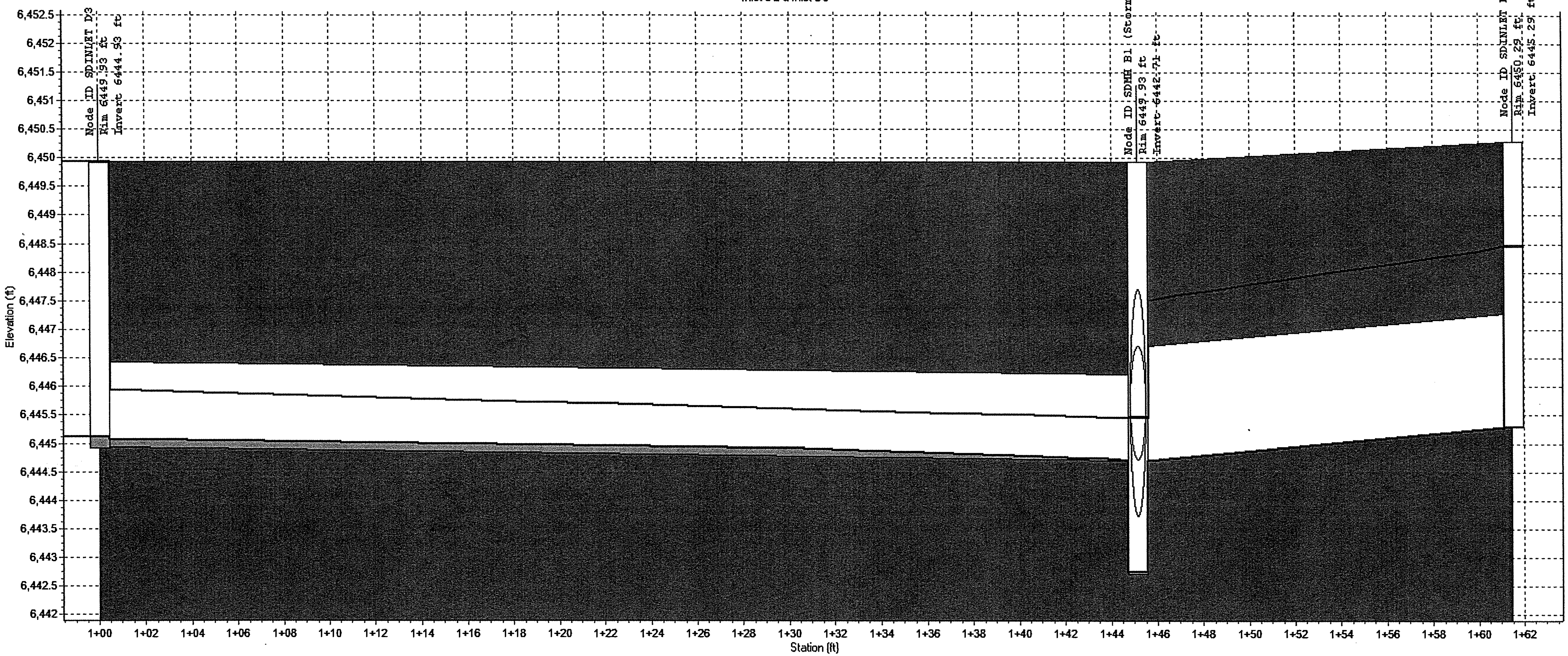
Node ID:	SDINLET D6	Jun-20	SDMH B1 (Storm)	EndNullStruct1
Rim (ft):	6453.80	6452.10	6449.93	6443.89
Invert (ft):	6448.81	6446.02	6442.71	6439.89
Min Pipe Cover (ft):		4.08	2.22	0.00
Max HGL (ft):	6452.89	6450.91	6445.46	6445.21

Link ID:	Link-48	Link-73	{Storm}.Pipe - (174) (Storm)
Length (ft):	96.99	172.48	210.73
Dia (in):	18.00	24.00	48.00
Slope (ft/ft):	0.0236	0.0076	0.0181
Up Invert (ft):	6448.81	6446.02	6443.71
Dn Invert (ft):	6446.52	6444.71	6439.89
Max Q (cfs):	11.67	24.13	66.38
Max Vel (ft/s):	7.11	7.90	6.98
[illegible]	1.50	1.87	2.84

Autodesk Storm and Sanitary Analysis

Profile Plot - 100YR 24 HOUR STORM

Inlet D2 & Inlet D3



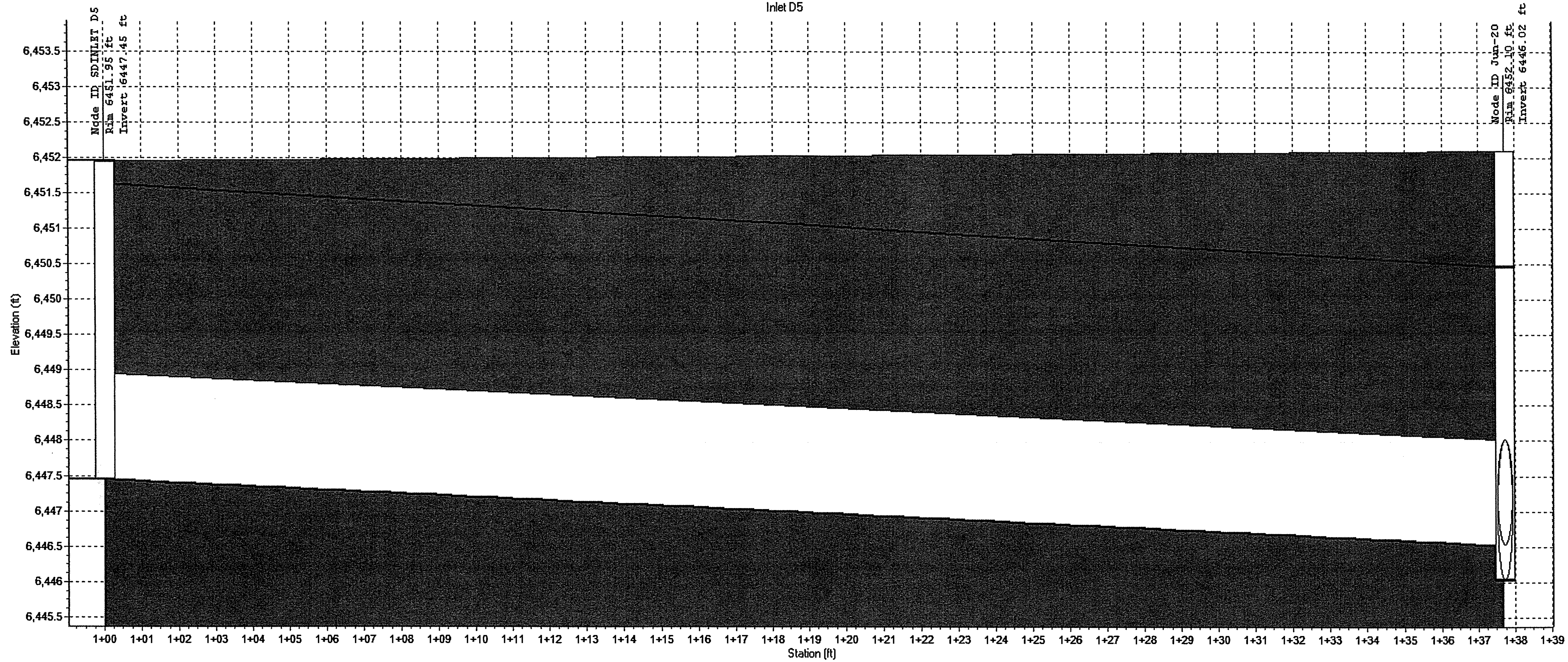
Node ID:	SDINLET D3	SDMH B1 (Storm)	SDINLET D2
Rim (ft):	6449.93	6449.93	6450.29
Invert (ft):	6444.93	6442.71	6445.29
Min Pipe Cover (ft):		2.22	
Max HGL (ft):	6449.93	6445.46	6448.47

Link ID:	{Storm}.Pipe - (171) (Storm)	{Storm}.Pipe - (172) (Storm)
Length (ft):	45.12	16.39
Dia (in):	18.00	24.00
Slope (ft/ft):	0.0049	0.0352
Up Invert (ft):	6444.93	6445.29
Dn Invert (ft):	6444.71	6444.71
Max Q (cfs):	17.95	25.35
Max Vel (ft/s):	10.16	9.66
[illegible]	1.50	1.56

Autodesk Storm and Sanitary Analysis

Profile Plot - 100YR 24 HOUR STORM

Inlet D5



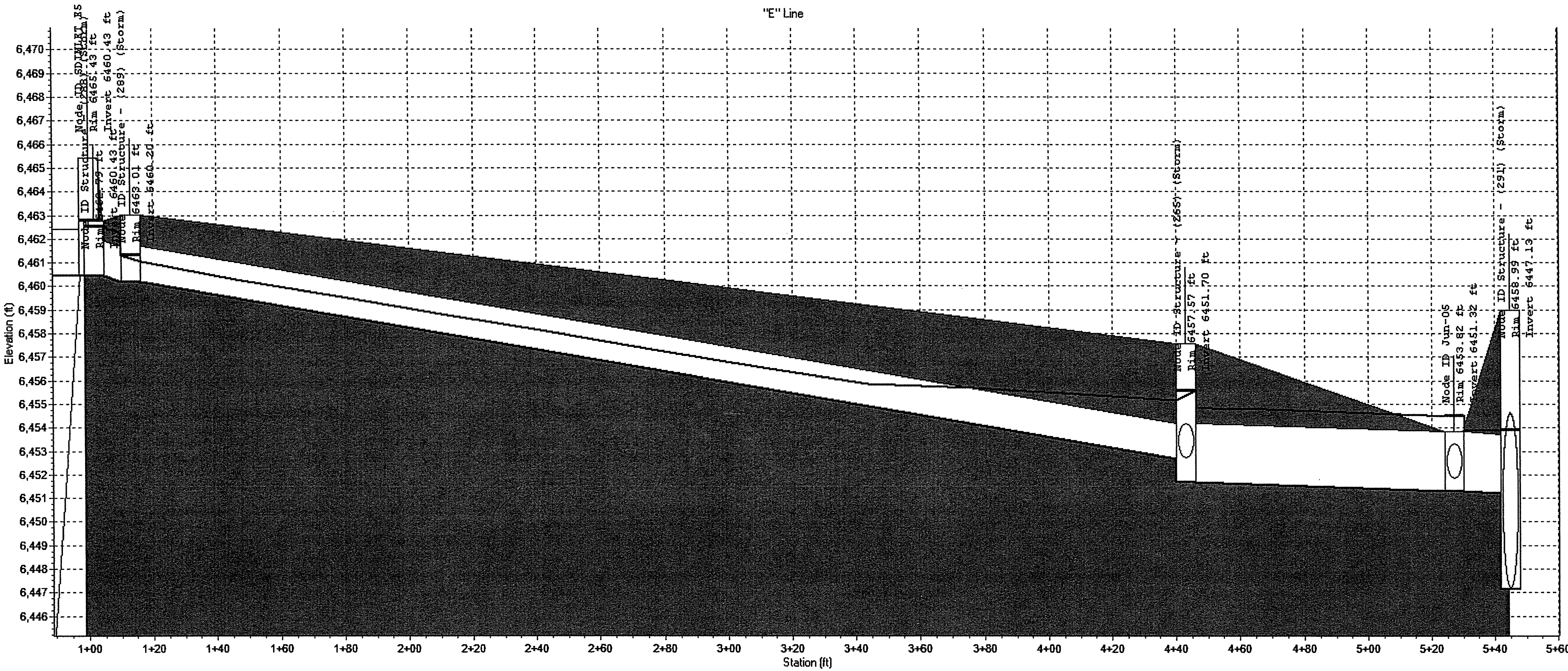
Node ID:	SDINLET D5	Jun-20
Rim (ft):	6451.95	6452.10
Invert (ft):	6447.45	6446.02
Min Pipe Cover (ft):		4.08
Max HGL (ft):	6451.95	6450.91

Link ID:	Link-87
Length (ft):	37.72
Dia (in):	18.00
Slope (ft/ft):	0.0247
Up Invert (ft):	6447.45
Dn Invert (ft):	6446.52
Max Q (cfs):	14.05
Max Vel (ft/s):	7.95
	1.50

Autodesk Storm and Sanitary Analysis

Profile Plot - 100YR 24 HOUR STORM

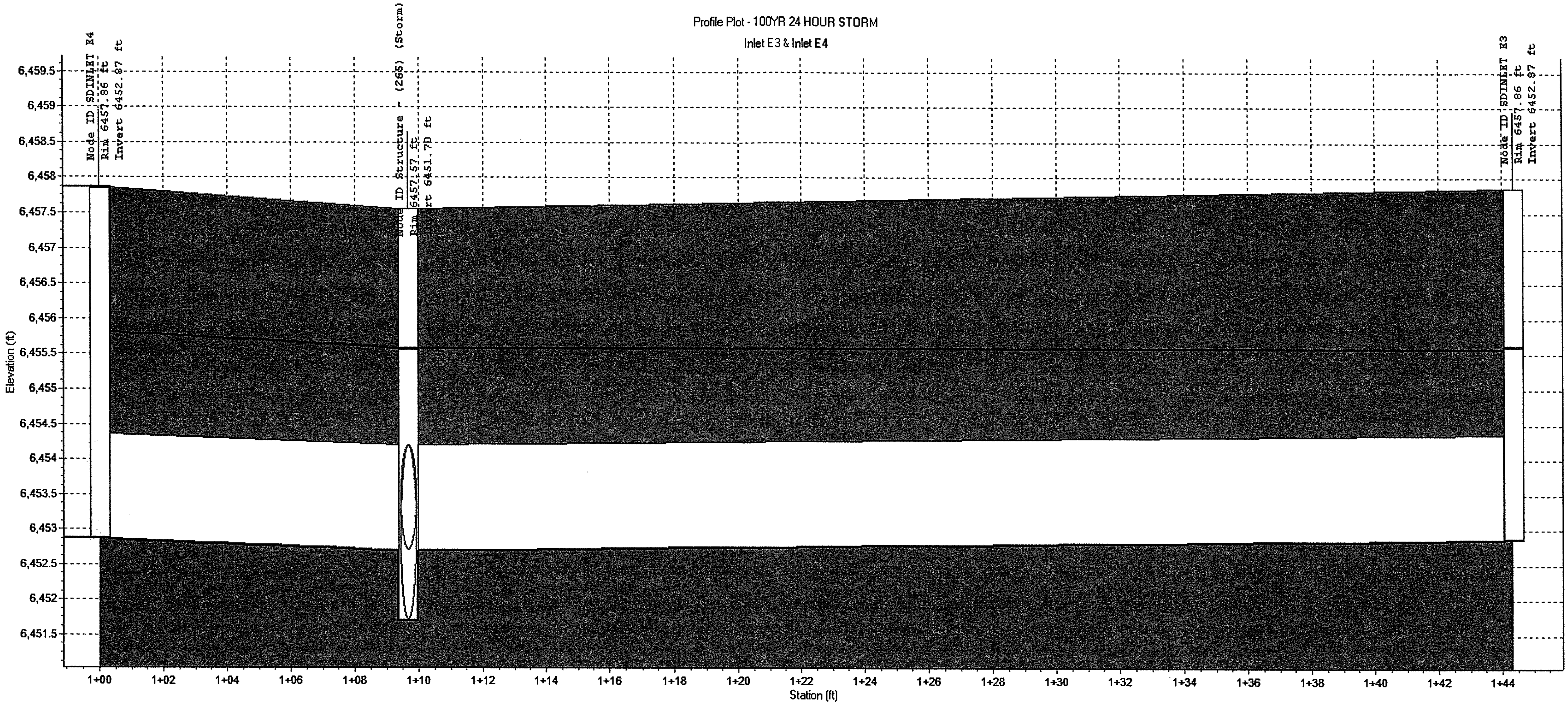
"E" Line



Node ID:	SDINtuEctEure5- (289) (Storm)	Structure - (265) (Storm)	Jun-05	
Rim (ft):	6465247356463.01	6457.57	6453.82	6458.99
Invert (ft):	6460.4436460.20	6451.70	6451.32	6447.13
Min Pipe Cover (ft):	0 36 1.31	3.37	0.00	4.35
Max HGL (ft):	6462.7646461.32	6455.58	6454.51	6453.89

Link ID:		{Storm}.Pipe - (110) (Storm)	{Storm}.Pipe - (201) (2) (Storm)	Link-14	
Length (ft):	1.511.54	329.65	84.29	17.74	
Dia (in):	24.008.00	18.00	30.00	30.00	
Slope (ft/ft):	0.00000200	0.0228	0.0045	0.0056	
Up Invert (ft):	64606480.43	6460.20	6451.70	6451.32	
Dn Invert (ft):	64606480.20	6452.70	6451.32	6451.22	
Max Q (cfs):	11.911.91	11.82	30.07	35.68	
Max Vel (ft/s):	3.797.28	7.80	6.13	7.64	
		1.31	2.50	2.50	

Autodesk Storm and Sanitary Analysis



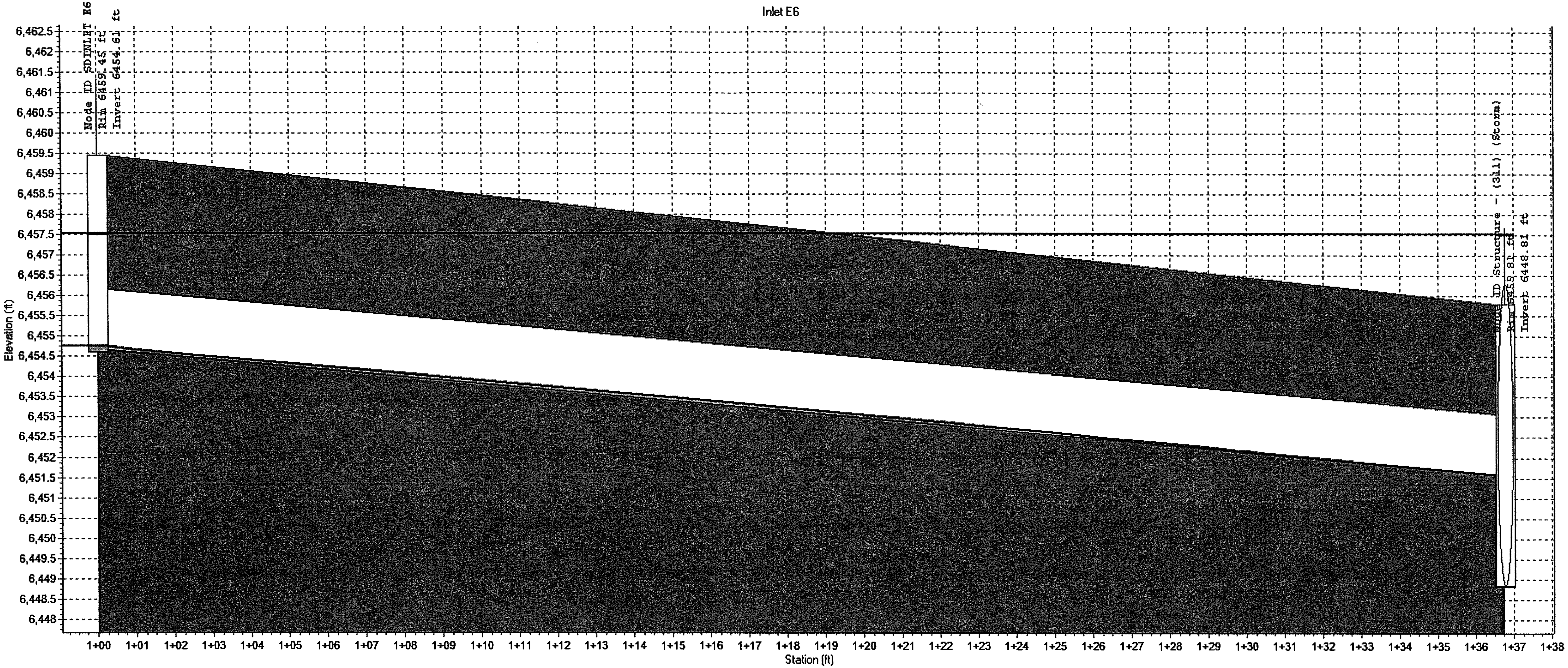
Node ID:	SDINLET E4	Structure - (265) (Storm)	SDINLET E3
Rim (ft):	6457.86	6457.57	6457.86
Invert (ft):	6452.87	6451.70	6452.87
Min Pipe Cover (ft):		3.37	
Max HGL (ft):	6457.86	6455.58	6455.61

Link ID:	{Storm}.Pipe - (197) (Storm)	{Storm}.Pipe - (198) (Storm)
Length (ft):	9.66	34.67
Dia (in):	18.00	18.00
Slope (ft/ft):	0.0176	0.0049
Up Invert (ft):	6452.87	6452.87
Dn Invert (ft):	6452.70	6452.70
Max Q (cfs):	17.51	3.63
Max Vel (ft/s):	9.91	2.70
[illegible]	1.50	1.50

Autodesk Storm and Sanitary Analysis

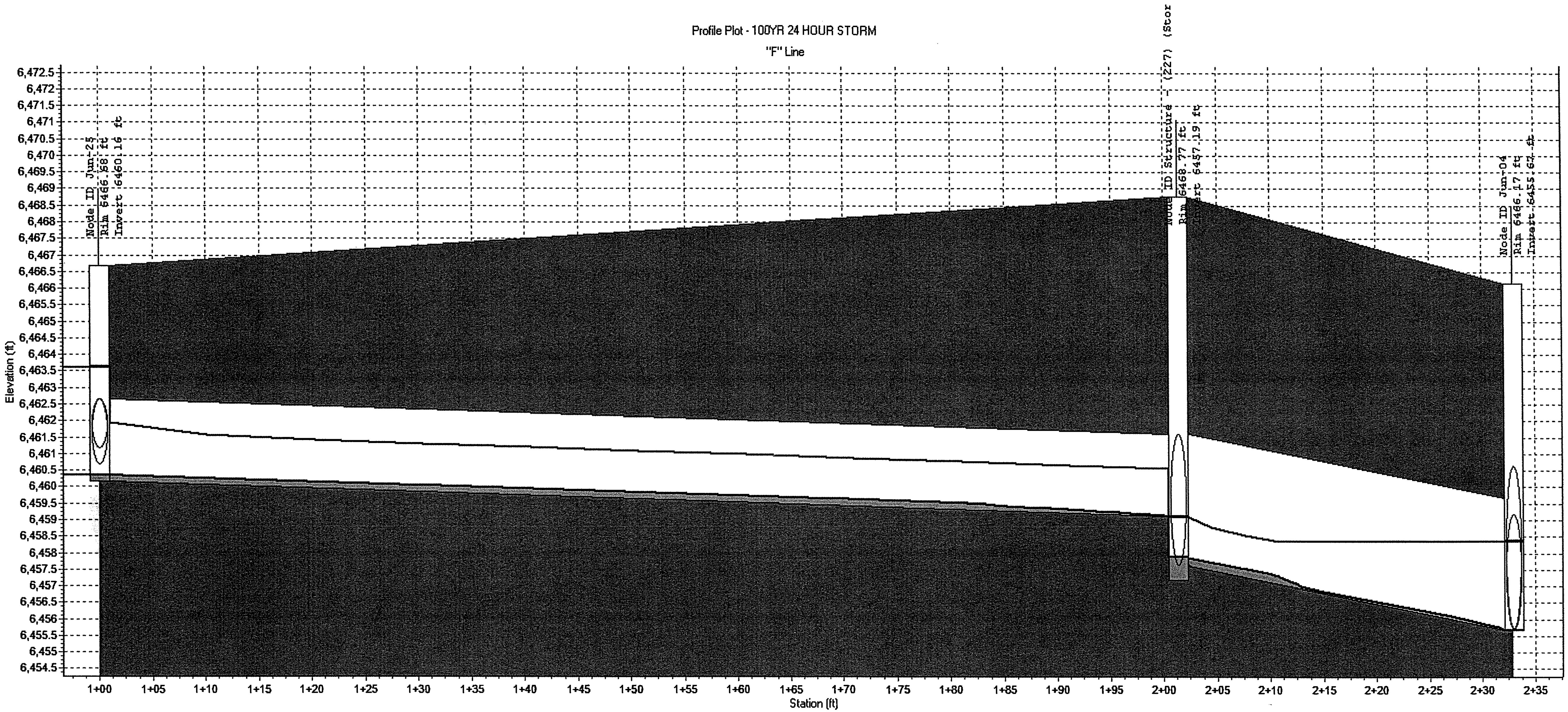
Profile Plot - 100YR 24 HOUR STORM

Inlet E6



Node ID:	SDINLET E6	
Rim (ft):	6459.45	6455.81
Invert (ft):	6454.61	6448.81
Min Pipe Cover (ft):		0.00
Max HGL (ft):	6457.52	6457.52
Link ID:	{Storm}.Pipe - (255) (Storm)	
Length (ft):	36.75	
Dia (in):	18.00	
Slope (ft/ft):	0.0835	
Up Invert (ft):	6454.65	
Dn Invert (ft):	6451.58	
Max Q (cfs):	9.80	
Max Vel (ft/s):	12.03	
Max Depth (ft):	1.50	

Autodesk Storm and Sanitary Analysis



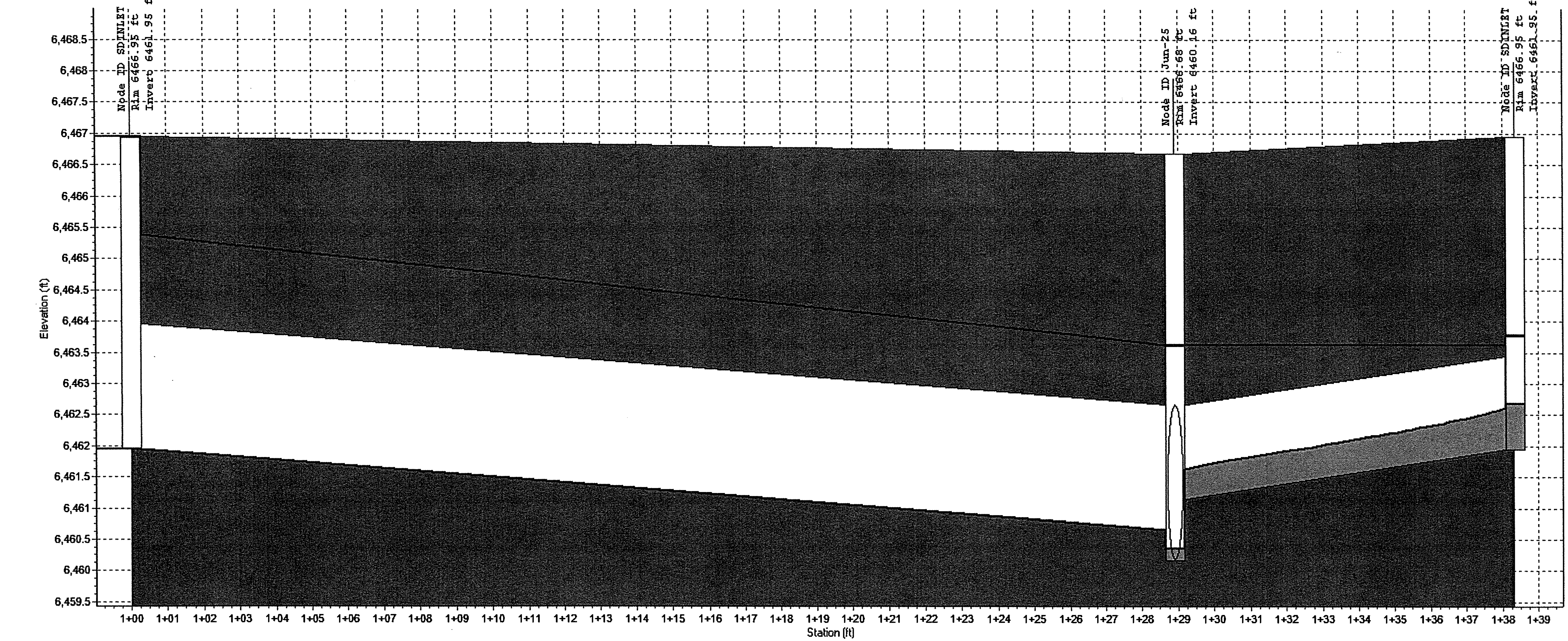
Node ID:	Jun-25	Structure - (227) (Storm)	Jun-04
Rim (ft):	6466.68	6468.77	6466.17
Invert (ft):	6460.16	6457.19	6455.67
Min Pipe Cover (ft):	4.02	7.16	5.50
Max HGL (ft):	6463.63	6459.09	6458.37

Link ID:	Link-75	Link-11
Length (ft):	101.31	31.68
Dia (in):	30.00	48.00
Slope (ft/ft):	0.0104	0.0612
Up Invert (ft):	6460.16	6457.61
Dn Invert (ft):	6459.11	6455.67
Max Q (cfs):	37.07	37.09
Max Vel (ft/s):	7.89	9.62
	2.28	1.77

Autodesk Storm and Sanitary Analysis

Profile Plot - 100YR 24 HOUR STORM

Inlet F3 & Inlet F4



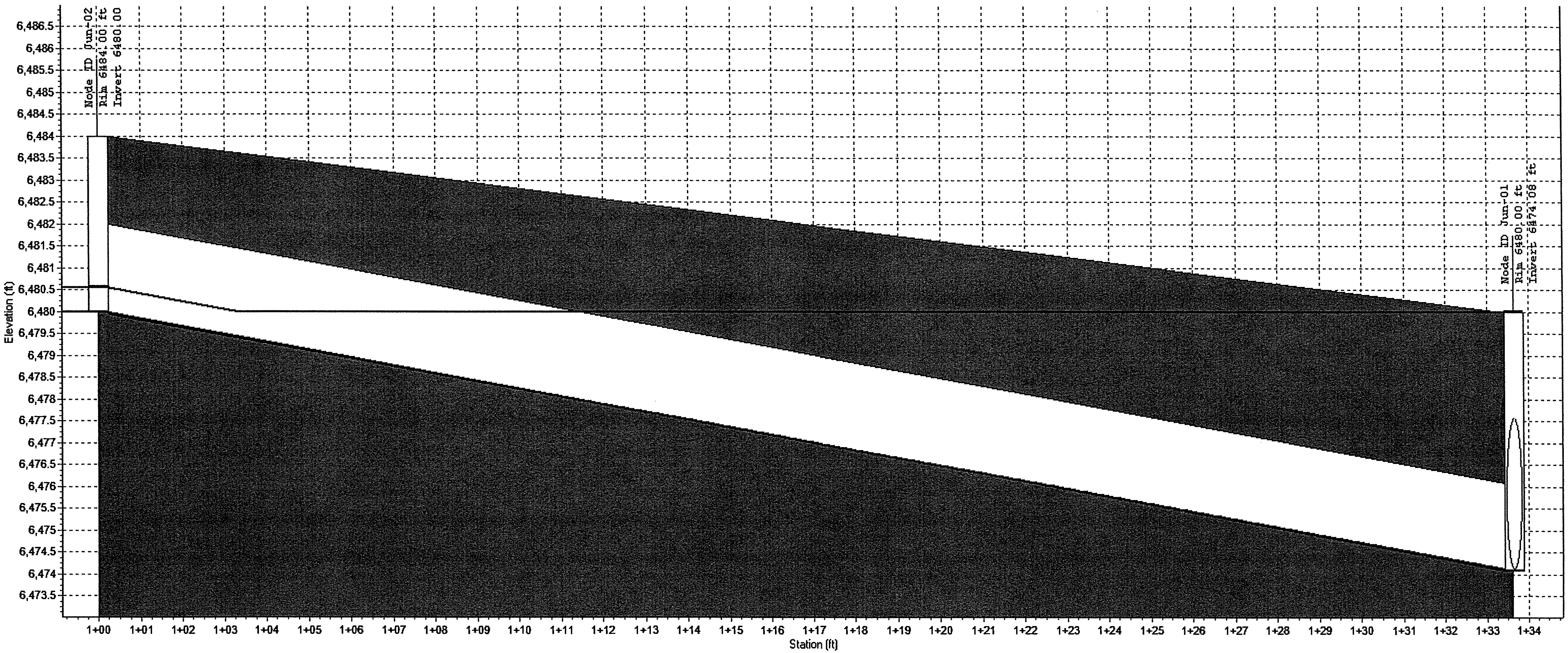
Node ID:	SDINLET F4	Jun-25	SDINLET F3
Rim (ft):	6466.95	6466.68	6466.95
Invert (ft):	6461.95	6460.16	6461.95
Min Pipe Cover (ft):		4.02	
Max HGL (ft):	6466.95	6463.63	6463.77

Link ID:	Link-77	Link-76
Length (ft):	28.90	9.43
Dia (in):	24.00	18.00
Slope (ft/ft):	0.0446	0.0838
Up Invert (ft):	6461.95	6461.95
Dn Invert (ft):	6460.66	6461.16
Max Q (cfs):	32.83	6.07
Max Vel (ft/s):	10.45	7.11
[illegible]	2.00	1.50

Autodesk Storm and Sanitary Analysis

Profile Plot - 100YR 24 HOUR STORM

West Type D Inlet



Node ID:	Jun-02	Jun-01
Rim (ft):	6484.00	6480.00
Invert (ft):	6480.00	6474.08
Min Pipe Cover (ft):	2.00	2.42
Max HGL (ft):	6480.56	6480.00
Link ID:	Link-09	
Length (ft):	33.62	
Dia (in):	24.00	
Slope (ft/ft):	0.1761	
Up Invert (ft):	6480.00	
Dn Invert (ft):	6474.08	
Max Q (cfs):	9.70	
Max Vel (ft/s):	13.34	
[illegible]	1.00	

Autodesk Storm and Sanitary Analysis

Inlet Summary - 5-year - Hannah Ridge at Feathergrass

SN	Element ID	Description	Inlet Location	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Max (Rim) Offset (ft)	Roadway Long. Slope (ft/ft)	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Interc. by Inlet (cfs)	Peak Flow Bypass. Inlet (cfs)	Inlet Effic. during Peak (%)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)
1	SDINLET A1	10' Type R	On Sag	6487.22	6496.07	8.85	N/A	9.23	9.23	N/A	N/A	N/A	21.57	6496.51	0.43
2	SDINLET A2	5' Type R	On Sag	6484.80	6496.07	11.27	N/A	0.72	0.72	N/A	N/A	N/A	2.23	6496.12	0.04
3	SDINLET B1	15' Type R	On Sag	6461.42	6467.30	5.88	N/A	9.16	0.84	N/A	N/A	N/A	16.49	6467.62	0.32
4	SDINLET B2	15' Type R	On Grade	6465.75	6470.75	5.00	0.040	18.30	18.30	9.9	8.4	53.9	15.88	6471.19	0.44
5	SDINLET C1	5' Type R	On Sag	6464.97	6469.97	5.00	N/A	3.69	3.69	N/A	N/A	N/A	15.33	6470.27	0.31
6	SDINLET C3	10' Type R	On Sag	6464.42	6469.42	5.00	N/A	6.60	6.60	N/A	N/A	N/A	16.79	6469.76	0.34
7	SDINLET C4	15' Type R	On Sag	6464.42	6469.42	5.00	N/A	12.18	12.18	N/A	N/A	N/A	20.90	6469.84	0.42
8	SDINLET C6	10' Type R	On Sag	6468.92	6473.92	5.00	N/A	5.51	5.51	N/A	N/A	N/A	14.73	6474.22	0.29
9	SDINLET C7	15' Type R	On Sag	6468.92	6473.92	5.00	N/A	8.90	8.90	N/A	N/A	N/A	16.09	6474.24	0.32
10	SDINLET C8	10' Type R	On Sag	6474.99	6479.99	5.00	N/A	10.22	8.62	N/A	N/A	N/A	23.44	6480.45	0.46
11	SDINLET C9	10' Type R	On Grade	6477.00	6481.75	4.75	0.015	6.62	6.62	4.9	1.7	74.1	12.76	6482.13	0.38
12	SDINLET D2	15' Type R	On Sag	6445.29	6450.29	5.00	N/A	12.43	3.86	N/A	N/A	N/A	21.24	6450.65	0.37
13	SDINLET D3	10' Type R	On Sag	6444.93	6449.93	5.00	N/A	9.78	9.78	N/A	N/A	N/A	22.62	6450.38	0.45
14	SDINLET D5	15' Type R	On Grade	6447.45	6451.95	4.50	0.015	19.34	19.34	12.0	7.4	61.8	19.77	6452.47	0.52
15	SDINLET D6	15' Type R	On Grade	6448.81	6453.80	5.00	0.015	9.02	9.02	7.7	1.3	85.5	14.53	6454.22	0.42
16	SDINLET E3	5' Type R	On Sag	6452.87	6457.86	5.00	N/A	1.80	1.80	N/A	N/A	N/A	7.06	6458.00	0.14
17	SDINLET E4	15' Type R	On Sag	6452.87	6457.86	5.00	N/A	12.46	9.33	N/A	N/A	N/A	21.28	6458.27	0.41
18	SDINLET E5	15' Type R	On Grade	6460.43	6465.43	5.00	0.028	11.94	11.94	8.4	3.6	70.1	14.35	6465.84	0.41
19	SDINLET E6	5' Type R	On Sag	6454.61	6459.45	4.83	N/A	5.18	5.18	N/A	N/A	N/A	20.59	6459.86	0.41
20	SDINLET F3	10' Type R	On Sag	6461.95	6466.95	5.00	N/A	5.13	5.13	N/A	N/A	N/A	13.52	6467.22	0.27
21	SDINLET F4	15' Type R	On Sag	6461.95	6466.95	5.00	N/A	13.45	13.45	N/A	N/A	N/A	22.63	6467.40	0.45

Inlet Summary - 100-year - Hannah Ridge at Feathergrass

SN	Element ID	Description	Inlet Location	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Max (Rim) Offset (ft)	Roadway Long. Slope (ft/ft)	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Interc. by Inlet (cfs)	Peak Flow Bypass Inlet (cfs)	Inlet Effic. during Peak (%)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)
1	SDINLET A1	10' Type R	On Sag	6487.22	6496.07	8.85	N/A	18.5	18.5	N/A	N/A	N/A	37.5	6496.82	0.75
2	SDINLET A2	5' Type R	On Sag	6484.80	6496.07	11.27	N/A	1.4	1.4	N/A	N/A	N/A	4.3	6496.16	0.09
3	SDINLET B1	15' Type R	On Sag	6461.42	6467.30	5.88	N/A	24.8	2.7	N/A	N/A	N/A	36.7	6468.02	0.71
4	SDINLET B2	15' Type R	On Grade	6465.75	6470.75	5.00	0.040	39.0	39.0	14.1	24.9	36.3	21.5	6471.31	0.56
5	SDINLET C1	5' Type R	On Sag	6464.97	6469.97	5.00	N/A	7.4	7.4	N/A	N/A	N/A	26.6	6470.50	0.53
6	SDINLET C3	10' Type R	On Sag	6464.42	6469.42	5.00	N/A	14.2	14.2	N/A	N/A	N/A	30.7	6470.04	0.61
7	SDINLET C4	15' Type R	On Sag	6464.42	6469.42	5.00	N/A	24.2	24.2	N/A	N/A	N/A	36.0	6470.14	0.72
8	SDINLET C6	10' Type R	On Sag	6468.92	6473.92	5.00	N/A	11.1	11.1	N/A	N/A	N/A	25.2	6474.42	0.50
9	SDINLET C7	15' Type R	On Sag	6468.92	6473.92	5.00	N/A	17.9	17.9	N/A	N/A	N/A	28.7	6474.50	0.57
10	SDINLET C8	10' Type R	On Sag	6474.99	6479.99	5.00	N/A	24.0	17.6	N/A	N/A	N/A	46.0	6480.88	0.89
11	SDINLET C9	10' Type R	On Grade	6477.00	6481.75	4.75	0.015	13.6	13.6	7.2	6.4	52.8	17.2	6482.22	0.47
12	SDINLET D2	15' Type R	On Sag	6445.29	6450.29	5.00	N/A	28.3	4.3	N/A	N/A	N/A	40.5	6451.03	0.75
13	SDINLET D3	10' Type R	On Sag	6444.93	6449.93	5.00	N/A	18.2	18.2	N/A	N/A	N/A	36.9	6450.67	0.74
14	SDINLET D5	15' Type R	On Grade	6447.45	6451.95	4.50	0.015	38.1	38.1	16.8	21.2	44.2	25.8	6452.59	0.64
15	SDINLET D6	15' Type R	On Grade	6448.81	6453.80	5.00	0.015	18.5	18.5	11.7	6.8	63.1	19.4	6454.32	0.51
16	SDINLET E3	5' Type R	On Sag	6452.87	6457.86	5.00	N/A	3.6	3.6	N/A	N/A	N/A	15.1	6458.16	0.30
17	SDINLET E4	15' Type R	On Sag	6452.87	6457.86	5.00	N/A	28.7	18.0	N/A	N/A	N/A	41.0	6458.65	0.79
18	SDINLET E5	15' Type R	On Grade	6460.43	6465.43	5.00	0.028	23.7	23.7	11.9	11.8	50.3	19.0	6465.93	0.51
19	SDINLET E6	5' Type R	On Sag	6454.61	6459.45	4.83	N/A	9.8	9.8	N/A	N/A	N/A	32.5	6460.10	0.65
20	SDINLET F3	10' Type R	On Sag	6461.95	6466.95	5.00	N/A	6.1	6.1	N/A	N/A	N/A	15.8	6467.27	0.32
21	SDINLET F4	15' Type R	On Sag	6461.95	6466.95	5.00	N/A	33.3	33.3	N/A	N/A	N/A	46.2	6467.88	0.92

Hydraulic Analysis
Autodesk Storm and Sanitary Analysis

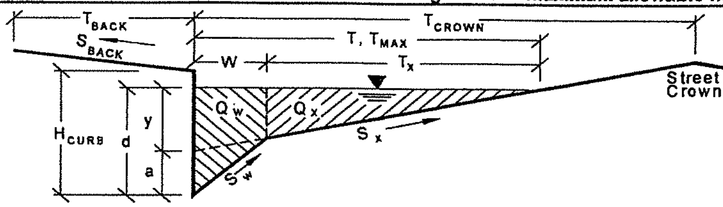
Storm Drain Inlet and Pipe System

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Major & Minor Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Hannah Ridge

Inlet ID: Curb Inlet in Constitution Ave. in front of Living Waters - maximum allowable flow



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.0200	ft. vert. / ft. horiz
Manning's Roughness Behind Curb	n_{BACK} =	0.0200	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	55.0	ft
Gutter Depression	a =	1.35	inches
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.0272	ft. vert. / ft. horiz
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.0160	ft. vert. / ft. horiz
Manning's Roughness for Street Section	n_{STREET} =	0.0160	

		Minor Storm	Major Storm	
Max. Allowable Water Spread for Minor & Major Storm	T_{MAX} =	17.0	55.0	ft
Max. Allowable Depth at Gutter Flow Line for Minor & Major Storm	d_{MAX} =	6.00	8.00	inches
Allow Flow Depth at Street Crown (leave blank for no)			X	X = yes

Maximum Gutter Capacity Based On Allowable Water Spread		Minor Storm	Major Storm	
Gutter Cross Slope (Eq. ST-8)	S_W =	0.0835	0.0835	ft/ft
Water Depth without Gutter Depression (Eq. ST-2)	y =	5.55	17.95	inches
Water Depth with a Gutter Depression	d =	6.90	19.30	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.0	53.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.328	0.100	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	14.9	431.7	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	7.3	47.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.2	96.0	cfs
Maximum Flow Based On Allowable Water Spread	Q_T =	**22.3**	**575.4**	**cfs**
Flow Velocity Within the Gutter Section	V =	7.4	15.7	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	4.2	25.2	

Maximum Gutter Capacity Based on Allowable Gutter Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	14.2	20.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	12.2	18.4	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.389	0.274	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	8.7	25.6	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	8.7	25.6	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	5.5	9.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	1.5	cfs
Total Discharge for Major & Minor Storm	Q =	**14.2**	**36.7**	**cfs**
Flow Velocity Within the Gutter Section	V =	6.6	8.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	3.3	5.5	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	1.00	1.00	
Max Flow Based on Allow. Gutter Depth (Safety Factor Applied)	Q_d =	**14.2**	**36.6**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	6.00	8.00	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	0.00	inches

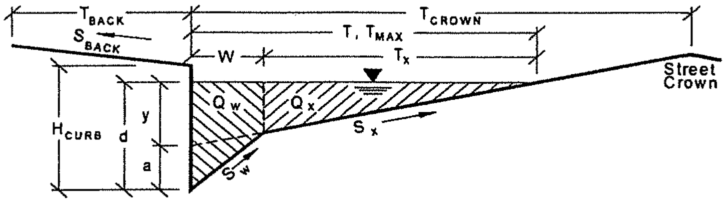
		Minor Storm	Major Storm	
Max. Allowable Gutter Capacity Based on Minimum of Q_T or Q_d	Q_{allow} =	**14.2**	**36.6**	**cfs**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Major & Minor Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Hannah Ridge

Inlet ID: Curb Inlet in Constitution Ave. in front of Living Waters - flooded with uncollected Basin OSA5e runoff



Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	100.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.0001		ft. vert. / ft. horiz
Manning's Roughness Behind Curb	n_{BACK} =	0.0200		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	55.0		ft
Gutter Depression	a =	1.35		inches
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.0272		ft. vert. / ft. horiz
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.0160		ft. vert. / ft. horiz
Manning's Roughness for Street Section	n_{STREET} =	0.0160		
		Minor Storm	Major Storm	
Max. Allowable Water Spread for Minor & Major Storm	T_{MAX} =	19.4	55.0	ft
Max. Allowable Depth at Gutter Flow Line for Minor & Major Storm	d_{MAX} =	7.66	8.49	inches
Allow Flow Depth at Street Crown (leave blank for no)			X	X = yes

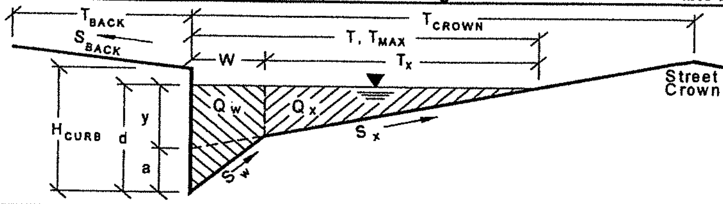
		Minor Storm	Major Storm	
Maximum Gutter Capacity Based On Allowable Water Spread				
Gutter Cross Slope (Eq. ST-8)	S_W =	0.0835	0.0835	ft/ft
Water Depth without Gutter Depression (Eq. ST-2)	y =	6.33	17.95	inches
Water Depth with a Gutter Depression	d =	7.68	19.30	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	17.4	53.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.287	0.100	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	22.1	431.7	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	8.9	47.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	33.6	1,112.9	cfs
Maximum Flow Based On Allowable Water Spread	Q_T =	64.7	1,592.3	cfs
Flow Velocity Within the Gutter Section	V =	8.0	15.7	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	5.1	25.2	
Maximum Gutter Capacity Based on Allowable Gutter Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	19.3	21.9	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	17.3	19.9	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.289	0.255	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	21.9	31.6	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	21.9	31.6	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	8.9	10.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	32.8	66.0	cfs
Total Discharge for Major & Minor Storm	Q =	63.6	108.3	cfs
Flow Velocity Within the Gutter Section	V =	8.0	8.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	5.1	6.1	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	1.00	1.00	
Max Flow Based on Allow. Gutter Depth (Safety Factor Applied)	Q_d =	63.6	108.0	cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	7.66	8.49	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	0.00	inches
		Minor Storm	Major Storm	
Max. Allowable Gutter Capacity Based on Minimum of Q_T or Q_d	Q_{allow} =	63.6	108.0	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Major & Minor Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Inlet ID: Median Inlet in Constitution Ave. in front of Living Waters - maximum allowable flow



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	4.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.0001		ft. vert. / ft. horiz
Manning's Roughness Behind Curb	n_{BACK} =	0.0160		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	43.0		ft
Gutter Depression	a =	1.35		inches
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.0272		ft. vert. / ft. horiz
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.0160		ft. vert. / ft. horiz
Manning's Roughness for Street Section	n_{STREET} =	0.0160		
		Minor Storm	Major Storm	
Max. Allowable Water Spread for Minor & Major Storm	T_{MAX} =	17.0	43.0	ft
Max. Allowable Depth at Gutter Flow Line for Minor & Major Storm	d_{MAX} =	6.00	8.00	inches
Allow Flow Depth at Street Crown (leave blank for no)			X	X = yes

Maximum Gutter Capacity Based On Allowable Water Spread

		Minor Storm	Major Storm	
Gutter Cross Slope (Eq. ST-8)	S_W =	0.0835	0.0835	ft/ft
Water Depth without Gutter Depression (Eq. ST-2)	y =	5.55	14.04	inches
Water Depth with a Gutter Depression	d =	6.90	15.39	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.0	41.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.328	0.128	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	14.9	217.7	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	7.3	32.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.6	31.3	cfs
Maximum Flow Based On Allowable Water Spread	Q_T =	22.8	281.0	cfs
Flow Velocity Within the Gutter Section	V =	7.4	13.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	4.2	17.1	

Maximum Gutter Capacity Based on Allowable Gutter Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	14.2	20.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	12.2	18.4	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.389	0.274	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	8.7	25.6	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	8.7	25.6	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	5.5	9.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	2.4	cfs
Total Discharge for Major & Minor Storm	Q =	14.2	37.6	cfs
Flow Velocity Within the Gutter Section	V =	6.6	8.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	3.3	5.5	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	1.00	1.00	
Max Flow Based on Allow. Gutter Depth (Safety Factor Applied)	Q_d =	14.2	37.5	cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	6.00	8.00	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	0.00	inches

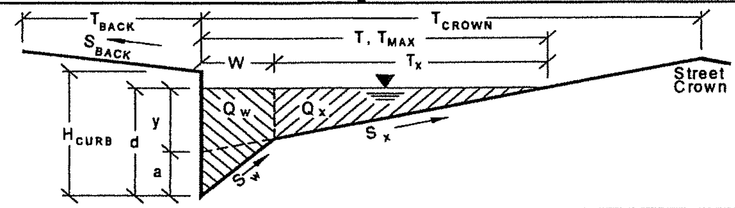
		Minor Storm	Major Storm	
Max. Allowable Gutter Capacity Based on Minimum of Q_T or Q_d	Q_{allow} =	14.2	37.5	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Major & Minor Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Hannah Ridge

Inlet ID: Median Inlet in Constitution Ave. in front of Living Waters - flooded with uncollected Basin OSA5e runoff



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	4.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.0001	ft. vert. / ft. horiz
Manning's Roughness Behind Curb	n_{BACK} =	0.0160	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	43.0	ft
Gutter Depression	a =	1.35	inches
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.0272	ft. vert. / ft. horiz
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.0160	ft. vert. / ft. horiz
Manning's Roughness for Street Section	n_{STREET} =	0.0160	

		Minor Storm	Major Storm	
Max. Allowable Water Spread for Minor & Major Storm	T_{MAX} =	0	43.0	ft
Max. Allowable Depth at Gutter Flow Line for Minor & Major Storm	d_{MAX} =	0	9.45	inches
Allow Flow Depth at Street Crown (leave blank for no)			X	X = yes

Maximum Gutter Capacity Based On Allowable Water Spread		Minor Storm	Major Storm	
Gutter Cross Slope (Eq. ST-8)	S_W =	0.0835	0.0835	ft/ft
Water Depth without Gutter Depression (Eq. ST-2)	y =	0.66	14.04	inches
Water Depth with a Gutter Depression	d =	2.01	15.39	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	0.0	41.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	1.000	0.128	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	217.7	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.4	32.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	31.3	cfs
Maximum Flow Based On Allowable Water Spread	Q_T =	0.4	281.0	cfs
Flow Velocity Within the Gutter Section	V =	2.7	13.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.4	17.1	

Maximum Gutter Capacity Based on Allowable Gutter Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	0.0	24.8	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	0.0	22.8	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	1.000	0.224	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	45.6	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	45.6	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	#DIV/0!	13.2	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.9	cfs
Total Discharge for Major & Minor Storm	Q =	0.0	64.7	cfs
Flow Velocity Within the Gutter Section	V =	#DIV/0!	9.4	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	#DIV/0!	7.4	
Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \geq 6"$) Storm	R =	0.00	1.00	
Max Flow Based on Allow. Gutter Depth (Safety Factor Applied)	Q_d =	0.0	64.5	cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	0.00	9.45	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	0.00	inches

		Minor Storm	Major Storm	
Max. Allowable Gutter Capacity Based on Minimum of Q_T or Q_d	Q_{allow} =	0.0	64.5	cfs

HYDRAULIC ANALYSES

please delete
blank pages

Hydraulic Analysis
HEC-RAS

Channel and Culverts
from Constitution/Akers Drive Culvert Upstream to Mainline RCP Outfall at Constitution Ave

HYDRAULIC ANALYSIS – CONSTITUTION/AKERS CULVERT TO 90" RCP

HEC-RAS Plan: Const Chan - HR River: EForkSandCreek Reach: Tributary6-Cnst

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary6-Cnst	2300	5-Year	289	6443.1	6445.1	6444.8	6445.6	0.0119	5.5	52	32.0	0.8
Tributary6-Cnst	2300	10-Year	428	6443.1	6445.6	6445.2	6446.2	0.0116	6.2	69	35.1	0.8
Tributary6-Cnst	2300	100-Year	991	6443.1	6447.9	6446.6	6448.5	0.0054	6.0	165	48.8	0.6
D/S END 90" RCP →												
Tributary6-Cnst	2275	5-Year	289	6442.8	6444.8		6445.3	0.0119	5.5	52	32.0	0.8
Tributary6-Cnst	2275	10-Year	428	6442.8	6445.3		6445.9	0.0111	6.1	70	35.3	0.8
Tributary6-Cnst	2275	100-Year	991	6442.8	6447.8		6448.3	0.0045	5.6	176	50.2	0.5
Tributary6-Cnst	2250	5-Year	289	6442.5	6444.5		6445.0	0.0117	5.5	53	32.1	0.8
Tributary6-Cnst	2250	10-Year	428	6442.5	6445.1		6445.6	0.0102	5.9	72	35.6	0.7
Tributary6-Cnst	2250	100-Year	991	6442.5	6447.8		6448.2	0.0037	5.3	189	51.6	0.5
Tributary6-Cnst	2225	5-Year	289	6442.2	6444.2		6444.7	0.0113	5.4	53	32.2	0.7
Tributary6-Cnst	2225	10-Year	428	6442.2	6444.9		6445.4	0.0090	5.7	76	36.2	0.7
Tributary6-Cnst	2225	100-Year	991	6442.2	6447.7		6448.1	0.0031	4.9	202	53.1	0.4
Tributary6-Cnst	2200	5-Year	289	6441.9	6444.0		6444.4	0.0105	5.3	55	32.5	0.7
Tributary6-Cnst	2200	10-Year	428	6441.9	6444.7		6445.2	0.0074	5.3	81	37.0	0.6
Tributary6-Cnst	2200	100-Year	991	6441.9	6447.7		6448.0	0.0026	4.6	216	54.7	0.4
Tributary6-Cnst	2175	5-Year	289	6441.6	6443.8		6444.2	0.0091	5.0	57	33.0	0.7
Tributary6-Cnst	2175	10-Year	428	6441.6	6444.6		6445.0	0.0059	4.9	87	38.1	0.6
Tributary6-Cnst	2175	100-Year	991	6441.6	6447.7		6447.9	0.0021	4.3	231	56.3	0.4
Tributary6-Cnst	2150	5-Year	289	6441.3	6443.6		6443.9	0.0072	4.7	62	33.8	0.6
Tributary6-Cnst	2150	10-Year	428	6441.3	6444.5		6444.8	0.0046	4.5	96	39.3	0.5
Tributary6-Cnst	2150	100-Year	991	6441.3	6447.6		6447.9	0.0018	4.0	247	58.0	0.3
Tributary6-Cnst	2125	5-Year	289	6441.0	6443.5		6443.8	0.0055	4.2	68	34.9	0.5
Tributary6-Cnst	2125	10-Year	428	6441.0	6444.5		6444.7	0.0035	4.1	105	40.8	0.4
Tributary6-Cnst	2125	100-Year	991	6441.0	6447.6		6447.8	0.0015	3.8	263	59.7	0.3
Tributary6-Cnst	2088	5-Year	289	6440.5	6443.3	6442.3	6443.7	0.0005	5.0	58	37.5	0.5
Tributary6-Cnst	2088	10-Year	428	6440.5	6444.2	6442.9	6444.7	0.0004	5.7	75	42.5	0.5
Tributary6-Cnst	2088	100-Year	991	6440.5	6446.9	6444.6	6447.7	0.0003	7.3	147	59.2	0.5
Tributary6-Cnst	2017		Culvert									
HANNAH RIDGE CULVERT →												
Tributary6-Cnst	1946	5-Year	289	6439.4	6441.8		6442.3	0.0008	5.9	49	35.0	0.7
Tributary6-Cnst	1946	10-Year	428	6439.4	6442.4		6443.1	0.0009	7.0	62	38.6	0.7
Tributary6-Cnst	1946	100-Year	991	6439.4	6442.8	6443.5	6445.9	0.0029	14.0	71	41.2	1.3
Tributary6-Cnst	1925	5-Year	289	6439.3	6441.8		6442.2	0.0086	5.0	58	32.8	0.7
Tributary6-Cnst	1925	10-Year	428	6439.3	6442.6		6443.0	0.0065	5.1	83	36.0	0.6
Tributary6-Cnst	1925	100-Year	991	6439.3	6444.6	6443.2	6445.2	0.0047	5.9	167	44.5	0.5
Tributary6-Cnst	1907.83	5-Year	289	6438.7	6441.8		6442.1	0.0053	4.5	64	28.9	0.5
Tributary6-Cnst	1907.83	10-Year	428	6438.7	6442.5		6442.9	0.0051	5.0	86	31.9	0.5
Tributary6-Cnst	1907.83	100-Year	991	6438.7	6444.5		6445.1	0.0049	6.2	159	40.9	0.6
Tributary6-Cnst	1900	5-Year	289	6438.6	6441.7		6442.0	0.0055	4.6	63	27.6	0.5
Tributary6-Cnst	1900	10-Year	428	6438.6	6442.4		6442.8	0.0054	5.2	83	30.4	0.6
Tributary6-Cnst	1900	100-Year	991	6438.6	6444.4		6445.1	0.0055	6.6	151	38.9	0.6
Tributary6-Cnst	1875	5-Year	289	6438.4	6441.4		6441.9	0.0083	5.5	53	24.2	0.7
Tributary6-Cnst	1875	10-Year	428	6438.4	6442.1		6442.6	0.0085	6.2	69	27.0	0.7
Tributary6-Cnst	1875	100-Year	991	6438.4	6444.0		6444.9	0.0084	7.6	130	36.7	0.7
Tributary6-Cnst	1863.36	5-Year	289	6438.3	6441.3		6441.8	0.0090	5.6	51	24.3	0.7
Tributary6-Cnst	1863.36	10-Year	428	6438.3	6441.9		6442.5	0.0089	6.2	68	27.2	0.7
Tributary6-Cnst	1863.36	100-Year	991	6438.3	6443.9		6444.8	0.0084	7.6	131	37.1	0.7
Tributary6-Cnst	1850	5-Year	289	6438.2	6441.2		6441.6	0.0083	5.3	54	26.1	0.7
Tributary6-Cnst	1850	10-Year	428	6438.2	6441.9		6442.4	0.0078	5.9	73	29.1	0.7
Tributary6-Cnst	1850	100-Year	991	6438.2	6443.8		6444.6	0.0071	7.1	140	38.4	0.7
Tributary6-Cnst	1839.5	5-Year	289	6438.1	6441.2		6441.5	0.0071	5.0	58	27.9	0.6
Tributary6-Cnst	1839.5	10-Year	428	6438.1	6441.9		6442.3	0.0066	5.4	79	31.0	0.6
Tributary6-Cnst	1839.5	100-Year	991	6438.1	6443.8		6444.5	0.0059	6.6	149	39.6	0.6
Tributary6-Cnst	1825	5-Year	289	6438.0	6441.1		6441.4	0.0055	4.6	64	28.6	0.5
Tributary6-Cnst	1825	10-Year	428	6438.0	6441.8		6442.2	0.0053	5.1	85	31.5	0.5

HEC-RAS Plan: Const Chan - HR River: EForkSandCreek Reach: Tributary6-Cnst (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Tributary6-Cnst	1825	100-Year	991	6438.0	6443.8		6444.4	0.0052	6.3	157	40.7	0.6
Tributary6-Cnst	1803.61	5-Year	289	6438.0	6440.9		6441.3	0.0067	5.0	58	26.2	0.6
Tributary6-Cnst	1803.61	10-Year	428	6438.0	6441.6		6442.1	0.0067	5.5	77	29.5	0.6
Tributary6-Cnst	1803.61	100-Year	991	6438.0	6443.6		6444.3	0.0064	6.8	147	40.3	0.6
Tributary6-Cnst	1800	5-Year	289	6438.0	6440.8		6441.3	0.0076	5.3	55	25.2	0.6
Tributary6-Cnst	1800	10-Year	428	6438.0	6441.5		6442.0	0.0077	5.9	73	28.5	0.6
Tributary6-Cnst	1800	100-Year	991	6438.0	6443.5		6444.3	0.0072	7.1	140	39.5	0.7
Tributary6-Cnst	1789.62	5-Year	289	6438.0	6440.4	6440.2	6441.1	0.0161	6.9	42	22.6	0.9
Tributary6-Cnst	1789.62	10-Year	428	6438.0	6441.0	6440.8	6441.9	0.0142	7.4	58	25.0	0.9
Tributary6-Cnst	1789.62	100-Year	991	6438.0	6443.1	6442.5	6444.2	0.0106	8.1	124	44.7	0.8
Tributary6-Cnst	1775	5-Year	289	6437.7	6440.3		6440.9	0.0117	5.9	49	27.1	0.8
Tributary6-Cnst	1775	10-Year	428	6437.7	6441.1		6441.6	0.0091	5.9	72	32.4	0.7
Tributary6-Cnst	1775	100-Year	991	6437.7	6443.4		6443.9	0.0061	5.7	175	62.1	0.6
Tributary6-Cnst	1765.24	5-Year	289	6437.4	6440.6		6440.7	0.0018	2.6	111	51.2	0.3
Tributary6-Cnst	1765.24	10-Year	428	6437.4	6441.4		6441.5	0.0015	2.8	153	56.6	0.3
Tributary6-Cnst	1765.24	100-Year	991	6437.4	6443.6		6443.8	0.0012	3.4	293	69.0	0.3
Tributary6-Cnst	1750	5-Year	289	6437.0	6440.6		6440.7	0.0018	2.7	109	49.4	0.3
Tributary6-Cnst	1750	10-Year	428	6437.0	6441.3		6441.5	0.0016	2.9	149	53.6	0.3
Tributary6-Cnst	1750	100-Year	991	6437.0	6443.6		6443.7	0.0014	3.5	283	66.6	0.3
Tributary6-Cnst	1745.59	5-Year	289	6437.0	6440.6		6440.7	0.0016	2.6	110	45.6	0.3
Tributary6-Cnst	1745.59	10-Year	428	6437.0	6441.3		6441.5	0.0015	2.9	147	49.3	0.3
Tributary6-Cnst	1745.59	100-Year	991	6437.0	6443.5		6443.7	0.0015	3.7	269	61.9	0.3
Tributary6-Cnst	1725	5-Year	289	6437.0	6440.5		6440.6	0.0013	2.5	116	43.2	0.3
Tributary6-Cnst	1725	10-Year	428	6437.0	6441.3		6441.4	0.0013	2.8	150	46.2	0.3
Tributary6-Cnst	1725	100-Year	991	6437.0	6443.5		6443.7	0.0014	3.8	261	55.4	0.3
Tributary6-Cnst	1720.85	5-Year	289	6437.0	6440.5		6440.6	0.0012	2.4	118	42.7	0.3
Tributary6-Cnst	1720.85	10-Year	428	6437.0	6441.3		6441.4	0.0012	2.8	153	45.9	0.3
Tributary6-Cnst	1720.85	100-Year	991	6437.0	6443.5		6443.7	0.0014	3.8	263	55.7	0.3
Tributary6-Cnst	1705.38	5-Year	289	6437.0	6440.5		6440.6	0.0016	2.8	105	39.4	0.3
Tributary6-Cnst	1705.38	10-Year	428	6437.0	6441.2		6441.4	0.0016	3.1	136	42.8	0.3
Tributary6-Cnst	1705.38	100-Year	991	6437.0	6443.4		6443.7	0.0018	4.1	240	52.9	0.3
Tributary6-Cnst	1700	5-Year	289	6437.0	6440.4		6440.6	0.0021	3.1	92	35.0	0.3
Tributary6-Cnst	1700	10-Year	428	6437.0	6441.2		6441.4	0.0021	3.6	120	37.8	0.4
Tributary6-Cnst	1700	100-Year	991	6437.0	6443.3		6443.7	0.0024	4.7	209	46.6	0.4
Tributary6-Cnst	1688.28	5-Year	289	6437.0	6440.4		6440.6	0.0026	3.5	84	32.9	0.4
Tributary6-Cnst	1688.28	10-Year	428	6437.0	6441.1		6441.4	0.0026	3.9	109	35.3	0.4
Tributary6-Cnst	1688.28	100-Year	991	6437.0	6443.2		6443.6	0.0030	5.1	193	44.9	0.4
Tributary6-Cnst	1675	5-Year	289	6437.0	6440.2		6440.5	0.0054	4.7	62	26.5	0.5
Tributary6-Cnst	1675	10-Year	428	6437.0	6440.9		6441.3	0.0055	5.2	82	29.6	0.6
Tributary6-Cnst	1675	100-Year	991	6437.0	6442.9		6443.5	0.0057	6.6	151	39.7	0.6
Tributary6-Cnst	1668.39	5-Year	289	6436.9	6440.0		6440.4	0.0066	5.1	57	24.9	0.6
Tributary6-Cnst	1668.39	10-Year	428	6436.9	6440.7		6441.2	0.0067	5.7	75	27.8	0.6
Tributary6-Cnst	1668.39	100-Year	991	6436.9	6442.7		6443.5	0.0071	7.1	140	38.7	0.7
Tributary6-Cnst	1650	5-Year	289	6436.5	6439.7		6440.3	0.0103	6.0	48	22.3	0.7
Tributary6-Cnst	1650	10-Year	428	6436.5	6440.3		6441.1	0.0108	6.8	63	25.0	0.8
Tributary6-Cnst	1650	100-Year	991	6436.5	6442.2		6443.3	0.0113	8.3	119	37.0	0.8
Tributary6-Cnst	1625	5-Year	289	6436.0	6439.5		6440.0	0.0099	6.0	48	22.2	0.7
Tributary6-Cnst	1625	10-Year	428	6436.0	6440.0		6440.8	0.0110	6.9	62	24.7	0.8
Tributary6-Cnst	1625	100-Year	991	6436.0	6442.0		6443.0	0.0108	8.2	120	36.3	0.8
Tributary6-Cnst	1600	5-Year	289	6436.0	6439.2		6439.8	0.0104	6.0	48	23.0	0.7
Tributary6-Cnst	1600	10-Year	428	6436.0	6439.7		6440.5	0.0120	7.0	62	26.1	0.8
Tributary6-Cnst	1600	100-Year	991	6436.0	6441.8		6442.7	0.0098	7.7	129	40.3	0.8
Tributary6-Cnst	1575	5-Year	289	6436.0	6439.1		6439.5	0.0091	5.2	56	30.9	0.7
Tributary6-Cnst	1575	10-Year	428	6436.0	6439.7		6440.2	0.0086	5.6	76	35.9	0.7

