CORE ENGINEERING GROUP

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Date: September 28, 2017

Project Number: 100.028

MEMORANDUM

To:	El Paso County DSD	**From:**	Richard Schindler
Re:	Drainage Memo for Pioneer Landing at Lorson Ranch Filing No. 3		

The following drainage memorandum is to provide updated drainage/bridge fees for the proposed plat for Pioneer Landing at Lorson Ranch Filing No. 3. The approved drainage report (attached) for Pioneer Landing Filing No. 2 included all the hydrologic, hydraulic, and construction documents necessary for Filing No. 3. All the streets, storm sewer, detention, and water quality necessary for Filing No. 3 was included in the previous drainage report and has been constructed.

Pioneer Landing at Lorson Ranch Filing No. 3 contains 1.836 acres. The 1.836 acres will be assessed Drainage, Bridge and Surety fees. This project has an impervious percentage of 53% which is consistent with the Pioneer Landing 2 drainage report.

The 2017 drainage fees are $15,720, bridge fees are $735 and Drainage Surety fees are $7,000 per impervious acre. The fees are due at plat recordation and are calculated as follows:

Table 1: Drainage/Bridge/Surety Fees

Type of Land Use	Total Area (ac)	Imperviousness	Drainage Fee	Bridge Fee	Surety Fee
Residential	1.836	53%	$15,296	$715	$6,811
		Total	$15,296	$715	$6,811

$16,270

$761

revise

$7,285

Cc: Attachment – Pioneer 2 approved FDR

From: Richard Schindler, P.E.

Reference Resolution No. 17-71, Rec. No. 2017021072

NEW DOC

FINAL DRAINAGE REPORT

PIONEER LANDING
FILING NO. 2

JUNE 30, 2016

Prepared for:

Lorson, LLC
212 N. Wahsatch Ave, Suite 301
Colorado Springs, Colorado 80903
(719) 635-3200

Prepared by:

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Project No. 100.028

CORE
ENGINEERING GROUP

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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 El Paso County for drainage reports and said report is in conformity with the 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.

Richard L. Schindler, P.E. #33997 Date

OWNER'S STATEMENT

I, the Owner, have read and will comply with all the requirements specified in the drainage report and plan.

Lorson, LLC 7/26/16

Business Name Date

By

Jeff Mark, Manager

Title

212 North Wahsatch Avenue, Suite 301

Address

Colorado Springs, Colorado 80903

FLOODPLAIN STATEMENT

To the best of my knowledge and belief, this development is located within a designated floodplain as shown on Flood Insurance Rate Map Panel No. 08041C0953 F, dated March 17, 1997. (See Appendix A, FEMA FIRM Exhibit)

Richard L. Schindler, #33997 Date

EL PASO COUNTY

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volume 1 and 2, and Engineering Criteria Manual, As Amended.

(printed name) 8 Aug 2016

County Engineer/ECM Administrator Date

1.0 INTRODUCTION

Purpose and Scope
The purpose of this Final Drainage Report (FDR) is to provide a detailed analysis of existing and developed runoff from a portion of Lorson Ranch called "Pioneer Landing Filing No. 2". This site is located within an area previously studied by the "Master Development Drainage Plan 1 for Lorson Ranch" (MDDP1) and the "Final Drainage Report for Fontaine Boulevard". This FDR will discuss developed drainage patterns and storm sewer infrastructure necessary to convey developed runoff for Pioneer Landing Filing No. 2 when developed.

Property Location and Description
Pioneer Landing Filing No. 2 is located on approximately 46.34 acres (preliminary plan area) with 170 proposed single family dwelling units of which 12 lots will be platted in a separate plat once the floodplain is removed. The site is in the south half of Section 14, Township 15 South, Range 65 West of the 6th Principal Meridian in the County of El Paso, State of Colorado. The property is bounded to the north by the future Banning Lewis Ranch, on the south by the Future Fontaine Boulevard, on the west by Old Glory Drive/Pioneer Landing Filing No. 1, and on the east by the East Tributary of Jimmy Camp Creek and unplatted land.

See ***Appendix A*** for vicinity map.

According to the current FEMA Flood Insurance Rate Map (FIRM) number 08041CO957 F, this site is located within the 100-year floodplain. The FEMA floodplain for the East Tributary of Jimmy Camp Creek has been revised but it is not removed from this site. A Regional Floodplain Development Permit will be acquired and a LOMR F will need to be submitted and approved by FEMA prior to platting of lots in the eastern portions of this site as a future plan.

See ***Appendix A*** for Fema Flood Map

2.0 DRAINAGE DESIGN CRITERIA

The supporting drainage design and calculations were performed in accordance with the City of Colorado Springs/El Paso County Drainage Criteria Manual DCM dated 1994; and Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs Drainage Criteria Manual dated May 2014.

The storm sewer facilities detailed in this report were designed in accordance with MDDP1 for Lorson Ranch and the Final Drainage Report for Pulte at Lorson Ranch.

The Rational Method as outlined in Section 3.2.7.F of the El Paso County "Engineering Criteria Manual" [5] was used for basins less than 100 acres to determine the rainfall and runoff conditions for the proposed development of the site. The runoff rates for the 5-year initial storm and 100-year major design storm were calculated.

3.0 EXISTING HYDROLOGICAL CONDITIONS

The site is located within the Jimmy Camp Creek Drainage Basin and currently consists of undeveloped areas used for irrigated farming and ranching. The study area is relatively flat and consists of an existing irrigated alfalfa field and has moderate slopes of less than 2%.
Excerpts of the El Paso County Soil Conservation Service (SCS) Soils Survey can be found in the appendix of this report. The following table summarizes the characteristics of the soil type.

Table 3.1: SCS Soils Survey

Soil	Hydro. Group	Shrink/Swell Potential	Permeability	Surface Runoff Potential	Erosion Hazard
Ascalon Sandy Loam (2)	B	Low	Moderately Rapid	Slow	Moderate
Manzanola Clay Loam (52)	C	Moderate to High	Slow	Medium	Moderate
Nunn Clay Loam (59)	C	Moderate to High	Slow	Medium	Moderate

See ***Appendix A*** for SCS Soils Map. Hydrologic Soils Group "C" is assumed for calculating runoff for the existing and proposed basins.

The only offsite runoff entering this site is from a small portion of Pioneer Landing Filing No. 1. The offsite runoff consists of backyards and some street flow from Desert Bloom Way and Silver Stirrup Drive. The offsite runoff has been planned to be accepted into this filing and will be in accordance with the preliminary grading plan and the MDDP1 for this site. The developed conditions will accommodate all offsite drainage entering the site.

Existing runoff flows south and east, overland to the East Tributary of Jimmy Camp Creek. A temporary detention/WQ Pond exists in the SE corner which will be upgraded to accept developed flow from this site.

4.0 DEVELOPED HYDROLOGICAL CONDITIONS

The proposed study area is delineated into numerous major and minor basins to analyze drainage characteristics at critical points within the study area. Storm sewer has been designed for the 5-year storm event while conveying a portion of the 100-year storm along with the street capacity to an outfall point. The onsite developed basins are shown on the "Developed Conditions Drainage Map".
Nearly all this site when developed will discharge runoff via new streets and new storm sewer to Pond B1 and then to the East Tributary. This flow has been broken into the "B2, B3, and "B4" basins. The B2 basins include future road improvements to Fontaine Boulevard, existing drainage from Pioneer Landing Filing No. 1, and from Ponderosa at Lorson Ranch Filing No. 2. The B3 basins are from Pioneer Landing Filing No. 1 and on-site drainage basins that flows southeast in Desert Bloom Way to a cul-de-sac in the

very south end of Desert Bloom Way. All the developed flow in the B3 basins will be collected by inlets and conveyed by storm sewer to Pond B1. The B4 basins are on-site basins in the eastern portion of the site. The B4 basins drain south and runoff is collected by inlets and conveyed by storm sewer to Pond B1. The B5 basins include portions of the very northern and eastern edges of the site will flow overland to the East Tributary of Jimmy Camp Creek.

All calculations for existing and developed runoff have been performed using a Microsoft Excel Spreadsheet and the rational method, and the Hydraflow computer modeling program.

Drainage concepts for each of the basins are briefly discussed as follow:

Basin B2.1
Basin B2.1 includes runoff from existing residential lots in Ponderosa Filing No.2, the west side of Old Glory Drive, and Fontaine Boulevard. This basin also includes the future Fontaine Boulevard as it crosses east over the East Tributary of Jimmy Camp Creek. There are existing storm sewer and swales that direct runoff east to Pond B1. At this time there are no new drainage facilities needed for this basin. The future Fontaine Boulevard will require storm sewer to be constructed to Pond B1 including a new forebay for the storm sewer. Pond B1 is designed for detention and Water Quality of the entire area of this drainage basin including the future Fontaine Boulevard. The total developed flow from this 13.92 acre basin is 37.8 cfs for the 5-year event and 74.4 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B2.3
Basin B2.3 consists of the backyards of residential lots and the east half of Old Glory Drive south of Cattle Baron Way. This basin was studied in the previously approved Final Drainage Report for Fontaine/Old Glory Drive. The runoff flows southerly in existing curb and gutter to an existing sump 12' type "R" inlet located at the NE corner of Fontaine/Old Glory. The storm sewer flows east to an existing swale and then into Pond B1. The total developed flow from this 1.1 acre basin is 3.8 cfs for the 5-year event and 7.5 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin. The size and runoff amounts from this basin are less than the amount allowed in the FDR for Old Glory (5.7cfs-5yr, 11.2cfs-100yr) The existing 12' inlet was designed to accept more runoff than what is proposed in this report and will be adequate to handle the storm runoff.

Basin B2.5
Basin B2.5 consists of the backyards of residential lots and the east half of Old Glory Drive north of Cattle Baron Way. This basin was studied in the previously approved Final Drainage Report for Fontaine/Old Glory Drive. The runoff flows southerly in existing curb and gutter to an existing on-grade 8' type "R" inlet located at the SE corner of Old Glory/Broomtail. Any runoff exceeding the inlet capacity will flowby the inlet southerly to the existing 12' sump inlet described in Basin B2.3. The existing storm sewer flows south and east to an existing swale and then into Pond B1. The total developed flow from this 2.3 acre basin is 6.7 cfs for the 5-year event and 13.4 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin. The runoff amounts from this basin are about 0.9cfs greater than the amount stated in the FDR for Old Glory (6.4cfs-5yr, 12.5cfs-100yr) but the existing 12' sump inlet located just downstream has the capacity to accept more runoff than what is proposed in this report due to a smaller Basin B2.3.

Basin B3.1
Basin B3.1 consists of existing residential lots in Pioneer Landing Filing No. 1 and directs runoff southerly to Desert Bloom Way. The runoff then flows easterly via curb and gutter to a proposed 12' type "R" inlet located at Design Point 1. The storm sewer flows south, then east to an outfall point and into Pond B1. The total developed flow from this 2.12 acre basin is 6.0 cfs for the 5-year event and 12.3 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.2
Basin B3.2 consists of residential lots and Cast Iron Drive and directs runoff southerly to Desert Bloom Way. The runoff then flows easterly via curb and gutter to a proposed 20' type "R" inlet located at Design Point 2. The storm sewer flows south, then east to an outfall point and into Pond B1. The total developed flow from this 1.19 acre basin is 3.5 cfs for the 5-year event and 7.1 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.3
Basin B3.3 consists of residential lots and Cast Iron Drive and directs runoff southerly to Desert Bloom Way. The runoff then flows easterly via curb and gutter to a proposed 20' type "R" inlet located at Design Point 2. The storm sewer flows south, then east to an outfall point and into Pond B1. The total developed flow from this 2.89 acre basin is 6.1 cfs for the 5-year event and 13.0 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.4
Basin B3.4 consists of residential lots and Outfit Drive/Ridgepole Drive and directs runoff southerly to Design Point 3 on Outfit Drive where runoff is collected by an inlet. The storm sewer flows south, then east to an outfall point and into Pond B1. The total developed flow from this 2.43 acre basin is 6.8cfs for the 5-year event and 14.0 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.5
Basin B3.5 consists of residential lots and Outfit Drive/Ridgepole Drive and directs runoff southerly to Desert Bloom Way where runoff is collected by an inlet at Design Pt. 4 on Desert Bloom Way. The storm sewer flows south, then east to an outfall point and into Pond B1. The total developed flow from this 0.92 acre basin is 2.7cfs for the 5-year event and 5.6 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.6
Basin B3.6 consists of residential lots and Outfit Drive and directs runoff southerly to an inlet at Design Pt. 4 on Desert Bloom Way. The storm sewer flows south, then east to an outfall point and into Pond B1. The total developed flow from this 2.19 acre basin is 6.6cfs for the 5-year event and 12.3 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.7
Basin B3.7 consists of residential lots and Popper Drive and directs runoff southerly to Cattle Baron Way where runoff is collected by an inlet at Design Pt. 6 on Cattle Baron Way. The storm sewer flows east, then south, then east to an outfall point and into Pond B1. The total developed flow from this 1.16 acre basin is 3.6cfs for the 5-year event and 7.3 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.8
Basin B3.8 consists of residential lots and Cattle Baron Way and directs runoff southerly to Desert Bloom Way where runoff is collected by an inlet at Design Pt. 7 on Desert Bloom Way. The storm sewer flows south, then east to an outfall point and into Pond B1. The total developed flow from this 0.6 acre basin is 2.2cfs for the 5-year event and 4.6 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.9
Basin B3.9 consists of residential lots and Popper Drive and directs runoff southerly to Cattle Baron Way where runoff is collected by an inlet at Design Pt. 6 on Cattle Baron Way. The storm sewer flows east, then south, then east to an outfall point and into Pond B1. The total developed flow from this 2.11 acre basin is 5.8cfs for the 5-year event and 12.0 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.10
Basin B3.10 consists of residential lots and Fiddle Way and directs runoff southerly and westerly to Cattle Baron Way where runoff is collected by an inlet at Design Pt. 5 on Cattle Baron Way. The storm sewer flows east, then south, then east to an outfall point and into Pond B1. The total developed flow from this 1.22 acre basin is 3.6cfs for the 5-year event and 7.3 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.11
Basin B3.11 consists of residential lots and Cattle Baron Way and directs runoff westerly to Desert Bloom Way where runoff is collected by an inlet at Design Pt. 7 on Desert Bloom Way. The storm sewer flows south, then east to an outfall point and into Pond B1. The total developed flow from this 0.71 acre basin is 2.4cfs for the 5-year event and 4.9cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.12
Basin B3.12 consists of residential lots and Decker Drive and directs runoff westerly to Desert Bloom Way where runoff is collected by a sump inlet at Design Pt. 9 on Desert Bloom Way. The storm sewer flows south, then east to an outfall point and into Pond B1. The total developed flow from this 2.07 acre basin is 5.6cfs for the 5-year event and 11.6cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.13
Basin B3.13 consists of residential lots and Decker Drive and directs runoff westerly to Desert Bloom Way where runoff is collected by a sump inlet at Design Pt. 10 on Desert Bloom Way. The storm sewer flows south, then east to an outfall point and into Pond B1. The total developed flow from this 0.39 acre basin is 1.3cfs for the 5-year event and 2.7cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.14
Basin B3.14 consists of residential lots and Desert Bloom Way and directs runoff southerly to Desert Bloom Way where runoff is collected by a sump inlet at Design Pt. 11 on Desert Bloom Way in the cul-de-sac. The storm sewer flows east into Pond B1. The total developed flow from this 0.49 acre basin is 1.7cfs for the 5-year event and 3.5cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.15
Basin B3.15 consists of residential lots and Desert Bloom Way and directs runoff south in Desert Bloom Way where runoff is collected by a sump inlet at Design Pt. 11 on Desert Bloom Way in the cul-de-sac. The storm sewer flows east into Pond B1. The total developed flow from this 1.84 acre basin is 5.5cfs for the 5-year event and 11.2cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B3.16
Basin B3.16 consists of residential lots and Desert Bloom Way and directs runoff southerly in Desert Bloom Way where runoff is collected by an inlet at Design Pt. 8 on Desert Bloom Way. The storm sewer flows south, then east to an outfall point and into Pond B1. The total developed flow from this 0.93 acre basin is 3.0cfs for the 5-year event and 6.1cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B4.1
Basin B4.1 consists of residential lots and Fiddle Way and directs runoff east in Cattle Baron Way where runoff is collected by an inlet at Design Pt. 12 on Decker Drive. The storm sewer flows south into Pond B1. The total developed flow from this 1.82 acre basin is 5.2cfs for the 5-year event and 10.6cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B4.2
Basin B4.2 consists of residential lots and Fiddle Way and directs runoff east in Cattle Baron Way where runoff is collected by an inlet at Design Pt. 13 on Decker Drive. The storm sewer flows south into Pond B1. The total developed flow from this 1.83 acre basin is 5.1cfs for the 5-year event and 10.5cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B4.3
Basin B4.3 consists of residential lots and Fiddle Way and directs runoff south in Cattle Baron Way where runoff is collected by a sump inlet at Design Pt. 15 on Decker Drive. The storm sewer flows south into Pond B1. The total developed flow from this 1.74 acre basin is 5.1cfs for the 5-year event and 10.4cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B4.4
Basin B4.4 consists of residential lots and Fiddle Way and directs runoff south in Cattle Baron Way where runoff is collected by a sump inlet at Design Pt. 14 on Decker Drive. The storm sewer flows south into Pond B1. The total developed flow from this 1.11 acre basin is 3.1cfs for the 5-year event and 6.3cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B4.5
Basin B4.5 consists of residential lots, open space, and Detention Pond B1. The runoff then flows south directly to Pond B1 where it is detained and treated for water quality. The total developed flow from this 4.02 acre basin is 5.5 cfs for the 5-year event and 13.4 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B5.1
Basin B5.1 consists of residential backyards and open space and directs runoff north to an existing swale on the north line of Pioneer Landing Filing No. 2. The runoff then flows easterly in the swale to the East Tributary of Jimmy Camp Creek. The total developed flow from this 4.09 acre basin is 5.3cfs for the 5-year event and 13.1 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Basin B5.2
Basin B5.2 consists of residential backyards and open space and directs runoff east directly to the East Tributary of Jimmy Camp Creek. The total developed flow from this 8.89 acre basin is 9.1 cfs for the 5-year event and 23.8 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

Overall Basins B3-B4 (for use in Hydraflow Pond Calculations)
This basin is included for determining the total runoff from all of the B3-B4 basins. The runoff coefficient for this overall basin was derived from the cumulative QxA's of all the basins divided by the total area (33.5ac). The resultant hydrograph is used in the hydraulic modeling of Pond B1 to determine pond size and runoff rates as required in the approved MDDP1 for Lorson Ranch. All the B3-B4 basins will be treated for water quality. The total developed flow from this 33.50 acre basin is 66.0 cfs for the 5-year event and 137.0 cfs for the 100-year storm event. See ***Appendix B*** for a flow summary of this basin.

5.0 HYDRAULIC SUMMARY

Hydraulic and pond calculations have been performed using an Excel spreadsheet, and Hydraflow Storm Sewers by Intellisolve.

It is the intent of this site to use the proposed curb/gutter and storm sewer in the streets to convey runoff to a detention/WQ facility where runoff can be treated prior to discharge into the East Tributary of Jimmy Camp Creek. Inlet locations have been indicated on the developed conditions drainage map and have been sized for either the 5-year or 100-year storms based on location. See Appendix C for detailed hydraulic calculations and the storm sewer model.

Design Point 1
Design Point 1 is located at the northwest corner of Cast Iron/Desert Bloom Way.

(5-year storm)
Tributary Basins: B3.1 **Inlet/MH Number:** b3.1
Upstream flowby: 0 cfs **Total Street Flow:** 6.0 cfs
Flow Intercepted: *5.56 cfs* ***Flow Bypassed:*** *0.44 cfs to Inlet b3.2*
Inlet Size: 15-foot, on-grade, Type R
Street Capacity: 6.8 cfs at 0.8% --- street capacity okay

(100-year storm)
Tributary Basins: B3.1 **Inlet/MH Number:** b3.1
Upstream flowby: 0 cfs **Total Street Flow:** 12.3 cfs
Flow Intercepted: 8.88 cfs **Flow Bypassed:** 3.44 cfs to Inlet b3.2
Inlet Size: 15-foot, on-grade, Type R
Street Capacity: 15 cfs at 0.8% --- street capacity (1/2 of street) okay

Comments:

Design Point 2
Design Point 2 is located at the northeast corner of Cast Iron/Desert Bloom Way.

(5-year storm)
Tributary Basins: B3.2 & B3.3 **Inlet/MH Number:** b3.2
Upstream flowby: 0.44 cfs **Total Street Flow:** 3.5cfs (west), 6.1 cfs(north) and 0.44 cfs bypass (west)
Flow Intercepted: 9.22 cfs **Flow Bypassed:** 0.74 cfs to Inlet b3.6
Inlet Size: 20-foot, on-grade, Type R
Street Capacity: 6.8 cfs at 0.8% --- street capacity okay

(100-year storm)
Tributary Basins: B3.2 & B3.3 **Inlet/MH Number:** b3.2
Upstream flowby: 3.44 cfs **Total Street Flow:** 7.1cfs (west),13.0 cfs(north) and 3.44 cfs flowby (west)
Flow Intercepted: 15.9 cfs **Flow Bypassed:** 7.2 cfs to Inlet b3.6
Inlet Size: 20-foot, on-grade, Type R
Street Capacity: 15 cfs at 0.8% --- street capacity (1/2 of street) okay

Design Point 3
Design Point 3 is located on Outfit Drive north of Desert Bloom Way.

(5-year storm)
Tributary Basins: B3.4 **Inlet/MH Number:** b3.4
Upstream flowby: 0 cfs **Total Street Flow:** 6.8cfs
Flow Intercepted: 5.16 cfs **Flow Bypassed:** 1.67 cfs to Inlet b3.6
Inlet Size: 12-foot, on-grade, Type R
Street Capacity: 7.2 cfs at 0.9% --- street capacity okay

(100-year storm)
Tributary Basins: B3.4 **Inlet/MH Number:** b3.4
Upstream flowby: 0 cfs **Total Street Flow:** 14.0 cfs
Flow Intercepted: 7.72 cfs **Flow Bypassed:** 6.28 cfs to Inlet b3.6
Inlet Size: 12-foot, on-grade, Type R
Street Capacity: 16 cfs at 0.9% --- street capacity (1/2 of street) okay

Comments:

Design Point 4
Design Point 4 is located at the northeast corner of Outfit Drive/Desert Bloom Way.

(5-year storm)
Tributary Basins: B3.5 & B3.6 **Inlet/MH Number:** b3.6
Upstream flowby: 2.4 cfs **Total Street Flow:** 2.7 cfs (west), 6.0 cfs(north) and 2.4 cfs flowby (west)
Flow Intercepted: 8.28 cfs **Flow Bypassed:** 2.66 cfs to Inlet b3.11
Inlet Size: 15-foot, on-grade, Type R
Street Capacity: 6.8 cfs at 0.8% --- street capacity okay

(100-year storm)
Tributary Basins: B3.5 & B3.6 **Inlet/MH Number:** b3.6
Upstream flowby: 13.47cfs **Total Street Flow:** 5.6cfs (west),12.3 cfs(north) and 13.47 cfs flowby (west)
Flow Intercepted: 14.88 cfs **Flow Bypassed:** 16.12 cfs to Inlet b3.11
Inlet Size: 15-foot, on-grade, Type R
Street Capacity: 15 cfs at 0.8% ---street capacity exceeded. Runoff will overtop crown and flow to south side of Desert Bloom Way in 100-yr storm. Total street capacity is okay since very little runoff is on south side of Desert Bloom Way (6.1cfs) and there is enough capacity.

Comments:

Design Point 5
Design Point 5 is located at the northeast corner of Popper Drive/Cattle Baron Way

(5-year storm)
Tributary Basins: B3.10 **Inlet/MH Number:** b3.9
Upstream flowby: 0 cfs **Total Street Flow:** 3.6 cfs
Flow Intercepted: 3.05 cfs **Flow Bypassed:** 0.51 cfs to Inlet b3.7
Inlet Size: 10-foot, on-grade, Type R
Street Capacity: 7.6 cfs at 1.0% --- street capacity okay

(100-year storm)
Tributary Basins: B3.10 **Inlet/MH Number:** 3.9
Upstream flowby: 0 cfs **Total Street Flow:** 7.3 cfs
Flow Intercepted: 4.69 cfs **Flow Bypassed:** 2.62 cfs to Inlet b3.7
Inlet Size: 10-foot, on-grade, Type R
Street Capacity: 17 cfs at 1.0% ---street capacity (1/2 of street) okay.

Comments:

Design Point 6
Design Point 6 is located at the northwest corner of Popper Drive/ Cattle Baron Way

(5-year storm)
Tributary Basins: B3.7 & B3.9 **Inlet/MH Number:** b3.7
Upstream flowby: 0.51 cfs **Total Street Flow:** 5.8 cfs (east),3.6 cfs(north) and 0.51 cfs flowby (east)
Flow Intercepted: 8.74 cfs **Flow Bypassed:** 0.82 cfs to Inlet b3.11
Inlet Size: 20-foot, on-grade, Type R
Street Capacity: 7.6 cfs at 1.0% --- street capacity okay

(100-year storm)
Tributary Basins: B3.7 & B3.9 **Inlet/MH Number:** b3.7
Upstream flowby: 2.62 cfs **Total Street Flow:** 12.0cfs(east),7.3 cfs(north) and 2.62 cfs flowby (east)
Flow Intercepted: 14.54 cfs **Flow Bypassed:** 6.65 cfs to Inlet b3.11
Inlet Size: 20-foot, on-grade, Type R
Street Capacity: 17 cfs at 1.0% ---street capacity (1/2 of street) okay.

Comments:

Design Point 7

Design Point 7 is located at the southeast corner of Cattle Baron Way./Desert Bloom Way

(5-year storm)

Tributary Basins: B3.8 & B3.11 **Inlet/MH Number:** b3.11

Upstream flowby: 3.48 cfs **Total Street Flow:** 2.4 cfs (east),1.8 cfs(north) and 3.48 cfs flowby (north)

Flow Intercepted: 7.32 cfs **Flow Bypassed:** 0.11 cfs to Inlet b3.12

Inlet Size: 20-foot, on-grade, Type R

Street Capacity: 6.8 cfs at 0.8% — street capacity okay

(100-year storm)

Tributary Basins: B3.8 & B3.11 **Inlet/MH Number:** b3.11

Upstream flowby: 22.76 cfs **Total Street Flow:** 4.9cfs(east),3.7 cfs(north) and 22.76 cfs flowby (north)

Flow Intercepted: 18.82 cfs **Flow Bypassed:** 12.05 cfs to Inlet b3.12

Inlet Size: 20-foot, on-grade, Type R

Street Capacity: 15 cfs at 0.8% — street capacity exceeded. Runoff will overtop crown and flow to south side of Desert Bloom Way in 100-yr storm. Total street capacity is okay since very little runoff is on south side of Desert Bloom Way (6.1cfs) and there is enough capacity.

Design Point 8

Design Point 8 is located at the southwest corner of Cattle Baron Way/Desert Bloom Way

(5-year storm)

Tributary Basins: B3.16 **Inlet/MH Number:** b3.16

Upstream flowby: 0 cfs **Total Street Flow:** 3.0 cfs

Flow Intercepted: 1.74 cfs **Flow Bypassed:** 1.24 cfs to Inlet b3.14

Inlet Size: 5-foot, on-grade, Type R

Street Capacity: 6.8 cfs at 0.8% --- street capacity okay

(100-year storm)

Tributary Basins: B3.16 **Inlet/MH Number:** b3.16

Upstream flowby: 0 cfs **Total Street Flow:** 6.1 cfs

Flow Intercepted: 2.5 cfs **Flow Bypassed:** 3.62 cfs to Inlet b3.14

Inlet Size: 5-foot, on-grade, Type R

Street Capacity: 15 cfs at 0.8% --- street capacity (1/2 of street) okay. This side of street can accept additional flow from Design Pt. 4 and 7 in the 100-yr storm event.

Comments:

Design Point 9
Design Point 9 is located at the northeast corner of Decker Dr./Desert Bloom Way

(5-year storm)
Tributary Basins: B3.12 **Inlet/MH Number:** b3.12
Upstream flowby: 0 cfs **Total Street Flow:** 5.6 cfs, 0.11cfs flowby
Flow Intercepted: 5.75 cfs **Flow Bypassed:** 0
Inlet Size: 10-foot, sump, Type R
Street Capacity: 6.8 cfs at 0.8% --- street capacity okay

(100-year storm)
Tributary Basins: B3.12 **Inlet/MH Number:** b3.12
Upstream flowby: 12.05 cfs **Total Street Flow:** 11.6 cfs, 12.05cfs flowby
Flow Intercepted: 9.06 cfs **Flow Bypassed:** 14.57 cfs to Inlet b3.13
Inlet Size: 10-foot, sump, Type R
Street Capacity: 15 cfs at 0.8% --- street capacity (1/2 of street) okay.

Comments: flow bypasses sump inlet for 100-yr storm because it overtops the crown and flows to Inlet b3.13.

Design Point 10
Design Point 10 is located at the southeast corner of Decker Dr./Desert Bloom Way

(5-year storm)
Tributary Basins: B3.13 **Inlet/MH Number:** b3.13
Upstream flowby: 0 cfs **Total Street Flow:** 1.3 cfs
Flow Intercepted: 1.33 cfs **Flow Bypassed:** 0
Inlet Size: 5-foot, sump, Type R
Street Capacity: 6.8 cfs at 0.8% --- street capacity okay

(100-year storm)
Tributary Basins: B3.13 **Inlet/MH Number:** b3.13
Upstream flowby: 14.57 cfs **Total Street Flow:** 2.7 cfs, 14.57cfs flowby
Flow Intercepted: 4.72 cfs **Flow Bypassed:** 12.58 cfs to Inlet b3.14
Inlet Size: 5-foot, sump, Type R
Street Capacity: 15 cfs at 0.8% --- street capacity exceeded.