HEC-RAS Plan: Const Chan - HR River: EForkSandCreek Reach: Tributary6-Cnst (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Tributary6-Cnst	1575	100-Year	991	6436.0	6441.9		6442.4	0.0051	5.7	175	54.0	0.6
Tributary6-Cnst	1567.04	5-Year	289	6436.0	6439.1		6439.4	0.0066	4.7	62	31.5	0.6
Tributary6-Cnst	1567.04	10-Year	428	6436.0	6439.7		6440.1	0.0070	5.1	83	38.1	0.6
Tributary6-Cnst	1567.04	100-Year	991	6436.0	6441.9		6442.4	0.0044	5.3	187	57.5	0.5
Tributary6-Cnst	1550	5-Year	289	6436.0	6438.8		6439.3	0.0090	5.4	54	27.9	0.7
Tributary6-Cnst	1550	10-Year	428	6436.0	6439.3		6439.9	0.0100	6.2	69	31.2	0.7
Tributary6-Cnst	1550	100-Year	991	6436.0	6441.7		6442.3	0.0063	6.0	165	55.5	0.6
Tributary6-Cnst	1525	5-Year	289	6436.0	6438.6		6439.0	0.0089	5.2	56	30.2	0.7
Tributary6-Cnst	1525	10-Year	428	6436.0	6439.1		6439.7	0.0096	5.9	72	33.8	0.7
Tributary6-Cnst	1525	100-Year	991	6436.0	6441.6		6442.1	0.0052	5.5	181	60.2	0.6
Tributary6-Cnst	1517.15	5-Year	289	6436.0	6438.5		6438.9	0.0100	5.3	54	30.6	0.7
Tributary6-Cnst	1517.15	10-Year	428	6436.0	6439.0		6439.6	0.0104	6.0	71	34.5	0.7
Tributary6-Cnst	1517.15	100-Year	991	6436.0	6441.6		6442.0	0.0045	5.4	184	55.7	0.5
Tributary6-Cnst	1500	5-Year	289	6435.8	6438.3		6438.8	0.0113	5.5	53	31.7	0.7
Tributary6-Cnst	1500	10-Year	428	6435.8	6438.8		6439.4	0.0109	6.0	71	36.1	0.8
Tributary6-Cnst	1500	100-Year	991	6435.8	6441.6		6442.0	0.0037	5.1	193	55.1	0.5
Tributary6-Cnst	1475	5-Year	289	6435.6	6438.2		6438.5	0.0074	4.5	64	37.3	0.6
Tributary6-Cnst	1475	10-Year	428	6435.6	6438.8		6439.1	0.0066	4.9	87	40.9	0.6
Tributary6-Cnst	1475	100-Year	991	6435.6	6441.5		6441.9	0.0024	4.4	224	57.7	0.4
Tributary6-Cnst	1450	5-Year	289	6435.4	6438.0		6438.3	0.0062	4.2	69	39.9	0.6
Tributary6-Cnst	1450	10-Year	428	6435.4	6438.7		6439.0	0.0053	4.5	95	43.1	0.5
Tributary6-Cnst	1450	100-Year	991	6435.4	6441.5		6441.8	0.0020	4.2	238	57.4	0.4
Tributary6-Cnst	1440.34	5-Year	289	6435.4	6438.1		6438.3	0.0004	3.6	80	41.9	0.5
Tributary6-Cnst	1440.34	10-Year	428	6435.4	6438.7		6438.9	0.0004	4.0	106	44.8	0.5
Tributary6-Cnst	1440.34	100-Year	991	6435.4	6441.5		6441.8	0.0002	3.9	253	58.8	0.3
Tributary6-Cnst	1425	5-Year	342	6435.4	6438.1		6438.3	0.0004	3.5	97	46.3	0.4
Tributary6-Cnst	1425	10-Year	457	6435.4	6438.7		6438.9	0.0003	3.6	128	49.6	0.4
Tributary6-Cnst	1425	100-Year	1076	6435.4	6441.5		6441.8	0.0001	3.8	287	64.0	0.3
Tributary6-Cnst	1406.37	5-Year	342	6435.3	6438.0		6438.2	0.0004	4.0	84	37.9	0.5
Tributary6-Cnst	1406.37	10-Year	457	6435.3	6438.6		6438.9	0.0004	4.2	109	40.8	0.5
Tributary6-Cnst	1406.37	100-Year	1076	6435.3	6441.4		6441.7	0.0002	4.5	237	52.4	0.4
Tributary6-Cnst	1394	5-Year	342	6435.3	6437.6	6437.1	6438.1	0.0011	5.9	58	24.9	0.7
Tributary6-Cnst	1394	10-Year	457	6435.3	6438.1	6437.4	6438.7	0.0011	6.5	71	24.9	0.7
Tributary6-Cnst	1394	100-Year	1076	6435.3	6440.4		6441.5	0.0010	8.5	127	24.9	0.7
Tributary6-Cnst	1392.2	5-Year	342	6435.3	6437.1	6437.1	6438.0	0.0028	7.6	45	24.0	1.0
Tributary6-Cnst	1392.2	10-Year	457	6435.3	6437.5	6437.5	6438.6	0.0028	8.4	54	24.0	1.0
Tributary6-Cnst	1392.2	100-Year	1076	6435.3	6440.1	6439.2	6441.4	0.0018	9.3	116	24.0	0.7
CONSTITUTION AVE. CULVERT →												
Tributary6-Cnst	1375	5-Year	342	6435.2	6436.9	6437.0	6437.9	0.0035	8.2	42	24.0	1.1
Tributary6-Cnst	1375	10-Year	457	6435.2	6437.3	6437.4	6438.5	0.0034	9.0	51	24.0	1.1
Tributary6-Cnst	1375	100-Year	1076	6435.2	6440.1	6439.1	6441.4	0.0017	9.1	118	24.0	0.7
Tributary6-Cnst	1350	5-Year	342	6435.0	6436.9	6436.9	6437.8	0.0028	7.7	44	24.0	1.0
Tributary6-Cnst	1350	10-Year	457	6435.0	6437.1	6437.2	6438.4	0.0038	9.3	49	24.0	1.2
Tributary6-Cnst	1350	100-Year	1076	6435.0	6440.1	6439.0	6441.3	0.0016	8.9	121	24.0	0.7
Tributary6-Cnst	1325	5-Year	342	6434.9	6436.6	6436.7	6437.7	0.0036	8.3	41	24.0	1.1
Tributary6-Cnst	1325	10-Year	457	6434.9	6437.0	6437.1	6438.2	0.0033	8.9	52	24.0	1.1
Tributary6-Cnst	1325	100-Year	1076	6434.9	6440.0	6438.9	6441.2	0.0015	8.7	124	24.0	0.7
Tributary6-Cnst	1300	5-Year	342	6434.7	6436.4	6436.6	6437.5	0.0041	8.7	39	24.0	1.2
Tributary6-Cnst	1300	10-Year	457	6434.7	6437.2	6437.0	6438.1	0.0021	7.7	59	24.0	0.9
Tributary6-Cnst	1300	100-Year	1076	6434.7	6440.0	6438.7	6441.1	0.0014	8.4	128	24.0	0.6
Tributary6-Cnst	1275	5-Year	342	6434.6	6436.3	6436.4	6437.4	0.0034	8.2	42	24.0	1.1
Tributary6-Cnst	1275	10-Year	457	6434.6	6437.2	6436.8	6438.0	0.0018	7.3	63	24.0	0.8
Tributary6-Cnst	1275	100-Year	1076	6434.6	6440.0	6438.6	6441.1	0.0013	8.2	131	24.0	0.6
Tributary6-Cnst	1250	5-Year	342	6434.4	6436.5	6436.3	6437.2	0.0020	6.9	50	24.0	0.8
Tributary6-Cnst	1250	10-Year	457	6434.4	6437.2	6436.7	6437.9	0.0016	6.9	66	24.0	0.7

HEC-RAS Plan: Const Chan - HR River: EForkSandCreek Reach: Tributary6-Cnst (Continued)

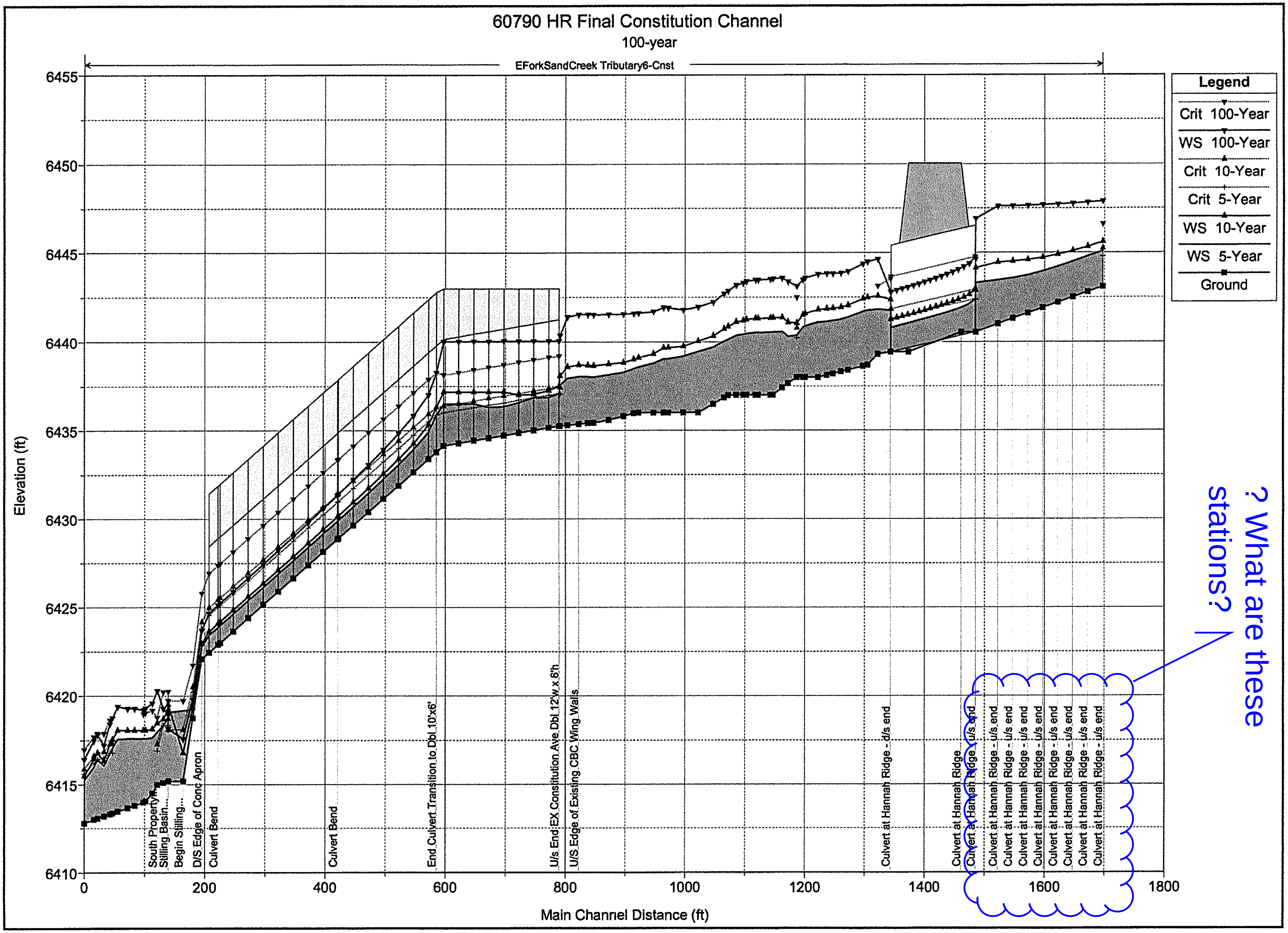
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Tributary6-Cnst	1250	100-Year	1076	6434.4	6440.0	6438.4	6441.0	0.0012	8.0	134	24.0	0.6
Tributary6-Cnst	1225	5-Year	342	6434.3	6436.5	6436.2	6437.2	0.0016	6.4	53	24.0	0.8
Tributary6-Cnst	1225	10-Year	457	6434.3	6437.2	6436.5	6437.9	0.0013	6.6	70	24.0	0.7
Tributary6-Cnst	1225	100-Year	1076	6434.3	6440.0	6438.3	6441.0	0.0011	7.8	138	24.0	0.6
Tributary6-Cnst	1200	5-Year	342	6434.2	6436.5	6436.0	6437.1	0.0014	6.0	57	24.0	0.7
Tributary6-Cnst	1200	10-Year	457	6434.2	6437.2	6436.4	6437.8	0.0012	6.3	73	24.0	0.6
Tributary6-Cnst	1200	100-Year	1076	6434.2	6440.0	6438.1	6440.9	0.0010	7.6	141	24.0	0.6
Tributary6-Cnst	1188	5-Year	342	6433.8	6435.9	6435.9	6436.9	0.0030	8.1	42	20.0	1.0
Tributary6-Cnst	1188	10-Year	457	6433.8	6436.3	6436.3	6437.6	0.0031	9.0	51	20.0	1.0
Tributary6-Cnst	1188	100-Year	1076	6433.8	6438.3	6438.3	6440.5	0.0035	12.0	90	20.0	1.0
Tributary6-Cnst	1175	5-Year	342	6433.4	6434.9	6435.5	6436.9	0.0076	11.1	31	20.0	1.6
Tributary6-Cnst	1175	10-Year	457	6433.4	6435.3	6435.9	6437.5	0.0070	11.9	38	20.0	1.5
Tributary6-Cnst	1175	100-Year	1076	6433.4	6437.0	6437.9	6440.4	0.0062	14.8	73	20.0	1.4
Tributary6-Cnst	1150	5-Year	342	6432.7	6434.0	6434.8	6436.6	0.0123	13.0	26	20.0	2.0
Tributary6-Cnst	1150	10-Year	457	6432.7	6434.3	6435.2	6437.3	0.0111	13.9	33	20.0	1.9
Tributary6-Cnst	1150	100-Year	1076	6432.7	6435.8	6437.1	6440.2	0.0089	16.8	64	20.0	1.7
Tributary6-Cnst	1125	5-Year	342	6431.9	6433.1	6434.0	6436.2	0.0162	14.2	24	20.0	2.3
Tributary6-Cnst	1125	10-Year	457	6431.9	6433.4	6434.4	6437.0	0.0144	15.1	30	20.0	2.2
Tributary6-Cnst	1125	100-Year	1076	6431.9	6434.9	6436.4	6440.0	0.0111	18.2	59	20.0	1.9
Tributary6-Cnst	1100	5-Year	342	6431.2	6432.3	6433.3	6435.8	0.0192	15.0	23	20.0	2.5
Tributary6-Cnst	1100	10-Year	457	6431.2	6432.6	6433.7	6436.6	0.0171	16.0	29	20.0	2.4
Tributary6-Cnst	1100	100-Year	1076	6431.2	6433.9	6435.6	6439.7	0.0130	19.2	56	20.0	2.0
Tributary6-Cnst	1075	5-Year	342	6430.4	6431.5	6432.5	6435.3	0.0216	15.6	22	20.0	2.6
Tributary6-Cnst	1075	10-Year	457	6430.4	6431.8	6432.9	6436.1	0.0194	16.7	27	20.0	2.5
Tributary6-Cnst	1075	100-Year	1076	6430.4	6433.1	6434.9	6439.3	0.0147	20.1	54	20.0	2.2
Tributary6-Cnst	1050	5-Year	342	6429.7	6430.7	6431.8	6434.7	0.0235	16.1	21	20.0	2.7
Tributary6-Cnst	1050	10-Year	457	6429.7	6431.0	6432.2	6435.6	0.0214	17.2	27	20.0	2.6
Tributary6-Cnst	1050	100-Year	1076	6429.7	6432.2	6434.1	6438.9	0.0162	20.8	52	20.0	2.3
Tributary6-Cnst	1025	5-Year	342	6428.9	6429.9	6431.0	6434.1	0.0250	16.4	21	20.0	2.8
Tributary6-Cnst	1025	10-Year	457	6428.9	6430.2	6431.4	6435.0	0.0230	17.6	26	20.0	2.7
Tributary6-Cnst	1025	100-Year	1076	6428.9	6431.4	6433.4	6438.5	0.0176	21.4	50	20.0	2.4
Tributary6-Cnst	1023.46	5-Year	342	6428.9	6429.9	6431.0	6434.1	0.0252	16.4	21	20.0	2.8
Tributary6-Cnst	1023.46	10-Year	457	6428.9	6430.1	6431.4	6435.0	0.0232	17.7	26	20.0	2.7
Tributary6-Cnst	1023.46	100-Year	1076	6428.9	6431.4	6433.3	6438.5	0.0177	21.4	50	20.0	2.4
Tributary6-Cnst	1000	5-Year	342	6428.2	6429.2	6430.3	6433.5	0.0262	16.6	21	20.0	2.9
Tributary6-Cnst	1000	10-Year	457	6428.2	6429.4	6430.7	6434.5	0.0244	18.0	25	20.0	2.8
Tributary6-Cnst	1000	100-Year	1076	6428.2	6430.6	6432.6	6438.1	0.0189	21.9	49	20.0	2.5
Tributary6-Cnst	975	5-Year	342	6427.4	6428.4	6429.5	6432.8	0.0271	16.8	20	20.0	2.9
Tributary6-Cnst	975	10-Year	457	6427.4	6428.7	6429.9	6433.8	0.0255	18.3	25	20.0	2.9
Tributary6-Cnst	975	100-Year	1076	6427.4	6429.8	6431.9	6437.6	0.0200	22.4	48	20.0	2.5
Tributary6-Cnst	950	5-Year	342	6426.7	6427.7	6428.8	6432.1	0.0278	17.0	20	20.0	3.0
Tributary6-Cnst	950	10-Year	457	6426.7	6427.9	6429.2	6433.2	0.0264	18.5	25	20.0	2.9
Tributary6-Cnst	950	100-Year	1076	6426.7	6429.0	6431.1	6437.1	0.0211	22.8	47	20.0	2.6
Tributary6-Cnst	925	5-Year	342	6425.9	6426.9	6428.0	6431.4	0.0283	17.0	20	20.0	3.0
Tributary6-Cnst	925	10-Year	457	6425.9	6427.1	6428.4	6432.5	0.0271	18.6	25	20.0	3.0
Tributary6-Cnst	925	100-Year	1076	6425.9	6428.2	6430.4	6436.5	0.0220	23.1	47	20.0	2.7
Tributary6-Cnst	900	5-Year	342	6425.2	6426.1	6427.3	6430.7	0.0287	17.1	20	20.0	3.0
Tributary6-Cnst	900	10-Year	457	6425.2	6426.4	6427.7	6431.8	0.0276	18.7	24	20.0	3.0
Tributary6-Cnst	900	100-Year	1076	6425.2	6427.4	6429.6	6436.0	0.0229	23.4	46	20.0	2.7
Tributary6-Cnst	875	5-Year	342	6424.4	6425.4	6426.5	6430.0	0.0290	17.2	20	20.0	3.0
Tributary6-Cnst	875	10-Year	457	6424.4	6425.6	6426.9	6431.1	0.0281	18.8	24	20.0	3.0
Tributary6-Cnst	875	100-Year	1076	6424.4	6426.7	6428.9	6435.4	0.0237	23.7	45	20.0	2.8
Tributary6-Cnst	850	5-Year	342	6423.7	6424.6	6425.8	6429.3	0.0293	17.2	20	20.0	3.1
Tributary6-Cnst	850	10-Year	457	6423.7	6424.9	6426.2	6430.4	0.0284	18.9	24	20.0	3.0

HEC-RAS Plan: Const Chan - HR River: EForkSandCreek Reach: Tributary6-Cnst (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Tributary6-Cnst	850	100-Year	1076	6423.7	6425.9	6428.1	6434.8	0.0244	23.9	45	20.0	2.8
Tributary6-Cnst	828.31	5-Year	342	6423.0	6424.0	6425.1	6428.6	0.0294	17.3	20	20.0	3.1
Tributary6-Cnst	828.31	10-Year	457	6423.0	6424.2	6425.5	6429.8	0.0287	19.0	24	20.0	3.0
Tributary6-Cnst	828.31	100-Year	1076	6423.0	6425.2	6427.5	6434.2	0.0248	24.1	45	20.0	2.8
Tributary6-Cnst	825	5-Year	342	6422.9	6423.9	6425.0	6428.5	0.0295	17.3	20	20.0	3.1
Tributary6-Cnst	825	10-Year	457	6422.9	6424.1	6425.4	6429.7	0.0287	19.0	24	20.0	3.1
Tributary6-Cnst	825	100-Year	1076	6422.9	6425.1	6427.4	6434.2	0.0249	24.1	45	20.0	2.8
Tributary6-Cnst	810	5-Year	342	6422.5	6423.4	6424.6	6428.1	0.0296	17.3	20	20.0	3.1
Tributary6-Cnst	810	10-Year	457	6422.5	6423.7	6425.0	6429.3	0.0289	19.0	24	20.0	3.1
Tributary6-Cnst	810	100-Year	1076	6422.5	6424.7	6426.9	6433.8	0.0253	24.2	44	20.0	2.9
Tributary6-Cnst	798	5-Year	342	6422.1	6422.8	6423.8	6427.7	0.0369	17.7	19	48.5	3.7
Tributary6-Cnst	798	10-Year	457	6422.1	6423.0	6424.2	6428.9	0.0345	19.5	23	49.4	3.7
Tributary6-Cnst	798	100-Year	1076	6422.1	6423.7	6425.8	6433.5	0.0254	25.1	43	53.8	3.5
Tributary6-Cnst	783	5-Year	342	6418.8	6419.2	6420.2	6426.2	0.6717	21.4	16	35.2	5.4
Tributary6-Cnst	783	10-Year	457	6418.8	6419.3	6420.5	6427.5	0.6010	23.2	20	35.8	5.3
Tributary6-Cnst	783	100-Year	1076	6418.8	6419.8	6421.7	6432.5	0.4217	29.0	38	38.8	4.9
Tributary6-Cnst	767.10	5-Year	342	6415.2	6419.2	6417.7	6419.4	0.0029	4.0	91	34.9	0.4
Tributary6-Cnst	767.10	10-Year	457	6415.2	6416.8	6418.1	6422.0	0.2193	19.0	25	20.5	2.6
Tributary6-Cnst	767.10	100-Year	1076	6415.2	6417.6	6419.7	6427.3	0.2455	26.3	43	25.3	3.0
Tributary6-Cnst	742.1	5-Year	342	6415.2	6419.1		6419.3	0.0032	4.2	88	34.3	0.4
Tributary6-Cnst	742.1	10-Year	457	6415.2	6419.5	6418.1	6419.8	0.0036	4.8	104	36.9	0.4
Tributary6-Cnst	742.1	100-Year	1076	6415.2	6418.2	6419.7	6423.5	0.1013	19.5	59	28.7	2.0
Tributary6-Cnst	742	5-Year	342	6415.2	6418.8	6418.4	6419.3	0.0096	4.9	62	32.7	0.5
Tributary6-Cnst	742	10-Year	457	6415.2	6419.2	6418.7	6419.8	0.0095	5.2	76	35.2	0.5
Tributary6-Cnst	742	100-Year	1076	6415.2	6418.9	6420.2	6423.1	0.0787	14.2	66	33.5	1.3
Tributary6-Cnst	734	5-Year	342	6415.1	6418.3	6418.3	6419.2	0.0220	6.7	47	29.8	0.7
Tributary6-Cnst	734	10-Year	457	6415.1	6418.7	6418.7	6419.7	0.0203	6.9	59	32.1	0.6
Tributary6-Cnst	734	100-Year	1076	6415.1	6419.3	6420.2	6422.3	0.0485	11.8	78	35.5	1.0
Tributary6-Cnst	724.09	5-Year	342	6415.0	6418.0	6416.9	6418.2	0.0026	4.5	86	37.9	0.5
Tributary6-Cnst	724.09	10-Year	457	6415.0	6418.5	6417.3	6418.8	0.0026	5.0	106	40.9	0.5
Tributary6-Cnst	724.09	100-Year	1076	6415.0	6420.3	6418.8	6420.9	0.0028	6.8	190	51.8	0.5
Tributary6-Cnst	716.13	5-Year	342	6414.5	6417.7		6418.2	0.0079	5.8	59	28.7	0.7
Tributary6-Cnst	716.13	10-Year	457	6414.5	6418.1		6418.7	0.0078	6.3	73	31.3	0.7
Tributary6-Cnst	716.13	100-Year	1076	6414.5	6419.6	6419.2	6420.8	0.0093	8.7	124	38.6	0.8
Tributary6-Cnst	704.68	5-Year	342	6414.1	6417.6		6418.1	0.0068	5.6	61	28.2	0.7
Tributary6-Cnst	704.68	10-Year	457	6414.1	6418.1		6418.6	0.0071	6.1	75	31.0	0.7
Tributary6-Cnst	704.68	100-Year	1076	6414.1	6419.3	6419.0	6420.6	0.0113	9.3	116	35.6	0.9
Tributary6-Cnst	701.08	5-Year	342	6414.0	6417.6		6418.1	0.0060	5.4	64	28.3	0.6
Tributary6-Cnst	701.08	10-Year	457	6414.0	6418.1		6418.6	0.0063	5.9	77	30.3	0.7
Tributary6-Cnst	701.08	100-Year	1076	6414.0	6419.2	6419.0	6420.6	0.0113	9.5	114	33.9	0.9
Tributary6-Cnst	686.39	5-Year	342	6413.8	6417.6		6418.0	0.0043	4.8	72	30.1	0.5
Tributary6-Cnst	686.39	10-Year	457	6413.8	6418.1		6418.5	0.0047	5.3	86	33.2	0.6
Tributary6-Cnst	686.39	100-Year	1076	6413.8	6419.3		6420.4	0.0081	8.3	129	37.9	0.8
Tributary6-Cnst	674.65	5-Year	342	6413.7	6417.6		6417.9	0.0033	4.3	79	31.2	0.5
Tributary6-Cnst	674.65	10-Year	457	6413.7	6418.1		6418.4	0.0037	4.9	94	33.9	0.5
Tributary6-Cnst	674.65	100-Year	1076	6413.7	6419.3		6420.2	0.0068	7.8	138	38.5	0.7
Tributary6-Cnst	658.57	5-Year	342	6413.5	6417.6		6417.8	0.0029	4.0	87	36.6	0.5
Tributary6-Cnst	658.57	10-Year	457	6413.5	6418.1		6418.3	0.0032	4.4	105	41.1	0.5
Tributary6-Cnst	658.57	100-Year	1076	6413.5	6419.4		6420.0	0.0050	6.5	167	51.0	0.6
Tributary6-Cnst	650.0	5-Year	342	6413.4	6417.1	6416.8	6417.7	0.0109	6.5	52	28.0	0.8
Tributary6-Cnst	650.0	10-Year	457	6413.4	6417.5	6417.3	6418.3	0.0119	6.8	67	36.8	0.9
Tributary6-Cnst	650.0	100-Year	1076	6413.4	6418.8	6418.8	6419.9	0.0142	8.7	124	53.5	1.0
Tributary6-Cnst	645.56	5-Year	342	6413.3	6416.8	6416.8	6417.7	0.0159	7.5	46	26.7	1.0
Tributary6-Cnst	645.56	10-Year	457	6413.3	6417.3	6417.3	6418.2	0.0158	7.6	60	33.9	1.0

HEC-RAS Plan: Const Chan - HR River: EForkSandCreek Reach: Tributary6-Cnst (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Tributary6-Cnst	645.56	100-Year	1076	6413.3	6418.4	6418.6	6419.8	0.0198	9.6	112	53.9	1.2
Tributary6-Cnst	635.65	5-Year	342	6413.2	6416.1	6416.5	6417.4	0.0383	9.2	37	31.2	1.5
Tributary6-Cnst	635.65	10-Year	457	6413.2	6416.3	6416.8	6417.9	0.0388	10.0	46	34.2	1.5
Tributary6-Cnst	635.65	100-Year	1076	6413.2	6417.2	6417.9	6419.5	0.0457	12.1	89	57.1	1.7
Tributary6-Cnst	625.0	5-Year	342	6413.1	6416.4	6416.4	6417.1	0.0174	6.5	53	41.0	1.0
Tributary6-Cnst	625.0	10-Year	457	6413.1	6416.8	6416.8	6417.5	0.0169	6.7	68	50.2	1.0
Tributary6-Cnst	625.0	100-Year	1076	6413.1	6417.8	6417.9	6418.9	0.0159	8.3	129	65.1	1.0
Tributary6-Cnst	618.89	5-Year	342	6413.0	6416.0	6416.2	6417.0	0.0217	7.8	44	30.4	1.1
Tributary6-Cnst	618.89	10-Year	457	6413.0	6416.5	6416.6	6417.3	0.0215	7.6	60	43.7	1.1
Tributary6-Cnst	618.89	100-Year	1076	6413.0	6417.5	6417.7	6418.8	0.0209	9.2	118	63.4	1.2
Tributary6-Cnst	603.08	5-Year	342	6412.8	6415.3	6415.6	6416.4	0.0473	8.8	39	41.6	1.6
Tributary6-Cnst	603.08	10-Year	457	6412.8	6415.5	6415.9	6416.8	0.0457	9.3	49	46.6	1.6
Tributary6-Cnst	603.08	100-Year	1076	6412.8	6416.4	6417.0	6418.3	0.0355	11.0	98	59.9	1.5


60790 HR Final Constitution Channel
100-year
EForkSandCreek Tributary6-Cnst
Legend
Crit 100-Year
WS 100-Year
Crit 10-Year
Crit 5-Year
WS 10-Year
WS 5-Year
Ground
Elevation (ft)
Main Channel Distance (ft)
South Property...
Stilling Basin...
Begin Stilling...
D/S Edge of Conc Apron
Culvert Bend
Culvert Bend
End Culvert Transition to Dbl 10'x6'
U/s End EX Constitution Ave Dbl 12'w x 6'h
U/S Edge of Existing CBC Wing Walls
Culvert at Hannah Ridge - d/s end
Culvert at Hannah Ridge
Culvert at Hannah Ridge - u/s end
Culvert at Hannah Ridge - u/s end
Culvert at Hannah Ridge - u/s end
Culvert at Hannah Ridge - u/s end
Culvert at Hannah Ridge - u/s end
Culvert at Hannah Ridge - u/s end
Culvert at Hannah Ridge - u/s end
Culvert at Hannah Ridge - u/s end
Culvert at Hannah Ridge - u/s end
? What are these stations?

```
                 HEC-RAS Version 4.1.0 Jan 2010
                 U.S. Army Corps of Engineers
                 Hydrologic Engineering Center
                       609 Second Street
                       Davis, California

      X     X  XXXXXX    XXXX         XXXX       XX      XXXX
      X     X  X        X    X        X   X     X  X    X
      X     X  X        X             X   X    X    X   X
      XXXXXXX  XXXX     X       XXX   XXXX     XXXXXX    XXXX
      X     X  X        X             X  X     X    X        X
      X     X  X        X    X        X   X    X    X        X
      X     X  XXXXXX    XXXX         X    X   X    X   XXXXX

*******************************************************************************

PROJECT DATA
Project Title: 60790 HR Final Constitution Channel
Project File : HRConstEX.prj
Run Date and Time: 8/20/2013 6:51:06 PM

Project in English units

Project Description:
Hannah Ridge at Feathergrass - Constitution Channel with HR culvert for SF
Residential

*******************************************************************************

FLOW DATA

Flow Title: Const Channel
Flow File : z:\60970\Calcs\HEC-RAS Final Constitution Channel\HRConstEX.f02

Flow Data (cfs)
*********************************************************************************************
* River            Reach             RS      *         5-Year        10-Year       100-Year *
* EForkSandCreek   Tributary6-Cnst  2300     *            289            428            991 *
* EForkSandCreek   Tributary6-Cnst  1425     *            342            457           1076 *
* EForkSandCreek   Tributary6-Cnst  603.08   *            342            457           1076 *
*********************************************************************************************

Boundary Conditions
***************************************************************************************************************
* River            Reach             Profile          *          Upstream                  Downstream        *
***************************************************************************************************************
* EForkSandCreek   Tributary6-Cnst  5-Year            *       Normal S = 0.012        Normal S = 0.0122 *
* EForkSandCreek   Tributary6-Cnst  10-Year           *       Normal S = 0.012        Normal S = 0.0122 *
* EForkSandCreek   Tributary6-Cnst  100-Year          *       Normal S = 0.012        Normal S = 0.0122 *
***************************************************************************************************************

CULVERT


RIVER: EForkSandCreek
REACH: Tributary6-Cnst     RS: 2017


CULVERT OUTPUT  Profile #5-Year  Culv Group:  HannahRidge
**********************************************************************************
* Q Culv Group (cfs)       *   289.00  * Culv Full Len (ft)      *           *
* # Barrels                *        2  * Culv Vel US (ft/s)      *     7.75  *
* Q Barrel (cfs)           *   144.50  * Culv Vel DS (ft/s)      *    10.34  *
* E.G. US. (ft)            *  6443.71  * Culv Inv El Up (ft)     *  6440.54  *
* W.S. US. (ft)            *  6443.33  * Culv Inv El Dn (ft)     *  6439.42  *
* E.G. DS (ft)             *  6442.31  * Culv Frctn Ls (ft)      *     0.86  *
* W.S. DS (ft)             *  6441.78  * Culv Exit Loss (ft)     *     0.16  *
* Delta EG (ft)            *     1.40  * Culv Entr Loss (ft)     *     0.37  *
* Delta WS (ft)            *     1.55  * Q Weir (cfs)            *           *
* E.G. IC (ft)             *  6443.47  * Weir Sta Lft (ft)       *           *
* E.G. OC (ft)             *  6443.71  * Weir Sta Rgt (ft)       *           *
```

Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	6442.41	Weir Max Depth (ft)	
Culv WS Outlet (ft)	6440.82	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.35	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.86	Min El Weir Flow (ft)	6450.07

Note: During the supercritical calculations a hydraulic jump occurred at the outlet of (leaving) the culvert.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10-Year Culv Group: HannahRidge

Q Culv Group (cfs)	428.00	Culv Full Len (ft)	
# Barrels	2	Culv Vel US (ft/s)	8.83
Q Barrel (cfs)	214.00	Culv Vel DS (ft/s)	11.62
E.G. US. (ft)	6444.66	Culv Inv El Up (ft)	6440.54
W.S. US. (ft)	6444.16	Culv Inv El Dn (ft)	6439.42
E.G. DS (ft)	6443.12	Culv Frctn Ls (ft)	0.82
W.S. DS (ft)	6442.37	Culv Exit Loss (ft)	0.24
Delta EG (ft)	1.54	Culv Entr Loss (ft)	0.48
Delta WS (ft)	1.79	Q Weir (cfs)	
E.G. IC (ft)	6444.38	Weir Sta Lft (ft)	
E.G. OC (ft)	6444.66	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	6442.96	Weir Max Depth (ft)	
Culv WS Outlet (ft)	6441.26	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.76	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.42	Min El Weir Flow (ft)	6450.07

Note: During the supercritical calculations a hydraulic jump occurred at the outlet of (leaving) the culvert.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100-Year Culv Group: HannahRidge

Q Culv Group (cfs)	991.00	Culv Full Len (ft)	
# Barrels	2	Culv Vel US (ft/s)	11.69
Q Barrel (cfs)	495.50	Culv Vel DS (ft/s)	14.64
E.G. US. (ft)	6447.75	Culv Inv El Up (ft)	6440.54
W.S. US. (ft)	6446.93	Culv Inv El Dn (ft)	6439.42
E.G. DS (ft)	6445.63	Culv Frctn Ls (ft)	0.77
W.S. DS (ft)	6443.79	Culv Exit Loss (ft)	0.50
Delta EG (ft)	2.12	Culv Entr Loss (ft)	0.85
Delta WS (ft)	3.13	Q Weir (cfs)	
E.G. IC (ft)	6447.40	Weir Sta Lft (ft)	
E.G. OC (ft)	6447.75	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	6444.78	Weir Max Depth (ft)	
Culv WS Outlet (ft)	6442.81	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	3.13	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	4.24	Min El Weir Flow (ft)	6450.07

Note: The flow in the culvert is entirely supercritical.

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary6-Cnst	2300	5-Year	289	6443.1	6445.1	6444.8	6445.6	0.0119	5.5	52	32.0	0.8
Tributary6-Cnst	2300	10-Year	428	6443.1	6445.6	6445.2	6446.2	0.0116	6.2	69	35.1	0.8
Tributary6-Cnst	2300	100-Year	991	6443.1	6447.9	6446.6	6448.5	0.0054	6.0	165	48.8	0.6
Tributary6-Cnst	2275	5-Year	289	6442.8	6444.8		6445.3	0.0119	5.5	52	32.0	0.8
Tributary6-Cnst	2275	10-Year	428	6442.8	6445.3		6445.9	0.0111	6.1	70	35.3	0.8
Tributary6-Cnst	2275	100-Year	991	6442.8	6447.8		6448.3	0.0045	5.6	176	50.2	0.5
Tributary6-Cnst	2250	5-Year	289	6442.5	6444.5		6445.0	0.0117	5.5	53	32.1	0.8
Tributary6-Cnst	2250	10-Year	428	6442.5	6445.1		6445.6	0.0102	5.9	72	35.6	0.7
Tributary6-Cnst	2250	100-Year	991	6442.5	6447.8		6448.2	0.0037	5.3	189	51.6	0.5
Tributary6-Cnst	2225	5-Year	289	6442.2	6444.2		6444.7	0.0113	5.4	53	32.2	0.7
Tributary6-Cnst	2225	10-Year	428	6442.2	6444.9		6445.4	0.0090	5.7	76	36.2	0.7
Tributary6-Cnst	2225	100-Year	991	6442.2	6447.7		6448.1	0.0031	4.9	202	53.1	0.4

Tributary6-Cnst	2200	5-Year	289	6441.9	6444.0		6444.4	0.0105	5.3	55	32.5	0.7
Tributary6-Cnst	2200	10-Year	428	6441.9	6444.7		6445.2	0.0074	5.3	81	37.0	0.6
Tributary6-Cnst	2200	100-Year	991	6441.9	6447.7		6448.0	0.0026	4.6	216	54.7	0.4
Tributary6-Cnst	2175	5-Year	289	6441.6	6443.8		6444.2	0.0091	5.0	57	33.0	0.7
Tributary6-Cnst	2175	10-Year	428	6441.6	6444.6		6445.0	0.0059	4.9	87	38.1	0.6
Tributary6-Cnst	2175	100-Year	991	6441.6	6447.7		6447.9	0.0021	4.3	231	56.3	0.4
Tributary6-Cnst	2150	5-Year	289	6441.3	6443.6		6443.9	0.0072	4.7	62	33.8	0.6
Tributary6-Cnst	2150	10-Year	428	6441.3	6444.5		6444.8	0.0046	4.5	96	39.3	0.5
Tributary6-Cnst	2150	100-Year	991	6441.3	6447.6		6447.9	0.0018	4.0	247	58.0	0.3
Tributary6-Cnst	2125	5-Year	289	6441.0	6443.5		6443.8	0.0055	4.2	68	34.9	0.5
Tributary6-Cnst	2125	10-Year	428	6441.0	6444.5		6444.7	0.0035	4.1	105	40.8	0.4
Tributary6-Cnst	2125	100-Year	991	6441.0	6447.6		6447.8	0.0015	3.8	263	59.7	0.3
Tributary6-Cnst	2088	5-Year	289	6440.5	6443.3	6442.3	6443.7	0.0005	5.0	58	37.5	0.5
Tributary6-Cnst	2088	10-Year	428	6440.5	6444.2	6442.9	6444.7	0.0004	5.7	75	42.5	0.5
Tributary6-Cnst	2088	100-Year	991	6440.5	6446.9	6444.6	6447.7	0.0003	7.3	147	59.2	0.5
Tributary6-Cnst	2017		Culvert									
Tributary6-Cnst	1946	5-Year	289	6439.4	6441.8		6442.3	0.0008	5.9	49	35.0	0.7
Tributary6-Cnst	1946	10-Year	428	6439.4	6442.4		6443.1	0.0009	7.0	62	38.6	0.7
Tributary6-Cnst	1946	100-Year	991	6439.4	6442.8	6443.5	6445.9	0.0029	14.0	71	41.2	1.3
Tributary6-Cnst	1925	5-Year	289	6439.3	6441.8		6442.2	0.0086	5.0	58	32.8	0.7
Tributary6-Cnst	1925	10-Year	428	6439.3	6442.6		6443.0	0.0065	5.1	83	36.0	0.6
Tributary6-Cnst	1925	100-Year	991	6439.3	6444.6	6443.2	6445.2	0.0047	5.9	167	44.5	0.5
Tributary6-Cnst	1907.83	5-Year	289	6438.7	6441.8		6442.1	0.0053	4.5	64	28.9	0.5
Tributary6-Cnst	1907.83	10-Year	428	6438.7	6442.5		6442.9	0.0051	5.0	86	31.9	0.5
Tributary6-Cnst	1907.83	100-Year	991	6438.7	6444.5		6445.1	0.0049	6.2	159	40.9	0.6
Tributary6-Cnst	1900	5-Year	289	6438.6	6441.7		6442.0	0.0055	4.6	63	27.6	0.5
Tributary6-Cnst	1900	10-Year	428	6438.6	6442.4		6442.8	0.0054	5.2	83	30.4	0.6
Tributary6-Cnst	1900	100-Year	991	6438.6	6444.4		6445.1	0.0055	6.6	151	38.9	0.6
Tributary6-Cnst	1875	5-Year	289	6438.4	6441.4		6441.9	0.0083	5.5	53	24.2	0.7
Tributary6-Cnst	1875	10-Year	428	6438.4	6442.1		6442.6	0.0085	6.2	69	27.0	0.7
Tributary6-Cnst	1875	100-Year	991	6438.4	6444.0		6444.9	0.0084	7.6	130	36.7	0.7
Tributary6-Cnst	1863.36	5-Year	289	6438.3	6441.3		6441.8	0.0090	5.6	51	24.3	0.7
Tributary6-Cnst	1863.36	10-Year	428	6438.3	6441.9		6442.5	0.0089	6.2	68	27.2	0.7
Tributary6-Cnst	1863.36	100-Year	991	6438.3	6443.9		6444.8	0.0084	7.6	131	37.1	0.7
Tributary6-Cnst	1850	5-Year	289	6438.2	6441.2		6441.6	0.0083	5.3	54	26.1	0.7
Tributary6-Cnst	1850	10-Year	428	6438.2	6441.9		6442.4	0.0078	5.9	73	29.1	0.7
Tributary6-Cnst	1850	100-Year	991	6438.2	6443.8		6444.6	0.0071	7.1	140	38.4	0.7
Tributary6-Cnst	1839.5	5-Year	289	6438.1	6441.2		6441.5	0.0071	5.0	58	27.9	0.6
Tributary6-Cnst	1839.5	10-Year	428	6438.1	6441.9		6442.3	0.0066	5.4	79	31.0	0.6
Tributary6-Cnst	1839.5	100-Year	991	6438.1	6443.8		6444.5	0.0059	6.6	149	39.6	0.6
Tributary6-Cnst	1825	5-Year	289	6438.0	6441.1		6441.4	0.0055	4.6	64	28.6	0.5
Tributary6-Cnst	1825	10-Year	428	6438.0	6441.8		6442.2	0.0053	5.1	85	31.5	0.5
Tributary6-Cnst	1825	100-Year	991	6438.0	6443.8		6444.4	0.0052	6.3	157	40.7	0.6
Tributary6-Cnst	1803.61	5-Year	289	6438.0	6440.9		6441.3	0.0067	5.0	58	26.2	0.6
Tributary6-Cnst	1803.61	10-Year	428	6438.0	6441.6		6442.1	0.0067	5.5	77	29.5	0.6
Tributary6-Cnst	1803.61	100-Year	991	6438.0	6443.6		6444.3	0.0064	6.8	147	40.3	0.6
Tributary6-Cnst	1800	5-Year	289	6438.0	6440.8		6441.3	0.0076	5.3	55	25.2	0.6
Tributary6-Cnst	1800	10-Year	428	6438.0	6441.5		6442.0	0.0077	5.9	73	28.5	0.6
Tributary6-Cnst	1800	100-Year	991	6438.0	6443.5		6444.3	0.0072	7.1	140	39.5	0.7
Tributary6-Cnst	1789.62	5-Year	289	6438.0	6440.4	6440.2	6441.1	0.0161	6.9	42	22.6	0.9
Tributary6-Cnst	1789.62	10-Year	428	6438.0	6441.0	6440.8	6441.9	0.0142	7.4	58	25.0	0.9
Tributary6-Cnst	1789.62	100-Year	991	6438.0	6443.1	6442.5	6444.2	0.0106	8.1	124	44.7	0.8
Tributary6-Cnst	1775	5-Year	289	6437.7	6440.3		6440.9	0.0117	5.9	49	27.1	0.8
Tributary6-Cnst	1775	10-Year	428	6437.7	6441.1		6441.6	0.0091	5.9	72	32.4	0.7
Tributary6-Cnst	1775	100-Year	991	6437.7	6443.4		6443.9	0.0061	5.7	175	62.1	0.6

Tributary6-Cnst	1765.24	5-Year	289	6437.4	6440.6		6440.7	0.0018	2.6	111	51.2	0.3
Tributary6-Cnst	1765.24	10-Year	428	6437.4	6441.4		6441.5	0.0015	2.8	153	56.6	0.3
Tributary6-Cnst	1765.24	100-Year	991	6437.4	6443.6		6443.8	0.0012	3.4	293	69.0	0.3
Tributary6-Cnst	1750	5-Year	289	6437.0	6440.6		6440.7	0.0018	2.7	109	49.4	0.3
Tributary6-Cnst	1750	10-Year	428	6437.0	6441.3		6441.5	0.0016	2.9	149	53.6	0.3
Tributary6-Cnst	1750	100-Year	991	6437.0	6443.6		6443.7	0.0014	3.5	283	66.6	0.3
Tributary6-Cnst	1745.59	5-Year	289	6437.0	6440.6		6440.7	0.0016	2.6	110	45.6	0.3
Tributary6-Cnst	1745.59	10-Year	428	6437.0	6441.3		6441.5	0.0015	2.9	147	49.3	0.3
Tributary6-Cnst	1745.59	100-Year	991	6437.0	6443.5		6443.7	0.0015	3.7	269	61.9	0.3
Tributary6-Cnst	1725	5-Year	289	6437.0	6440.5		6440.6	0.0013	2.5	116	43.2	0.3
Tributary6-Cnst	1725	10-Year	428	6437.0	6441.3		6441.4	0.0013	2.8	150	46.2	0.3
Tributary6-Cnst	1725	100-Year	991	6437.0	6443.5		6443.7	0.0014	3.8	261	55.4	0.3
Tributary6-Cnst	1720.85	5-Year	289	6437.0	6440.5		6440.6	0.0012	2.4	118	42.7	0.3
Tributary6-Cnst	1720.85	10-Year	428	6437.0	6441.3		6441.4	0.0012	2.8	153	45.9	0.3
Tributary6-Cnst	1720.85	100-Year	991	6437.0	6443.5		6443.7	0.0014	3.8	263	55.7	0.3
Tributary6-Cnst	1705.38	5-Year	289	6437.0	6440.5		6440.6	0.0016	2.8	105	39.4	0.3
Tributary6-Cnst	1705.38	10-Year	428	6437.0	6441.2		6441.4	0.0016	3.1	136	42.8	0.3
Tributary6-Cnst	1705.38	100-Year	991	6437.0	6443.4		6443.7	0.0018	4.1	240	52.9	0.3
Tributary6-Cnst	1700	5-Year	289	6437.0	6440.4		6440.6	0.0021	3.1	92	35.0	0.3
Tributary6-Cnst	1700	10-Year	428	6437.0	6441.2		6441.4	0.0021	3.6	120	37.8	0.4
Tributary6-Cnst	1700	100-Year	991	6437.0	6443.3		6443.7	0.0024	4.7	209	46.6	0.4
Tributary6-Cnst	1688.28	5-Year	289	6437.0	6440.4		6440.6	0.0026	3.5	84	32.9	0.4
Tributary6-Cnst	1688.28	10-Year	428	6437.0	6441.1		6441.4	0.0026	3.9	109	35.3	0.4
Tributary6-Cnst	1688.28	100-Year	991	6437.0	6443.2		6443.6	0.0030	5.1	193	44.9	0.4
Tributary6-Cnst	1675	5-Year	289	6437.0	6440.2		6440.5	0.0054	4.7	62	26.5	0.5
Tributary6-Cnst	1675	10-Year	428	6437.0	6440.9		6441.3	0.0055	5.2	82	29.6	0.6
Tributary6-Cnst	1675	100-Year	991	6437.0	6442.9		6443.5	0.0057	6.6	151	39.7	0.6
Tributary6-Cnst	1668.39	5-Year	289	6436.9	6440.0		6440.4	0.0066	5.1	57	24.9	0.6
Tributary6-Cnst	1668.39	10-Year	428	6436.9	6440.7		6441.2	0.0067	5.7	75	27.8	0.6
Tributary6-Cnst	1668.39	100-Year	991	6436.9	6442.7		6443.5	0.0071	7.1	140	38.7	0.7
Tributary6-Cnst	1650	5-Year	289	6436.5	6439.7		6440.3	0.0103	6.0	48	22.3	0.7
Tributary6-Cnst	1650	10-Year	428	6436.5	6440.3		6441.1	0.0108	6.8	63	25.0	0.8
Tributary6-Cnst	1650	100-Year	991	6436.5	6442.2		6443.3	0.0113	8.3	119	37.0	0.8
Tributary6-Cnst	1625	5-Year	289	6436.0	6439.5		6440.0	0.0099	6.0	48	22.2	0.7
Tributary6-Cnst	1625	10-Year	428	6436.0	6440.0		6440.8	0.0110	6.9	62	24.7	0.8
Tributary6-Cnst	1625	100-Year	991	6436.0	6442.0		6443.0	0.0108	8.2	120	36.3	0.8
Tributary6-Cnst	1600	5-Year	289	6436.0	6439.2		6439.8	0.0104	6.0	48	23.0	0.7
Tributary6-Cnst	1600	10-Year	428	6436.0	6439.7		6440.5	0.0120	7.0	62	26.1	0.8
Tributary6-Cnst	1600	100-Year	991	6436.0	6441.8		6442.7	0.0098	7.7	129	40.3	0.8
Tributary6-Cnst	1575	5-Year	289	6436.0	6439.1		6439.5	0.0091	5.2	56	30.9	0.7
Tributary6-Cnst	1575	10-Year	428	6436.0	6439.7		6440.2	0.0086	5.6	76	35.9	0.7
Tributary6-Cnst	1575	100-Year	991	6436.0	6441.9		6442.4	0.0051	5.7	175	54.0	0.6
Tributary6-Cnst	1567.04	5-Year	289	6436.0	6439.1		6439.4	0.0066	4.7	62	31.5	0.6
Tributary6-Cnst	1567.04	10-Year	428	6436.0	6439.7		6440.1	0.0070	5.1	83	38.1	0.6
Tributary6-Cnst	1567.04	100-Year	991	6436.0	6441.9		6442.4	0.0044	5.3	187	57.5	0.5
Tributary6-Cnst	1550	5-Year	289	6436.0	6438.8		6439.3	0.0090	5.4	54	27.9	0.7
Tributary6-Cnst	1550	10-Year	428	6436.0	6439.3		6439.9	0.0100	6.2	69	31.2	0.7
Tributary6-Cnst	1550	100-Year	991	6436.0	6441.7		6442.3	0.0063	6.0	165	55.5	0.6
Tributary6-Cnst	1525	5-Year	289	6436.0	6438.6		6439.0	0.0089	5.2	56	30.2	0.7
Tributary6-Cnst	1525	10-Year	428	6436.0	6439.1		6439.7	0.0096	5.9	72	33.8	0.7
Tributary6-Cnst	1525	100-Year	991	6436.0	6441.6		6442.1	0.0052	5.5	181	60.2	0.6
Tributary6-Cnst	1517.15	5-Year	289	6436.0	6438.5		6438.9	0.0100	5.3	54	30.6	0.7
Tributary6-Cnst	1517.15	10-Year	428	6436.0	6439.0		6439.6	0.0104	6.0	71	34.5	0.7
Tributary6-Cnst	1517.15	100-Year	991	6436.0	6441.6		6442.0	0.0045	5.4	184	55.7	0.5
Tributary6-Cnst	1500	5-Year	289	6435.8	6438.3		6438.8	0.0113	5.5	53	31.7	0.7
Tributary6-Cnst	1500	10-Year	428	6435.8	6438.8		6439.4	0.0109	6.0	71	36.1	0.8
Tributary6-Cnst	1500	100-Year	991	6435.8	6441.6		6442.0	0.0037	5.1	193	55.1	0.5

Tributary6-Cnst	1475	5-Year	289	6435.6	6438.2		6438.5	0.0074	4.5	64	37.3	0.6
Tributary6-Cnst	1475	10-Year	428	6435.6	6438.8		6439.1	0.0066	4.9	87	40.9	0.6
Tributary6-Cnst	1475	100-Year	991	6435.6	6441.5		6441.9	0.0024	4.4	224	57.7	0.4
Tributary6-Cnst	1450	5-Year	289	6435.4	6438.0		6438.3	0.0062	4.2	69	39.9	0.6
Tributary6-Cnst	1450	10-Year	428	6435.4	6438.7		6439.0	0.0053	4.5	95	43.1	0.5
Tributary6-Cnst	1450	100-Year	991	6435.4	6441.5		6441.8	0.0020	4.2	238	57.4	0.4
Tributary6-Cnst	1440.34	5-Year	289	6435.4	6438.1		6438.3	0.0004	3.6	80	41.9	0.5
Tributary6-Cnst	1440.34	10-Year	428	6435.4	6438.7		6438.9	0.0004	4.0	106	44.8	0.5
Tributary6-Cnst	1440.34	100-Year	991	6435.4	6441.5		6441.8	0.0002	3.9	253	58.8	0.3
Tributary6-Cnst	1425	5-Year	342	6435.4	6438.1		6438.3	0.0004	3.5	97	46.3	0.4
Tributary6-Cnst	1425	10-Year	457	6435.4	6438.7		6438.9	0.0003	3.6	128	49.6	0.4
Tributary6-Cnst	1425	100-Year	1076	6435.4	6441.5		6441.8	0.0001	3.8	287	64.0	0.3
Tributary6-Cnst	1406.37	5-Year	342	6435.3	6438.0		6438.2	0.0004	4.0	84	37.9	0.5
Tributary6-Cnst	1406.37	10-Year	457	6435.3	6438.6		6438.9	0.0004	4.2	109	40.8	0.5
Tributary6-Cnst	1406.37	100-Year	1076	6435.3	6441.4		6441.7	0.0002	4.5	237	52.4	0.4
Tributary6-Cnst	1394	5-Year	342	6435.3	6437.6	6437.1	6438.1	0.0011	5.9	58	24.9	0.7
Tributary6-Cnst	1394	10-Year	457	6435.3	6438.1	6437.4	6438.7	0.0011	6.5	71	24.9	0.7
Tributary6-Cnst	1394	100-Year	1076	6435.3	6440.4		6441.5	0.0010	8.5	127	24.9	0.7
Tributary6-Cnst	1392.2	5-Year	342	6435.3	6437.1	6437.1	6438.0	0.0028	7.6	45	24.0	1.0
Tributary6-Cnst	1392.2	10-Year	457	6435.3	6437.5	6437.5	6438.6	0.0028	8.4	54	24.0	1.0
Tributary6-Cnst	1392.2	100-Year	1076	6435.3	6440.1	6439.2	6441.4	0.0018	9.3	116	24.0	0.7
Tributary6-Cnst	1375	5-Year	342	6435.2	6436.9	6437.0	6437.9	0.0035	8.2	42	24.0	1.1
Tributary6-Cnst	1375	10-Year	457	6435.2	6437.3	6437.4	6438.5	0.0034	9.0	51	24.0	1.1
Tributary6-Cnst	1375	100-Year	1076	6435.2	6440.1	6439.1	6441.4	0.0017	9.1	118	24.0	0.7
Tributary6-Cnst	1350	5-Year	342	6435.0	6436.9	6436.9	6437.8	0.0028	7.7	44	24.0	1.0
Tributary6-Cnst	1350	10-Year	457	6435.0	6437.1	6437.2	6438.4	0.0038	9.3	49	24.0	1.2
Tributary6-Cnst	1350	100-Year	1076	6435.0	6440.1	6439.0	6441.3	0.0016	8.9	121	24.0	0.7
Tributary6-Cnst	1325	5-Year	342	6434.9	6436.6	6436.7	6437.7	0.0036	8.3	41	24.0	1.1
Tributary6-Cnst	1325	10-Year	457	6434.9	6437.0	6437.1	6438.2	0.0033	8.9	52	24.0	1.1
Tributary6-Cnst	1325	100-Year	1076	6434.9	6440.0	6438.9	6441.2	0.0015	8.7	124	24.0	0.7
Tributary6-Cnst	1300	5-Year	342	6434.7	6436.4	6436.6	6437.5	0.0041	8.7	39	24.0	1.2
Tributary6-Cnst	1300	10-Year	457	6434.7	6437.2	6437.0	6438.1	0.0021	7.7	59	24.0	0.9
Tributary6-Cnst	1300	100-Year	1076	6434.7	6440.0	6438.7	6441.1	0.0014	8.4	128	24.0	0.6
Tributary6-Cnst	1275	5-Year	342	6434.6	6436.3	6436.4	6437.4	0.0034	8.2	42	24.0	1.1
Tributary6-Cnst	1275	10-Year	457	6434.6	6437.2	6436.8	6438.0	0.0018	7.3	63	24.0	0.8
Tributary6-Cnst	1275	100-Year	1076	6434.6	6440.0	6438.6	6441.1	0.0013	8.2	131	24.0	0.6
Tributary6-Cnst	1250	5-Year	342	6434.4	6436.5	6436.3	6437.2	0.0020	6.9	50	24.0	0.8
Tributary6-Cnst	1250	10-Year	457	6434.4	6437.2	6436.7	6437.9	0.0016	6.9	66	24.0	0.7
Tributary6-Cnst	1250	100-Year	1076	6434.4	6440.0	6438.4	6441.0	0.0012	8.0	134	24.0	0.6
Tributary6-Cnst	1225	5-Year	342	6434.3	6436.5	6436.2	6437.2	0.0016	6.4	53	24.0	0.8
Tributary6-Cnst	1225	10-Year	457	6434.3	6437.2	6436.5	6437.9	0.0013	6.6	70	24.0	0.7
Tributary6-Cnst	1225	100-Year	1076	6434.3	6440.0	6438.3	6441.0	0.0011	7.8	138	24.0	0.6
Tributary6-Cnst	1200	5-Year	342	6434.2	6436.5	6436.0	6437.1	0.0014	6.0	57	24.0	0.7
Tributary6-Cnst	1200	10-Year	457	6434.2	6437.2	6436.4	6437.8	0.0012	6.3	73	24.0	0.6
Tributary6-Cnst	1200	100-Year	1076	6434.2	6440.0	6438.1	6440.9	0.0010	7.6	141	24.0	0.6
Tributary6-Cnst	1188	5-Year	342	6433.8	6435.9	6435.9	6436.9	0.0030	8.1	42	20.0	1.0
Tributary6-Cnst	1188	10-Year	457	6433.8	6436.3	6436.3	6437.6	0.0031	9.0	51	20.0	1.0
Tributary6-Cnst	1188	100-Year	1076	6433.8	6438.3	6438.3	6440.5	0.0035	12.0	90	20.0	1.0
Tributary6-Cnst	1175	5-Year	342	6433.4	6434.9	6435.5	6436.9	0.0076	11.1	31	20.0	1.6
Tributary6-Cnst	1175	10-Year	457	6433.4	6435.3	6435.9	6437.5	0.0070	11.9	38	20.0	1.5
Tributary6-Cnst	1175	100-Year	1076	6433.4	6437.0	6437.9	6440.4	0.0062	14.8	73	20.0	1.4
Tributary6-Cnst	1150	5-Year	342	6432.7	6434.0	6434.8	6436.6	0.0123	13.0	26	20.0	2.0
Tributary6-Cnst	1150	10-Year	457	6432.7	6434.3	6435.2	6437.3	0.0111	13.9	33	20.0	1.9
Tributary6-Cnst	1150	100-Year	1076	6432.7	6435.8	6437.1	6440.2	0.0089	16.8	64	20.0	1.7
Tributary6-Cnst	1125	5-Year	342	6431.9	6433.1	6434.0	6436.2	0.0162	14.2	24	20.0	2.3
Tributary6-Cnst	1125	10-Year	457	6431.9	6433.4	6434.4	6437.0	0.0144	15.1	30	20.0	2.2

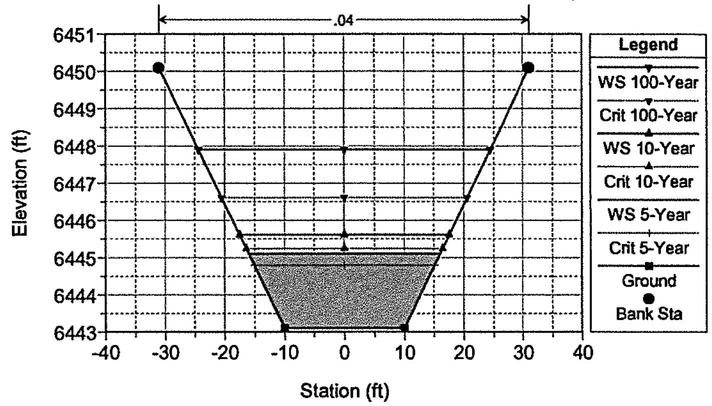
Tributary6-Cnst	1125	100-Year	1076	6431.9	6434.9	6436.4	6440.0	0.0111	18.2	59	20.0	1.9
Tributary6-Cnst	1100	5-Year	342	6431.2	6432.3	6433.3	6435.8	0.0192	15.0	23	20.0	2.5
Tributary6-Cnst	1100	10-Year	457	6431.2	6432.6	6433.7	6436.6	0.0171	16.0	29	20.0	2.4
Tributary6-Cnst	1100	100-Year	1076	6431.2	6433.9	6435.6	6439.7	0.0130	19.2	56	20.0	2.0
Tributary6-Cnst	1075	5-Year	342	6430.4	6431.5	6432.5	6435.3	0.0216	15.6	22	20.0	2.6
Tributary6-Cnst	1075	10-Year	457	6430.4	6431.8	6432.9	6436.1	0.0194	16.7	27	20.0	2.5
Tributary6-Cnst	1075	100-Year	1076	6430.4	6433.1	6434.9	6439.3	0.0147	20.1	54	20.0	2.2
Tributary6-Cnst	1050	5-Year	342	6429.7	6430.7	6431.8	6434.7	0.0235	16.1	21	20.0	2.7
Tributary6-Cnst	1050	10-Year	457	6429.7	6431.0	6432.2	6435.6	0.0214	17.2	27	20.0	2.6
Tributary6-Cnst	1050	100-Year	1076	6429.7	6432.2	6434.1	6438.9	0.0162	20.8	52	20.0	2.3
Tributary6-Cnst	1025	5-Year	342	6428.9	6429.9	6431.0	6434.1	0.0250	16.4	21	20.0	2.8
Tributary6-Cnst	1025	10-Year	457	6428.9	6430.2	6431.4	6435.0	0.0230	17.6	26	20.0	2.7
Tributary6-Cnst	1025	100-Year	1076	6428.9	6431.4	6433.4	6438.5	0.0176	21.4	50	20.0	2.4
Tributary6-Cnst	1023.46	5-Year	342	6428.9	6429.9	6431.0	6434.1	0.0252	16.4	21	20.0	2.8
Tributary6-Cnst	1023.46	10-Year	457	6428.9	6430.1	6431.4	6435.0	0.0232	17.7	26	20.0	2.7
Tributary6-Cnst	1023.46	100-Year	1076	6428.9	6431.4	6433.3	6438.5	0.0177	21.4	50	20.0	2.4
Tributary6-Cnst	1000	5-Year	342	6428.2	6429.2	6430.3	6433.5	0.0262	16.6	21	20.0	2.9
Tributary6-Cnst	1000	10-Year	457	6428.2	6429.4	6430.7	6434.5	0.0244	18.0	25	20.0	2.8
Tributary6-Cnst	1000	100-Year	1076	6428.2	6430.6	6432.6	6438.1	0.0189	21.9	49	20.0	2.5
Tributary6-Cnst	975	5-Year	342	6427.4	6428.4	6429.5	6432.8	0.0271	16.8	20	20.0	2.9
Tributary6-Cnst	975	10-Year	457	6427.4	6428.7	6429.9	6433.8	0.0255	18.3	25	20.0	2.9
Tributary6-Cnst	975	100-Year	1076	6427.4	6429.8	6431.9	6437.6	0.0200	22.4	48	20.0	2.5
Tributary6-Cnst	950	5-Year	342	6426.7	6427.7	6428.8	6432.1	0.0278	17.0	20	20.0	3.0
Tributary6-Cnst	950	10-Year	457	6426.7	6427.9	6429.2	6433.2	0.0264	18.5	25	20.0	2.9
Tributary6-Cnst	950	100-Year	1076	6426.7	6429.0	6431.1	6437.1	0.0211	22.8	47	20.0	2.6
Tributary6-Cnst	925	5-Year	342	6425.9	6426.9	6428.0	6431.4	0.0283	17.0	20	20.0	3.0
Tributary6-Cnst	925	10-Year	457	6425.9	6427.1	6428.4	6432.5	0.0271	18.6	25	20.0	3.0
Tributary6-Cnst	925	100-Year	1076	6425.9	6428.2	6430.4	6436.5	0.0220	23.1	47	20.0	2.7
Tributary6-Cnst	900	5-Year	342	6425.2	6426.1	6427.3	6430.7	0.0287	17.1	20	20.0	3.0
Tributary6-Cnst	900	10-Year	457	6425.2	6426.4	6427.7	6431.8	0.0276	18.7	24	20.0	3.0
Tributary6-Cnst	900	100-Year	1076	6425.2	6427.4	6429.6	6436.0	0.0229	23.4	46	20.0	2.7
Tributary6-Cnst	875	5-Year	342	6424.4	6425.4	6426.5	6430.0	0.0290	17.2	20	20.0	3.0
Tributary6-Cnst	875	10-Year	457	6424.4	6425.6	6426.9	6431.1	0.0281	18.8	24	20.0	3.0
Tributary6-Cnst	875	100-Year	1076	6424.4	6426.7	6428.9	6435.4	0.0237	23.7	45	20.0	2.8
Tributary6-Cnst	850	5-Year	342	6423.7	6424.6	6425.8	6429.3	0.0293	17.2	20	20.0	3.1
Tributary6-Cnst	850	10-Year	457	6423.7	6424.9	6426.2	6430.4	0.0284	18.9	24	20.0	3.0
Tributary6-Cnst	850	100-Year	1076	6423.7	6425.9	6428.1	6434.8	0.0244	23.9	45	20.0	2.8
Tributary6-Cnst	828.31	5-Year	342	6423.0	6424.0	6425.1	6428.6	0.0294	17.3	20	20.0	3.1
Tributary6-Cnst	828.31	10-Year	457	6423.0	6424.2	6425.5	6429.8	0.0287	19.0	24	20.0	3.0
Tributary6-Cnst	828.31	100-Year	1076	6423.0	6425.2	6427.5	6434.2	0.0248	24.1	45	20.0	2.8
Tributary6-Cnst	825	5-Year	342	6422.9	6423.9	6425.0	6428.5	0.0295	17.3	20	20.0	3.1
Tributary6-Cnst	825	10-Year	457	6422.9	6424.1	6425.4	6429.7	0.0287	19.0	24	20.0	3.1
Tributary6-Cnst	825	100-Year	1076	6422.9	6425.1	6427.4	6434.2	0.0249	24.1	45	20.0	2.8
Tributary6-Cnst	810	5-Year	342	6422.5	6423.4	6424.6	6428.1	0.0296	17.3	20	20.0	3.1
Tributary6-Cnst	810	10-Year	457	6422.5	6423.7	6425.0	6429.3	0.0289	19.0	24	20.0	3.1
Tributary6-Cnst	810	100-Year	1076	6422.5	6424.7	6426.9	6433.8	0.0253	24.2	44	20.0	2.9
Tributary6-Cnst	798	5-Year	342	6422.1	6422.8	6423.8	6427.7	0.0369	17.7	19	48.5	3.7
Tributary6-Cnst	798	10-Year	457	6422.1	6423.0	6424.2	6428.9	0.0345	19.5	23	49.4	3.7
Tributary6-Cnst	798	100-Year	1076	6422.1	6423.7	6425.8	6433.5	0.0254	25.1	43	53.8	3.5
Tributary6-Cnst	783	5-Year	342	6418.8	6419.2	6420.2	6426.2	0.6717	21.4	16	35.2	5.4
Tributary6-Cnst	783	10-Year	457	6418.8	6419.3	6420.5	6427.5	0.6010	23.2	20	35.8	5.3
Tributary6-Cnst	783	100-Year	1076	6418.8	6419.8	6421.7	6432.5	0.4217	29.0	38	38.8	4.9
Tributary6-Cnst	767.10	5-Year	342	6415.2	6419.2	6417.7	6419.4	0.0029	4.0	91	34.9	0.4
Tributary6-Cnst	767.10	10-Year	457	6415.2	6416.8	6418.1	6422.0	0.2193	19.0	25	20.5	2.6
Tributary6-Cnst	767.10	100-Year	1076	6415.2	6417.6	6419.7	6427.3	0.2455	26.3	43	25.3	3.0
Tributary6-Cnst	742.1	5-Year	342	6415.2	6419.1		6419.3	0.0032	4.2	88	34.3	0.4

Tributary6-Cnst	742.1	10-Year	457	6415.2	6419.5	6418.1	6419.8	0.0036	4.8	104	36.9	0.4
Tributary6-Cnst	742.1	100-Year	1076	6415.2	6418.2	6419.7	6423.5	0.1013	19.5	59	28.7	2.0
Tributary6-Cnst	742	5-Year	342	6415.2	6418.8	6418.4	6419.3	0.0096	4.9	62	32.7	0.5
Tributary6-Cnst	742	10-Year	457	6415.2	6419.2	6418.7	6419.8	0.0095	5.2	76	35.2	0.5
Tributary6-Cnst	742	100-Year	1076	6415.2	6418.9	6420.2	6423.1	0.0787	14.2	66	33.5	1.3
Tributary6-Cnst	734	5-Year	342	6415.1	6418.3	6418.3	6419.2	0.0220	6.7	47	29.8	0.7
Tributary6-Cnst	734	10-Year	457	6415.1	6418.7	6418.7	6419.7	0.0203	6.9	59	32.1	0.6
Tributary6-Cnst	734	100-Year	1076	6415.1	6419.3	6420.2	6422.3	0.0485	11.8	78	35.5	1.0
Tributary6-Cnst	724.09	5-Year	342	6415.0	6418.0	6416.9	6418.2	0.0026	4.5	86	37.9	0.5
Tributary6-Cnst	724.09	10-Year	457	6415.0	6418.5	6417.3	6418.8	0.0026	5.0	106	40.9	0.5
Tributary6-Cnst	724.09	100-Year	1076	6415.0	6420.3	6418.8	6420.9	0.0028	6.8	190	51.8	0.5
Tributary6-Cnst	716.13	5-Year	342	6414.5	6417.7		6418.2	0.0079	5.8	59	28.7	0.7
Tributary6-Cnst	716.13	10-Year	457	6414.5	6418.1		6418.7	0.0078	6.3	73	31.3	0.7
Tributary6-Cnst	716.13	100-Year	1076	6414.5	6419.6	6419.2	6420.8	0.0093	8.7	124	38.6	0.8
Tributary6-Cnst	704.68	5-Year	342	6414.1	6417.6		6418.1	0.0068	5.6	61	28.2	0.7
Tributary6-Cnst	704.68	10-Year	457	6414.1	6418.1		6418.6	0.0071	6.1	75	31.0	0.7
Tributary6-Cnst	704.68	100-Year	1076	6414.1	6419.3	6419.0	6420.6	0.0113	9.3	116	35.6	0.9
Tributary6-Cnst	701.08	5-Year	342	6414.0	6417.6		6418.1	0.0060	5.4	64	28.3	0.6
Tributary6-Cnst	701.08	10-Year	457	6414.0	6418.1		6418.6	0.0063	5.9	77	30.3	0.7
Tributary6-Cnst	701.08	100-Year	1076	6414.0	6419.2	6419.0	6420.6	0.0113	9.5	114	33.9	0.9
Tributary6-Cnst	686.39	5-Year	342	6413.8	6417.6		6418.0	0.0043	4.8	72	30.1	0.5
Tributary6-Cnst	686.39	10-Year	457	6413.8	6418.1		6418.5	0.0047	5.3	86	33.2	0.6
Tributary6-Cnst	686.39	100-Year	1076	6413.8	6419.3		6420.4	0.0081	8.3	129	37.9	0.8
Tributary6-Cnst	674.65	5-Year	342	6413.7	6417.6		6417.9	0.0033	4.3	79	31.2	0.5
Tributary6-Cnst	674.65	10-Year	457	6413.7	6418.1		6418.4	0.0037	4.9	94	33.9	0.5
Tributary6-Cnst	674.65	100-Year	1076	6413.7	6419.3		6420.2	0.0068	7.8	138	38.5	0.7
Tributary6-Cnst	658.57	5-Year	342	6413.5	6417.6		6417.8	0.0029	4.0	87	36.6	0.5
Tributary6-Cnst	658.57	10-Year	457	6413.5	6418.1		6418.3	0.0032	4.4	105	41.1	0.5
Tributary6-Cnst	658.57	100-Year	1076	6413.5	6419.4		6420.0	0.0050	6.5	167	51.0	0.6
Tributary6-Cnst	650.0	5-Year	342	6413.4	6417.1	6416.8	6417.7	0.0109	6.5	52	28.0	0.8
Tributary6-Cnst	650.0	10-Year	457	6413.4	6417.5	6417.3	6418.3	0.0119	6.8	67	36.8	0.9
Tributary6-Cnst	650.0	100-Year	1076	6413.4	6418.8	6418.8	6419.9	0.0142	8.7	124	53.5	1.0
Tributary6-Cnst	645.56	5-Year	342	6413.3	6416.8	6416.8	6417.7	0.0159	7.5	46	26.7	1.0
Tributary6-Cnst	645.56	10-Year	457	6413.3	6417.3	6417.3	6418.2	0.0158	7.6	60	33.9	1.0
Tributary6-Cnst	645.56	100-Year	1076	6413.3	6418.4	6418.6	6419.8	0.0198	9.6	112	53.9	1.2
Tributary6-Cnst	635.65	5-Year	342	6413.2	6416.1	6416.5	6417.4	0.0383	9.2	37	31.2	1.5
Tributary6-Cnst	635.65	10-Year	457	6413.2	6416.3	6416.8	6417.9	0.0388	10.0	46	34.2	1.5
Tributary6-Cnst	635.65	100-Year	1076	6413.2	6417.2	6417.9	6419.5	0.0457	12.1	89	57.1	1.7
Tributary6-Cnst	625.0	5-Year	342	6413.1	6416.4	6416.4	6417.1	0.0174	6.5	53	41.0	1.0
Tributary6-Cnst	625.0	10-Year	457	6413.1	6416.8	6416.8	6417.5	0.0169	6.7	68	50.2	1.0
Tributary6-Cnst	625.0	100-Year	1076	6413.1	6417.8	6417.9	6418.9	0.0159	8.3	129	65.1	1.0
Tributary6-Cnst	618.89	5-Year	342	6413.0	6416.0	6416.2	6417.0	0.0217	7.8	44	30.4	1.1
Tributary6-Cnst	618.89	10-Year	457	6413.0	6416.5	6416.6	6417.3	0.0215	7.6	60	43.7	1.1
Tributary6-Cnst	618.89	100-Year	1076	6413.0	6417.5	6417.7	6418.8	0.0209	9.2	118	63.4	1.2
Tributary6-Cnst	603.08	5-Year	342	6412.8	6415.3	6415.6	6416.4	0.0473	8.8	39	41.6	1.6
Tributary6-Cnst	603.08	10-Year	457	6412.8	6415.5	6415.9	6416.8	0.0457	9.3	49	46.6	1.6
Tributary6-Cnst	603.08	100-Year	1076	6412.8	6416.4	6417.0	6418.3	0.0355	11.0	98	59.9	1.5

No Data for Plot

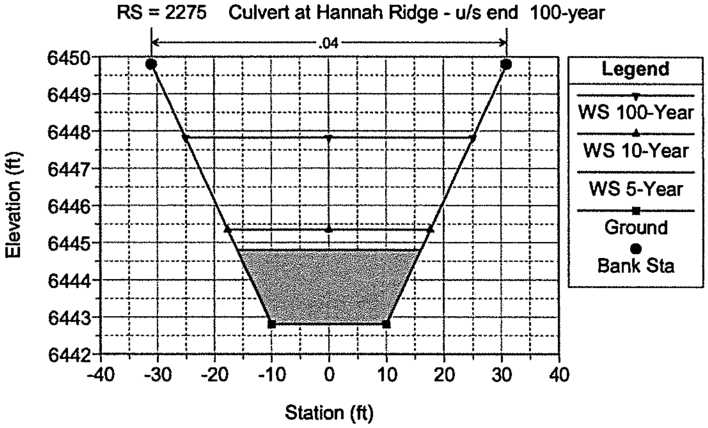
60790 HR Final Constitution Channel

RS = 2300 Culvert at Hannah Ridge - u/s end 100-year



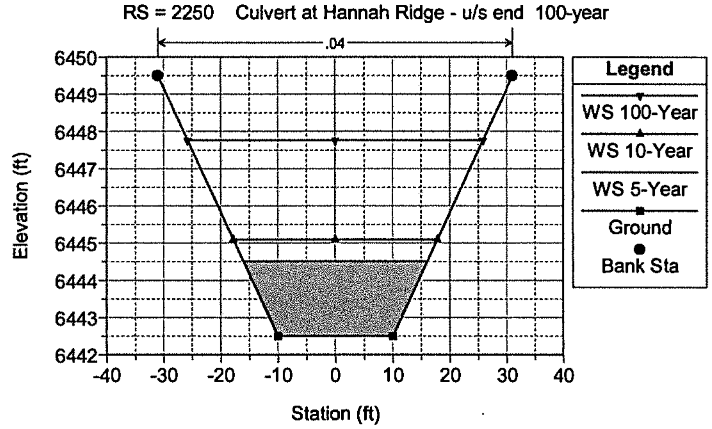
60790 HR Final Constitution Channel

RS = 2275 Culvert at Hannah Ridge - u/s end 100-year



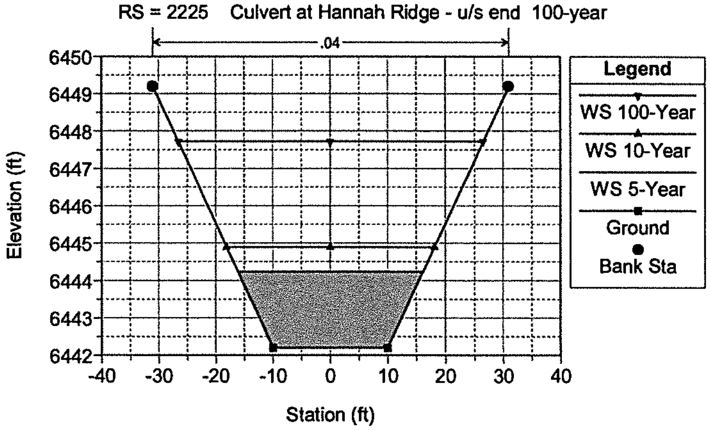
60790 HR Final Constitution Channel

RS = 2250 Culvert at Hannah Ridge - u/s end 100-year



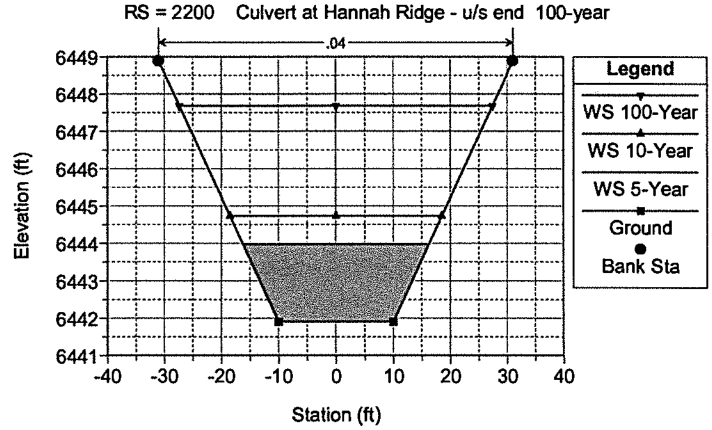
60790 HR Final Constitution Channel

RS = 2225 Culvert at Hannah Ridge - u/s end 100-year



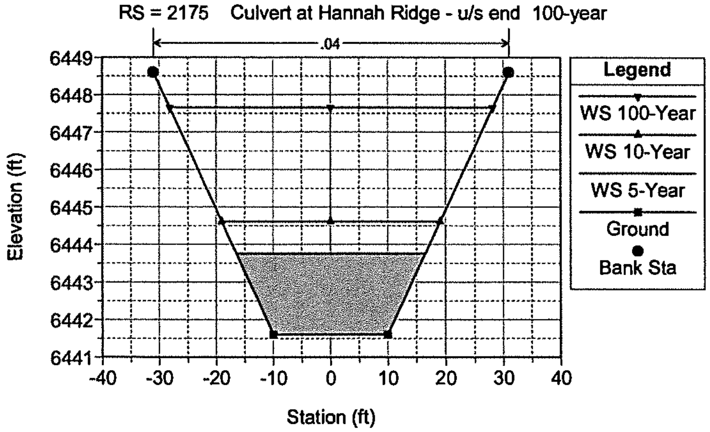
60790 HR Final Constitution Channel

RS = 2200 Culvert at Hannah Ridge - u/s end 100-year



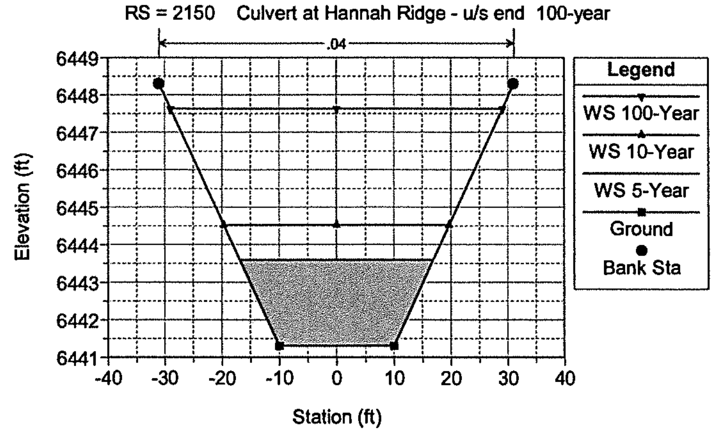
60790 HR Final Constitution Channel

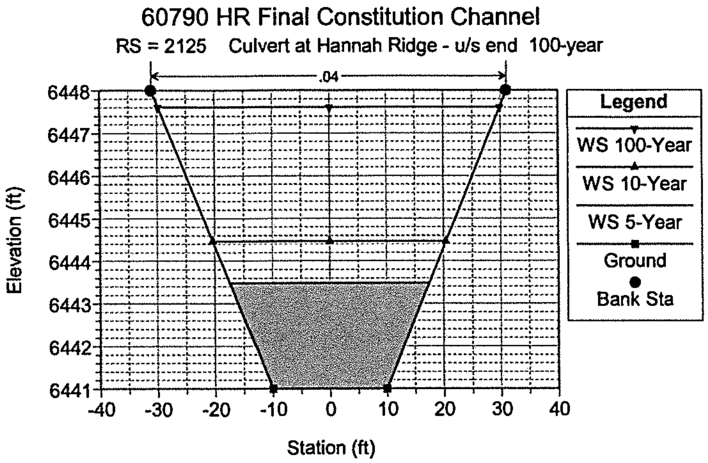
RS = 2175 Culvert at Hannah Ridge - u/s end 100-year

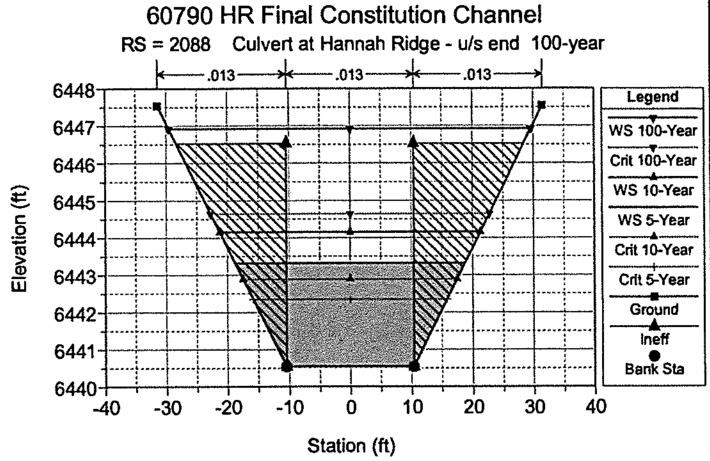


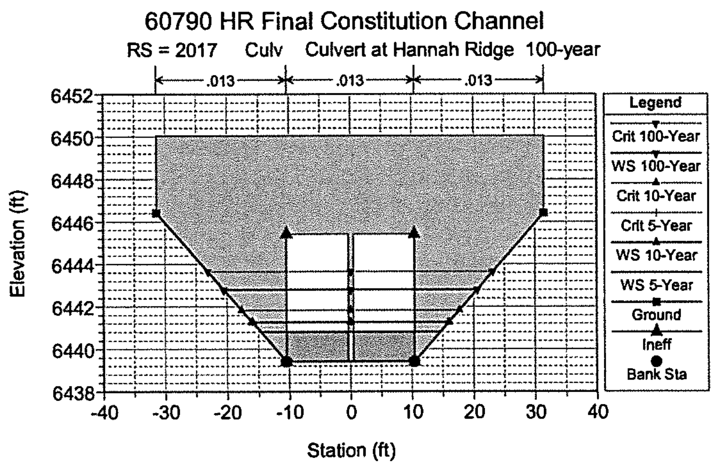
60790 HR Final Constitution Channel

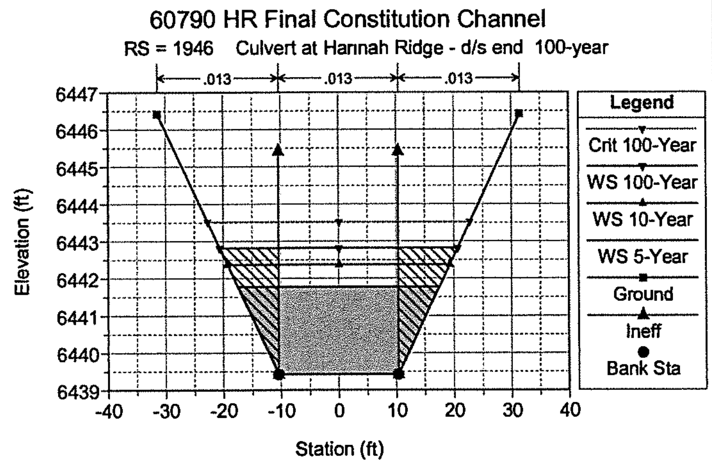
RS = 2150 Culvert at Hannah Ridge - u/s end 100-year

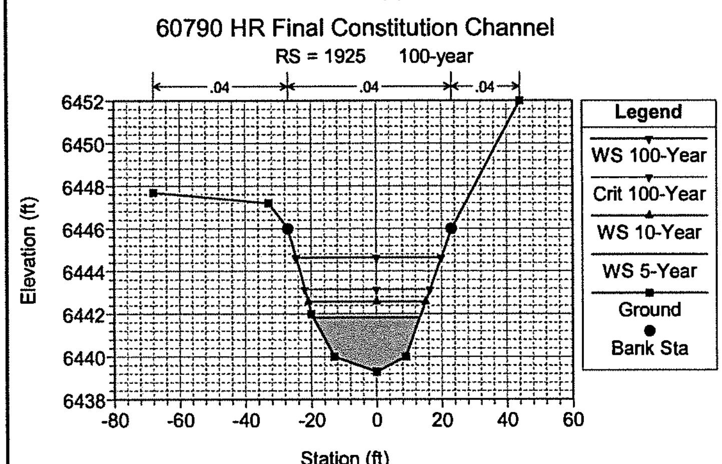


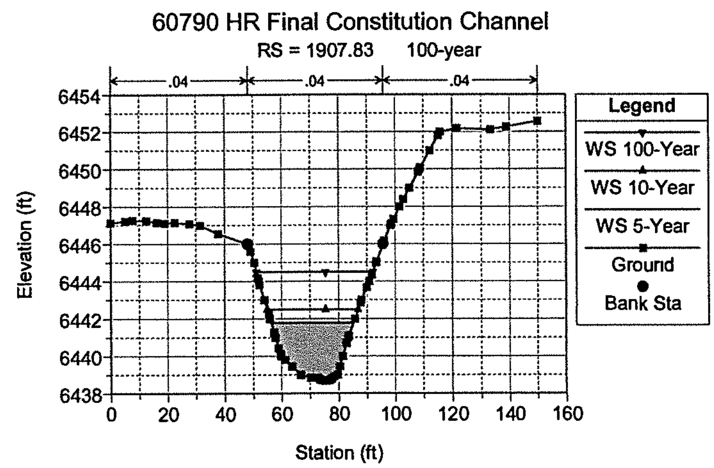

60790 HR Final Constitution Channel
RS = 2125 Culvert at Hannah Ridge - u/s end 100-year
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

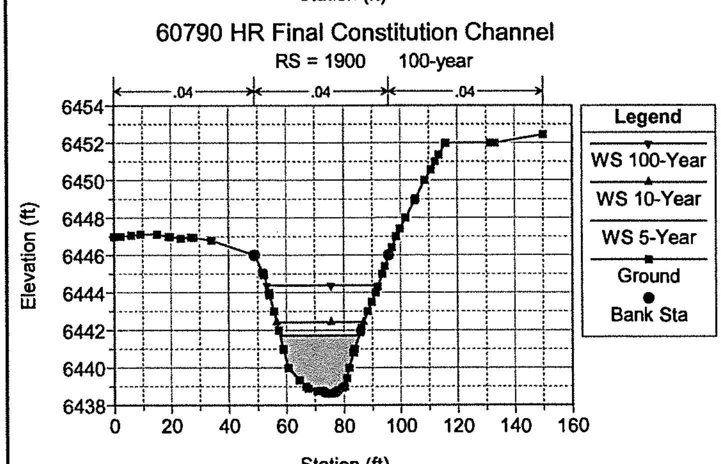

60790 HR Final Constitution Channel
RS = 2088 Culvert at Hannah Ridge - u/s end 100-year
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Crit 100-Year
WS 10-Year
WS 5-Year
Crit 10-Year
Crit 5-Year
Ground
Ineff
Bank Sta

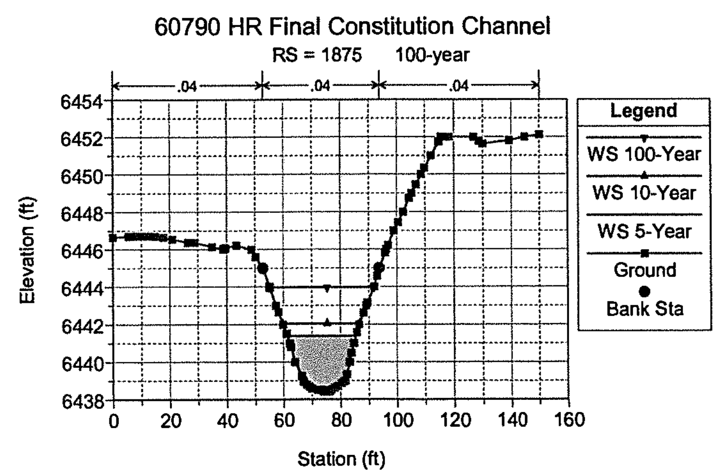

60790 HR Final Constitution Channel
RS = 2017 Culv Culvert at Hannah Ridge 100-year
Elevation (ft)
Station (ft)
Legend
Crit 100-Year
WS 100-Year
Crit 10-Year
Crit 5-Year
WS 10-Year
WS 5-Year
Ground
Ineff
Bank Sta


60790 HR Final Constitution Channel
RS = 1946 Culvert at Hannah Ridge - d/s end 100-year
Elevation (ft)
Station (ft)
Legend
Crit 100-Year
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Ineff
Bank Sta

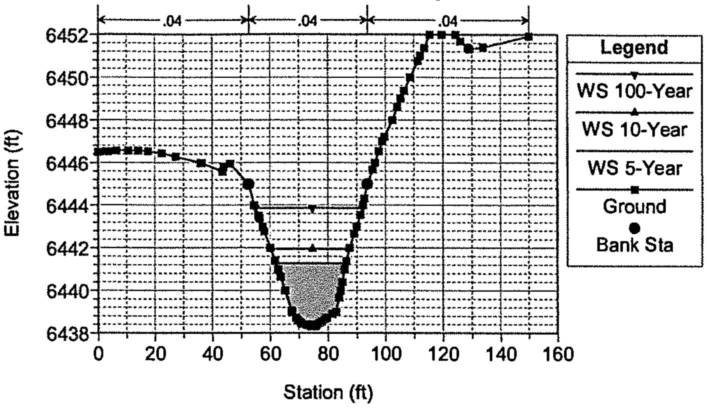

60790 HR Final Constitution Channel
RS = 1925 100-year
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Crit 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta


60790 HR Final Constitution Channel
RS = 1907.83 100-year
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

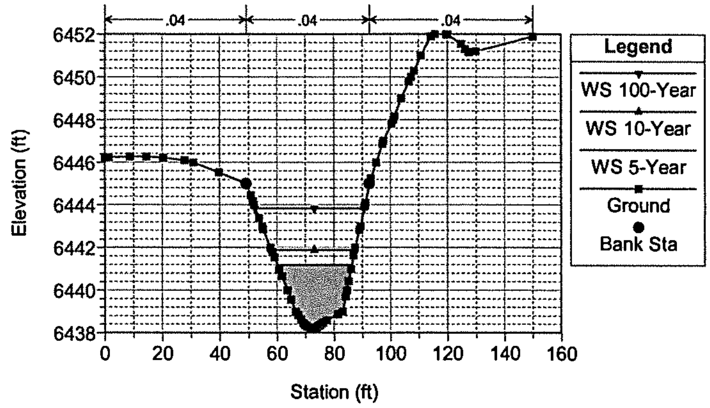

60790 HR Final Constitution Channel
RS = 1900 100-year
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta


60790 HR Final Constitution Channel
RS = 1875 100-year
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

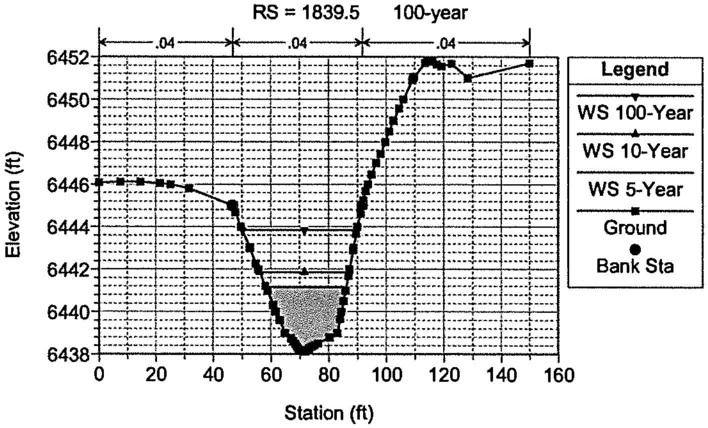
60790 HR Final Constitution Channel
RS = 1863.36 100-year



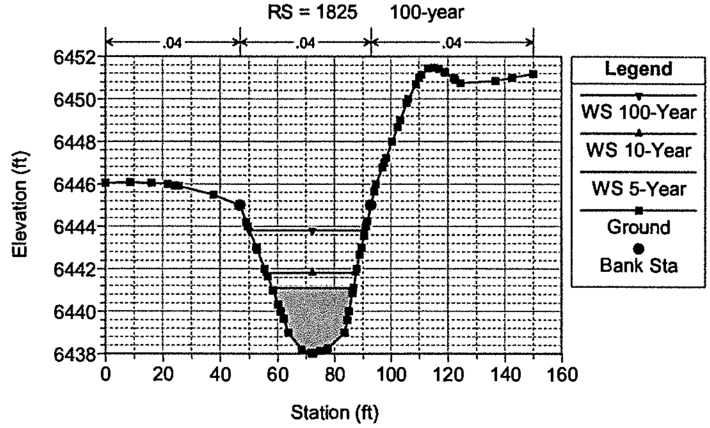
60790 HR Final Constitution Channel
RS = 1850 100-year



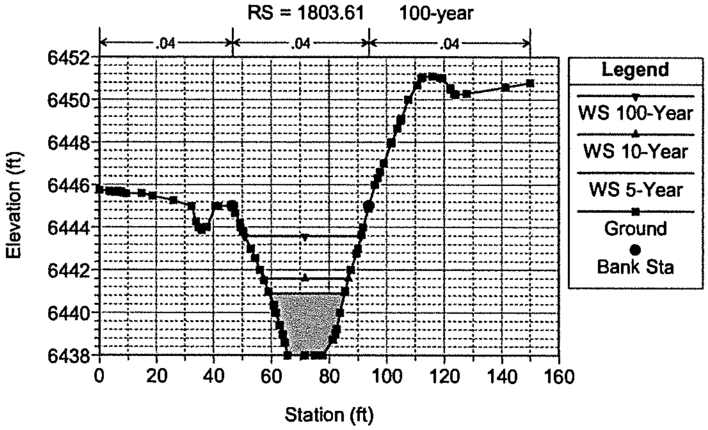
60790 HR Final Constitution Channel
RS = 1839.5 100-year



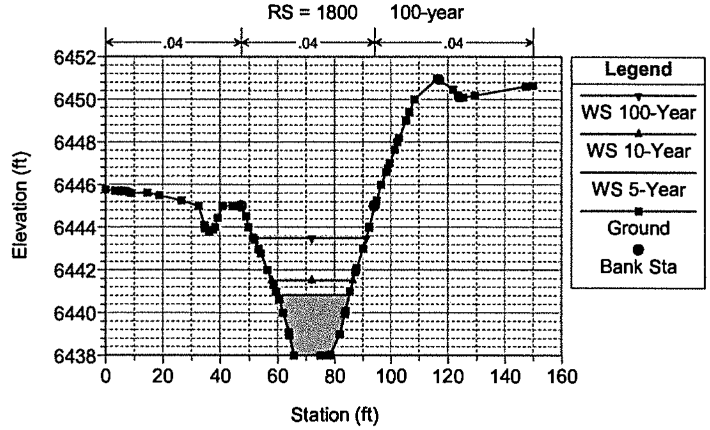
60790 HR Final Constitution Channel
RS = 1825 100-year



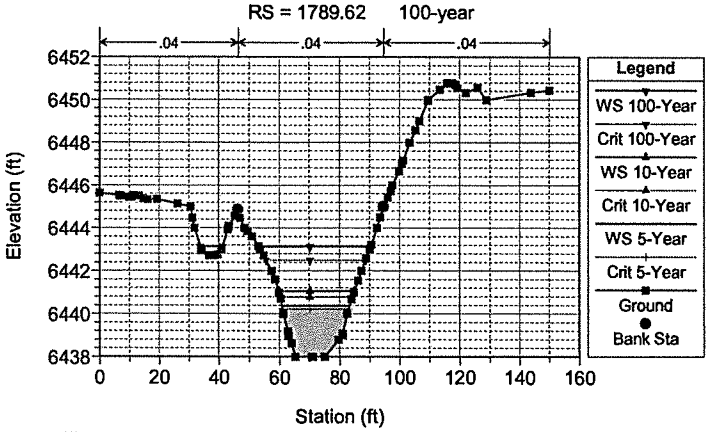
60790 HR Final Constitution Channel
RS = 1803.61 100-year



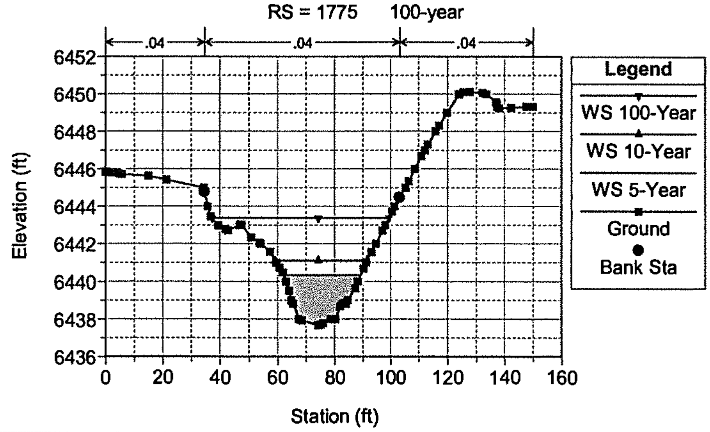
60790 HR Final Constitution Channel
RS = 1800 100-year

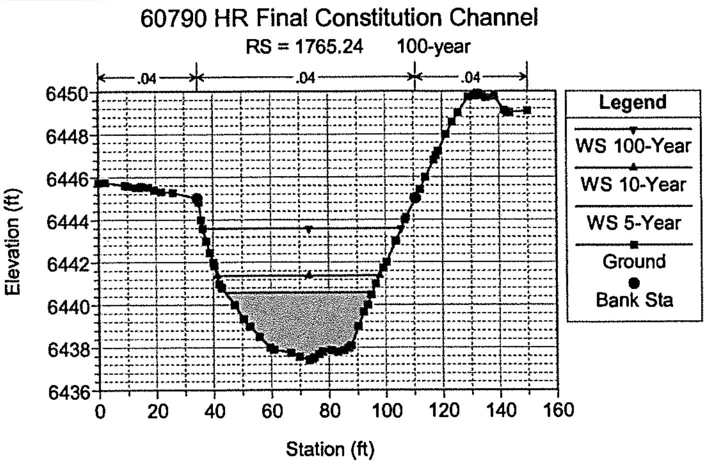


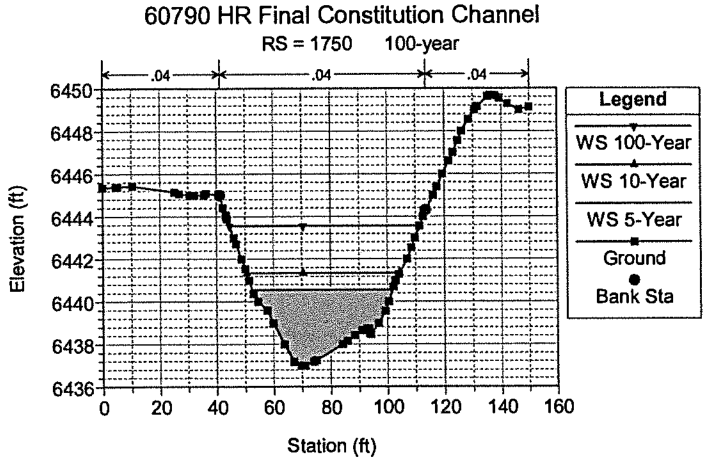
60790 HR Final Constitution Channel
RS = 1789.62 100-year

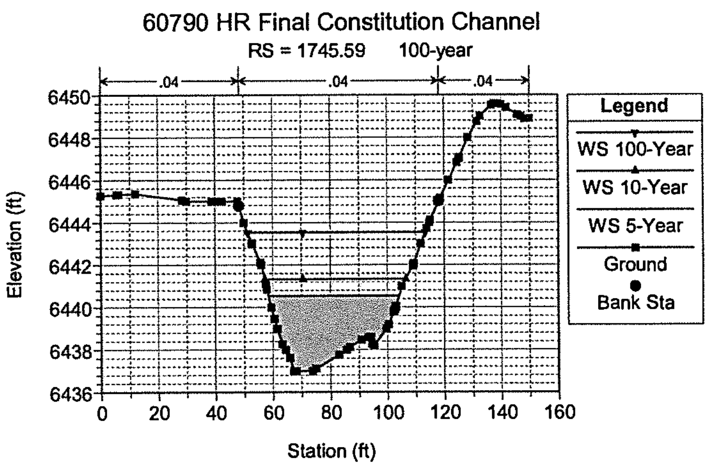


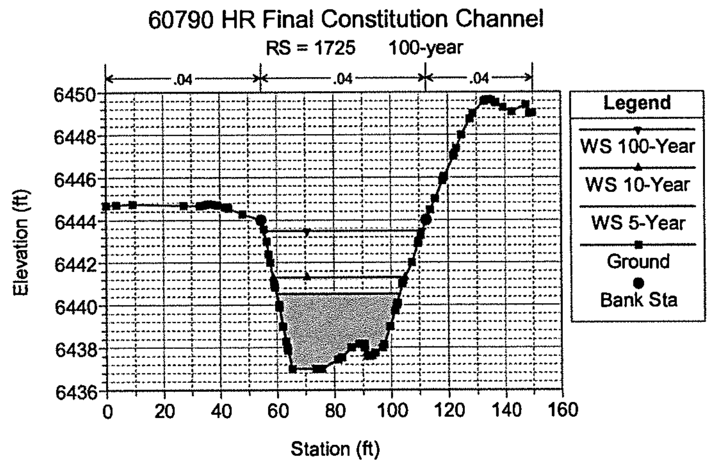
60790 HR Final Constitution Channel
RS = 1775 100-year

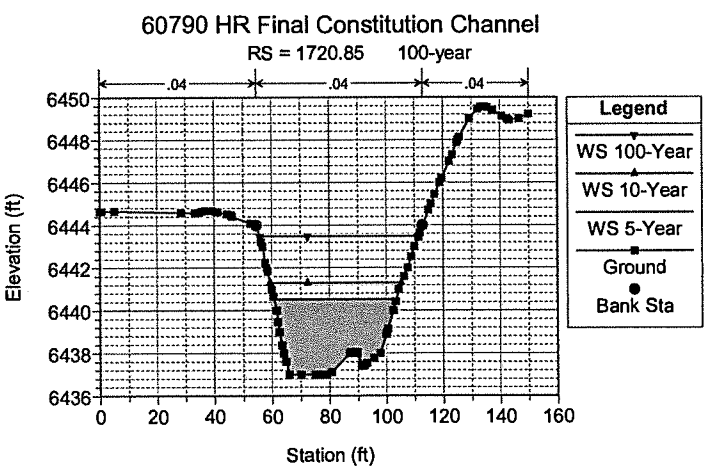


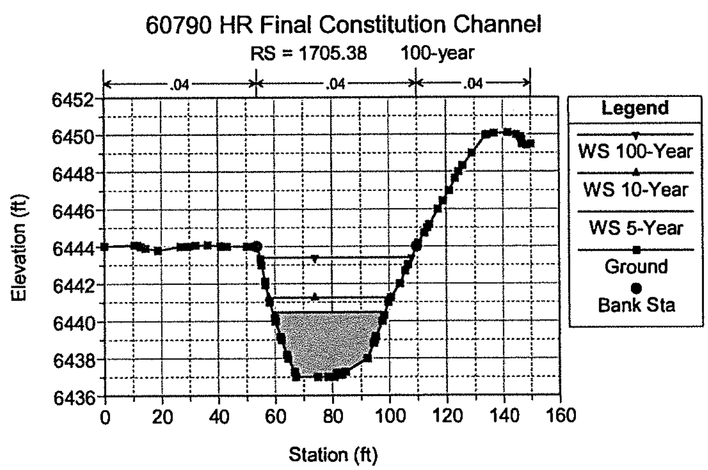

60790 HR Final Constitution Channel
RS = 1765.24 100-year
.04
.04
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

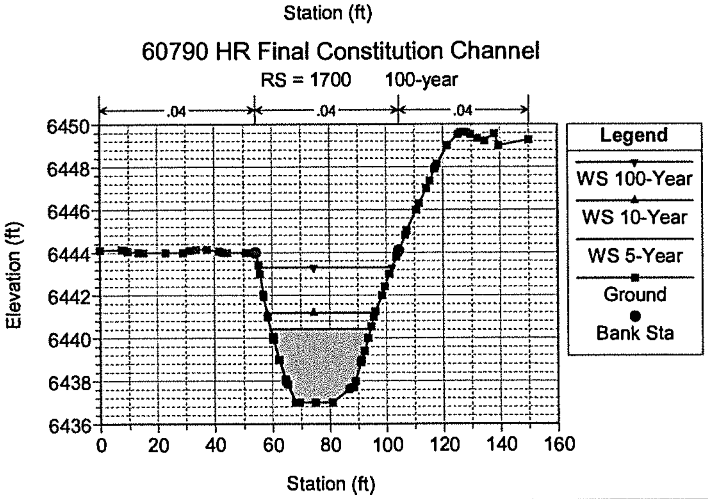

60790 HR Final Constitution Channel
RS = 1750 100-year
.04
.04
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

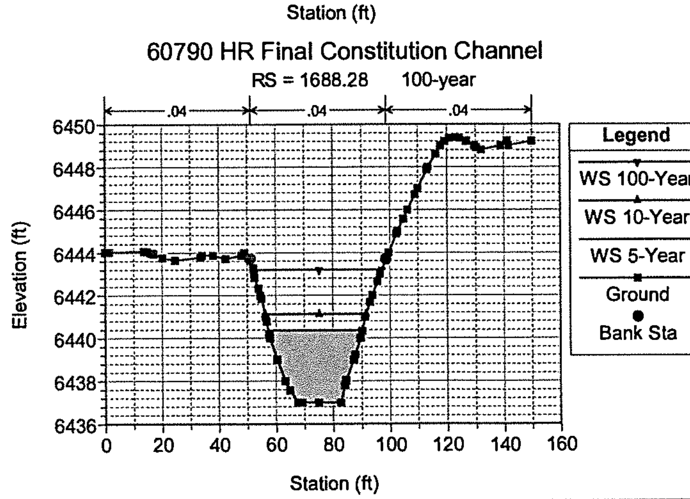

60790 HR Final Constitution Channel
RS = 1745.59 100-year
.04
.04
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

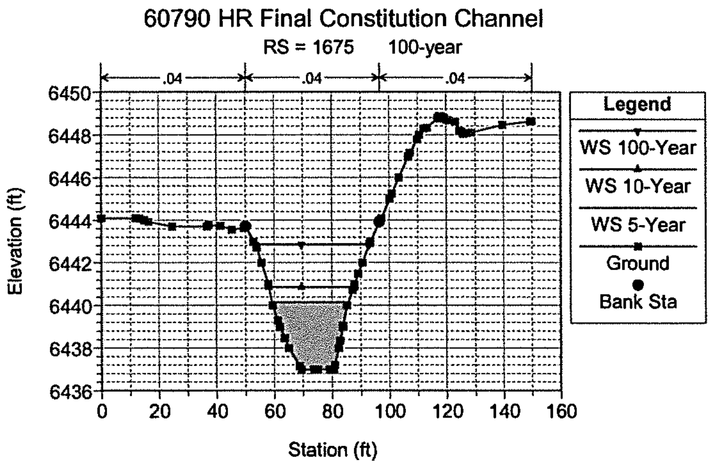

60790 HR Final Constitution Channel
RS = 1725 100-year
.04
.04
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

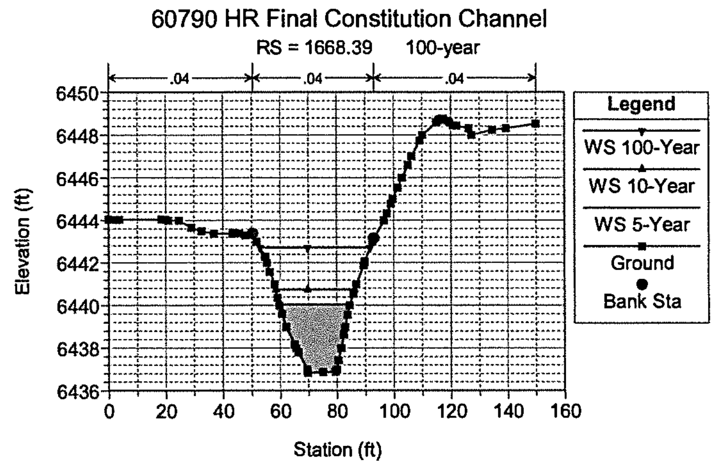

60790 HR Final Constitution Channel
RS = 1720.85 100-year
.04
.04
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

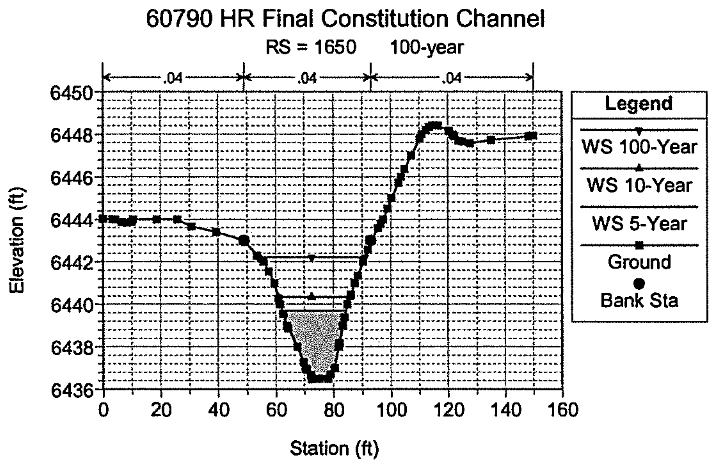

60790 HR Final Constitution Channel
RS = 1705.38 100-year
.04
.04
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

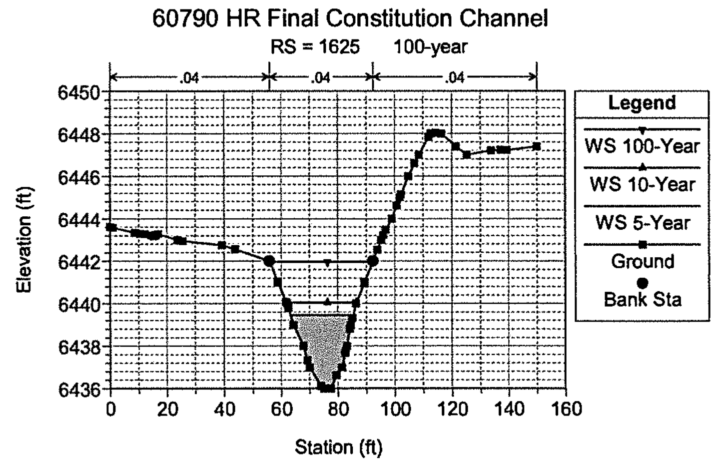

60790 HR Final Constitution Channel
RS = 1700 100-year
.04
.04
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

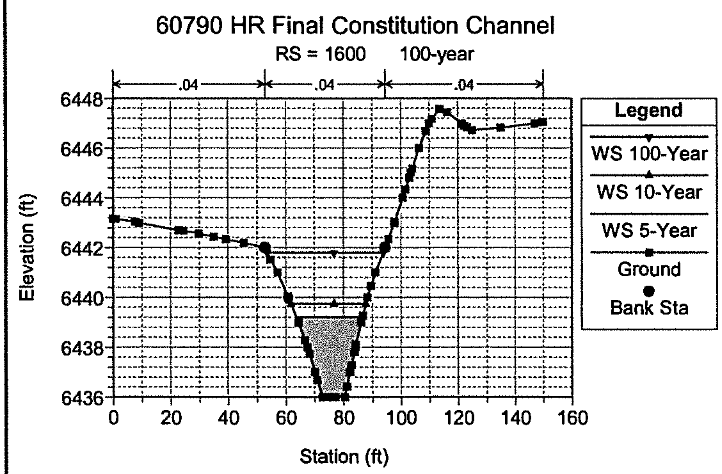

60790 HR Final Constitution Channel
RS = 1688.28 100-year
.04
.04
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

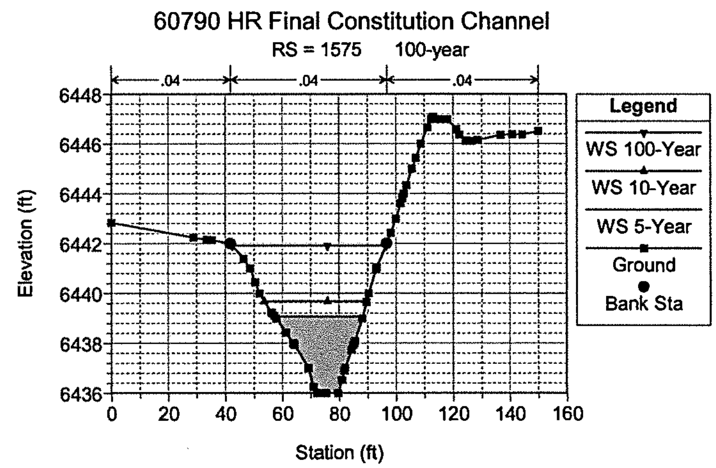

60790 HR Final Constitution Channel
RS = 1675 100-year
.04 .04 .04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

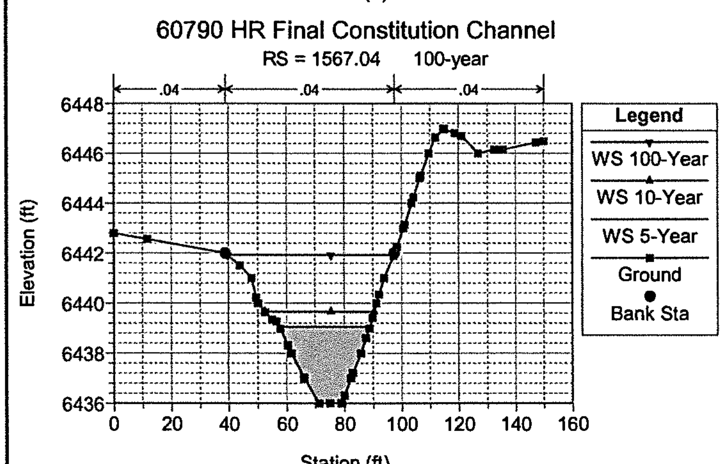

60790 HR Final Constitution Channel
RS = 1668.39 100-year
.04 .04 .04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

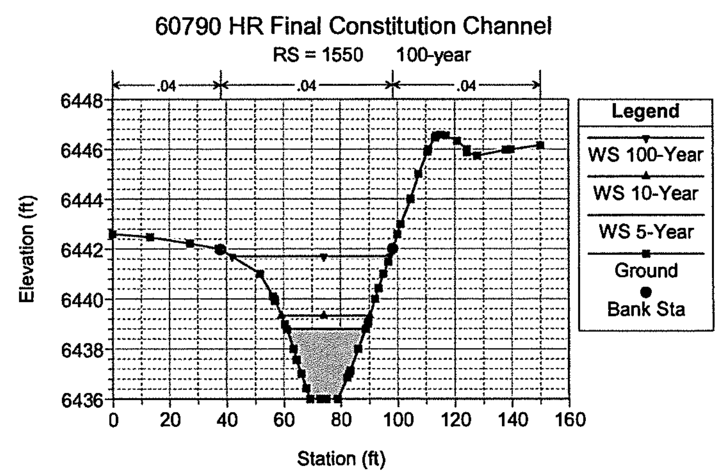

60790 HR Final Constitution Channel
RS = 1650 100-year
.04 .04 .04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta


60790 HR Final Constitution Channel
RS = 1625 100-year
.04 .04 .04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

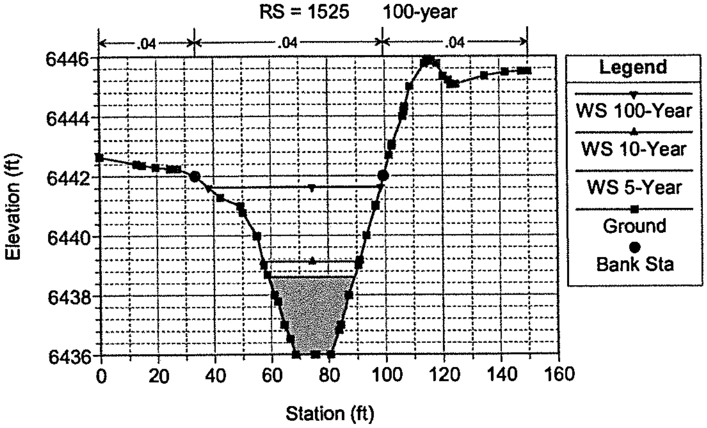

60790 HR Final Constitution Channel
RS = 1600 100-year
.04 .04 .04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta


60790 HR Final Constitution Channel
RS = 1575 100-year
.04 .04 .04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

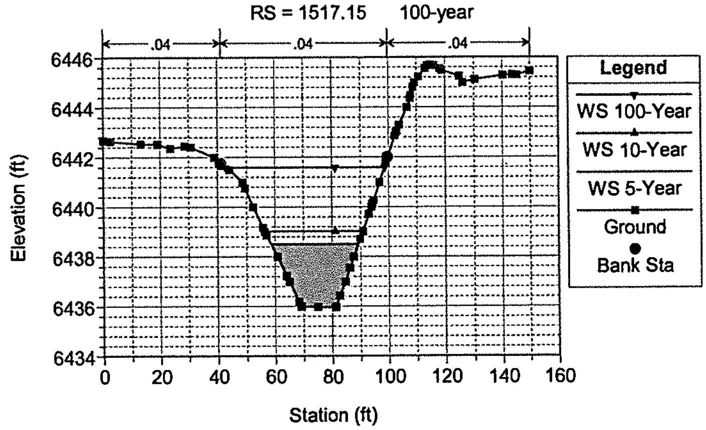

60790 HR Final Constitution Channel
RS = 1567.04 100-year
.04 .04 .04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta


60790 HR Final Constitution Channel
RS = 1550 100-year
.04 .04 .04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

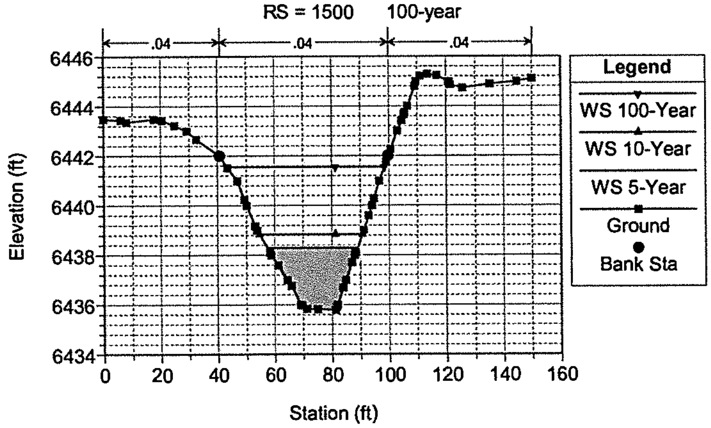
60790 HR Final Constitution Channel
RS = 1525 100-year



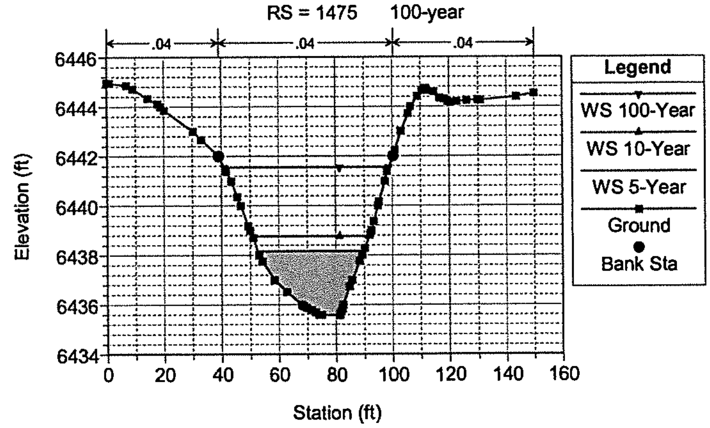
60790 HR Final Constitution Channel
RS = 1517.15 100-year



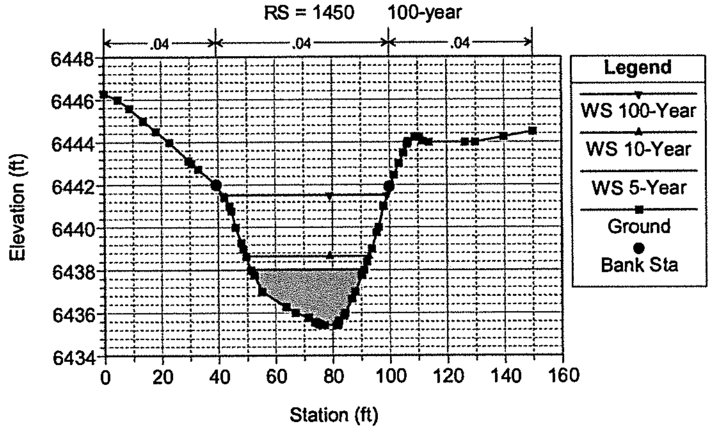
60790 HR Final Constitution Channel
RS = 1500 100-year



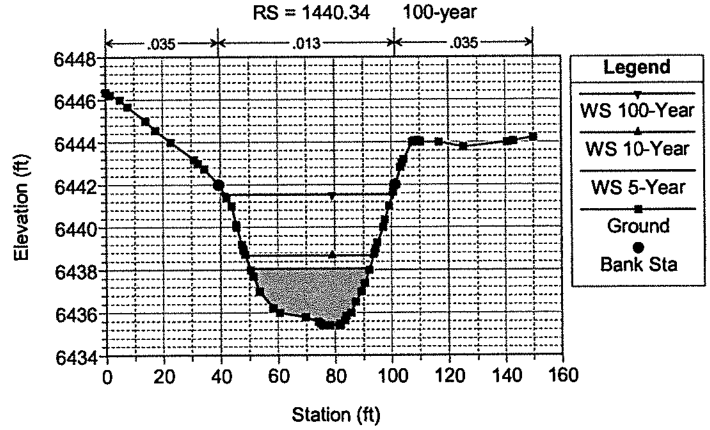
60790 HR Final Constitution Channel
RS = 1475 100-year



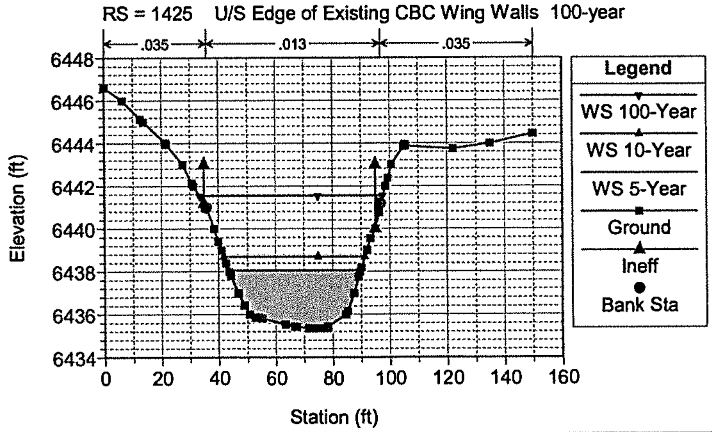
60790 HR Final Constitution Channel
RS = 1450 100-year



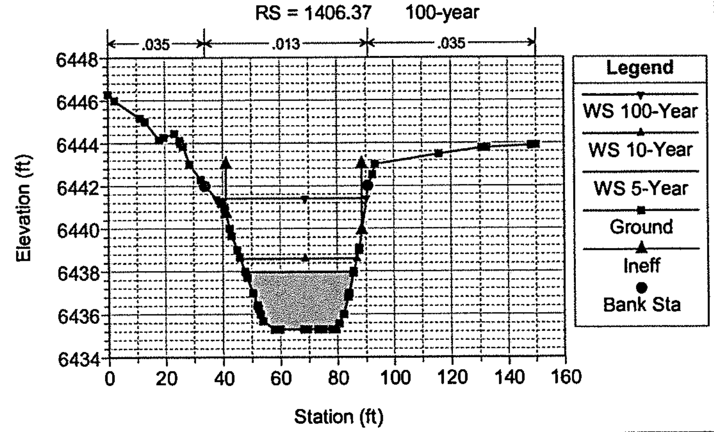
60790 HR Final Constitution Channel
RS = 1440.34 100-year



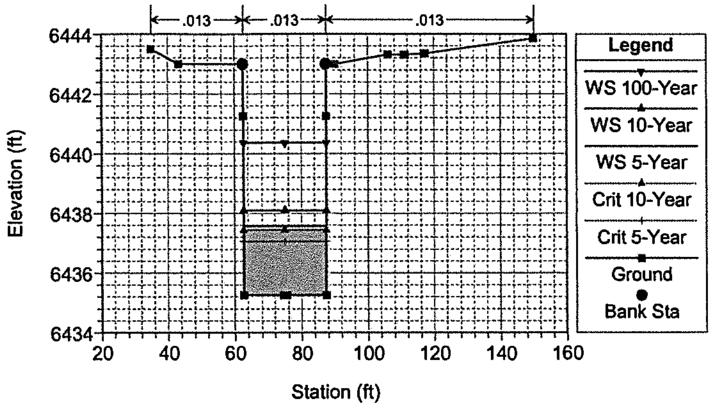
60790 HR Final Constitution Channel
RS = 1425 U/S Edge of Existing CBC Wing Walls 100-year



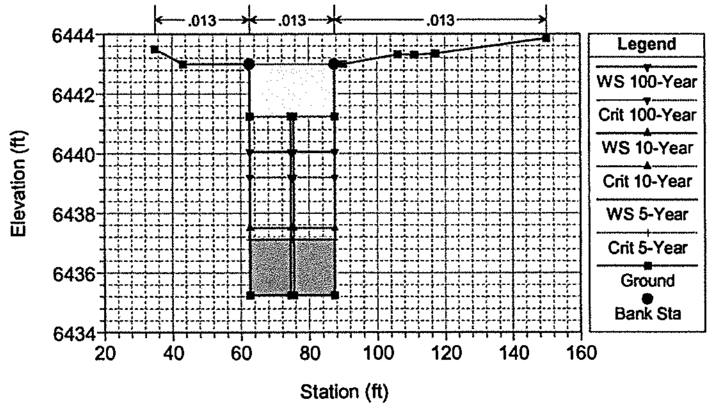
60790 HR Final Constitution Channel
RS = 1406.37 100-year



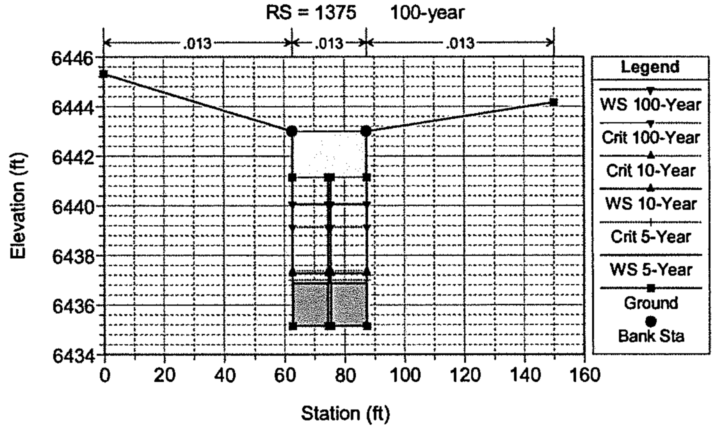
60790 HR Final Constitution Channel
RS = 1394 100-year



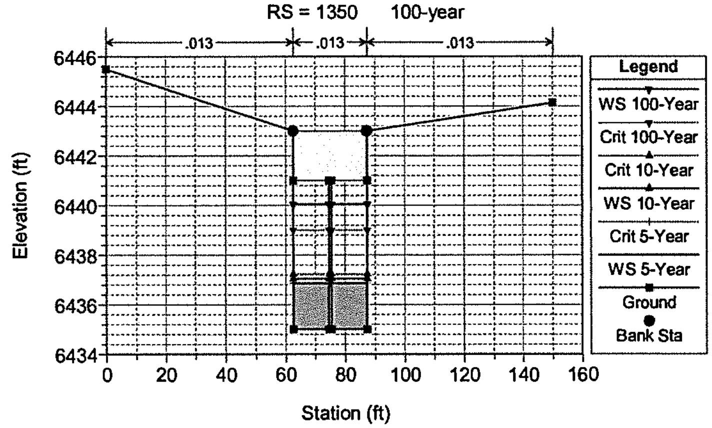
60790 HR Final Constitution Channel
RS = 1392.2 U/s End EX Constitution Ave Dbl 12'w x 6'h 100-year



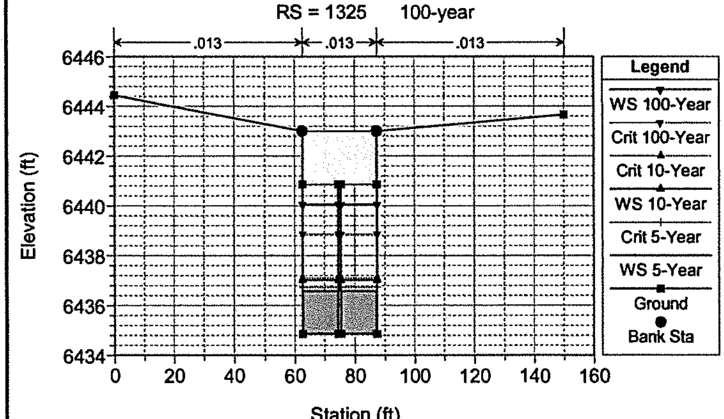
60790 HR Final Constitution Channel
RS = 1375 100-year



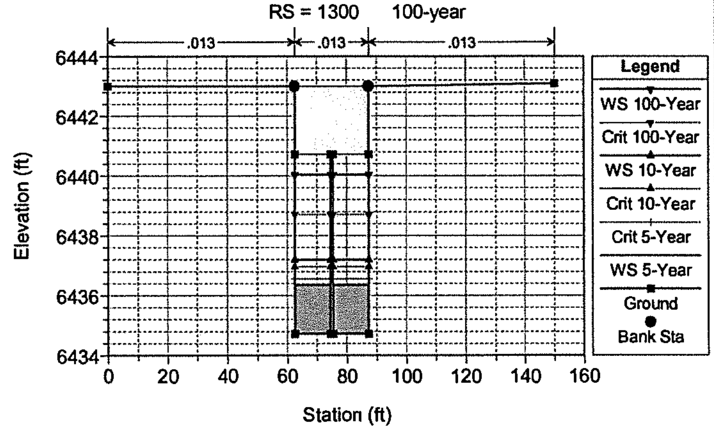
60790 HR Final Constitution Channel
RS = 1350 100-year



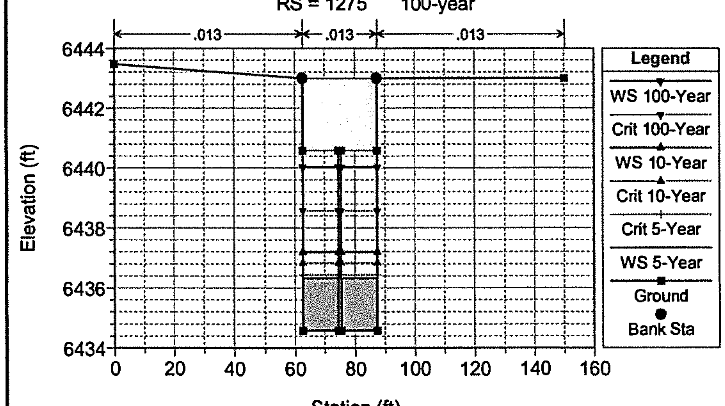
60790 HR Final Constitution Channel
RS = 1325 100-year



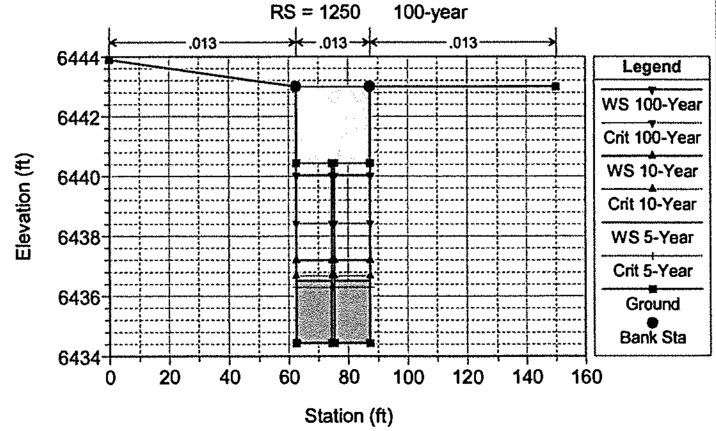
60790 HR Final Constitution Channel
RS = 1300 100-year



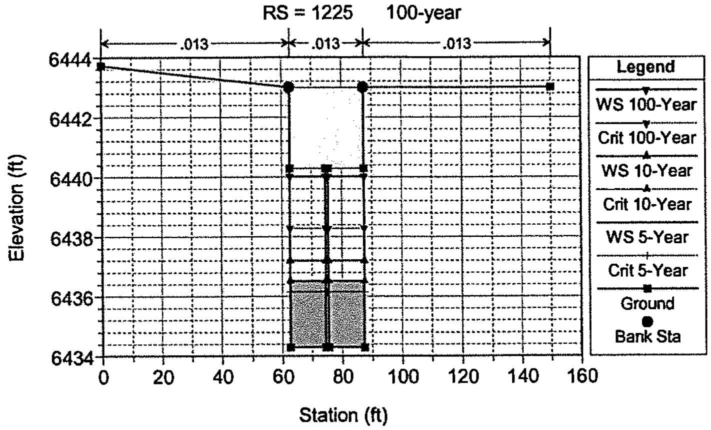
60790 HR Final Constitution Channel
RS = 1275 100-year