Comments: flow bypasses sump inlet for 100-yr storm because it will flow south around the curb return to the south and flow to Inlet b3.14. If the street capacity is exceeded the additional flow can flow on the west side of Desert Bloom Way since there is only 3.62cfs on that side of the road (see Design Pt. 8)

Design Point 11
Design Point 11 is located at the south end of Desert Bloom Way in the cul-de-sac.

(5-year storm)

Tributary Basins: B3.14 and B3.15		**Inlet/MH Number:**	b3.14
Upstream flowby: 1.24 cfs		**Total Street Flow:**	1.7 cfs(east), 5.5cfs(north) 1.24cfs flowby
Flow Intercepted: 8.16 cfs		**Flow Bypassed:**	0

Inlet Size: 20-foot, sump, Type R
Street Capacity: 6.8 cfs at 0.8% --- street capacity okay

(100-year storm)

Tributary Basins: B3.14 and B3.15		**Inlet/MH Number:**	b3.14
Upstream flowby: 16.20 cfs		**Total Street Flow:**	11.2cfs(east),3.5cfs(north) 16.20cfs flowby (north)
Flow Intercepted: 30.39 cfs		**Flow Bypassed:**	0

Inlet Size: 20-foot, sump, Type R
Street Capacity: 15.4 cfs at 0.8% --- street capacity (1/2 of street) okay.

Comments: Overflow swale designed at this point. The total flow in the pipe at this design point is 48cfs and 107cfs in the 5/100-yr storm. The swale is designed with a capacity of 120cfs and is located in a tract of land between two houses.

Design Point 12
Design Point 12 is located at the northwest corner of Cattle Baron Way /Decker Drive.

(5-year storm)

Tributary Basins: B4.1		**Inlet/MH Number:**	b4.1
Upstream flowby: 0 cfs		**Total Street Flow:**	5.2 cfs
Flow Intercepted: 2.18 cfs		**Flow Bypassed:**	2.97 cfs to Inlet b4.2

Inlet Size: 5-foot, on-grade, Type R
Street Capacity: 7.6 cfs at 1.0% --- street capacity okay

(100-year storm)

Tributary Basins: B4.1		**Inlet/MH Number:**	b4.1
Upstream flowby: 0 cfs		**Total Street Flow:**	10.6 cfs
Flow Intercepted: 3.09 cfs		**Flow Bypassed:**	7.48 cfs to Inlet b4.2

Inlet Size: 5-foot, on-grade, Type R
Street Capacity: 17 cfs at 1.0% --- street capacity (1/2 of street) okay.

Comments:

Design Point 13
Design Point 13 is located at the southwest corner of Cattle Baron Way /Decker Drive.

(5-year storm)

Tributary Basins: B4.2		**Inlet/MH Number:**	b4.2
Upstream flowby: 2.97 cfs		**Total Street Flow:**	5.1 cfs (east), 2.97cfs Flowby (north)
Flow Intercepted: 4.93 cfs		**Flow Bypassed:**	3.16 cfs to Inlet b4.4

Inlet Size: 10-foot, on-grade, Type R
Street Capacity: 7.6 cfs at 1.0% --- street capacity okay

(100-year storm)

Tributary Basins: B4.2		**Inlet/MH Number:**	b4.2
Upstream flowby: 7.48 cfs		**Total Street Flow:**	10.5 cfs (east), 7.48cfs Flowby (north)
Flow Intercepted: 7.49 cfs		**Flow Bypassed:**	10.5 cfs to Inlet b4.4

Inlet Size: 10-foot, on-grade, Type R
Street Capacity: 17 cfs at 1.0% --- street capacity (1/2 of street) okay.

Comments:

Design Point 14
Design Point 14 is located on the north side of Decker Drive at a low point near the East Tributary of JCC.

(5-year storm)

Tributary Basins: B4.4		**Inlet/MH Number:**	b4.4
Upstream flowby: 3.16 cfs		**Total Street Flow:**	3.1cfs, 3.16cfs Flowby (north)
Flow Intercepted: 6.22cfs		**Flow Bypassed:**	0

Inlet Size: 10-foot, sump, Type R
Street Capacity: 7.6 cfs at 1.0% --- street capacity okay

(100-year storm)

Tributary Basins: B4.4		**Inlet/MH Number:**	b4.4
Upstream flowby: 10.5 cfs		**Total Street Flow:**	6.3 cfs, 10.5cfs Flowby (north)
Flow Intercepted: 16.78 cfs		**Flow Bypassed:**	0

Inlet Size: 10-foot, sump, Type R
Street Capacity: 17 cfs at 1.0% --- street capacity (1/2 of street) okay.

Comments:

Design Point 15

Design Point 15 is located on the south side of Decker Drive at a low point near the East Tributary of JCC.

(5-year storm)

Tributary Basins: B4.3 **Inlet/MH Number:** b4.3
Upstream flowby: 0 **Total Street Flow:** 5.1 cfs
Flow Intercepted: 5.1 cfs **Flow Bypassed:** 0
Inlet Size: 10-foot, sump, Type R
Street Capacity: 7.6 cfs at 1.0% --- street capacity okay

(100-year storm)

Tributary Basins: B4.3 **Inlet/MH Number:** b4.3
Upstream flowby: 0 **Total Street Flow:** 10.4 cfs
Flow Intercepted: *10.4 cfs* ***Flow Bypassed:*** *0*
Inlet Size: 10-foot, sump, Type R
Street Capacity: 17 cfs at 1.0% --- street capacity (1/2 of street) okay.

Comments: The total flow in the pipe at this design point is 16cfs and 34cfs in the 5/100-yr storm.

Design Point 16

Design Point 16 is the total flow into Pond B1 before it is detained and treated for water quality. This includes all the B2 basins, B3 basins, and B4 basins. The detention pond is sized to detain both the 5-year and 100-year storm events and includes water quality treatment for all the B2, B3, and B4 basins. This flow has been modeled separately in hydraflow and will be routed through the pond to achieve the required release rates. See pond calculations for pond details. The total flow at this design point is 99cfs in the 5-year storm and 201cfs for the 100-year storm event

Design Point 17

Design Point 17 is the total flow out of Pond B1 as it is discharged into the East Tributary of Jimmy Camp Creek. The hydrograph from Design Point 16 is routed through the proposed Pond B1 and the resultant outflow is 4.0 cfs in the 5-year storm and 9.0 cfs in the 100-year storm event. The target outflow rate from the approved MDDP1 for Lorson Ranch shows the required rates should be 13cfs (5-yr) and 65cfs (100-year). The pond is oversized because Lorson Ranch constructed the majority of it several years ago as part of Ponderosa Filing No. 2 and the outlet pipe elevation had to drain and daylight into the East Tributary before reconstruction of the East Tributary occurred. This resulted in

a larger surface area and shallow depths to achieve the required volume. Since reconstruction of the East Tributary, the outlet pipe can now be lowered several feet increasing the volume significantly using the same surface area at the top.

Basin B5.2 has been allowed to drain east to the East Tributary without detention and if you add these flows to the pond outflow the total flow in the East Tributary would be (9.8cfs+4cfs) = 13.8 cfs in the 5-year and (24.5cfs+9cfs) = 33.5 cfs in the 100-year storm event.

6.0 COMPLIANCE WITH ADJACENT DRAINAGE REPORTS

The only drainage report that pertains to this development is the approved MDDP1 for Lorson Ranch. The following is a brief summary of the MDDP1 and how we are in compliance with it.

MDDP1 for Lorson Ranch, Dated October 26, 2006 by Pentacor Engineering LLC– MDDP1 studied the entire area that comprises Pioneer Landing Filing No. 2. There are two discharge points for runoff in this area.

1. The first discharge point is on the north side of Lorson Ranch where a diversion swale diverts offsite flows (Basin OS-3) from the north (Banning Lewis Ranch) directly to the East Tributary before they can enter Lorson Ranch. The swale also accepts some runoff from Lorson Ranch, Basin OS-5, was a 2.65ac basin and generated 2.6cfs and 7.0 cfs in the 5/100-yr storm events. The proposed development of Pioneer Landing Filing No. 2 increases this amount to 5.3cfs and 13.1cfs in the 5/100-yr storm events (Basin B5.1) but the increase is offset by a reduction of flow from the proposed Pond B1.
2. The second discharge point is from Pond B1. The pond tributary areas from the MDDP1 and the proposed Pioneer Landing Filing No. 2 are the same. The target outflow rate from the approved MDDP1 for Lorson Ranch shows the required pond outflow rates should be 13cfs (5-yr) and 65cfs (100-year). The proposed outflow rates are 4.0 cfs in the 5-year storm and 9.0 cfs in the 100-year storm event in the Pioneer Landing Filing No. 2 development. The pond outflow requirements are met.

Pioneer Landing is in compliance with the MDDP1.

7.0 DRAINAGE AND BRIDGE FEES

Pioneer Landing Filing No.2 is located within the Jimmy Camp Creek drainage basin which is currently a fee basin in El Paso County. Current El Paso County regulations require drainage and bridge fees to be paid for platting of land. Lorson Ranch Metro District has negotiated a development agreement with El Paso County which defines major drainage infrastructure to be constructed as part of the district.

Lorson Ranch Metro District will compile and submit to the county on a yearly basis the Drainage and bridge fees for the approved plats, and shall show all credits they have received for the same yearly time frame.

Pioneer Landing Filing No.2 Final Plat contains 46.34 acres. Lots with the future Filing No. 3 (Tracts G, H, & K) totaling 1.84 acres have been removed from fee calculations and will be paid when Filing No. 3 is platted. The remaining 44.5 acres will be assessed Drainage, Bridge and Surety fees. This project has a percent impervious of 53%, this is based on 0.138 acre lots obtained from the "Addendum; Revised Drainage Basin Fees Based on Impervious Area". The 2015 drainage fees are $15,720, bridge fees are $735 and Drainage Surety fees are $7,000 per impervious acre. The fees are calculated as follows:

Table 1; Drainage/Bridge Fees

Type of Land Use	Total Area (ac)	Imperviousness	Drainage Fee	Bridge Fee	Surety Fee
Residential	44.5	53%	$370,756	$17,335	$165,095
		Total	$370,756	$17,335	$165,095

Construction costs of on-site storm sewer are not reimbursable.

8.0 DETENTION AND WATER QUALITY POND

According to the MDDP1 Lorson Ranch is required to limit developed discharge to near historic conditions for this study area and includes permanent detention facilities. The proposed Pond B1 meets the MDDP1 requirements and will discharge east to the East Tributary of Jimmy Camp Creek.

Pond B1 exists today but was constructed several years ago (with Ponderosa Filing No. 2) with a temporary outlet structure that discharged into the East Tributary. The existing pond and outlet structure have not been sized for the developed conditions of Pioneer Landing Filing No. 2 and the reconstructed conditions of the East Tributary. For example, the temporary outlet pipe was constructed to discharge at the existing elevation of the creek. The East Tributary is now reconstructed and the outlet pipe can be lowered thus increasing the volume of the pond. Both the volume for detention and for water quality must be increased to meet the developed conditions of Pioneer Landing Filing No. 2 thus requiring reconstruction of a small portion of Pond B1. New El Paso County regulations require that the 100-year volume of the pond must meet Full Spectrum Analysis size. The 100-year full spectrum size is 5.75ac-ft and the design volume is 6.15 ac-ft.

Pond B1 reconstruction includes a new access road to the bottom on the north side, lowering the bottom around 3 feet, new permanent outlet structure, new overflow wier, and new forebays at the two new storm sewer locations for water quality. The upper elevations of the pond will remain the same as well as the swale on the south side. The south swale will not be removed until Fontaine Boulevard is constructed over the East Tributary at which time new storm sewer will replace the swale.

The Pond B1 calculations have been included in the appendix of this report. Pond B1 is an extended detention basin and a dual stage outlet structure for detention (5/100yr) and includes a water quality plate. The outlet structure of the pond consists of a CDOT Type C inlet (riser) connecting to a 24" RCP outlet pipe.

Water Quality

In the appendix of this report is a map of the area to be treated for water quality. The design area includes a portion from Ponderosa Filing No. 1, a portion of Pioneer Landing Filing No. 1, nearly all of Pioneer Landing Filing No. 2, and the future Fontaine Boulevard over the East Tributary as shown on the map. Basin B5.1 flows north to an existing swale where the backyards and swale will remove sediment/pollutants from the runoff. Basin B5.2 consists of open space and backyards and drains overland to the East Tributary. The grass backyards and the buffer from the creek will remove sediment and pollutants from the runoff. All other areas will drain to Pond B1 for treatment of water quality.

Table 1: Water Quality Pond Summary (Pond B1)

Pond	Tributary Area	WQCV Req.	WQCV Provided	WSEL
Pond B1	51.24 ac	1.3 ac-ft	1.6 ac-ft	5708.50

Table 2: Detention Pond Data (Pond B1 – 5yr)

Pond (5 yr.)	Incoming Flow	Pond Discharge	WSEL	Storage (ac-ft)	Water Quality
Pond B1	99 cfs	4.0 cfs	5710.83	3.9	yes

Table 3: Detention Pond Data (Pond B1– 100yr)

Pond (100 yr.)	Incoming Flow	Pond Discharge	WSEL	Storage (ac-ft)	Water Quality
Pond B1	201 cfs	9.0 cfs	5712.71	6.15	yes

Based on the above tables of design flows from Pond B1, the release rates are less than the amounts of 13cfs/65cfs in the 5/100yr storms per the approved MDDP1 for Lorson Ranch and meet full spectrum pond sizing.

9.0 FEMA 100-YEAR FLOODPLAIN

Core Engineering has submitted a LOMR to FEMA in June, 2013 which calculated and depicted the new 100-year floodplain. The LOMR is approved and is now effective. For the purposes of this drainage report, we are designing all houses and infrastructure to be above the calculated/FEMA 100-year floodplain. The revised floodplain elevations and limits will be shown on the drainage maps as well as the existing old floodplain limits as depicted on the old FIRM map.

Portions of this site do fall within the 100-year floodplain limits. Since final plats cannot include lots located within the floodplain, the plat will be split into two phases. The west side will be phase 1 and the east side (containing floodplain) will be in phase 2. This will allow the developer to plat phase 1 (contains no floodplain). In conjunction with phase 1, the developer will secure a regional floodplain permit, work within FEMA regulations, and grade both phase 1 and 2 via a Pre-Development Site Grading Plan. This will raise the ground elevations in Phase 2 above the 100-year flood elevations. After the Pre-Development Grading is complete, a LOMR-F will be submitted to FEMA for Phase 2

effectively removing phase 2 from the floodplain and allowing platting to proceed in Phase 2 at a later date.

10.0 ARMORING OF THE EAST TRIBUTARY OF JIMMY CAMP CREEK

In 2013 the East Tributary of Jimmy Camp Creek was realigned and lowered to a point just north of the future Fontaine Boulevard. At this point, a drop structure was constructed from the lowered creek bed up to the existing stream bed. From this point, upstream, north to the northern property line of Lorson Ranch, the creek was left in its natural state since it appeared to be stable.

There are three distinct sections of the East Tributary that will be addressed in Pioneer Landing Filing 2.

Section 1: This section is next to Pond B1. The existing grade control/drop structure within the East Tributary was not armored during the East Tributary Reconstruction and will be completed. This will protect Pond B1 and the upstream creek bed. The armoring shown in the East Tributary Reconstruction plans previously approved by El Paso County can be used for construction.

Section 2: Selective armoring of the creekbanks upstream of the last drop structure will be necessary. Lorson Ranch will evaluate recommendations for the East Tributary shown in the Kiowa Engineering DBPS for the East Tributary and submit construction plans.

Section 3: Erosion of the backlots next to the East Tributary. The lots adjacent to the East Tributary have been raised up from existing elevations and slope down to existing starting at the rear property line at a 5:1 slope. It is recommended that the 5:1 slope on backlot line of lots adjacent to the East Tributary be protected with Coconut Erosion Control Blankets to prevent erosion since the 100-year flood elevation is located on this slope. Velocities on the overbanks in this area range from 1fps to 6fps which is within the allowable velocity for the ECB. See drainage map for locations.

11.0 CONCLUSIONS

This drainage report has been prepared in accordance with the City of Colorado Springs/El Paso County Drainage Criteria Manual. The proposed development and drainage infrastructure will not cause adverse impacts to adjacent properties or properties located downstream. Several key aspects of the development discussed above are summarized as follows:

- Developed runoff will be conveyed via curb/gutter and storm sewer facilities
- Detention for this filing is provided in Pond B1
- Water Quality for this filing is provided in Pond B1

All storm sewer is located within public drainage easements or public ROW and will be maintained by El Paso County. The Lorson Ranch Metropolitan District will maintain Detention Pond B1.

12.0 REFERENCES

1. City of Colorado Springs/El Paso County Drainage Criteria Manual DCM dated 1994 and Chapter 6 and Section 3.2.1 Chapter 13 of the City of Colorado Springs Drainage Criteria Manual dated May 2014.
2. Soil Survey of El Paso County Area, Colorado by USDA, SCS
3. City of Colorado Springs "Drainage Criteria Manual, Volume 2
4. El Paso County "Engineering Criteria Manual"
5. MDDP1 for Lorson Ranch, Dated October 26, 2006 by Pentacor Engineering
6. Final Drainage Report for Fontaine Boulevard, Old Glory Drive, and Marksheffel Road Phase 1 Improvements, Dated February 6, 2006, Revised September 7, 2006, by Pentacor Engineering.

APPENDIX A – VICINTIY MAP, SOILS MAP, FEMA MAP

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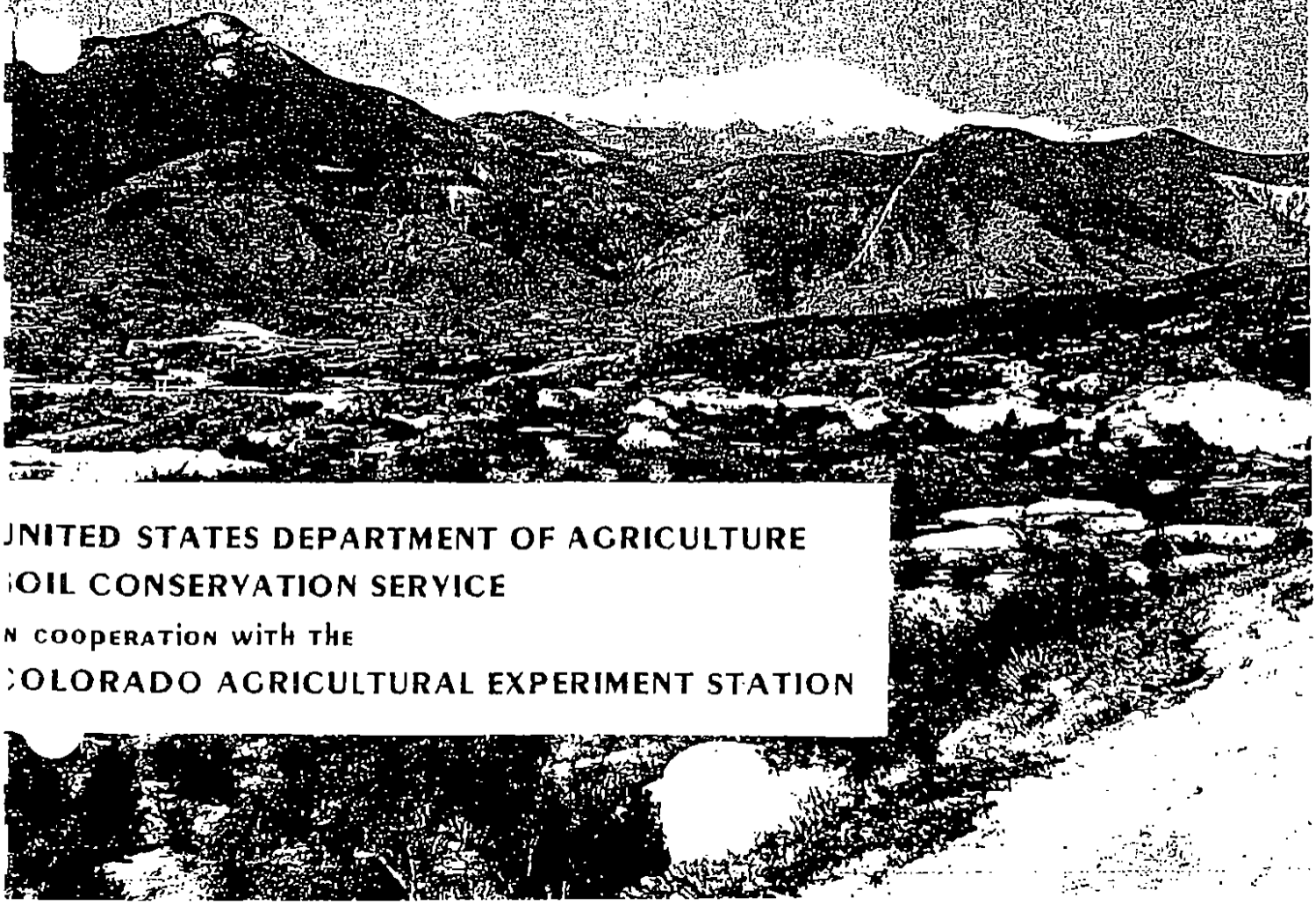
PIONEER LANDING FILING NO. 2
VICINITY MAP

SCALE:	DATE:	FIGURE NO.
NTS	AUGUST, 2014	--

SOIL SURVEY OF

EL PASO COUNTY AREA, COLORADO



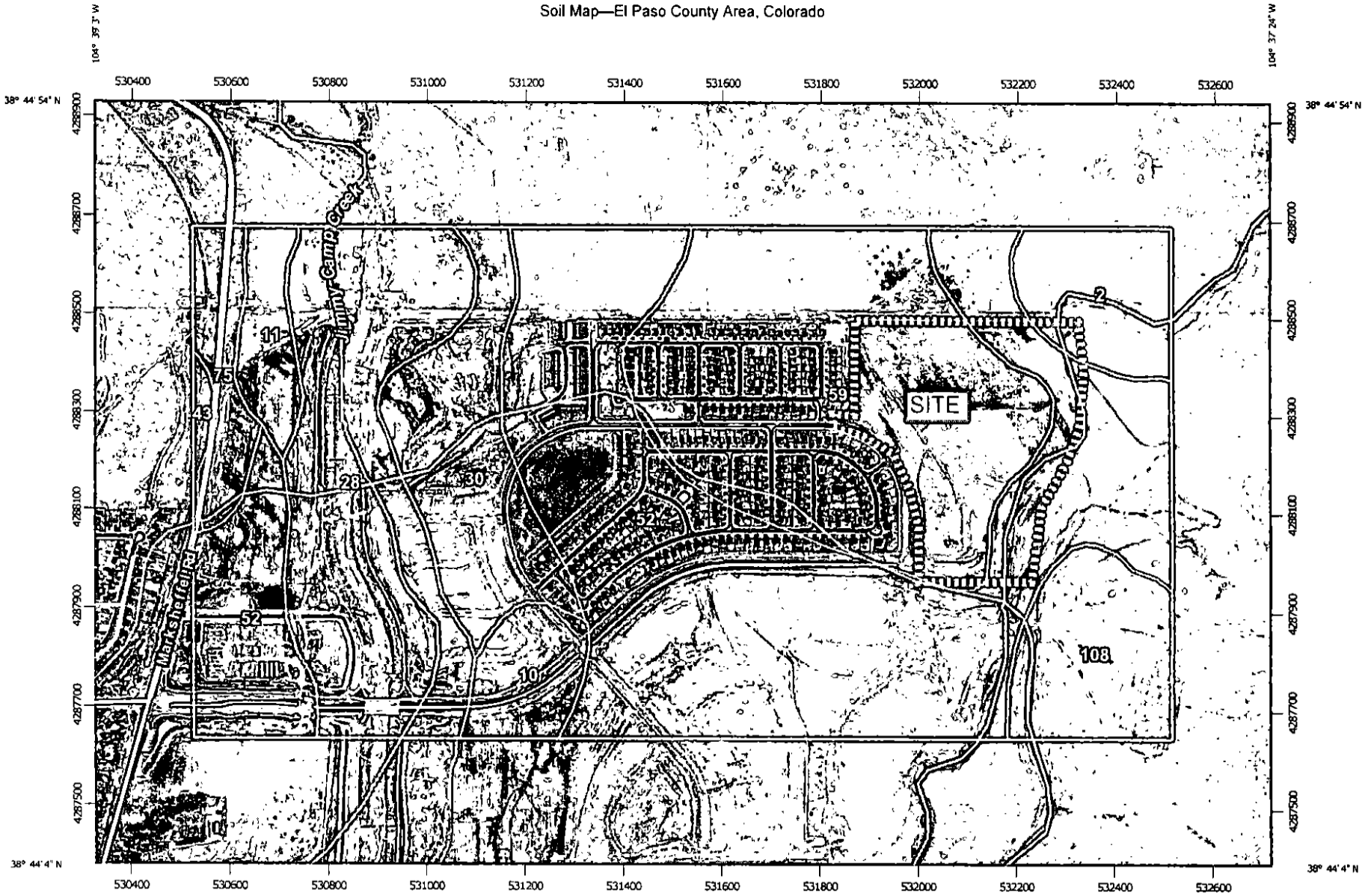
UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

IN COOPERATION WITH THE

COLORADO AGRICULTURAL EXPERIMENT STATION

Soil Map—El Paso County Area, Colorado



Map Scale: 1:10,900 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

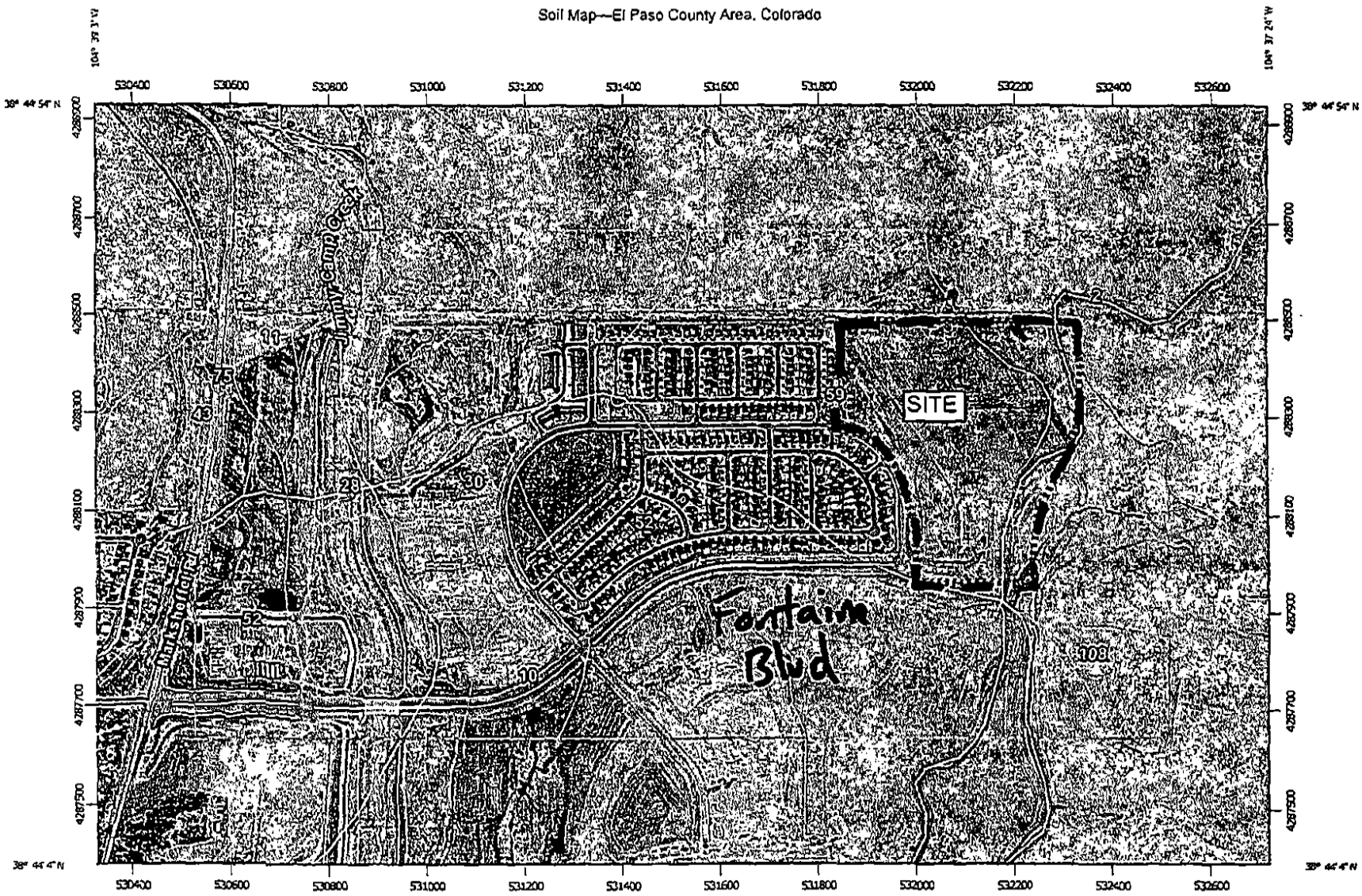
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

USDA **Natural Resources Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

PIONEER LANDING FILING 2
SCS SOILS MAP

Soil Map—El Paso County Area, Colorado



Map Scale: 1:10,900 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

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

USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

PIONEER LANDING FILING 2
SCS SOILS MAP

Map Unit Legend

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Ascalon sandy loam, 1 to 3 percent slopes	20.9	4.1%
10	Blendon sandy loam, 0 to 3 percent slopes	13.6	2.7%
11	Bresser sandy loam, 0 to 3 percent slopes	11.2	2.2%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	75.3	14.6%
30	Fort Collins loam, 0 to 3 percent slopes	39.0	7.6%
43	Kim loam, 1 to 8 percent slopes	2.4	0.5%
52	Manzanola clay loam, 1 to 3 percent slopes	200.8	39.0%
59	Nunn clay loam, 0 to 3 percent slopes	110.3	21.4%
75	Razor-Midway complex	13.4	2.6%
108	Wiley silt loam, 3 to 9 percent slopes	27.5	5.3%
Totals for Area of Interest		514.4	100.0%

Map Unit Legend

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Ascalon sandy loam, 1 to 3 percent slopes	20.9	4.1%
10	Blendon sandy loam, 0 to 3 percent slopes	13.6	2.7%
11	Bresser sandy loam, 0 to 3 percent slopes	11.2	2.2%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	75.3	14.6%
30	Fort Collins loam, 0 to 3 percent slopes	39.0	7.6%
43	Kim loam, 1 to 8 percent slopes	2.4	0.5%
52	Manzanola clay loam, 1 to 3 percent slopes	200.8	39.0%
59	Nunn clay loam, 0 to 3 percent slopes	110.3	21.4%
75	Razor-Midway complex	13.4	2.6%
108	Wiley silt loam, 3 to 9 percent slopes	27.5	5.3%
Totals for Area of Interest		514.4	100.0%

Included with this soil in mapping are small areas of Nunn clay loam, 0 to 3 percent slopes; Sampson loam, 0 to 3 percent slopes; and Ustic Torrifluvents, loamy.