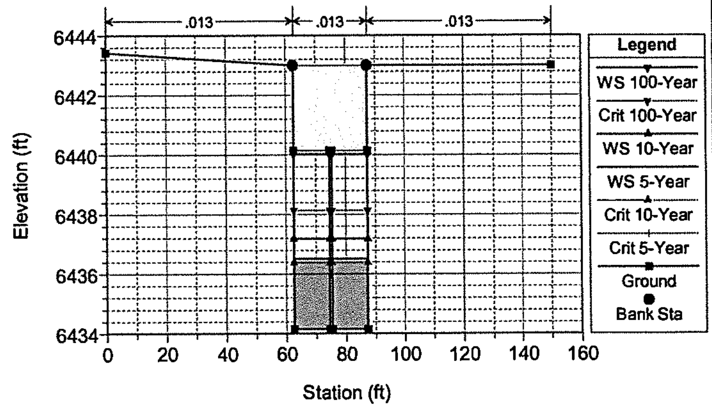
60790 HR Final Constitution Channel
RS = 1250 100-year



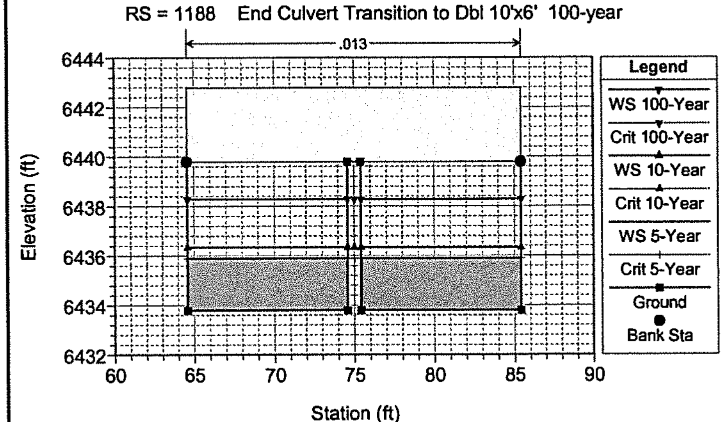
60790 HR Final Constitution Channel
RS = 1225 100-year



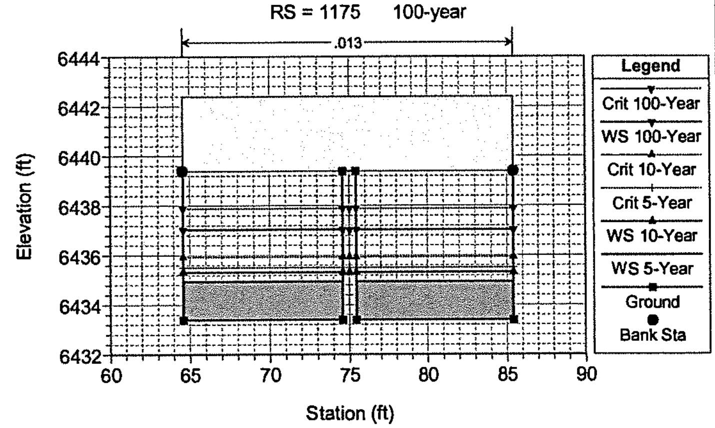
60790 HR Final Constitution Channel
RS = 1200 D/S End EX Constitution Ave Dbl 12'w x 6'h - Begin Culvert Exten 100-year



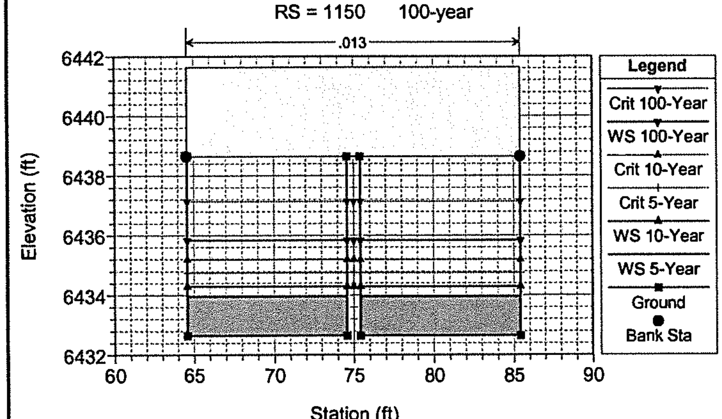
60790 HR Final Constitution Channel
RS = 1188 End Culvert Transition to Dbl 10'x6' 100-year



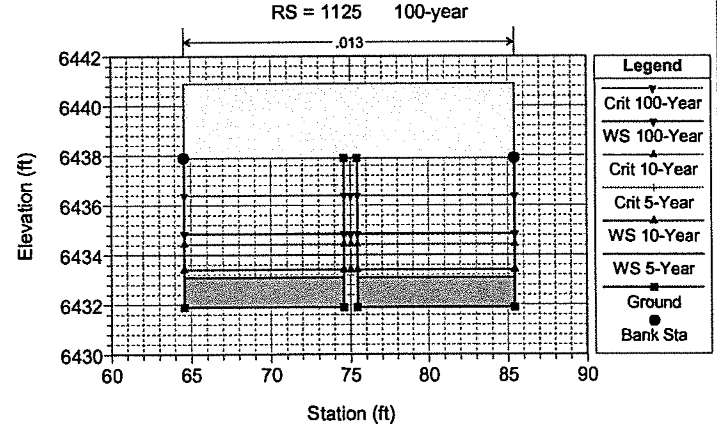
60790 HR Final Constitution Channel
RS = 1175 100-year



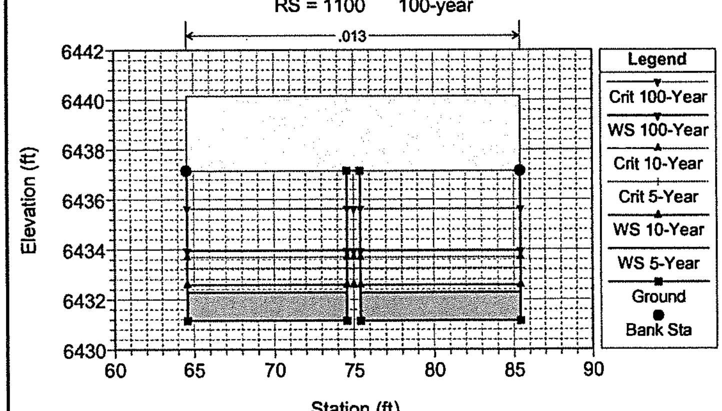
60790 HR Final Constitution Channel
RS = 1150 100-year



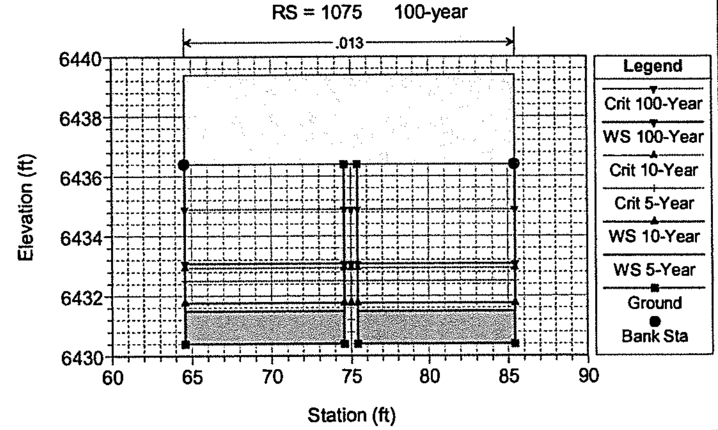
60790 HR Final Constitution Channel
RS = 1125 100-year



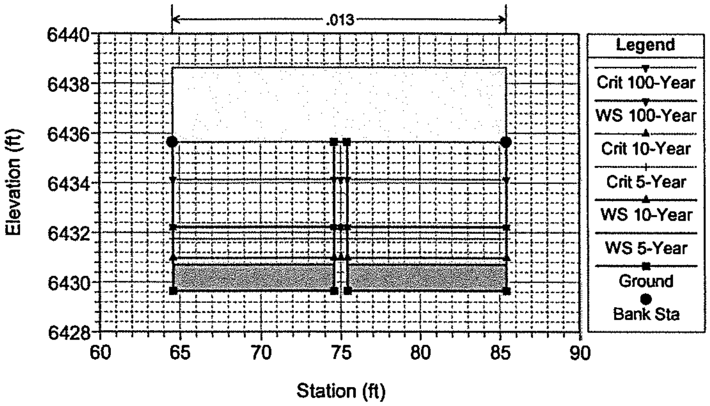
60790 HR Final Constitution Channel
RS = 1100 100-year



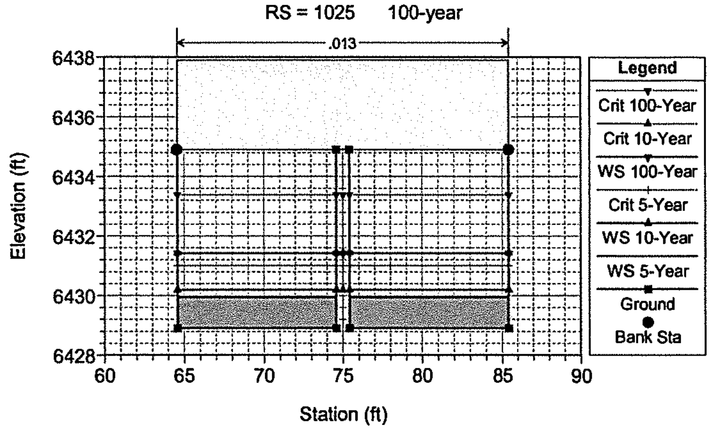
60790 HR Final Constitution Channel
RS = 1075 100-year



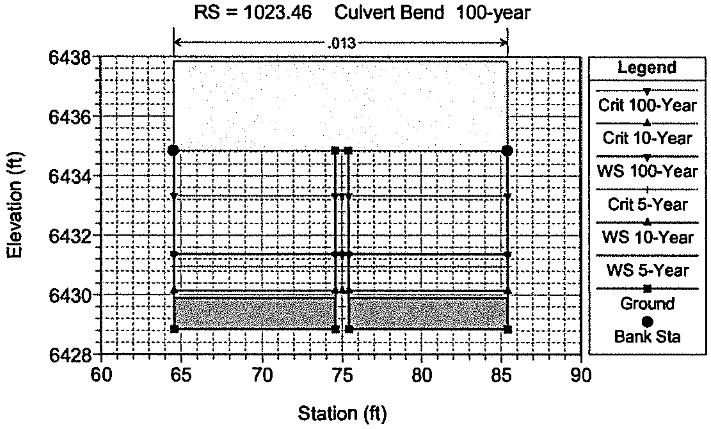
60790 HR Final Constitution Channel
RS = 1050 100-year



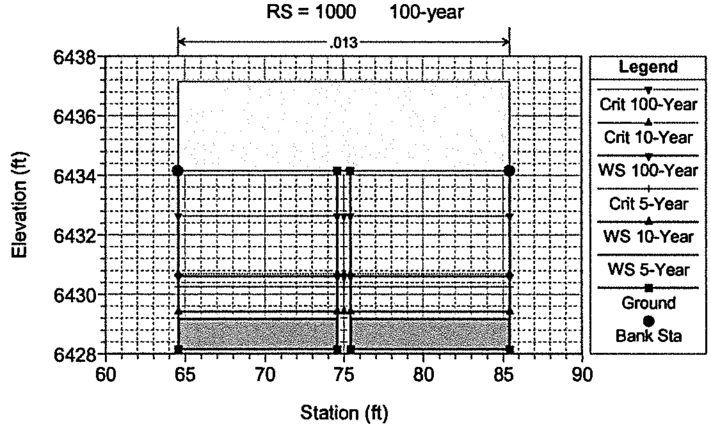
60790 HR Final Constitution Channel
RS = 1025 100-year



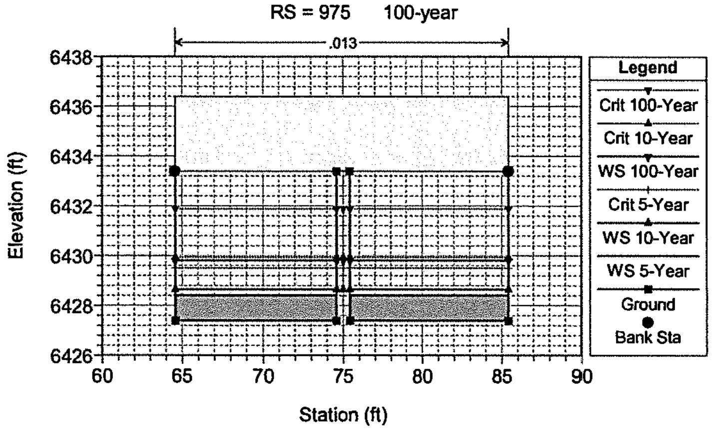
60790 HR Final Constitution Channel
RS = 1023.46 Culvert Bend 100-year



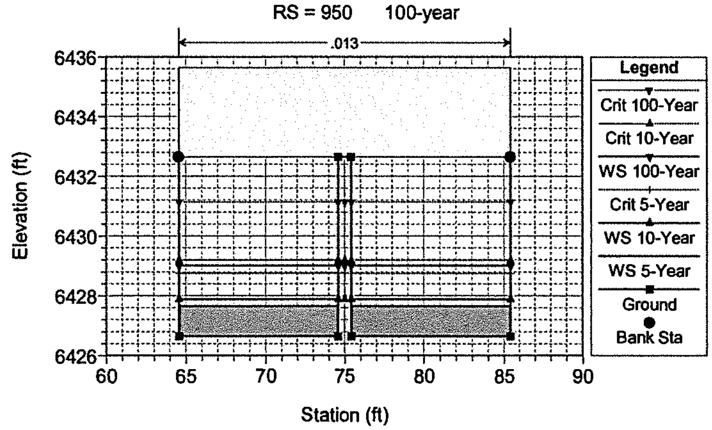
60790 HR Final Constitution Channel
RS = 1000 100-year



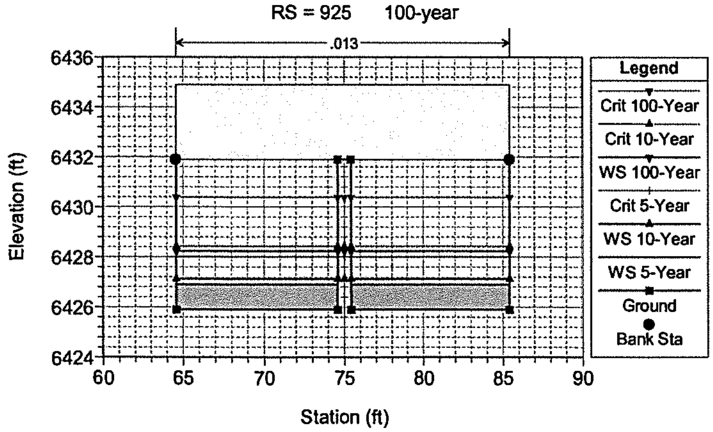
60790 HR Final Constitution Channel
RS = 975 100-year



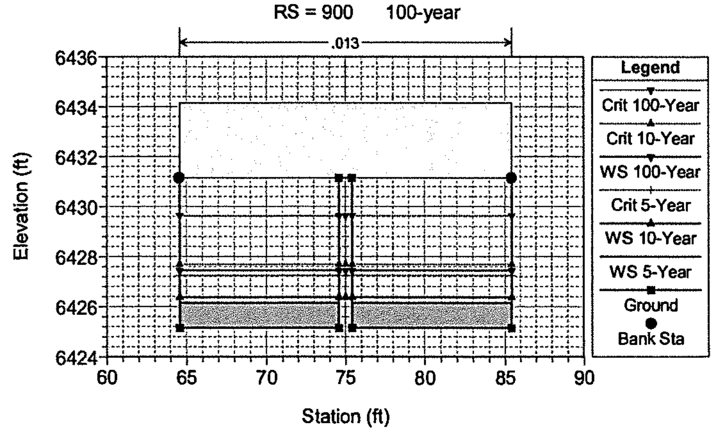
60790 HR Final Constitution Channel
RS = 950 100-year



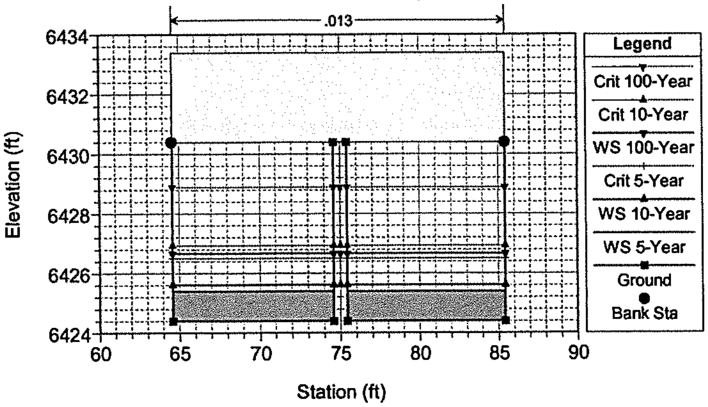
60790 HR Final Constitution Channel
RS = 925 100-year



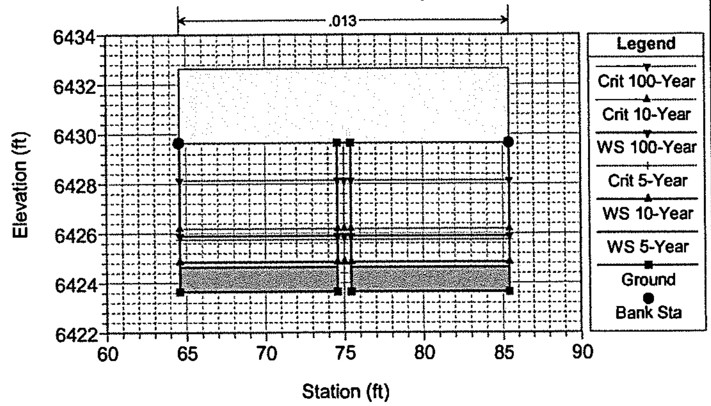
60790 HR Final Constitution Channel
RS = 900 100-year



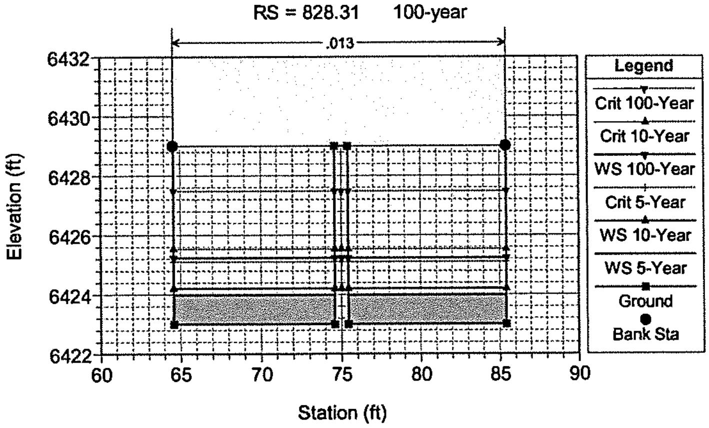
60790 HR Final Constitution Channel
RS = 875 100-year



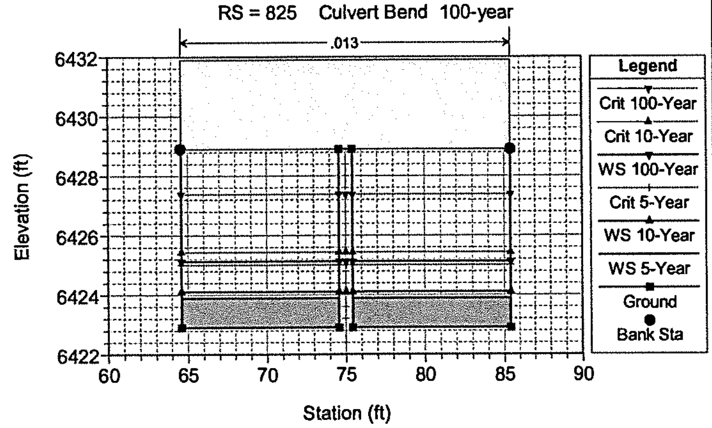
60790 HR Final Constitution Channel
RS = 850 100-year



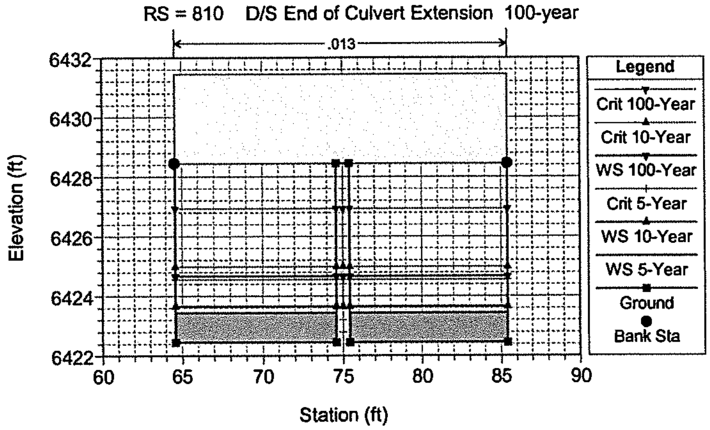
60790 HR Final Constitution Channel
RS = 828.31 100-year



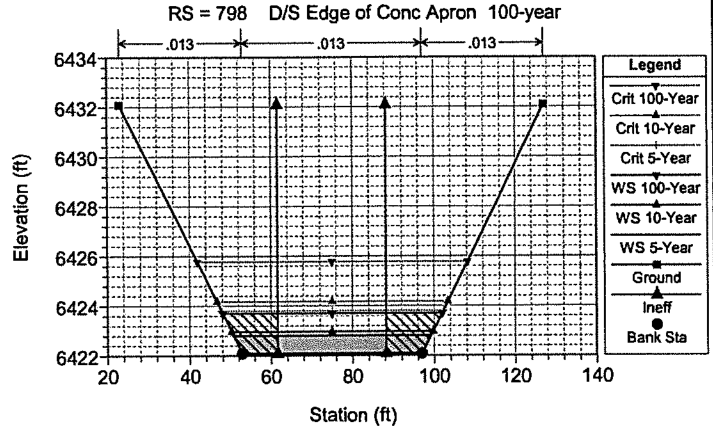
60790 HR Final Constitution Channel
RS = 825 Culvert Bend 100-year



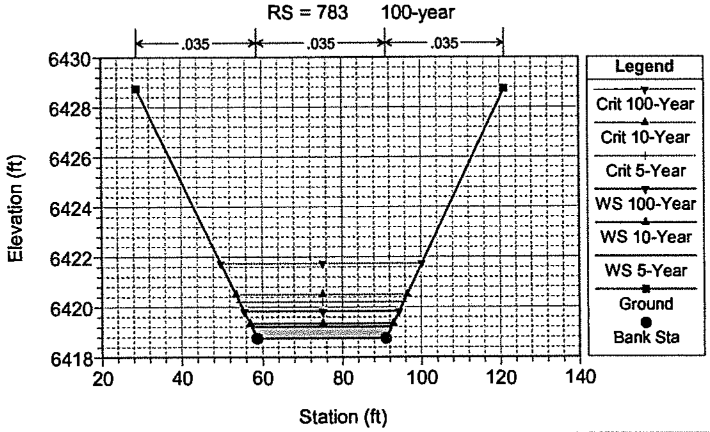
60790 HR Final Constitution Channel
RS = 810 D/S End of Culvert Extension 100-year



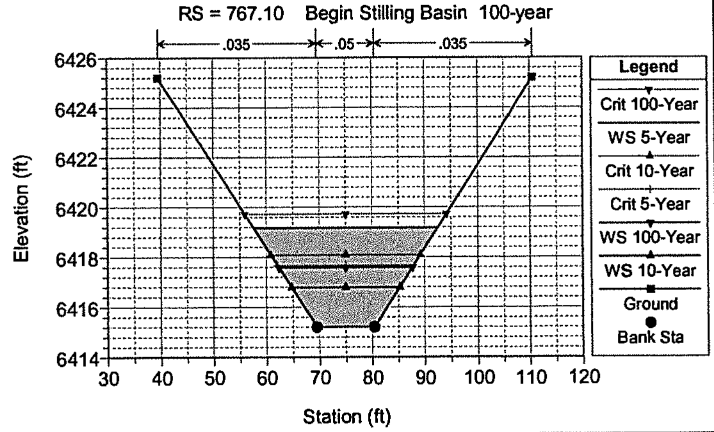
60790 HR Final Constitution Channel
RS = 798 D/S Edge of Conc Apron 100-year

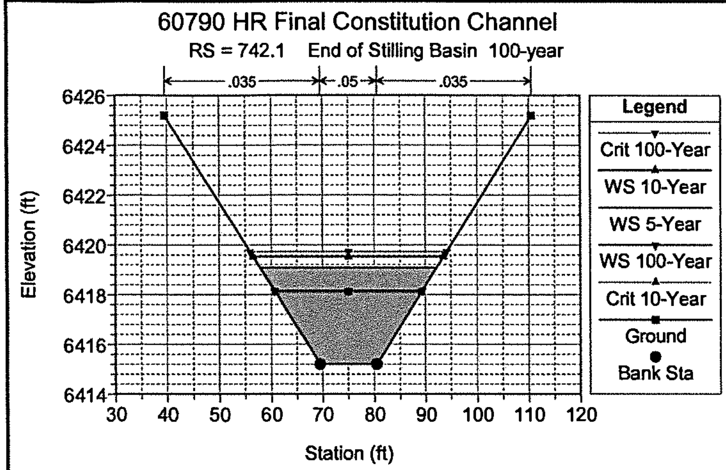


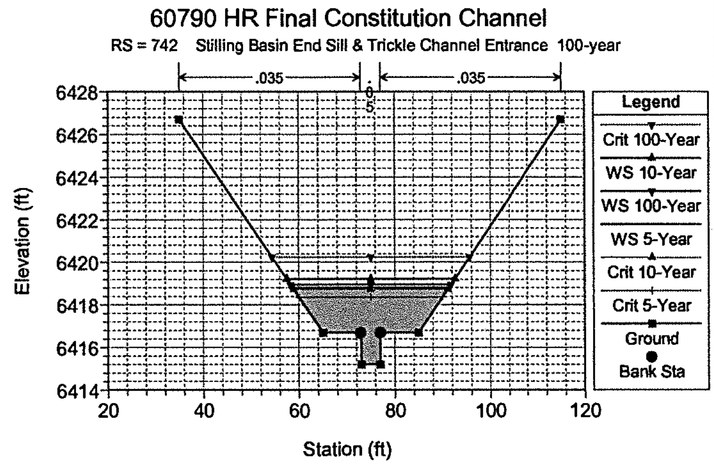
60790 HR Final Constitution Channel
RS = 783 100-year

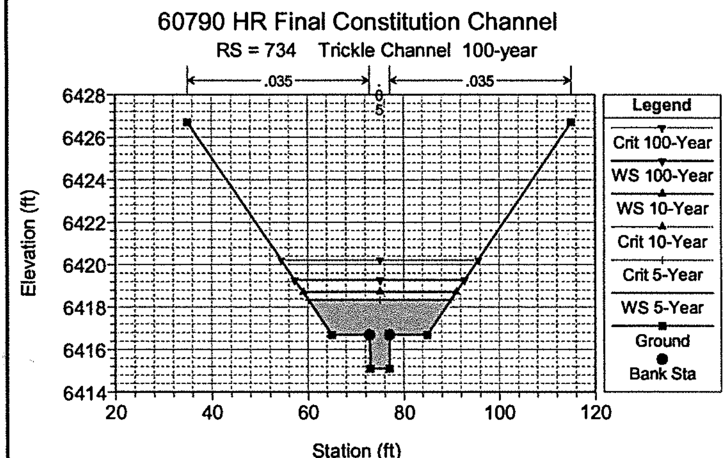


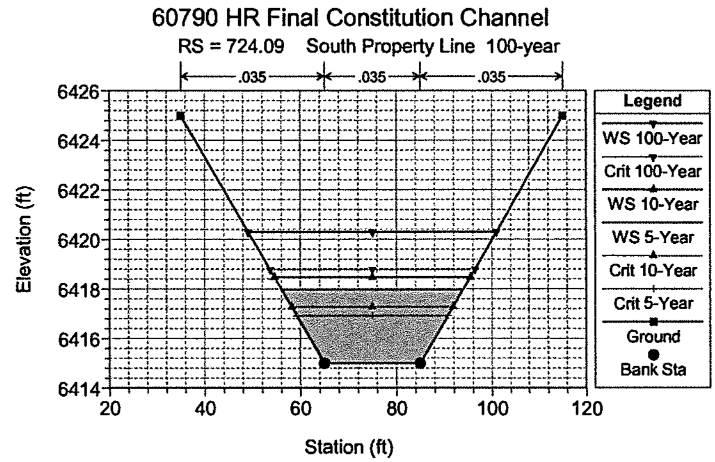
60790 HR Final Constitution Channel
RS = 767.10 Begin Stilling Basin 100-year

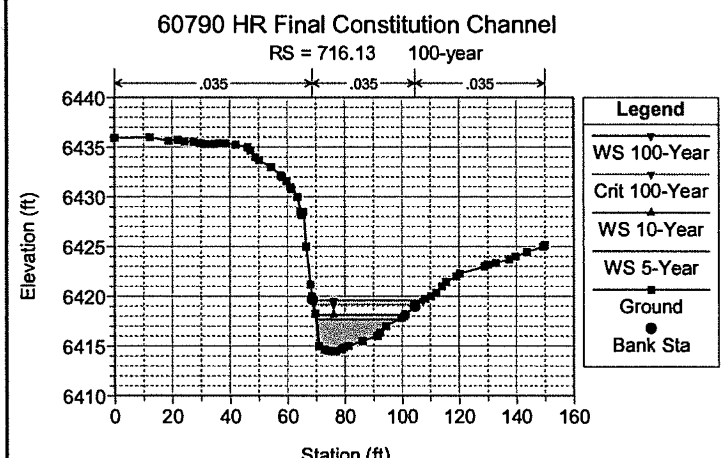


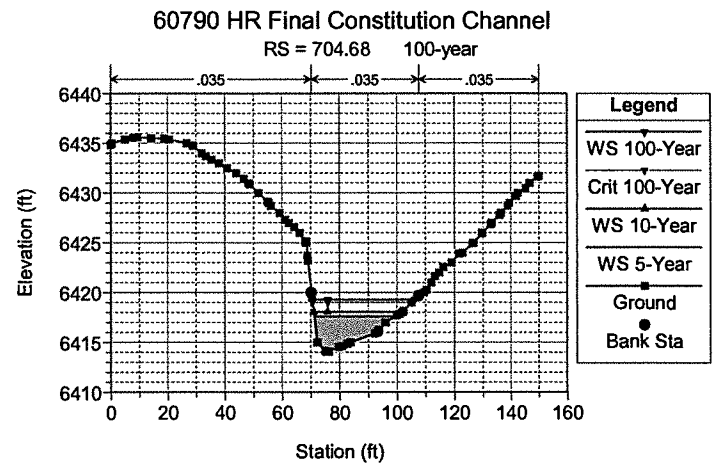

60790 HR Final Constitution Channel
RS = 742.1 End of Stilling Basin 100-year
.035
.05
.035
Elevation (ft)
Station (ft)
Legend
Crit 100-Year
WS 10-Year
WS 5-Year
WS 100-Year
Crit 10-Year
Ground
Bank Sta

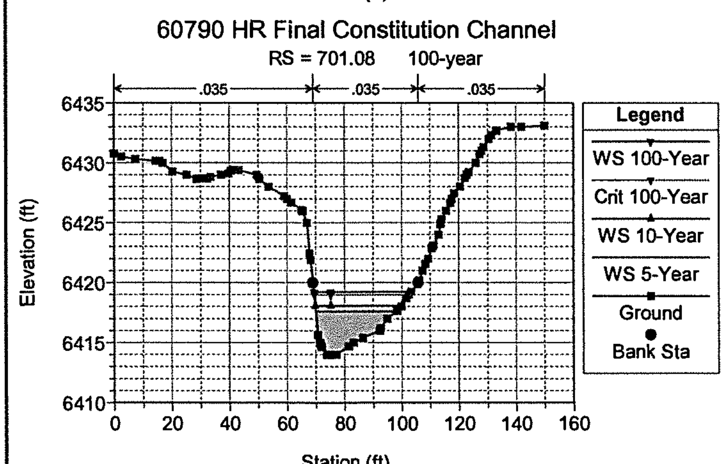

60790 HR Final Constitution Channel
RS = 742 Stilling Basin End Sill & Trickle Channel Entrance 100-year
.035
.035
Elevation (ft)
Station (ft)
Legend
Crit 100-Year
WS 10-Year
WS 100-Year
WS 5-Year
Crit 10-Year
Crit 5-Year
Ground
Bank Sta

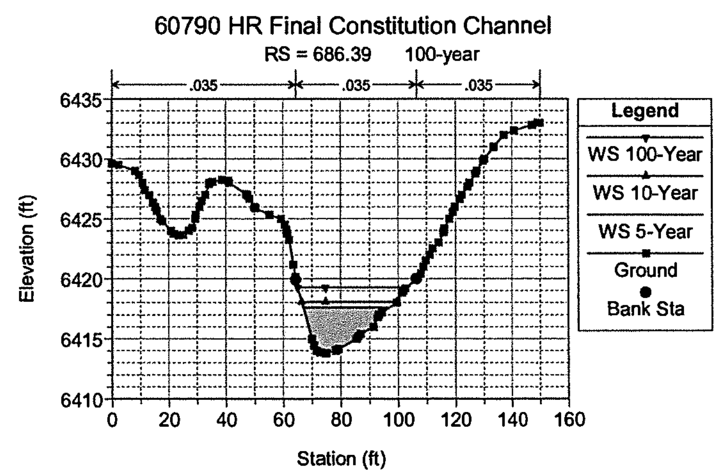

60790 HR Final Constitution Channel
RS = 734 Trickle Channel 100-year
.035
.035
Elevation (ft)
Station (ft)
Legend
Crit 100-Year
WS 100-Year
WS 10-Year
Crit 10-Year
Crit 5-Year
WS 5-Year
Ground
Bank Sta

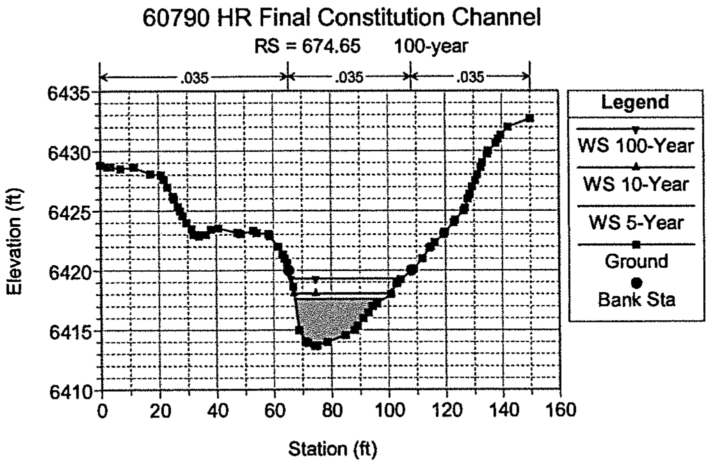

60790 HR Final Constitution Channel
RS = 724.09 South Property Line 100-year
.035
.035
.035
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Crit 100-Year
WS 10-Year
WS 5-Year
Crit 10-Year
Crit 5-Year
Ground
Bank Sta

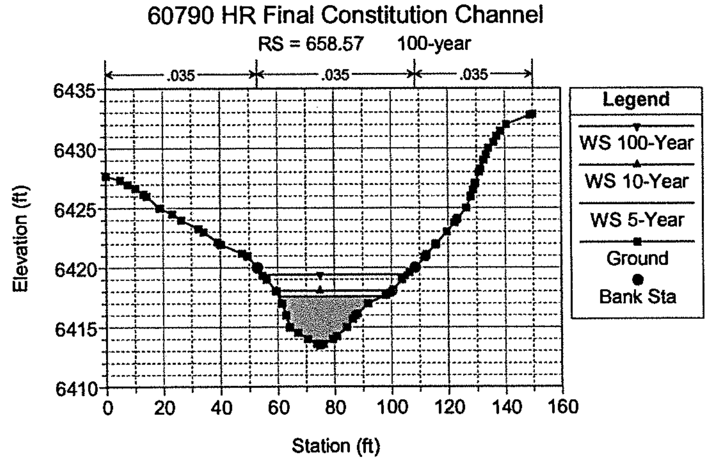

60790 HR Final Constitution Channel
RS = 716.13 100-year
.035
.035
.035
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Crit 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

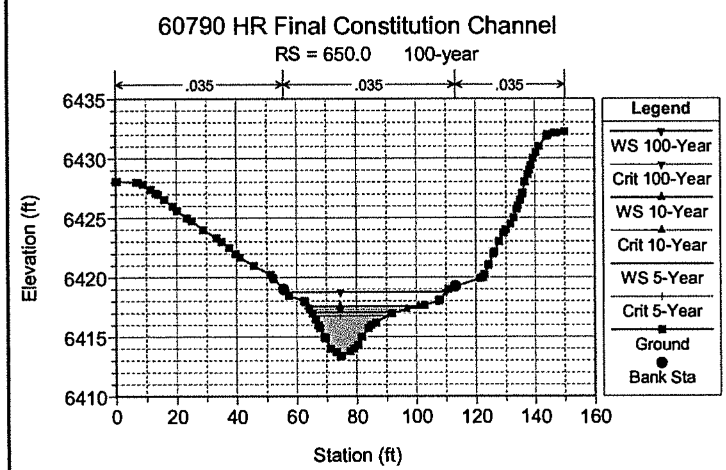

60790 HR Final Constitution Channel
RS = 704.68 100-year
.035
.035
.035
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Crit 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

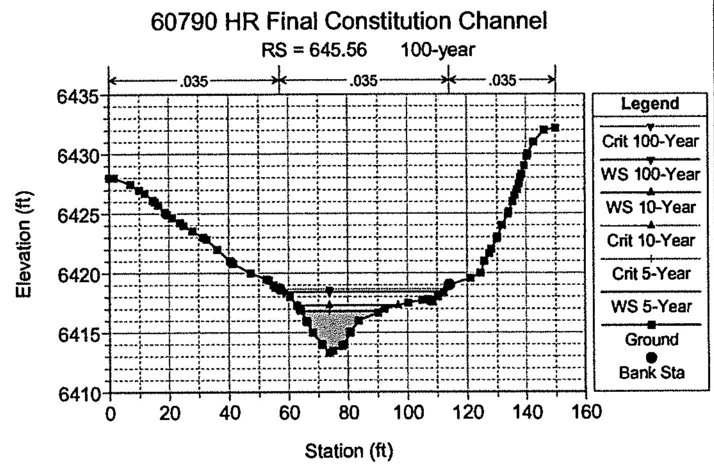

60790 HR Final Constitution Channel
RS = 701.08 100-year
.035
.035
.035
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Crit 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

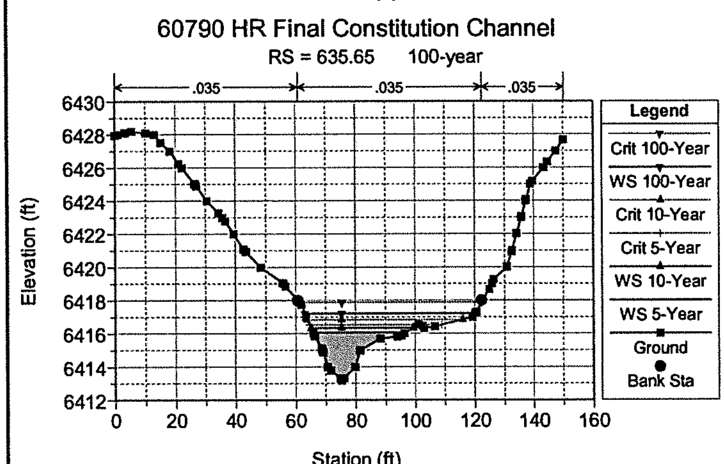

60790 HR Final Constitution Channel
RS = 686.39 100-year
.035
.035
.035
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

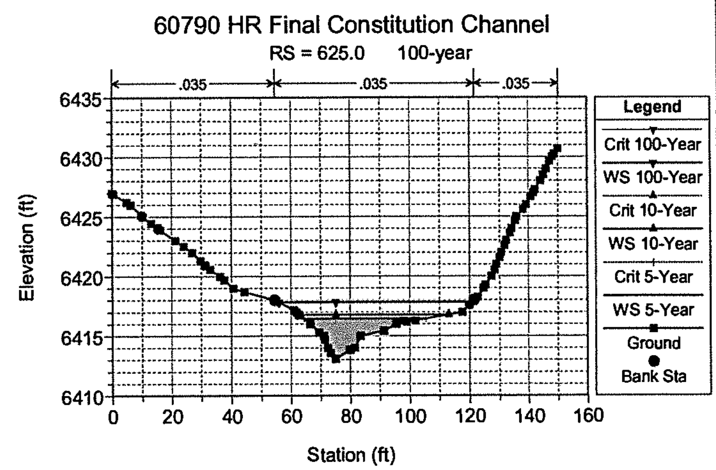

60790 HR Final Constitution Channel
RS = 674.65 100-year
.035 .035 .035
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

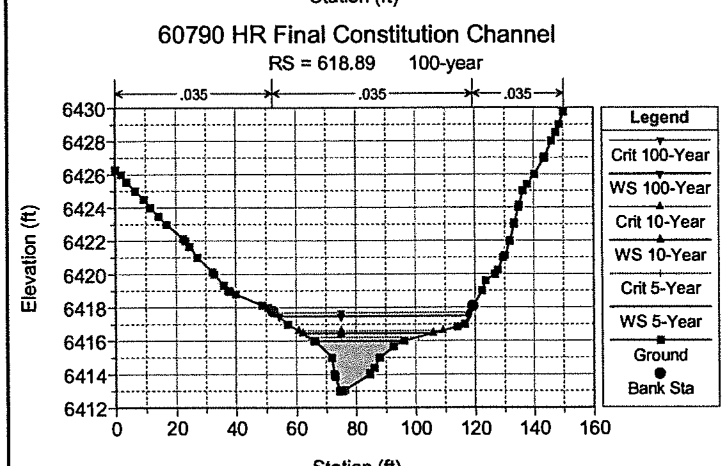

60790 HR Final Constitution Channel
RS = 658.57 100-year
.035 .035 .035
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

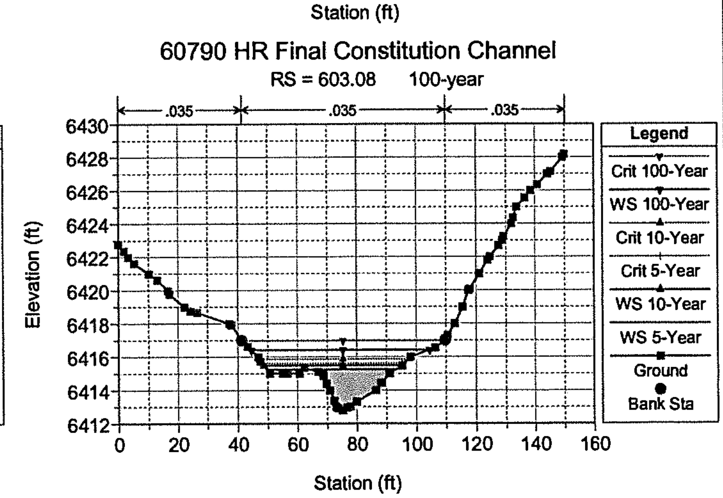

60790 HR Final Constitution Channel
RS = 650.0 100-year
.035 .035 .035
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Crit 100-Year
WS 10-Year
Crit 10-Year
WS 5-Year
Crit 5-Year
Ground
Bank Sta


60790 HR Final Constitution Channel
RS = 645.56 100-year
.035 .035 .035
Elevation (ft)
Station (ft)
Legend
Crit 100-Year
WS 100-Year
WS 10-Year
Crit 10-Year
Crit 5-Year
WS 5-Year
Ground
Bank Sta


60790 HR Final Constitution Channel
RS = 635.65 100-year
.035 .035 .035
Elevation (ft)
Station (ft)
Legend
Crit 100-Year
WS 100-Year
Crit 10-Year
Crit 5-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta


60790 HR Final Constitution Channel
RS = 625.0 100-year
.035 .035 .035
Elevation (ft)
Station (ft)
Legend
Crit 100-Year
WS 100-Year
Crit 10-Year
WS 10-Year
Crit 5-Year
WS 5-Year
Ground
Bank Sta


60790 HR Final Constitution Channel
RS = 618.89 100-year
.035 .035 .035
Elevation (ft)
Station (ft)
Legend
Crit 100-Year
WS 100-Year
Crit 10-Year
WS 10-Year
Crit 5-Year
WS 5-Year
Ground
Bank Sta


60790 HR Final Constitution Channel
RS = 603.08 100-year
.035 .035 .035
Elevation (ft)
Station (ft)
Legend
Crit 100-Year
WS 100-Year
Crit 10-Year
Crit 5-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta

Hydraulic Analysis
HEC-RAS

Channel and Culverts
from Mainline RCP Entrance North of Winslow Park Drive to North Property Line

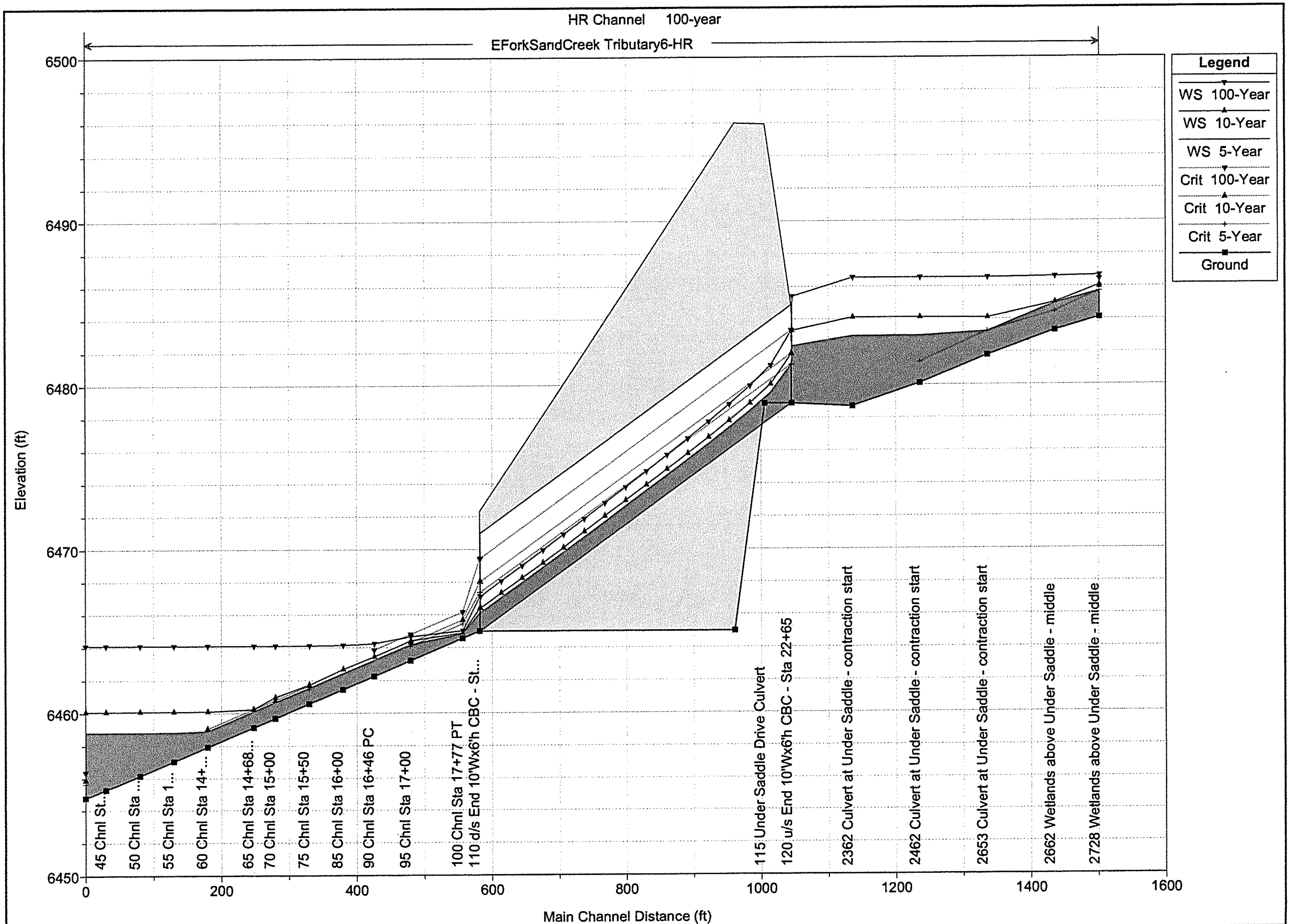
HYDRAULIC ANALYSIS – WINSLOW PARK DRIVE TO NORTH BOUNDARY

HEC-RAS Plan: HR Final-Mod River: EForkSandCreek Reach: Tributary6-HR

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Tributary6-HR	2728	5-Year	250	6484.10	6485.71	6485.71	6486.12	0.0404	5.16	48.4	60.2	1.01
Tributary6-HR	2728	10-Year	360	6484.10	6486.08	6485.97	6486.45	0.0278	4.94	72.8	72.9	0.87
Tributary6-HR	2728	100-Year	640	6484.10	6486.66	6486.44	6487.11	0.0212	5.33	120.1	87.6	0.80
Tributary6-HR	2662	5-Year	250	6483.30	6484.96	6484.43	6485.07	0.0070	2.63	95.2	88.0	0.44
Tributary6-HR	2662	10-Year	360	6483.30	6485.01		6485.21	0.0127	3.61	99.7	89.2	0.60
Tributary6-HR	2662	100-Year	640	6483.30	6486.60		6486.68	0.0020	2.38	271.5	124.4	0.27
Tributary6-HR	2653	5-Year	250	6481.80	6483.25	6483.25	6483.63	0.0409	4.92	50.8	68.5	1.01
Tributary6-HR	2653	10-Year	360	6481.80	6484.08		6484.21	0.0078	2.92	123.4	105.0	0.47
Tributary6-HR	2653	100-Year	640	6481.80	6486.54		6486.57	0.0005	1.40	459.1	166.2	0.14
Tributary6-HR	2462	5-Year	250	6480.10	6482.99	6481.37	6483.00	0.0005	1.02	253.8	151.1	0.13
Tributary6-HR	2462	10-Year	360	6480.10	6484.11		6484.12	0.0002	0.87	442.4	183.9	0.09
Tributary6-HR	2462	100-Year	640	6480.10	6486.55		6486.55	0.0001	0.74	940.0	217.0	0.06
Tributary6-HR	2362	5-Year	250	6478.70	6482.98		6482.98	0.0001	0.52	487.6	180.9	0.05
Tributary6-HR	2362	10-Year	360	6478.70	6484.10		6484.11	0.0000	0.53	707.9	211.5	0.05
Tributary6-HR	2362	100-Year	640	6478.70	6486.54		6486.55	0.0000	0.54	1318.9	275.0	0.04
Tributary6-HR	120	5-Year	250	6478.87	6482.36	6481.24	6482.92	0.0005	5.97	41.9	12.0	0.56
Tributary6-HR	120	10-Year	360	6478.87	6483.32	6481.90	6484.03	0.0005	6.74	53.5	12.0	0.56
Tributary6-HR	120	100-Year	640	6478.87	6485.40	6483.31	6486.44	0.0004	8.16	78.5	12.0	0.56
Tributary6-HR	115		Culvert									
Tributary6-HR	110	5-Year	250	6464.98	6466.09	6467.35	6471.54	0.0233	18.73	13.3	12.0	3.13
Tributary6-HR	110	10-Year	360	6464.98	6466.39	6468.01	6473.47	0.0222	21.36	16.9	12.0	3.18
Tributary6-HR	110	100-Year	640	6464.98	6467.11	6469.42	6476.82	0.0174	25.01	25.6	12.0	3.02
Tributary6-HR	100	5-Year	250	6464.54	6464.82	6465.43	6469.51	1.2588	17.38	14.4	53.3	5.90
Tributary6-HR	100	10-Year	360	6464.54	6464.87	6465.65	6471.61	1.4360	20.82	17.3	54.0	6.48
Tributary6-HR	100	100-Year	640	6464.54	6465.01	6466.14	6475.34	1.4180	25.80	24.8	55.6	6.81
Tributary6-HR	95	5-Year	250	6463.19	6464.17	6464.07	6464.49	0.0181	4.59	54.5	61.7	0.86
Tributary6-HR	95	10-Year	360	6463.19	6464.40	6464.30	6464.82	0.0177	5.18	69.5	64.6	0.88
Tributary6-HR	95	100-Year	640	6463.19	6464.65	6464.79	6465.52	0.0297	7.48	85.5	67.5	1.17
Tributary6-HR	90	5-Year	250	6462.23	6463.22		6463.54	0.0172	4.52	55.3	61.9	0.84
Tributary6-HR	90	10-Year	360	6462.23	6463.44		6463.86	0.0178	5.19	69.3	64.5	0.88
Tributary6-HR	90	100-Year	640	6462.23	6464.23	6463.84	6464.64	0.0098	5.17	123.9	74.0	0.70
Tributary6-HR	85	5-Year	250	6461.43	6462.42		6462.74	0.0175	4.54	55.1	61.8	0.85
Tributary6-HR	85	10-Year	360	6461.43	6462.67		6463.07	0.0163	5.04	71.4	64.9	0.85
Tributary6-HR	85	100-Year	640	6461.43	6464.14		6464.33	0.0033	3.57	179.2	82.5	0.43
Tributary6-HR	75	5-Year	250	6460.55	6461.53	6461.44	6461.85	0.0179	4.57	54.7	61.7	0.86
Tributary6-HR	75	10-Year	360	6460.55	6461.73	6461.67	6462.17	0.0196	5.35	67.2	64.1	0.92
Tributary6-HR	75	100-Year	640	6460.55	6464.11		6464.21	0.0012	2.52	254.2	92.7	0.27
Tributary6-HR	70	5-Year	250	6459.67	6460.66		6460.98	0.0171	4.51	55.5	61.9	0.84
Tributary6-HR	70	10-Year	360	6459.67	6460.98	6460.78	6461.33	0.0138	4.77	75.4	65.7	0.78
Tributary6-HR	70	100-Year	640	6459.67	6464.10		6464.16	0.0005	1.89	338.5	98.0	0.18
Tributary6-HR	65	5-Year	250	6459.12	6460.11		6460.43	0.0174	4.53	55.2	61.8	0.85
Tributary6-HR	65	10-Year	360	6459.12	6460.23	6460.23	6460.74	0.0243	5.74	62.7	63.3	1.02
Tributary6-HR	65	100-Year	640	6459.12	6464.10		6464.14	0.0003	1.63	392.1	98.0	0.14
Tributary6-HR	60	5-Year	250	6457.92	6458.90		6459.22	0.0180	4.58	54.6	61.7	0.86
Tributary6-HR	60	10-Year	360	6457.92	6460.10	6459.04	6460.21	0.0023	2.61	137.7	76.2	0.34
Tributary6-HR	60	100-Year	640	6457.92	6464.10		6464.12	0.0001	1.26	509.6	98.0	0.10
Tributary6-HR	55	5-Year	250	6457.04	6458.82		6458.90	0.0023	2.32	107.9	71.3	0.33
Tributary6-HR	55	10-Year	360	6457.04	6460.09		6460.13	0.0007	1.73	208.0	86.6	0.20
Tributary6-HR	55	100-Year	640	6457.04	6464.10		6464.12	0.0001	1.05	623.9	116.4	0.08
Tributary6-HR	50	5-Year	250	6456.16	6458.81		6458.84	0.0005	1.44	174.2	81.7	0.17
Tributary6-HR	50	10-Year	360	6456.16	6460.08		6460.11	0.0003	1.25	288.4	97.1	0.13
Tributary6-HR	50	100-Year	640	6456.16	6464.10		6464.11	0.0000	0.91	728.6	121.6	0.06
Tributary6-HR	45	5-Year	250	6455.28	6458.80		6458.82	0.0002	1.00	250.4	92.3	0.11
Tributary6-HR	45	10-Year	360	6455.28	6460.08		6460.10	0.0001	0.96	376.5	102.8	0.09

HEC-RAS Plan: HR Final-Mod River: EForkSandCreek Reach: Tributary6-HR (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Tributary6-HR	45	100-Year	640	6455.28	6464.10		6464.11	0.0000	0.80	836.0	122.0	0.05
Tributary6-HR	40	5-Year	250	6454.76	6458.80	6455.65	6458.81	0.0001	0.83	299.9	98.2	0.08
Tributary6-HR	40	10-Year	360	6454.76	6460.08	6455.88	6460.09	0.0001	0.84	430.6	105.9	0.07
Tributary6-HR	40	100-Year	640	6454.76	6464.10	6456.37	6464.11	0.0000	0.75	899.5	122.0	0.05



HR Channel 100-year
EForkSandCreek Tributary6-HR
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Crit 100-Year
Crit 10-Year
Crit 5-Year
Ground
Elevation (ft)
6500
6490
6480
6470
6460
6450
0
200
400
600
800
1000
1200
1400
1600
Main Channel Distance (ft)
45 Chnl St...
50 Chnl Sta ...
55 Chnl Sta 1...
60 Chnl Sta 14+...
65 Chnl Sta 14+68...
70 Chnl Sta 15+00
75 Chnl Sta 15+50
85 Chnl Sta 16+00
90 Chnl Sta 16+46 PC
95 Chnl Sta 17+00
100 Chnl Sta 17+77 PT
110 d/s End 10'Wx6'h CBC - St...
115 Under Saddle Drive Culvert
120 u/s End 10'Wx6'h CBC - Sta 22+65
2362 Culvert at Under Saddle - contraction start
2462 Culvert at Under Saddle - contraction start
2653 Culvert at Under Saddle - contraction start
2662 Wetlands above Under Saddle - middle
2728 Wetlands above Under Saddle - middle

```
                   HEC-RAS Version 4.1.0 Jan 2010
                    U.S. Army Corps of Engineers
                   Hydrologic Engineering Center
                         609 Second Street
                         Davis, California

            X     X  XXXXXX   XXXX       XXXX      XX     XXXX
            X     X  X       X    X      X   X    X  X   X
            X     X  X       X           X   X   X    X  X
            XXXXXXX  XXXX    X      XXX  XXXX    XXXXXX   XXXX
            X     X  X       X           X  X    X    X       X
            X     X  X       X    X      X   X   X    X       X
            X     X  XXXXXX   XXXX       X    X  X    X  XXXXX

********************************************************************************

PROJECT DATA
Project Title: HR Channel
Project File : HRChannel.prj
Run Date and Time: 8/21/2013 2:45:13 PM

Project in English units

Project Description:
Developed HR Channel - Final - 5yr, 10yr and 100yr


********************************************************************************

FLOW DATA

Flow Title: HR Channel 1
Flow File : z:\60970\Calcs\HEC-RAS Final HR Channel\HRChannel.f01

Flow Data (cfs)
*********************************************************************************************
* River           Reach           RS     *          5-Year        10-Year        100-Year *
* EForkSandCreek  Tributary6-HR   2728   *             250            360             640 *
* EForkSandCreek  Tributary6-HR   40     *             250            360             640 *
*********************************************************************************************

Boundary Conditions
********************************************************************************************************
* River           Reach           Profile         *         Upstream                  Downstream    *
********************************************************************************************************
* EForkSandCreek  Tributary6-HR   5-Year          *      Normal S = 0.0176       Known WS = 6458.8 *
* EForkSandCreek  Tributary6-HR   10-Year         *      Normal S = 0.0176      Known WS = 6460.08 *
* EForkSandCreek  Tributary6-HR   100-Year        *      Normal S = 0.0176       Known WS = 6464.1 *
********************************************************************************************************

CULVERT


RIVER: EForkSandCreek
REACH: Tributary6-HR      RS: 115


CULVERT OUTPUT  Profile #5-Year  Culv Group:  UnderSaddle
**************************************************************************
* Q Culv Group (cfs)     *  250.00  * Culv Full Len (ft)     *          *
* # Barrels              *       1  * Culv Vel US (ft/s)     *    8.75  *
* Q Barrel (cfs)         *  250.00  * Culv Vel DS (ft/s)     *   18.89  *
* E.G. US. (ft)          * 6482.92  * Culv Inv El Up (ft)    * 6478.87  *
* W.S. US. (ft)          * 6482.36  * Culv Inv El Dn (ft)    * 6464.98  *
* E.G. DS (ft)           * 6468.55  * Culv Frctn Ls (ft)     *   10.81  *
* W.S. DS (ft)           * 6467.35  * Culv Exit Loss (ft)    *    3.08  *
* Delta EG (ft)          *   14.37  * Culv Entr Loss (ft)    *    0.48  *
* Delta WS (ft)          *   15.01  * Q Weir (cfs)           *          *
* E.G. IC (ft)           * 6482.57  * Weir Sta Lft (ft)      *          *
* E.G. OC (ft)           * 6482.92  * Weir Sta Rgt (ft)      *          *
* Culvert Control        *  Outlet  * Weir Submerg           *          *
* Culv WS Inlet (ft)     * 6481.25  * Weir Max Depth (ft)    *          *
```

Culv WS Outlet (ft)	6466.08	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.10	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.38	Min El Weir Flow (ft)	6496.01

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10-Year Culv Group: UnderSaddle

Q Culv Group (cfs)	360.00	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	9.89
Q Barrel (cfs)	360.00	Culv Vel DS (ft/s)	21.50
E.G. US. (ft)	6484.03	Culv Inv El Up (ft)	6478.87
W.S. US. (ft)	6483.32	Culv Inv El Dn (ft)	6464.98
E.G. DS (ft)	6469.53	Culv Frctn Ls (ft)	9.87
W.S. DS (ft)	6468.01	Culv Exit Loss (ft)	4.02
Delta EG (ft)	14.50	Culv Entr Loss (ft)	0.61
Delta WS (ft)	15.31	Q Weir (cfs)	
E.G. IC (ft)	6483.65	Weir Sta Lft (ft)	
E.G. OC (ft)	6484.03	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	6481.91	Weir Max Depth (ft)	
Culv WS Outlet (ft)	6466.38	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.40	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	3.03	Min El Weir Flow (ft)	6496.01

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100-Year Culv Group: UnderSaddle

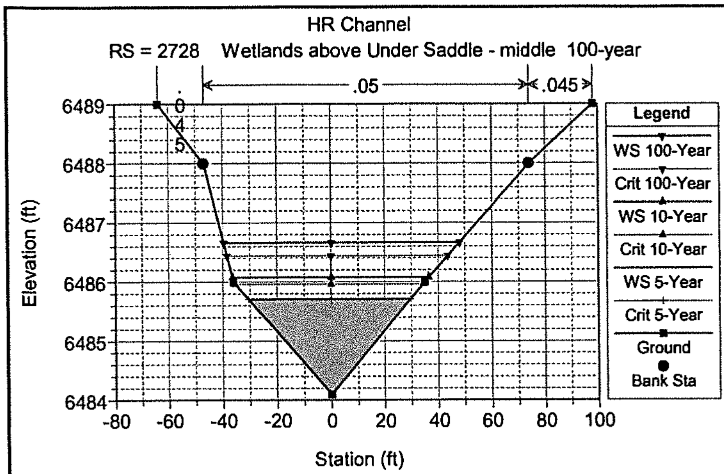
Q Culv Group (cfs)	640.00	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	11.98
Q Barrel (cfs)	640.00	Culv Vel DS (ft/s)	25.12
E.G. US. (ft)	6486.44	Culv Inv El Up (ft)	6478.87
W.S. US. (ft)	6485.40	Culv Inv El Dn (ft)	6464.98
E.G. DS (ft)	6471.66	Culv Frctn Ls (ft)	8.65
W.S. DS (ft)	6469.42	Culv Exit Loss (ft)	5.24
Delta EG (ft)	14.78	Culv Entr Loss (ft)	0.89
Delta WS (ft)	15.99	Q Weir (cfs)	
E.G. IC (ft)	6486.20	Weir Sta Lft (ft)	
E.G. OC (ft)	6486.44	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	6483.32	Weir Max Depth (ft)	
Culv WS Outlet (ft)	6467.10	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	2.03	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	4.45	Min El Weir Flow (ft)	6496.01

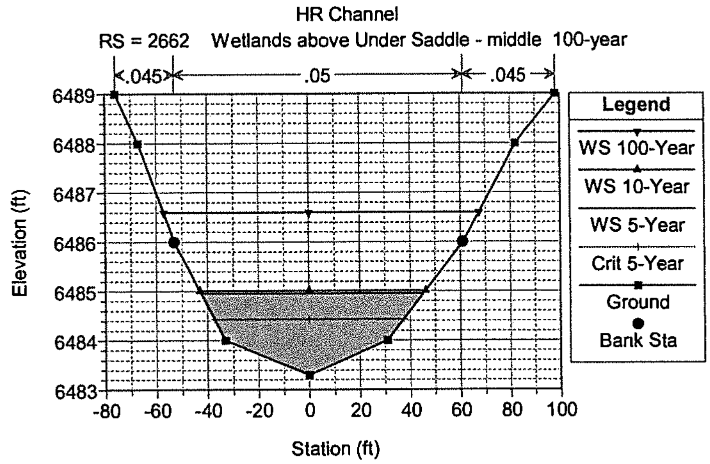
Note: The flow in the culvert is entirely supercritical.

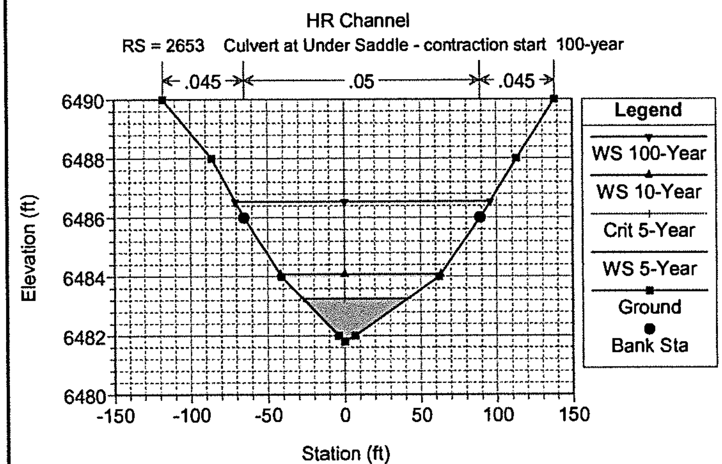
Profile Output Table - Standard Table 1

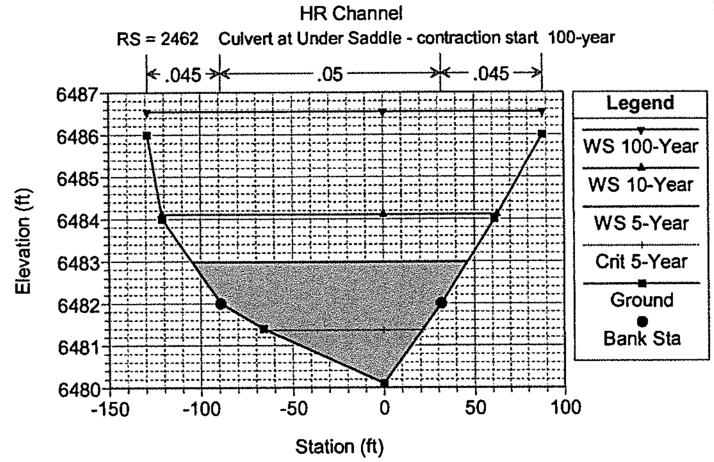
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary6-HR	2728	5-Year	250	6484.10	6485.71	6485.71	6486.12	0.0404	5.16	48.4	60.2	1.01
Tributary6-HR	2728	10-Year	360	6484.10	6486.08	6485.97	6486.45	0.0278	4.94	72.8	72.9	0.87
Tributary6-HR	2728	100-Year	640	6484.10	6486.66	6486.44	6487.11	0.0212	5.33	120.1	87.6	0.80
Tributary6-HR	2662	5-Year	250	6483.30	6484.96	6484.43	6485.07	0.0070	2.63	95.2	88.0	0.44
Tributary6-HR	2662	10-Year	360	6483.30	6485.01		6485.21	0.0127	3.61	99.7	89.2	0.60
Tributary6-HR	2662	100-Year	640	6483.30	6486.60		6486.68	0.0020	2.38	271.5	124.4	0.27
Tributary6-HR	2653	5-Year	250	6481.80	6483.25	6483.25	6483.63	0.0409	4.92	50.8	68.5	1.01
Tributary6-HR	2653	10-Year	360	6481.80	6484.08		6484.21	0.0078	2.92	123.4	105.0	0.47
Tributary6-HR	2653	100-Year	640	6481.80	6486.54		6486.57	0.0005	1.40	459.1	166.2	0.14
Tributary6-HR	2462	5-Year	250	6480.10	6482.99	6481.37	6483.00	0.0005	1.02	253.8	151.1	0.13
Tributary6-HR	2462	10-Year	360	6480.10	6484.11		6484.12	0.0002	0.87	442.4	183.9	0.09
Tributary6-HR	2462	100-Year	640	6480.10	6486.55		6486.55	0.0001	0.74	940.0	217.0	0.06

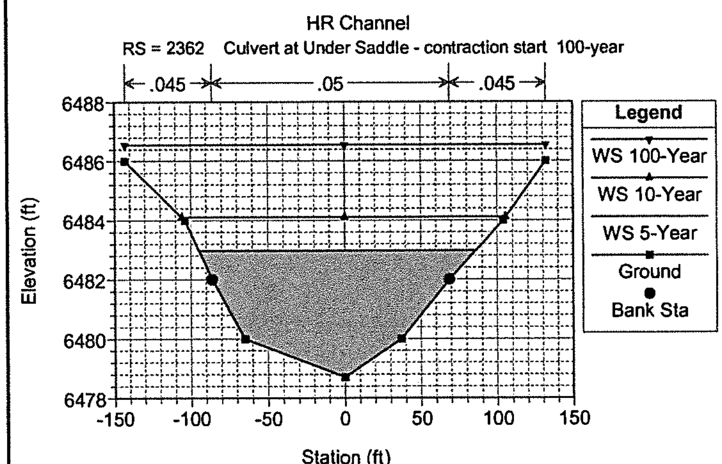
Tributary6-HR	2362	5-Year	250	6478.70	6482.98		6482.98	0.0001	0.52	487.6	180.9	0.05
Tributary6-HR	2362	10-Year	360	6478.70	6484.10		6484.11	0.0000	0.53	707.9	211.5	0.05
Tributary6-HR	2362	100-Year	640	6478.70	6486.54		6486.55	0.0000	0.54	1318.9	275.0	0.04
Tributary6-HR	120	5-Year	250	6478.87	6482.36	6481.24	6482.92	0.0005	5.97	41.9	12.0	0.56
Tributary6-HR	120	10-Year	360	6478.87	6483.32	6481.90	6484.03	0.0005	6.74	53.5	12.0	0.56
Tributary6-HR	120	100-Year	640	6478.87	6485.40	6483.31	6486.44	0.0004	8.16	78.5	12.0	0.56
Tributary6-HR	115		Culvert									
Tributary6-HR	110	5-Year	250	6464.98	6466.09	6467.35	6471.54	0.0233	18.73	13.3	12.0	3.13
Tributary6-HR	110	10-Year	360	6464.98	6466.39	6468.01	6473.47	0.0222	21.36	16.9	12.0	3.18
Tributary6-HR	110	100-Year	640	6464.98	6467.11	6469.42	6476.82	0.0174	25.01	25.6	12.0	3.02
Tributary6-HR	100	5-Year	250	6464.54	6464.82	6465.43	6469.51	1.2588	17.38	14.4	53.3	5.90
Tributary6-HR	100	10-Year	360	6464.54	6464.87	6465.65	6471.61	1.4360	20.82	17.3	54.0	6.48
Tributary6-HR	100	100-Year	640	6464.54	6465.01	6466.14	6475.34	1.4180	25.80	24.8	55.6	6.81
Tributary6-HR	95	5-Year	250	6463.19	6464.17	6464.07	6464.49	0.0181	4.59	54.5	61.7	0.86
Tributary6-HR	95	10-Year	360	6463.19	6464.40	6464.30	6464.82	0.0177	5.18	69.5	64.6	0.88
Tributary6-HR	95	100-Year	640	6463.19	6464.65	6464.79	6465.52	0.0297	7.48	85.5	67.5	1.17
Tributary6-HR	90	5-Year	250	6462.23	6463.22		6463.54	0.0172	4.52	55.3	61.9	0.84
Tributary6-HR	90	10-Year	360	6462.23	6463.44		6463.86	0.0178	5.19	69.3	64.5	0.88
Tributary6-HR	90	100-Year	640	6462.23	6464.23	6463.84	6464.64	0.0098	5.17	123.9	74.0	0.70
Tributary6-HR	85	5-Year	250	6461.43	6462.42		6462.74	0.0175	4.54	55.1	61.8	0.85
Tributary6-HR	85	10-Year	360	6461.43	6462.67		6463.07	0.0163	5.04	71.4	64.9	0.85
Tributary6-HR	85	100-Year	640	6461.43	6464.14		6464.33	0.0033	3.57	179.2	82.5	0.43
Tributary6-HR	75	5-Year	250	6460.55	6461.53	6461.44	6461.85	0.0179	4.57	54.7	61.7	0.86
Tributary6-HR	75	10-Year	360	6460.55	6461.73	6461.67	6462.17	0.0196	5.35	67.2	64.1	0.92
Tributary6-HR	75	100-Year	640	6460.55	6464.11		6464.21	0.0012	2.52	254.2	92.7	0.27
Tributary6-HR	70	5-Year	250	6459.67	6460.66		6460.98	0.0171	4.51	55.5	61.9	0.84
Tributary6-HR	70	10-Year	360	6459.67	6460.98	6460.78	6461.33	0.0138	4.77	75.4	65.7	0.78
Tributary6-HR	70	100-Year	640	6459.67	6464.10		6464.16	0.0005	1.89	338.5	98.0	0.18
Tributary6-HR	65	5-Year	250	6459.12	6460.11		6460.43	0.0174	4.53	55.2	61.8	0.85
Tributary6-HR	65	10-Year	360	6459.12	6460.23	6460.23	6460.74	0.0243	5.74	62.7	63.3	1.02
Tributary6-HR	65	100-Year	640	6459.12	6464.10		6464.14	0.0003	1.63	392.1	98.0	0.14
Tributary6-HR	60	5-Year	250	6457.92	6458.90		6459.22	0.0180	4.58	54.6	61.7	0.86
Tributary6-HR	60	10-Year	360	6457.92	6460.10	6459.04	6460.21	0.0023	2.61	137.7	76.2	0.34
Tributary6-HR	60	100-Year	640	6457.92	6464.10		6464.12	0.0001	1.26	509.6	98.0	0.10
Tributary6-HR	55	5-Year	250	6457.04	6458.82		6458.90	0.0023	2.32	107.9	71.3	0.33
Tributary6-HR	55	10-Year	360	6457.04	6460.09		6460.13	0.0007	1.73	208.0	86.6	0.20
Tributary6-HR	55	100-Year	640	6457.04	6464.10		6464.12	0.0001	1.05	623.9	116.4	0.08
Tributary6-HR	50	5-Year	250	6456.16	6458.81		6458.84	0.0005	1.44	174.2	81.7	0.17
Tributary6-HR	50	10-Year	360	6456.16	6460.08		6460.11	0.0003	1.25	288.4	97.1	0.13
Tributary6-HR	50	100-Year	640	6456.16	6464.10		6464.11	0.0000	0.91	728.6	121.6	0.06
Tributary6-HR	45	5-Year	250	6455.28	6458.80		6458.82	0.0002	1.00	250.4	92.3	0.11
Tributary6-HR	45	10-Year	360	6455.28	6460.08		6460.10	0.0001	0.96	376.5	102.8	0.09
Tributary6-HR	45	100-Year	640	6455.28	6464.10		6464.11	0.0000	0.80	836.0	122.0	0.05
Tributary6-HR	40	5-Year	250	6454.76	6458.80	6455.65	6458.81	0.0001	0.83	299.9	98.2	0.08
Tributary6-HR	40	10-Year	360	6454.76	6460.08	6455.88	6460.09	0.0001	0.84	430.6	105.9	0.07
Tributary6-HR	40	100-Year	640	6454.76	6464.10	6456.37	6464.11	0.0000	0.75	899.5	122.0	0.05

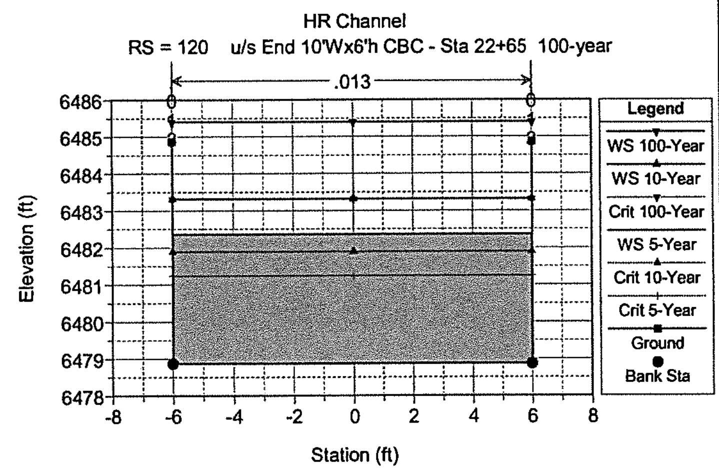

HR Channel
RS = 2728 Wetlands above Under Saddle - middle 100-year
.05
.045
Legend
WS 100-Year
Crit 100-Year
WS 10-Year
Crit 10-Year
WS 5-Year
Crit 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

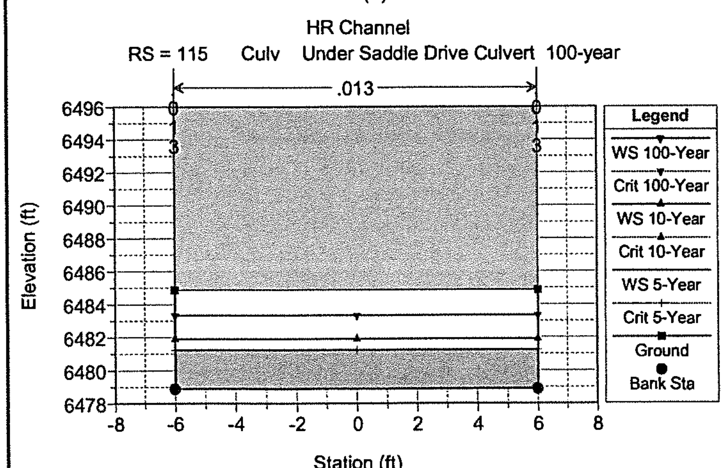

HR Channel
RS = 2662 Wetlands above Under Saddle - middle 100-year
.045
.05
.045
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Crit 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

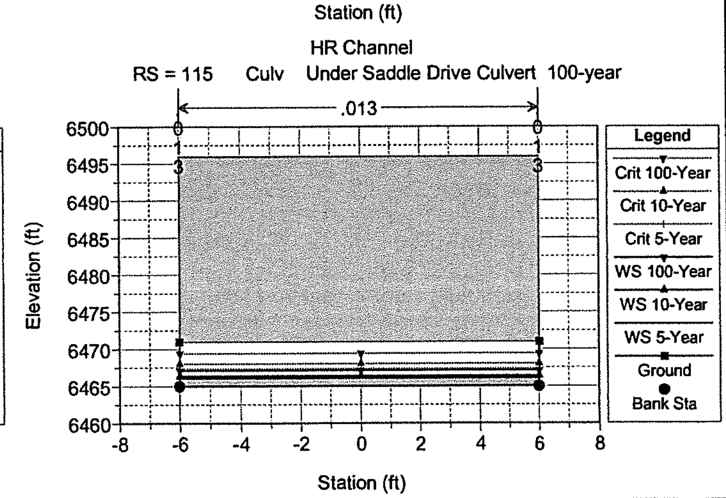

HR Channel
RS = 2653 Culvert at Under Saddle - contraction start 100-year
.045
.05
.045
Legend
WS 100-Year
WS 10-Year
Crit 5-Year
WS 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

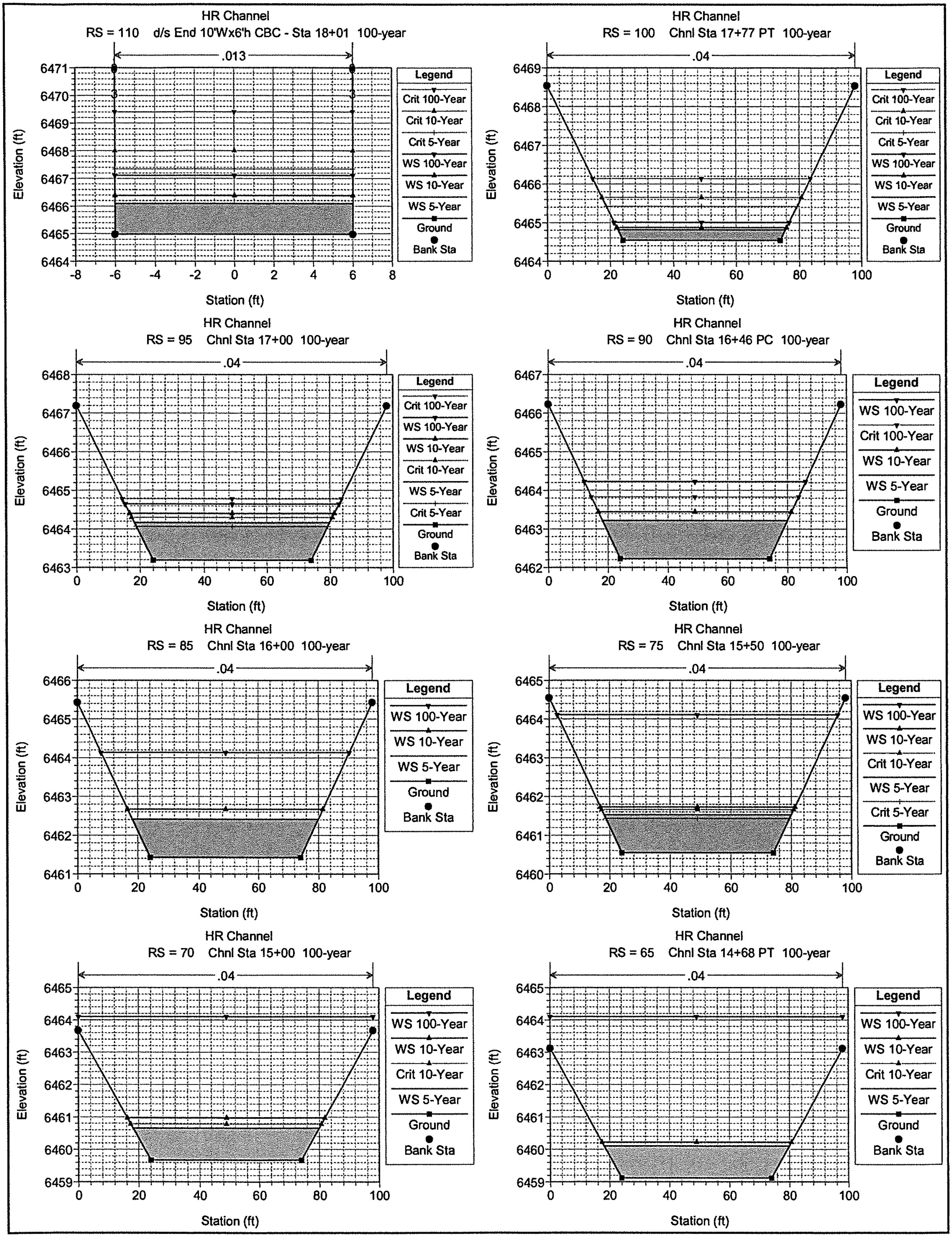

HR Channel
RS = 2462 Culvert at Under Saddle - contraction start 100-year
.045
.05
.045
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Crit 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

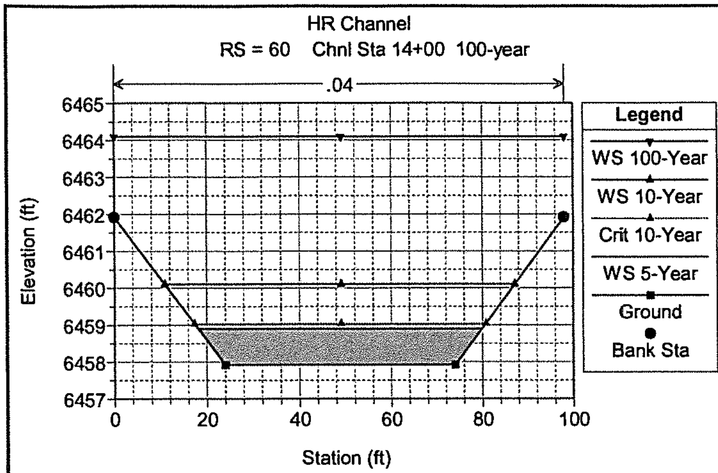

HR Channel
RS = 2362 Culvert at Under Saddle - contraction start 100-year
.045
.05
.045
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

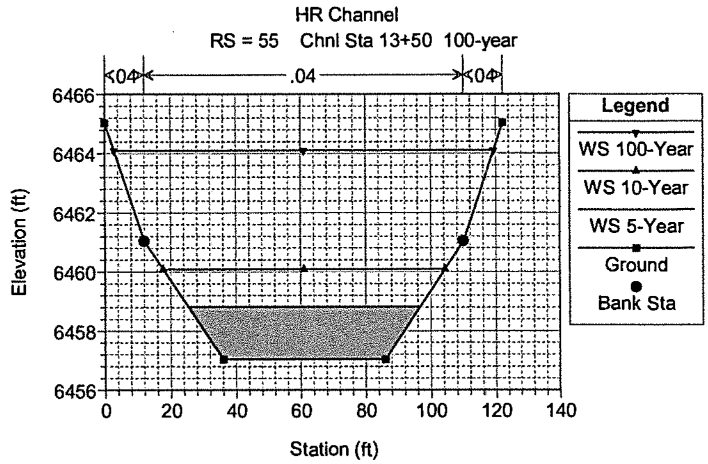

HR Channel
RS = 120 u/s End 10'Wx6'h CBC - Sta 22+65 100-year
.013
Legend
WS 100-Year
WS 10-Year
Crit 100-Year
WS 5-Year
Crit 10-Year
Crit 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

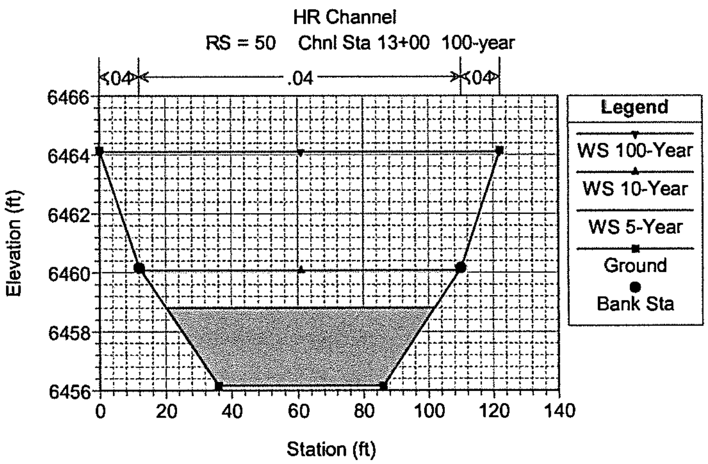

HR Channel
RS = 115 Culv Under Saddle Drive Culvert 100-year
.013
Legend
WS 100-Year
Crit 100-Year
WS 10-Year
Crit 10-Year
WS 5-Year
Crit 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

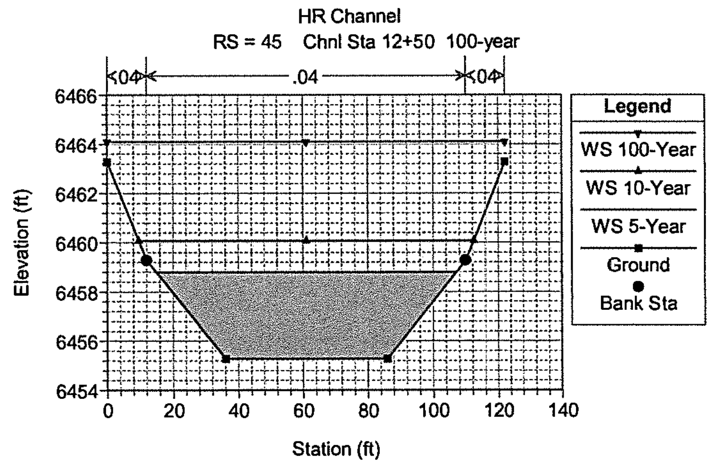

HR Channel
RS = 115 Culv Under Saddle Drive Culvert 100-year
.013
Legend
Crit 100-Year
Crit 10-Year
Crit 5-Year
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

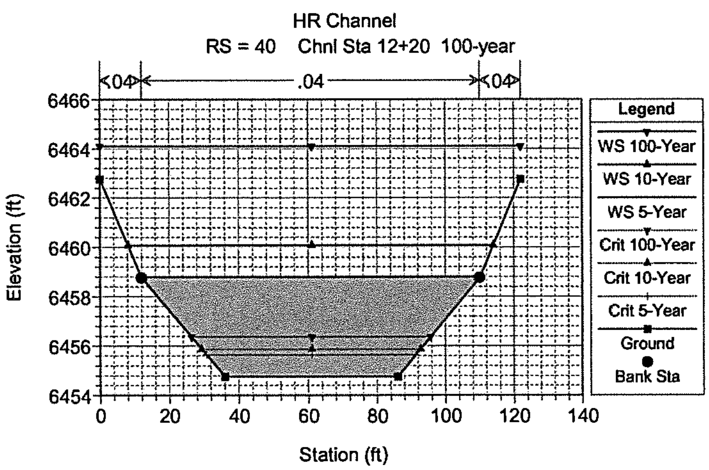

HR Channel
RS = 110 d/s End 10'Wx6'h CBC - Sta 18+01 100-year
.013
Legend
Crit 100-Year
Crit 10-Year
Crit 5-Year
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
HR Channel
RS = 100 Chnl Sta 17+77 PT 100-year
.04
Legend
Crit 100-Year
Crit 10-Year
Crit 5-Year
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
HR Channel
RS = 95 Chnl Sta 17+00 100-year
.04
Legend
Crit 100-Year
WS 100-Year
WS 10-Year
Crit 10-Year
WS 5-Year
Crit 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
HR Channel
RS = 90 Chnl Sta 16+46 PC 100-year
.04
Legend
WS 100-Year
Crit 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
HR Channel
RS = 85 Chnl Sta 16+00 100-year
.04
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
HR Channel
RS = 75 Chnl Sta 15+50 100-year
.04
Legend
WS 100-Year
WS 10-Year
Crit 10-Year
WS 5-Year
Crit 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
HR Channel
RS = 70 Chnl Sta 15+00 100-year
.04
Legend
WS 100-Year
WS 10-Year
Crit 10-Year
WS 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
HR Channel
RS = 65 Chnl Sta 14+68 PT 100-year
.04
Legend
WS 100-Year
WS 10-Year
Crit 10-Year
WS 5-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


HR Channel
RS = 60 Chnl Sta 14+00 100-year
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
Crit 10-Year
WS 5-Year
Ground
Bank Sta


HR Channel
RS = 55 Chnl Sta 13+50 100-year
.04
.04
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta


HR Channel
RS = 50 Chnl Sta 13+00 100-year
.04
.04
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta


HR Channel
RS = 45 Chnl Sta 12+50 100-year
.04
.04
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Ground
Bank Sta


HR Channel
RS = 40 Chnl Sta 12+20 100-year
.04
.04
.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year
WS 10-Year
WS 5-Year
Crit 100-Year
Crit 10-Year
Crit 5-Year
Ground
Bank Sta

Main Channel Free Board and Rip-Rap Calculations

Hannah Ridge Channel - Sand Creek Tributary 6

Freeboard & Superelevation Calculations

Channel Station	Chn FL El (ft)	WSE 100-yr (ft)	Flow Depth (ft)	Fr100	Avg Chn V100 (ft/sec)	Min. Freebrd (ft)	Flow Width (ft)	Chn CL Radius (ft)	Min. CL Radius (ft)	Super-Elev Coeff	Superel Height (ft)	Min. Top El (ft)	Design Top El (ft)	Freebrd + SuperEl (ft)	Avail Ht Above WSE (ft)	Design Meets Criteria?	Section Desc
1801.00	6464.98	6467.11	2.13	3.02	25.0	1.80	12.0	0	100	1.0	0.00	6468.91	**6471.00**	1.80	3.89	Yes	Under Saddle Culv Exit
1777.00	6464.54	6465.01	0.47	6.81	25.8	1.50	55.6	0	167	1.0	0.00	6466.51	**6468.50**	1.50	3.49	Yes	Chnl Sta 17+77 PT
1700.00	6463.19	6464.65	1.46	1.17	7.5	1.21	67.5	200	203	1.0	0.59	6466.45	**6467.80**	1.80	3.15	Yes	Chnl Sta 17+00 Curve
1646.00	6462.23	6464.23	2.00	0.70	5.2	1.16	74.0	200	222	0.5	0.15	6465.55	**6470.00**	1.32	5.77	Yes	Chnl Sta 1646 PC
1600.00	6461.43	6464.14	2.71	0.43	3.6	1.12	82.5	0	248	0.5	0.00	6465.26	**6468.00**	1.12	3.86	Yes	Chnl Sta 16+00
1550.00	6460.55	6464.11	3.56	0.27	2.5	1.10	92.7	0	278	0.5	0.00	6465.21	**6468.00**	1.10	3.89	Yes	Chnl Sta 15+50
1500.00	6459.67	6464.10	4.43	0.18	1.9	1.08	98.0	0	294	0.5	0.00	6465.18	**6466.00**	1.08	1.90	Yes	Chnl Sta 15+00
1468.00	6459.12	6464.10	4.98	0.14	1.6	1.07	98.0	0	294	0.5	0.00	6465.17	**6466.00**	1.07	1.90	Yes	Chnl Sta 14+68 PT
1400.00	6457.92	6464.10	6.18	0.10	1.3	1.06	98.0	275	294	0.5	0.01	6465.17	**6466.00**	1.07	1.90	Yes	Chnl Sta 14+00 Curve
1350.00	6457.04	6464.10	7.06	0.08	1.1	1.05	116.4	275	349	0.5	0.01	6465.16	**6466.00**	1.06	1.90	Yes	Chnl Sta 13+50 Curve
1300.00	6456.16	6464.10	7.94	0.06	0.9	1.05	121.6	275	365	0.5	0.01	6465.15	**6466.00**	1.05	1.90	Yes	Chnl Sta 3+00 Curve
1250.00	6455.28	6464.10	8.82	0.05	0.8	1.04	122.0	275	366	0.5	0.00	6465.15	**6466.00**	1.05	1.90	Yes	Chnl Sta 12+50 Curve
1220.00	6454.76	6464.10	9.34	0.05	0.8	1.04	122.0	275	366	0.5	0.00	6465.14	**6466.00**	1.04	1.90	Yes	U/S of Winslow Culv
2300.00	6443.10	6447.90	4.80	0.57	6.0	1.25	48.8	0	146	0.5	0.00	6449.15	**6456.00**	1.25	8.10	Yes	90" RCP Outfall
2275.00	6442.80	6447.83	5.03	0.53	5.6	1.24	50.2	0	151	0.5	0.00	6449.07	**6456.00**	1.24	8.17	Yes	Chnl
2250.00	6442.50	6447.77	5.27	0.48	5.3	1.23	51.6	0	155	0.5	0.00	6449.00	**6456.00**	1.23	8.23	Yes	Chnl
2225.00	6442.20	6447.72	5.52	0.44	4.9	1.22	53.1	0	159	0.5	0.00	6448.94	**6456.00**	1.22	8.28	Yes	Chnl
2200.00	6441.90	6447.68	5.78	0.41	4.6	1.20	54.7	0	164	0.5	0.00	6448.88	**6456.00**	1.20	8.32	Yes	Chnl
2175.00	6441.60	6447.65	6.05	0.37	4.3	1.19	56.3	0	169	0.5	0.00	6448.84	**6456.00**	1.19	8.35	Yes	Chnl
2150.00	6441.30	6447.63	6.33	0.34	4.0	1.18	58.0	0	174	0.5	0.00	6448.81	**6456.00**	1.18	8.37	Yes	Chnl
2125.00	6441.00	6447.61	6.61	0.32	3.8	1.18	59.7	0	179	0.5	0.00	6448.79	**6456.00**	1.18	8.39	Yes	Chnl
2088.00	6440.54	6446.93	6.39	0.51	7.3	1.34	59.2	0	178	0.5	0.00	6448.27	**6456.00**	1.34	9.07	Yes	U/S Entrance HR Drive Culv
1946.00	6439.42	6442.82	3.40	1.34	14.0	1.52	41.2	0	124	1.0	0.00	6444.34	**6456.00**	1.52	13.18	Yes	D/S Exit HR Drive Culv
1925.00	6439.30	6444.64	5.34	0.54	6.0	1.26	44.5	0	134	0.5	0.00	6445.90	**6456.00**	1.26	11.36	Yes	Existing Chnl
1900.00	6438.62	6444.39	5.77	0.59	6.6	1.29	38.9	0	117	0.5	0.00	6445.68	**6456.00**	1.29	11.61	Yes	Existing Chnl

Min. Freeboard Height = 1.0+0.025*v*d^0.33 **DCM 10.5.5**

Min CL Radius = 3*w or 100'

Superelevation Height = C*(v^2*w)/(g*R) **DCM 10.5.6**

Hannah Ridge Channel - Sand Creek Tributary 6

Rip Rap Lining Rock Sizing

Channel Station	Min Ch El (ft)	d/s Ch S (ft/ft)	V-100 (ft/s)	V-5 (ft/s)	Fr-100	Fr-5	Rock Spc Gravity	Vel & S Factor* 100-yr	Vel & S Factor* 5-yr	Bottom Lining	Side Slope Lining	100-yr Calc'd Rock Type	5-yr Calc'd Rock Type	Desc
2265.00	6478.87	0.0300	8.16	5.97	0.6	0.6	2.60	3.3	2.4	Rock	Rock	**L**	**VL**	Under Saddle Culv Entr
1801.00	6464.98	0.0176	25.01	18.73	3.0	3.1	2.60	9.2	6.9	Rock	Rock	**GROUT**	**GROUT**	Under Saddle Culv Exit
1777.00	6464.54	0.0176	25.80	17.38	6.8	5.9	2.60	9.5	6.4	Rock	Rock	**GROUT**	**GROUT**	
1700.00	6463.19	0.0176	7.48	4.59	1.2	0.9	2.60	2.8	1.7	Rock	Rock	**VL**	**VL**	
1646.00	6462.23	0.0176	5.17	4.52	0.7	0.8	2.60	1.9	1.7	Rock	Rock	**VL**	**VL**	
1600.00	6461.43	0.0176	3.57	4.54	0.4	0.9	2.60	1.3	1.7	Grass	Grass	**none**	**none**	
1550.00	6460.55	0.0176	2.52	4.57	0.3	0.9	2.60	0.9	1.7	Grass	Grass	**none**	**none**	
1500.00	6459.67	0.0176	1.89	4.51	0.2	0.8	2.60	0.7	1.7	Grass	Grass	**none**	**none**	
1468.00	6459.12	0.0176	1.63	4.53	0.1	0.9	2.60	0.6	1.7	Grass	Grass	**none**	**none**	
1400.00	6457.92	0.0176	1.26	4.58	0.1	0.9	2.60	0.5	1.7	Grass	Grass	**none**	**none**	
1350.00	6457.04	0.0176	1.05	2.32	0.1	0.3	2.60	0.4	0.9	Grass	Grass	**none**	**none**	
1300.00	6456.16	0.0176	0.91	1.44	0.1	0.2	2.60	0.3	0.5	Grass	Grass	**none**	**none**	
1250.00	6455.28	0.0176	0.80	1.00	0.1	0.1	2.60	0.3	0.4	Grass	Grass	**none**	**none**	
1220.00	6454.76	0.0176	0.75	0.83	0.1	0.1	2.60	0.3	0.3	Grass	Grass	**none**	**none**	Winslow Park Culv Entr
2300.00	6443.10	0.0120	6.00	5.54	0.6	0.8	2.60	2.1	1.9	Rock	Rock	**VL**	**VL**	RCP Outfall
2275.00	6442.80	0.0120	5.62	5.53	0.5	0.8	2.60	1.9	1.9	Rock	Rock	**VL**	**VL**	
2250.00	6442.50	0.0120	5.26	5.50	0.5	0.8	2.60	1.8	1.9	Rock	Rock	**VL**	**VL**	
2225.00	6442.20	0.0120	4.91	5.44	0.4	0.8	2.60	1.7	1.9	Rock	Rock	**VL**	**VL**	
2200.00	6441.90	0.0120	4.59	5.30	0.4	0.7	2.60	1.6	1.8	Rock	Rock	**VL**	**VL**	
2175.00	6441.60	0.0120	4.29	5.04	0.4	0.7	2.60	1.5	1.7	Rock	Rock	**VL**	**VL**	
2150.00	6441.30	0.0120	4.01	4.67	0.3	0.6	2.60	1.4	1.6	Grass	Grass	**none**	**none**	
2125.00	6441.00	0.0120	3.76	4.23	0.3	0.5	2.60	1.3	1.5	Grass	Grass	**none**	**none**	
2088.00	6440.54	0.0080	7.33	4.98	0.5	0.5	2.60	2.4	1.6	Rock	Rock	**VL**	**VL**	HR Drive Culv Entr
1946.00	6439.42	0.0080	14.00	5.88	1.3	0.7	2.60	4.5	1.9	Rock	Rock	**H**	**VL**	HR Drive Culv Exit
1925.00	6439.30	0.0080	5.95	4.97	0.5	0.7	2.60	1.9	1.6	Rock	Rock	**VL**	**VL**	
1900.00	6438.62	0.0080	6.56	4.62	0.6	0.5	2.60	2.1	1.5	Rock	Rock	**VL**	**VL**	

this seems high for grass

***(V*S^.17)/(Ss-1)^.66**
DCM 10.10.2

Conc = Concrete Culvert or Lining
L Rock = Type L Rip Rap (non-grouted)
Gr L Rock = Grouted Type L Rip Rap
Grass - used for lining - Allowable V= 5.00 fps

Culvert Hydraulic Calculations
FHA HY-8

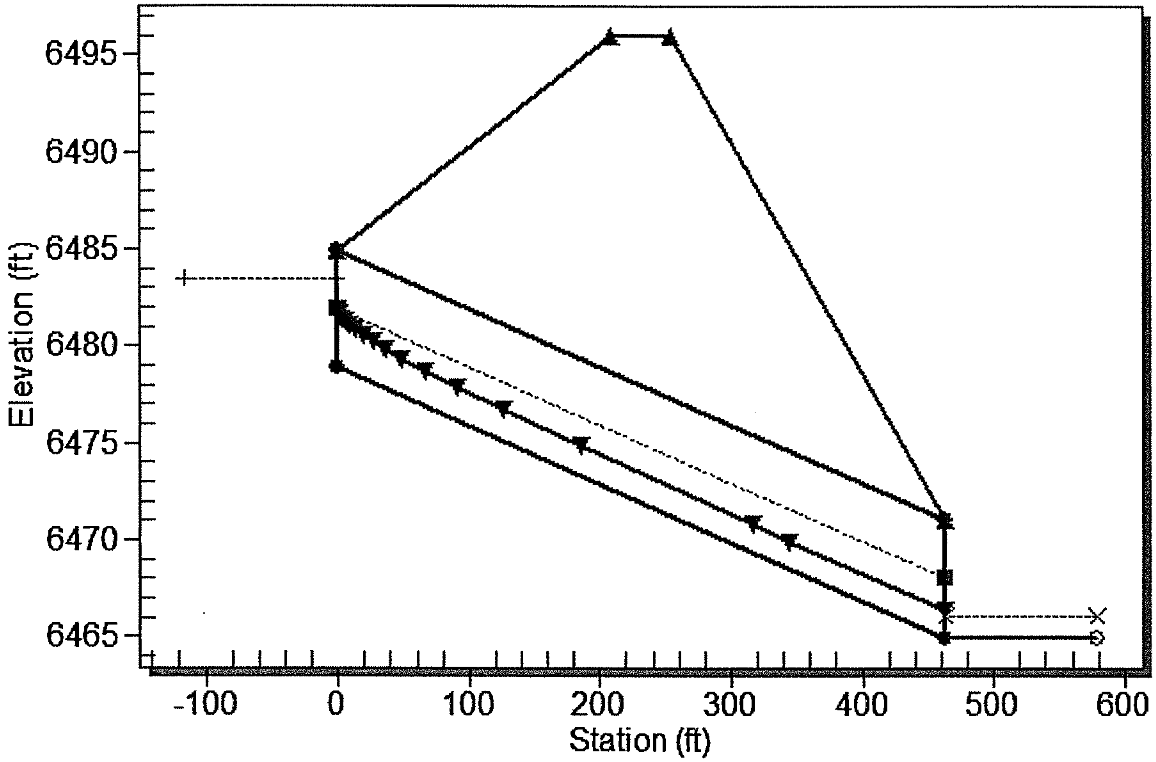
(For verification of HEC-RAS results)

Provide for Winslow Park Dr.

Water Surface Profile Plot for Culvert: 6'h x 12'w UNDER SADDLE

Crossing - CBC Sta 22+00, Design Discharge - 360.0 cfs (5 yr)

Culvert - 6'h x 12'w, Culvert Discharge - 360.0 cfs



Site Data - 6'h x 12'w

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6478.87 ft

Outlet Station: 462.91 ft

Outlet Elevation: 6464.98 ft

Number of Barrels: 1

Culvert Data Summary - 6'h x 12'w

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 6.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (30-75° flare) Wingwall

Inlet Depression: NONE

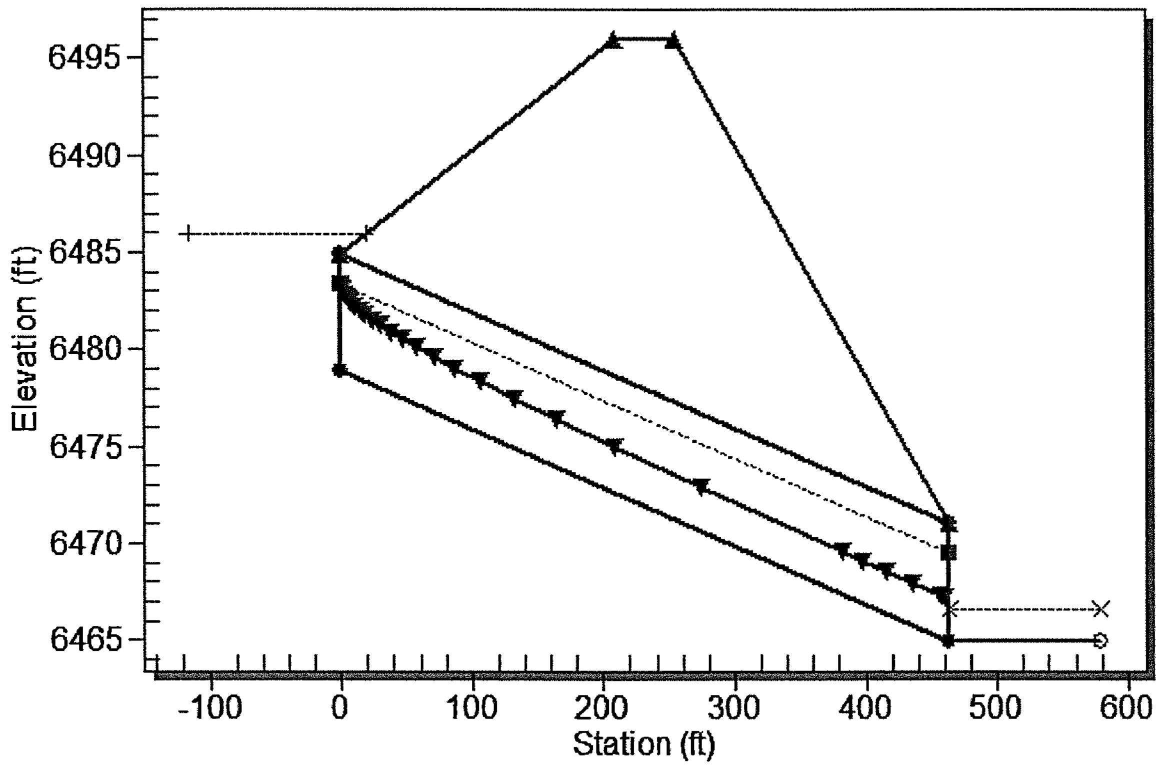
Table 1 - Summary of Culvert Flows at Crossing: CBC Sta 22+00

	Headwater Elevation (ft)	Total Discharge (cfs)	6'h x 12'w Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5 YR	6482.46	250.00	250.00	0.00	1
	6482.56	261.00	261.00	0.00	1
	6482.67	272.00	272.00	0.00	1
	6482.77	283.00	283.00	0.00	1
	6482.88	294.00	294.00	0.00	1
	6482.98	305.00	305.00	0.00	1
	6483.08	316.00	316.00	0.00	1
	6483.18	327.00	327.00	0.00	1
	6483.28	338.00	338.00	0.00	1
	6483.38	349.00	349.00	0.00	1
10 YR	6483.47	360.00	360.00	0.00	1
	6496.00	1341.21	1341.21	0.00	Overtopping

Water Surface Profile Plot for Culvert: 6'h x 12'w UNDER SADDLE St.

Crossing - CBC Sta 22+00, Design Discharge - 640.0 cfs (100-YR)

Culvert - 6'h x 12'w, Culvert Discharge - 640.0 cfs



Site Data - 6'h x 12'w

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6478.87 ft

Outlet Station: 462.91 ft

Outlet Elevation: 6464.98 ft

Number of Barrels: 1

Culvert Data Summary - 6'h x 12'w

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 6.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (30-75° flare) Wingwall

Inlet Depression: NONE

?

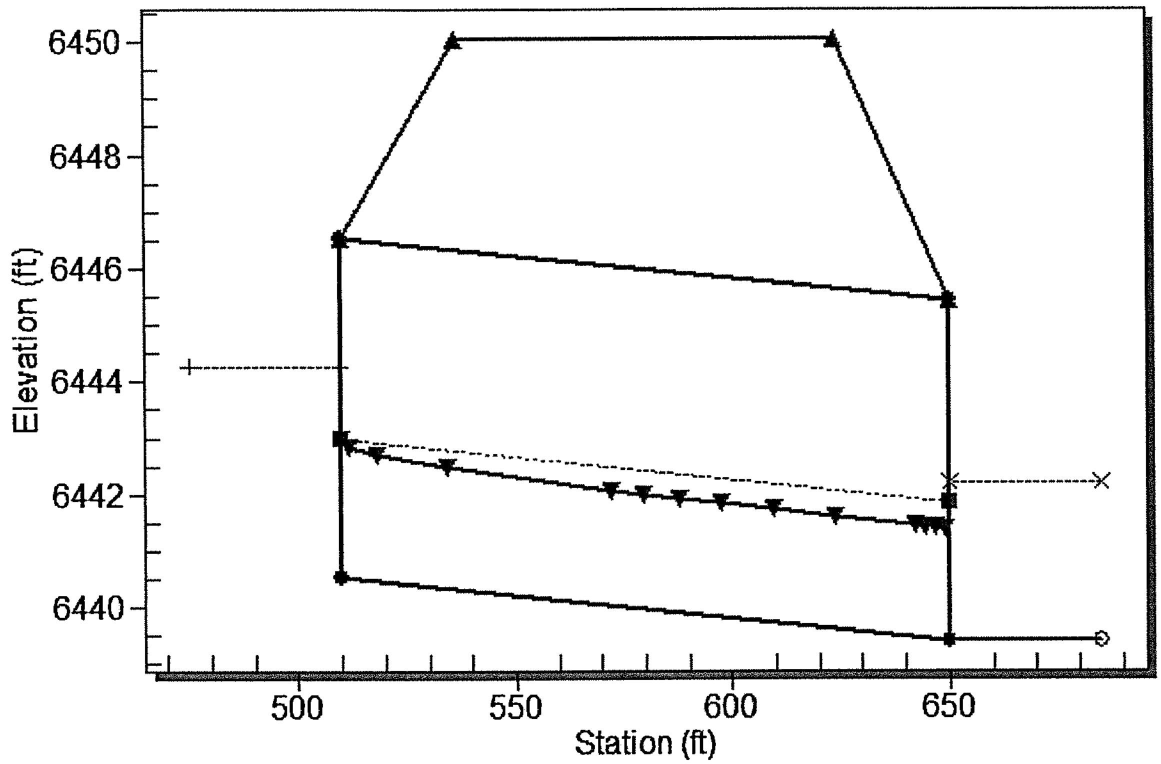
Table 1 - Summary of Culvert Flows at Crossing: CBC Sta 22+00

	Headwater Elevation (ft)	Total Discharge (cfs)	6'h x 12'w Discharge (cfs)	Roadway Discharge (cfs)	Iterations
10 YR	6483.47	360.00	360.00	0.00	1
	6483.72	388.00	388.00	0.00	1
	6483.96	416.00	416.00	0.00	1
	6484.19	444.00	444.00	0.00	1
	6484.43	472.00	472.00	0.00	1
	6484.67	500.00	500.00	0.00	1
	6484.91	528.00	528.00	0.00	1
	6485.16	556.00	556.00	0.00	1
	6485.41	584.00	584.00	0.00	1
	6485.66	612.00	612.00	0.00	1
100 YR	6485.92	640.00	640.00	0.00	1
	6496.00	1341.21	1341.21	0.00	Overtopping

Water Surface Profile Plot for Culvert: Double 10'Wx6'H Hannah Ridge Dr

Crossing - Hannah Ridge Dr Culvert, Design Discharge - 428.0 cfs (5-yr)

Culvert - Double 10'Wx6'H, Culvert Discharge - 428.0 cfs



Site Data - Double 10'Wx6'H

Site Data Option: Culvert Invert Data

Inlet Station: 510.00 ft

Inlet Elevation: 6440.54 ft

Outlet Station: 650.00 ft

Outlet Elevation: 6439.42 ft

Number of Barrels: 2

Culvert Data Summary - Double 10'Wx6'H

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 6.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0150

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (30-75° flare) Wingwall

Inlet Depression: NONE

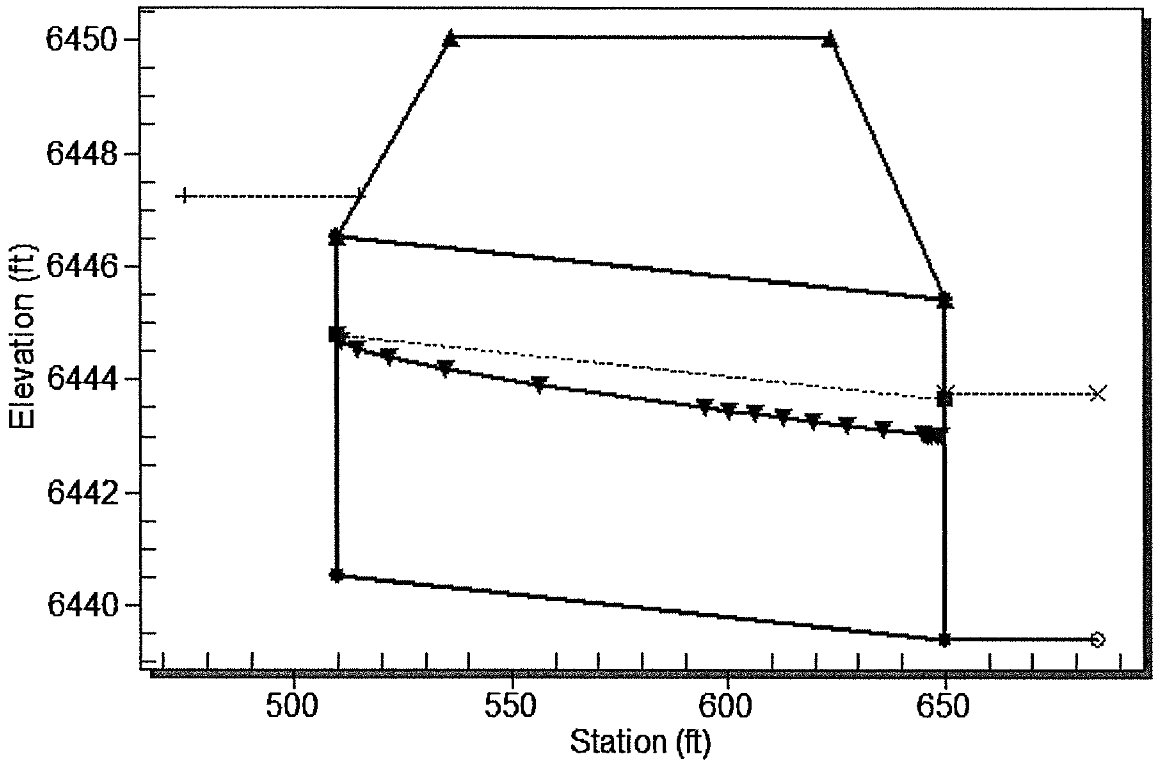
Table 1 - Summary of Culvert Flows at Crossing: Hannah Ridge Dr Culvert

	Headwater Elevation (ft)	Total Discharge (cfs)	Double 10'Wx6'H Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5 YR	6443.38	289.00	289.00	0.00	1
	6443.48	302.90	302.90	0.00	1
	6443.57	316.80	316.80	0.00	1
	6443.66	330.70	330.70	0.00	1
	6443.75	344.60	344.60	0.00	1
	6443.84	358.50	358.50	0.00	1
	6443.92	372.40	372.40	0.00	1
	6444.01	386.30	386.30	0.00	1
	6444.09	400.20	400.20	0.00	1
	6444.18	414.10	414.10	0.00	1
10 YR	6444.26	428.00	428.00	0.00	1
	6450.06	1437.89	1437.89	0.00	Overtopping

Water Surface Profile Plot for Culvert: Double 10'Wx6'H Hannah Ridge Dr

Crossing - Hannah Ridge Dr Culvert, Design Discharge - 991.0 cfs (100-yr)

Culvert - Double 10'Wx6'H, Culvert Discharge - 991.0 cfs



Site Data - Double 10'Wx6'H

Site Data Option: Culvert Invert Data

Inlet Station: 510.00 ft

Inlet Elevation: 6440.54 ft

Outlet Station: 650.00 ft

Outlet Elevation: 6439.42 ft

Number of Barrels: 2

Culvert Data Summary - Double 10'Wx6'H

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 6.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0150

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (30-75° flare) Wingwall

Inlet Depression: NONE

Table 1 - Summary of Culvert Flows at Crossing: Hannah Ridge Dr Culvert

	Headwater Elevation (ft)	Total Discharge (cfs)	Double 10'Wx6'H Discharge (cfs)	Roadway Discharge (cfs)	Iterations
10 YR	6444.26	428.00	428.00	0.00	1
	6444.58	484.30	484.30	0.00	1
	6444.89	540.60	540.60	0.00	1
	6445.19	596.90	596.90	0.00	1
	6445.49	653.20	653.20	0.00	1
	6445.77	709.50	709.50	0.00	1
	6446.06	765.80	765.80	0.00	1
	6446.35	822.10	822.10	0.00	1
	6446.64	878.40	878.40	0.00	1
	6446.94	934.70	934.70	0.00	1
100 YR	6447.24	991.00	991.00	0.00	1
	6450.06	1437.83	1437.83	0.00	Overtopping

Street Flow Capacity Calculations

Missing?

Stormwater Quality Sand Filter Basin Sizing Calculations
UDFCD Design Worksheets

why in this report?

Design Procedure Form: Sand Filter (SF)

Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 15, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins A1-A5 at Park north end

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 48.3 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.483
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time $WQCV = 0.9 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.18 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 198,198 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume $V_{WQCV} = WQCV / 12 * Area$	V_{WQCV} = 2,998 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 2,928 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 2,965 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 2.0 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 659 sq ft
D) Actual Filter Area	A_{Actual} = 1056 sq ft
E) Volume Provided	V_T = 2965 cu ft
3. Filter Material	~~Choose One~~ ◉ 18" CDOT Class C Filter Material ○ Other (Explain):
4. Underdrain System	Choose One
A) Are underdrains provided?	◉ YES ○ NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 2,965 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 1.27 in

$Q_2 = 7.2$ cfs

$Q_{WQCV} = 1/2\, Q_2 = 3.6$ cfs

PIPE SIZE INTO S.F. @ 1.0% = 12"

Design Procedure Form: Sand Filter (SF)

Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 15, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins A1-A5 at Park north end

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 15, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins A1-A5 at Park north end

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	A1-A5													
Receiving Pervious Area Soil Type	Loamy Sand													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	4.550													
Directly Connected Impervious Area (DCIA, acres)	1.674													
Unconnected Impervious Area (UIA, acres)	0.880													
Receiving Pervious Area (RPA, acres)	0.950													
Separate Pervious Area (SPA, acres)	1.046													
RPA Treatment Type: Conveyance (C) or Volume (V)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	4.550													
Directly Connected Impervious Area (DCIA, %)	36.8%													
Unconnected Impervious Area (UIA, %)	19.3%													
Receiving Pervious Area (RPA, %)	20.9%													
Separate Pervious Area (SPA, %)	23.0%													
A_R (RPA / UIA)	1.080													
I_a Check	0.480													
f / I for WQCV Event:	2.8													
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:	0.60													
IRF for 5-Year Event:	0.91													
IRF for 100-Year Event:	0.93													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	56.1%													
Effective Imperviousness for WQCV Event:	48.3%													
Effective Imperviousness for 5-Year Event:	54.4%													
Effective Imperviousness for 100-Year Event:	54.8%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	9.9%	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:	2.4%	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:	56.1%
Total Site Effective Imperviousness for WQCV Event:	48.3%
Total Site Effective Imperviousness for 5-Year Event:	54.4%
Total Site Effective Imperviousness for 100-Year Event:	54.8%
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

why isn't this combined with "c" basins?

Design Procedure Form: Sand Filter (SF)

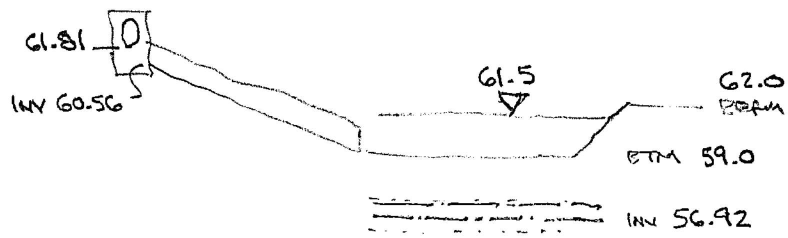
Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 15, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins OSB1-B8 at Park SE

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 56.1 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.561
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time WQCV= $0.9 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.20 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 394,218 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = 6,615 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 6,461 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 6,503 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 2.5 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 1445 sq ft
D) Actual Filter Area	A_{Actual} = 1892 sq ft
E) Volume Provided	V_T = 6503 cu ft
3. Filter Material	~~Choose One~~ ◉ 18" CDOT Class C Filter Material ○ Other (Explain):
4. Underdrain System	Choose One
A) Are underdrains provided?	◉ YES ○ NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 6,503 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 1.88 in

Q_2 = 14.7 cfs

Q_{WQCV} = 1/2 Q_2 = 7.4 cfs

Pipe Size into S.F. @ 1.0% = 18"
out = 18"



Design Procedure Form: Sand Filter (SF)

Designer:	**D. Gorman**
Company:	**M.V.E., Inc.**
Date:	**August 15, 2013**
Project:	**Hannah Ridge at Feathergrass**
Location:	**Basins OSB1-B8 at Park SE**

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 15, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins OSB1-B8 at Park SE

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	OSB1-B8
Receiving Pervious Area Soil Type	Sandy Loam
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	9.050
Directly Connected Impervious Area (DCIA, acres)	3.620
Unconnected Impervious Area (UIA, acres)	2.110
Receiving Pervious Area (RPA, acres)	2.330
Separate Pervious Area (SPA, acres)	0.990
RPA Treatment Type: Conveyance (C) or Volume (V)	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	9.050
Directly Connected Impervious Area (DCIA, %)	40.0%
Unconnected Impervious Area (UIA, %)	23.3%
Receiving Pervious Area (RPA, %)	25.7%
Separate Pervious Area (SPA, %)	10.9%
A_R (RPA / UIA)	1.104
I_a Check	0.480
f / I for WQCV Event:	1.5
f / I for 5-Year Event:	0.5
f / I for 100-Year Event:	0.3
f / I for Optional User Defined Storm CUHP:	
IRF for WQCV Event:	0.69
IRF for 5-Year Event:	0.91
IRF for 100-Year Event:	0.95
IRF for Optional User Defined Storm CUHP:	
Total Site Imperviousness: I_{total}	63.3%
Effective Imperviousness for WQCV Event:	56.1%
Effective Imperviousness for 5-Year Event:	61.2%
Effective Imperviousness for 100-Year Event:	62.2%
Effective Imperviousness for Optional User Defined Storm CUHP:	

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	9.7%	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:	1.7%	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:	63.3%
Total Site Effective Imperviousness for WQCV Event:	56.1%
Total Site Effective Imperviousness for 5-Year Event:	61.2%
Total Site Effective Imperviousness for 100-Year Event:	62.2%
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

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

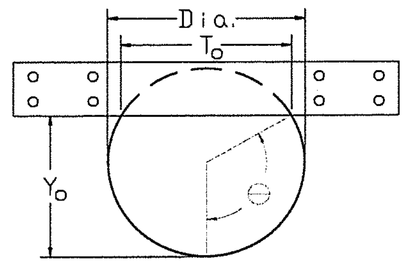
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

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

RESTRICTOR PLATE SIZING FOR CIRCULAR VERTICAL ORIFICES

Project: **Hannah Ridge at Feathergrass**
Basin ID: **Basin OSC1-C12**

X



		#1 Vertical Orifice	#2 Vertical Orifice	
Sizing the Restrictor Plate for Circular Vertical Orifices or Pipes (Input)				
Water Surface Elevation at Design Depth	Elev: WS =	102.20		feet
Pipe/Vertical Orifice Entrance Invert Elevation	Elev: Invert =	100.00		feet
Required Peak Flow through Orifice at Design Depth	Q =	16.20		cfs
Pipe/Vertical Orifice Diameter (inches)	Dia =	24.0		inches
Orifice Coefficient	C_o =	0.65		
Full-flow Capacity (Calculated)				
Full-flow area	Af =	3.14		sq ft
Half Central Angle in Radians	Theta =	3.14		rad
Full-flow capacity	Qf =	18.0		cfs
	Percent of Design Flow =	111%		
Calculation of Orifice Flow Condition				
Half Central Angle (0<Theta<3.1416)	Theta =	2.14		rad
Flow area	A_o =	2.60		sq ft
Top width of Orifice (inches)	T_o =	20.18		inches
Height from Invert of Orifice to Bottom of Plate (feet)	Y_o =	1.54		feet
Elevation of Bottom of Plate	Elev Plate Bottom Edge =	101.54		feet
Resultant Peak Flow Through Orifice at Design Depth	Q_o =	16.2		cfs
Width of Equivalent Rectangular Vertical Orifice	**Equivalent Width =**	**1.69**		**feet**

why isn't this combined with "B" basins?

Design Procedure Form: Sand Filter (SF)

Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 15, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins OSC1-C12 at Park SW

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 46.6 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.466
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time WQCV= 0.9 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i)	WQCV = 0.18 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 1,100,325 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = 16,270 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 15,891 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 16,000 cu ft

2. Basin Geometry

A) WQCV Depth	D_{WQCV} = 2.5 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 3556 sq ft
D) Actual Filter Area	A_{Actual} = 6400 sq ft
E) Volume Provided	V_T = 16000 cu ft

3. Filter Material

Choose One
- (●) 18" CDOT Class C Filter Material
- ( ) Other (Explain):

4. Underdrain System

A) Are underdrains provided?	Choose One: (●) YES ( ) NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 16,000 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 2.95 in

Q_2 = 35.3 cfs

Q_{WQCV} = 1/2 Q_2 = 17.7 cfs

PIPE SIZE INTO S.F @ 1.0% = 24"

RESTRICTOR PLATE 21.6" ABOVE INVERT

Design Procedure Form: Sand Filter (SF)

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 15, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins OSC1-C12 at Park SW

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 15, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins OSC1-C12 at Park SW

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	OSC1-C12
Receiving Pervious Area Soil Type	Sandy Loam
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	25.260
Directly Connected Impervious Area (DCIA, acres)	7.030
Unconnected Impervious Area (UIA, acres)	6.850
Receiving Pervious Area (RPA, acres)	7.340
Separate Pervious Area (SPA, acres)	4.040
RPA Treatment Type: Conveyance (C) or Volume (V)	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	25.260
Directly Connected Impervious Area (DCIA, %)	27.8%
Unconnected Impervious Area (UIA, %)	27.1%
Receiving Pervious Area (RPA, %)	29.1%
Separate Pervious Area (SPA, %)	16.0%
A_R (RPA / UIA)	1.072
I_a Check	0.480
f / I for WQCV Event:	1.5
f / I for 5-Year Event:	0.5
f / I for 100-Year Event:	0.3
f / I for Optional User Defined Storm CUHP:	
IRF for WQCV Event:	0.69
IRF for 5-Year Event:	0.91
IRF for 100-Year Event:	0.95
IRF for Optional User Defined Storm CUHP:	
Total Site Imperviousness: I_{total}	54.9%
Effective Imperviousness for WQCV Event:	46.6%
Effective Imperviousness for 5-Year Event:	52.5%
Effective Imperviousness for 100-Year Event:	53.7%
Effective Imperviousness for Optional User Defined Storm CUHP:	

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	10.5%	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:	2.3%	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:	54.9%
Total Site Effective Imperviousness for WQCV Event:	46.6%
Total Site Effective Imperviousness for 5-Year Event:	52.5%
Total Site Effective Imperviousness for 100-Year Event:	53.7%
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

why in this report?

Design Procedure Form: Sand Filter (SF)

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 17, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins D1-D12 at Park SW

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 51.3 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.513
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time WQCV= $0.9 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.19 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 777,110 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = 12,229 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 11,945 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 11,945 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 2.5 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 2654 sq ft
D) Actual Filter Area	A_{Actual} = 3540 sq ft
E) Volume Provided	V_T = 12076 cu ft
3. Filter Material	Choose One (●) 18" CDOT Class C Filter Material ( ) Other (Explain):
4. Underdrain System	Choose One
A) Are underdrains provided?	(●) YES ( ) NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 11,945 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 2.55 in

Q_2 = 26.7 cfs

Q_{WQCV} = ½ Q_2 = 13.4 cfs

PIPE SIZE = 24" @ 0.5% – 1.0%

RESTRICTOR PLATE AT 1'-4" ABOVE INVERT

Design Procedure Form: Sand Filter (SF)

Designer:	**D. Gorman**
Company:	**M.V.E., Inc.**
Date:	**August 17, 2013**
Project:	**Hannah Ridge at Feathergrass**
Location:	**Basins D1-D12 at Park SW**

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

	User Input		
	Calculated cells		
***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 17, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins D1-D12 at Park SW

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	D1-D12													
Receiving Pervious Area Soil Type	Sandy Loam													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	17.840													
Directly Connected Impervious Area (DCIA, acres)	5.790													
Unconnected Impervious Area (UIA, acres)	4.850													
Receiving Pervious Area (RPA, acres)	5.110													
Separate Pervious Area (SPA, acres)	2.090													
RPA Treatment Type: Conveyance (C) or Volume (V)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	17.840													
Directly Connected Impervious Area (DCIA, %)	32.5%													
Unconnected Impervious Area (UIA, %)	27.2%													
Receiving Pervious Area (RPA, %)	28.6%													
Separate Pervious Area (SPA, %)	11.7%													
A_R (RPA / UIA)	1.054													
I_a Check	0.490													
f / I for WQCV Event:	1.5													
f / I for 5-Year Event:	0.5													
f / I for 100-Year Event:	0.3													
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	0.69													
IRF for 5-Year Event:	0.91													
IRF for 100-Year Event:	0.95													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	59.6%													
Effective Imperviousness for WQCV Event:	51.3%													
Effective Imperviousness for 5-Year Event:	57.2%													
Effective Imperviousness for 100-Year Event:	58.4%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	10.6%	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:	2.0%	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
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	59.6%
Total Site Effective Imperviousness for WQCV Event:	51.3%
Total Site Effective Imperviousness for 5-Year Event:	57.2%
Total Site Effective Imperviousness for 100-Year Event:	58.4%
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.

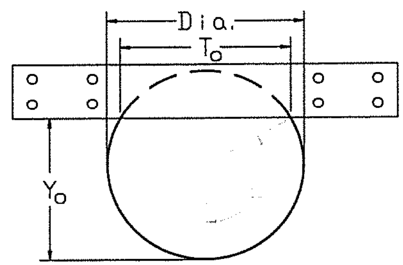
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

RESTRICTOR PLATE SIZING FOR CIRCULAR VERTICAL ORIFICES

Project: **Hannah Ridge at Feathergrass**

Basin ID: **Basin D1-D12**

X



		#1 Vertical Orifice	#2 Vertical Orifice	
Sizing the Restrictor Plate for Circular Vertical Orifices or Pipes (Input)				
Water Surface Elevation at Design Depth	Elev: WS =	102.00		feet
Pipe/Vertical Orifice Entrance Invert Elevation	Elev: Invert =	100.00		feet
Required Peak Flow through Orifice at Design Depth	Q =	13.40		cfs
Pipe/Vertical Orifice Diameter (inches)	Dia =	24.0		inches
Orifice Coefficient	C_o =	0.65		
Full-flow Capacity (Calculated)				
Full-flow area	Af =	3.14		sq ft
Half Central Angle in Radians	Theta =	3.14		rad
Full-flow capacity	Qf =	16.4		cfs
	Percent of Design Flow =	122%		
Calculation of Orifice Flow Condition				
Half Central Angle (0<Theta<3.1416)	Theta =	1.91		rad
Flow area	A_o =	2.23		sq ft
Top width of Orifice (inches)	T_o =	22.62		inches
Height from Invert of Orifice to Bottom of Plate (feet)	Y_o =	1.33		feet
Elevation of Bottom of Plate	Elev Plate Bottom Edge =	101.33		feet
Resultant Peak Flow Through Orifice at Design Depth	Q_o =	13.4		cfs
Width of Equivalent Rectangular Vertical Orifice	**Equivalent Width =**	**1.68**		**feet**

Design Procedure Form: Sand Filter (SF)

and B8?

Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 16, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins E6-E7 at Hunter Jumper north side

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 33.7 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.337
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time WQCV= $0.9 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.15 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 179,903 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = 2,193 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 2,142 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 2,142 cu ft

2. Basin Geometry

A) WQCV Depth	D_{WQCV} = 2.0 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 476 sq ft
D) Actual Filter Area	A_{Actual} = 729 sq ft
E) Volume Provided	V_T = 2178 cu ft

3. Filter Material

Choose One
- (●) 18" CDOT Class C Filter Material
- ( ) Other (Explain):

Basins E6-E7 at Hunter Jumper north side

4. Underdrain System

A) Are underdrains provided?