Permeability of this Manzanola soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is moderate.

Most areas of this soil are used for irrigated crops. The main crops are alfalfa, corn, small grain, and pasture. Use of deep-rooted crops, timely tillage, and crop residue to keep the soil in good tilth are necessary on this soil. A small acreage of this soil is used for the production of forage sorghum or sudangrass for feed crops. The remaining acreage is used as nonirrigated cropland and rangeland.

This soil is well suited to plants for suitable grazing, and both grasses and legumes grow well if the soil is irrigated.

The native vegetation is mainly alkali sacaton, vinemesquite, western wheatgrass, blue grama, and lesser amounts of switchgrass. Big bluestem, switchgrass, and junegrass are also present where this soil occurs in the northern part of the survey area.

Stocking rates and distribution of grazing should be controlled to facilitate uniform grazing. Fencing and properly locating livestock watering facilities help to control grazing. With good range management, this soil produces good quantities of forage.

Windbreaks and environmental plantings are generally well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing wildlife areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for urban use of this soil are slow permeability and shrink-swell potential. Septic tank absorption fields do not function well because of the slow permeability. Special designs for buildings and roads are required to overcome the limitation of the shrink-swell potential. Capability subclasses IIs, irrigated, and IVe, nonirrigated.

52—Manzanola clay loam, 1 to 3 percent slopes. This deep, well drained soil formed in calcareous loamy alluvium on fans and terraces. Elevation ranges from about 5,200 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown clay loam about 6 inches thick. The subsoil is grayish brown heavy clay loam about 26 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more. The lower part of the subsoil and the substratum contain visible soft masses of lime.

Included with this soil in mapping are small areas of Manzanola clay loam, 0 to 1 percent slopes; Nunn clay loam, 0 to 3 percent slopes; and Sampson loam, 0 to 3 percent slopes.

Permeability of this Manzanola soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

About 50 percent of the acreage of this soil is used for irrigated crops. The main crops are alfalfa, corn, small grain, and pasture. Use of deep-rooted crops, timely tillage, and crop residue to keep the soil in good tilth is necessary. A small percentage of this soil is used for the production of forage sorghum or sudangrass for feed crops. The remaining acreage is used as rangeland.

This soil is well suited to plants suitable for grazing, and grass and legumes grow well if it is irrigated.

The native vegetation is mainly alkali sacaton, vinemesquite, western wheatgrass, blue grama, and lesser amounts of switchgrass. Big bluestem, switchgrass, and junegrass are also present where this soil occurs in the northern part of the survey area.

Stocking rates and distribution of grazing should be controlled to facilitate uniform grazing. Fences and proper location of livestock watering facilities help to control grazing. With good range management, this soil produces good quantities of forage.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be assisted by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for urban use of this soil are slow permeability and high shrink-swell potential. Septic tank absorption fields do not function well as a result of the slow permeability. Special designs for buildings and roads are required to overcome the limitation of the high shrink-swell potential. Capability subclasses IVe, nonirrigated, and IIe, irrigated.

53—Manzanola clay loam, 3 to 9 percent slopes. This deep, well drained soil formed in calcareous loamy alluvium on fans, terraces, and valley side slopes. Elevation ranges from about 5,200 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown clay loam about 6 inches thick. The subsoil is grayish brown heavy clay loam about 26 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more. The lower part of the subsoil and the substratum contain visible soft masses of lime.

Included with this soil in mapping are small areas of Manvel loam, 3 to 9 percent slopes; Neville-Rednun complex, 3 to 9 percent slopes; and Satanta-Neville complex, 3 to 8 percent slopes.

Permeability of this Manzanola soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is rapid, and the hazard of erosion is high.

Most areas of this soil are used as rangeland and for military maneuvers.

This soil is well suited to the production of native vegetation suitable for grazing. The native vegetation is mainly blue grama, western wheatgrass, side-oats grama, dropseed, and galleta. Production varies from year to year, depending on amount of precipitation.

Fencing and properly locating livestock watering facilities help to control grazing. Deferment of grazing may be necessary to maintain a needed balance between livestock use and forage production. In areas where the plant cover has been depleted, pitting can be used to help the native vegetation recover. Chemical control practices may be needed in disturbed areas where dense stands of pricklypear occur. Ample amounts of litter and forage need to be left on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged y developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for urban uses are slow permeability and high shrink-swell potential. Septic tank absorption fields do not function well because of the slow permeability. Special designs for buildings and roads are required to overcome the limitation of high shrink-swell potential. Capability subclass VIe.

54—Midway clay loam, 3 to 25 percent slopes. This shallow, well drained soil formed in residuum derived from calcareous shale on uplands. Elevation ranges from 5,200 to 6,200 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the frost-free period is about 145 days.

Typically, the surface layer is light yellowish brown clay loam about 4 inches thick. The underlying material is light yellowish brown clay about 4 inches thick and grayish brown clay that contains 50 percent soft shale fragments and is about 5 inches thick. Shale is at a depth of 13 inches.

Included with this soil in mapping are small areas of Louviers silty clay loam, 3 to 18 percent slopes; Nelson-Tassel fine sandy loams, 3 to 18 percent slopes; and Razor clay loam, 3 to 9 percent slopes.

Permeability of this Midway soil is slow. Effective rooting depth is less than 20 inches. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high.

Most areas of this soil are used as rangeland.

The native vegetation is mainly blue grama, galleta, alkali sacaton, western wheatgrass, and fourwing saltbush. Little bluestem, side-oats grama, and needleandthread are also present where this soil occurs in the northern part of the survey area. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

This soil is difficult to revegetate, and it is therefore especially important that livestock grazing be carefully managed. Excessive removal of vegetation can result in severe erosion. Properly locating livestock watering facilities helps to control grazing.

Windbreak and environmental plantings generally are not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

This treeless soil produces little vegetation, especially in times of drought, when annual production may be as low as 300 pounds per acre. Rangeland wildlife, such as antelope and scaled quail, can be encouraged by properly managing livestock grazing, installing livestock watering facilities, and reseeding range where necessary.

The main limitations for the use of this soil as sites for buildings and homes are shallow depth to shale and high shrink-swell potential. Septic tank absorption fields do not function properly because of the slow permeability of this soil. Practices are needed to reduce surface runoff and thus keep erosion to a minimum. Special designs for buildings and roads are needed because of the shallow

tices help to maintain vigor and growth of plants. Fencing and properly locating livestock watering facilities also help to control grazing.

Windbreaks and environmental plantings generally are well suited to these soils. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure establishment and survival. Trees that are best suited to these soils are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited to these soils are skunkbush sumac, lilac, Siberian peashrub, and American plum.

These soils are best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. Rangeland widlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of the Neville soil for urban use are its limited ability to support a load, moderate shrink-swell potential, and frost action potential. The main limitations of the Rednun soil are slow permeability, shrink-swell potential, and frost action potential. Special designs for buildings and roads are needed to overcome these limitations. Community sewage systems may be required because septic tank absorption fields do not function properly where permeability is slow. Capability subclass IVe.

59—Nunn clay loam, 0 to 3 percent slopes. This deep, well drained soil is on terraces, fans, and uplands. It formed in mixed alluvium. Elevation ranges from about 5,400 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown clay loam about 12 inches thick. The subsoil is grayish brown heavy clay loam about 18 inches thick. The substratum to a depth of 72 inches is light olive brown sandy clay loam in the upper part and light brownish gray clay in the lower part. Visible lime occurs as soft masses and streaks throughout the substratum.

Included with this soil in mapping are small areas of Manzanola clay loam, 0 to 1 percent slopes; Manzanola clay loam, 1 to 3 percent slopes; Sampson loam, 0 to 3 percent slopes; and Ustic Torrifluvents, loamy.

Permeability of this Nunn soil is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow to medium, and the hazard of erosion is slight.

About 70 percent of the acreage of this soil is in dryland and irrigated crops. Wheat is the main dryland crop, and corn and alfalfa are the main irrigated crops. The remaining acreage is used as rangeland.

This soil is suited to the production of native vegetation table for grazing. The native vegetation is mainly western wheatgrass, blue grama, alkali sacaton, needleandthread, and side-oats grama. Galleta and fourwing saltbush are also present where this soil occurs in the southern part of the survey area. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

Good grazing management is essential to maintain the desirable grasses. Deferment of grazing early in spring helps to maintain the vigor of cool-season grasses. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by providing nesting areas and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development; this is especially true for intensively farmed areas. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for urban use are slow permeability, low strength, and shrink-swell potential. Buildings and roads must be designed to overcome the limitations of low bearing strength and shrink-swell potential. Septic tank absorption fields do not function properly because of the slow permeability. Capability subclasses IIIc, nonirrigated, and IIe, irrigated.

60—Olney sandy loam, 0 to 3 percent slopes. This deep, well drained soil formed in calcareous sandy sediment on uplands. Elevation ranges from 5,200 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown sandy loam about 6 inches thick. The subsoil, about 21 inches thick, is brown sandy clay loam in the upper 7 inches and pale brown sandy clay loam grading to sandy loam in the lower 14 inches. The substratum to a depth of 60 inches is very pale brown sandy loam that grades to loamy sand. The lower part of the subsoil and the substratum have visible lime in the form of soft masses and seams.

Included with this soil in mapping are small areas of Olney and Vona soils, eroded; Vona sandy loam, 1 to 3 percent slopes; and soils that are similar to this Olney soil in the upper 40 inches but that are very dark brown and loamy below a depth of 40 inches. Also included are

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See "flooding" in Glossary for definition of terms as "rare," "brief," and "very brief." The symbol > means greater than]

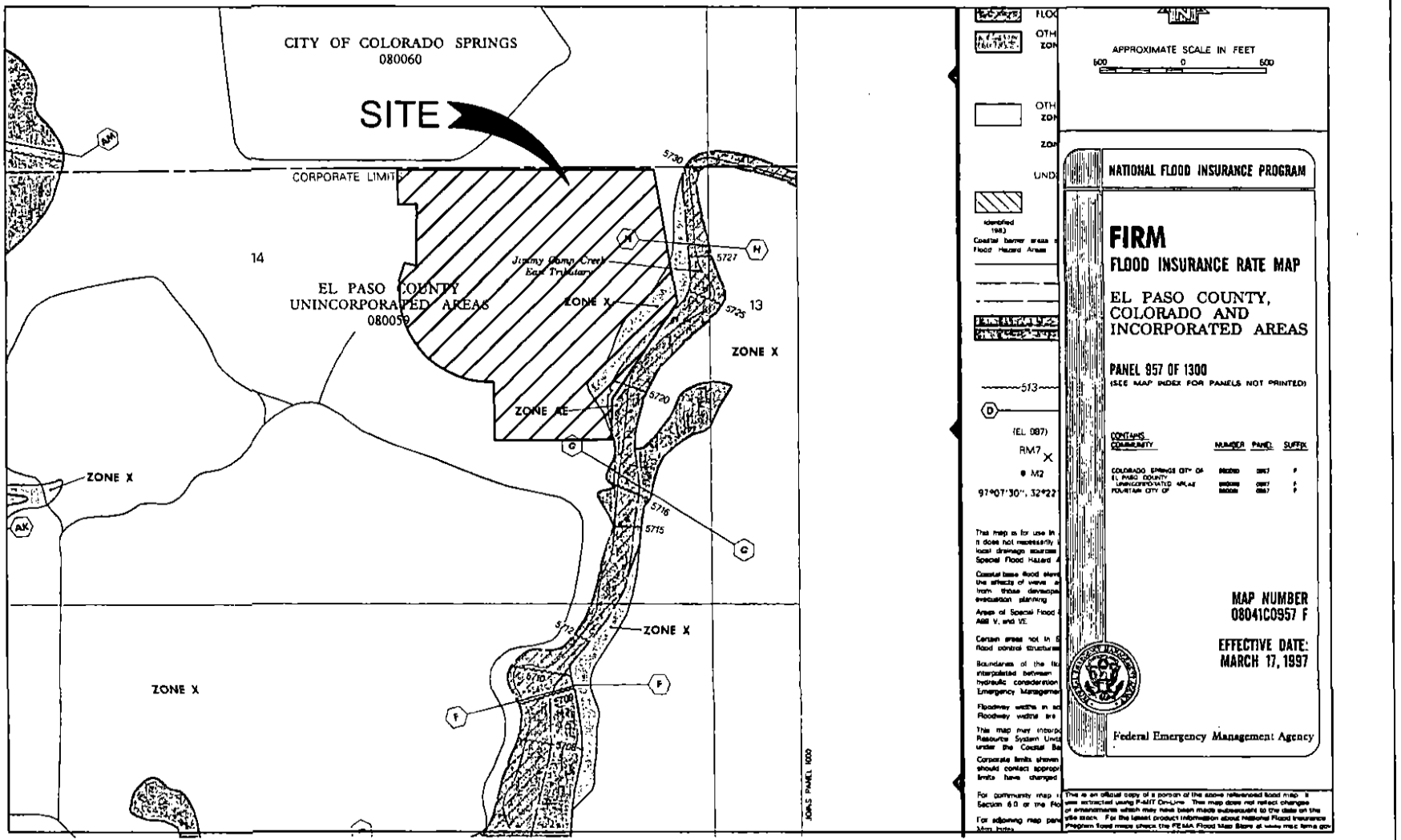
Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Alamosa: 1	C	Frequent	Brief	May-Jun	>60	---	High.
Ascalon: 2, 3	B	None	---	---	>60	---	Moderate.
Badland: 4	D	---	---	---	---	---	---
Bijou: 5, 6, 7	B	None	---	---	>60	---	Low.
Blakeland: 8	A	None	---	---	>60	---	Low.
[1]9: Blakeland part	A	None	---	---	>60	---	Low.
Fluvaquentic Haplaquolls part	D	Common	Very brief	Mar-Aug	>60	---	High.
Blendon: 10	B	None	---	---	>60	---	Moderate.
Bresser: 11, 12, 13	B	None	---	---	>60	---	Low.
Brussett: 14, 15	B	None	---	---	>60	---	Moderate.
Chaseville: 16, 17	A	None	---	---	>60	---	Low.
[1]18: Chaseville part	A	None	---	---	>60	---	Low.
Midway part	D	None	---	---	10-20	Rippable	Moderate.
Columbine: 19	A	None to rare	---	---	>60	---	Low.
Connerton: [1]20: Connerton part	B	None	---	---	>60	---	High.
Rock outcrop part	D	---	---	---	---	---	---
Cruckton: 21	B	None	---	---	>60	---	Moderate.
Cushman: 22, 23	C	None	---	---	20-40	Rippable	Moderate.
[1]24: Cushman part	C	None	---	---	20-40	Rippable	Moderate.
Kutch part	C	None	---	---	20-40	Rippable	Moderate.
Elbeth: 25, 26	B	None	---	---	>60	---	Moderate.
[1]27: Elbeth part	B	None	---	---	>60	---	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Manvel:							
50	C	None	---	---	>60	---	High.
Manzanola:							
51, 52, 53	C	None to rare	---	---	>60	---	Moderate.
Midway:							
54	D	None	---	---	10-20	Rippable	Moderate.
Nederland:							
55	B	None	---	---	>60	---	Moderate.
Nelson:							
[1]56:							
Nelson part	B	None	---	---	20-40	Rippable	Low.
Tassel part	D	None	---	---	10-20	Rippable	Low.
Neville:							
57	B	None	---	---	>60	---	High.
[1]58:							
Neville part	B	None	---	---	>60	---	High.
Rednun part	C	None	---	---	>60	---	Moderate.
Nunn:							
59	C	None	---	---	>60	---	Moderate.
Olney:							
60, 61	B	None	---	---	>60	---	Moderate.
[1]62:							
Olney part	B	None	---	---	>60	---	Moderate.
Vona part	B	None	---	---	>60	---	Moderate.
Paunsaugunt:							
[1]63:							
Paunsaugunt part	D	None	---	---	10-20	Hard	Moderate.
Rock outcrop part	D	---	---	---	---	---	---
Penrose:							
[1]64:							
Penrose part	D	None	---	---	10-20	Rippable	Low.
Manvel part	C	None	---	---	>60	---	High.
Perrypark:							
65	B	None	---	---	>60	---	Moderate.
Peyton:							
66, 67	B	None	---	---	>60	---	Moderate.
[1]68, [1]69:							
Peyton part	B	None	---	---	>60	---	Moderate.
Pring part	B	None	---	---	>60	---	Moderate.
Pits, gravel:							
70	A	---	---	---	---	---	---
Pring:							
71, 72	B	None	---	---	>60	---	Moderate.
Razor:							
73, 74	C	None	---	---	20-40	Rippable	Moderate.

See footnote at end of table.



P:\100\100.028\Drainage\100.028soils.dwg Aug 19, 2014 - 2:00pm

CORE ENGINEERING GROUP
15004 1st AVENUE S.
BURNSVILLE, MN 55306
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CONTACT: RICHARD L. SCHINDLER, P.E.
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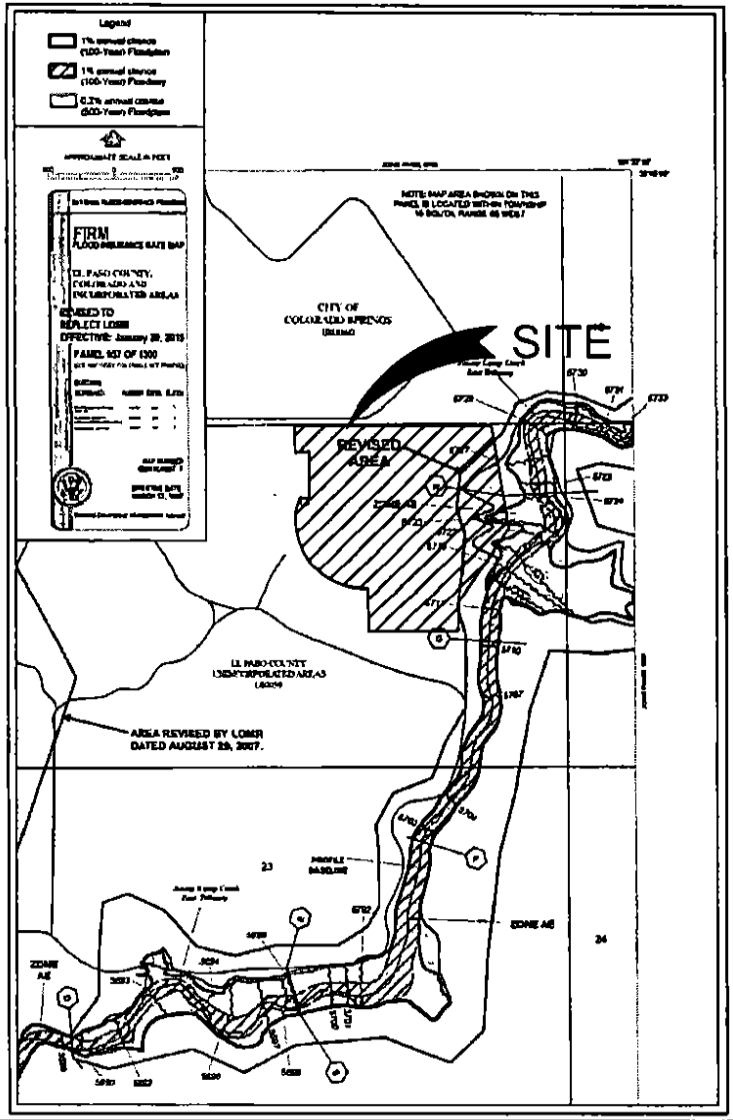
PIONEER LANDING FILING NO. 2
FEMA FLOODPLAIN MAP

SCALE:	DATE:	FIGURE NO.
NTS	AUGUST, 2014	--



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PIONEER LANDING FILING NO. 2
FEMA FLOODPLAIN MAP - Approved LOMR

SCALE:	DATE:	FIGURE NO.
NTS	OCTOBER, 2014	--

P: \100\100.028\Drainage\100.028 fema.dwg Oct 27, 2014 - 3:32pm

APPENDIX B – HYDROLOGY & HYDRAULIC CALCULATIONS

CORE
ENGINEERING GROUP

15004 1st Avenue S.
Burnsville, MN 55306

PROJECT NAME: *Pioneer Landing Filing No 2*
PROJECT NUMBER: *100.028*
ENGINEER: *RLS*
DATE: *10/27/14*

Preliminary Drainage Plan
DEVELOPED CONDITIONS HYDROLOGY CALCULATIONS

BASIN	CRITERIA REFERENCE[1]	B3.1	B3.2	B3.3	B3.4	B3.5	B3.6	B3.7	B3.8
AREA, A [ACRE]	-	2.12	1.19	2.89	2.43	0.92	2.19	1.16	0.60
RUN-OFF COEFFICIENT, C_5	-	0.65	0.65	0.56	0.65	0.65	0.65	0.65	0.65
OVERLAND DROP [FT]	-	1.8	2.0	2.4	3.2	2.4	3.0	1.4	2.4
OVERLAND FLOW LENGTH, L_O [FT]	-	90.0	100.0	120.0	160.0	120.0	150.0	70.0	120.0
OVERLAND SLOPE, S_O [%]	-	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
OVERLAND FLOW TIME, t_i [MIN]	-	6.1	6.4	8.5	8.1	7.0	7.9	5.4	7.0
TRAVEL FLOW DROP [FT]	-	4.0	2.5	5.0	2.8	2.4	4.9	5.4	2.1
TRAVEL FLOW LENGTH, Lt [FT]	-	560.0	390.0	780.0	310.0	270.0	490.0	450.0	210.0
TRAVEL SLOPE, S_t [%]	-	0.71%	0.64%	0.64%	0.90%	0.90%	1.00%	1.20%	1.00%
TRAVEL VELOCITY, V_t [FT/SEC]	$V=1.486/n * R^{2/3} * S^{1/2}$	2.49	2.36	2.36	2.80	2.80	2.95	3.23	2.95
TRAVEL TIME, t_t [MIN]	-	3.7	2.8	5.5	1.8	1.6	2.8	2.3	1.2
TIME OF CONCENTRATION, t_c	t_i+t_t	9.8	9.2	14.0	10.0	8.6	10.6	7.7	8.2
	-								
5-YR RUN-OFF COEFFICIENT, C_5	-	0.65	0.65	0.56	0.65	0.65	0.65	0.65	0.65
5-YR RAINFALL INTENSITY, I_5 [IN/HR]	-	4.35	4.46	3.77	4.32	4.56	4.22	4.74	4.64
5-YR MAXIMUM RUN-OFF, Q_5 [CFS]	Q=CIA	6.0	3.5	6.1	6.8	2.7	6.0	3.6	1.8
100-YR RUN-OFF COEFFICIENT, C_{100}		0.75	0.75	0.67	0.75	0.75	0.75	0.75	0.75
100-YR RAINFALL INTENSITY, I_{100} [IN/HR]	-	7.73	7.93	6.70	7.69	8.10	7.50	8.43	8.25
100-YR MAXIMUM RUN-OFF, Q_{100} [CFS]	Q=CIA	12.3	7.1	13.0	14.0	5.6	12.3	7.3	3.7

[1] *City of Colorado Springs and El Paso County Drainage Criteria Manual* unless otherwise noted.
[2] *Urban Drainage Criteria Manual*

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DEVELOPED CONDITIONS HYDROLOGY CALCULATIONS

BASIN	CRITERIA REFERENCE[1]	B3.9	B3.10	B3.11	B3.12	B3.13	B3.14	B3.15	B3.16
AREA, A [ACRE]	-	2.11	1.22	0.71	2.07	0.39	0.49	1.84	0.93
RUN-OFF COEFFICIENT, C_5	-	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
OVERLAND DROP [FT]	-	3.2	1.4	1.0	3.8	0.6	0.6	1.2	0.4
OVERLAND FLOW LENGTH, L_O [FT]	-	160.0	70.0	50.0	190.0	30.0	30.0	60.0	20.0
OVERLAND SLOPE, S_O [%]	-	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
OVERLAND FLOW TIME, t_i [MIN]	-	8.1	5.4	4.5	8.9	3.5	3.5	5.0	2.9
TRAVEL FLOW DROP [FT]	-	5.3	6.3	2.3	3.5	3.5	3.0	4.6	5.0
TRAVEL FLOW LENGTH, Lt [FT]	-	440.0	630.0	230.0	345.0	350.0	300.0	570.0	620.0
TRAVEL SLOPE, S_t [%]	-	1.20%	0.99%	1.00%	1.00%	1.00%	1.00%	0.80%	0.80%
TRAVEL VELOCITY, V_t [FT/SEC]	$V=1.486/n * R^{2/3} * S^{1/2}$	3.24	2.94	2.95	2.95	2.95	2.95	2.64	2.64
TRAVEL TIME, t_t [MIN]	-	2.3	3.6	1.3	1.9	2.0	1.7	3.6	3.9
TIME OF CONCENTRATION, t_c	t_i+t_t	10.4	9.0	5.8	10.8	5.5	5.2	8.6	6.8
	-								
5-YR RUN-OFF COEFFICIENT, C_5	-	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
5-YR RAINFALL INTENSITY, I_5 [IN/HR]	-	4.26	4.50	5.16	4.19	5.24	5.32	4.57	4.93
5-YR MAXIMUM RUN-OFF, Q_5 [CFS]	Q=CIA	5.8	3.6	2.4	5.6	1.3	1.7	5.5	3.0
100-YR RUN-OFF COEFFICIENT, C_{100}		0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
100-YR RAINFALL INTENSITY, I_{100} [IN/HR]	-	7.57	8.01	9.17	7.46	9.33	9.46	8.13	8.77
100-YR MAXIMUM RUN-OFF, Q_{100} [CFS]	Q=CIA	12.0	7.3	4.9	11.6	2.7	3.5	11.2	6.1

[1] *City of Colorado Springs and El Paso County Drainage Criteria Manual* unless otherwise noted.
[2] *Urban Drainage Criteria Manual*

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PROJECT NUMBER: 100.028
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DATE: 10/27/14

Preliminary Drainage Plan
DEVELOPED CONDITIONS HYDROLOGY CALCULATIONS

BASIN	CRITERIA REFERENCE[1]	B4.1	B4.2	B4.3	B4.4	B4.5	B5.1	B6.2	B2.1
AREA, A [ACRE]	-	1.82	1.83	1.74	1.11	4.02	4.09	8.89	13.92
RUN-OFF COEFFICIENT, C_5	-	0.65	0.65	0.65	0.65	0.37	0.37	0.32	0.75
OVERLAND DROP [FT]	-	2.6	1.8	0.6	4.6	4.0	3.0	2.6	2.6
OVERLAND FLOW LENGTH, L_O [FT]	-	130.0	90.0	30.0	230.0	200.0	130.0	130.0	130.0
OVERLAND SLOPE, S_O [%]	-	2.00%	2.00%	2.00%	2.00%	2.00%	2.31%	2.00%	2.00%
OVERLAND FLOW TIME, t_i [MIN]	-	7.3	6.1	3.5	9.8	14.7	11.3	12.7	5.7
TRAVEL FLOW DROP [FT]	-	4.3	7.0	9.7	1.3		3.0	18.0	9.0
TRAVEL FLOW LENGTH, Lt [FT]	-	430.0	700.0	970.0	130.0		600.0	1400.0	1370.0
TRAVEL SLOPE, S_t [%]	-	1.00%	1.00%	1.00%	1.00%		0.50%	1.29%	0.66%
TRAVEL VELOCITY, V_t [FT/SEC]	$V=1.486/n * R^{2/3} * S^{1/2}$	2.95	2.95	2.95	2.95		2.09	3.34	2.39
TRAVEL TIME, t_t [MIN]	-	2.4	4.0	5.5	0.7		4.8	7.0	9.6
TIME OF CONCENTRATION, t_c	t_i+t_t	9.8	10.1	9.0	10.5	14.7	16.1	19.7	15.3
	-								
5-YR RUN-OFF COEFFICIENT, C_5	-	0.65	0.65	0.65	0.65	0.37	0.37	0.32	0.75
5-YR RAINFALL INTENSITY, I_5 [IN/HR]	-	4.36	4.31	4.49	4.24	3.67	3.53	3.20	3.62
5-YR MAXIMUM RUN-OFF, Q_5 [CFS]	Q=CIA	5.2	5.1	5.1	3.1	5.5	5.3	9.1	37.8
100-YR RUN-OFF COEFFICIENT, C_{100}		0.75	0.75	0.75	0.75	0.51	0.51	0.47	0.83
100-YR RAINFALL INTENSITY, I_{100} [IN/HR]	-	7.76	7.67	7.99	7.55	6.54	6.27	5.69	6.44
100-YR MAXIMUM RUN-OFF, Q_{100} [CFS]	Q=CIA	10.6	10.5	10.4	6.3	13.4	13.1	23.8	74.4