Choose One
- (●) YES
- ( ) NO

B) Underdrain system orifice diameter for 12 hour drain time

i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 2,142 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 1.08 in

$Q_2 = 4.6$ CFS

$Q_{WQCV} = \frac{1}{2} Q_2 = 2.3$ CFS

From E6 only

$Q_2 = 3.2$ CFS

$Q_{WQCV} = \frac{1}{2} Q_2 = 1.6$ CFS

PIPE SIZE INTO S.F. = 12" @ 1.0%

Design Procedure Form: Sand Filter (SF)

Designer:	**D. Gorman**
Company:	**M.V.E., Inc.**
Date:	**August 16, 2013**
Project:	**Hannah Ridge at Feathergrass**
Location:	**Basins E6-E7 at Hunter Jumper north side**

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 16, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins E6-E7 at Hunter Jumper north side

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	E6-E7													
Receiving Pervious Area Soil Type	Loamy Sand													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	4.130													
Directly Connected Impervious Area (DCIA, acres)	0.960													
Unconnected Impervious Area (UIA, acres)	0.860													
Receiving Pervious Area (RPA, acres)	1.860													
Separate Pervious Area (SPA, acres)	0.450													
RPA Treatment Type: Conveyance (C) or Volume (V)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	4.130													
Directly Connected Impervious Area (DCIA, %)	23.2%													
Unconnected Impervious Area (UIA, %)	20.8%													
Receiving Pervious Area (RPA, %)	45.0%													
Separate Pervious Area (SPA, %)	10.9%													
A_R (RPA / UIA)	2.163													
I_a Check	0.320													
f / I for WQCV Event:	2.8													
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:	0.89													
IRF for 100-Year Event:	0.91													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	44.1%													
Effective Imperviousness for WQCV Event:	33.7%													
Effective Imperviousness for 5-Year Event:	41.8%													
Effective Imperviousness for 100-Year Event:	42.3%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	14.7%	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:	4.1%	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:	44.1%
Total Site Effective Imperviousness for WQCV Event:	33.7%
Total Site Effective Imperviousness for 5-Year Event:	41.8%
Total Site Effective Imperviousness for 100-Year Event:	42.3%
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

Design Procedure Form: Sand Filter (SF)

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 16, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins E1-E5,E8 at Hunter Jumper south side

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 54.6 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.546
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time $WQCV = 0.9 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.20 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 404,672 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume $V_{WQCV} = WQCV / 12 * Area$	V_{WQCV} = 6,654 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 6,499 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 6,499 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 2.5 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 1444 sq ft
D) Actual Filter Area	A_{Actual} = 1980 sq ft
E) Volume Provided	V_T = 6760 cu ft
3. Filter Material	Choose One ◉ 18" CDOT Class C Filter Material ○ Other (Explain):
4. Underdrain System	
A) Are underdrains provided?	Choose One ◉ YES ○ NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 6,499 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 1.88 in

$Q_2 = 15.2$ cfs

$Q_{WQCV} = 1/2\, Q_2 = 7.6$ cfs

PIPE INTO S.F. = 18" @ 1.0%
WITH RESTRICTOR PLATE 13.5" ABOVE INVERT

Design Procedure Form: Sand Filter (SF)

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 16, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins E1-E5,E8 at Hunter Jumper south side

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 16, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins E1-E5,E8 at Hunter Jumper south side

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	E1-E5,E8													
Receiving Pervious Area Soil Type	Sandy Loam													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	9.290													
Directly Connected Impervious Area (DCIA, acres)	2.860													
Unconnected Impervious Area (UIA, acres)	3.180													
Receiving Pervious Area (RPA, acres)	3.250													
Separate Pervious Area (SPA, acres)	0.000													
RPA Treatment Type: Conveyance (C) or Volume (V)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	9.290													
Directly Connected Impervious Area (DCIA, %)	30.8%													
Unconnected Impervious Area (UIA, %)	34.2%													
Receiving Pervious Area (RPA, %)	35.0%													
Separate Pervious Area (SPA, %)	0.0%													
A_R (RPA / UIA)	1.022													
I_a Check	0.490													
f / I for WQCV Event:	1.5													
f / I for 5-Year Event:	0.5													
f / I for 100-Year Event:	0.3													
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	0.69													
IRF for 5-Year Event:	0.91													
IRF for 100-Year Event:	0.95													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	65.0%													
Effective Imperviousness for WQCV Event:	54.6%													
Effective Imperviousness for 5-Year Event:	62.0%													
Effective Imperviousness for 100-Year Event:	63.4%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	13.8%	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:	2.3%	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:	65.0%
Total Site Effective Imperviousness for WQCV Event:	54.6%
Total Site Effective Imperviousness for 5-Year Event:	62.0%
Total Site Effective Imperviousness for 100-Year Event:	63.4%
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.

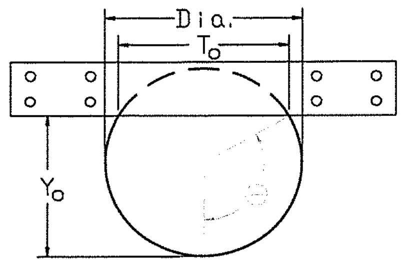
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

RESTRICTOR PLATE SIZING FOR CIRCULAR VERTICAL ORIFICES

Project: Hannah Ridge at Feathergrass

Basin ID: Basin E1-E5 E8

X



			#1 Vertical Orifice	#2 Vertical Orifice	
Sizing the Restrictor Plate for Circular Vertical Orifices or Pipes (Input)					
	Water Surface Elevation at Design Depth	Elev: WS =	101.60		feet
	Pipe/Vertical Orifice Entrance Invert Elevation	Elev: Invert =	100.00		feet
	Required Peak Flow through Orifice at Design Depth	Q =	7.60		cfs
	Pipe/Vertical Orifice Diameter (inches)	Dia =	18.0		inches
	Orifice Coefficient	C_o =	0.65		
Full-flow Capacity (Calculated)					
	Full-flow area	Af =	1.77		sq ft
	Half Central Angle in Radians	Theta =	3.14		rad
	Full-flow capacity	Qf =	8.5		cfs
		Percent of Design Flow =	112%		
Calculation of Orifice Flow Condition					
	Half Central Angle (0<Theta<3.1416)	Theta =	2.11		rad
	Flow area	A_o =	1.43		sq ft
	Top width of Orifice (inches)	T_o =	15.45		inches
	Height from Invert of Orifice to Bottom of Plate (feet)	Y_o =	1.13		feet
	Elevation of Bottom of Plate	Elev Plate Bottom Edge =	101.13		feet
	Resultant Peak Flow Through Orifice at Design Depth	Q_o =	7.6		cfs
	Width of Equivalent Rectangular Vertical Orifice	**Equivalent Width =**	**1.27**		**feet**

Design Procedure Form: Sand Filter (SF)

and E1? seems low?

Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 16, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins F1-F5 at Hunter Jumper south side

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 35.1 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.351
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time WQCV= 0.9 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i)	WQCV = 0.15 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 496,148 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = 6,196 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 6,052 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 6,052 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 2.0 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 1345 sq ft
D) Actual Filter Area	A_{Actual} = 1764 sq ft
E) Volume Provided	V_T = 6126 cu ft
3. Filter Material	Choose One ◉ 18" CDOT Class C Filter Material ○ Other (Explain): Basins E6-E7 at Hunter Jumper north side
4. Underdrain System	
A) Are underdrains provided?	Choose One ◉ YES ○ NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 6,052 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 1.81 in

$Q_2 = 14.0$ CFS

$Q_{WQCV} = \frac{1}{2} Q_2 = 7.0$

PIPE SIZE INTO S.F. = 18" @ 1.0%

WITH RESTRICTOR PLATE 12" ABOVE INVERT

Design Procedure Form: Sand Filter (SF)

Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 16, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins F1-F5 at Hunter Jumper south side

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 16, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins F1-F5 at Hunter Jumper south side

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	F1-F5
Receiving Pervious Area Soil Type	Loamy Sand
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	11.390
Directly Connected Impervious Area (DCIA, acres)	2.500
Unconnected Impervious Area (UIA, acres)	2.520
Receiving Pervious Area (RPA, acres)	2.750
Separate Pervious Area (SPA, acres)	3.620
RPA Treatment Type: Conveyance (C) or Volume (V)	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	11.390
Directly Connected Impervious Area (DCIA, %)	21.9%
Unconnected Impervious Area (UIA, %)	22.1%
Receiving Pervious Area (RPA, %)	24.1%
Separate Pervious Area (SPA, %)	31.8%
A_R (RPA / UIA)	1.091
I_a Check	0.480
f / I for WQCV Event:	2.8
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:	0.60
IRF for 5-Year Event:	0.91
IRF for 100-Year Event:	0.93
IRF for Optional User Defined Storm CUHP:	
Total Site Imperviousness: I_{total}	44.1%
Effective Imperviousness for WQCV Event:	35.1%
Effective Imperviousness for 5-Year Event:	42.1%
Effective Imperviousness for 100-Year Event:	42.5%
Effective Imperviousness for Optional User Defined Storm CUHP:	

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	12.6%	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:	3.5%	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:	44.1%
Total Site Effective Imperviousness for WQCV Event:	35.1%
Total Site Effective Imperviousness for 5-Year Event:	42.1%
Total Site Effective Imperviousness for 100-Year Event:	42.5%
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

Swale, Pipe and Area Inlet Calculations

M.V.E., INC.
1903 Lelaray St., Suite 200
COLORADO SPRINGS, CO 80909
(719) 635-5736

JOB 60970 HANNAH RIDGE AT FEATHERGRASS
SHEET NO. 1 OF 2
CALCULATED BY DAG DATE 8/12/13
CHECKED BY ____ DATE ____
SCALE ____

BASINS OSC1 -C12
WATER QUALITY INVERTED SIPHON UNDER CHANNEL

$Q_{WQCV} = \frac{1}{2} Q_2 = \frac{1}{2}(35.4) \doteq 17.7$ cfs (HYDROLOGY CALCS)

INLET SIDE

$INV_1 = 60.5$

(D) PIPE SIZE = 27" @ PIPE SLOPE 5:1

OPENING ht = $D/\cos\alpha_1 = 2.25/(\cos 11.3) = 2.29'$

$V_1 = 17.7/(31" \times 4') = 1.7$ fps

$h_{v1} = V^2/2g = 1.7/64.4 = .04$

SEAL REQUIRED = $1.5(h_v) = 1.5(h_{vp} - h_{v1})$

$= 1.5(.31 - .04) = 0.41$ ft

WSE = $60.5 + 2.29 + 0.41 = 63.2$

SIPHON

NON-REINFORCED CONCRETE PIPE

$A_s = 3.98$ SF

$V_s = Q/A = 17.7/3.98 = 4.5$ FPS

h_{vp} (VELOCITY HEAD) $= V^2/2g = 4.5^2/64.4 = 0.31$

WET PERIM. $= \pi D = 3.14 \times 2.25 = 7.07$ ft

R (HYD RADIUS) = A/W.P. = $3.98/7.07 = 0.56$

$n = 0.013$

FRICTION SLOPE PIPE $= n^2 V^2 / 2.2 R^{4/3}$

$= (.013)^2 (4.5)^2 / 2.2(.56)^{4/3}$

$= 0.0034$ ft/ft

OUTLET SIDE

$INV_2 = 59.0$ (SAND FILTER FLOOR)

OPENING height $= D/\cos\alpha_2 = 2.25/\cos 11.3 = 2.29$ ft. (H_t)

$d_2 = 2.5$ ft., $WSE_2 = 59.0 + 2.5 = 61.5$

$V_2 = 1.7$ fps

$h_{v2} = .04$

SUBMERGENCE AT OUTLET $= 2.5 - 2.29 = 0.21$ ft.

$1/6\ H_t = 1/6(2.29) = 0.38$ — SUBMERGE < .38 SO OUTLET HEAD LOSS IS $0.7\Delta h_v$, BUT WILL ADD RESTRICTION PLATE, USE $1.0\Delta h_v$

M.V.E., INC.
1903 Lelaray St., Suite 200
COLORADO SPRINGS, CO 80909
(719) 635-5736

JOB 60970 HANNAH RIDGE AT FEATHERGRASS
SHEET NO. 2 OF 2
CALCULATED BY [illegible] DATE 8/12/13
CHECKED BY ______ DATE ______
SCALE ______

AVAILABLE HEAD $\Delta h = WSE_1 - WSE_2 = 63.2 - 61.50 = 1.7$ ft.

TOTAL HEAD LOSS w/ 10% SAFETY FACTOR =
1.1 (INLET LOSS + PIPE FRICTION LOSS + BEND LOSS + OUTLET LOSS)

INLET LOSS $= 0.4 h_v = 0.4(h_{vp} - h_{v_1}) = 0.4(.31 - .04) = .11$

PIPE FRICTION LOSS = LENGTH (FRICTION SLOPE) $= 150(.0034) = 0.51$

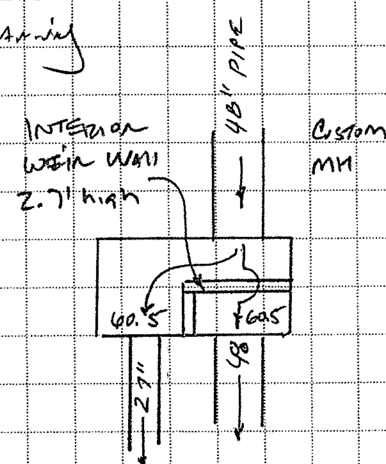
BEND LOSS $= 2(.04)(h_{vp}) = 2(.04)(.31) = 0.02$

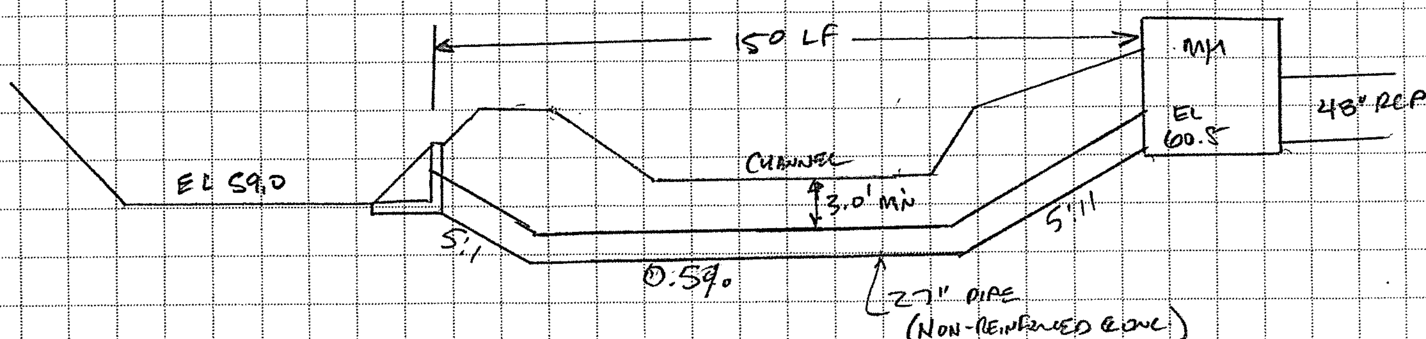
OUTLET LOSS $= 1.0 \Delta h_v = 1.0(h_{vp} - h_{v_2}) = .31 - .04 = .27$

TOTAL HEAD LOSS $= 1.1(.11 + .51 + .02 + .27) = 1.0$ ft.

1.0 ft < 1.7 ft HEADLOSS OKAY

V = 4.5 FPS VELOCITY OKAY FOR CLEANING

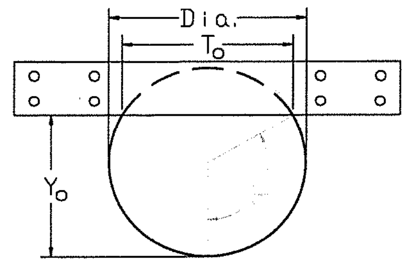




RESTRICTOR PLATE SIZING FOR CIRCULAR VERTICAL ORIFICES

Project: Hannah Ridge at Feathergrass
Basin ID: Basin OSC1-C12 Sand Filter Inlet Pipe

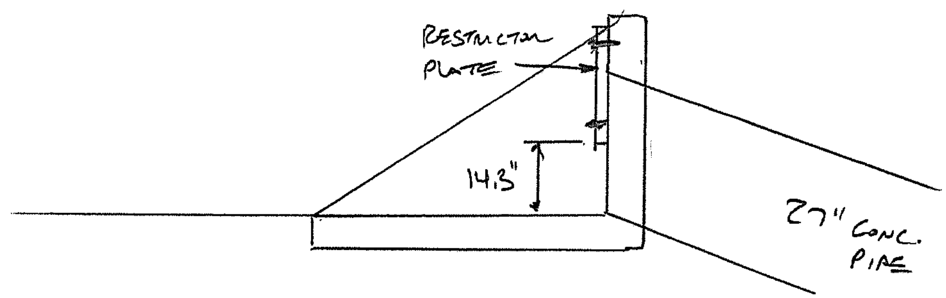
X



		#1 Vertical Orifice	#2 Vertical Orifice	
Sizing the Restrictor Plate for Circular Vertical Orifices or Pipes (Input)				
Water Surface Elevation at Design Depth	Elev: WS =	62.20		feet
Pipe/Vertical Orifice Entrance Invert Elevation	Elev: Invert =	59.00		feet
Required Peak Flow through Orifice at Design Depth	Q =	17.70		cfs
Pipe/Vertical Orifice Diameter (inches)	Dia =	27.0		inches
Orifice Coefficient	C_o =	0.65		
Full-flow Capacity (Calculated)				
Full-flow area	Af =	3.98		sq ft
Half Central Angle in Radians	Theta =	3.14		rad
Full-flow capacity	Qf =	29.9		cfs
	Percent of Design Flow =	169%		
Calculation of Orifice Flow Condition				
Half Central Angle (0<Theta<3.1416)	Theta =	1.62		rad
Flow area	A_o =	2.10		sq ft
Top width of Orifice (inches)	T_o =	26.97		inches
Height from Invert of Orifice to Bottom of Plate (feet)	Y_o =	1.17		feet
Elevation of Bottom of Plate	Elev Plate Bottom Edge =	60.17		feet
Resultant Peak Flow Through Orifice at Design Depth	Q_o =	17.7		cfs
Width of Equivalent Rectangular Vertical Orifice	**Equivalent Width =**	**1.79**		**feet**

63.2 UPSTREAM WSE IN MH
− 1.0 HEADLOSS
= 62.2

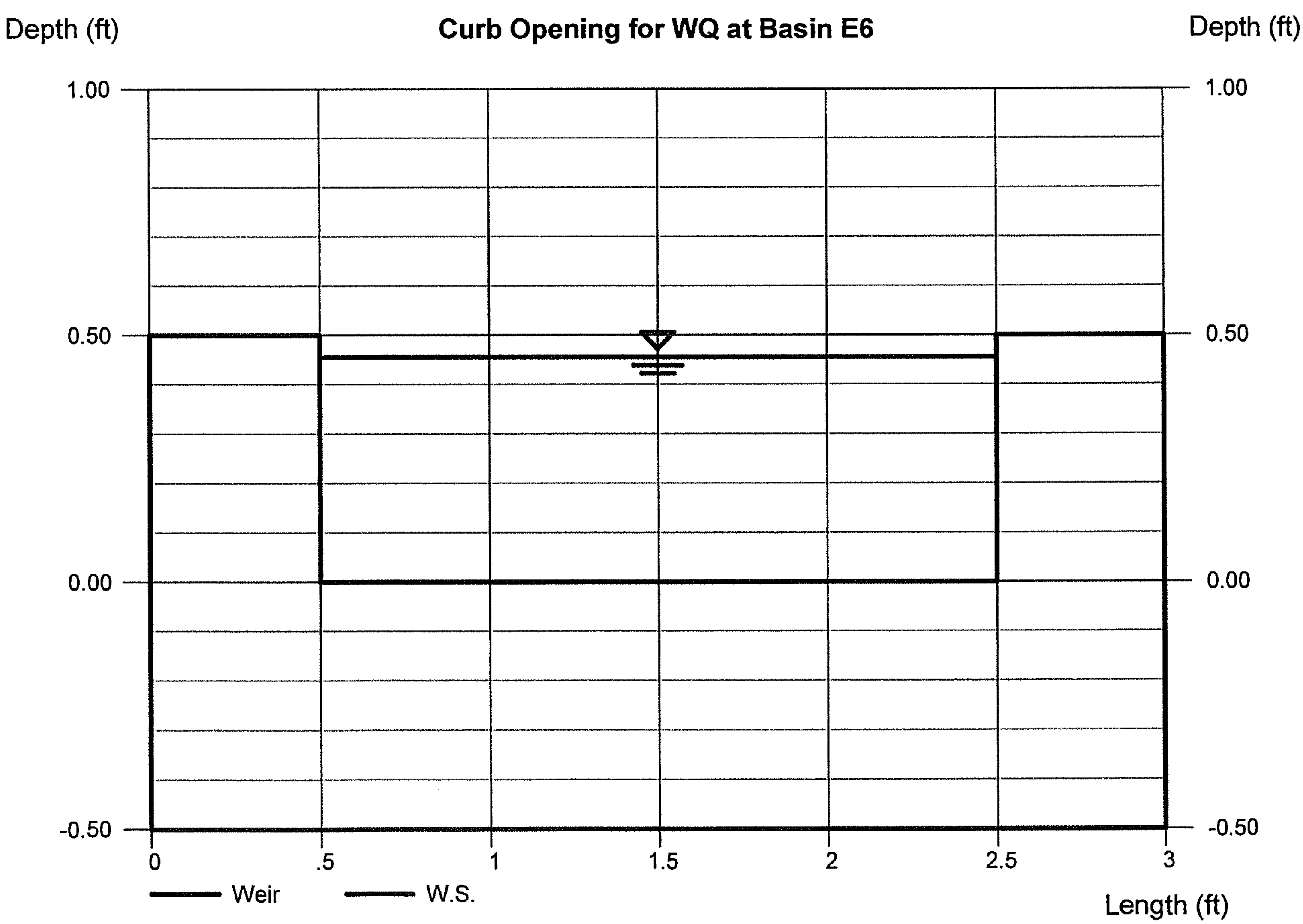
$y_o/(\cos\alpha) =$
$1.17/(\cos 11.3^\circ) = 1.19'$
$= 14.3''$



Weir Report

Curb Opening for WQ at Basin E6

Rectangular Weir		**Highlighted**	
Crest	= Broad	Depth (ft)	= 0.46
Bottom Length (ft)	= 2.00	Q (cfs)	= 1.600
Total Depth (ft)	= 0.50	Area (sqft)	= 0.91
		Velocity (ft/s)	= 1.76
Calculations		Top Width (ft)	= 2.00
Weir Coeff. Cw	= 2.60		
Compute by:	Known Q		
Known Q (cfs)	= 1.60		

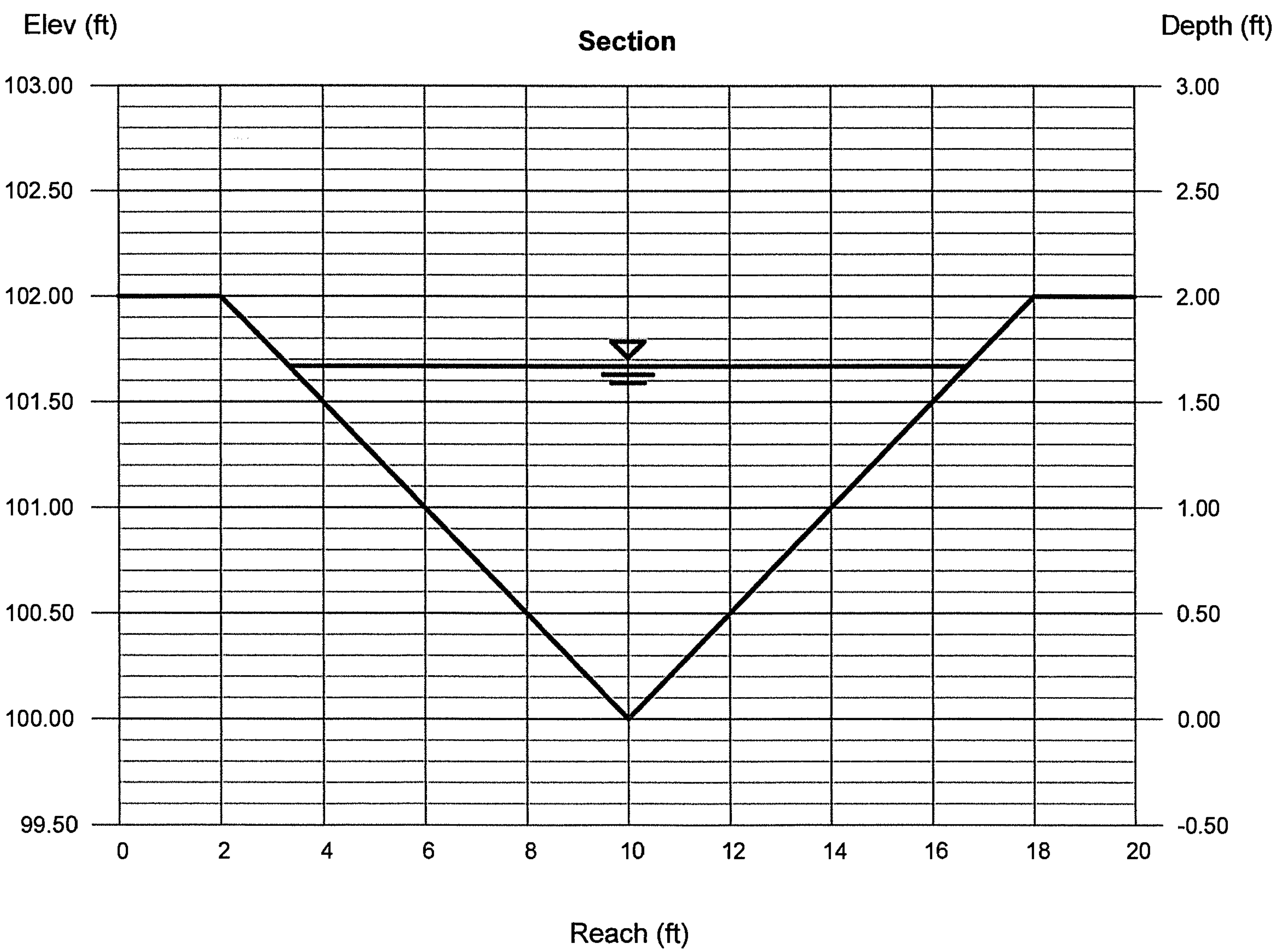


Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. Wednesday, Aug 21 2013

Swale to Type D Inlet - Basin OSF2

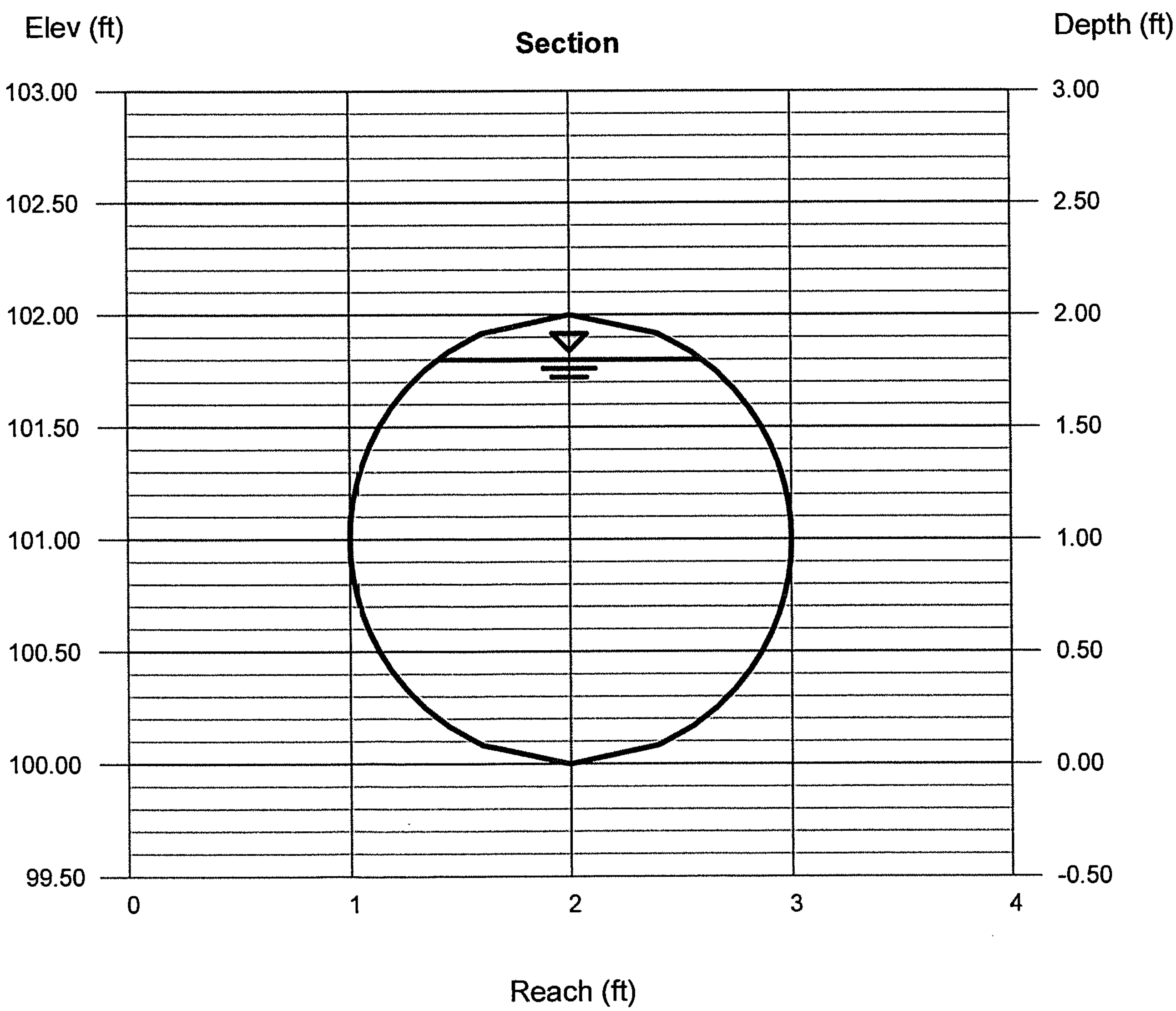
Triangular		**Highlighted**	
Side Slopes (z:1)	= 4.00, 4.00	Depth (ft)	= 1.67
Total Depth (ft)	= 2.00	Q (cfs)	= 41.00
		Area (sqft)	= 11.16
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 3.68
Slope (%)	= 1.00	Wetted Perim (ft)	= 13.77
N-Value	= 0.035	Crit Depth, Yc (ft)	= 1.46
		Top Width (ft)	= 13.36
Calculations		EGL (ft)	= 1.88
Compute by:	Known Q(100)		
Known Q (cfs)	= 41.00		



Channel Report

24in RCP from Basin OSF2 Type D Inlet - Minimum slope

Circular		**Highlighted**	
Diameter (ft)	= 2.00	Depth (ft)	= 1.80
		Q (cfs)	= 41.00
		Area (sqft)	= 2.98
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 13.76
Slope (%)	= 2.90	Wetted Perim (ft)	= 5.00
N-Value	= 0.013	Crit Depth, Yc (ft)	= 1.96
		Top Width (ft)	= 1.20
Calculations		EGL (ft)	= 4.74
Compute by:	Known Q		
Known Q (cfs)	= 41.00		



Stormwater Quality Sand Filter Basin Sizing Calculations
UDFCD Design Worksheets

Update with newest versions of spreadsheet for proposed BMPs.

Design Procedure Form: Sand Filter (SF)

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 15, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins A1-A5 at Park north end

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 48.3 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.483
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time WQCV= $0.9 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.18 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 198,198 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = 2,998 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 2,928 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 2,965 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 2.0 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 659 sq ft
D) Actual Filter Area	A_{Actual} = 1056 sq ft
E) Volume Provided	V_T = 2965 cu ft
3. Filter Material	Choose One ◉ 18" CDOT Class C Filter Material ○ Other (Explain):
4. Underdrain System	
A) Are underdrains provided?	Choose One ◉ YES ○ NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y= 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 2,965 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 1.27 in

Q_2 = 7.2 cfs

Q_{WQCV} = ½ Q_2 = 3.6 cfs

PIPE SIZE INTO S.F. @ 1.0% = 12"

Design Procedure Form: Sand Filter (SF)

Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 15, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins A1-A5 at Park north end

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 15, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins A1-A5 at Park north end

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	A1-A5													
Receiving Pervious Area Soil Type	Loamy Sand													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	4.550													
Directly Connected Impervious Area (DCIA, acres)	1.674													
Unconnected Impervious Area (UIA, acres)	0.880													
Receiving Pervious Area (RPA, acres)	0.950													
Separate Pervious Area (SPA, acres)	1.046													
RPA Treatment Type: Conveyance (C) or Volume (V)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	4.550													
Directly Connected Impervious Area (DCIA, %)	36.8%													
Unconnected Impervious Area (UIA, %)	19.3%													
Receiving Pervious Area (RPA, %)	20.9%													
Separate Pervious Area (SPA, %)	23.0%													
A_R (RPA / UIA)	1.080													
I_a Check	0.480													
f / I for WQCV Event:	2.8													
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:	0.60													
IRF for 5-Year Event:	0.91													
IRF for 100-Year Event:	0.93													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	56.1%													
Effective Imperviousness for WQCV Event:	48.3%													
Effective Imperviousness for 5-Year Event:	54.4%													
Effective Imperviousness for 100-Year Event:	54.8%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	9.9%	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:	2.4%	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:	56.1%
Total Site Effective Imperviousness for WQCV Event:	48.3%
Total Site Effective Imperviousness for 5-Year Event:	54.4%
Total Site Effective Imperviousness for 100-Year Event:	54.8%
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

Design Procedure Form: Sand Filter (SF)

Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 15, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins OSB1-B8 at Park SE

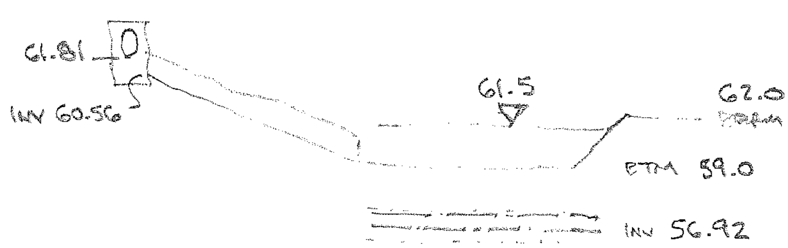
1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 56.1 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.561
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time $WQCV = 0.9 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.20 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 394,218 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = 6,615 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 6,461 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 6,503 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 2.5 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 1445 sq ft
D) Actual Filter Area	A_{Actual} = 1892 sq ft
E) Volume Provided	V_T = 6503 cu ft
3. Filter Material	Choose One ◉ 18" CDOT Class C Filter Material ○ Other (Explain):
4. Underdrain System	
A) Are underdrains provided?	Choose One ◉ YES ○ NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 6,503 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 1.88 in

Q_2 = 14.7 cfs

$Q_{WQCV} = 1/2\ Q_2$ = 7.4 cfs

PIPE SIZE INTO S.F. @ 1.0% = 18"

OUT = 18"



Design Procedure Form: Sand Filter (SF)

Designer:	D. Gorman
Company:	**M.V.E., Inc.**
Date:	**August 15, 2013**
Project:	**Hannah Ridge at Feathergrass**
Location:	**Basins OSB1-B8 at Park SE**

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric

A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?

Choose One

○ YES ◉ NO

6-7. Inlet / Outlet Works

A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 15, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins OSB1-B8 at Park SE

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	OSB1-B8													
Receiving Pervious Area Soil Type	Sandy Loam													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	9.050													
Directly Connected Impervious Area (DCIA, acres)	3.620													
Unconnected Impervious Area (UIA, acres)	2.110													
Receiving Pervious Area (RPA, acres)	2.330													
Separate Pervious Area (SPA, acres)	0.990													
RPA Treatment Type: Conveyance (C) or Volume (V)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	9.050													
Directly Connected Impervious Area (DCIA, %)	40.0%													
Unconnected Impervious Area (UIA, %)	23.3%													
Receiving Pervious Area (RPA, %)	25.7%													
Separate Pervious Area (SPA, %)	10.9%													
A_R (RPA / UIA)	1.104													
I_a Check	0.480													
f / I for WQCV Event:	1.5													
f / I for 5-Year Event:	0.5													
f / I for 100-Year Event:	0.3													
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	0.69													
IRF for 5-Year Event:	0.91													
IRF for 100-Year Event:	0.95													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	63.3%													
Effective Imperviousness for WQCV Event:	56.1%													
Effective Imperviousness for 5-Year Event:	61.2%													
Effective Imperviousness for 100-Year Event:	62.2%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	9.7%	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:	1.7%	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:	63.3%
Total Site Effective Imperviousness for WQCV Event:	56.1%
Total Site Effective Imperviousness for 5-Year Event:	61.2%
Total Site Effective Imperviousness for 100-Year Event:	62.2%
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

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

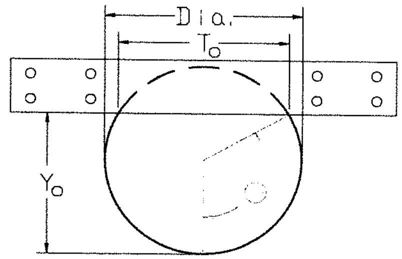
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

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

RESTRICTOR PLATE SIZING FOR CIRCULAR VERTICAL ORIFICES

Project: **Hannah Ridge at Feathergrass**
Basin ID: **Basin OSC1-C12**

X



Sizing the Restrictor Plate for Circular Vertical Orifices or Pipes (Input)

		#1 Vertical Orifice	#2 Vertical Orifice	
Water Surface Elevation at Design Depth	Elev: WS =	102.20		feet
Pipe/Vertical Orifice Entrance Invert Elevation	Elev: Invert =	100.00		feet
Required Peak Flow through Orifice at Design Depth	Q =	16.20		cfs
Pipe/Vertical Orifice Diameter (inches)	Dia =	24.0		inches
Orifice Coefficient	C_o =	0.65		

Full-flow Capacity (Calculated)

		#1 Vertical Orifice	#2 Vertical Orifice	
Full-flow area	Af =	3.14		sq ft
Half Central Angle in Radians	Theta =	3.14		rad
Full-flow capacity	Qf =	18.0		cfs
	Percent of Design Flow =	111%		

Calculation of Orifice Flow Condition

		#1 Vertical Orifice	#2 Vertical Orifice	
Half Central Angle (0<Theta<3.1416)	Theta =	2.14		rad
Flow area	A_o =	2.60		sq ft
Top width of Orifice (inches)	T_o =	20.18		inches
Height from Invert of Orifice to Bottom of Plate (feet)	Y_o =	1.54		feet
Elevation of Bottom of Plate	Elev Plate Bottom Edge =	101.54		feet
Resultant Peak Flow Through Orifice at Design Depth	Q_o =	16.2		cfs
Width of Equivalent Rectangular Vertical Orifice	**Equivalent Width =**	**1.69**		**feet**

Design Procedure Form: Sand Filter (SF)

Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 15, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins OSC1-C12 at Park SW

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 46.6 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.466
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time $WQCV= 0.9 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.18 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 1,100,325 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume $V_{WQCV} = WQCV / 12 * Area$	V_{WQCV} = 16,270 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 15,891 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 16,000 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 2.5 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 3556 sq ft
D) Actual Filter Area	A_{Actual} = 6400 sq ft
E) Volume Provided	V_T = 16000 cu ft
3. Filter Material	Choose One ◉ 18" CDOT Class C Filter Material ○ Other (Explain):
4. Underdrain System	Choose One ◉ YES ○ NO
A) Are underdrains provided?	
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 16,000 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 2.95 in

Q_2 = 35.3 cfs

$Q_{WQCV} = \frac{1}{2} Q_2$ = 17.7 cfs

PIPE SIZE INTO S.F @ 1.0% = 24"

RESTRICTOR PLATE @ 1.6" ABOVE INVERT

Design Procedure Form: Sand Filter (SF)

Designer:	**D. Gorman**
Company:	**M.V.E., Inc.**
Date:	**August 15, 2013**
Project:	**Hannah Ridge at Feathergrass**
Location:	**Basins OSC1-C12 at Park SW**

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 15, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins OSC1-C12 at Park SW

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	OSC1-C12
Receiving Pervious Area Soil Type	Sandy Loam
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	25.260
Directly Connected Impervious Area (DCIA, acres)	7.030
Unconnected Impervious Area (UIA, acres)	6.850
Receiving Pervious Area (RPA, acres)	7.340
Separate Pervious Area (SPA, acres)	4.040
RPA Treatment Type: Conveyance (C) or Volume (V)	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	25.260
Directly Connected Impervious Area (DCIA, %)	27.8%
Unconnected Impervious Area (UIA, %)	27.1%
Receiving Pervious Area (RPA, %)	29.1%
Separate Pervious Area (SPA, %)	16.0%
A_R (RPA / UIA)	1.072
I_a Check	0.480
f / I for WQCV Event:	1.5
f / I for 5-Year Event:	0.5
f / I for 100-Year Event:	0.3
f / I for Optional User Defined Storm CUHP:	
IRF for WQCV Event:	0.69
IRF for 5-Year Event:	0.91
IRF for 100-Year Event:	0.95
IRF for Optional User Defined Storm CUHP:	
Total Site Imperviousness: I_{total}	54.9%
Effective Imperviousness for WQCV Event:	46.6%
Effective Imperviousness for 5-Year Event:	52.5%
Effective Imperviousness for 100-Year Event:	53.7%
Effective Imperviousness for Optional User Defined Storm CUHP:	

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	10.5%	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:	2.3%	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:	54.9%
Total Site Effective Imperviousness for WQCV Event:	46.6%
Total Site Effective Imperviousness for 5-Year Event:	52.5%
Total Site Effective Imperviousness for 100-Year Event:	53.7%
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

Design Procedure Form: Sand Filter (SF)

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 17, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins D1-D12 at Park SW

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 51.3 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.513
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time WQCV= $0.9 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.19 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 777,110 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = 12,229 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 11,945 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 11,945 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 2.5 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 2654 sq ft
D) Actual Filter Area	A_{Actual} = 3540 sq ft
E) Volume Provided	V_T = 12076 cu ft
3. Filter Material	Choose One (●) 18" CDOT Class C Filter Material ( ) Other (Explain):
4. Underdrain System	
A) Are underdrains provided?	Choose One (●) YES ( ) NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 11,945 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 2.55 in

Q_2 = 26.7 cfs

Q_{WQCV} = ½ Q_2 = 13.4 cfs

PIPE SIZE = 24" @ 0.5% – 1.0%

RESTRICTOR PLATE AT 1'-4" ABOVE INVERT

Design Procedure Form: Sand Filter (SF)

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 17, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins D1-D12 at Park SW

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 17, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins D1-D12 at Park SW

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	D1-D12													
Receiving Pervious Area Soil Type	Sandy Loam													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	17.840													
Directly Connected Impervious Area (DCIA, acres)	5.790													
Unconnected Impervious Area (UIA, acres)	4.850													
Receiving Pervious Area (RPA, acres)	5.110													
Separate Pervious Area (SPA, acres)	2.090													
RPA Treatment Type: Conveyance (C) or Volume (V)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	17.840													
Directly Connected Impervious Area (DCIA, %)	32.5%													
Unconnected Impervious Area (UIA, %)	27.2%													
Receiving Pervious Area (RPA, %)	28.6%													
Separate Pervious Area (SPA, %)	11.7%													
A_R (RPA / UIA)	1.054													
I_a Check	0.490													
f / I for WQCV Event:	1.5													
f / I for 5-Year Event:	0.5													
f / I for 100-Year Event:	0.3													
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	0.69													
IRF for 5-Year Event:	0.91													
IRF for 100-Year Event:	0.95													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	59.6%													
Effective Imperviousness for WQCV Event:	51.3%													
Effective Imperviousness for 5-Year Event:	57.2%													
Effective Imperviousness for 100-Year Event:	58.4%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	10.6%	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:	2.0%	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
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	59.6%
Total Site Effective Imperviousness for WQCV Event:	51.3%
Total Site Effective Imperviousness for 5-Year Event:	57.2%
Total Site Effective Imperviousness for 100-Year Event:	58.4%
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

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

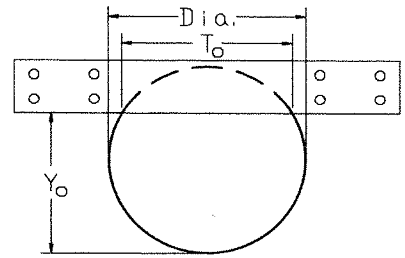
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

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

RESTRICTOR PLATE SIZING FOR CIRCULAR VERTICAL ORIFICES

Project: **Hannah Ridge at Feathergrass**
Basin ID: **Basin D1-D12**

X



		#1 Vertical Orifice	#2 Vertical Orifice	
Sizing the Restrictor Plate for Circular Vertical Orifices or Pipes (Input)				
Water Surface Elevation at Design Depth	Elev: WS =	102.00		feet
Pipe/Vertical Orifice Entrance Invert Elevation	Elev: Invert =	100.00		feet
Required Peak Flow through Orifice at Design Depth	Q =	13.40		cfs
Pipe/Vertical Orifice Diameter (inches)	Dia =	24.0		inches
Orifice Coefficient	C_o =	0.65		
Full-flow Capacity (Calculated)				
Full-flow area	Af =	3.14		sq ft
Half Central Angle in Radians	Theta =	3.14		rad
Full-flow capacity	Qf =	16.4		cfs
	Percent of Design Flow =	122%		
Calculation of Orifice Flow Condition				
Half Central Angle (0<Theta<3.1416)	Theta =	1.91		rad
Flow area	A_o =	2.23		sq ft
Top width of Orifice (inches)	T_o =	22.62		inches
Height from Invert of Orifice to Bottom of Plate (feet)	Y_o =	1.33		feet
Elevation of Bottom of Plate	Elev Plate Bottom Edge =	101.33		feet
Resultant Peak Flow Through Orifice at Design Depth	Q_o =	13.4		cfs
Width of Equivalent Rectangular Vertical Orifice	**Equivalent Width =**	**1.68**		**feet**

Design Procedure Form: Sand Filter (SF)

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 16, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins E6-E7 at Hunter Jumper north side

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 33.7 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.337
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time $WQCV = 0.9 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.15 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 179,903 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume $V_{WQCV} = WQCV / 12 * Area$	V_{WQCV} = 2,193 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 2,142 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 2,142 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 2.0 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 476 sq ft
D) Actual Filter Area	A_{Actual} = 729 sq ft
E) Volume Provided	V_T = 2178 cu ft
3. Filter Material	Choose One ◉ 18" CDOT Class C Filter Material ○ Other (Explain): Basins E6-E7 at Hunter Jumper north side
4. Underdrain System	
A) Are underdrains provided?	Choose One ◉ YES ○ NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 2,142 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 1.08 in

$Q_2 = 4.6$ cfs

$Q_{WQCV} = \frac{1}{2} Q_2 = 2.3$ cfs

FROM E6 ONLY

$Q_2 = 3.2$ cfs

$Q_{WQCV} = \frac{1}{2} Q_2 = 1.6$ cfs

PIPE SIZE INTO S.F. = 12" @ 1.0%

Design Procedure Form: Sand Filter (SF)

Designer:	**D. Gorman**
Company:	**M.V.E., Inc.**
Date:	**August 16, 2013**
Project:	**Hannah Ridge at Feathergrass**
Location:	**Basins E6-E7 at Hunter Jumper north side**

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 16, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins E6-E7 at Hunter Jumper north side

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	E6-E7
Receiving Pervious Area Soil Type	Loamy Sand
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	4.130
Directly Connected Impervious Area (DCIA, acres)	0.960
Unconnected Impervious Area (UIA, acres)	0.860
Receiving Pervious Area (RPA, acres)	1.860
Separate Pervious Area (SPA, acres)	0.450
RPA Treatment Type: Conveyance (C) or Volume (V)	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	4.130
Directly Connected Impervious Area (DCIA, %)	23.2%
Unconnected Impervious Area (UIA, %)	20.8%
Receiving Pervious Area (RPA, %)	45.0%
Separate Pervious Area (SPA, %)	10.9%
A_R (RPA / UIA)	2.163
I_a Check	0.320
f / I for WQCV Event:	2.8
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:	0.89
IRF for 100-Year Event:	0.91
IRF for Optional User Defined Storm CUHP:	
Total Site Imperviousness: I_{total}	44.1%
Effective Imperviousness for WQCV Event:	33.7%
Effective Imperviousness for 5-Year Event:	41.8%
Effective Imperviousness for 100-Year Event:	42.3%
Effective Imperviousness for Optional User Defined Storm CUHP:	

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	14.7%	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:	4.1%	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:	44.1%
Total Site Effective Imperviousness for WQCV Event:	33.7%
Total Site Effective Imperviousness for 5-Year Event:	41.8%
Total Site Effective Imperviousness for 100-Year Event:	42.3%
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

Design Procedure Form: Sand Filter (SF)

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 16, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins E1-E5,E8 at Hunter Jumper south side

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 54.6 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.546
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time $WQCV = 0.9 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.20 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 404,672 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = 6,654 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 6,499 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 6,499 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 2.5 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 1444 sq ft
D) Actual Filter Area	A_{Actual} = 1980 sq ft
E) Volume Provided	V_T = 6760 cu ft
3. Filter Material	Choose One (●) 18" CDOT Class C Filter Material ( ) Other (Explain):
4. Underdrain System	
A) Are underdrains provided?	Choose One (●) YES ( ) NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 6,499 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 1.88 in

Q_2 = 15.2 cfs

$Q_{WQCV} = \frac{1}{2} Q_2$ = 7.6 cfs

PIPE INTO S.F. = 18" @ 1.0%
WITH RESTRICTOR PLATE 13.5" ABOVE INVERT

Design Procedure Form: Sand Filter (SF)

Designer:	**D. Gorman**
Company:	**M.V.E., Inc.**
Date:	**August 16, 2013**
Project:	**Hannah Ridge at Feathergrass**
Location:	**Basins E1-E5,E8 at Hunter Jumper south side**

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric

A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?

Choose One

○ YES ◉ NO

6-7. Inlet / Outlet Works

A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 16, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins E1-E5,E8 at Hunter Jumper south side

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	E1-E5,E8													
Receiving Pervious Area Soil Type	Sandy Loam													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	9.290													
Directly Connected Impervious Area (DCIA, acres)	2.860													
Unconnected Impervious Area (UIA, acres)	3.180													
Receiving Pervious Area (RPA, acres)	3.250													
Separate Pervious Area (SPA, acres)	0.000													
RPA Treatment Type: Conveyance (C) or Volume (V)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	9.290													
Directly Connected Impervious Area (DCIA, %)	30.8%													
Unconnected Impervious Area (UIA, %)	34.2%													
Receiving Pervious Area (RPA, %)	35.0%													
Separate Pervious Area (SPA, %)	0.0%													
A_R (RPA / UIA)	1.022													
I_a Check	0.490													
f / I for WQCV Event:	1.5													
f / I for 5-Year Event:	0.5													
f / I for 100-Year Event:	0.3													
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	0.69													
IRF for 5-Year Event:	0.91													
IRF for 100-Year Event:	0.95													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	65.0%													
Effective Imperviousness for WQCV Event:	54.6%													
Effective Imperviousness for 5-Year Event:	62.0%													
Effective Imperviousness for 100-Year Event:	63.4%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	13.8%	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:	2.3%	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:	65.0%
Total Site Effective Imperviousness for WQCV Event:	54.6%
Total Site Effective Imperviousness for 5-Year Event:	62.0%
Total Site Effective Imperviousness for 100-Year Event:	63.4%
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

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

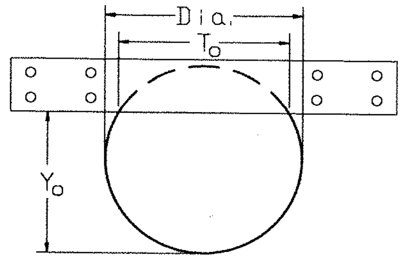
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

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

RESTRICTOR PLATE SIZING FOR CIRCULAR VERTICAL ORIFICES

Project: **Hannah Ridge at Feathergrass**
Basin ID: **Basin E1-E5 E8**

X



		#1 Vertical Orifice	#2 Vertical Orifice	
Sizing the Restrictor Plate for Circular Vertical Orifices or Pipes (Input)				
Water Surface Elevation at Design Depth	Elev: WS =	101.60		feet
Pipe/Vertical Orifice Entrance Invert Elevation	Elev: Invert =	100.00		feet
Required Peak Flow through Orifice at Design Depth	Q =	7.60		cfs
Pipe/Vertical Orifice Diameter (inches)	Dia =	18.0		inches
Orifice Coefficient	C_o =	0.65		
Full-flow Capacity (Calculated)				
Full-flow area	Af =	1.77		sq ft
Half Central Angle in Radians	Theta =	3.14		rad
Full-flow capacity	Qf =	8.5		cfs
	Percent of Design Flow =	112%		
Calculation of Orifice Flow Condition				
Half Central Angle (0<Theta<3.1416)	Theta =	2.11		rad
Flow area	A_o =	1.43		sq ft
Top width of Orifice (inches)	T_o =	15.45		inches
Height from Invert of Orifice to Bottom of Plate (feet)	Y_o =	1.13		feet
Elevation of Bottom of Plate	Elev Plate Bottom Edge =	101.13		feet
Resultant Peak Flow Through Orifice at Design Depth	Q_o =	7.6		cfs
Width of Equivalent Rectangular Vertical Orifice	**Equivalent Width =**	**1.27**		**feet**

Design Procedure Form: Sand Filter (SF)

Designer: D. Gorman
Company: M.V.E., Inc.
Date: August 16, 2013
Project: Hannah Ridge at Feathergrass
Location: Basins F1-F5 at Hunter Jumper south side

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 35.1 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.351
C) Water Quality Capture Volume (WQCV) Based on 24-hour Drain Time WQCV= 0.9 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i)	WQCV = 0.15 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 496,148 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = 6,196 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 6,052 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = 6,052 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 2.0 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE
C) Mimimum Filter Area (Flat Surface Area)	A_{Min} = 1345 sq ft
D) Actual Filter Area	A_{Actual} = 1764 sq ft
E) Volume Provided	V_T = 6126 cu ft
3. Filter Material	~~Choose One~~ ◉ 18" CDOT Class C Filter Material ○ Other (Explain): Basins E6-E7 at Hunter Jumper north side
4. Underdrain System	Choose One
A) Are underdrains provided?	◉ YES ○ NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 1.9 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 6,052 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 1.81 in

Q_2 = 14.0 cfs

$Q_{WQCV} = 1/2\, Q_2 = 7.0$

PIPE SIZE INTO S.F. = 18" @ 1.0%

WITH RESTRICTOR PLATE 12" ABOVE INVERT

Design Procedure Form: Sand Filter (SF)

Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 16, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins F1-F5 at Hunter Jumper south side

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	

Notes:

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

LID Credit by Impervious Reduction Factor (IRF) Method

User Input	
Calculated cells	

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.68	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.67	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	50-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer:	D. Gorman
Company:	M.V.E., Inc.
Date:	August 16, 2013
Project:	Hannah Ridge at Feathergrass
Location:	Basins F1-F5 at Hunter Jumper south side

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	F1-F5													
Receiving Pervious Area Soil Type	Loamy Sand													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	11.390													
Directly Connected Impervious Area (DCIA, acres)	2.500													
Unconnected Impervious Area (UIA, acres)	2.520													
Receiving Pervious Area (RPA, acres)	2.750													
Separate Pervious Area (SPA, acres)	3.620													
RPA Treatment Type: Conveyance (C) or Volume (V)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	11.390													
Directly Connected Impervious Area (DCIA, %)	21.9%													
Unconnected Impervious Area (UIA, %)	22.1%													
Receiving Pervious Area (RPA, %)	24.1%													
Separate Pervious Area (SPA, %)	31.8%													
A_R (RPA / UIA)	1.091													
I_a Check	0.480													
f / I for WQCV Event:	2.8													
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:	0.60													
IRF for 5-Year Event:	0.91													
IRF for 100-Year Event:	0.93													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	44.1%													
Effective Imperviousness for WQCV Event:	35.1%													
Effective Imperviousness for 5-Year Event:	42.1%													
Effective Imperviousness for 100-Year Event:	42.5%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	12.6%	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:	3.5%	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:	44.1%
Total Site Effective Imperviousness for WQCV Event:	35.1%
Total Site Effective Imperviousness for 5-Year Event:	42.1%
Total Site Effective Imperviousness for 100-Year Event:	42.5%
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

Swale, Pipe and Area Inlet Calculations

M.V.E., INC.
1903 Lelaray St., Suite 200
COLORADO SPRINGS, CO 80909
(719) 635-5736

JOB 60970 HANNAH RIDGE AT FEATHERGRASS
SHEET NO. 1 OF 2
CALCULATED BY DAG DATE 8/12/13
CHECKED BY ______ DATE ______
SCALE ______

BASINS OSC1 - C12
WATER QUALITY INVERTED SIPHON UNDER CHANNEL

$Q_{WQCV} = 1/2\ Q_2 = 1/2(35.4) \doteq 17.7$ cfs (HYDROLOGY CALCS)

INLET SIDE

$INV_1 = 60.5$

(1) PIPE SIZE = 27" @ PIPE SLOPE 5:1

OPENING Ht = $D/\cos\alpha_1 = 2.25/(\cos 11.3) = 2.29'$

$V_1 = 17.7/(31" \times 4') = 1.7$ fps

$h_{v_1} = V^2/2g = 1.7/64.4 = .04$

SEAL REQUIRED = $1.5(h_v) = 1.5(h_{vp} - h_{v_1})$

$= 1.5(.31 - .04) = 0.41$ ft

WSE = 60.5 + 2.29 + 0.41 = 63.2

SIPHON

NON-REINFORCED CONCRETE PIPE

$A_s = 3.98$ SF.

$V_s = Q/A = 17.7/3.98 = 4.5$ FPS

h_{vp} (VELOCITY HEAD) $= V^2/2g = 4.5^2/64.4 = 0.31$

WET PERIM. $= \pi D = 3.14 \times 2.25 = 7.07$ ft

R (HYD RADIUS) = A/w.p. = 3.98/7.07 = 0.56

n = 0.013

FRICTION SLOPE PIPE $= n^2V^2/2.2R^{4/3}$

$= (.013)^2(4.5)^2/2.2(.56)^{4/3}$

$= 0.0034$ ft/ft

is this part of Filing 3?

OUTLET SIDE

$INV_2 = 59.0$ (SAND FILTER FLOOR)

OPENING height $= D/\cos\alpha_2 = 2.25/\cos 11.3 = 2.29$ ft. (H_t)

$d_2 = 2.5$ ft., $WSE_2 = 59.0 + 2.5 = 61.5$

$V_2 = 1.7$ fps

$h_{v_2} = .04$

SUBMERGENCE AT OUTLET = 2.5 − 2.29 = 0.21 ft.

$1/6\ H_t = 1/6(2.29) = 0.38$ — SUBMERGE < .38 SO OUTLET HEAD LOSS IS $0.7\Delta h_v$, BUT WILL ADD RESTRICTION PLATE, USE $1.0\Delta h_v$

PRODUCT 204-1 (Single Sheets) 205-1 (Padded)

M.V.E., INC.
1903 Lelaray St., Suite 200
COLORADO SPRINGS, CO 80909
(719) 635-5736

JOB 60970 HANNAH RIDGE AT FEATHERGRASS
SHEET NO. 2 OF 2
CALCULATED BY bag DATE 8/12/13
CHECKED BY ____ DATE ____
SCALE ____

AVAILABLE HEAD $\Delta h = WSE_1 - WSE_2 = 63.2 - 61.50 = 1.7$ ft.

TOTAL HEAD LOSS w/ 10% SAFETY FACTOR =
1.1 (INLET LOSS + PIPE FRICTION LOSS + BEND LOSS + OUTLET LOSS)

INLET LOSS $= 0.4\, h_v = 0.4(h_{vp} - h_{v_1}) = 0.4(.31 - .04) = .11$

PIPE FRICTION LOSS = LENGTH (FRICTION SLOPE) $= 150\,(.0034) = 0.51$

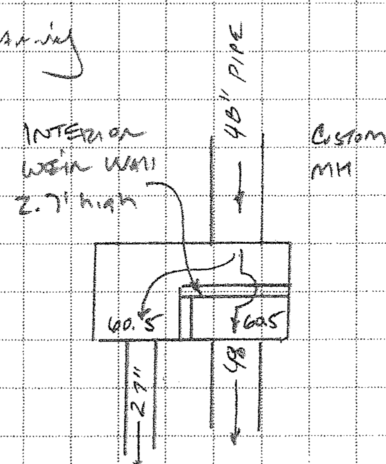
BEND LOSS $= 2(.04)(h_{vp}) = 2(.04)(.31) = 0.02$

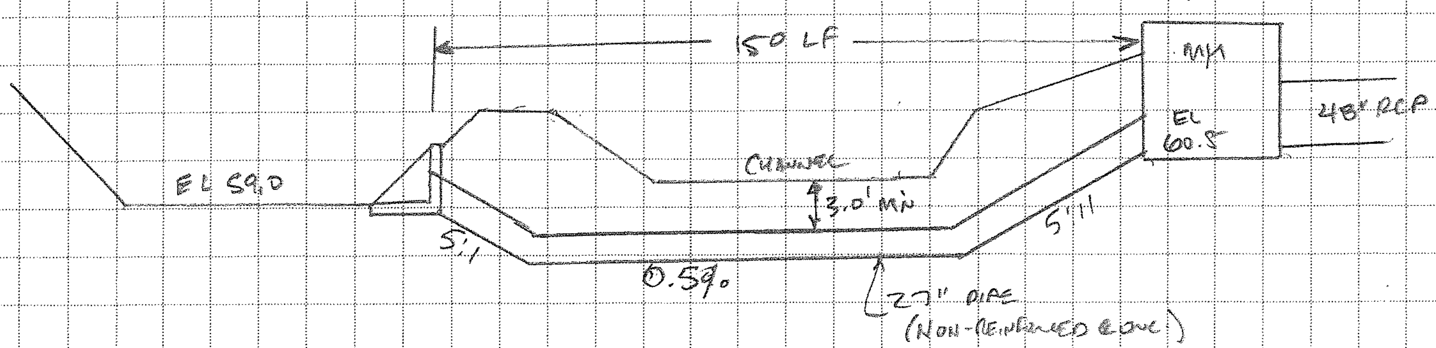
OUTLET LOSS $= 1.0\, \Delta h_v = 1.0(h_{vp} - h_{v_2}) = .31 - .04 = .27$

TOTAL HEAD LOSS $= 1.1(.11 + .51 + .02 + .27) = 1.0$ ft.

1.0 ft < 1.7 ft HEADLOSS OKAY

V = 4.5 FPS VELOCITY OKAY FOR CLEANING

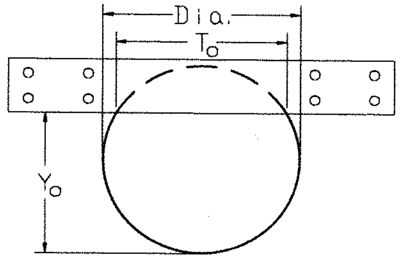




RESTRICTOR PLATE SIZING FOR CIRCULAR VERTICAL ORIFICES

Project: **Hannah Ridge at Feathergrass**
Basin ID: **Basin OSC1-C12 Sand Filter Inlet Pipe**

X

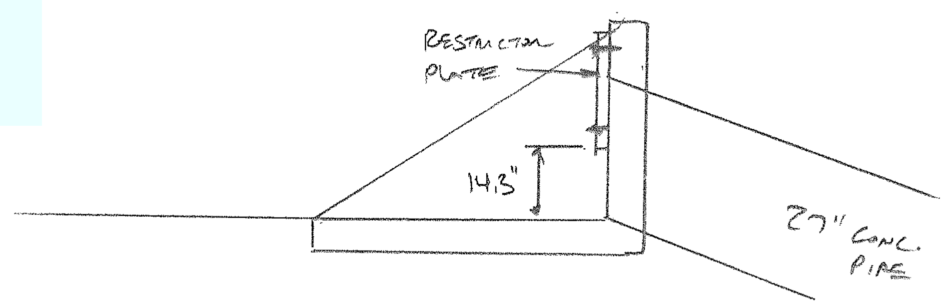


Description		#1 Vertical Orifice	#2 Vertical Orifice	
Sizing the Restrictor Plate for Circular Vertical Orifices or Pipes (Input)				
Water Surface Elevation at Design Depth	Elev: WS =	62.20		feet
Pipe/Vertical Orifice Entrance Invert Elevation	Elev: Invert =	59.00		feet
Required Peak Flow through Orifice at Design Depth	Q =	17.70		cfs
Pipe/Vertical Orifice Diameter (inches)	Dia =	27.0		inches
Orifice Coefficient	C_o =	0.65		
Full-flow Capacity (Calculated)				
Full-flow area	Af =	3.98		sq ft
Half Central Angle in Radians	Theta =	3.14		rad
Full-flow capacity	Qf =	29.9		cfs
	Percent of Design Flow =	169%		
Calculation of Orifice Flow Condition				
Half Central Angle (0<Theta<3.1416)	Theta =	1.62		rad
Flow area	A_o =	2.10		sq ft
Top width of Orifice (inches)	T_o =	26.97		inches
Height from Invert of Orifice to Bottom of Plate (feet)	Y_o =	1.17		feet
Elevation of Bottom of Plate	Elev Plate Bottom Edge =	60.17		feet
Resultant Peak Flow Through Orifice at Design Depth	Q_o =	17.7		cfs
Width of Equivalent Rectangular Vertical Orifice	**Equivalent Width =**	**1.79**		**feet**

where is this located?