[1] *City of Colorado Springs and El Paso County Drainage Criteria Manual* unless otherwise noted.
[2] *Urban Drainage Criteria Manual*

CORE
ENGINEERING GROUP

15004 1st Avenue S.
Burnsville, MN 55306

PROJECT NAME: Pioneer Landing Filing #2
PROJECT NUMBER: 100.028
ENGINEER: RLS
DATE: October, 2014

Preliminary Drainage Plan
DEVELOPED CONDITIONS RUNOFF COEFFICIENTS

Basin	Area	Cover (%)	C5	Wtd. C5	C100	Wtd. C100	Type of Cover
B3.3	1.20	41.52%	0.30	0.12	0.45	0.19	backyard
	1.10	38.06%	0.65	0.25	0.75	0.29	houses
	0.59	20.42%	0.90	0.18	0.95	0.19	street
	2.89	100.00%		0.56		0.67	
B5.1	3.29	80.44%	0.30	0.24	0.45	0.36	backyard
	0.80	19.56%	0.65	0.13	0.75	0.15	houses
	0.00	0.00%	0.90	0.00	0.95	0.00	street
	4.09	100.00%		0.37		0.51	
B5.2	7.89	93.15%	0.30	0.28	0.45	0.42	open space
	0.58	6.85%	0.65	0.04	0.75	0.05	houses
	0.00	0.00%	0.90	0.00	0.95	0.00	street
	8.47	100.00%		0.32		0.47	
B4.5	3.22	80.10%	0.30	0.24	0.45	0.36	open space
	0.80	19.90%	0.65	0.13	0.75	0.15	houses
	4.02	100.00%		0.37		0.51	
B2.1	0.00	0.00%	0.30	0.00	0.45	0.00	backyard
	8.12	58.33%	0.65	0.38	0.75	0.44	houses
	5.80	41.67%	0.90	0.38	0.95	0.40	street
	13.92	100.00%		0.75		0.83	
B2.3	0.00	0.00%	0.30	0.00	0.45	0.00	backyard
	0.65	59.09%	0.65	0.38	0.75	0.44	houses
	0.45	40.91%	0.90	0.37	0.95	0.39	street
	1.10	100.00%		0.75		0.83	
B2.5	0.30	13.04%	0.30	0.04	0.45	0.06	backyard
	1.20	52.17%	0.65	0.34	0.75	0.39	houses
	0.80	34.78%	0.90	0.31	0.95	0.33	street
	2.30	100.00%		0.69		0.78	

Weir Report

Hydraflow Express by Intelisolve — Tuesday, Jul 8 2014, 2:40 PM

overflow wier

Trapezoidal Weir

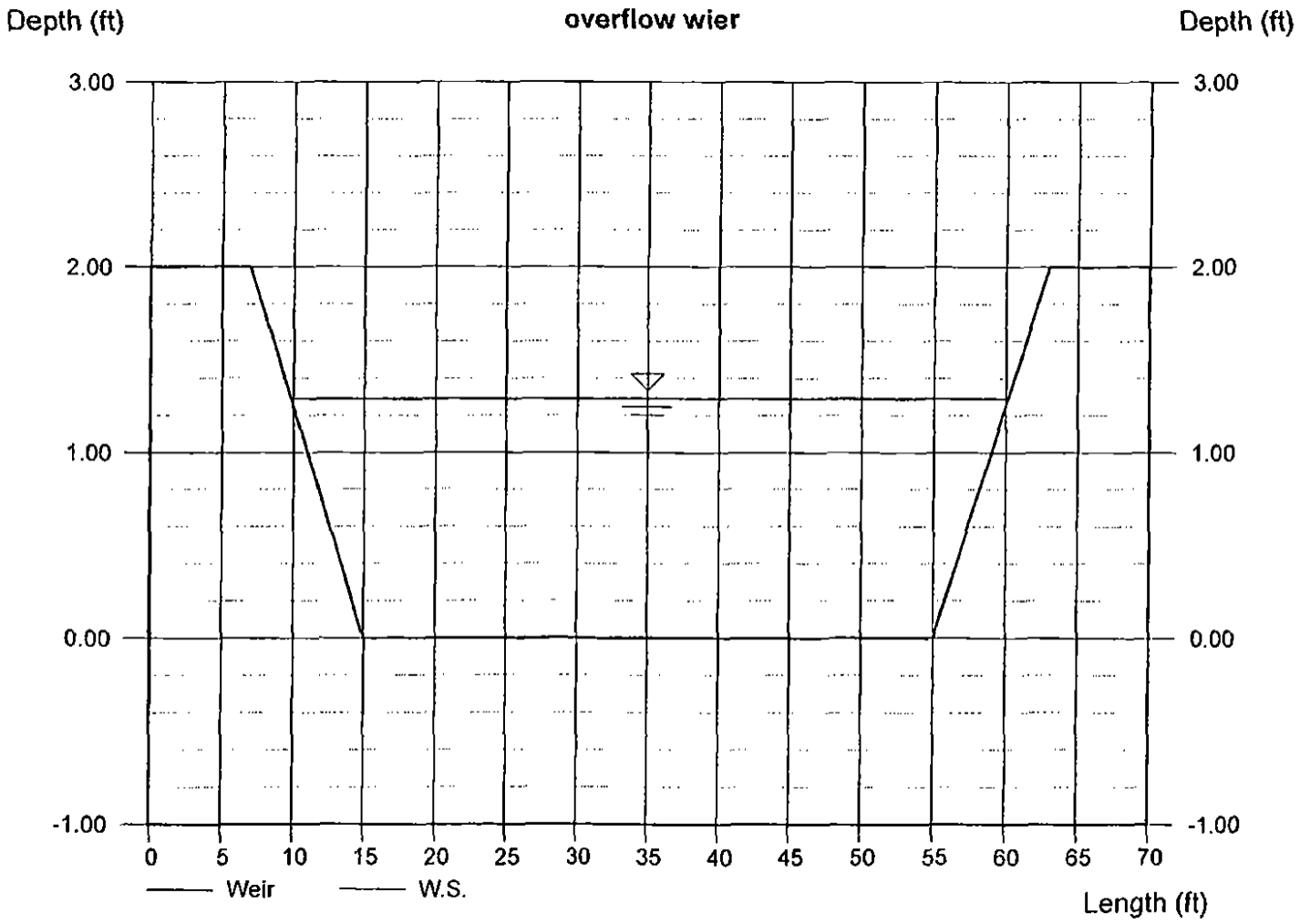
Crest	= Sharp
Bottom Length (ft)	= 40.00
Total Depth (ft)	= 2.00
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 200.00

Highlighted

Depth (ft)	= 1.29
Q (cfs)	= 200.00
Area (sqft)	= 58.26
Velocity (ft/s)	= 3.43
Top Width (ft)	= 50.32



Channel Report

OVERFLOW SWALE TO POND B1

Trapezoidal

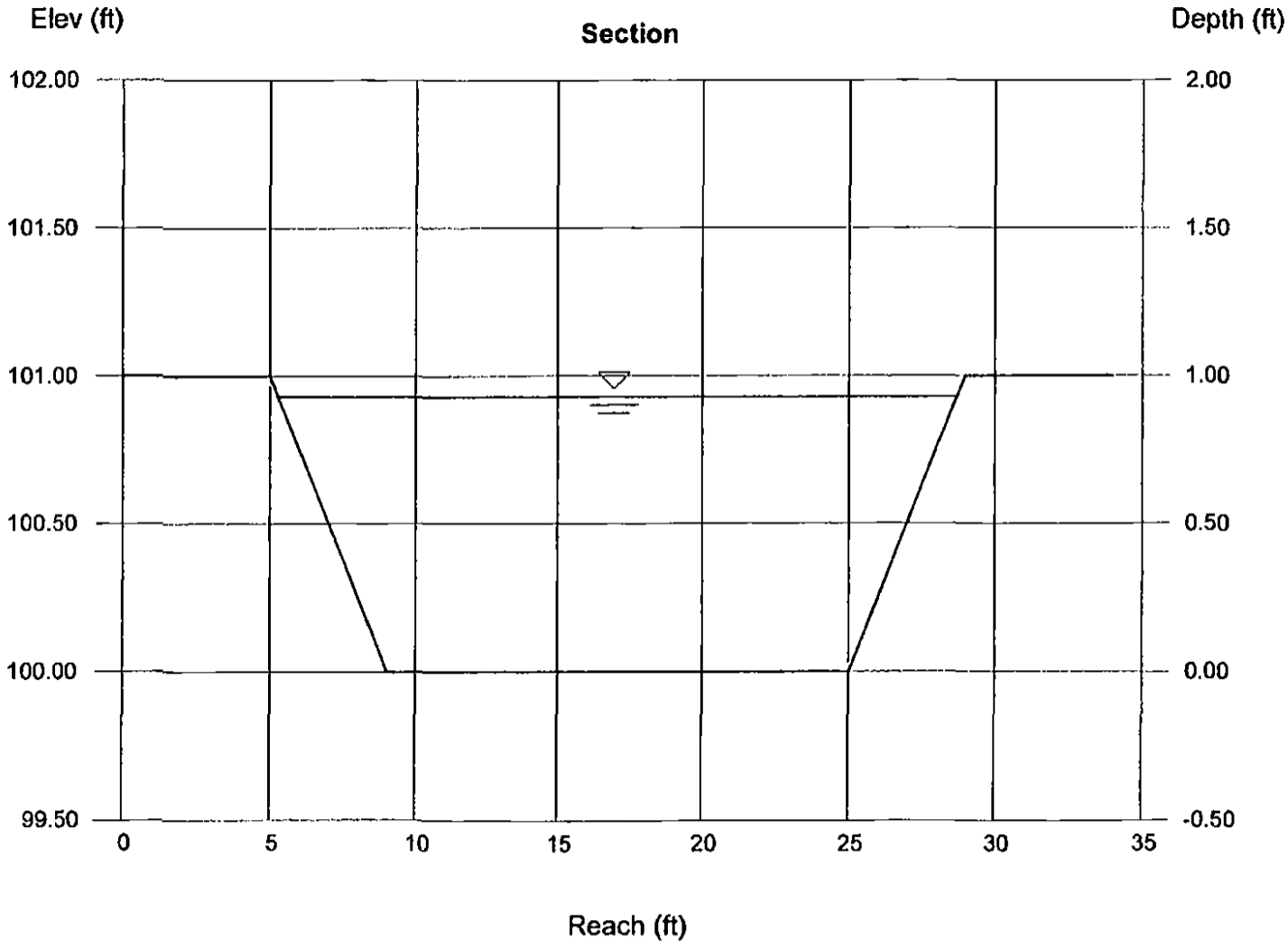
Botom Width (ft)	= 16.00
Side Slope (z:1)	= 4.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 2.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 107.00

Highlighted

Depth (ft)	= 0.93
Q (cfs)	= 107.00
Area (sqft)	= 18.34
Velocity (ft/s)	= 5.83
Wetted Perim (ft)	= 23.67
Crit Depth, Yc (ft)	= 1.00
Top Width (ft)	= 23.44
EGL (ft)	= 1.46



Channel Report

Hydraflow Express by Intelisolve — Tuesday, Jul 1 2014, 2:33 PM

5 year Street Capacity - 0.6%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 0.60
N-Value	= Composite

Calculations

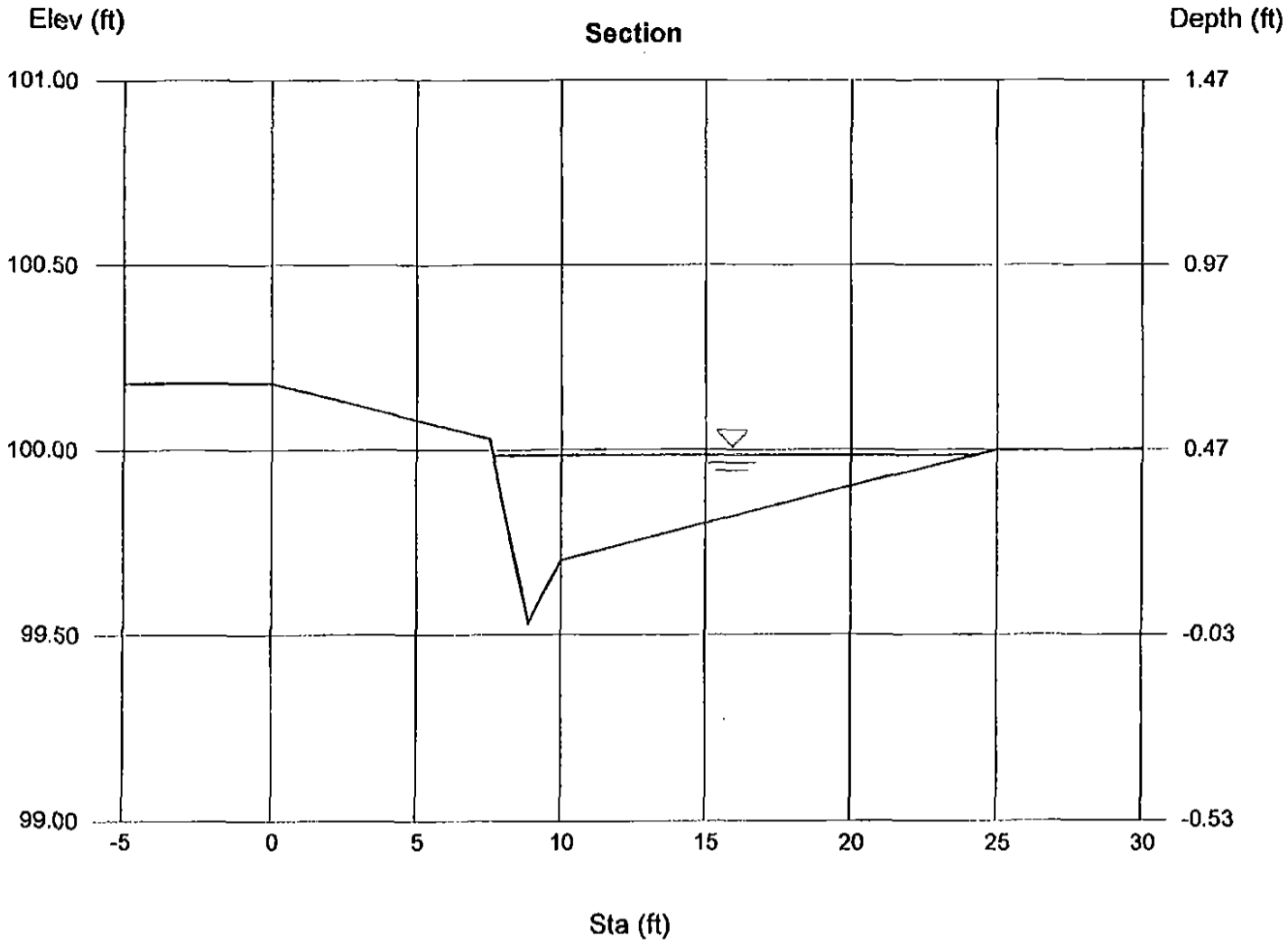
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 5.906
Area (sqft)	= 2.74
Velocity (ft/s)	= 2.16
Wetted Perim (ft)	= 16.73
Crit Depth, Yc (ft)	= 0.42
Top Width (ft)	= 16.63
EGL (ft)	= 0.53

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)



Channel Report

Hydraflow Express by Intellisolve — Tuesday, Jul 1 2014, 2:32 PM

5 year Street Capacity - 0.7%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 0.70
N-Value	= Composite

Calculations

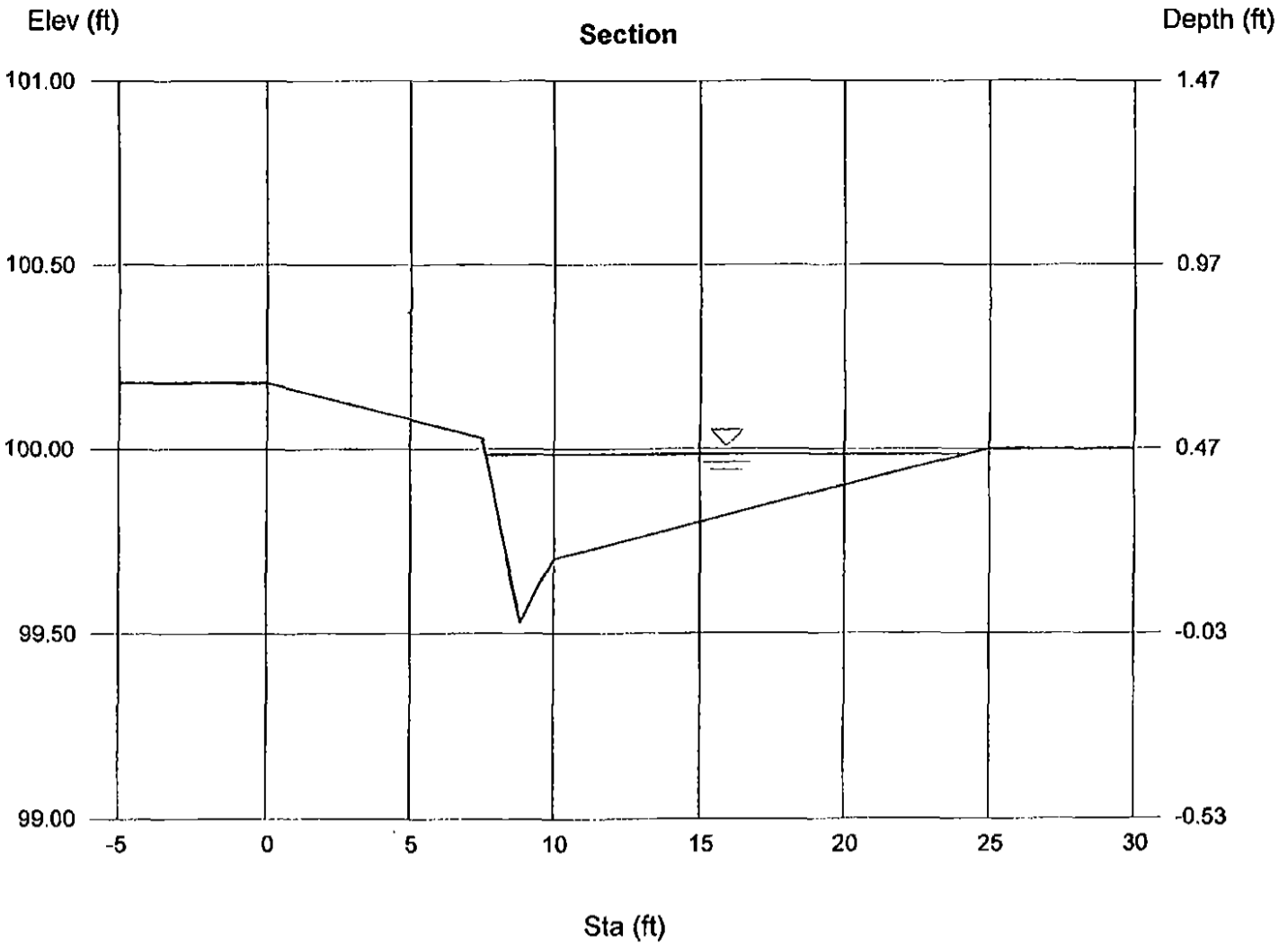
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 6.379
Area (sqft)	= 2.74
Velocity (ft/s)	= 2.33
Wetted Perim (ft)	= 16.73
Crit Depth, Yc (ft)	= 0.43
Top Width (ft)	= 16.63
EGL (ft)	= 0.54

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)



Channel Report

Hydraflow Express by Intellisolve — Tuesday, Jul 1 2014, 2:32 PM

5 year Street Capacity - 0.8%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 0.80
N-Value	= Composite

Calculations

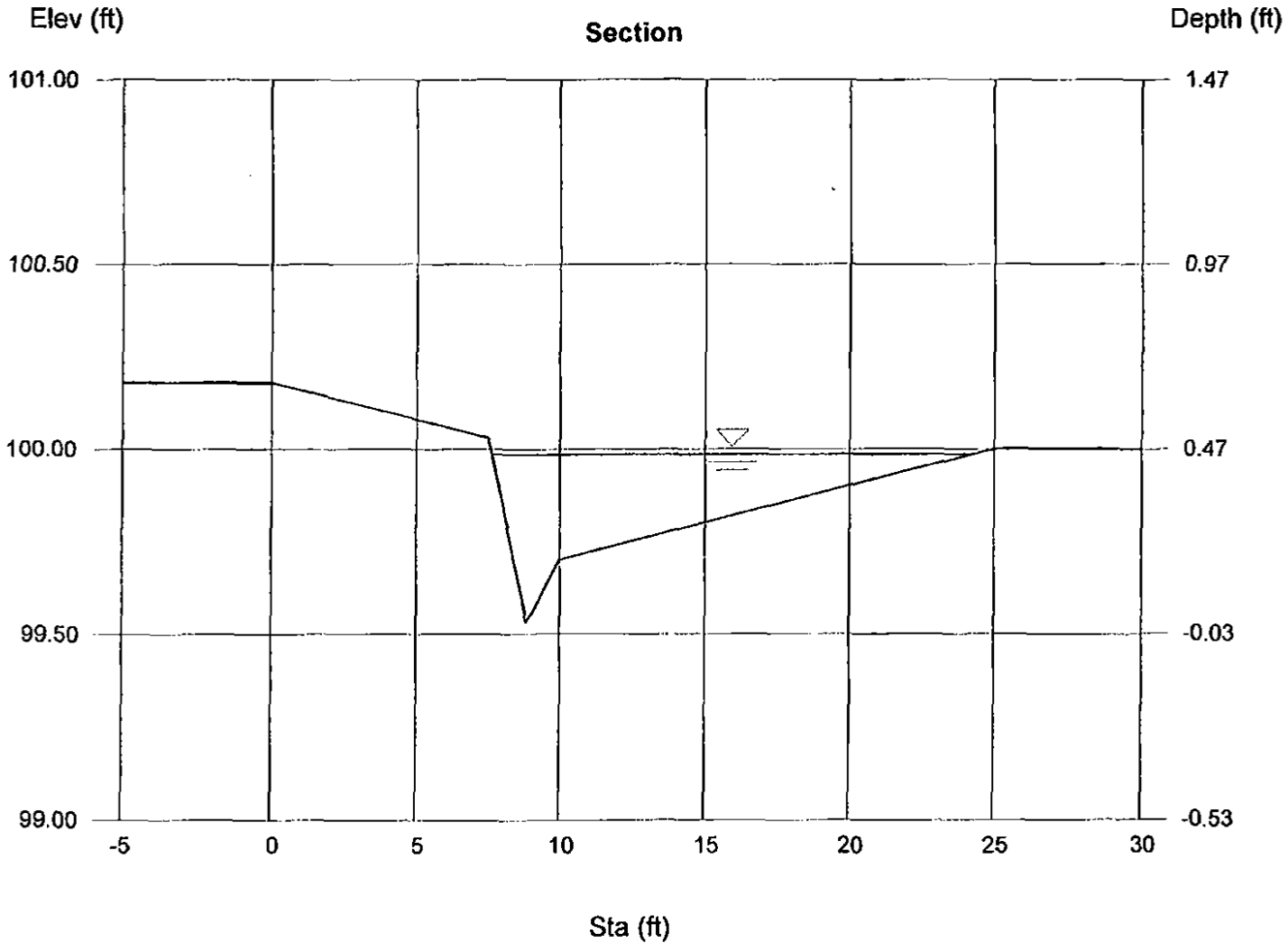
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 6.819
Area (sqft)	= 2.74
Velocity (ft/s)	= 2.49
Wetted Perim (ft)	= 16.73
Crit Depth, Yc (ft)	= 0.44
Top Width (ft)	= 16.63
EGL (ft)	= 0.55

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)



Channel Report

Hydraflow Express by Intellisolve — Tuesday, Jul 1 2014, 2:31 PM

5 year Street Capacity - 0.9%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 0.90
N-Value	= Composite

Calculations

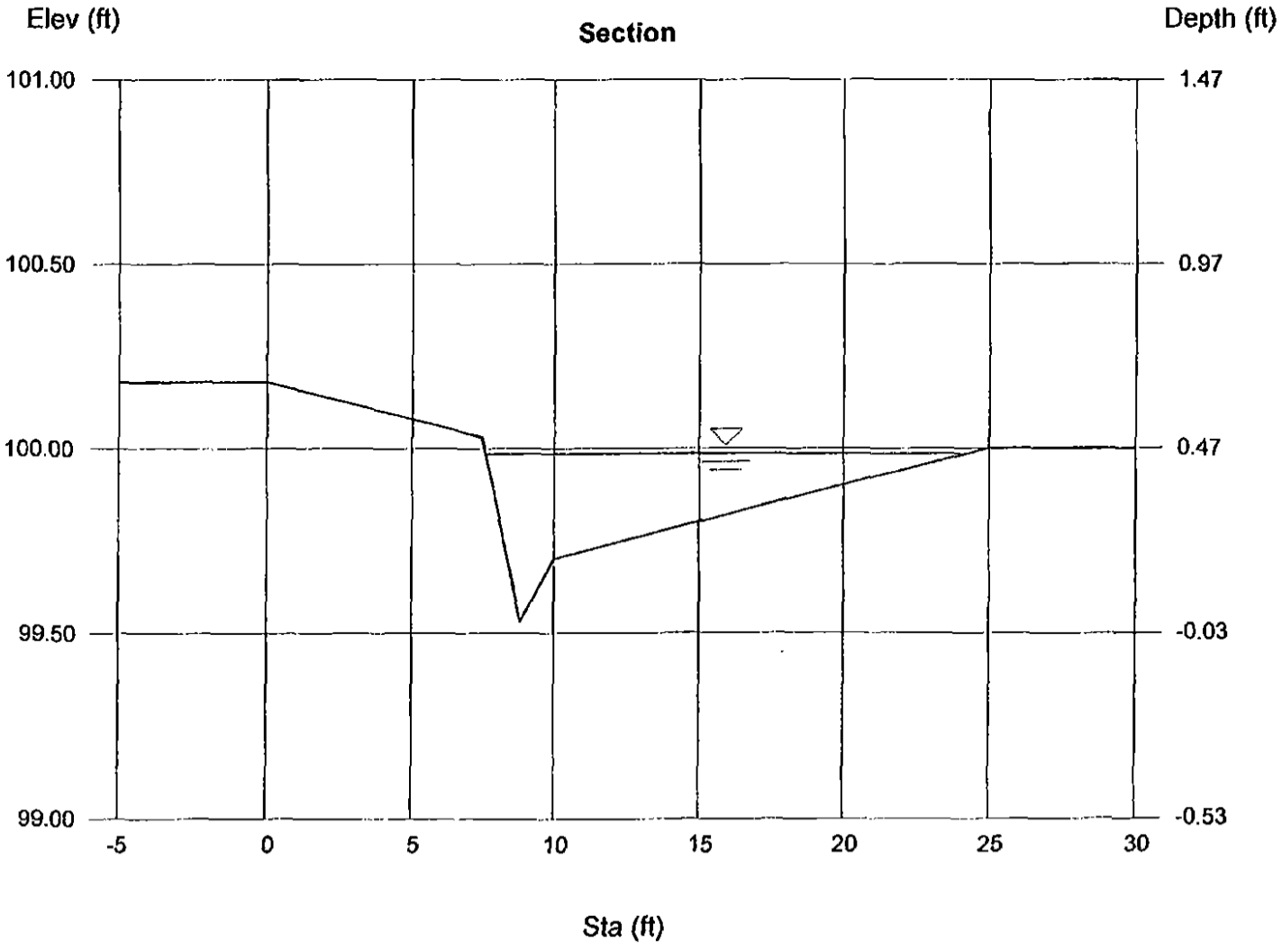
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 7.233
Area (sqft)	= 2.74
Velocity (ft/s)	= 2.64
Wetted Perim (ft)	= 16.73
Crit Depth, Yc (ft)	= 0.44
Top Width (ft)	= 16.63
EGL (ft)	= 0.56

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)



Channel Report

Hydraflow Express by Intelisolve — Tuesday, Jul 1 2014, 2:31 PM

5 year Street Capacity - 1.0%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 1.00
N-Value	= Composite