63.2 UPSTREAM WSE IN MH
− 1.0 HEADLOSS'
= 62.2

$y_o/(\cos\alpha) =$
$1.17/(\cos 11.3^\circ) = 1.19'$
$= 14.3''$



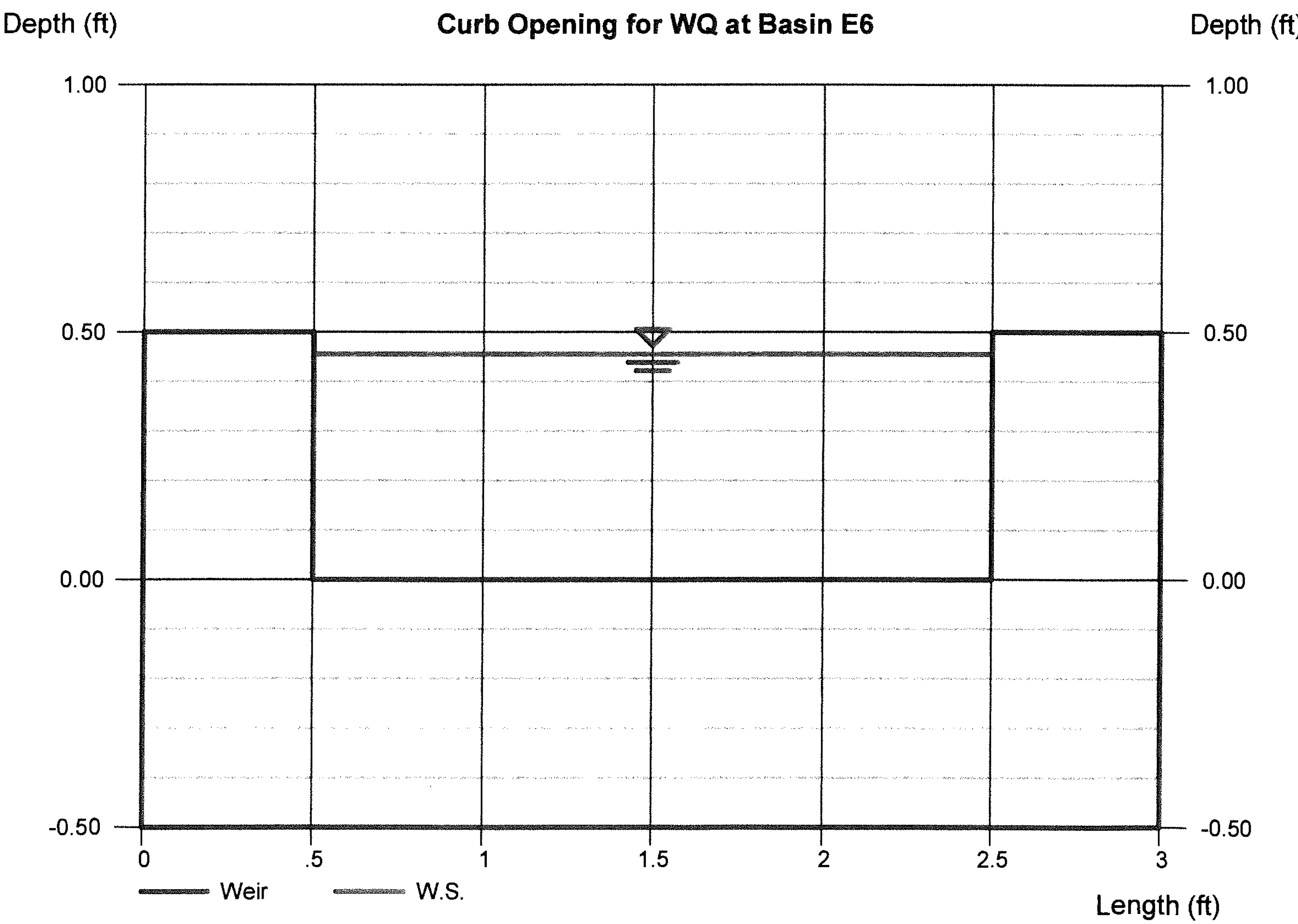
Weir Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. Saturday, Aug 17 2013

Curb Opening for WQ at Basin E6

Rectangular Weir		**Highlighted**	
Crest	= Broad	Depth (ft)	= 0.46
Bottom Length (ft)	= 2.00	Q (cfs)	= 1.600
Total Depth (ft)	= 0.50	Area (sqft)	= 0.91
		Velocity (ft/s)	= 1.76
Calculations		Top Width (ft)	= 2.00
Weir Coeff. Cw	= 2.60		
Compute by:	Known Q		
Known Q (cfs)	= 1.60		

show location on plan

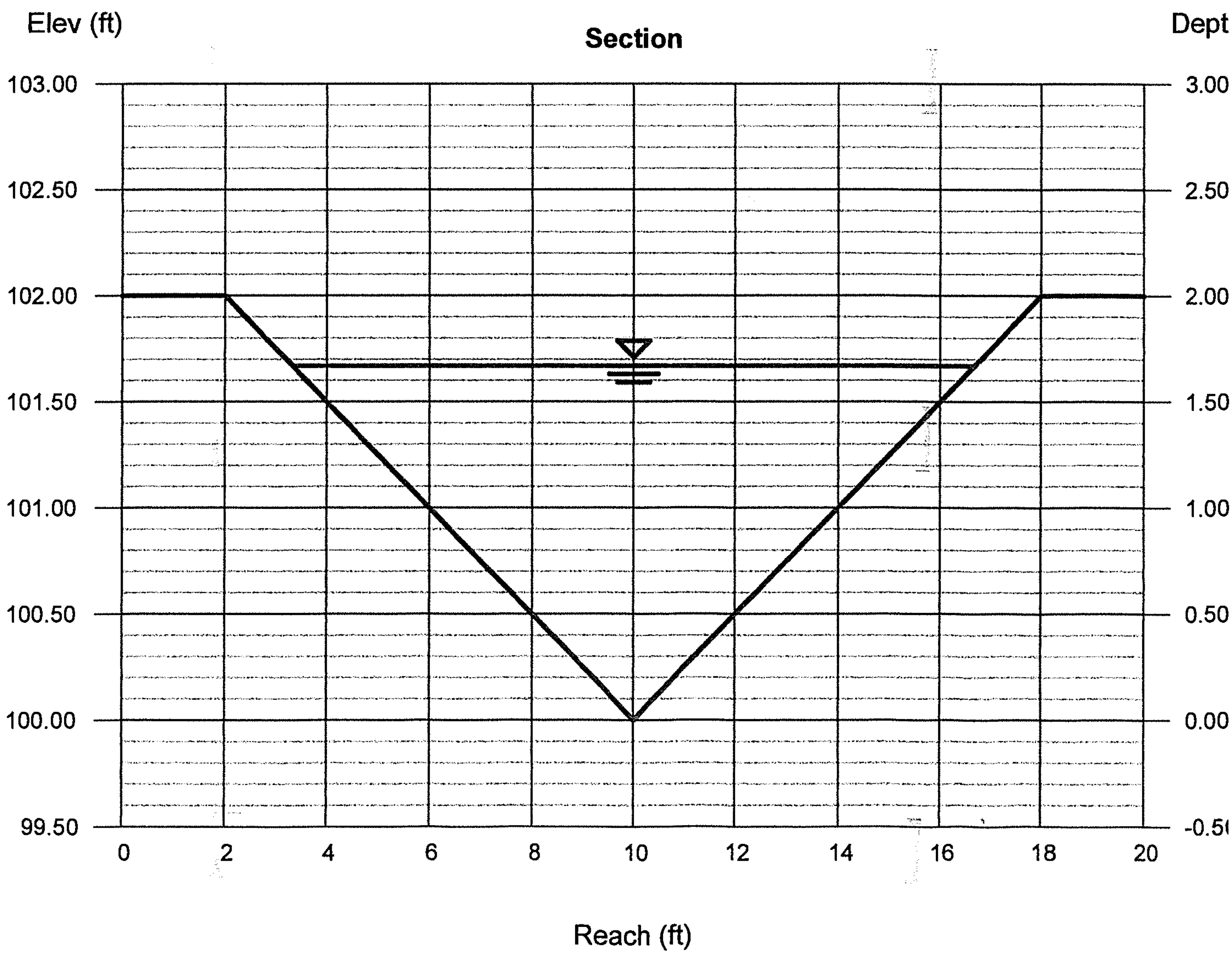


Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. — Wednesday, Aug 21 2013

Swale to Type D Inlet - Basin OSF2

Triangular		**Highlighted**	
Side Slopes (z:1)	= 4.00, 4.00	Depth (ft)	= 1.67
Total Depth (ft)	= 2.00	Q (cfs)	= 41.00
		Area (sqft)	= 11.16
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 3.68
Slope (%)	= 1.00	Wetted Perim (ft)	= 13.77
N-Value	= 0.035	Crit Depth, Yc (ft)	= 1.46
		Top Width (ft)	= 13.36
Calculations		EGL (ft)	= 1.88
Compute by:	Known Q(100)		
Known Q (cfs)	= 41.00		



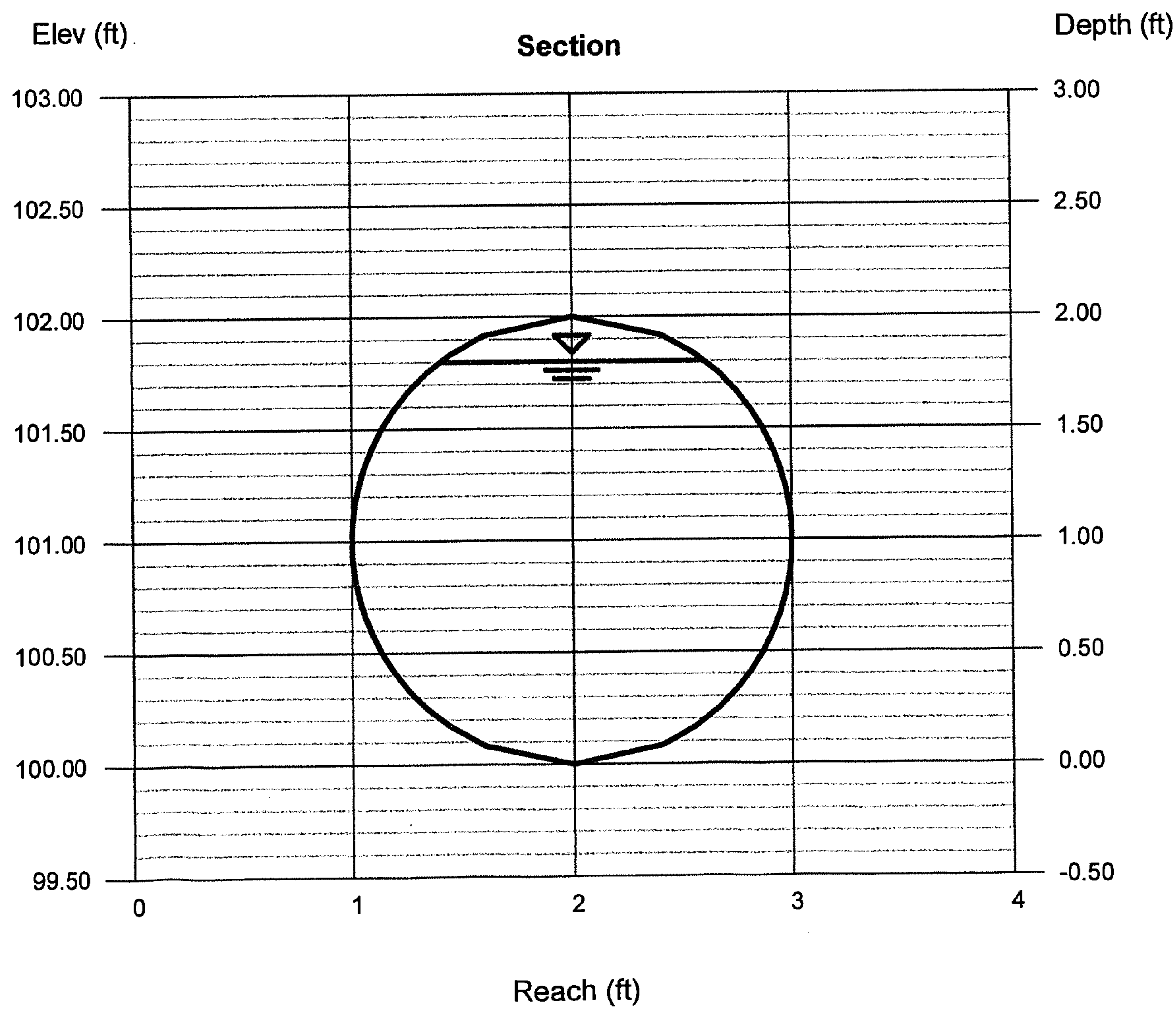
Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc.

Wednesday, Aug 21 2013

24in RCP from Basin OSF2 Type D Inlet - Minimum slope

Circular		**Highlighted**	
Diameter (ft)	= 2.00	Depth (ft)	= 1.80
		Q (cfs)	= 41.00
		Area (sqft)	= 2.98
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 13.76
Slope (%)	= 2.90	Wetted Perim (ft)	= 5.00
N-Value	= 0.013	Crit Depth, Yc (ft)	= 1.96
		Top Width (ft)	= 1.20
Calculations		EGL (ft)	= 4.74
Compute by:	Known Q		
Known Q (cfs)	= 41.00		



Downstream Hydrologic & Hydraulic Analysis

Full Reach Developed Condition Hydrology with Developed Hannah Ridge (Directly From DBPS Hydrology Update – Kiowa Engineering 1/18/07) 10-yr, 100-year

Full Reach Existing Condition Hydrology with totally undeveloped Hannah Ridge (Directly From DBPS Hydrology Update – Kiowa Engineering 1/18/07) 10-yr, 100-year

Full Reach Existing Condition Hydrology with Fully Developed Hannah Ridge (Modified from From DBPS Hydrology Update) 10-yr, 100-year

Full Reach Existing Offsite Conditions Hydrology with Only Hannah Ridge Phases 1 – 4 Developed (Modified from From DBPS Hydrology Update) 10-yr, 100-year

HEC-RAS Data and output - Existing Condition Hydrology with totally undeveloped Hannah Ridge

HEC-RAS Data and output - Existing Condition Hydrology with Fully Developed Hannah Ridge

HEC-RAS Data and output - Existing Offsite Conditions Hydrology with Only Hannah Ridge Phases 1 – 4 Developed

?

```
1***************************************
 *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *             JUN   1998              *
 *           VERSION 4.1               *
 *                                     *
 *  RUN DATE   17JAN07  TIME  11:08:32  *
 *                                     *
 ***************************************

***************************************
*                                     *
*   U.S. ARMY CORPS OF ENGINEERS      *
*   HYDROLOGIC ENGINEERING CENTER     *
*        609 SECOND STREET            *
*     DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104             *
*                                     *
***************************************

          X      X  XXXXXXX   XXXXX        X
          X      X  X        X     X      XX
          X      X  X        X             X
          XXXXXXX   XXXX     X      XXXXX  X
          X      X  X        X             X
          X      X  X        X     X       X
          X      X  XXXXXXX   XXXXX       XXX
```

Full Reach Developed Condition with Developed Hannah Ridge
From DBPS Hydrology Update - Kiowa Engineering 1/18/07

```
THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                  HEC-1 INPUT                                              PAGE  1

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1         ID           East Fork Subtributary hydrology  FN:  06040
   2         ID           Future developed condition with storge at RR Embankment
   3         ID           Sand Creek DBPS Hydrology update
   4         ID           Existing culvert under RR in-place and no blockage
   5         ID           10- and 100 Year, 24 hr Type IIA  Storm  FN e3std.dat
            *DIAGRAM
   6         IT       5       0       0     300
   7         IO       5       0
   8         JR    PREC     .63     1.0

   9         KK       5
  10         KM      RUNOFF - Sub-basin 5
  11         BA     .20
  12         IN      15
```

```
 13      PB     4.4
 14      PC  0.0000  0.0005  0.0015  0.0030  0.0045  0.0060  0.0080  0.0100  0.0120  0.0143
 15      PC  0.0165  0.0188  0.0210  0.0233  0.0255  0.0278  0.0320  0.0390  0.0460  0.0530
 16      PC  0.0600  0.0750  0.1000  0.4000  0.7000  0.7250  0.7500  0.7650  0.7800  0.7900
 17      PC  0.8000  0.8100  0.8200  0.8250  0.8300  0.8350  0.8400  0.8450  0.8500  0.8550
 18      PC  0.8600  0.8638  0.8675  0.8713  0.8750  0.8788  0.8825  0.8863  0.8900  0.8938
 19      PC  0.8975  0.9013  0.9050  0.9083  0.9115  0.9148  0.9180  0.9210  0.9240  0.9270
 20      PC  0.9300  0.9325  0.9350  0.9375  0.9400  0.9425  0.9450  0.9475  0.9500  0.9525
 21      PC  0.9550  0.9575  0.9600  0.9625  0.9650  0.9675  0.9700  0.9725  0.9750  0.9775
 22      PC  0.9800  0.9813  0.9825  0.9838  0.9850  0.9863  0.9875  0.9888  0.9900  0.9913
 23      PC  0.9925  0.9938  0.9950  0.9963  0.9975  0.9988  1.0000
 24      LS       0      75
 25      UD    0.14

 26      KK  RT-5A
 27      KM         ROUTE FLOW from SUB-BASIN 5 TO RT-5A
 28      RD    1050    0.01    .013            TRAP      30      20

 29      KK    RT-5
 30      KM         ROUTE FLOW FROM RT-5A TO DP-1
 31      RD    1100   .0133    .035            TRAP       5      10

 32      KK       1
 33      KM         RUNOFF - Sub-basin 1
 34      BA     .14
 35      LS       0    76.3
 36      UD    0.14

 37      KK    DP-1
 38      KM  COMBINE FLOW FROM RT-5 AND SUB-BASIN 1
 39      HC       2

 40      KK    RT-1
 41      KM         ROUTE FLOW from DESIGN POINT DP-1 TO DP-14
 42      RD    4400    .016   0.035            TRAP      20      10
1                                      HEC-1 INPUT                                              PAGE  2

LINE     ID.......1.......2.......3.......4.......5.......6.......7.......8.......9.......10


 43      KK       2
 44      KM         RUNOFF - Sub-basin 2
 45      BA    .325
 46      LS       0    73.6
 47      UD    0.19

 48      KK   DP-14
 49      KM  COMBINE RUNOFF FROM RT-1 AND SUB-BASIN 2
 50      HC       2

 51      KK   DB-14
 52      KM         ROUTE FLOW FROM DP 14 THROUGH DETENTION BASIN
```

```
      53          RS      1     ELEV      83
      54          SQ      0       75     325     480     575     675     775     850
      55          SE     83       86      90      92      94      96      98     100
      56          SV      0       .4      .8     1.7     4.6     8.9    17.6    31.6

      57          KK   RT-2B
      58          KM             ROUTE FLOW FROM DE14 TO DP-4A
      59          RD   2660     .005    .025             TRAP      16       4

      60          KK      3
      61          KM          RUNOFF FROM SUB-BASIN 3
      62          BA   .164
      63          LS      0     74.9
      64          UD    .12

      65          KK   RT-3A
      66          KM        ROUTE RUNOFF FROM SB 3 TO RT-3
      67          RD   1300      .02    .013             CIRC     3.5

      68          KK    RT-3
      69          KM        ROUTE RUNOFF FROM RT-3A TO DP 4A
      70          RD    500      .02    .013             CIRC       5

      71          KK      4
Site  72          KM        RUNOFF FROM SUB-BASIN 4
      73          BA   .147
      74          LS      0     83.5
      75          UD   .144

      76          KK   DP-4A
      77          KM        COMBINE RUNOFF FROM RT-3, RT-2B AND SB 4
      78          HC      3

      79          KK   RT-2A
      80          KM        ROUTE RUNOFF FROM DP 4A TO DP 8
      81          RD   1200     .007    .035             TRAP      30       3
                                              HEC-1 INPUT                                     PAGE  3

    LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

      82          KK     12
Site  83          KM      RUNOFF FROM SUB-BASIN 12
      84          BA   .C53
      85          LS      0       92
      86          UD   .C58

Site  87          KK     13
      88          KM         RUNOFF FROM SUB-BASIN 13
      89          BA   .C47
      90          LS      0     88.5
      91          UD    .06
```

```
 92         KK    DP-8
 93         KM       COMBINE RUNOFF FROM RT-2A SUB-BASIN 12 AND SUB-BASIN 13
 94         HC       3

 95         KK   RT-6A
 96         KM       ROUTE RUNOFF FROM DP 8 TO RT6
 97         RD     600     .02     .03            TRAP       2       3.

 98         KK     RT6
 99         KM       ROUTE RUNOFF FROM RT-6A TO DP 6
100         RD    1000    .007    .035            TRAP      30       3.

101         KK       6
102         KM       RUNOFF FROM SUB-BASIN 6
103         BA     .12
104         LS       0      83
105         UD     .14

106         KK   DP -6
107         KM       COMBINE RINOFF FROM SUB-BASIN 6 AND RT-6
108         HC       2

109         KK    RT-7
110         KM       ROUTE RUNOFF FROM DP 6 TO DP 7
111         RD    3050    .007     .03            TRAP      45       3.

112         KK       7
113         KM       RUNOFF FROM SUB-BASIN 7
114         BA     .17
115         LS       0    76.3
116         UD     .26

117         KK    DP-7
118         KM       COMBINE RUNOFF FROM SUB-BASIN 7 AND RT-7
119         HC       2

120         KK    RT-8
121         KM       ROUTE RUNOFF FROM DP-7 TO DP-3A
122         RD    6800    .007    .035            TRAP      45       3.
                                       HEC-1 INPUT                                       PAGE  4

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


123         KK       9
124         KM       RUNOFF FROM SUB-BASIN 9
125         BA     .14
126         LS       0    75.4
127         UD     .34

128         KK      11
```

```
129            KM         RUNOFF FROM SUB-BASIN 11
130            BA    .146
131            LS       0      78
132            UD    .135

133            KK    DB11
134            KM       ROUTE RUNOFF FROM SB 11 THROUGH EXISTING NORTHCREST DETENTION BASIN
135            RS       1     ELEV  6436.5
136            SQ       0      45      48      52      55      57      60
137            SE  6436.5  6441.5    6442    6444    6446    6448    6450
138            SV       0      .1     .15       2    4.93    8.56    12.8

139            KK   RT11A
140            KM        ROUTE DISCHARGE FROM NORTHCREST DB TO RT11B
141            RD    2100     .02    .025            CIRC       3

142            KK   RT11B
143            KM        ROUTE RT11A TO DP 10
144            RD     700     .02    .035            TRAP      10       3

145            KK      10
146            KM       RUNOFF FROM SUB-BASIN 10
147            BA     .07
148            LS       0    79.7
149            UD     .22

150            KK    DP10
151            KM       COMBINE RUNOFF FROM SUB-BASIN 10 AND RT11B
152            HC       2

153            KK    DP-9
154            KM       COMBINE RUNOFF FROM SB 9 AND DP 10
155            HC       2

156            KK    RT-9
157            KM       ROUTE RUNOFF FROM DP 9 TO DP 8A
158            RD    2650     .01    .035            TRAP      15       3

159            KK       8
160            KM       RUNOFF FROM SUB-BASIN 8
161            BA     .19
162            LS       0    63.5
163            UD     .26
1                                    HEC-1 INPUT                                                  PAGE  5

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

164            KK   DP-8A
165            KM       COMBINE RUNOFF ROM SUB-BASIN 8, RT-9 AND RT-8
166            HC       3
167            ZZ
```

```
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   9           5
               V
               V
  26       RT-5A
               V
               V
  29        RT-5
               .
               .
  32           .          1
               .          .
               .          .
  37        DP-1...........
               V
               V
  40        RT-1
               .
               .
  43           .          2
               .          .
               .          .
  48       DP-14...........
               V
               V
  51       DB-14
               V
               V
  57       RT-2B
               .
               .
  60           .          3
               .          V
               .          V
  65           .      RT-3A
               .          V
               .          V
  68           .       RT-3
               .          .
               .          .
  71           .          .          4
               .          .          .
               .          .          .
  76       DP-4A......................
               V
               V
```

```
 79     RT-2A
            .
            .
 82         .         12
            .          .
            .          .
 87         .          .         13
            .          .          .
            .          .          .
 92      DP-8......................
            V
            V
 95     RT-6A
            V
            V
 98       RT6
            .
            .
101         .          6
            .          .
            .          .
106     DP -6...........
            V
            V
109      RT-7
            .
            .
112         .          7
            .          .
            .          .
117      DP-7...........
            V
            V
120      RT-8
            .
            .
123         .          9
            .          .
            .          .
128         .          .         11
            .          .          V
            .          .          V
133         .          .       DB11
            .          .          V
            .          .          V
139         .          .      RT11A
            .          .          V
            .          .          V
142         .          .      RT11B
            .          .          .
            .          .          .
145         .          .          .         10
```

```
150         .          .         DP10.............
            .          .          .
            .          .          .
153         .        DP-9.............
            .          V
            .          V
156         .        RT-9
            .          .
            .          .
159         .          .          8
            .          .          .
            .          .          .
164       DP-8A...........................

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*             VERSION 4.1               *
*                                       *
* RUN DATE   17JAN07   TIME  11:08:32   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*     U.S. ARMY CORPS OF ENGINEERS      *
*     HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*            (916) 756-1104             *
*                                       *
*****************************************
```

```
                East Fork Subtributary Hydrology  PN:  06040
                Future developed condition with storge at RR Embankment
                Sand Creek DBPS Hydrology update
                Existing culvert under RR in-place and no blockage
                10- and 100 Year, 24 hr Type IIA  Storm  FN efstq.dat

  7 IO      OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT      HYDROGRAPH TIME DATA
                  NMIN          5  MINUTES IN COMPUTATION INTERVAL
                 IDATE      1   0  STARTING DATE
                 ITIME       0000  STARTING TIME
                    NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                NDDATE      2   0  ENDING DATE
                NDTIME       0055  ENDING TIME
                 ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL     .08 HOURS
```

```
                    TOTAL TIME BASE    24.92 HOURS

           ENGLISH UNITS
                DRAINAGE AREA          SQUARE MILES
                PRECIPITATION DEPTH    INCHES
                LENGTH, ELEVATION      FEET
                FLOW                   CUBIC FEET PER SECOND
                STORAGE VOLUME         ACRE-FEET
                SURFACE AREA           ACRES
                TEMPERATURE            DEGREES FAHRENHEIT

      JP          MULTI-PLAN OPTION
                        NPLAN              1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                      .68       1.00
1
```

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .68	RATIO 2 1.00
HYDROGRAPH AT						
+	5	.20	1	FLOW	154.	326.
				TIME	6.08	6.00
ROUTED TO						
+	RT-5A	.20	1	FLOW	151.	322.
				TIME	6.08	6.08
ROUTED TO						
+	RT-5	.20	1	FLOW	142.	313.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	1	.14	1	FLOW	117.	242.
				TIME	6.08	6.00
2 COMBINED AT						
+	DP-1	.34	1	FLOW	255.	551.
				TIME	6.08	6.08
ROUTED TO						
+	RT-1	.34	1	FLOW	245.	518.
				TIME	6.25	6.25

HYDROGRAPH AT							
+	2	.32	1	FLOW	207.	467.	
				TIME	6.08	6.08	
2 COMBINED AT							
+	DP-14	.66	1	FLOW	374.	915.	← INFLOW TO RR
				TIME	6.25	6.17	
ROUTED TO							
+	DB-14	.66	1	FLOW	360.	640.	← OUTFLOW FROM RR
				TIME	6.25	6.33	
			**	PEAK STAGES IN FEET **			
			1	STAGE	90.45	95.31	
				TIME	6.25	6.33	
ROUTED TO							
+	RT-2B	.66	1	FLOW	352.	636.	
				TIME	6.33	6.42	
HYDROGRAPH AT							
+	3	.16	1	FLOW	130.	283.	
				TIME	6.00	6.00	
ROUTED TO							
+	RT-3A	.16	1	FLOW	126.	273.	
				TIME	6.08	6.00	
ROUTED TO							
+	RT-3	.16	1	FLOW	126.	270.	
				TIME	6.08	6.00	
HYDROGRAPH AT							
+	4	.15	1	FLOW	179.	333.	
				TIME	6.00	6.00	
3 COMBINED AT							
+	DP-4A	.98	1	FLOW	428.	991.	
				TIME	6.33	6.08	
ROUTED TO							
+	RT-2A	.98	1	FLOW	425.	948.	
				TIME	6.33	6.17	
HYDROGRAPH AT							
+	12	.05	1	FLOW	107.	168.	
				TIME	6.00	6.00	
HYDROGRAPH AT							
+	13	.05	1	FLOW	85.	139.	
				TIME	6.00	6.00	

```
 3 COMBINED AT
+              DP-8     1.08     1   FLOW      457.    1076.
                                     TIME      6.00    6.08

 ROUTED TO
+              RT-6A    1.08     1   FLOW      448.    1069.
                                     TIME      6.08    6.08

 ROUTED TO
+              RT6      1.08     1   FLOW      447.    1044.
                                     TIME      6.08    6.08

 HYDROGRAPH AT
+              6         .12     1   FLOW      144.     269.
                                     TIME      6.00    6.00

 2 COMBINED AT
+              DP -6    1.20     1   FLOW      588.    1299.
                                     TIME      6.08    6.08

 ROUTED TO
+              RT-7     1.20     1   FLOW      570.    1296.
                                     TIME      6.17    6.17

 HYDROGRAPH AT
+              7         .17     1   FLOW      125.     255.
                                     TIME      6.17    6.17

 2 COMBINED AT
+              DP-7     1.37     1   FLOW      695.    1551.
                                     TIME      6.17    6.17

 ROUTED TO
+              RT-8     1.37     1   FLOW      685.    1481.
                                     TIME      6.42    6.42

 HYDROGRAPH AT
+              9         .14     1   FLOW       72.     159.
                                     TIME      6.25    6.17

 HYDROGRAPH AT
+              11        .15     1   FLOW      134.     275.
                                     TIME      6.08    6.00

 ROUTED TO
+              DB11      .15     1   FLOW       52.      56.
                                     TIME      6.25    6.33

                                 ** PEAK STAGES IN FEET **
                                 1   STAGE  6443.93  6446.82
                                     TIME      6.25    6.33
```

```
 ROUTED TO
+                  RT11A        .15      1    FLOW          52.       56.
                                              TIME        6.33      6.42

 ROUTED TO
+                  RT11B        .15      1    FLOW          52.       56.
                                              TIME        6.33      6.50

 HYDROGRAPH AT
+                     10        .07      1    FLOW          61.      122.
                                              TIME        6.08      6.08

  2 COMBINED AT
+                   DP10        .22      1    FLOW         110.      175.
                                              TIME        6.08      6.08

  2 COMBINED AT
+                   DP-9        .36      1    FLOW         177.      325.
                                              TIME        6.17      6.17

 ROUTED TO
+                   RT-9        .36      1    FLOW         174.      321.
                                              TIME        6.25      6.25

 HYDROGRAPH AT
+                      8        .19      1    FLOW         187.      353.
                                              TIME        6.17      6.08

  3 COMBINED AT
+                  D3-8A       1.91      1    FLOW         925.     2088.
                                              TIME        6.42      6.25
1

*** NORMAL END OF HEC-1 ***
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE    04SEP07  TIME  11:53:45  *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*         609 SECOND STREET             *
*      DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104               *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X       XXXXX   X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

— Full Reach Existing Condition with Undeveloped Hannah Ridge —
Kiowa Engineering 9/5/07

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1

```
                                 HEC-1 INPUT                                                      PAGE  1

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID              East Fork Subtributary hydrology  PN:  06040
  2           ID              Existing devel   condition with storage at RR Embankment
  3           ID              Sand Creek DBPS Hydrology update
  4           ID              Existing culvert under RR in-place and no blockage
  5           ID              10- and 100 Year, 24 hr Type IIA  Storm  FN efstd.dat
              *DIAGRAM
  6           IT       5       0       0     300
  7           IO       5       0
  8           JR    PREC     .68     1.0

  9           KK       5
 10           KM      RUNOFF - Sub-basin 5
 11           BA     .20
 12           IN      15
```

```
13    PB     4.4
14    PC  0.0000  0.0005  0.0015  0.0030  0.0045  0.0060  0.0080  0.0100  0.0120  0.0143
15    PC  0.0165  0.0188  0.0210  0.0233  0.0255  0.0278  0.0320  0.0390  0.0460  0.0530
16    PC  0.0600  0.0750  0.1000  0.4000  0.7000  0.7250  0.7500  0.7650  0.7800  0.7900
17    PC  0.8000  0.8100  0.8200  0.8250  0.8300  0.8350  0.8400  0.8450  0.8500  0.8550
18    PC  0.8600  0.8638  0.8675  0.8713  0.8750  0.8788  0.8825  0.8863  0.8900  0.8938
19    PC  0.8975  0.9013  0.9050  0.9083  0.9115  0.9148  0.9180  0.9210  0.9240  0.9270
20    PC  0.9300  0.9325  0.9350  0.9375  0.9400  0.9425  0.9450  0.9475  0.9500  0.9525
21    PC  0.9550  0.9575  0.9600  0.9625  0.9650  0.9675  0.9700  0.9725  0.9750  0.9775
22    PC  0.9800  0.9813  0.9825  0.9838  0.9850  0.9863  0.9875  0.9888  0.9900  0.9913
23    PC  0.9925  0.9938  0.9950  0.9963  0.9975  0.9988  1.0000
24    LS       0      75
25    UD    0.14

26    KK   RT-5A
27    KM          ROUTE FLOW from SUB-BASIN 5 TO RT-5A
28    RD    1050    0.01    .013              TRAP      30      20

29    KK    RT-5
30    KM          ROUTE FLOW FROM RT-5A TO DP-1
31    RD    1100   .0133    .035              TRAP       5      10

32    KK       1
33    KM          RUNOFF - Sub-basin 1
34    BA     .14
35    LS       0    76.3
36    UD    0.14

37    KK    DP-1
38    KM  COMBINE FLOW FROM RT-5 AND SUB-BASIN 1
39    HC       2

40    KK    RT-1
41    KM          ROUTE FLOW from DESIGN POINT DP-1 TO DP-14
42    RD    4400    .016   0.035              TRAP      20      10
```

1

HEC-1 INPUT


```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

43    KK       2
44    KM          RUNOFF - Sub-basin 2
45    BA    .325
46    LS       0    71.8
47    UD    0.19

48    KK   DP-14
49    KM  COMBINE RUNOFF FROM RT-1 AND SUB-BASIN 2
50    HC       2

51    KK   DB-14
52    KM          ROUTE FLOW FROM DP 14 THROUGH DETENTION BASIN
```

```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 53       RS       1    ELEV      83
 54       SQ       0      75     325     480     575     675     775     850
 55       SE      83      86      90      92      94      96      98     100
 56       SV       0      .4      .8     1.7     4.6     8.9    17.6    31.6

 57       KK   RT-2B
 58       KM            ROUTE FLOW FROM DB14 TO DP-4A
 59       RD    2650    .005    .025            TRAP      16       4

 60       KK       3
 61       KM        RUNOFF FROM SUB-BASIN 3
 62       BA    .164
 63       LS       0    74.9
 64       UD     .12

 65       KK   RT-3A
 66       KM        ROUTE RUNOFF FROM SB 3 TO RT-3
 67       RD    1300     .02    .013            CIRC     3.5

 68       KK    RT-3
 69       KM        ROUTE RUNOFF FROM RT-3A TO DP 4A
 70       RD     500     .02    .013            CIRC       5

 71       KK       4
 72       KM        RUNOFF FROM SUB-BASIN 4
 73       BA    .147
 74       LS       0      69
 75       UD    .144

 76       KK   DP-4A
 77       KM        COMBINE RUNOFF FROM RT-3,
 78       HC       3

 79       KK   RT-2A
 80       KM        ROUTE RUNOFF FROM DP 4A TO DP 8
 81       RD    1200    .007    .035            TRAP      30       3

 82       KK      12
 83       KM        RUNOFF FROM SUB-BASIN 12
 84       BA    .053
 85       LS       0      69
 86       UD    .058

 87       KK      13
 88       KM        RUNOFF FROM SUB-BASIN 13
 89       BA    .047
 90       LS       0      69
 91       UD     .06
```

SITE

SITE

SITE

```
 92     KK    DP-8
 93     KM       COMBINE RUNOFF FROM RT-2A SUB-BASIN 12 AND SUB-BASIN 13
 94     HC       3

 95     KK    RT-6A
 96     KM       ROUTE RUNOFF FROM DP 8 TO RT6
 97     RD     600     .02     .03           TRAP      2      3

 98     KK     RT6
 99     KM       ROUTE RUNOFF FROM RT-6A TO DP 6
100     RD    1000    .007    .035           TRAP     30      3

101     KK       6
102     KM       RUNOFF FROM SUB-BASIN 6
103     BA     .12
104     LS       0      83
105     UD     .14

106     KK    DP -6
107     KM       COMBINE RINOFF FROM SUB-BASIN 6 AND RT-6
108     HC       2

109     KK    RT-7
110     KM       ROUTE RUNOFF FROM DP 6 TO DP 7
111     RD    3050    .007     .03           TRAP     45      3

112     KK       7
113     KM       RUNOFF FROM SUB-BASIN 7
114     BA     .17
115     LS       0      70
116     UD     .26

117     KK    DP-7
118     KM       COMBINE RUNOFF FROM SUB-BASIN 7 AND RT-7
119     HC       2

120     KK    RT-8
121     KM       ROUTE RUNOFF FROM DP-7 TO DP-8A
122     RD    6800    .007    .035           TRAP     45      3
```

1


```
LINE    ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

123     KK       9
124     KM       RUNOFF FROM SUB-BASIN 9
125     BA     .14
126     LS       0    75.4
127     UD     .34

128     KK      11
```

```
 129      KM       RUNOFF FROM SUB-BASIN 11
 130      BA    .146
 131      LS       0      78
 132      UD    .135

 133      KK    DB11
 134      KM      ROUTE RUNOFF FROM SB 11 THROUGH EXISTING NORTHCREST DETENTION BASIN
 135      RS       1    ELEV  6436.5
 136      SQ       0      45      48      52      55      57      60
 137      SE  6436.5  6441.5    6442    6444    6446    6448    6450
 138      SV       0      .1     .15       2    4.93    8.56    12.8

 139      KK    RT11A
 140      KM      ROUTE DISCHARGE FROM NORTHCREST DB TO RT11B
 141      RD.   2100     .02    .025            CIRC       3

 142      KK    RT11B
 143      KM      ROUTE RT11A TO DP 10
 144      RD     700     .02    .035            TRAP      10       3

 145      KK      10
 146      KM      RUNOFF FROM SUB-BASIN 10
 147      BA     .07
 148      LS       0    79.7
 149      UD     .22

 150      KK    DP10
 151      KM      COMBINE RUNOFF FROM SUB-BASIN 10 AND RT11B
 152      HC       2

 153      KK    DP-9
 154      KM      COMBINE RUNOFF FROM SB 9 AND DP 10
 155      HC       2

 156      KK    RT-9
 157      KM      ROUTE RUNOFF FROM DP 9 TO DP 8A
 158      RD    2650     .01    .035            TRAP      15       3

 159      KK       8
 160      KM      RUNOFF FROM SUB-BASIN 8
 161      BA     .19
 162      LS       0      70
 163      UD     .26
1
                                   HEC-1 INPUT                                                  PAGE  5

LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 164      KK    DP-8A
 165      KM      COMBINE RUNOFF ROM SUB-BASIN 8, RT-9 AND RT-8
 166      HC       3
 167      ZZ
```

```
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   9          5
              V
              V
  26       RT-5A
              V
              V
  29        RT-5
              .
              .
  32          .          1
              .          .
              .          .
  37        DP-1.........
              V
              V
  40        RT-1
              .
              .
  43          .          2
              .          .
              .          .
  48       DP-14.........
              V
              V
  51       DB-14
              V
              V
  57       RT-2B
              .
              .
  60          .          3
              .          V
              .          V
  65          .      RT-3A
              .          V
              .          V
  68          .       RT-3
              .          .
              .          .
  71          .          .          4
              .          .          .
              .          .          .
  76       DP-4A.....................
              V
              V
```

```
 79   RT-2A
          .
          .
 82       .          12
          .           .
          .           .
 87       .           .          13
          .           .           .
          .           .           .
 92    DP-8.........................
          V
          V
 95   RT-6A
          V
          V
 98     RT6
          .
          .
101       .           6
          .           .
          .           .
106   DP -6............
          V
          V
109    RT-7
          .
          .
112       .           7
          .           .
          .           .
117    DP-7............
          V
          V
120    RT-8
          .
          .
123       .           9
          .           .
          .           .
128       .           .          11
          .           .           V
          .           .           V
133       .           .        DB11
          .           .           V
          .           .           V
139       .           .       RT11A
          .           .           V
          .           .           V
142       .           .       RT11B
          .           .           .
          .           .           .
145       .           .           .        10
```

```
     .            .            .            .
     .            .            .            .
150  .            .          DP10............
     .            .            .
     .            .            .
153  .          DP-9............
     .            V
     .            V
156  .          RT-9
     .            .
     .            .
159  .            .            8
     .            .            .
     .            .            .
164 DP-8A.........................

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************
*                                        *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *
*             JUN   1998                 *
*           VERSION 4.1                  *
*                                        *
*  RUN DATE   04SEP07  TIME  11:53:45    *
*                                        *
******************************************
```

```
******************************************
*                                        *
*    U.S. ARMY CORPS OF ENGINEERS        *
*    HYDROLOGIC ENGINEERING CENTER       *
*          609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616          *
*           (916) 756-1104               *
*                                        *
******************************************
```

```
                  East Fork Subtributary hydrology  PN:  06040
                  Existing devel   condition with storage at RR Embankment
                  Sand Creek DBPS Hydrology update
                  Existing culvert under RR in-place and no blockage
                  10- and 100 Year, 24 hr Type IIA  Storm  FN efstd.dat

  7 IO      OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT      HYDROGRAPH TIME DATA
                  NMIN          5  MINUTES IN COMPUTATION INTERVAL
                 IDATE      1   0  STARTING DATE
                 ITIME       0000  STARTING TIME
                    NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                NDDATE      2   0  ENDING DATE
                NDTIME       0055  ENDING TIME
                 ICENT         19  CENTURY MARK

             COMPUTATION INTERVAL     .08 HOURS
```

TOTAL TIME BASE   24.92 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

JP   MULTI-PLAN OPTION
NPLAN   1 NUMBER OF PLANS

JR   MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.68   1.00

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .68	 RATIO 2 1.00
HYDROGRAPH AT						
+	5	.20	1	FLOW	154.	326.
				TIME	6.08	6.00
ROUTED TO						
+	RT-5A	.20	1	FLOW	151.	322.
				TIME	6.08	6.08
ROUTED TO						
+	RT-5	.20	1	FLOW	142.	313.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	1	.14	1	FLOW	117.	242.
				TIME	6.08	6.00
2 COMBINED AT						
+	DP-1	.34	1	FLOW	255.	551.
				TIME	6.08	6.08
ROUTED TO						
+	RT-1	.34	1	FLOW	245.	518.
				TIME	6.25	6.25

```
HYDROGRAPH AT
+                  2       .32     1   FLOW        181.      429.
                                       TIME        6.08      6.08

 2 COMBINED AT
+               DP-14      .66     1   FLOW        360.      886.
                                       TIME        6.25      6.17

ROUTED TO
+               DB-14      .66     1   FLOW        351.      627.
                                       TIME        6.25      6.33

                                  ** PEAK STAGES IN FEET **
                                   1   STAGE      90.33     95.05
                                       TIME        6.25      6.33

ROUTED TO
+               RT-2B      .66     1   FLOW        340.      624.
                                       TIME        6.33      6.42

HYDROGRAPH AT
+                  3       .16     1   FLOW        130.      283.
                                       TIME        6.00      6.00

ROUTED TO
+               RT-3A      .16     1   FLOW        126.      273.
                                       TIME        6.08      6.00

ROUTED TO
+                RT-3      .16     1   FLOW        126.      270.
                                       TIME        6.08      6.00

HYDROGRAPH AT
+                  4       .15     1   FLOW         74.      183.
                                       TIME        6.08      6.08

 3 COMBINED AT
+               DP-4A      .98     1   FLOW        393.      831.
                                       TIME        6.33      6.08

ROUTED TO
+               RT-2A      .98     1   FLOW        384.      824.
                                       TIME        6.42      6.17

HYDROGRAPH AT
+                 12       .05     1   FLOW         37.       85.
                                       TIME        6.00      6.00

HYDROGRAPH AT
+                 13       .05     1   FLOW         32.       75.
                                       TIME        6.00      6.00
```

3 COMBINED AT							
+	DP-8	1.08	1	FLOW	392.	856.	8
				TIME	6.42	6.17	
ROUTED TO							
+	RT-6A	1.08	1	FLOW	390.	852.	
				TIME	6.42	6.17	
ROUTED TO							
+	RT6	1.08	1	FLOW	385.	835.	
				TIME	6.42	6.17	
HYDROGRAPH AT							
+	6	.12	1	FLOW	144.	269.	
				TIME	6.00	6.00	
2 COMBINED AT							
+	DP -6	1.20	1	FLOW	410.	1004.	6
				TIME	6.42	6.17	
ROUTED TO							
+	RT-7	1.20	1	FLOW	402.	993.	
				TIME	6.50	6.25	
HYDROGRAPH AT							
+	7	.17	1	FLOW	69.	174.	
				TIME	6.17	6.17	
2 COMBINED AT							
+	DP-7	1.37	1	FLOW	429.	1151.	7
				TIME	6.50	6.17	
ROUTED TO							
+	RT-8	1.37	1	FLOW	444.	1144.	
				TIME	6.50	6.42	
HYDROGRAPH AT							
+	9	.14	1	FLOW	72.	159.	
				TIME	6.25	6.17	
HYDROGRAPH AT							
+	11	.15	1	FLOW	134.	275.	
				TIME	6.08	6.00	
ROUTED TO							
+	DB11	.15	1	FLOW	52.	56.	
				TIME	6.25	6.33	

** PEAK STAGES IN FEET **

1	STAGE	6443.93	6446.82
	TIME	6.25	6.33

```
 ROUTED TO
+                RT11A      .15    1   FLOW       52.     56.
                                       TIME      6.33    6.42

 ROUTED TO
+                RT11B      .15    1   FLOW       52.     56.
                                       TIME      6.33    6.50

 HYDROGRAPH AT
+                   10      .07    1   FLOW       61.    122.
                                       TIME      6.08    6.08

  2 COMBINED AT
+                 DP10      .22    1   FLOW      110.    175.
                                       TIME      6.08    6.08

  2 COMBINED AT
+                 DP-9      .36    1   FLOW      177.    325.
                                       TIME      6.17    6.17

 ROUTED TO
+                 RT-9      .36    1   FLOW      174.    321.
                                       TIME      6.25    6.25

 HYDROGRAPH AT
+                    8      .19    1   FLOW       77.    194.
                                       TIME      6.17    6.17

  3 COMBINED AT
+                DP-8A     1.91    1   FLOW      609.   1497.
1                                      TIME      6.50    6.42

*** NORMAL END OF HEC-1 ***
```

```
1***************************************
 *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1) *
 *             JUN   1998              *
 *           VERSION 4.1               *
 *                                     *
 *  RUN DATE   19OCT07  TIME  09:48:32 *
 *                                     *
 ***************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*        609 SECOND STREET             *
*     DAVIS, CALIFORNIA 95616          *
*         (916) 756-1104               *
*                                      *
****************************************
```

```
X     X  XXXXXXX   XXXXX         X
X     X  X        X     X       XX
X     X  X        X              X
XXXXXXX  XXXX     X       XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

— Full Reach Existing Condition with Developed Hannah Ridge —
MVE 10/19/07 (Based on Kiowa Runs 1/18/07 & 9/5/07)

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                 HEC-1 INPUT                                              PAGE  1

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1         ID       East Fork Subtributary Hydrology PN:  60754
   2         ID       Existing Offsite Development Condition with Developed On-Site Hannah
   3         ID       with storage at RR Embankment, Existing RR culvert in place and no
   4         ID       blockage.
   5         ID       10- and 100 Year, 24 hr Typoe IIA Storm  FN efsceo.dat
             *DIAGRAM
   6         IT       5       0       0     300
   7         IO       5       0
   8         JR    PREC     .68     1.0

   9         KK       5
  10         KM       RUNOFF - Sub-basin 5
  11         BA     .20
  12         IN      15
```

```
 13          PB    4.4
 14          PC 0.0000  0.0005  0.0015  0.0030  0.0045  0.0060  0.0080  0.0100  0.0120  0.0143
 15          PC 0.0165  0.0188  0.0210  0.0233  0.0255  0.0278  0.0320  0.0390  0.0460  0.0530
 16          PC 0.0600  0.0750  0.1000  0.4000  0.7000  0.7250  0.7500  0.7650  0.7800  0.7900
 17          PC 0.8000  0.8100  0.8200  0.8250  0.8300  0.8350  0.8400  0.8450  0.8500  0.8550
 18          PC 0.8600  0.8638  0.8675  0.8713  0.8750  0.8788  0.8825  0.8863  0.8900  0.8938
 19          PC 0.8975  0.9013  0.9050  0.9083  0.9115  0.9148  0.9180  0.9210  0.9240  0.9270
 20          PC 0.9300  0.9325  0.9350  0.9375  0.9400  0.9425  0.9450  0.9475  0.9500  0.9525
 21          PC 0.9550  0.9575  0.9600  0.9625  0.9650  0.9675  0.9700  0.9725  0.9750  0.9775
 22          PC 0.9800  0.9813  0.9825  0.9838  0.9850  0.9863  0.9875  0.9888  0.9900  0.9913
 23          PC 0.9925  0.9938  0.9950  0.9963  0.9975  0.9988  1.0000
 24          LS      0      75
 25          UD   0.14

 26          KK   RT-5A
 27          KM       ROUTE FLOW from SUB-BASIN 5 TO RT-5A
 28          RD   1050    0.01    .013            TRAP      30      20

 29          KK   RT-5
 30          KM       ROUTE FLOW FROM RT-5A TP DP-1
 31          RD   1100   .0133    .035            TRAP       5      10

 32          KK       1
 33          KM       RUNOFF - Sub-basin 1
 34          BA    .14
 35          LS      0    76.3
 36          UD   0.14

 37          KK   DP-1
 38          KM       COMBINE FLOW FROM RT-5 AND SUB-BASIN 1
 39          HC       2

 40          KK   RT-1
 41          KM       ROUTE FLOW from DESIGN POINT DP-1 TO DP-14
 42          RD   4400   0.016    .035            TRAP      20      10
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 43          KK       2
 44          KM       RUNOFF - Sub-basin 2
 45          BA   .325
 46          LS      0    71.8
 47          UD   0.19

 48          KK   DP-14
 49          KM       COMBINE FLOW FROM RT-1 AND SUB-BASIN 2
 50          HC       2

 51          KK   DB-14
 52          KM       ROUTE FLOW from DESIGN POINT DP-14 THROUGH DETENTION BASIN
```

```
      53          RS      1    ELEV     83
      54          SQ      0     75     325     480     575     675     775     850
      55          SE     83     86      90      92      94      96      98     100
      56          SV      0     .4      .8     1.7     4.6     8.9    17.6    31.6

      57          KK   RT-2B
      58          KM        ROUTE FLOW from DESIGN POINT DB-14 TO DP-4A
      59          RD   2650   .005    .025            TRAP      16       4

      60          KK      3
      61          KM        RUNOFF FROM SUB-BASIN 3
      62          BA    .164
      63          LS      0    74.9
      64          UD   0.12

      65          KK   RT-3A
      66          KM        ROUTE RUNOFF FROM SB-3 TO RT-3
      67          RD   1300    .02    .013            CIRC     3.5

      68          KK   RT-3
      69          KM        ROUTE RUNOFF FROM RT-3A TO DP 4A
      70          RD    500    .02    .013            CIRC       5

      71          KK      4
SITE  72          KM        RUNOFF FROM SUB-BASIN 4
      73          BA    .147
      74          LS      0    83.5
      75          UD  0.144

      76          KK   DP-4A
      77          KM        COMBINE RUNOFF FROM RT-3, RT-2B AND SB 4
      78          HC      3

      79          KK   RT-2A
      80          KM        ROUTE RUNOFF FROM DP 4A TO DP 8
      81          RD   1200   .007    .035            TRAP      30       3
1                                        HEC-1 INPUT                                    PAGE  3

    LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

      82          KK     12
SITE  83          KM        RUNOFF FROM SUB-BASIN 12
      84          BA   .053
      85          LS      0      92
      86          UD  0.058

      87          KK     13
      88          KM        RUNOFF FROM SUB-BASIN 13
SITE  89          BA   .047
      90          LS      0    88.5
      91          UD   0.06
```

```
  92           KK    DP-8
  93           KM        COMBINE RUNOFF FROM RT-2A SUB-BASIN 12 AND SUB-BASIN 13
  94           HC        3

  95           KK   RT-6A
  96           KM        ROUTE RUNOFF FROM DP 8 TO RT 6
  97           RD     600     .02     .03             TRAP       2       3

  98           KK    RT-6
  99           KM        ROUTE RUNOFF FROM RT-6A TO DP 6
 100           RD    1000    .007    .035             TRAP      30       3

 101           KK        6
 102           KM        RUNOFF FROM SUB-BASIN 6
 103           BA     .12
 104           LS       0      83
 105           UD    0.14

 106           KK    DP-6
 107           KM        COMBINE RUNOFF FROM RT-2A SUB-BASIN 6 AND RT-6
 108           HC        2

 109           KK    RT-7
 110           KM        ROUTE RUNOFF FROM DP 6 TO DP 7
 111           RD    3050    .007     .03             TRAP      45       3

 112           KK        7
 113           KM        RUNOFF FROM SUB-BASIN 7
 114           BA     .17
 115           LS       0      70
 116           UD    0.26

 117           KK    DP-7
 118           KM        COMBINE RUNOFF FROM SUB-BASIN 7 AND RT-7
 119           HC        2

 120           KK    RT-8
 121           KM        ROUTE RUNOFF FROM DP-7 TO DP-8A
 122           RD    6800    .007    .035             TRAP      45       3
1                                          HEC-1 INPUT                                          PAGE  4

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 123           KK        9
 124           KM        RUNOFF FROM SUB-BASIN 9
 125           BA     .14
 126           LS       0    75.4
 127           UD    0.34

 128           KK       11
```

```
129          KM        RUNOFF FROM SUB-BASIN 11
130          BA    .146
131          LS       0      78
132          UD   0.135

133          KK    DB11
134          KM        ROUTE FLOW from SB 11 THROUGH EXISTING NORTHCREST DETENTION BASIN
135          RS       1    ELEV  6436.5
136          SQ       0      45      48      52      55      57      60
137          SE  6436.5  6441.5    6442    6444    6446    6448    6450
138          SV       0      .1     .15       2    4.93    8.56    12.8

139          KK   RT11A
140          KM        ROUTE DISCHARGE FROM NORTHCREST DB TO RT-11B
141          RD    2100     .02    .025            CIRC       3

142          KK   RT11B
143          KM        ROUTE RT11A TO DP 10
144          RD     700     .02    .035            TRAP      10       3

145          KK      10
146          KM        RUNOFF FROM SUB-BASIN 10
147          BA     .07
148          LS       0    79.7
149          UD     .22

150          KK    DP10
151          KM        COMBINE RUNOFF FROM SUB-BASIN 10 AND RT11B
152          HC       2

153          KK    DP-9
154          KM        COMBINE RUNOFF FROM SB 9 AND DP 10
155          HC       2

156          KK    RT-9
157          KM        ROUTE RUNOFF FROM DP 9 TO DP 8A
158          RD    2650     .01    .035            TRAP      15       3

159          KK       8
160          KM        RUNOFF FROM SUB-BASIN 8
161          BA     .19
162          LS       0      70
163          UD     .26
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

164          KK   DP-8A
165          KM        COMBINE RUNOFF FROM SUB-BASIN 8, RT-9 AND RT-8
166          HC       3
167          ZZ
```

```
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING         (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR       (<---) RETURN OF DIVERTED OR PUMPED FLOW

     9           5
                 V
                 V
    26       RT-5A
                 V
                 V
    29        RT-5
                 .
                 .
    32           .           1
                 .           .
                 .           .
    37        DP-1............
                 V
                 V
    40        RT-1
                 .
                 .
    43           .           2
                 .           .
                 .           .
    48       DP-14............
                 V
                 V
    51       DB-14
                 V
                 V
    57       RT-2B
                 .
                 .
    60           .           3
                 .           V
                 .           V
    65           .       RT-3A
                 .           V
                 .           V
    68           .        RT-3
                 .           .
                 .           .
    71           .           .           4
                 .           .           .
                 .           .           .
    76       DP-4A........................
                 V
                 V
```

```
 79     RT-2A
          .
          .
 82       .        12
          .         .
          .         .
 87       .         .        13
          .         .         .
          .         .         .
 92     DP-8......................
          V
          V
 95     RT-6A
          V
          V
 98     RT-6
          .
          .
101       .         6
          .         .
          .         .
106     DP-6...........
          V
          V
109     RT-7
          .
          .
112       .         7
          .         .
          .         .
117     DP-7...........
          V
          V
120     RT-8
          .
          .
123       .         9
          .         .
          .         .
128       .         .        11
          .         .         V
          .         .         V
133       .         .       DB11
          .         .         V
          .         .         V
139       .         .      RT11A
          .         .         V
          .         .         V
142       .         .      RT11B
          .         .         .
          .         .         .
145       .         .         .         10
```

```
                  .           .           .           .
                  .           .           .           .
150               .           .         DP10...........
                  .           .           .
                  .           .           .
153               .         DP-9...........
                  .           V
                  .           V
156               .         RT-9
                  .           .
                  .           .
159               .           .           8
                  .           .           .
                  .           .           .
164             DP-8A.......................

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                          ***************************************
 *                                       *                          *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                          *   U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998                *                          *   HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                          *        609 SECOND STREET            *
 *                                       *                          *    DAVIS, CALIFORNIA 95616          *
 *  RUN DATE   19OCT07  TIME  09:48:32   *                          *         (916) 756-1104              *
 *                                       *                          *                                     *
 *****************************************                          ***************************************


                              East Fork Subtributary Hydrology PN:  60754
                              Existing Offsite Development Condition with Developed On-Site Hannah
                              with storage at RR Embankment, Existing RR culvert in place and no
                              blockage.
                              10- and 100 Year, 24 hr Typoe IIA Storm  FN efsceo.dat

  7 IO         OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT         HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE     1    0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     2    0  ENDING DATE
                    NDTIME       0055  ENDING TIME
                     ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
```

TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.68 1.00

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .68	RATIO 2 1.00
HYDROGRAPH AT						
+	5	.20	1	FLOW	154.	326.
				TIME	6.08	6.00
ROUTED TO						
+	RT-5A	.20	1	FLOW	151.	322.
				TIME	6.08	6.08
ROUTED TO						
+	RT-5	.20	1	FLOW	142.	313.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	1	.14	1	FLOW	117.	242.
				TIME	6.08	6.00
2 COMBINED AT						
+	DP-1	.34	1	FLOW	255.	551.
				TIME	6.08	6.08
ROUTED TO						
+	RT-1	.34	1	FLOW	245.	518.
				TIME	6.25	6.25

```
 HYDROGRAPH AT
+                  2        .32      1   FLOW        181.     429.
                                         TIME        6.08     6.08

  2 COMBINED AT
+               DP-14       .66      1   FLOW        360.     886.
                                         TIME        6.25     6.17

 ROUTED TO
+               DB-14       .66      1   FLOW        351.     627.
                                         TIME        6.25     6.33

                                    ** PEAK STAGES IN FEET **
                                     1   STAGE      90.33    95.05
                                         TIME        6.25     6.33

 ROUTED TO
+               RT-2B       .66      1   FLOW        340.     624.
                                         TIME        6.33     6.42

 HYDROGRAPH AT
+                  3        .16      1   FLOW        130.     283.
                                         TIME        6.00     6.00

 ROUTED TO
+               RT-3A       .16      1   FLOW        126.     273.
                                         TIME        6.08     6.00

 ROUTED TO
+                RT-3       .16      1   FLOW        126.     270.
                                         TIME        6.08     6.00

 HYDROGRAPH AT
+                  4        .15      1   FLOW        179.     333.
                                         TIME        6.00     6.00

  3 COMBINED AT
+               DP-4A       .98      1   FLOW        416.     966.
                                         TIME        6.33     6.08

 ROUTED TO
+               RT-2A       .98      1   FLOW        406.     931.
                                         TIME        6.33     6.17

 HYDROGRAPH AT
+                 12        .05      1   FLOW        107.     168.
                                         TIME        6.00     6.00

 HYDROGRAPH AT
+                 13        .05      1   FLOW         85.     139.
                                         TIME        6.00     6.00
```

```
  3 COMBINED AT
 +                 DP-8      1.08     1   FLOW         453.    1041.   8
                                          TIME         6.00     6.08

 ROUTED TO
 +                 RT-6A     1.08     1   FLOW         438.    1033.
                                          TIME         6.00     6.08

 ROUTED TO
 +                 RT-6      1.08     1   FLOW         436.    1006.
                                          TIME         6.08     6.17

 HYDROGRAPH AT
 +                    6       .12     1   FLOW         144.     269.
                                          TIME         6.00     6.00

  2 COMBINED AT
 +                 DP-6      1.20     1   FLOW         577.    1261.   6
                                          TIME         6.08     6.08

 ROUTED TO
 +                 RT-7      1.20     1   FLOW         560.    1259.
                                          TIME         6.17     6.17

 HYDROGRAPH AT
 +                    7       .17     1   FLOW          69.     174.
                                          TIME         6.17     6.17

  2 COMBINED AT
 +                 DP-7      1.37     1   FLOW         629.    1433.   7
                                          TIME         6.17     6.17

 ROUTED TO
 +                 RT-8      1.37     1   FLOW         632.    1391.
                                          TIME         6.42     6.42

 HYDROGRAPH AT
 +                    9       .14     1   FLOW          72.     159.
                                          TIME         6.25     6.17

 HYDROGRAPH AT
 +                   11       .15     1   FLOW         134.     275.
                                          TIME         6.08     6.00

 ROUTED TO
 +                 DB11       .15     1   FLOW          52.      56.
                                          TIME         6.25     6.33

                                     ** PEAK STAGES IN FEET **
                                      1  STAGE      6443.93  6446.82
                                         TIME          6.25     6.33
```

```
 ROUTED TO
+                  RT11A      .15     1   FLOW        52.     56.
                                          TIME       6.33    6.42

 ROUTED TO
+                  RT11B      .15     1   FLOW        52.     56.
                                          TIME       6.33    6.50

 HYDROGRAPH AT
+                     10      .07     1   FLOW        61.    122.
                                          TIME       6.08    6.08

  2 COMBINED AT
+                   DP10      .22     1   FLOW       110.    175.
                                          TIME       6.08    6.08

  2 COMBINED AT
+                   DP-9      .36     1   FLOW       177.    325.
                                          TIME       6.17    6.17

 ROUTED TO
+                   RT-9      .36     1   FLOW       174.    321.
                                          TIME       6.25    6.25

 HYDROGRAPH AT
+                      8      .19     1   FLOW        77.    194.
                                          TIME       6.17    6.17

  3 COMBINED AT
+                  DP-8A     1.91     1   FLOW       826.   1869.
                                          TIME       6.42    6.25
1

 *** NORMAL END OF HEC-1 ***
```

8A

```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS        *
 *             JUN   1998                *                    *   HYDROLOGIC ENGINEERING CENTER       *
 *           VERSION 4.1                 *                    *         609 SECOND STREET             *
 *                                       *                    *      DAVIS, CALIFORNIA 95616          *
 * RUN DATE   13NOV07  TIME  11:49:01    *                    *          (916) 756-1104               *
 *                                       *                    *                                       *
 *****************************************                    *****************************************


                    X     X  XXXXXXX   XXXXX          X
                    X     X  X        X     X        XX
                    X     X  X        X               X
                    XXXXXXX  XXXX     X       XXXXX   X
                    X     X  X        X               X
                    X     X  X        X     X         X
                    X     X  XXXXXXX   XXXXX         XXX
```

— Existing offsite conditions with Hannah Ridge Phases 1-4 only.

```
THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                     HEC-1 INPUT                                            PAGE  1

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1         ID        East Fork Subtributary Hydrology PN:  60754
   2         ID        Existing Offsite Development Condition with Developed Phase 1-4 Hannah only
   3         ID        with storage at RR Embankment, Existing RR culvert in place and no
   4         ID        blockage.
   5         ID        10- and 100 Year, 24 hr Typoe IIA Storm  FN efscdph1.dat
             *DIAGRAM
   6         IT       5       0       0     300
   7         IO       5       0
   8         JR    PREC     .68     1.0

   9         KK       5
  10         KM        RUNOFF - Sub-basin 5
  11         BA     .20
  12         IN      15
  13         PB     4.4
  14         PC  0.0000  0.0005  0.0015  0.0030  0.0045  0.0060  0.0080  0.0100  0.0120  0.0143
```

```
 15          PC  0.0165  0.0188  0.0210  0.0233  0.0255  0.0278  0.0320  0.0390  0.0460  0.0530
 16          PC  0.0600  0.0750  0.1000  0.4000  0.7000  0.7250  0.7500  0.7650  0.7800  0.7900
 17          PC  0.8000  0.8100  0.8200  0.8250  0.8300  0.8350  0.8400  0.8450  0.8500  0.8550
 18          PC  0.8600  0.8638  0.8675  0.8713  0.8750  0.8788  0.8825  0.8863  0.8900  0.8938
 19          PC  0.8975  0.9013  0.9050  0.9083  0.9115  0.9148  0.9180  0.9210  0.9240  0.9270
 20          PC  0.9300  0.9325  0.9350  0.9375  0.9400  0.9425  0.9450  0.9475  0.9500  0.9525
 21          PC  0.9550  0.9575  0.9600  0.9625  0.9650  0.9675  0.9700  0.9725  0.9750  0.9775
 22          PC  0.9800  0.9813  0.9825  0.9838  0.9850  0.9863  0.9875  0.9888  0.9900  0.9913
 23          PC  0.9925  0.9938  0.9950  0.9963  0.9975  0.9988  1.0000
 24          LS       0      75
 25          UD    0.14

 26          KK   RT-5A
 27          KM        ROUTE FLOW from SUB-BASIN 5 TO RT-5A
 28          RD    1050    0.01    .013            TRAP      30      20

 29          KK    RT-5
 30          KM        ROUTE FLOW FROM RT-5A TP DP-1
 31          RD    1100   .0133    .035            TRAP       5      10

 32          KK       1
 33          KM        RUNOFF - Sub-basin 1
 34          BA     .14
 35          LS       0    76.3
 36          UD    0.14

 37          KK    DP-1
 38          KM        COMBINE FLOW FROM RT-5 AND SUB-BASIN 1
 39          HC       2

 40          KK    RT-1
 41          KM        ROUTE FLOW from DESIGN POINT DP-1 TO DP-14
 42          RD    4400   0.016    .035            TRAP      20      10
1                                      HEC-1 INPUT                                          PAGE  2

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 43          KK       2
 44          KM        RUNOFF - Sub-basin 2
 45          BA    .325
 46          LS       0    71.8
 47          UD    0.19

 48          KK   DP-14
 49          KM        COMBINE FLOW FROM RT-1 AND SUB-BASIN 2
 50          HC       2

 51          KK   DB-14
 52          KM        ROUTE FLOW from DESIGN POINT DP-14 THROUGH DETENTION BASIN
 53          RS       1    ELEV      83
 54          SQ       0      75     325     480     575     675     775     850
 55          SE      83      86      90      92      94      96      98     100
 56          SV       0      .4      .8     1.7     4.6     8.9    17.6    31.6
```

```
  57         KK   RT-2B
  58         KM        ROUTE FLOW from DESIGN POINT DB-14 TO DP-4A
  59         RD    2650    .005    .025            TRAP      16       4

  60         KK       3
  61         KM        RUNOFF FROM SUB-BASIN 3
  62         BA    .164
  63         LS       0    74.9
  64         UD    0.12

  65         KK   RT-3A
  66         KM        ROUTE RUNOFF FROM SB-3 TO RT-3
  67         RD    1300     .02    .013            CIRC     3.5

  68         KK    RT-3
  69         KM        ROUTE RUNOFF FROM RT-3A TO DP 4A
  70         RD     500     .02    .013            CIRC       5

  71         KK       4
  72         KM        RUNOFF FROM SUB-BASIN 4
  73         BA    .147
  74         LS       0    71.5
  75         UD   0.144

  76         KK   DP-4A
  77         KM        COMBINE RUNOFF FROM RT-3, RT-2B AND SB 4
  78         HC       3

  79         KK   RT-2A
  80         KM        ROUTE RUNOFF FROM DP 4A TO DP 8
  81         RD    1200    .007    .035            TRAP      30       3
1                                  HEC-1 INPUT                                          PAGE  3

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  82         KK      12
  83         KM        RUNOFF FROM SUB-BASIN 12
  84         BA    .053
  85         LS       0      69
  86         UD   0.058

  87         KK      13
  88         KM        RUNOFF FROM SUB-BASIN 13
  89         BA    .047
  90         LS       0    73.1
  91         UD    0.06

  92         KK    DP-8
  93         KM        COMBINE RUNOFF FROM RT-2A SUB-BASIN 12 AND SUB-BASIN 13
  94         HC       3

  95         KK   RT-6A
```

```
 96        KM        ROUTE RUNOFF FROM DP 8 TO RT 6
 97        RD     600     .02     .03            TRAP       2       3

 98        KK     RT-6
 99        KM        ROUTE RUNOFF FROM RT-6A TO DP 6
100        RD     1000    .007    .035           TRAP      30       3

101        KK        6
102        KM        RUNOFF FROM SUB-BASIN 6
103        BA      .12
104        LS        0       83
105        UD     0.14

106        KK     DP-6
107        KM        COMBINE RUNOFF FROM RT-2A SUB-BASIN 6 AND RT-6
108        HC        2

109        KK     RT-7
110        KM        ROUTE RUNOFF FROM DP 6 TO DP 7
111        RD     3050    .007    .03            TRAP      45       3

112        KK        7
113        KM        RUNOFF FROM SUB-BASIN 7
114        BA      .17
115        LS        0       70
116        UD     0.26

117        KK     DP-7
118        KM        COMBINE RUNOFF FROM SUB-BASIN 7 AND RT-7
119        HC        2

120        KK     RT-8
121        KM        ROUTE RUNOFF FROM DP-7 TO DP-8A
122        RD     6800    .007    .035           TRAP      45       3
1                                         HEC-1 INPUT                                        PAGE  4

LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

123        KK        9
124        KM        RUNOFF FROM SUB-BASIN 9
125        BA      .14
126        LS        0    75.4
127        UD     0.34

128        KK       11
129        KM        RUNOFF FROM SUB-BASIN 11
130        BA     .146
131        LS        0       78
132        UD    0.135

133        KK     DB11
134        KM        ROUTE FLOW from SB 11 THROUGH EXISTING NORTHCREST DETENTION BASIN
135        RS        1    ELEV  6436.5
```

```
 136           SQ      0     45     48     52     55     57     60
 137           SE 6436.5 6441.5   6442   6444   6446   6448   6450
 138           SV      0     .1    .15      2   4.93   8.56   12.8

 139           KK  RT11A
 140           KM       ROUTE DISCHARGE FROM NORTHCREST DB TO RT-11B
 141           RD   2100    .02   .025          CIRC      3

 142           KK  RT11B
 143           KM       ROUTE RT11A TO DP 10
 144           RD    700    .02   .035          TRAP     10      3

 145           KK     10
 146           KM       RUNOFF FROM SUB-BASIN 10
 147           BA    .07
 148           LS      0   79.7
 149           UD    .22

 150           KK   DP10
 151           KM       COMBINE RUNOFF FROM SUB-BASIN 10 AND RT11B
 152           HC      2

 153           KK   DP-9
 154           KM       COMBINE RUNOFF FROM SB 9 AND DP 10
 155           HC      2

 156           KK   RT-9
 157           KM       ROUTE RUNOFF FROM DP 9 TO DP 8A
 158           RD   2650    .01   .035          TRAP     15      3

 159           KK      8
 160           KM       RUNOFF FROM SUB-BASIN 8
 161           BA    .19
 162           LS      0     70
 163           UD    .26
1                                 HEC-1 INPUT                                        PAGE  5

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 164           KK  DP-8A
 165           KM       COMBINE RUNOFF FROM SUB-BASIN 8, RT-9 AND RT-8
 166           HC      3
 167           ZZ
1
        SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING         (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR       (<---) RETURN OF DIVERTED OR PUMPED FLOW

   9         5
             V
             V
```

```
26      RT-5A
            V
            V
29       RT-5
            .
            .
32          .           1
            .           .
            .           .
37       DP-1............
            V
            V
40       RT-1
            .
            .
43          .           2
            .           .
            .           .
48      DP-14............
            V
            V
51      DB-14
            V
            V
57      RT-2B
            .
            .
60          .           3
            .           V
            .           V
65          .       RT-3A
            .           V
            .           V
68          .        RT-3
            .           .
            .           .
71          .           .           4
            .           .           .
            .           .           .
76      DP-4A.......................
            V
            V
79      RT-2A
            .
            .
82          .          12
            .           .
            .           .
87          .           .          13
            .           .           .
            .           .           .
92       DP-8.......................
            V
            V
```

```
 95     RT-6A
            V
            V
 98      RT-6
            .
            .
101         .           6
            .           .
            .           .
106      DP-6............
            V
            V
109      RT-7
            .
            .
112         .           7
            .           .
            .           .
117      DP-7............
            V
            V
120      RT-8
            .
            .
123         .           9
            .           .
            .           .
128         .           .          11
            .           .           V
            .           .           V
133         .           .        DB11
            .           .           V
            .           .           V
139         .           .       RT11A
            .           .           V
            .           .           V
142         .           .       RT11B
            .           .           .
            .           .           .
145         .           .           .          10
            .           .           .           .
            .           .           .           .
150         .           .        DP10............
            .           .           .
            .           .           .
153         .        DP-9............
            .           V
            .           V
156         .        RT-9
            .           .
            .           .
159         .           .           8
            .           .           .
            .           .           .
```

```
  164       DP-8A......................