Calculations

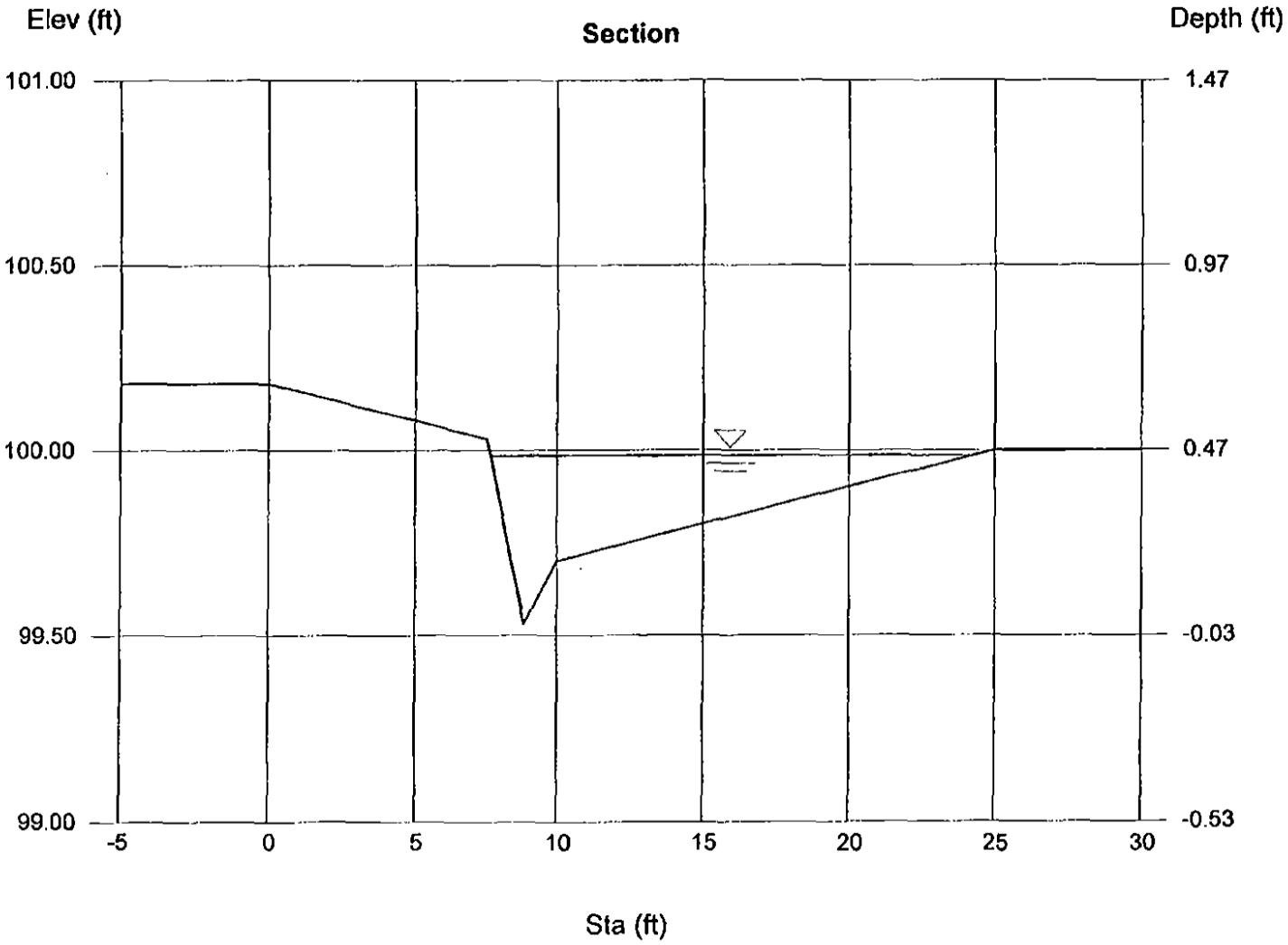
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 7.624
Area (sqft)	= 2.74
Velocity (ft/s)	= 2.78
Wetted Perim (ft)	= 16.73
Crit Depth, Yc (ft)	= 0.45
Top Width (ft)	= 16.63
EGL (ft)	= 0.58

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)



Channel Report

5 year Street Capacity - 1.1%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 1.10
N-Value	= Composite

Calculations

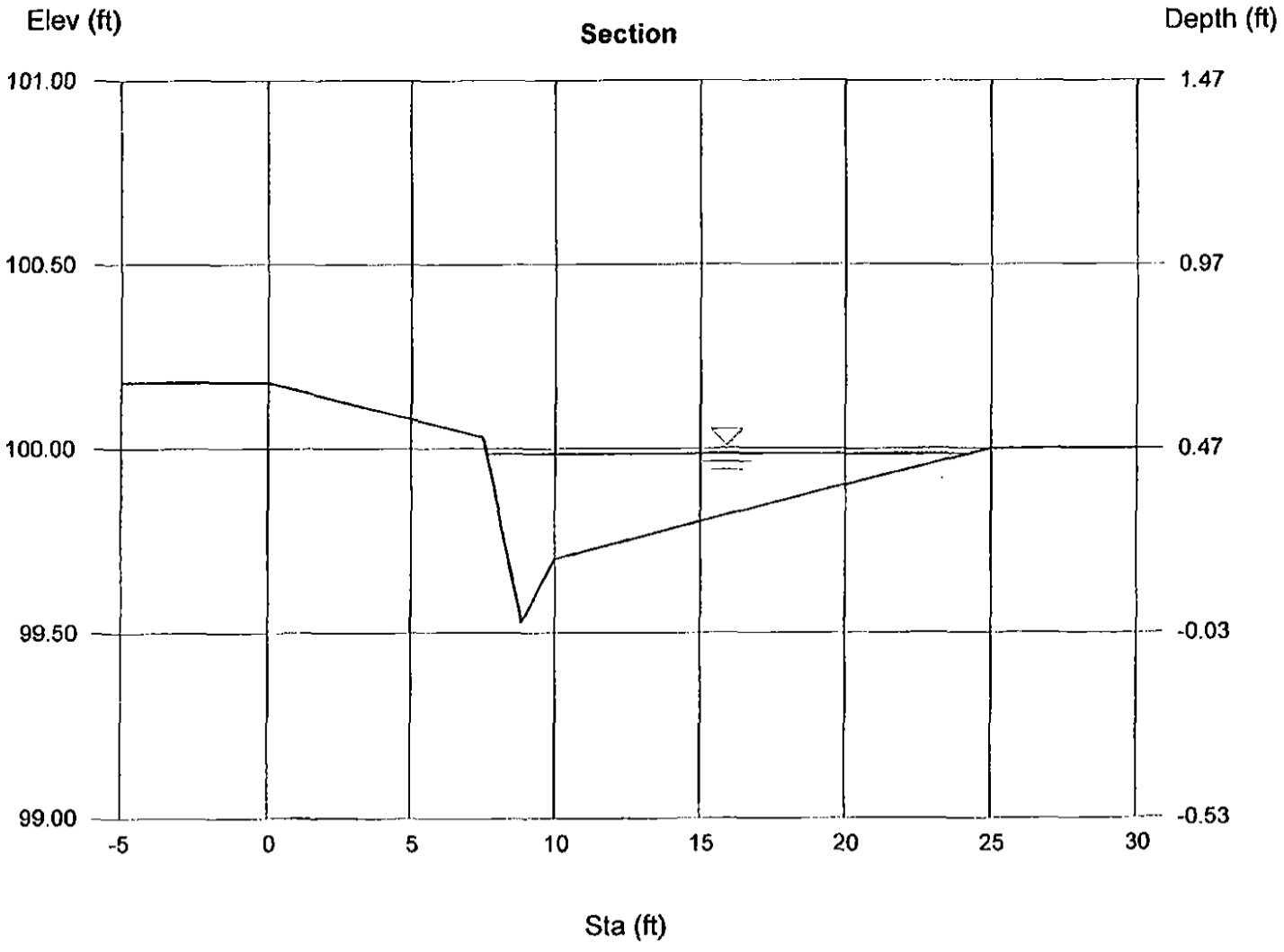
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 7.996
Area (sqft)	= 2.74
Velocity (ft/s)	= 2.92
Wetted Perim (ft)	= 16.73
Crit Depth, Yc (ft)	= 0.46
Top Width (ft)	= 16.63
EGL (ft)	= 0.59

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)



Channel Report

5 year Street Capacity - 1.2%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 1.20
N-Value	= Composite

Calculations

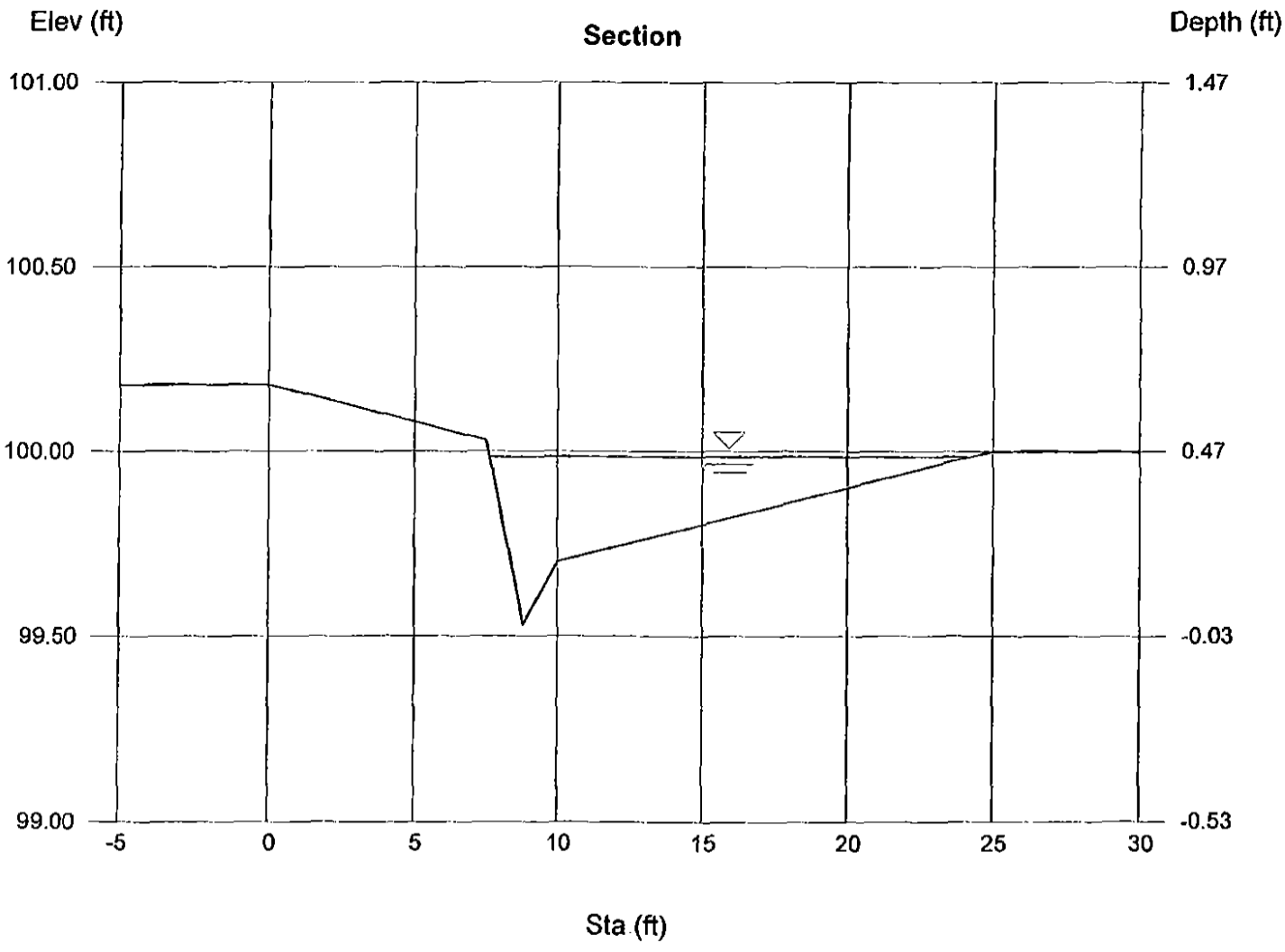
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 8.352
Area (sqft)	= 2.74
Velocity (ft/s)	= 3.05
Wetted Perim (ft)	= 16.73
Crit Depth, Yc (ft)	= 0.46
Top Width (ft)	= 16.63
EGL (ft)	= 0.60

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)



Channel Report

Hydraflow Express by Intellisolve — Tuesday, Jul 1 2014, 2:34 PM

100 year Street Capacity - 0.6%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 0.60
N-Value	= Composite

Calculations

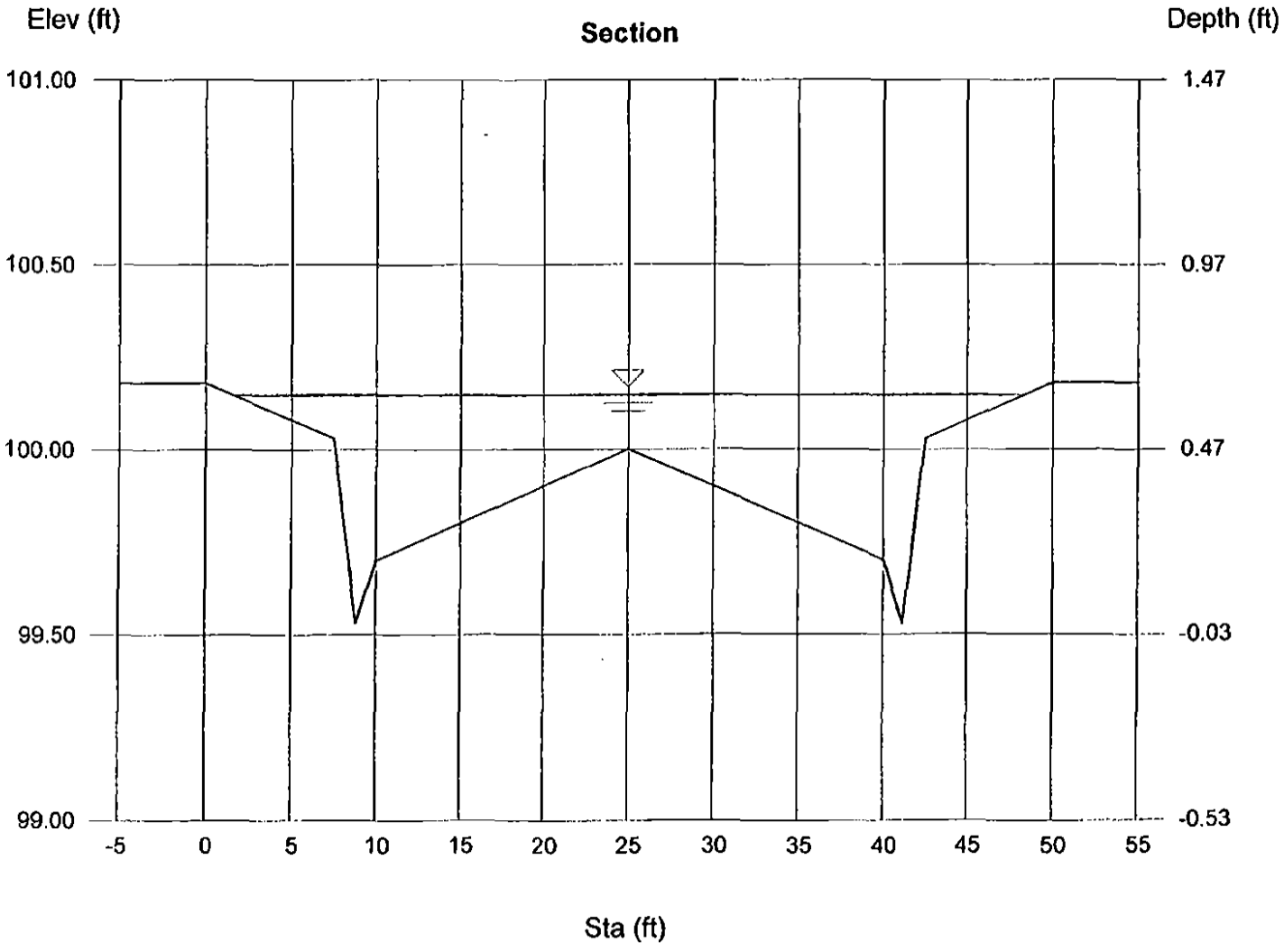
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 26.70
Area (sqft)	= 11.84
Velocity (ft/s)	= 2.25
Wetted Perim (ft)	= 46.96
Crit Depth, Yc (ft)	= 0.55
Top Width (ft)	= 46.75
EGL (ft)	= 0.70

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)-(40.00, 99.70, 0.016)-(41.17, 99.53, 0.016)-(42.50, 100.03, 0.030)-(50.00, 100.18, 0.030)



Channel Report

Hydraflow Express by Intellisolve — Tuesday, Jul 1 2014, 2:24 PM

100 year Street Capacity - 0.7%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 0.70
N-Value	= Composite

Calculations

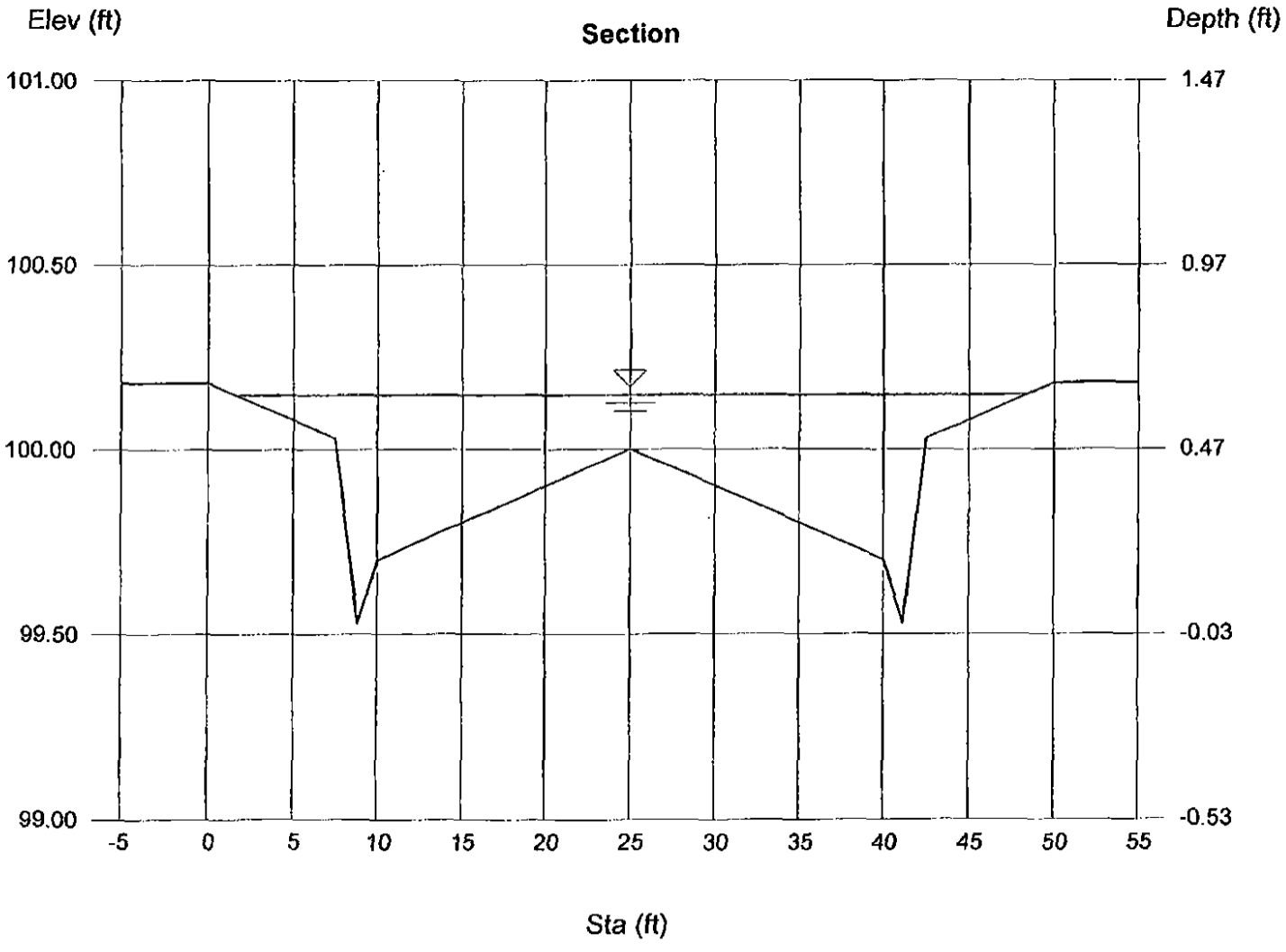
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 28.84
Area (sqft)	= 11.84
Velocity (ft/s)	= 2.44
Wetted Perim (ft)	= 46.96
Crit Depth, Yc (ft)	= 0.57
Top Width (ft)	= 46.75
EGL (ft)	= 0.71

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)-(40.00, 99.70, 0.016)-(41.17, 99.53, 0.016)-(42.50, 100.03, 0.030)-(50.00, 100.18, 0.030)



Channel Report

Hydraflow Express by Intelisolve — Tuesday, Jul 1 2014, 2:25 PM

100 year Street Capacity - 0.8%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 0.80
N-Value	= Composite

Calculations

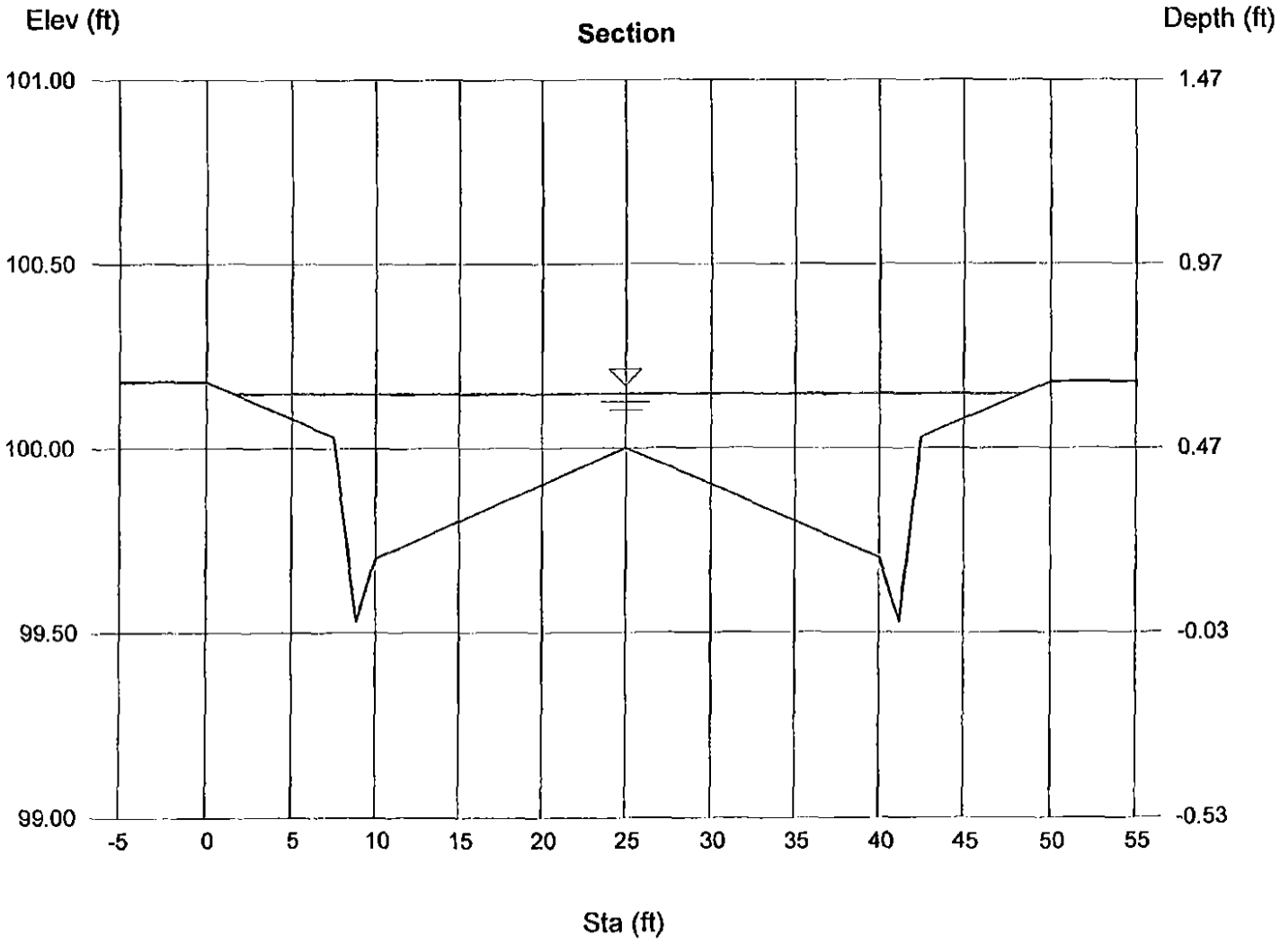
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 30.83
Area (sqft)	= 11.84
Velocity (ft/s)	= 2.60
Wetted Perim (ft)	= 46.96
Crit Depth, Yc (ft)	= 0.58
Top Width (ft)	= 46.75
EGL (ft)	= 0.72

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)-(40.00, 99.70, 0.016)-(41.17, 99.53, 0.016)-(42.50, 100.03, 0.030)-(50.00, 100.18, 0.030)



Channel Report

Hydraflow Express by Intellisolve — Tuesday, Jul 1 2014, 2:25 PM

100 year Street Capacity - 0.9%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 0.90
N-Value	= Composite

Calculations

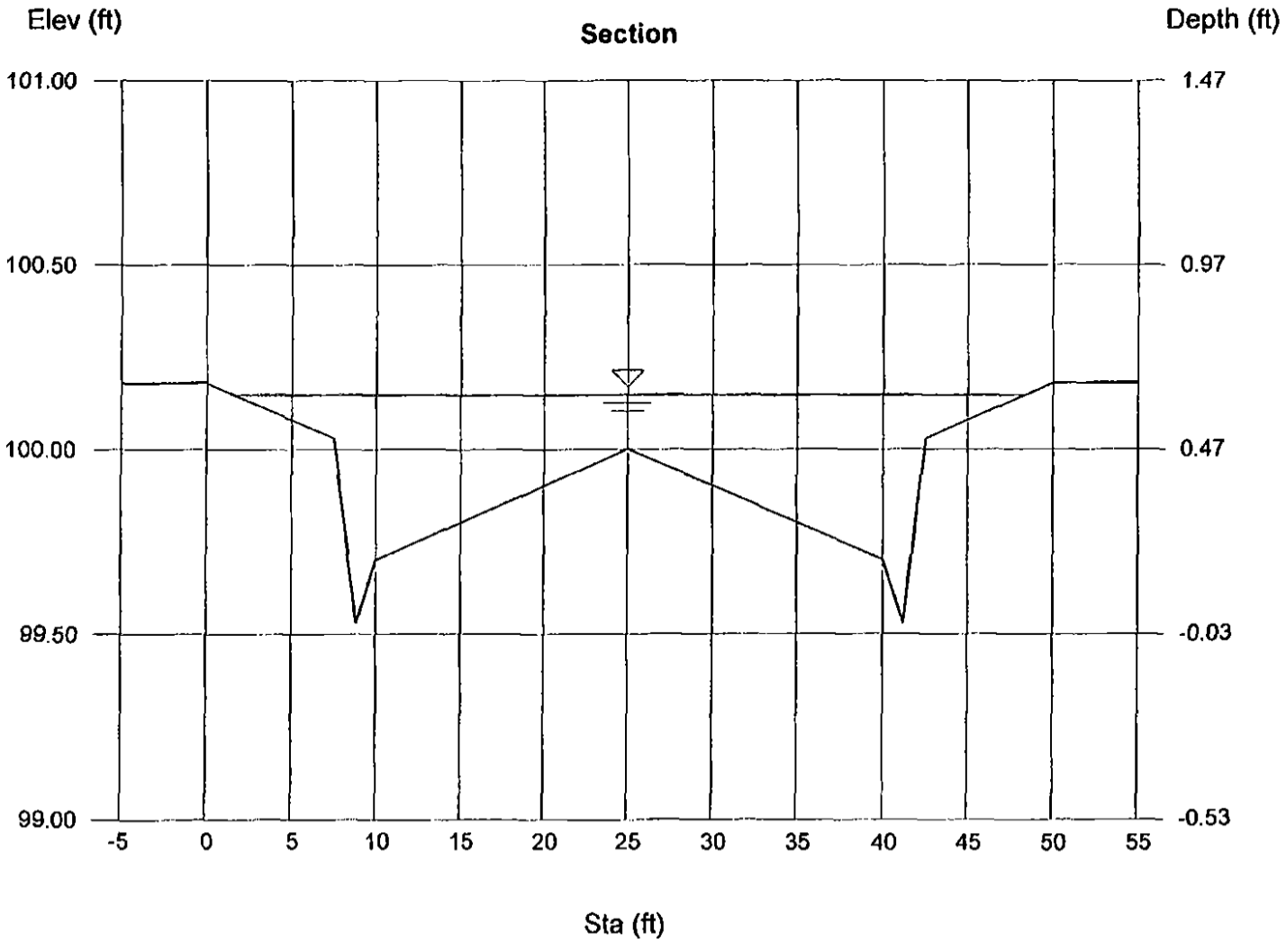
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 32.70
Area (sqft)	= 11.84
Velocity (ft/s)	= 2.76
Wetted Perim (ft)	= 46.96
Crit Depth, Yc (ft)	= 0.59
Top Width (ft)	= 46.75
EGL (ft)	= 0.74

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)-(40.00, 99.70, 0.016)-(41.17, 99.53, 0.016)-(42.50, 100.03, 0.030)-(50.00, 100.18, 0.030)



Channel Report

Hydraflow Express by Intelisolve — Tuesday, Jul 1 2014, 2:26 PM

100 year Street Capacity - 1.0%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 1.00
N-Value	= Composite

Calculations

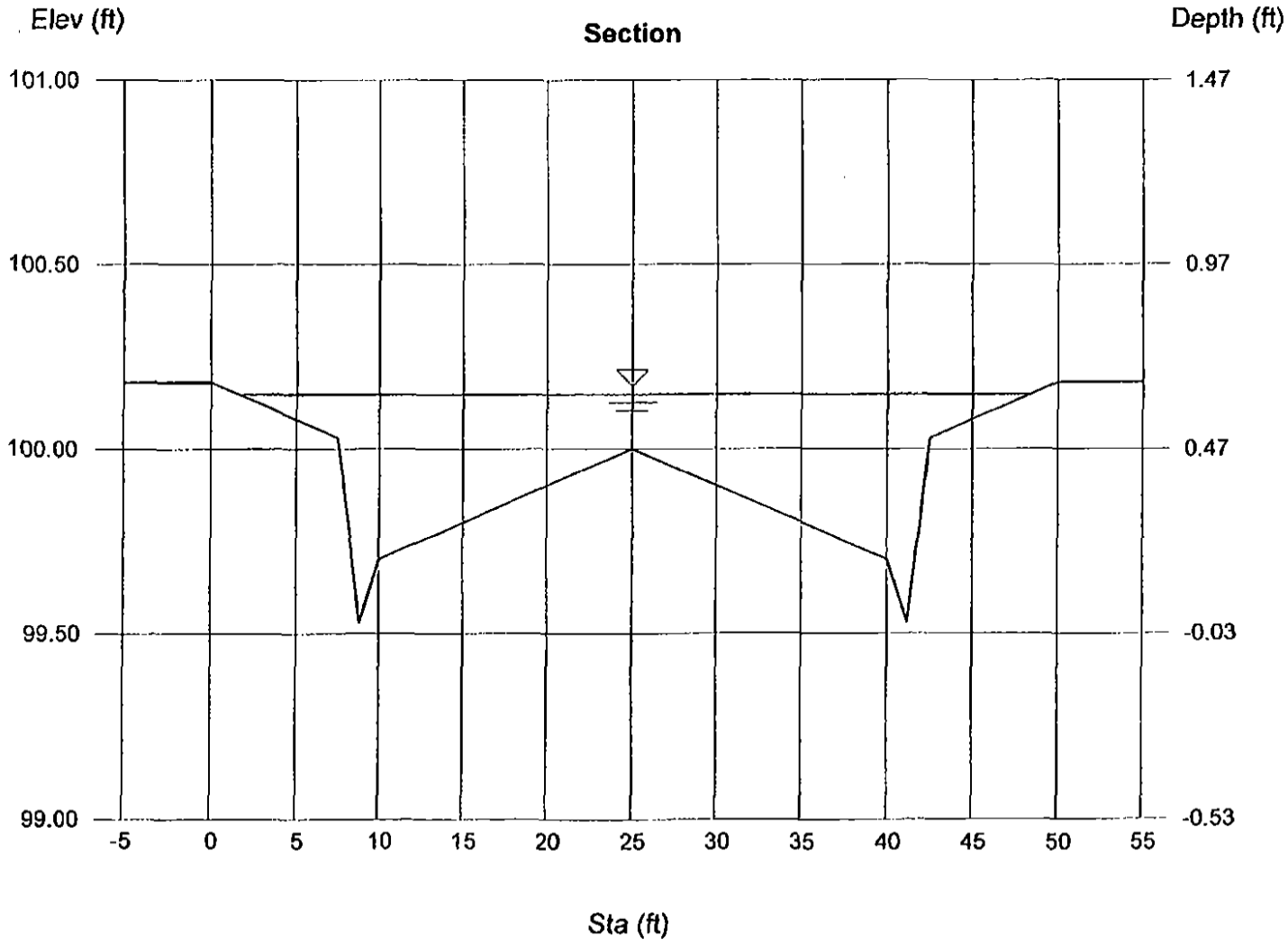
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 34.47
Area (sqft)	= 11.84
Velocity (ft/s)	= 2.91
Wetted Perim (ft)	= 46.96
Crit Depth, Yc (ft)	= 0.60
Top Width (ft)	= 46.75
EGL (ft)	= 0.75

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)-(40.00, 99.70, 0.016)-(41.17, 99.53, 0.016)-(42.50, 100.03, 0.030)-(50.00, 100.18, 0.030)



Channel Report

Hydraflow Express by Intellisolve — Tuesday, Jul 1 2014, 2:26 PM

100 year Street Capacity - 1.1%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 1.10
N-Value	= Composite

Calculations

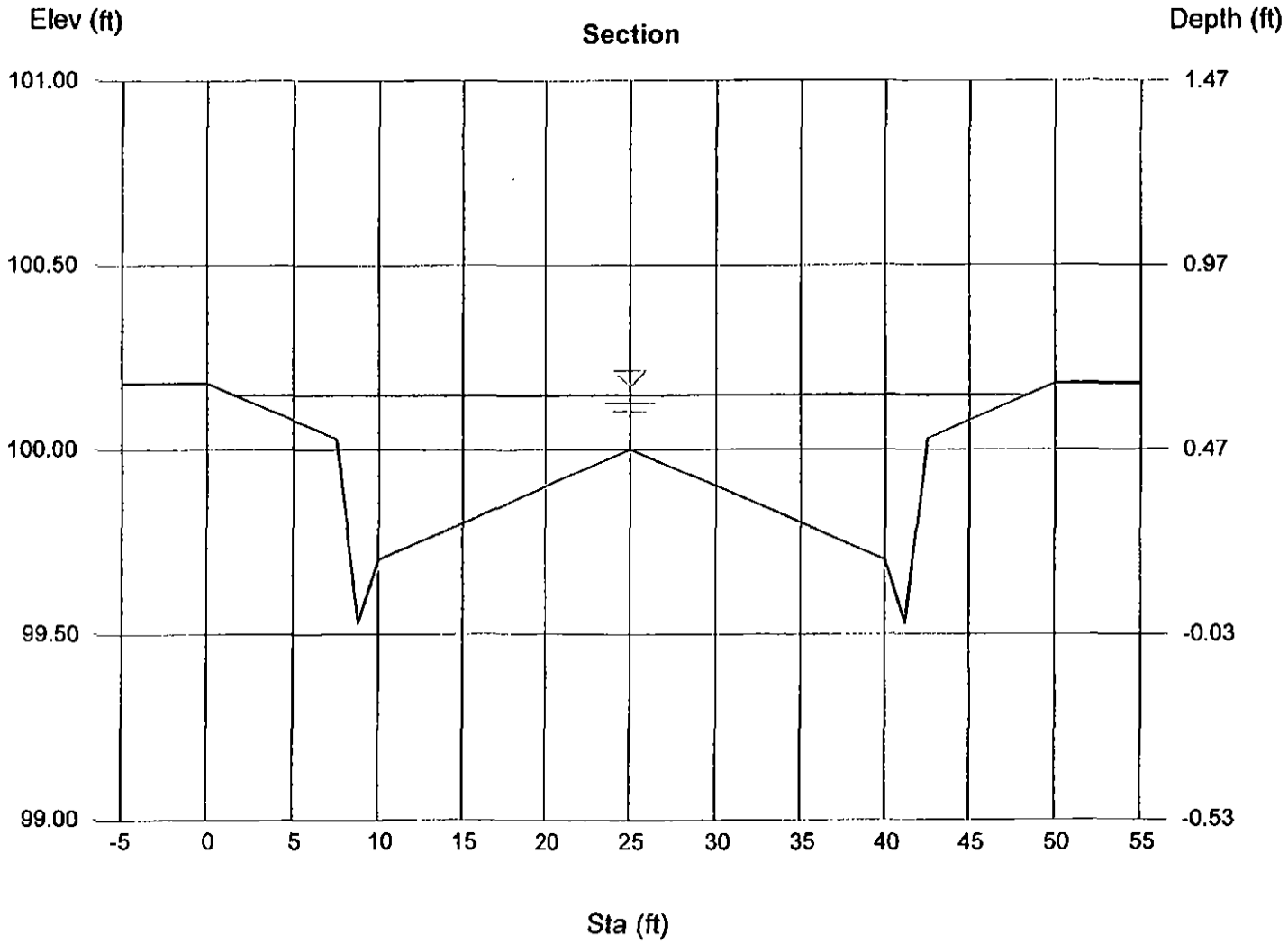
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 36.15
Area (sqft)	= 11.84
Velocity (ft/s)	= 3.05
Wetted Perim (ft)	= 46.96
Crit Depth, Yc (ft)	= 0.61
Top Width (ft)	= 46.75
EGL (ft)	= 0.76

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)-(40.00, 99.70, 0.016)-(41.17, 99.53, 0.016)-(42.50, 100.03, 0.030)-(50.00, 100.18, 0.030)



Channel Report

100 year Street Capacity - 1.2%

User-defined

Invert Elev (ft)	= 99.53
Slope (%)	= 1.20
N-Value	= Composite

Calculations

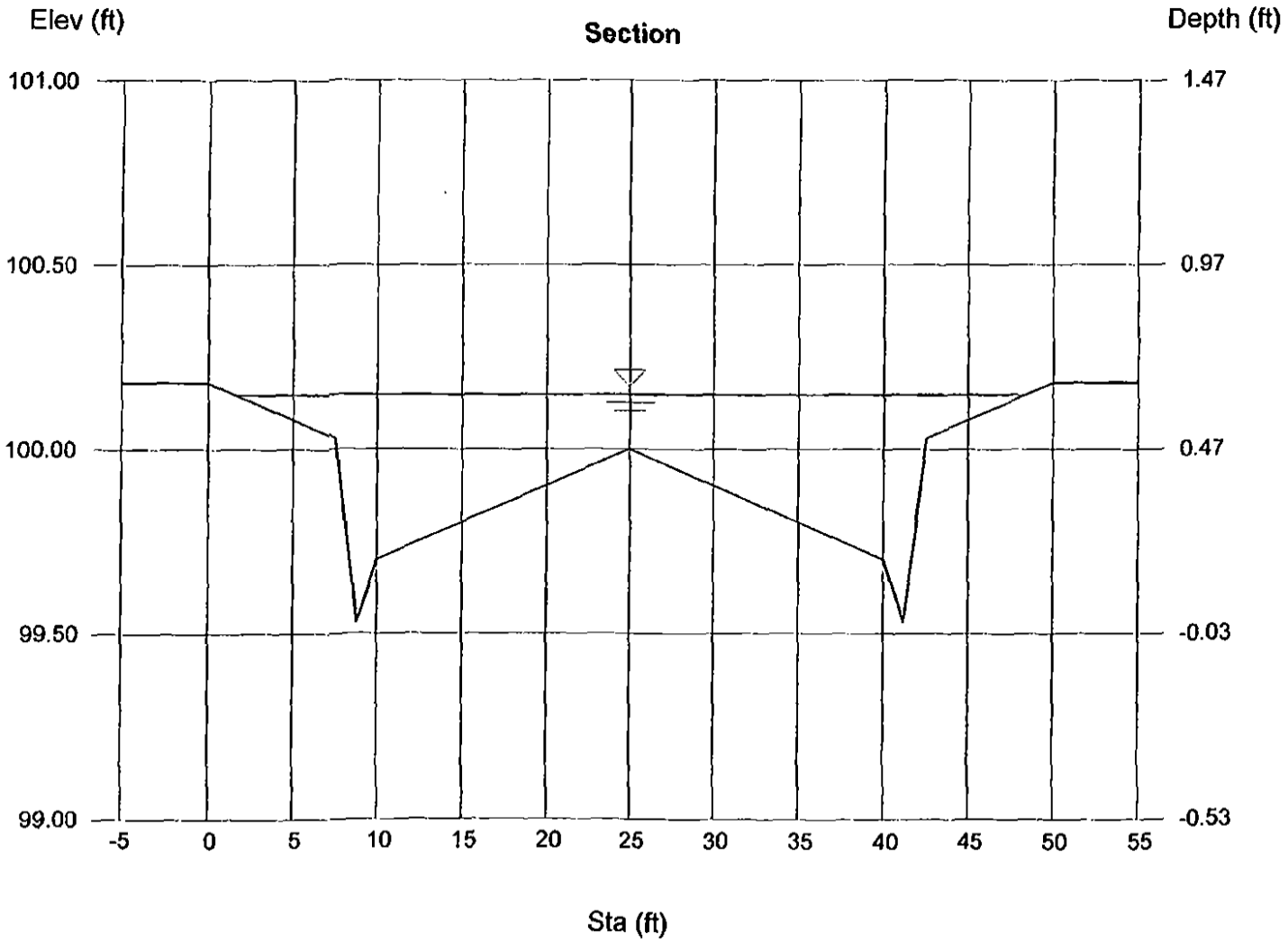
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

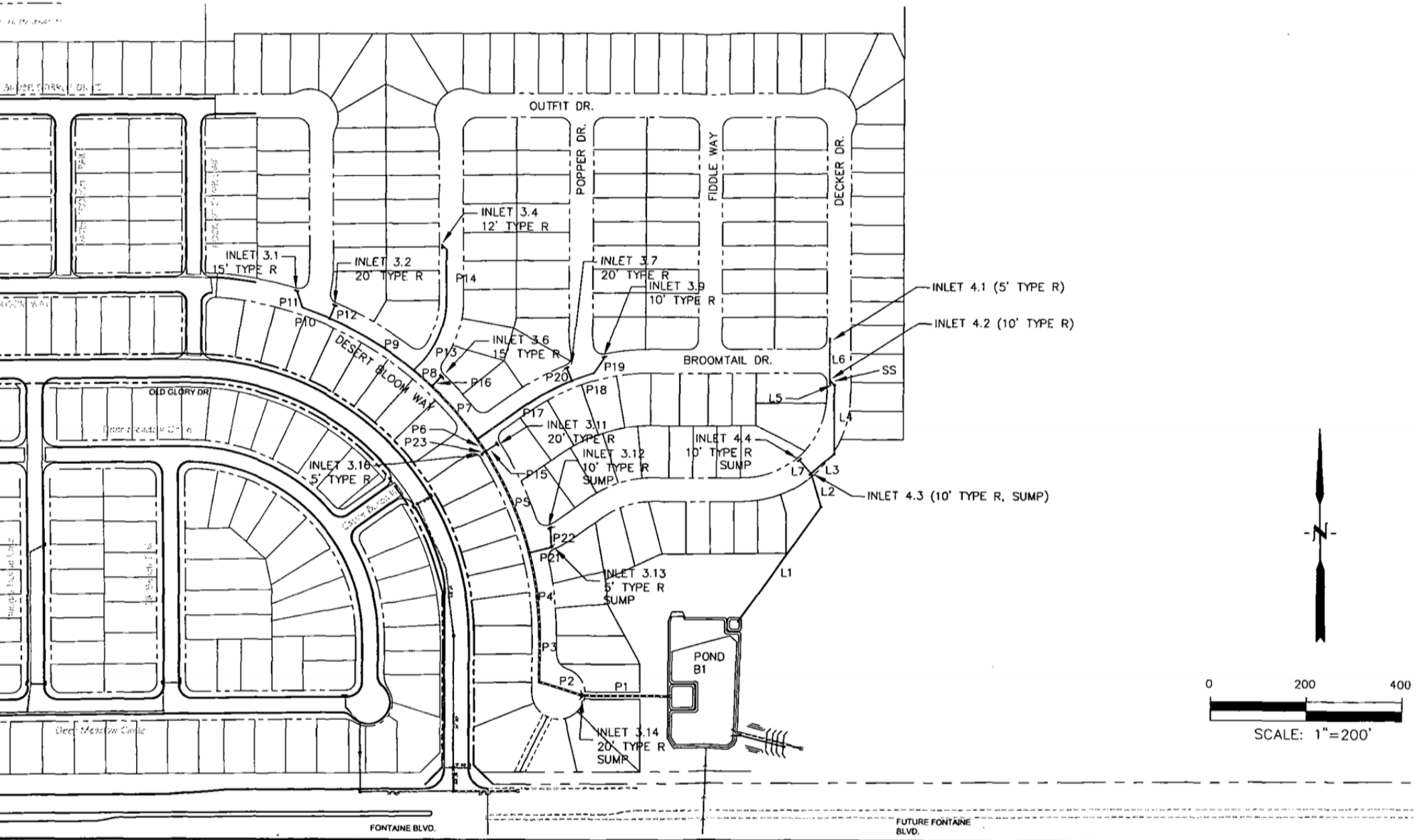
Depth (ft)	= 0.62
Q (cfs)	= 37.75
Area (sqft)	= 11.84
Velocity (ft/s)	= 3.19
Wetted Perim (ft)	= 46.96
Crit Depth, Yc (ft)	= 0.62
Top Width (ft)	= 46.75
EGL (ft)	= 0.78

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.18)-(7.50, 100.03, 0.030)-(8.83, 99.53, 0.016)-(10.00, 99.70, 0.016)-(25.00, 100.00, 0.016)-(40.00, 99.70, 0.016)-(41.17, 99.53, 0.016) -(42.50, 100.03, 0.030)-(50.00, 100.18, 0.030)



APPENDIX C – STORM SEWER SCHEMATIC & CALCULATIONS



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PIONEER LANDING FIL. 2
STORM SEWER SCHEMATIC LAYOUT

SCALE:	DATE:	FIGURE NO.
1"=200'	SEPTEMBER, 2014	1

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	L1	16.97	30 c	286.0	5706.29	5713.17	2.406	5708.79	5714.55	n/a	5714.55 j	End
2	L2	17.23	30 c	110.9	5714.78	5717.50	2.453	5715.66	5718.89	0.83	5718.89	1
3	L3	9.79	24 c	61.1	5717.60	5718.22	1.015	5719.33	5719.33	n/a	5719.33 j	2
4	L4	10.07	24 c	149.6	5718.22	5719.73	1.009	5719.64	5720.85	n/a	5720.85 j	3
5	L5	5.14	24 c	14.0	5719.93	5720.16	1.643	5721.15	5721.07	0.21	5721.28	4
6	L6	5.11	18 c	83.9	5720.76	5721.68	1.097	5721.48	5722.54	n/a	5722.54	4
7	L7	3.00	18 c	34.3	5718.40	5718.79	1.137	5719.43	5719.45	n/a	5719.45 j	2

100.028-B4 basins-5yr | Number of lines: 7 | Run Date: 05-06-2016

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	286.0	-48.5	MH	0.00	0.00	0.00	0.0	5706.29	2.41	5713.17	30	Cir	0.013	0.88	5720.00	L1
2	1	110.9	-58.9	Curb	0.00	1.74	0.65	9.0	5714.78	2.45	5717.50	30	Cir	0.013	1.41	5722.36	L2
3	2	61.1	68.5	MH	0.00	0.00	0.00	0.0	5717.60	1.01	5718.22	24	Cir	0.013	0.82	5723.00	L3
4	3	149.6	-52.2	MH	0.00	0.00	0.00	0.0	5718.22	1.01	5719.73	24	Cir	0.013	0.75	5725.00	L4
5	4	14.0	-45.1	Curb	0.00	1.83	0.65	10.0	5719.93	1.64	5720.16	24	Cir	0.013	1.00	5725.20	L5
6	4	83.9	-5.7	Curb	0.00	1.82	0.65	10.0	5720.76	1.10	5721.68	18	Cir	0.013	1.00	5726.40	L6
7	2	34.3	-23.1	Curb	0.00	1.11	0.65	11.0	5718.40	1.14	5718.79	18	Cir	0.013	1.00	5722.36	L7

Storm Sewer Tabu ation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	286.0	0.00	6.50	0.00	0.00	4.23	0.0	12.0	4.0	16.97	63.61	4.79	30	2.41	5713.17	5706.29	5714.55	5708.79	5720.00	5708.00	L1
2	1	110.9	1.74	6.50	0.65	1.13	4.23	9.0	11.6	4.1	17.23	64.24	8.62	30	2.45	5717.50	5714.78	5718.89	5715.66	5722.36	5720.00	L2
3	2	61.1	0.00	3.65	0.00	0.00	2.37	0.0	11.3	4.1	9.79	22.78	4.44	24	1.01	5718.22	5717.60	5719.33	5719.33	5723.00	5722.36	L3
4	3	149.6	0.00	3.65	0.00	0.00	2.37	0.0	10.5	4.2	10.07	22.72	4.89	24	1.01	5719.73	5718.22	5720.85	5719.64	5725.00	5723.00	L4
5	4	14.0	1.83	1.83	0.65	1.19	1.19	10.0	10.0	4.3	5.14	28.99	3.13	24	1.64	5720.16	5719.93	5721.07	5721.15	5725.20	5725.00	L5
6	4	83.9	1.82	1.82	0.65	1.18	1.18	10.0	10.0	4.3	5.11	11.00	5.48	18	1.10	5721.68	5720.76	5722.54	5721.48	5726.40	5725.00	L6
7	2	34.3	1.11	1.11	0.65	0.72	0.72	11.0	11.0	4.2	3.00	11.20	3.16	18	1.14	5718.79	5718.40	5719.45	5719.43	5722.36	5722.36	L7

100.028-B4 basins-5yr | Number of lines: 7 | Run Date: 05-06-2016

NOTES: Intensity = 42.11 / (Inlet time + 10.00) ^ 0.76; Return period = 5 Yrs.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1		0.00	0.00	0.00	0.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
2	4.3	5.08	0.00	5.08	0.00	Curb	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.42	14.80	0.46	14.80	2.00	1
3		0.00	0.00	0.00	0.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	2
4		0.00	0.00	0.00	0.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	3
5	4.2	5.14	2.94	4.92	3.15	Curb	6.0	10.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.40	13.90	0.44	13.57	2.00	7
6	4.1	5.11	0.00	2.18	2.94	Curb	6.0	5.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.35	11.45	0.39	11.07	2.00	5
7	4.4	3.00	3.15	6.16	0.00	Curb	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.46	16.83	0.50	16.83	2.00	2

100.028-B4 basins-5yr | Number of lines: 7 | Run Date: 05-06-2016

NOTES: Inlet N-Values = 0.016 ; Intensity = 42.11 / (Inlet time + 10.00) ^ 0.76; Return period = 5 Yrs. ; * Indicates Known Q added

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	L1	35.56	30 c	286.0	5706.29	5713.17	2.406	5708.79	5715.16	n/a	5715.16 j	End
2	L2	35.89	30 c	110.9	5714.78	5717.50	2.453	5716.12	5719.72	1.33	5721.05	1
3	L3	20.56	24 c	61.1	5717.60	5718.22	1.015	5721.33*	5721.83*	0.55	5722.38	2
4	L4	20.85	24 c	149.6	5718.22	5719.73	1.009	5722.38*	5723.65*	0.51	5724.16	3
5	L5	10.55	24 c	14.0	5719.93	5720.16	1.643	5724.67*	5724.70*	0.18	5724.88	4
6	L6	10.49	18 c	82.9	5720.76	5721.68	1.110	5724.30*	5725.13*	0.55	5725.68	4
7	L7	6.16	18 c	34.3	5718.40	5718.79	1.137	5721.80*	5721.92*	0.19	5722.11	2

100.028-B4 basins-100yr | Number of lines: 7 | Run Date: 05-06-2016

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	286.0	-48.5	MH	0.00	0.00	0.00	0.0	5706.29	2.41	5713.17	30	Cir	0.013	0.88	5720.00	L1
2	1	110.9	-58.9	Curb	0.00	1.74	0.75	9.0	5714.78	2.45	5717.50	30	Cir	0.013	1.41	5722.36	L2
3	2	61.1	68.5	MH	0.00	0.00	0.00	0.0	5717.60	1.01	5718.22	24	Cir	0.013	0.82	5723.00	L3
4	3	149.6	-52.2	MH	0.00	0.00	0.00	0.0	5718.22	1.01	5719.73	24	Cir	0.013	0.75	5725.00	L4
5	4	14.0	-45.1	Curb	0.00	1.83	0.75	10.0	5719.93	1.64	5720.16	24	Cir	0.013	1.00	5725.20	L5
6	4	82.9	-4.8	Curb	0.00	1.82	0.75	10.0	5720.76	1.11	5721.68	18	Cir	0.013	1.00	5726.40	L6
7	2	34.3	-23.1	Curb	0.00	1.11	0.75	11.0	5718.40	1.14	5718.79	18	Cir	0.013	1.00	5722.36	L7

Storm Sewer Tabu ation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(In/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	286.0	0.00	6.50	0.00	0.00	4.88	0.0	11.4	7.3	35.56	63.61	7.86	30	2.41	5713.17	5706.29	5715.16	5708.79	5720.00	5708.00	L1
2	1	110.9	1.74	6.50	0.75	1.31	4.88	9.0	11.2	7.4	35.89	64.24	10.61	30	2.45	5717.50	5714.78	5719.72	5716.12	5722.36	5720.00	L2
3	2	61.1	0.00	3.65	0.00	0.00	2.74	0.0	10.6	7.5	20.56	22.78	6.55	24	1.01	5718.22	5717.60	5721.83	5721.33	5723.00	5722.36	L3
4	3	149.6	0.00	3.65	0.00	0.00	2.74	0.0	10.2	7.6	20.85	22.72	6.64	24	1.01	5719.73	5718.22	5723.65	5722.38	5725.00	5723.00	L4
5	4	14.0	1.83	1.83	0.75	1.37	1.37	10.0	10.0	7.7	10.55	28.99	3.36	24	1.64	5720.16	5719.93	5724.70	5724.67	5725.20	5725.00	L5
6	4	82.9	1.82	1.82	0.75	1.37	1.37	10.0	10.0	7.7	10.49	11.06	5.94	18	1.11	5721.68	5720.76	5725.13	5724.30	5726.40	5725.00	L6
7	2	34.3	1.11	1.11	0.75	0.83	0.83	11.0	11.0	7.4	6.16	11.20	3.49	18	1.14	5718.79	5718.40	5721.92	5721.80	5722.36	5722.36	L7

100.028-B4 basins-100yr | Number of lines: 7 | Run Date: 05-06-2016

NOTES: Intensity = 74.89 / (Inlet time + 10.00) ^ 0.76; Return period = 100 Yrs.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1		0.00	0.00	0.00	0.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	Off
2	4.3	10.43	0.00	10.43	0.00	Curb	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.60	23.95	0.65	23.95	2.00	1
3		0.00	0.00	0.00	0.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	2
4		0.00	0.00	0.00	0.00	MH	6.0	6.00	2.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	3
5	4.2	10.55	7.41	7.49	10.47	Curb	6.0	10.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.50	19.20	0.55	18.97	2.00	7
6	4.1	10.49	0.00	3.08	7.41	Curb	6.0	5.00	2.00	4.00	2.00	0.010	2.00	0.080	0.020	0.013	0.43	15.50	0.47	15.22	2.00	5
7	4.4	6.16	10.47	16.64	0.00	Curb	6.0	10.00	2.00	4.00	2.00	Sag	2.00	0.080	0.020	0.013	0.78	32.76	0.82	32.76	2.00	2

100.028-B4 basins-100yr | Number of lines: 7 | Run Date: 05-06-2016

NOTES: Inlet N-Values = 0.016 ; Intensity = 74.89 / (Inlet time + 10.00) ^ 0.76; Return period = 100 Yrs. ; * Indicates Known Q added

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	P1	48.16	48 c	187.0	5707.00	5708.87	1.000	5709.09	5710.92	n/a	5710.92 j	End
2	P2	43.78	48 c	89.4	5710.77	5711.45	0.761	5712.40	5713.42	0.78	5714.17	1
3	P3	44.32	48 c	98.0	5711.45	5712.15	0.714	5714.33	5714.13	n/a	5714.25 j	2
4	P4	45.31	48 c	177.7	5712.15	5713.50	0.760	5714.84	5715.49	n/a	5715.49 j	3
5	P5	41.26	48 c	230.1	5713.70	5715.77	0.900	5716.14	5717.67	n/a	5717.67 j	4
6	P6	38.38	48 c	30.5	5715.97	5716.23	0.852	5718.30	5718.14	0.58	5718.73	5
7	P7	26.88	42 c	146.6	5716.73	5717.92	0.812	5719.19	5719.51	n/a	5719.51 j	6
8	P8	19.82	36 c	52.0	5718.42	5719.13	1.365	5720.01	5720.55	n/a	5720.55	7
9	P9	14.63	30 c	205.8	5719.63	5720.74	0.539	5720.98	5722.02	n/a	5722.02 j	8
10	P10	5.88	24 c	61.5	5721.34	5721.79	0.732	5722.49	5722.65	n/a	5722.65 j	9
11	P11	5.95	24 c	37.5	5721.80	5722.19	1.040	5722.92	5723.05	n/a	5723.05 j	10
12	P12	9.52	24 c	29.1	5721.44	5721.60	0.550	5722.52	5722.70	0.45	5723.15	9
13	P13	6.52	24 c	113.0	5720.23	5720.91	0.602	5721.07	5721.81	0.21	5721.81	8
14	P14	6.82	24 c	183.3	5720.91	5722.23	0.808	5722.09	5723.16	n/a	5723.16 j	13
15	P15	3.99	18 c	31.0	5718.27	5718.55	0.903	5718.93	5719.32	0.30	5719.62	5
16	P16	8.42	24 c	27.6	5719.27	5719.63	1.306	5720.06	5720.84	0.28	5721.12	7
17	P17	12.62	30 c	229.1	5717.73	5719.39	0.725	5719.21	5720.57	n/a	5720.57 j	6
18	P18	3.51	18 c	47.1	5720.39	5720.81	0.891	5721.01	5721.53	0.17	5721.53	17
19	P19	3.56	18 c	44.1	5720.81	5721.62	1.837	5721.74	5722.34	n/a	5722.34 j	18
20	P20	9.18	24 c	32.8	5719.84	5720.20	1.107	5720.91	5721.27	n/a	5721.27	17
21	P21	6.57	24 c	44.7	5715.50	5715.92	0.939	5716.25	5716.83	0.51	5717.34	4
22	P22	5.60	24 c	39.7	5716.12	5716.42	0.754	5717.52	5717.50	0.16	5717.66	21
23	P23	2.96	18 c	5.0	5718.27	5718.28	0.195	5719.14	5719.15	0.12	5719.27	5