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                                                ****************************************
 *                                       *                                                *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                                                *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                                                *          609 SECOND STREET           *
 *                                       *                                                *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   13NOV07  TIME  11:49:01   *                                                *          (916) 756-1104              *
 *                                       *                                                *                                      *
*****************************************                                                 ****************************************


                            East Fork Subtributary Hydrology PN:  60754
                            Existing Offsite Development Condition with Developed Phase 1 Hannah onl
                            with storage at RR Embankment, Existing RR culvert in place and no
                            blockage.
                            10- and 100 Year, 24 hr Typoe IIA Storm  FN efscdph1.dat

  7 IO         OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT         HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1   0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      2   0  ENDING DATE
                    NDTIME       0055  ENDING TIME
                     ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT

    JP         MULTI-PLAN OPTION
                     NPLAN          1  NUMBER OF PLANS

    JR         MULTI-RATIO OPTION
                   RATIOS OF PRECIPITATION
```

.68 1.00

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .68	RATIO 2 1.00
HYDROGRAPH AT						
+	5	.20	1	FLOW	154.	326.
				TIME	6.08	6.00
ROUTED TO						
+	RT-5A	.20	1	FLOW	151.	322.
				TIME	6.08	6.08
ROUTED TO						
+	RT-5	.20	1	FLOW	142.	313.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	1	.14	1	FLOW	117.	242.
				TIME	6.08	6.00
2 COMBINED AT						
+	DP-1	.34	1	FLOW	255.	551.
				TIME	6.08	6.08
ROUTED TO						
+	RT-1	.34	1	FLOW	245.	518.
				TIME	6.25	6.25
HYDROGRAPH AT						
+	2	.32	1	FLOW	181.	429.
				TIME	6.08	6.08
2 COMBINED AT						
+	DP-14	.66	1	FLOW	360.	886.
				TIME	6.25	6.17
ROUTED TO						
+	DB-14	.66	1	FLOW	351.	627.
				TIME	6.25	6.33
			** PEAK STAGES IN FEET **			
			1	STAGE	90.33	95.05
				TIME	6.25	6.33
ROUTED TO						
+	RT-2B	.66	1	FLOW	340.	624.

				TIME	6.33	6.42	
HYDROGRAPH AT +	3	.16	1	FLOW TIME	130. 6.00	283. 6.00	
ROUTED TO +	RT-3A	.16	1	FLOW TIME	126. 6.08	273. 6.00	
ROUTED TO +	RT-3	.16	1	FLOW TIME	126. 6.08	270. 6.00	
HYDROGRAPH AT +	4	.15	1	FLOW TIME	90. 6.08	205. 6.08	
3 COMBINED AT +	DP-4A	.98	1	FLOW TIME	397. 6.33	853. 6.08	
ROUTED TO +	RT-2A	.98	1	FLOW TIME	387. 6.42	842. 6.17	
HYDROGRAPH AT +	12	.05	1	FLOW TIME	37. 6.00	85. 6.00	
HYDROGRAPH AT +	13	.05	1	FLOW TIME	42. 6.00	89. 6.00	
3 COMBINED AT +	DP-8	1.08	1	FLOW TIME	395. 6.42	876. 6.17	8
ROUTED TO +	RT-6A	1.08	1	FLOW TIME	394. 6.42	873. 6.17	
ROUTED TO +	RT-6	1.08	1	FLOW TIME	390. 6.42	862. 6.17	
HYDROGRAPH AT +	6	.12	1	FLOW TIME	144. 6.00	269. 6.00	
2 COMBINED AT +	DP-6	1.20	1	FLOW TIME	415. 6.42	1030. 6.17	6

```
 ROUTED TO
+                RT-7      1.20     1   FLOW         408.    1014.
                                        TIME         6.50     6.25

 HYDROGRAPH AT
+                   7       .17     1   FLOW          69.     174.
                                        TIME         6.17     6.17

  2 COMBINED AT
+                DP-7      1.37     1   FLOW         449.    1180.    7
                                        TIME         6.25     6.17

 ROUTED TO
+                RT-8      1.37     1   FLOW         436.    1164.
                                        TIME         6.58     6.42

 HYDROGRAPH AT
+                   9       .14     1   FLOW          72.     159.
                                        TIME         6.25     6.17

 HYDROGRAPH AT
+                  11       .15     1   FLOW         134.     275.
                                        TIME         6.08     6.00

 ROUTED TO
+                DB11       .15     1   FLOW          52.      56.
                                        TIME         6.25     6.33

                                   ** PEAK STAGES IN FEET **
                                    1   STAGE     6443.93  6446.82
                                        TIME         6.25     6.33

 ROUTED TO
+               RT11A       .15     1   FLOW          52.      56.
                                        TIME         6.33     6.42

 ROUTED TO
+               RT11B       .15     1   FLOW          52.      56.
                                        TIME         6.33     6.50

 HYDROGRAPH AT
+                  10       .07     1   FLOW          61.     122.
                                        TIME         6.08     6.08

  2 COMBINED AT
+                DP10       .22     1   FLOW         110.     175.
                                        TIME         6.08     6.08

  2 COMBINED AT
+                DP-9       .36     1   FLOW         177.     325.
                                        TIME         6.17     6.17

 ROUTED TO
+                RT-9       .36     1   FLOW         174.     321.
```

				TIME	6.25	6.25
HYDROGRAPH AT						
+	8	.19	1	FLOW	77.	194.
				TIME	6.17	6.17
3 COMBINED AT						
+	DP-8A	1.91	1	FLOW	588.	1523.
				TIME	6.50	6.33

8a

*** NORMAL END OF HEC-1 ***

M.V.E., INC.
1903 Lelaray St., Ste. 200
COLORADO SPRINGS, CO 80909
(719) 635-5736

JOB 60754
SHEET NO. 1 OF 1
CALCULATED BY DAG DATE 11/13/07
CHECKED BY ____ DATE ____
SCALE ____

CN VALUE CALCULATION FOR PHASE 1 ONLY

SB #4 AREA 92 ACRES

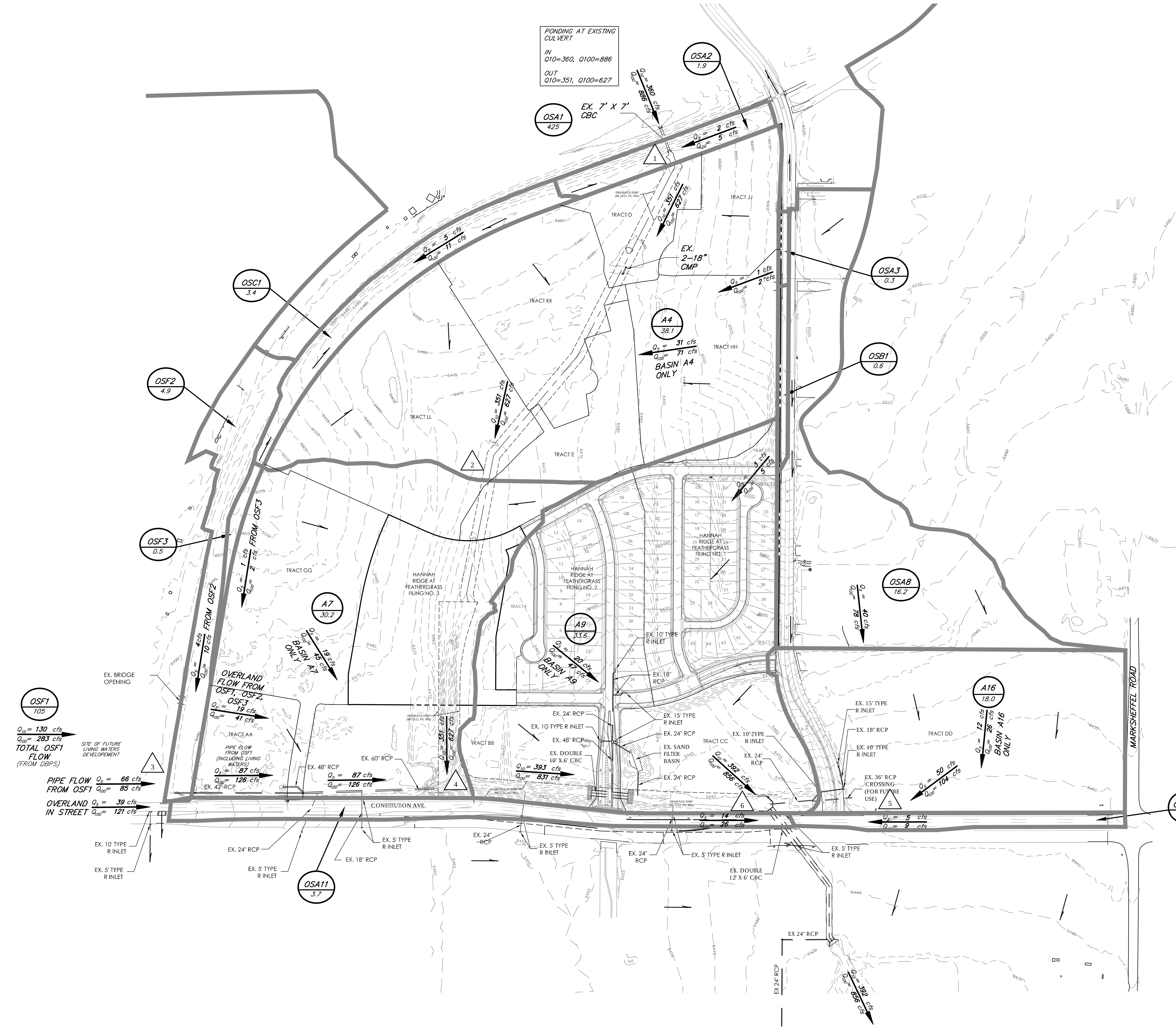
24.7 ACRES 1/5 ACRE ~~ACREAGE~~ RES. CN = 78 (26.8%)
67.3 ACRES OPEN AREA CN = 69 (73.2%)

WTD CN = .268 (78) + .732 (69) = 71.5

SB #13 AREA 30 ACRES

13.6 ACRES 1/10 ACRE RES. CN = 78 (45.3%)
16.4 ACRES OPEN AREA CN = 69 (54.7%)

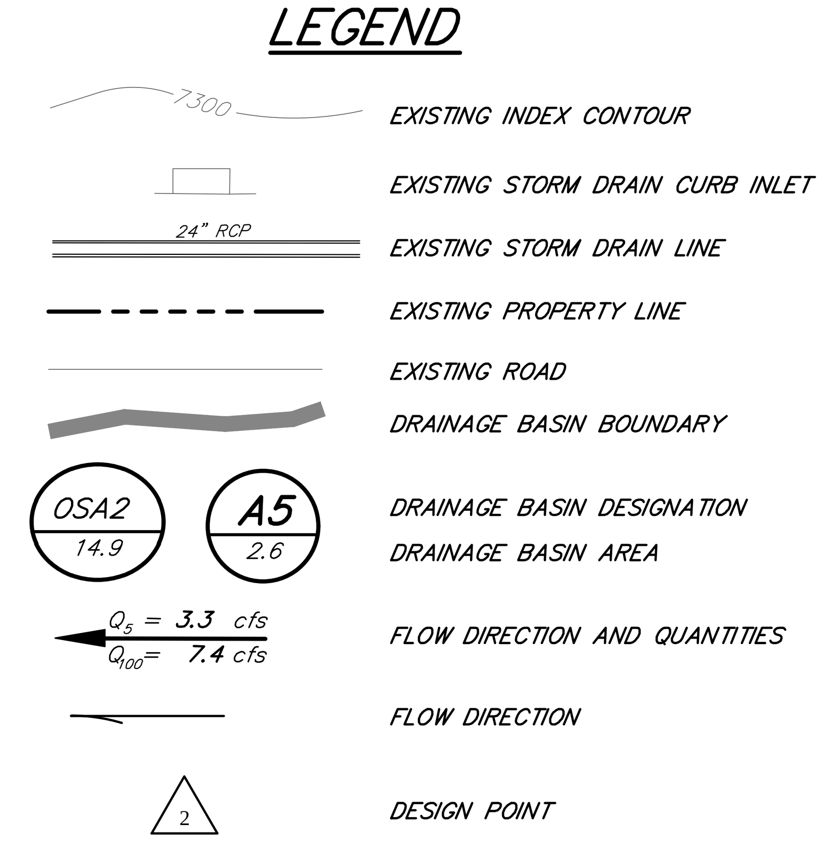
WTD CN = .453 (78) + .547 (69) = 73.1

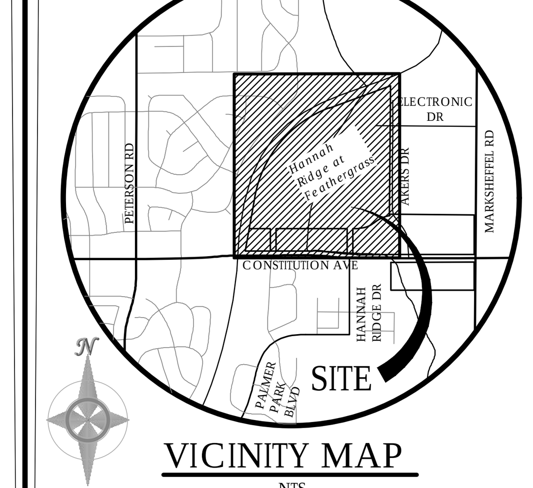


EXISTING SUMMARY RUNOFF TABLE				
BASIN or DESIGN POINT	CONTRIBUTING BASINS	CONTRIBUTING AREA (AC)	5-YR(Q5) RUNOFF (CFS)*	100-YR (Q100) RUNOFF (CFS)
OSA1 (IN)		425	360 *	886 (IN)
1 (OUT)	OSA1	425	351 *	627 (OUT)
OSA2		1.9	2	5
OSA3		0.3	1	2
OSC1		3.4	5	11
A4		38.1	31	71
2	OSA1, OSA2, OSA3, OSC1, A4	468.7	351 *	627
3	OSF1	105	130 *	283
OSF2		4.9	4	9
OSF3		0.5	1	2
A7		30.2	19	45
4	OSA1, OSA2, OSA3, OSC1, A4, OSF1, OSF2, OSF3, F7	137.1	393 *	831
OSB1		0.6	3	5
A9		33.6	19	46
OSA8		16.2	40	78
A16		18.0	12	26
5	OSA8, A16	34.2	50	103
OSA11		3.7	12	21
OSA12		1.7	5	9
6	OSA1, OSA2, OSA3, OSC1, A4, OSF1, OSF2, OSF3, A7, A9, OSB1, OSA8, A16, OSA11, OSA12	650.5	392 *	856

* NOTE: MAIN CHANNEL MINOR STORM FLOW RATES ARE10-YEAR IN ACCORDANCE WITH DRAINAGE BASIN PLANNING STUDY

LEGEND

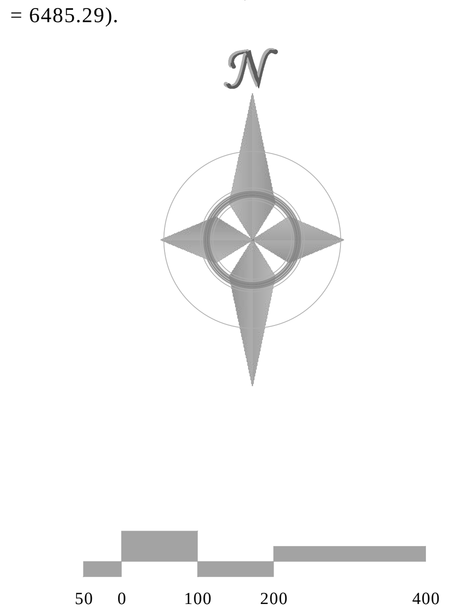




VICINITY MAP
NTS

BENCHMARK

THE BENCHMARK FOR THESE PLANS IS THE TOP OF #4 REBAR, PANEL POINT NO. 1, LOCATED ON THE SOUTH EDGE OF CONSTITUTION AVE AND THE WEST EDGE OF THE ROCK ISLAND TRAIL, 535 FEET WEST OF THE CENTERLINE OF SHAWNEE DR. ELEVATION = 6486.63. (EPC DATUM ELEVATION = 6485.29).



1" = 200' 1:2,400

MVE, INC.
ENGINEERS / SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

Hannah Ridge at Feathergrass

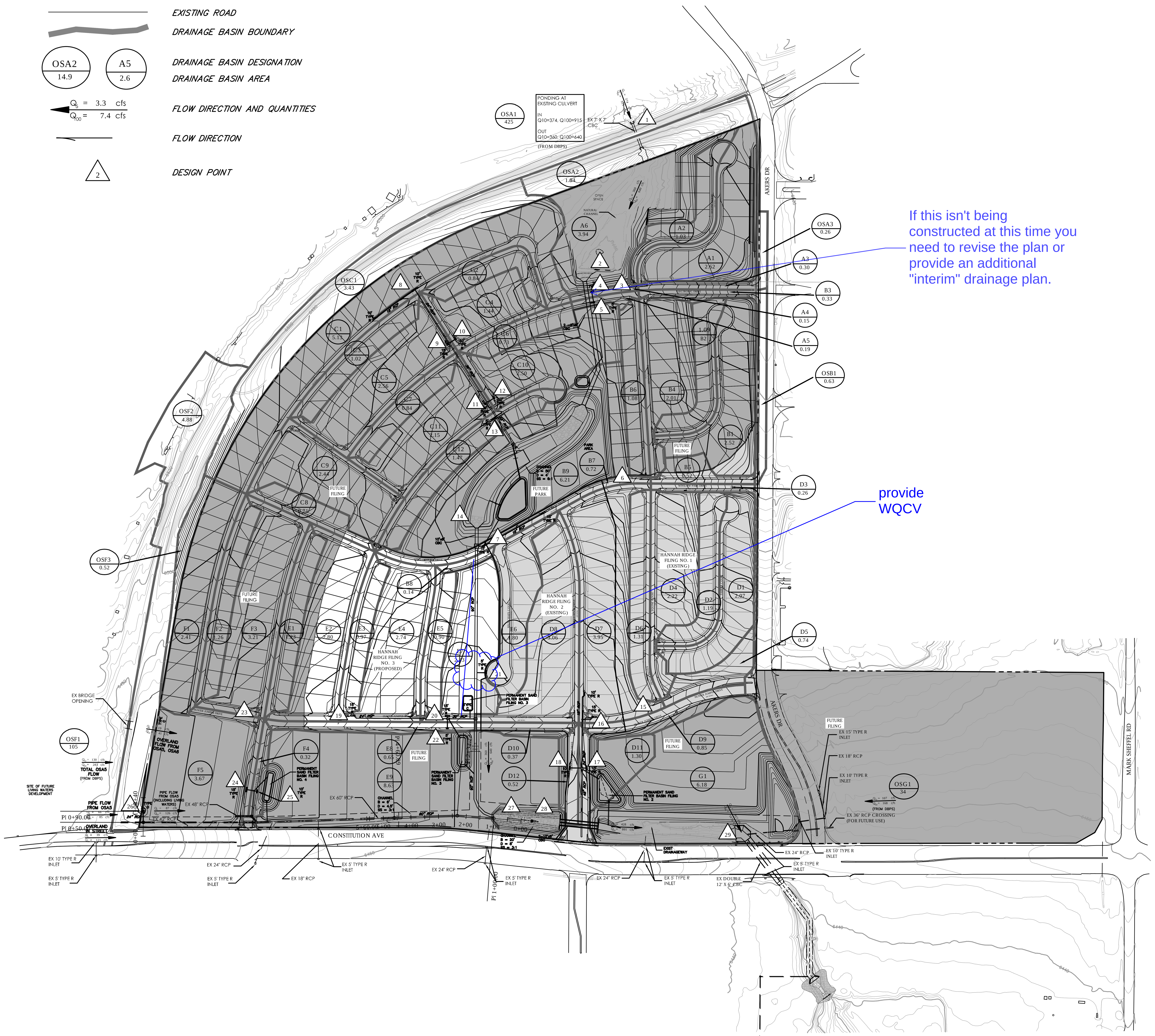
EXISTING DRAINAGE MAP

MVE PROJECT 60970
MVE DRAWING 60970111-F3

April 20, 2017
SHEET 1 OF 1

LEGEND

- EXISTING INDEX CONTOUR
- EXISTING STORM DRAIN CURB INLET
- EXISTING STORM DRAIN LINE
- EXISTING PROPERTY LINE
- EXISTING ROAD
- DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN DESIGNATION (OSA2, A5)
- DRAINAGE BASIN AREA (14.9, 2.6)
- FLOW DIRECTION AND QUANTITIES (Q_5 = 3.3 cfs, Q_{100} = 7.4 cfs)
- FLOW DIRECTION
- DESIGN POINT



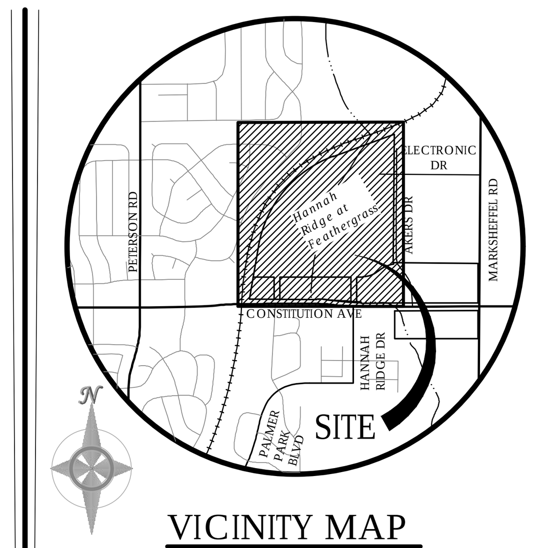
If this isn't being constructed at this time you need to revise the plan or provide an additional "interim" drainage plan.

provide WQCV

BASIN or DESIGN POINT	CONTRIBUTING BASINS	CONTRIBUTING AREA (AC)	5-YR(Q5) RUNOFF (CFS)*	100-YR (Q100) RUNOFF (CFS)	DESCRIPTION
OSA1 (IN)		425	374 *	915 (IN)	
1 (OUT)	OSA1	425	360 *	640 (OUT)	EX 7x7 CBC
2	OSA1, OSA2, A6	430.8	360 *	640 *	12'Wx6'H CBC
3	A1,A2,OSA3,A3	4.2	9.4	18.8	CROSS PAN
4	A1,A2,OSA3,A3,A4	4.4	9.7	19.2	10' TYPE R INLET (SUMP)
5	A5	0.2	0.7	1.3	5' TYPE R INLET (SUMP)
6	OSB1,B1,B2,B3,B4,B5,B6	8.2	19.5	38.5	CROSS PAN
7	OSB1,B1,B2,B3,B4,B5,B6,B7	8.9	20.4	40.1	15' TYPE R (SUMP),15' TYPE R INLETS
8	OSC1,C1	8.6	15.0	31.1	10' TYPE R (SUMP),10' TYPE R INLETS
9	C3,C5	3.6	8.9	17.8	15' TYPE R INLET (SUMP)
10	C2,C4	2.3	5.5	10.9	10' TYPE R INLET (SUMP)
11	C7,C8,C9,C11	6.1	13.4	26.6	15' TYPE R INLET (SUMP)
12	C6,C10	3.2	6.6	14.1	10' TYPE R INLET (SUMP)
13	C12	1.5	3.7	7.4	5' TYPE R INLET (SUMP)
14	OSA1-A6,OSB1-B9, OSC1-C12	476	360 *	640 *	10'Wx6'H CBC & 90" RCP
15	D1,D2,D3,D4,D5,D6	7.8	19.2	38.0	CROSS PAN
16	D1,D2,D3,D4,D5,D6,D7	11.7	26.6	52.8	10' TYPE R & 15' TYPE R INLETS
17	D1-D7,D9,D11	13.9	29.6	59.0	15' TYPE R INLET (SUMP)
18	D8,D10,D12	4.0	8.7	17.1	10' TYPE R INLET (SUMP)
19	E1,E2,E3	5.0	11.9	23.7	15' TYPE R INLET
20	E1,E2,E3,E4,E5,E7	11.0	23.4	48.4	15' TYPE R (SUMP),TYPE C INLETS
21	E6	1.8	4.5	9.0	5' TYPE R INLET (SUMP)
22	E8	0.7	1.8	3.6	5' TYPE R INLET (SUMP)
23	OSF1,F1,F2,F3	7.4	16.2	32.5	CROSS PAN
24	OSF1,F1,F2,F3,F5	11.0	23.4	48.4	15' TYPE R (SUMP),TYPE C INLETS
25	F4	0.3	0.9	1.9	5' TYPE R INLET (SUMP)
26	OSF2	4.9	4.2	9.6	TYPE D INLET (SUMP)
27	OSA1-A6,OSB1-B9, OSC1-C12, E1-E9, OSF1-OSF3, F1-F5	619	428 *	991 *	OPEN CHANNEL
28	OSA1-A6,OSB1-B9, OSC1-C12, E1-E9, OSF1-OSF3, F1-F5, D1-D12	647	428 *	991 *	DBL 10'Wx6'H CBC
29	OSA1-A6,OSB1-B9, OSC1-C12, E1-E9, OSF1-OSF3, F1-F5, D1-D12, G1	685	457 *	1076 *	EXISTING DBL 12'Wx6'H CBC

DEVELOPED SUMMARY RUNOFF TABLE

* NOTE: MAIN CHANNEL MINOR STORM FLOW RATES ARE 10-YEAR IN ACCORDANCE WITH DRAINAGE BASIN PLANNING STUDY



VICINITY MAP
NTS

BENCHMARK

THE BENCHMARK FOR THESE PLANS IS THE TOP OF #4 REBAR, PANEL POINT NO. 1, LOCATED ON THE SOUTH EDGE OF CONSTITUTION AVE AND THE WEST EDGE OF THE ROCK ISLAND TRAIL, 535 FEET WEST OF THE CENTERLINE OF SHAWNEE DR. ELEVATION = 6486.63. (EPC DATUM ELEVATION = 6485.29).

50 0 100 200 400
1" = 200' 1:2,400

MVE INC.
ENGINEERS, SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

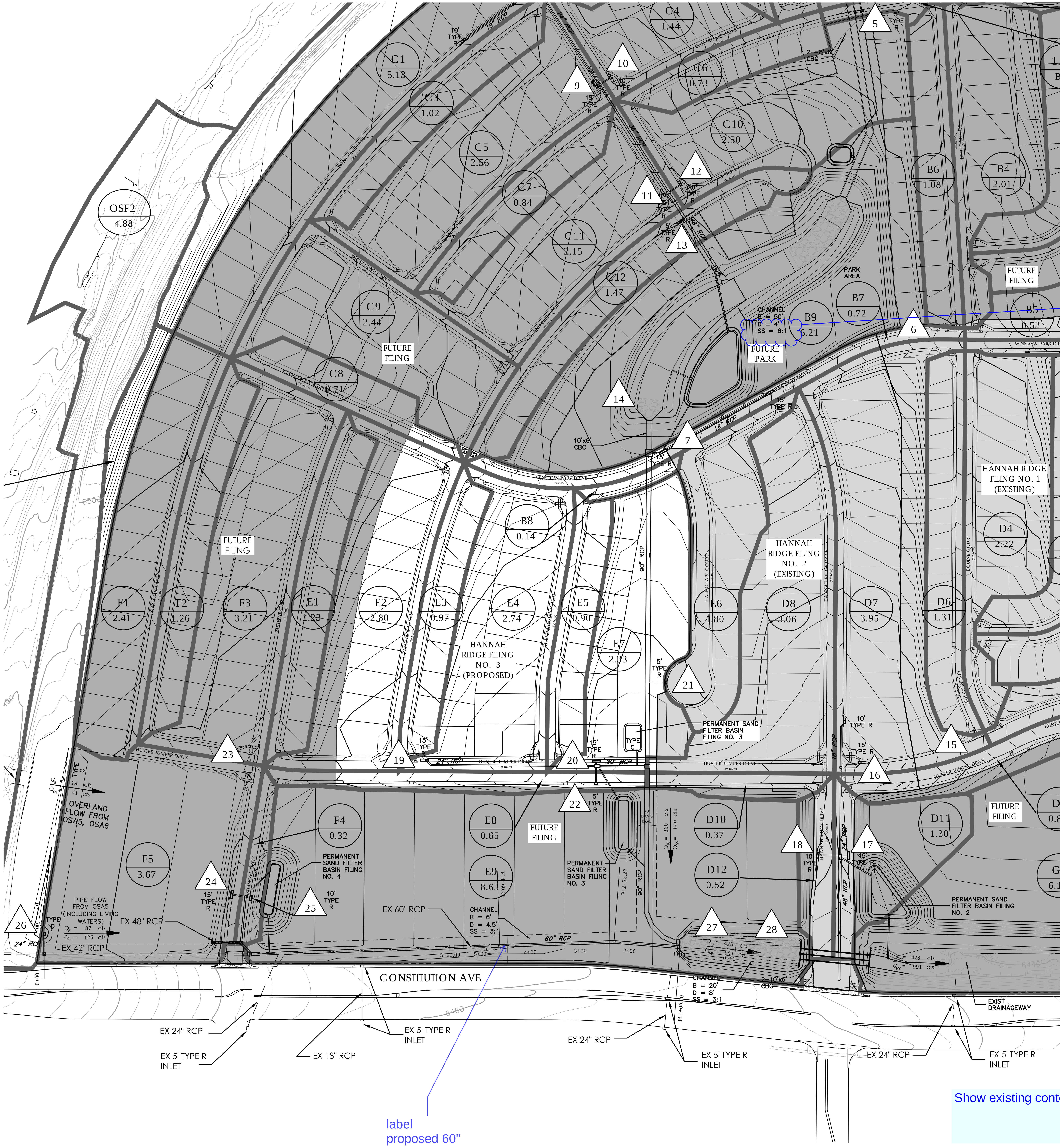
DESIGNED BY
DRAWN BY
CHECKED BY ____ ______________
AS-BUILTS BY
CHECKED BY ____ ______________

Hannah Ridge at Feathergrass

Filing No. 3
DEVELOPED
Drainage Map

MVE PROJECT 60970
MVE DRAWING 60970112-F3

April 20, 2017
SHEET 1 OF 2



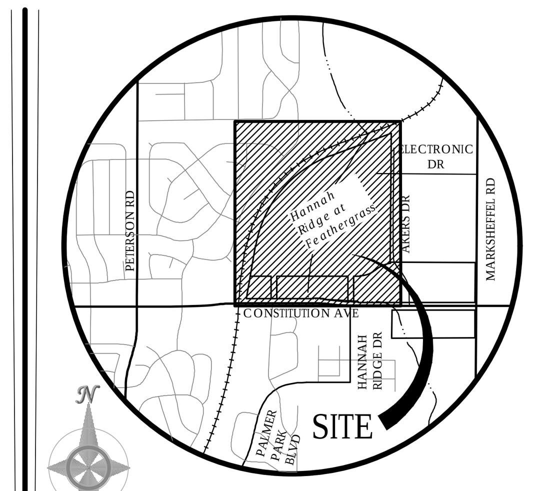
Show existing contours in areas that are not being graded with this subdivision.

LEGEND

- EXISTING INDEX CONTOUR (7300)
- EXISTING STORM DRAIN CURB INLET
- EXISTING STORM DRAIN LINE (24" RCP)
- EXISTING PROPERTY LINE
- EXISTING ROAD
- DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN DESIGNATION / DRAINAGE BASIN AREA (OSA2 14.9; A5 2.6)
- FLOW DIRECTION AND QUANTITIES (Q_5 = 3.3 cfs, Q_{100} = 7.4 cfs)
- FLOW DIRECTION
- DESIGN POINT (2)

DEVELOPED SUMMARY RUNOFF TABLE					
BASIN or DESIGN POINT	CONTRIBUTING BASINS	CONTRIBUTING AREA (AC)	5-YR(Q5) RUNOFF (CFS)*	100-YR (Q100) RUNOFF (CFS)	DESCRIPTION
OSA1 (IN)		425	374 *	915 (IN)	
1 (OUT)	OSA1	425	360 *	640 (OUT)	EX 7x7 CBC
2	OSA1, OSA2, A6	430.8	360 *	640 *	12'Wx6'H CBC
3	A1,A2,OSA3,A3	4.2	9.4	18.8	CROSS PAN
4	A1,A2,OSA3,A3,A4	4.4	9.7	19.2	10' TYPE R INLET (SUMP)
5	A5	0.2	0.7	1.3	5' TYPE R INLET (SUMP)
6	OSB1,B1,B2,B3,B4,B5,B6	8.2	19.5	38.5	CROSS PAN
7	OSB1,B1,B2,B3,B4,B5,B6,B7	8.9	20.4	40.1	15' TYPE R (SUMP),15' TYPE R INLETS
8	OSC1,C1	8.6	15.0	31.1	10' TYPE R (SUMP),10' TYPE R INLETS
9	C3,C5	3.6	8.9	17.8	15' TYPE R INLET (SUMP)
10	C2,C4	2.3	5.5	10.9	10' TYPE R INLET (SUMP)
11	C7,C8,C9,C11	6.1	13.4	26.6	15' TYPE R INLET (SUMP)
12	C6,C10	3.2	6.6	14.1	10' TYPE R INLET (SUMP)
13	C12	1.5	3.7	7.4	5' TYPE R INLET (SUMP)
14	OSA1-A6,OSB1-B9, OSC1-C12	476	360 *	640 *	10'Wx6'H CBC & 90" RCP
15	D1,D2,D3,D4,D5,D6	7.8	19.2	38.0	CROSS PAN
16	D1,D2,D3,D4,D5,D6,D7	11.7	26.6	52.8	10' TYPE R & 15' TYPE R INLETS
17	D1-D7,D9,D11	13.9	29.6	59.0	15' TYPE R INLET (SUMP)
18	D8,D10,D12	4.0	8.7	17.1	10' TYPE R INLET (SUMP)
19	E1,E2,E3	5.0	11.9	23.7	15' TYPE R INLET
20	E1,E2,E3,E4,E5,E7	11.0	23.4	48.4	15' TYPE R (SUMP),TYPE C INLETS
21	E6	1.8	4.5	9.0	5' TYPE R INLET (SUMP)
22	E8	0.7	1.8	3.6	5' TYPE R INLET (SUMP)
23	OSF1,F1,F2,F3	7.4	16.2	32.5	CROSS PAN
24	OSF1,F1,F2,F3,F5	11.0	23.4	48.4	15' TYPE R (SUMP),TYPE C INLETS
25	F4	0.3	0.9	1.9	5' TYPE R INLET (SUMP)
26	OSF2	4.9	4.2	9.6	TYPE D INLET (SUMP)
27	OSA1-A6,OSB1-B9, OSC1-C12, E1-E9, OSF1-OSF3, F1-F5	619	428 *	991 *	OPEN CHANNEL
28	OSA1-A6,OSB1-B9, OSC1-C12, E1-E9, OSF1-OSF3, F1-F5, D1-D12	647	428 *	991 *	DBL 10'Wx6'H CBC
29	OSA1-A6,OSB1-B9, OSC1-C12, E1-E9, OSF1-OSF3, F1-F5, D1-D12, G1	685	457 *	1076 *	EXISTING DBL 12'Wx6'H CBC

* NOTE: MAIN CHANNEL MINOR STORM FLOW RATES ARE 10-YEAR IN ACCORDANCE WITH DRAINAGE BASIN PLANNING STUDY



VICINITY MAP
NTS

BENCHMARK
THE BENCHMARK FOR THESE PLANS IS THE TOP OF #4 REBAR, PANEL POINT NO. 1, LOCATED ON THE SOUTH EDGE OF CONSTITUTION AVE AND THE WEST EDGE OF THE ROCK ISLAND TRAIL, 535 FEET WEST OF THE CENTERLINE OF SHAWNEE DR. ELEVATION = 6486.63. (EPC DATUM ELEVATION = 6485.29).

10 0 50 100 200
1" = 100' 1:1,200

MVE INC.
ENGINEERS, SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

Hannah Ridge at Feathergrass

Filing No. 3
DEVELOPED DRAINAGE MAP

MVE PROJECT 60970
MVE DRAWING 60970112-F3

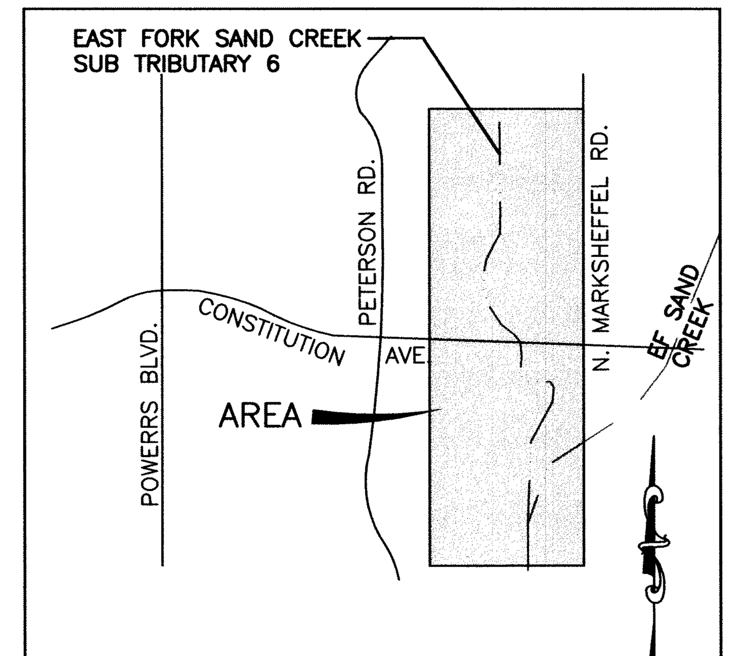
April 20, 2017
SHEET 2 OF 2

SUMMARY OF DISCHARGES

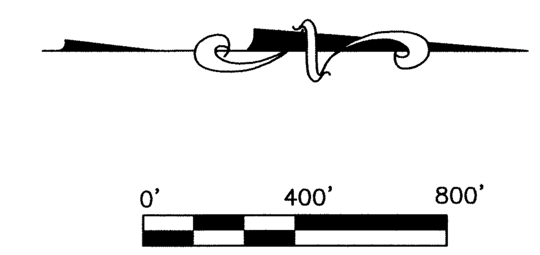
DESIGN POINT LOCATION	DRAINAGE AREA (SM)	Q_{100}/Q_{10} (cfs)
1 AT N, CAREFREE CIR.	0.34	551/255
14 AT RAILROAD GRADE (INFLOW)	0.66	915/374
14 AT RAILROAD GRADE (OUTFLOW)	0.66	640/360
8 AT CONSTITUTION	1.07	1076/457
8A AT CONFLUENCE WITH EF SAND CREEK	1.91	2088/925
9 AT MINEOLA ST.	0.21	267/123
6 AT PALMER PARK BLVD.	1.2	1299/588
7 AT RIVER WALK PARKWAY	1.36	1561/695
10 AT MINEOLA AND RT. 9	0.22	175/110
9 AT MINEOLA AND RT. 9	0.36	3251/174

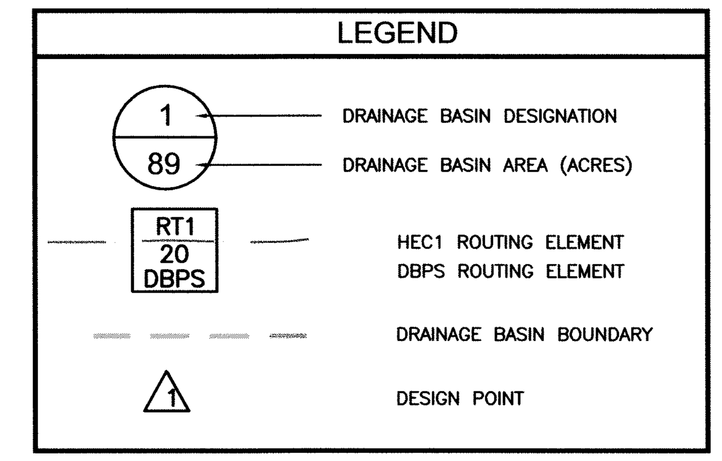
SUMMARY OF ROUTING ELEMENTS

ROUTING ELEMENT	LOCATION	DESCRIPTION
RT-9	DP 9 TO DP 8A	15' BW, 3:1 SS, S = 1.0% RIPRAP CHANNEL
RT-8	DP 7 TO DP 8A	45' BW, 3:1 SS, S = 0.7% RIPRAP CHANNEL
RT-7	DP 6 TO DP 7	45' BW, 3:1 SS, S = 0.7% RIPRAP CHANNEL
RT-6/6A	DP 8 TO D 6	30' BW, 3:1 SS, S = 0.7% RIPRAP CHANNEL
RT-2A	DP 4A TO DP 8	30' BW, 3:1 SS, S = 1.0% RIPRAP CHANNEL
RT-2B	DP 14 TO DP 4A	16' BW, 3:1 SS, S = 0.5% RIPRAP CHANNEL
RT 3 - RT 3A	SB 3 TO DP4A	60" RCP TO 42" RCP
RT-1	DP 1 TO DP14	NATURAL CHANNEL, S = 3.0%
RT-5	SB 5 TO DP1	NATURAL CHANNEL, S = 3.0%

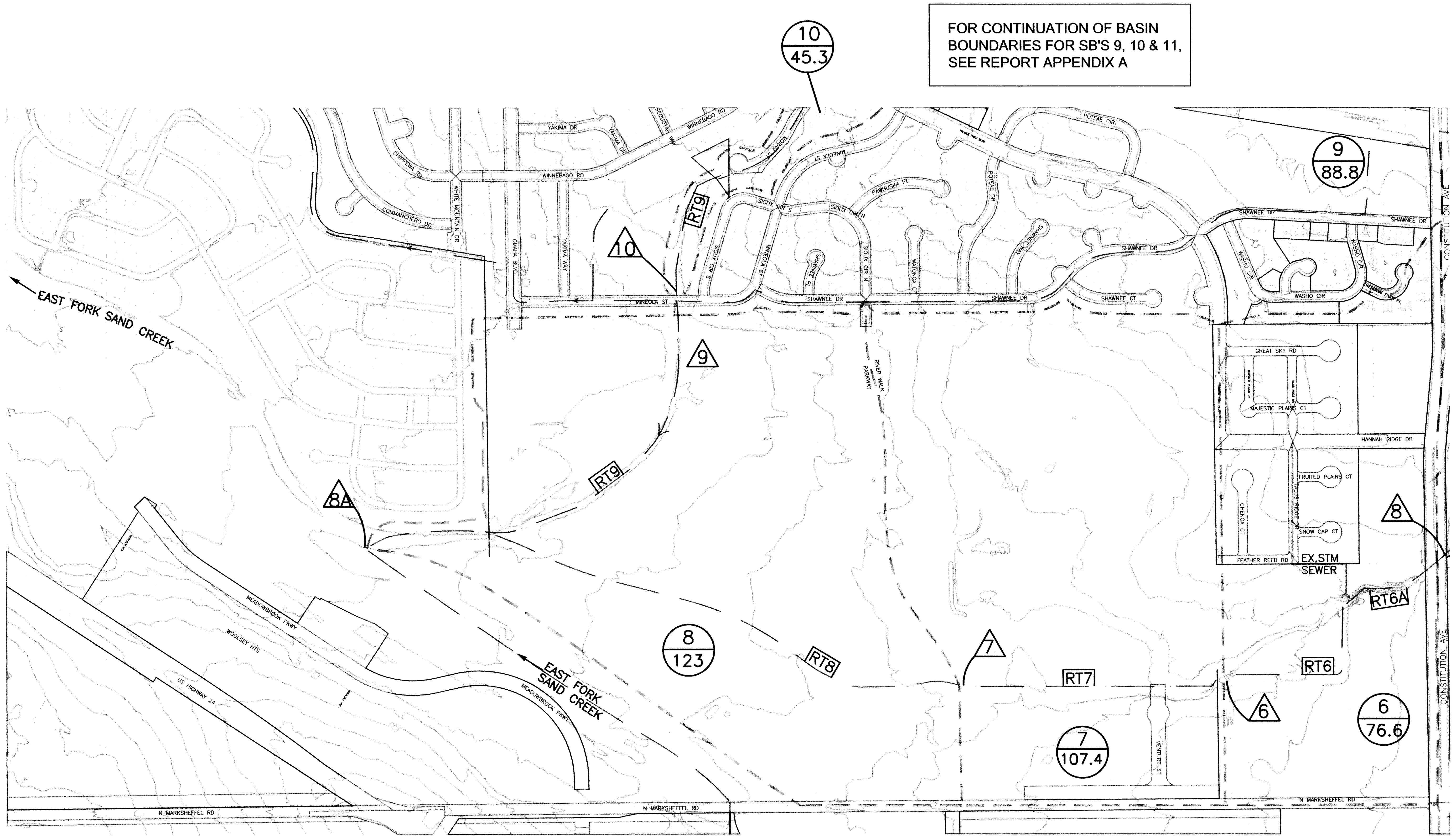


VICINITY MAP
NO SCALE





FOR CONTINUATION OF BASIN BOUNDARIES FOR SB'S 9, 10 & 11, SEE REPORT APPENDIX A



Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado
80904-4208
(719) 630-7342

SAND CREEK DBPS UPDATE
EAST FORK SAND CREEK SUBTRIBUTARY 6
HYDROLOGIC BASIN MAP
EL PASO COUNTY, COLORADO

Project No.:	06040
Date:	AUG 2006
Design:	RNW
Drawn:	MFA
Check:	RNW
Revisions:	

FIG 4.1

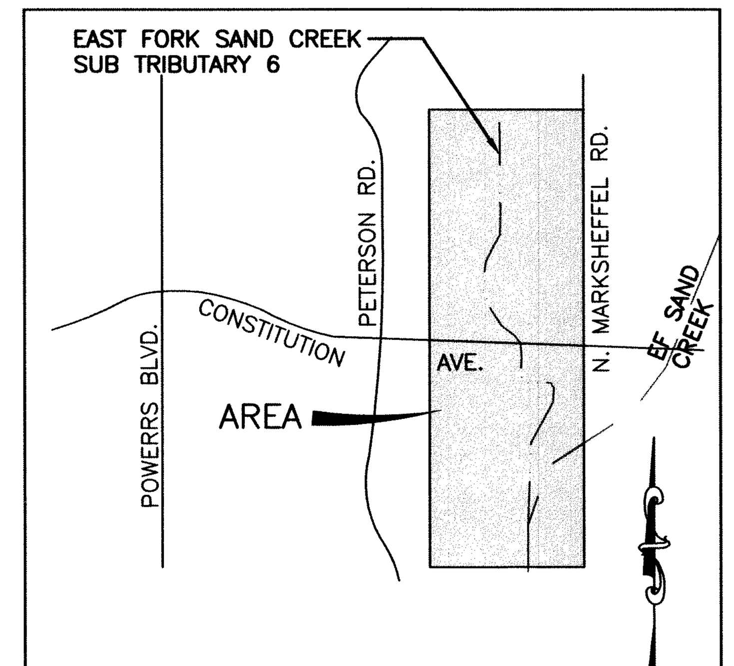
06040 Fig4.1.dwg/Aug 02, 2011
60970

SUMMARY OF DISCHARGES

DESIGN POINT LOCATION	DRAINAGE AREA (SM)	Q_{100}/Q_{10} (cfs)
1 AT N, CAREFREE CIR.	0.34	551/255
14 AT RAILROAD GRADE (INFLOW)	0.66	915/374
14 AT RAILROAD GRADE (OUTFLOW)	0.66	640/360
8 AT CONSTITUTION	1.07	1076/457
8A AT CONFLUENCE WITH EF SAND CREEK	1.91	2088/925

SUMMARY OF ROUTING ELEMENTS

ROUTING ELEMENT	LOCATION	DESCRIPTION
RT-8	DP 7 TO DP 8A	45' BW, 3:1 SS, S = 0.7% RIPRAP CHANNEL
RT-7	DP 6 TO DP 7	45' BW, 3:1 SS, S = 0.7% RIPRAP CHANNEL
RT-6/6A	DP 8 TO D 6	30' BW, 3:1 SS, S = 0.7% RIPRAP CHANNEL
RT-2A	DP 4A TO DP 8	30' BW, 3:1 SS, S = 1.0% RIPRAP CHANNEL
RT-2B	DP 14 TO DP 4A	16' BW, 3:1 SS, S = 0.5% RIPRAP CHANNEL
RT 3 - RT 3A	SB 3 TO DP4A	60" RCP TO 42" RCP
RT-1	DP 1 TO DP14	NATURAL CHANNEL, S = 3.0%
RT-5	SB 5 TO DP1	NATURAL CHANNEL, S = 3.0%

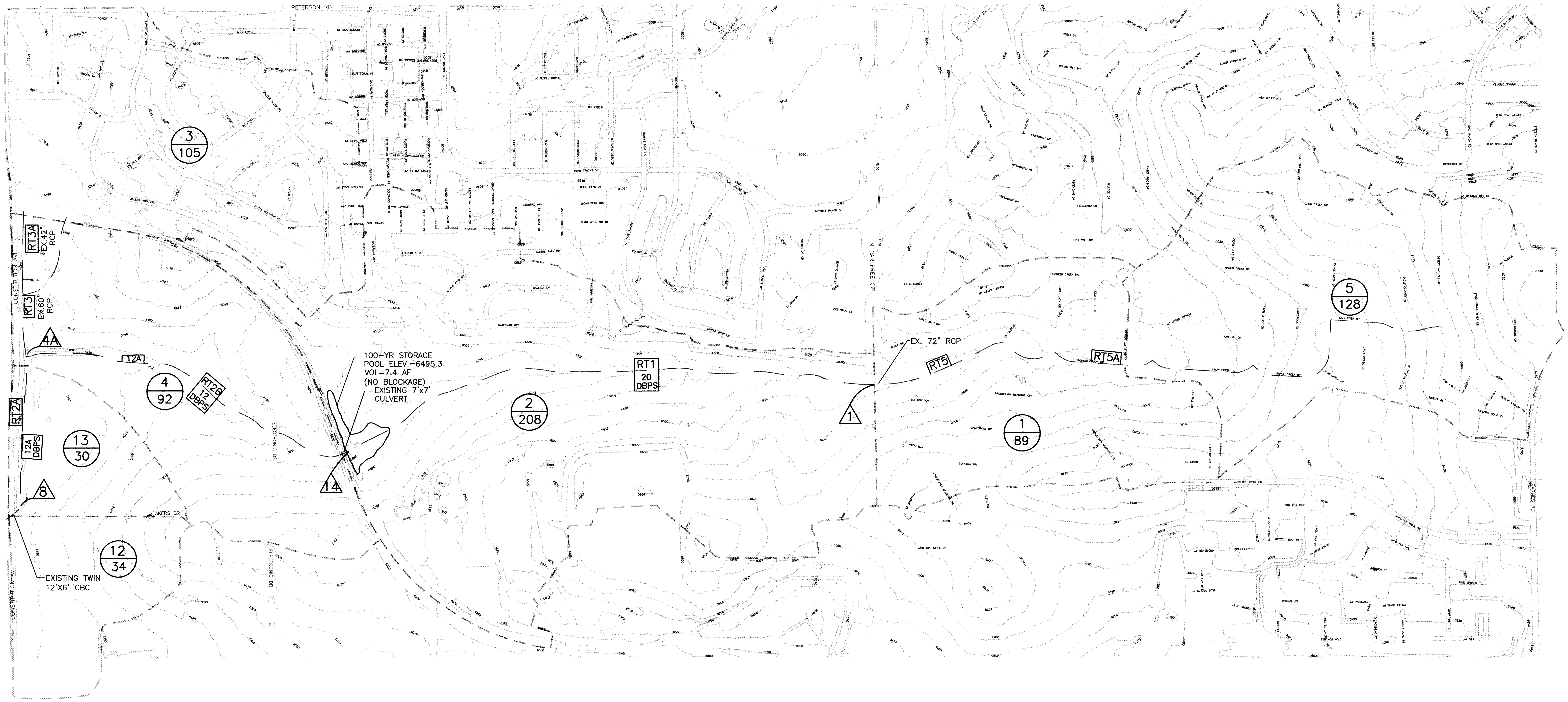


VICINITY MAP
NO SCALE

0' 400' 800'

LEGEND

1	DRAINAGE BASIN DESIGNATION
89	DRAINAGE BASIN AREA (ACRES)
RT1 / 20 / DBPS	HEC1 ROUTING ELEMENT / DBPS ROUTING ELEMENT
— — —	DRAINAGE BASIN BOUNDARY
△	DESIGN POINT



Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado
80904-4208
(719) 630-7342

EAST FORK SAND CREEK
SUBTRIBUTARY HYDROLOGIC ANALYSIS
HYDROLOGIC BASIN MAP
EL PASO COUNTY, COLORADO

Project No.:	06040
Date:	AUG 2006
Design:	RNW
Drawn:	MFA
Check:	RNW
Revisions:	

Fig. 4.2

06040 Fig4.2.dwg/Aug 02, 2011

6970

Markup Summary

AutoCAD SHX Text (646)

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6475

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

30.2

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6495

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6455

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6525

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

360

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

87

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EX. 2-18" CMP

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6525

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OSC1

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

392

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OSB1

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

1.9

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6440

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OSA3

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING PROPERTY LINE

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

T

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6520

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

2

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6450

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OSA1

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OVERLAND IN STREET

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6510

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6475

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DESIGN POINT

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6510

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6495

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

LEGEND

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6460

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

47

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6495

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

SITE OF FUTURE LIVING WATERS DEVELOPEMENT

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

41

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6445

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

FLOW DIRECTION AND QUANTITIES

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

392

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

3.4

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6450

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

856

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6470

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6510

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PONDING AT EXISTING CULVERT IN Q10=360, Q100=886 OUT Q10=351, Q100=627

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

425

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OSF1

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

14.9

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6470

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6470

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

A16

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6475

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6495

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

4.9

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6465

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

BASIN A4 ONLY

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6495

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6485

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

886

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6465

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

33.6

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6470

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

2

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DRAINAGE BASIN AREA

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6450

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6450

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

FROM OSF3

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6475

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6485

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

85

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

126

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

126

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6485

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6495

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6460

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6485

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6530

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

0.3

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

4

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OVERLAND FLOW FROM OSF1, OSF2, OSF3

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TOTAL OSF1 FLOW

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6510

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

1.7

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6470

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

87

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

19

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6455

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

MARKSHEFFEL ROAD

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PIPE FLOW FROM OSF1

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6495

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

A9

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OSA12

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

31

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6455

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

BASIN A7 ONLY

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

3.3

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

283

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

3

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

105

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

38.1

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

26

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6515

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

2.6

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6470

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

627

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

9

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6505

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

71

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6445

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TL

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

19

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OSA2

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

351

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6435

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

BASIN A9 ONLY

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6465

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6470

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OSF2

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

627

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

66

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

627

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6485

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

A7

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

1

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7300

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6510

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6465

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING STORM DRAIN CURB INLET

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6505

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6515

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6450

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TL

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6510

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

A4

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

16.2

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6445

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OSA11

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6460

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7.4

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6530

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6460

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6520

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING STORM DRAIN LINE

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6435

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6525

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

(FROM DBPS)

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

11

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

351

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

BASIN A16 ONLY

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

1

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6455

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OSF3

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6520

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6455

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

104

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

831

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6450

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

3.7

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

12

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6505

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6440

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

26

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

39

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6515

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

78

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6460

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6460

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6470

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6455

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6470

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

856

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

24" RCP

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

393

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TL

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6450

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

18.0

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OSA2

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

2

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

40

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6460

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6460

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

130

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6470

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6460

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6445

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DRAINAGE BASIN DESIGNATION

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6485

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

121

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6505

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PIPE FLOW FROM OSF1 (INCLUDING LIVING WATERS)

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING ROAD

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6510

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

FLOW DIRECTION

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

351

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6455

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6520

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

14

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

20

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

0.5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6465

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6525

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6485

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6530

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

0.6

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6525

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

A5

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

45

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6470

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DRAINAGE BASIN BOUNDARY

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6505

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6440

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EX. 7' X 7' CBC

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6450

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

cfs

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6515

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6450

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

50

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Q

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OSA8

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6440

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TL

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

FROM OSF2

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

=

Subject:
Page Label: 341
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING INDEX CONTOUR

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6510

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TYPE C

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6440

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

T

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TYPE D

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TOTAL OSA5 FLOW

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

2 -8'x6' CBC

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6460

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10'x6' CBC

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PERMANENT SAND FILTER BASIN FILING NO. 2

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

24" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXIST DRAINAGEWAY

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DRAINAGE BASIN AREA

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6450

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

LEGEND

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PIPE FLOW FROM OSA5 (INCLUDING LIVING WATERS)

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PERMANENT SAND FILTER BASIN FILING NO. 3

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PARK AREA

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6480

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DRAINAGE BASIN DESIGNATION

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6520

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

24" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6460

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6440

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

60" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING INDEX CONTOUR

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

24" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING PROPERTY LINE

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

FLOW DIRECTION AND QUANTITIES

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TYPE C

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING STORM DRAIN CURB INLET

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6505

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

(FROM DBPS)

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6440

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6530

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

30" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7300

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

CHANNEL B = 6' D = 4.5' SS = 3:1

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

36" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

18" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

CHANNEL B = 50' D = 4' SS = 6:1

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OVERLAND FLOW FROM OSA5, OSA6

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

CHANNEL B = 20' D = 8' SS = 3:1

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PIPE FLOW FROM OSA5

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

48" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OVERLAND IN STREET

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

2-10'x6' CBC

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

FLOW DIRECTION

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DESIGN POINT

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

18" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

24" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DRAINAGE BASIN BOUNDARY

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

24" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

48" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

90" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

18" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING STORM DRAIN LINE

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6440

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

(FROM DBPS)

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

SITE OF FUTURE LIVING WATERS DEVELOPMENT

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

90" RCP

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DESIGN POINT

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PERMANENT SAND FILTER BASIN FILING NO. 3

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PERMANENT SAND FILTER BASIN FILING NO. 4

Subject:
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING ROAD

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING PROPERTY LINE

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

24" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

30" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PARK AREA

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

FLOW DIRECTION

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PERMANENT SAND FILTER BASIN FILING NO. 2

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

LEGEND

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING STORM DRAIN LINE

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6520

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

2 -8'x6' CBC

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6440

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DESIGN POINT

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

24" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TYPE D

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10'x6' CBC

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OVERLAND FLOW FROM OSA5, OSA6

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DESIGN POINT

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TYPE C

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TYPE C

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

18" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

CHANNEL B = 50' D = 4' SS = 6:1

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DRAINAGE BASIN BOUNDARY

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7300

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXIST DRAINAGEWAY

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

2-10'x6' CBC

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

48" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

90" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PERMANENT SAND FILTER BASIN FILING NO. 4

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PIPE FLOW FROM OSA5 (INCLUDING LIVING WATERS)

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

24" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING STORM DRAIN CURB INLET

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

48" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

36" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

24" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DRAINAGE BASIN AREA

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

CHANNEL B = 20' D = 8' SS = 3:1

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DRAINAGE BASIN DESIGNATION

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING INDEX CONTOUR

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6500

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PERMANENT SAND FILTER BASIN FILING NO. 3

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

5' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

60" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6460

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

18" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

FLOW DIRECTION AND QUANTITIES

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

18" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

CHANNEL B = 6' D = 4.5' SS = 3:1

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6490

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

24" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EXISTING ROAD

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

90" RCP

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

10' TYPE R

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PERMANENT SAND FILTER BASIN FILING NO. 3

Subject:
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

15' TYPE R

dsdrice (80)

Subject: Highlight
Page Label: 11
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 6:27:59 PM
Color:

Subject: Highlight
Page Label: 11
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 6:29:04 PM
Color:

Subject: Callout
Page Label: 11
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:08:23 PM
Color:

Specify and quantify type of maintenance required

Subject: Cloud+
Page Label: 12
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 7:57:01 PM
Color:

and all other necessary improvements down to Sand Creek.

Subject: Callout
Page Label: 12
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 8:03:07 PM
Color:

This is up to the County Engineer to approve. You need to make your case.

Subject: Rectangle
Page Label: 12
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 8:35:18 PM
Color:

southwestern?

Subject: Insert
Page Label: 13
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 8:43:57 PM
Color:

Insert

Subject: Insert
Page Label: 13
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 8:43:46 PM
Color:

Insert

Subject: Callout
Page Label: 13
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 8:44:06 PM
Color:

= provide all cfs values

Subject: Insert
Page Label: 13
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 8:43:24 PM
Color:

Insert

Subject: Insert
Page Label: 13
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 8:43:15 PM
Color:

Insert

Subject: Insert
Page Label: 13
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 8:42:59 PM
Color:

Insert

Subject: Insert
Page Label: 13
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 8:42:46 PM
Color:

Insert

Subject: Insert
Page Label: 13
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 8:42:34 PM
Color:

Insert

Subject: Callout
Page Label: 13
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 8:40:11 PM
Color:

from ___ to ___ cfs...

Subject: Callout
Page Label: 14
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 8:48:19 PM
Color:

(This outdated methodology may have resulted in overestimated historic flows.)

Subject: Cloud+
Page Label: 17
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/13/2017 4:32:45 PM
Color:

would any of this flow enter the site?

Subject: Cloud+
Page Label: 18
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 7:55:58 AM
Color:

If this is not done yet, it needs to be.

Subject: Cloud+
Page Label: 19
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:05:52 AM
Color:

where?

Subject: Cloud+
Page Label: 19
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:04:04 AM
Color:

west?

Subject: Cloud+
Page Label: 19
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:04:45 AM
Color:

"

Subject: Cloud+
Page Label: 19
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:08:13 AM
Color:

where is WQCV?

Subject: Cloud+
Page Label: 19
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 9:57:55 AM
Color:

existing?

Subject: Cloud+
Page Label: 19
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 9:58:58 AM
Color:

recently constructed?

Subject: Transpose Elements
Page Label: 20
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:27:59 AM
Color:

Transpose Elements

Subject: Highlight
Page Label: 20
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:42:39 AM
Color:

- 251

Subject: Cloud+
Page Label: 20
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:26:07 AM
Color:

how and how much?

Subject: Cloud+
Page Label: 20
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:10:23 AM
Color:

Subject: Callout
Page Label: 21
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:50:48 PM
Color:

provide Q5 flows also

Subject: Callout
Page Label: 22
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:40:52 PM
Color:

this subdivision

Subject: Callout
Page Label: 23
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:42:06 PM
Color:

Are these costs inflated?

Subject: Cloud+
Page Label: 24
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:39:11 PM
Color:

At least 0.53 (per ECM Appendix L). This filing is only lots and streets. (54.6 per pond calcs?)

Subject: Callout
Page Label: 53
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:15:55 PM
Color:

Shouldn't this be type A?

Subject: Callout
Page Label: 61
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:20:51 PM
Color:

Highlight or circle the areas of concern with this filing.

Subject: Callout
Page Label: 65
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:21:37 PM
Color:

Highlight or circle the areas of concern with this filing.

Subject: Callout
Page Label: 68
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:21:58 PM
Color:

Highlight or circle the areas of concern with this filing.

Subject: Callout
Page Label: 69
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:22:14 PM
Color:

Highlight or circle the areas of concern with this filing.

Subject: Callout
Page Label: 71
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:22:30 PM
Color:

Highlight or circle the areas of concern with this filing.

Subject: Callout
Page Label: 72
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:22:44 PM
Color:

Highlight or circle the areas of concern with this filing.

Subject: Callout
Page Label: 73
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:22:57 PM
Color:

Highlight or circle the areas of concern with this filing.

Subject: Callout
Page Label: 74
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:23:10 PM
Color:

Highlight or circle the areas of concern with this filing.

Subject: Callout
Page Label: 75
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:25:58 PM
Color:

This is an excessive amount of information. Please provide just the applicable pages (including the first page), summarize in the report and reference MDDP and DBPS.

Subject: Callout
Page Label: 125
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:40:39 PM
Color:

label - what is this?

Subject: Callout
Page Label: 125
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:32:50 PM
Color:

Why is this diameter reduced?

Subject: Callout
Page Label: 125
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:32:22 PM
Color:

Why is this diameter reduced?

Subject: Highlight
Page Label: 128
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 9:43:31 PM
Color:

Subject: Callout
Page Label: 166
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 10:40:54 PM
Color:

please delete blank pages

Subject: Cloud+
Page Label: 175
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 10:45:09 PM
Color:

? What are these stations?

Subject: Cloud+
Page Label: 208
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:02:13 PM
Color:

this seems high for grass

Subject: Callout
Page Label: 209
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:11:21 PM
Color:

Provide for Winslow Park Dr.

Subject: Highlight
Page Label: 211
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:02:59 PM
Color:

Subject: Cloud+
Page Label: 213
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:04:53 PM
Color:

?

Subject: Highlight
Page Label: 214
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:08:44 PM
Color:

Subject: Highlight
Page Label: 218
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:06:48 PM
Color:

Subject: Callout
Page Label: 219
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:12:14 PM
Color:

Missing?

Subject: Callout
Page Label: 223
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:47:50 AM
Color:

why in this report?

Subject: Callout
Page Label: 226
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:22:37 PM
Color:

why isn't this combined with "c" basins?

Subject: Callout
Page Label: 230
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:23:42 PM
Color:

why isn't this combined with "B" basins?

Subject: Callout
Page Label: 233
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:26:01 PM
Color:

why in this report?

Subject: Cloud+
Page Label: 237
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:33:02 PM
Color:

and B8?

Subject: Square
Page Label: 240
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:30:14 PM
Color:

Subject: Cloud+
Page Label: 244
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:35:11 PM
Color:

and E1?

Subject: Cloud+
Page Label: 244
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 11:35:45 PM
Color:

seems low?

Subject: Highlight
Page Label: 255
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 11:06:44 AM
Color:

ignore this

Subject: Text Box
Page Label: 255
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:51:09 AM
Color:

Update with newest versions of spreadsheet for proposed BMPs.

Subject: Text Box
Page Label: 283
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 11:04:48 AM
Color:

is this part of Filing 3?

Subject: Text Box
Page Label: 285
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 11:04:04 AM
Color:

where is this located?

Subject: Text Box
Page Label: 286
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 11:02:37 AM
Color:

show location on plan

Subject: Highlight
Page Label: 289
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:46:35 AM
Color:

ignore this

Subject: Cloud+
Page Label: 289
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:59:28 AM
Color:

?

Subject: Highlight
Page Label: 302
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:58:20 AM
Color:

ignore this

Subject: Highlight
Page Label: 313
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:57:12 AM
Color:

ignore this

Subject: Highlight
Page Label: 325
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:56:26 AM
Color:

ignore this

Subject: Highlight
Page Label: 336
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:56:47 AM
Color:

ignore this

Subject: Callout
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 10:20:33 PM
Color: ■

If this isn't being constructed at this time you need to revise the plan or provide an additional "interim" drainage plan.

Subject: Line
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:23:58 AM
Color: ■

Adjust Filing 3 boundary hatching

Subject: Cloud+
Page Label: 342
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 10:24:21 AM
Color: ■

provide WQCV

Subject: Callout
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 9:07:40 AM
Color: ■

label proposed 60" tie-in

Subject: Text Box
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/14/2017 9:00:01 AM
Color: ■

Show existing contours in areas that are not being graded with this subdivision.

Subject: Cloud+
Page Label: 343
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 6/12/2017 10:38:32 PM
Color: ■

s=___
(this channel grade looks steep)