5-year flows | Number of lines: 23 | Run Date: 09-01-2014

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Lon	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	187.0	2.33	23.26	0.65	1.51	15.00	9.0	19.6	3.2	48.16	143.7	7.33	48	1.00	5708.87	5707.00	5710.92	5709.09	5716.74	5707.00	P1
2	1	89.4	0.00	20.93	0.00	0.00	13.48	0.0	19.1	3.2	43.78	125.3	8.10	48	0.76	5711.45	5710.77	5713.42	5712.40	5717.94	5716.74	P2
3	2	98.0	0.00	20.93	0.00	0.00	13.48	0.0	18.7	3.3	44.32	121.4	5.86	48	0.71	5712.15	5711.45	5714.13	5714.33	5718.50	5717.94	P3
4	3	177.7	0.00	20.93	0.00	0.00	13.48	0.0	17.8	3.4	45.31	125.2	6.15	48	0.76	5713.50	5712.15	5715.49	5714.84	5720.24	5718.50	P4
5	4	230.1	0.00	18.47	0.00	0.00	11.88	0.0	16.7	3.5	41.26	136.3	6.07	48	0.90	5715.77	5713.70	5717.67	5716.14	5722.12	5720.24	P5
6	5	30.5	0.00	16.23	0.00	0.00	10.43	0.0	16.5	3.5	36.38	132.6	5.45	48	0.85	5716.23	5715.97	5718.14	5718.30	5722.38	5722.12	P6
7	6	146.6	0.00	11.74	0.00	0.00	7.51	0.0	15.6	3.6	26.88	90.63	5.03	42	0.81	5717.92	5716.73	5719.51	5719.19	5723.51	5722.38	P7
8	7	52.0	0.00	8.63	0.00	0.00	5.49	0.0	15.3	3.6	19.82	77.92	5.62	36	1.36	5719.13	5718.42	5720.55	5720.01	5723.88	5723.51	P8
9	8	205.8	0.00	6.20	0.00	0.00	3.91	0.0	14.2	3.7	14.63	30.12	5.61	30	0.54	5720.74	5719.63	5722.02	5720.98	5725.48	5723.88	P9
10	9	61.5	0.00	2.12	0.00	0.00	1.38	0.0	10.3	4.3	5.88	19.35	3.86	24	0.73	5721.79	5721.34	5722.65	5722.49	5726.00	5725.48	P10
11	10	37.5	2.12	2.12	0.65	1.38	1.38	10.0	10.0	4.3	5.95	23.07	3.94	24	1.04	5722.19	5721.80	5723.05	5722.92	5726.47	5726.00	P11
12	9	29.1	4.08	4.08	0.62	2.53	2.53	14.0	14.0	3.8	9.52	16.77	5.45	24	0.55	5721.60	5721.44	5722.70	5722.52	5725.71	5725.48	P12
13	8	113.0	0.00	2.43	0.00	0.00	1.58	0.0	11.3	4.1	6.52	17.55	4.95	24	0.60	5720.91	5720.23	5721.81	5721.07	5724.60	5723.88	P13
14	13	163.3	2.43	2.43	0.65	1.58	1.58	10.0	10.0	4.3	6.82	20.34	4.17	24	0.81	5722.23	5720.91	5723.16	5722.09	5726.03	5724.60	P14
15	5	31.0	1.31	1.31	0.65	0.85	0.85	8.0	8.0	4.7	3.99	9.98	4.86	18	0.90	5718.55	5718.27	5719.32	5718.93	5722.36	5722.12	P15
16	7	27.6	3.11	3.11	0.65	2.02	2.02	11.0	11.0	4.2	8.42	25.85	5.80	24	1.31	5719.83	5719.27	5720.84	5720.06	5723.75	5723.51	P16
17	6	229.1	0.00	4.49	0.00	0.00	2.92	0.0	10.2	4.3	12.52	34.91	4.81	30	0.72	5719.39	5717.73	5720.57	5719.21	5724.19	5722.38	P17
18	17	47.1	0.00	1.22	0.00	0.00	0.79	0.0	9.4	4.4	3.51	9.91	4.67	18	0.89	5720.81	5720.39	5721.53	5721.01	5724.25	5724.19	P18
19	18	44.1	1.22	1.22	0.65	0.79	0.79	9.0	9.0	4.5	3.56	14.23	3.67	18	1.84	5721.62	5720.81	5722.34	5721.74	5725.37	5724.25	P19
20	17	32.6	3.27	3.27	0.65	2.13	2.13	10.0	10.0	4.3	9.18	23.79	5.37	24	1.11	5720.20	5719.84	5721.27	5720.91	5724.46	5724.19	P20
21	4	44.7	0.39	2.46	0.65	0.25	1.60	6.0	11.4	4.1	6.57	21.92	5.40	24	0.94	5715.92	5715.50	5716.83	5716.25	5720.70	5720.24	P21

5-year flows

Number of lines: 23

Run Date: 09-01-2014

NOTES: Intensity = 42.11 / (Inlet time + 10.00) ^ 0.76; Return period = 5 Yrs.

Storm Sewer Tabulation

Station		Lon	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
22	21	39.7	2.07	2.07	0.65	1.35	1.35	11.0	11.0	4.2	5.60	19.65	2.82	24	0.75	5716.42	5716.12	5717.50	5717.52	5720.70	5720.70	P22
23	5	5.0	0.93	0.93	0.65	0.60	0.60	7.0	7.0	4.9	2.96	4.64	2.78	18	0.20	5718.28	5718.27	5719.15	5719.14	5722.36	5722.12	P23

5-yoar flows | Number of lines: 23 | Run Date: 09-01-2014

NOTES: Intensity = 42.11 / (Inlet time + 10.00) ^ 0.76; Return period = 5 Yrs.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	3.14	6.80	1.23	8.03	0.00	Curb	6.0	20.00	0.00	0.00	0.00	Sag	2.00	0.086	0.020	0.000	0.39	13.00	0.51	13.00	3.00	Off
2		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
3		0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
4		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
5		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
6		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
7		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
8		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
9		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
10		0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
11	3.1	5.95	0.00	5.53	0.42	Curb	6.0	15.00	0.00	0.00	0.00	0.008	2.00	0.084	0.020	0.013	0.38	12.75	0.42	12.47	2.00	12
12	3.2	9.52	0.42	9.21	0.73	Curb	6.0	20.00	0.00	0.00	0.00	0.008	2.00	0.085	0.020	0.013	0.45	15.80	0.48	15.57	2.00	16
13		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
14	3.4	6.82	0.00	5.16	1.67	Curb	6.0	12.00	0.00	0.00	0.00	0.010	2.00	0.085	0.020	0.013	0.39	12.90	0.42	12.62	2.00	16
15	3.11	3.99	3.46	7.33	0.11	Curb	6.0	20.00	0.00	0.00	0.00	0.008	2.00	0.085	0.020	0.013	0.41	14.00	0.44	13.77	2.00	22
16	3.6	8.42	2.40	8.22	2.60	Curb	6.0	15.00	0.00	0.00	0.00	0.008	2.00	0.085	0.020	0.013	0.46	16.35	0.49	16.12	2.00	15
17		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
18		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
19	3.9	3.56	0.00	3.05	0.51	Curb	6.0	10.00	0.00	0.00	0.00	0.010	2.00	0.085	0.020	0.013	0.32	9.65	0.35	9.27	2.00	20
20	3.7	9.18	0.51	8.83	0.86	Curb	6.0	20.00	0.00	0.00	0.00	0.010	2.00	0.085	0.020	0.013	0.43	14.95	0.46	14.72	2.00	15
21	3.13	1.30	0.00	1.30	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.085	0.020	0.000	0.29	8.06	0.41	8.06	3.00	Off
22	3.12	5.60	0.11	5.71	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.085	0.020	0.000	0.45	16.01	0.49	16.01	2.00	Off

5-year flows | Number of lines: 23 | Run Date: 09-01-2014

NOTES: Inlet N-Values = 0.016 ; Intensity = 42.11 / (Inlet time + 10.00) ^ 0.76; Return period = 5 Yrs. ; * Indicates Known Q added

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Guttor							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
23	3.16	2.96	0.00	1.73	1.23	Curb	6.0	5.00	0.00	0.00	0.00	0.008	2.00	0.085	0.020	0.013	0.32	9.30	0.34	8.92	2.00	1

5-year flows | Number of lines: 23 | Run Date: 09-01-2014

NOTES: Inlet N-Values = 0.016 ; Intensity = 42.11 / (Inlet time + 10.00) ^ 0.76; Return period = 5 Yrs. ; * Indicates Known Q added

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	P1	106.9	48 c	187.0	5707.00	5708.87	1.000	5710.06	5711.93	n/a	5711.93	End
2	P2	96.67	48 c	89.4	5710.77	5711.45	0.761	5713.41	5714.45	1.37	5715.82	1
3	P3	97.30	48 c	98.0	5711.45	5712.15	0.714	5716.31*	5716.76*	0.14	5716.90	2
4	P4	98.44	48 c	177.7	5712.15	5713.50	0.760	5716.90*	5717.73*	0.94	5718.68	3
5	P5	88.26	48 c	230.1	5713.70	5715.77	0.900	5718.86	5719.67	0.78	5720.45	4
6	P6	77.66	48 c	30.5	5715.97	5716.23	0.852	5720.63*	5720.72*	0.59	5721.32	5
7	P7	56.68	42 c	146.6	5716.73	5717.92	0.812	5721.37*	5721.84*	0.54	5722.38	6
8	P8	41.65	36 c	52.0	5718.42	5719.13	1.365	5722.38*	5722.58*	0.53	5723.11	7
9	P9	30.22	30 c	205.8	5719.63	5720.74	0.539	5723.11*	5724.23*	0.58	5724.81	8
10	P10	12.14	24 c	61.5	5721.34	5721.80	0.748	5725.17*	5725.35*	0.19	5725.54	9
11	P11	12.22	24 c	37.5	5721.80	5722.19	1.040	5725.54*	5725.65*	0.24	5725.89	10
12	P12	19.65	24 c	29.1	5721.44	5721.60	0.550	5724.81*	5725.03*	0.61	5725.64	9
13	P13	13.69	24 c	113.0	5720.23	5720.91	0.602	5723.36*	5723.77*	0.18	5723.95	8
14	P14	14.01	24 c	163.3	5720.91	5722.23	0.808	5723.95*	5724.58*	0.31	5724.88	13
15	P15	8.18	18 c	31.0	5718.27	5718.55	0.903	5720.89*	5721.08*	0.33	5721.42	5
16	P16	17.27	24 c	27.6	5719.27	5719.63	1.306	5722.45*	5722.61*	0.47	5723.08	7
17	P17	25.79	30 c	229.1	5717.73	5719.39	0.726	5721.48*	5722.39*	0.42	5722.81	6
18	P18	7.26	18 c	47.1	5720.39	5720.81	0.891	5722.98*	5723.20*	0.18	5723.36	17
19	P19	7.31	18 c	44.1	5720.81	5721.62	1.837	5723.36*	5723.58*	0.27	5723.84	18
20	P20	18.85	24 c	32.6	5719.84	5720.20	1.107	5722.81*	5723.04*	0.56	5723.60	17
21	P21	13.57	24 c	44.7	5715.50	5715.92	0.939	5719.34*	5719.50*	0.43	5719.93	4
22	P22	11.50	24 c	39.7	5716.12	5716.42	0.754	5720.01*	5720.11*	0.21	5720.32	21
23	P23	6.06	18 c	5.0	5718.27	5718.28	0.195	5721.04*	5721.06*	0.18	5721.24	5

100.028- 100-yr flows	Number of lines: 23	Run Date: 09-01-2014

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	187.0	2.33	23.26	0.75	1.75	17.32	9.0	16.7	6.2	106.9	143.7	10.36	48	1.00	5708.87	5707.00	5711.93	5710.06	5716.74	5707.00	P1
2	1	89.4	0.00	20.93	0.00	0.00	15.58	0.0	16.5	6.2	96.67	125.3	10.29	48	0.76	5711.45	5710.77	5714.45	5713.41	5717.94	5716.74	P2
3	2	98.0	0.00	20.93	0.00	0.00	15.58	0.0	16.3	6.2	97.30	121.4	7.74	48	0.71	5712.15	5711.45	5716.76	5716.31	5718.50	5717.94	P3
4	3	177.7	0.00	20.93	0.00	0.00	15.58	0.0	15.9	6.3	98.44	125.2	7.83	48	0.76	5713.50	5712.15	5717.73	5716.90	5720.24	5718.50	P4
5	4	230.1	0.00	18.47	0.00	0.00	13.73	0.0	15.3	6.4	88.26	136.3	7.05	48	0.90	5715.77	5713.70	5719.67	5718.86	5722.12	5720.24	P5
6	5	30.5	0.00	16.23	0.00	0.00	12.05	0.0	15.2	6.4	77.66	132.6	6.18	48	0.85	5716.23	5715.97	5720.72	5720.63	5722.38	5722.12	P6
7	6	146.6	0.00	11.74	0.00	0.00	8.68	0.0	14.8	6.5	56.68	90.63	5.89	42	0.81	5717.92	5716.73	5721.84	5721.37	5723.51	5722.38	P7
8	7	52.0	0.00	8.63	0.00	0.00	6.36	0.0	14.6	6.6	41.65	77.92	5.89	36	1.36	5719.13	5718.42	5722.58	5722.38	5723.88	5723.51	P8
9	8	205.8	0.00	6.20	0.00	0.00	4.53	0.0	14.1	6.7	30.22	30.12	6.16	30	0.54	5720.74	5719.63	5724.23	5723.11	5725.48	5723.88	P9
10	9	61.5	0.00	2.12	0.00	0.00	1.59	0.0	10.2	7.6	12.14	19.56	3.87	24	0.75	5721.80	5721.34	5725.35	5725.17	5726.00	5725.48	P10
11	10	37.5	2.12	2.12	0.75	1.59	1.59	10.0	10.0	7.7	12.22	23.07	3.89	24	1.04	5722.19	5721.80	5725.65	5725.54	5726.47	5726.00	P11
12	9	29.1	4.08	4.08	0.72	2.94	2.94	14.0	14.0	6.7	19.65	16.77	6.26	24	0.55	5721.60	5721.44	5725.03	5724.81	5725.71	5725.48	P12
13	8	113.0	0.00	2.43	0.00	0.00	1.82	0.0	10.6	7.5	13.69	17.55	4.36	24	0.60	5720.91	5720.23	5723.77	5723.36	5724.60	5723.88	P13
14	13	163.3	2.43	2.43	0.75	1.82	1.82	10.0	10.0	7.7	14.01	20.34	4.46	24	0.81	5722.23	5720.91	5724.58	5723.95	5726.03	5724.60	P14
15	5	31.0	1.31	1.31	0.75	0.98	0.98	8.0	8.0	8.3	8.18	9.98	4.63	18	0.90	5718.55	5718.27	5721.08	5720.89	5722.36	5722.12	P15
16	7	27.6	3.11	3.11	0.75	2.33	2.33	11.0	11.0	7.4	17.27	25.85	5.50	24	1.31	5719.63	5719.27	5722.61	5722.45	5723.75	5723.51	P16
17	6	229.1	0.00	4.49	0.00	0.00	3.37	0.0	10.1	7.7	25.79	34.91	5.25	30	0.72	5719.39	5717.73	5722.39	5721.48	5724.19	5722.38	P17
18	17	47.1	0.00	1.22	0.00	0.00	0.92	0.0	9.2	7.9	7.26	9.91	4.11	18	0.89	5720.81	5720.39	5723.20	5722.98	5724.25	5724.19	P18
19	18	44.1	1.22	1.22	0.75	0.92	0.92	9.0	9.0	8.0	7.31	14.23	4.14	18	1.84	5721.62	5720.81	5723.58	5723.36	5725.37	5724.25	P19
20	17	32.6	3.27	3.27	0.75	2.45	2.45	10.0	10.0	7.7	18.85	23.79	6.00	24	1.11	5720.20	5719.84	5723.04	5722.81	5724.46	5724.19	P20
21	4	44.7	0.39	2.46	0.75	0.29	1.85	6.0	11.2	7.4	13.57	21.92	4.32	24	0.94	5715.92	5715.50	5719.50	5719.34	5720.70	5720.24	P21

100.028- 100-yr flows

Number of lines: 23

Run Date: 09-01-2014

NOTES: Intensity = 74.89 / (Inlet time + 10.00) ^ 0.76; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
22	21	39.7	2.07	2.07	0.75	1.55	1.55	11.0	11.0	7.4	11.50	19.65	3.66	24	0.75	5716.42	5716.12	5720.11	5720.01	5720.70	5720.70	P22
23	5	5.0	0.93	0.93	0.75	0.70	0.70	7.0	7.0	8.7	6.06	4.64	3.43	18	0.20	5718.28	5718.27	5721.06	5721.04	5722.38	5722.12	P23

100.028- 100-yr flows

Number of lines: 23

Run Date: 09-01-2014

NOTES: Intensity = 74.89 / (Inlet time + 10.00) ^ 0.76; Return period = 100 Yrs.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	3.14	13.96	16.05	30.01	0.00	Curb	6.0	20.00	0.00	0.00	0.00	Sag	2.00	0.086	0.020	0.000	0.76	31.43	0.88	31.43	3.00	Off
2		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
3		0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
4		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
5		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
6		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
7		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
8		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
9		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
10		0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
11	3.1	12.22	0.00	8.84	3.38	Curb	6.0	15.00	0.00	0.00	0.00	0.008	2.00	0.084	0.020	0.013	0.47	17.20	0.51	16.97	2.00	12
12	3.2	19.65	3.38	15.88	7.15	Curb	6.0	20.00	0.00	0.00	0.00	0.008	2.00	0.085	0.020	0.013	0.57	22.10	0.60	21.92	2.00	16
13		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
14	3.4	14.01	0.00	7.72	6.28	Curb	6.0	12.00	0.00	0.00	0.00	0.010	2.00	0.085	0.020	0.013	0.48	17.35	0.51	17.17	2.00	16
15	3.11	8.18	22.72	18.83	12.07	Curb	6.0	20.00	0.00	0.00	0.00	0.008	2.00	0.085	0.020	0.013	0.62	24.75	0.66	24.62	2.00	22
16	3.6	17.27	13.43	14.80	15.90	Curb	6.0	15.00	0.00	0.00	0.00	0.008	2.00	0.085	0.020	0.013	0.62	24.70	0.66	24.57	2.00	15
17		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
18		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
19	3.9	7.31	0.00	4.69	2.62	Curb	6.0	10.00	0.00	0.00	0.00	0.010	2.00	0.085	0.020	0.013	0.39	13.25	0.43	13.02	2.00	20
20	3.7	18.85	2.62	14.65	6.82	Curb	6.0	20.00	0.00	0.00	0.00	0.010	2.00	0.085	0.020	0.013	0.54	20.55	0.57	20.42	2.00	15
21	3.13	2.66	14.52	4.71	12.47	Curb	6.0	5.00	0.00	0.00	0.00	0.008	2.00	0.085	0.020	0.013	0.52	19.70	0.63	19.10	3.00	1
22	3.12	11.50	12.07	9.05	14.52	Curb	6.0	10.00	0.00	0.00	0.00	0.008	2.00	0.085	0.020	0.013	0.58	22.30	0.61	22.12	2.00	21

100.028- 100-yr flows | Number of lines: 23 | Run Date: 09-01-2014

NOTES: Inlet N-Values = 0.016 ; Intensity = 74.89 / (Inlet time + 10.00) ^ 0.76; Return period = 100 Yrs. ; * Indicates Known Q added

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
23	3.16	6.06	0.00	2.49	3.58	Curb	6.0	5.00	0.00	0.00	0.00	0.008	2.00	0.085	0.020	0.013	0.39	12.85	0.42	12.57	2.00	1

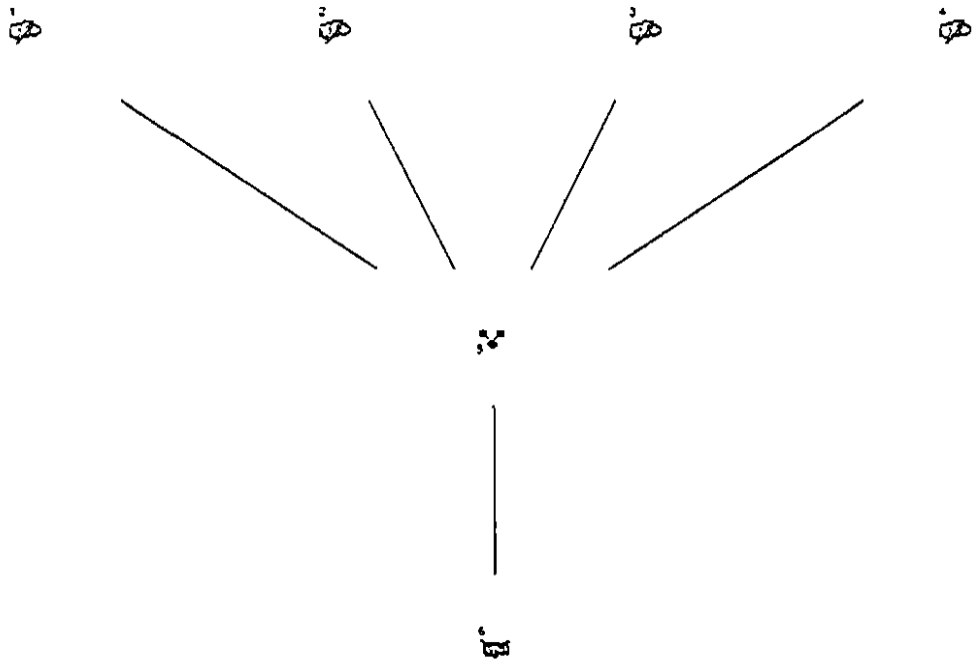
100.028- 100-yr flows

Number of lines: 23

Run Date: 09-01-2014

NOTES: Inlet N-Values = 0.016 ; Intensity = 74.89 / (Inlet time + 10.00) ^ 0.76; Return period = 100 Yrs. ; * Indicates Known Q added

APPENDIX D – DETENTION POND & WATER QUALITY CALCULATIONS



Legend

Hyd.	Origin	Description
1	Rational	Basin B3
2	Rational	Basin B2.3
3	Rational	Basin B2.5
4	Rational	Basin B2.1
5	Combine	total flow into pond
6	Reservoir	Pond B1

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	65.64	1	17	66,950	---	-----	----	Basin B3
2	Rational	3.666	1	8	1,760	---	-----	----	Basin B2.3
3	Rational	6.510	1	10	3,906	---	-----	----	Basin B2.5
4	Rational	36.15	1	15	32,531	---	-----	----	Basin B2.1
5	Combine	98.92	1	17	105,147	1, 2, 3, 4	-----	----	total flow into pond
6	Reservoir	3.569	1	33	99,172	5	5710.76	170,054	Pond B1

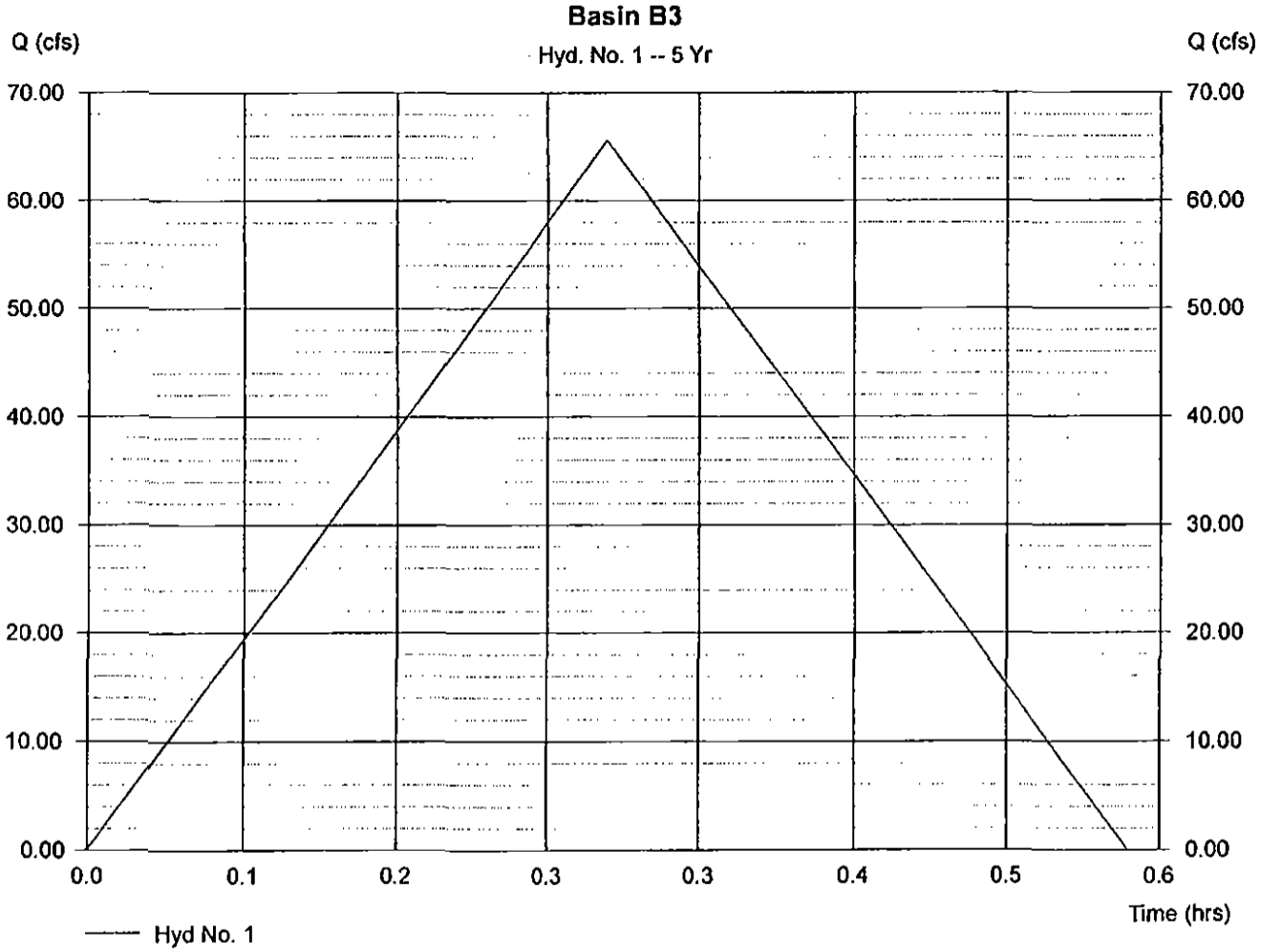
Hydrograph Plot

Hyd. No. 1

Basin B3

Hydrograph type	= Rational	Peak discharge	= 65.64 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Drainage area	= 33.500 ac	Runoff coeff.	= 0.6
Intensity	= 3.266 in/hr	Tc by User	= 17.00 min
IDF Curve	= Colorado Springs - El Paso County.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 68,950 cuft



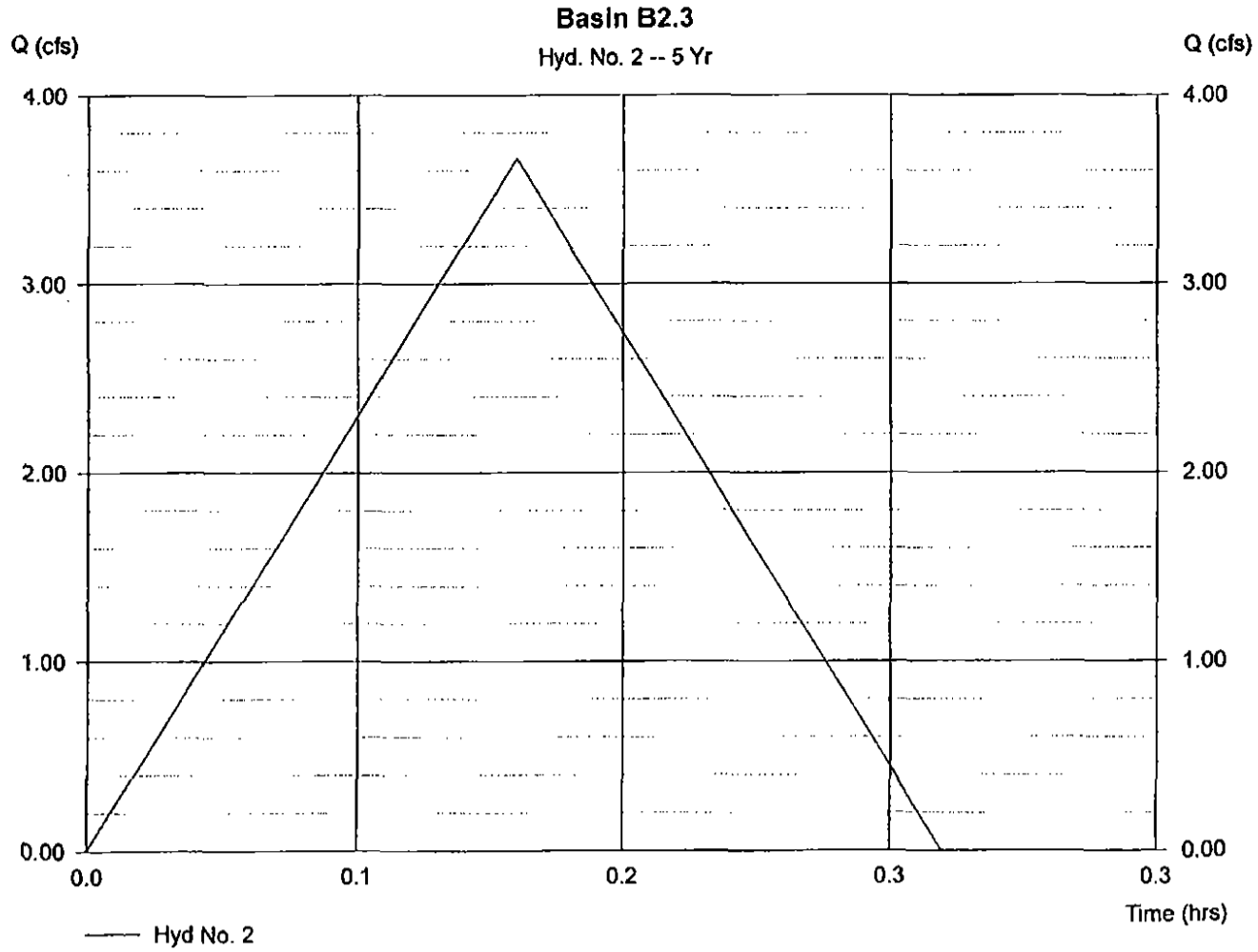
Hydrograph Plot

Hyd. No. 2

Basin B2.3

Hydrograph type	= Rational	Peak discharge	= 3.666 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Drainage area	= 1.100 ac	Runoff coeff.	= 0.75
Intensity	= 4.444 in/hr	Tc by User	= 8.00 min
IDF Curve	= *Colorado Springs - El Paso County.IDF*	*Asc/Rec limb fact*	= *1/1*

Hydrograph Volume = 1,760 cuft



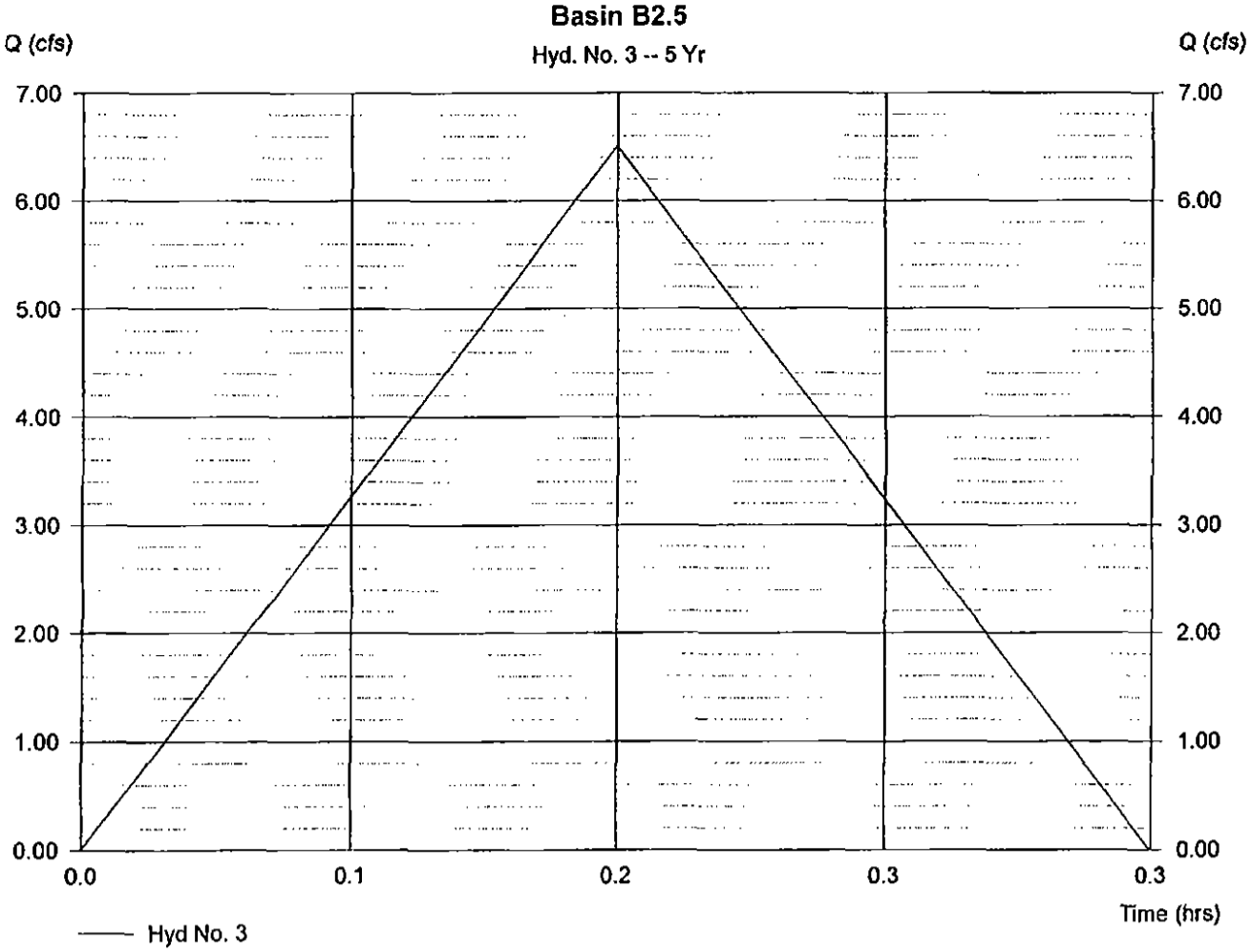
Hydrograph Plot

Hyd. No. 3

Basin B2.5

Hydrograph type	= Rational	Peak discharge	= 6.510 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Drainage area	= 2.300 ac	Runoff coeff.	= 0.69
Intensity	= 4.102 in/hr	Tc by User	= 10.00 min
IDF Curve	= Colorado Springs - El Paso County.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 3,906 cuft



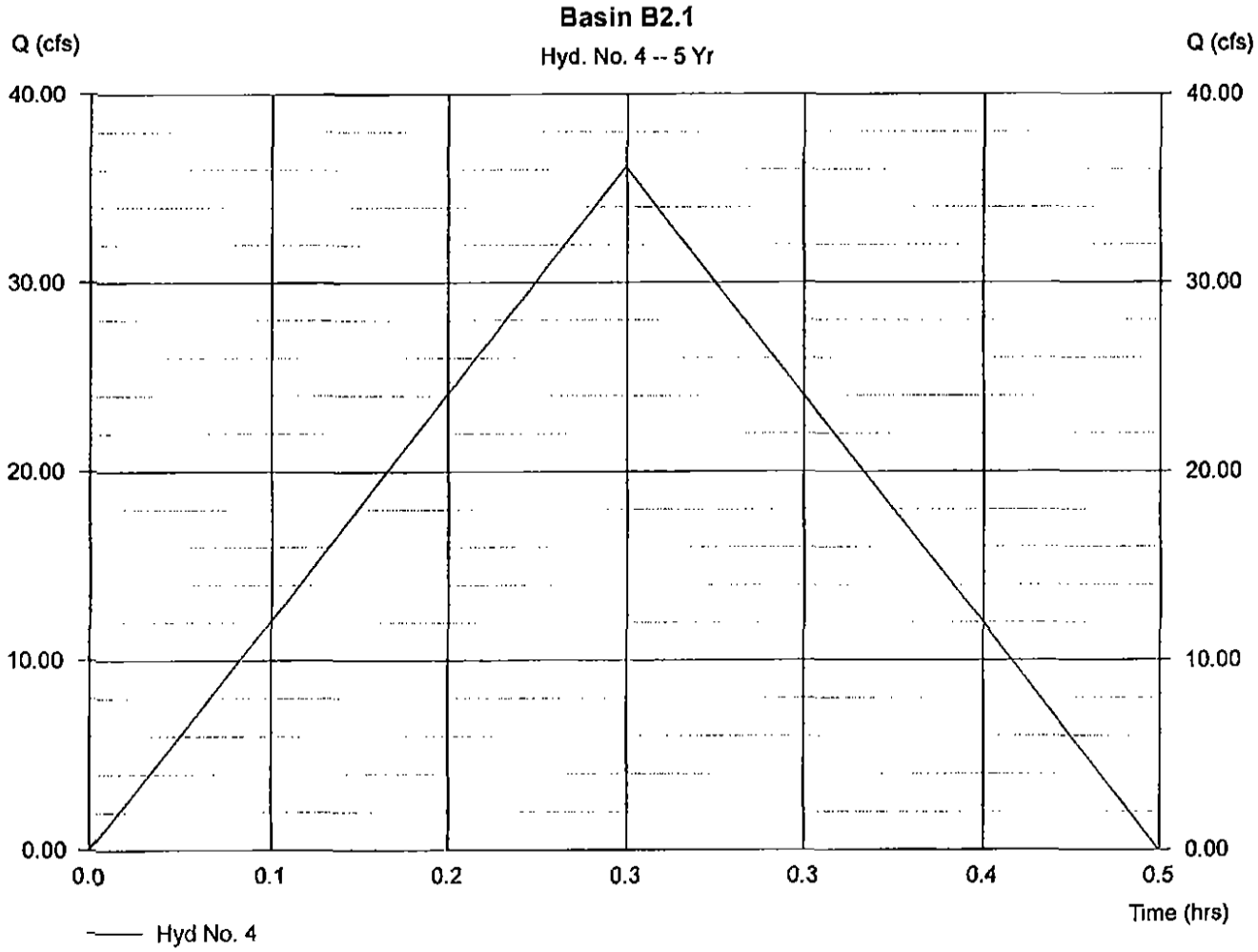
Hydrograph Plot

Hyd. No. 4

Basin B2.1

Hydrograph type	= Rational	Peak discharge	= 36.15 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Drainage area	= 13.920 ac	Runoff coeff.	= 0.75
Intensity	= 3.462 in/hr	Tc by User	= 15.00 min
IDF Curve	= Colorado Springs - El Paso County.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 32,531 cuft



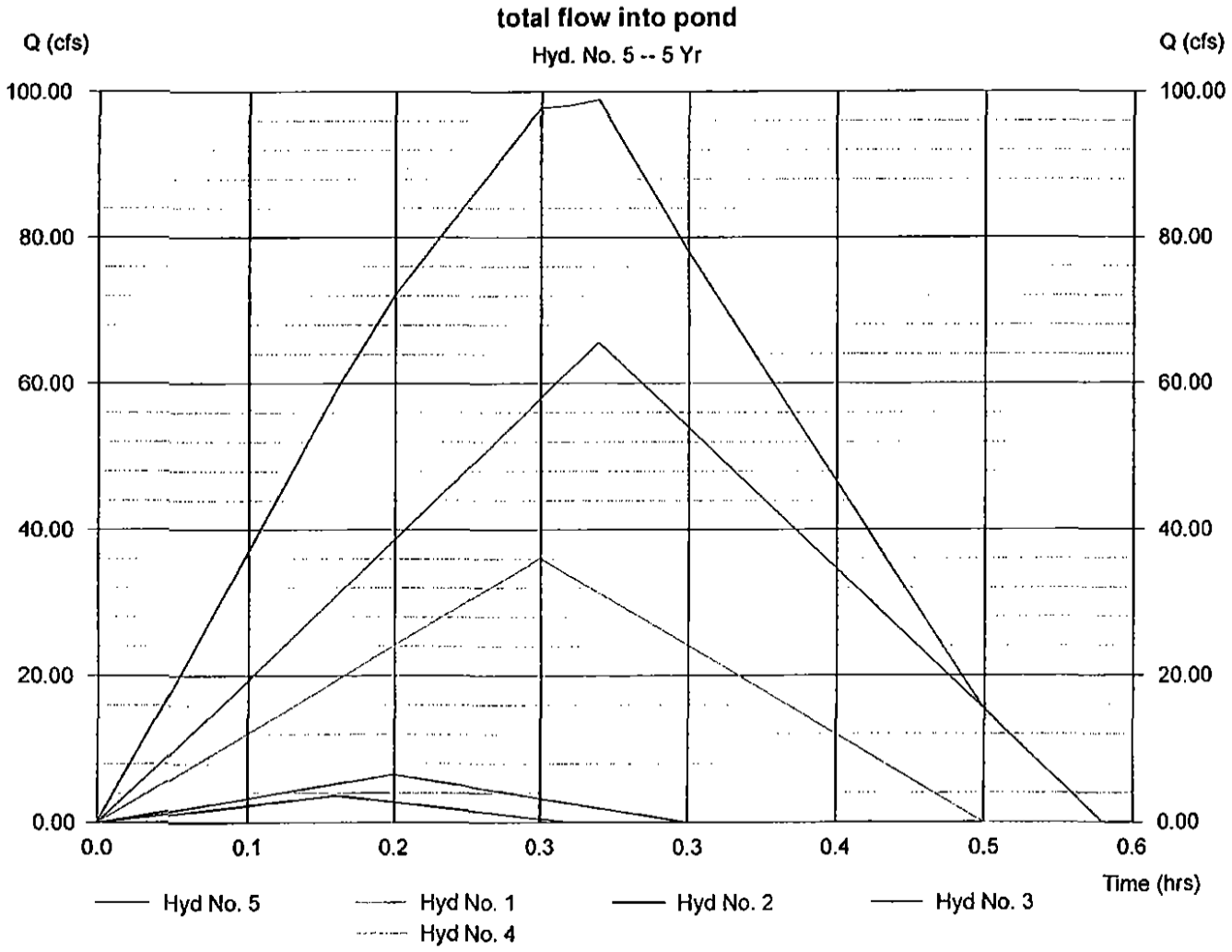
Hydrograph Plot

Hyd. No. 5

total flow into pond

Hydrograph type	= Combine	Peak discharge	= 98.92 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Inflow hyds.	= 1, 2, 3, 4		

Hydrograph Volume = 105,147 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve — Monday, Sep 1 2014, 6:6 PM

Pond No. 1 - Pond B1

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	5706.00	00	0	0
1.00	5707.00	34,450	17,225	17,225
2.00	5708.00	37,600	36,025	53,250
3.00	5709.00	40,850	39,225	92,475
4.00	5710.00	44,198	42,524	134,999
5.00	5711.00	47,653	45,926	180,925
6.00	5712.00	51,212	49,433	230,357
7.00	5713.00	54,870	53,041	283,398
8.00	5714.00	58,640	56,755	340,153
9.00	5715.00	62,500	60,570	400,723

Culvert / Orifice Structures

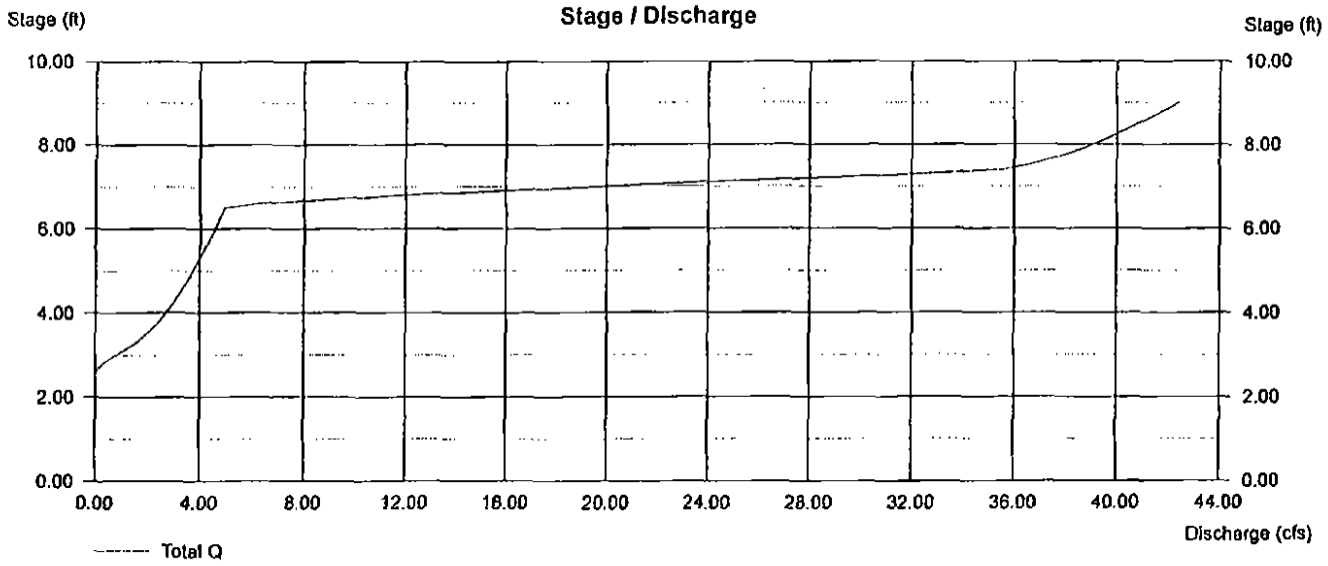
	[A]	[B]	[C]	[D]
Rise (in)	= 24.00	10.00	0.00	0.00
Span (in)	= 24.00	10.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 5706.00	5708.50	0.00	0.00
Length (ft)	= 90.00	0.00	0.00	0.00
Slope (%)	= *0.50*	*0.00*	*0.00*	*0.00*
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.50	0.00	0.00	0.00
Crest El. (ft)	= 5712.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

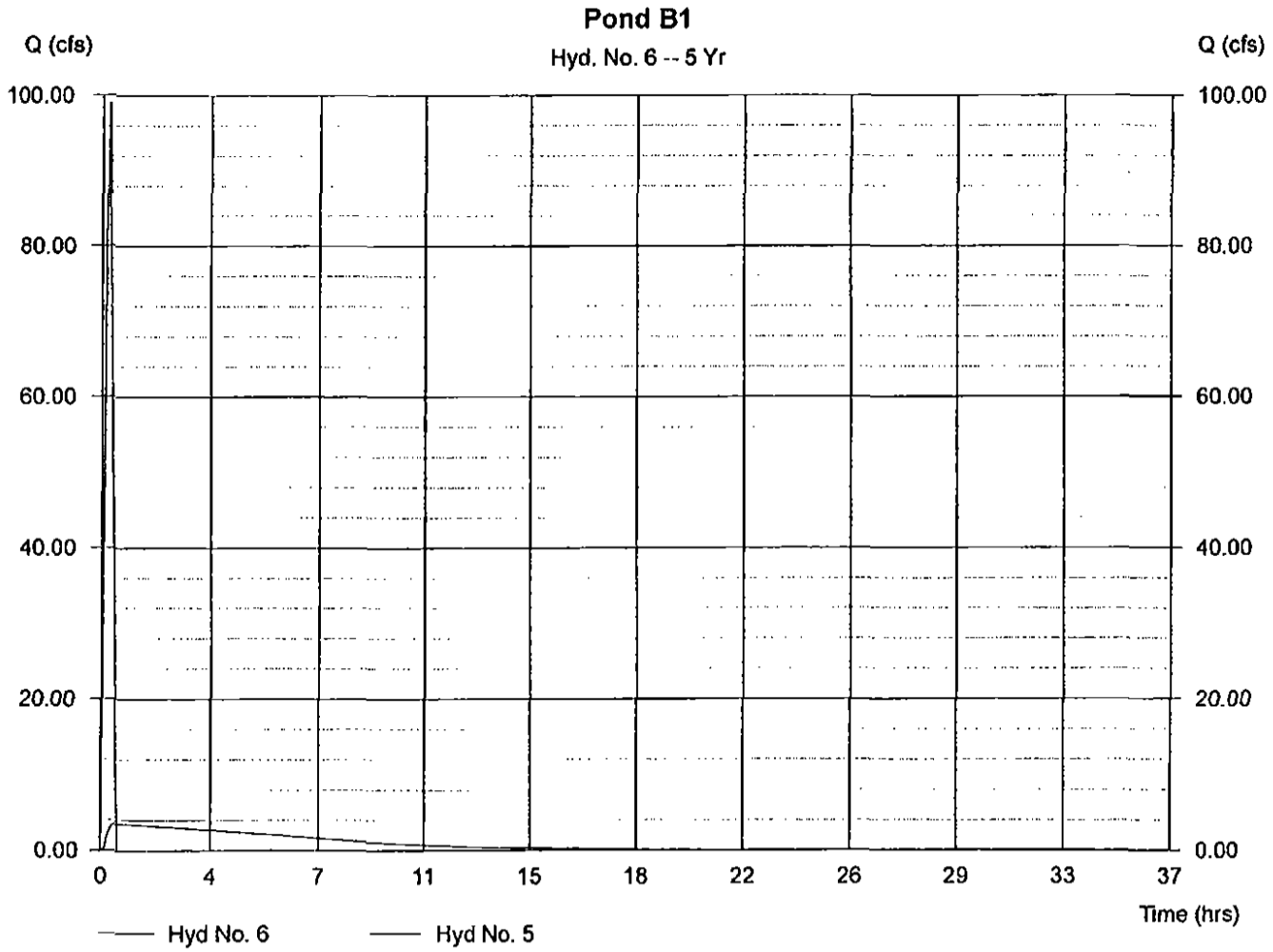
Hydraflow Hydrographs by Intelisolve — Monday, Sep 1 2014, 5:5 PM

Hyd. No. 6

Pond B1

Hydrograph type	= Reservoir	Peak discharge	= 3.569 cfs
Storm frequency	= 5 yrs	Time interval	= 1 min
Inflow hyd. No.	= 5	Max. Elevation	= 5710.76 ft
Reservoir name	= Pond B1	Max. Storage	= 170,054 cuft

Storage Indication method used. Wet pond routing start elevation = 5708.40 ft. — Hydrograph Volume = 99,172 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	7.317	1	8	3,512	---	-----	-----	B2.3
2	Rational	135.69	1	17	138,402	---	-----	-----	Basin B3
3	Rational	13.21	1	10	7,928	---	-----	-----	B2.5
4	Rational	71.13	1	15	64,018	---	-----	-----	Basin B2.1
5	Combine	201.30	1	17	213,860	1, 2, 3, 4	-----	-----	total flow into pond
6	Reservoir	9.081	1	33	199,491	5	5712.71	267,870	Pond B1

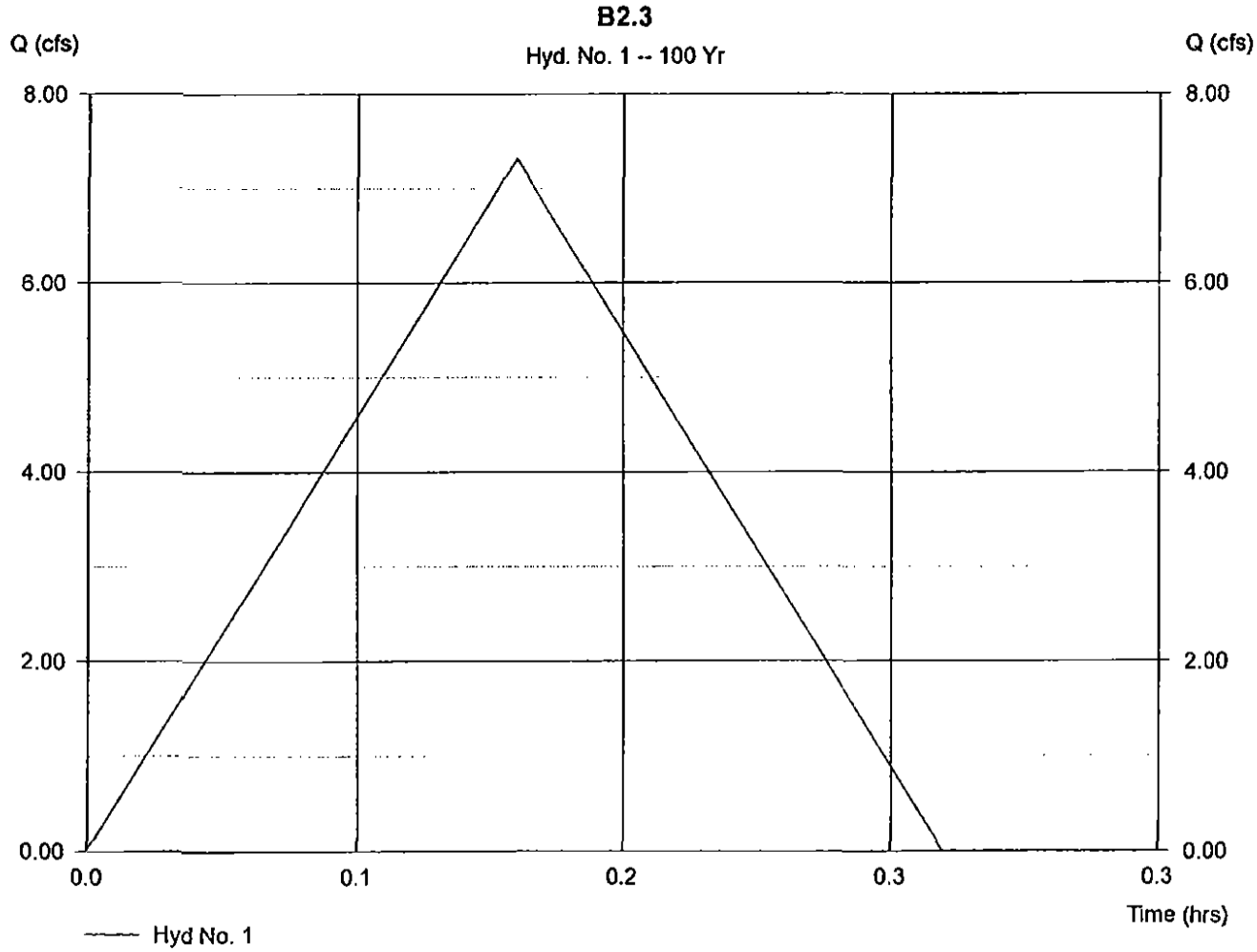
Hydrograph Plot

Hyd. No. 1

B2.3

Hydrograph type	= Rational	Peak discharge	= 7.317 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 1.100 ac	Runoff coeff.	= 0.83
Intensity	= 8.014 in/hr	Tc by User	= 8.00 min
IDF Curve	= CS-IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 3,512 cuft



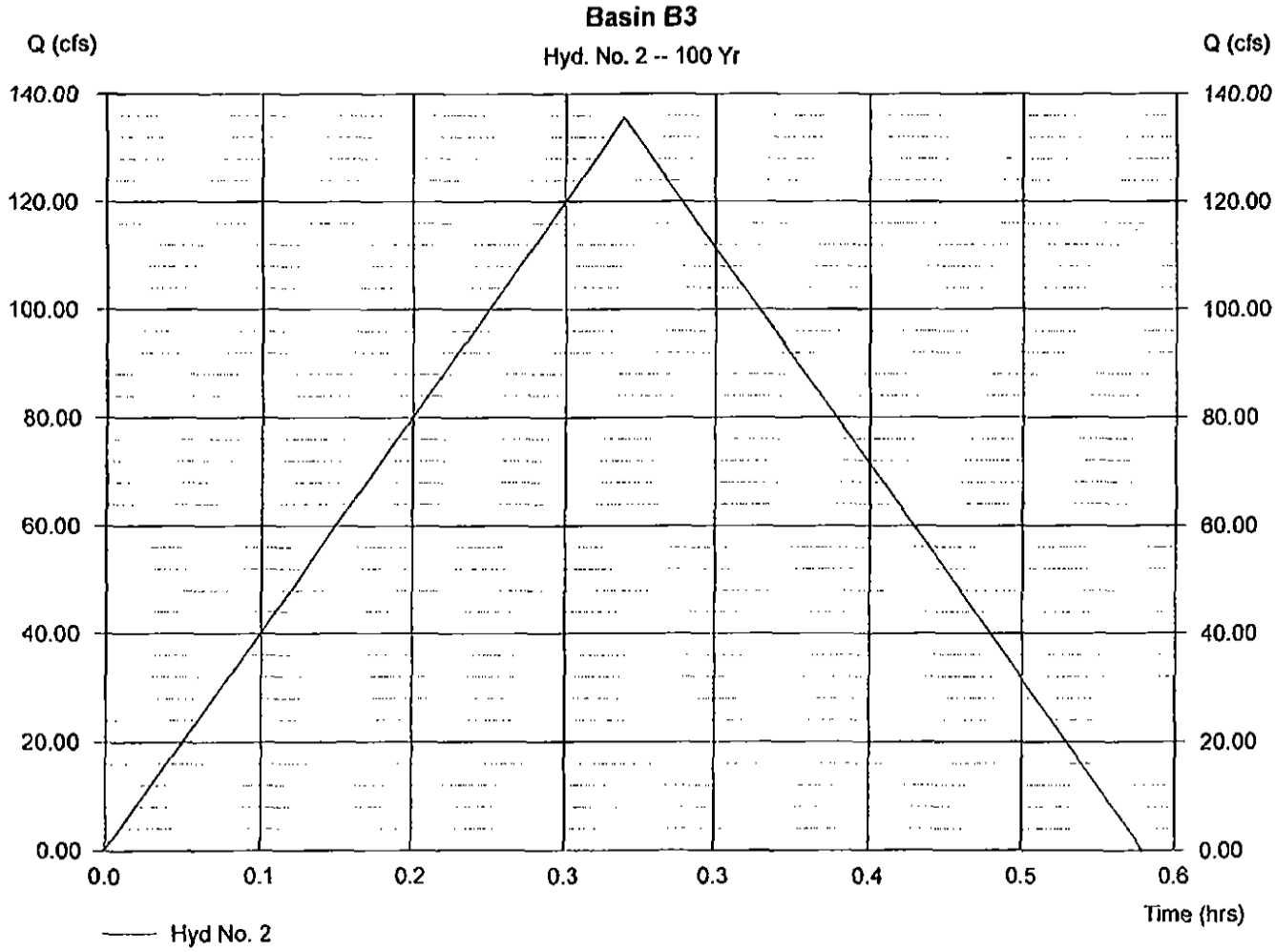
Hydrograph Plot

Hyd. No. 2

Basin B3

Hydrograph type	= *Rational*	*Peak discharge*	= *135.69 cfs*
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 33.500 ac	Runoff coeff.	= 0.7
Intensity	= 5.786 in/hr	Tc by User	= 17.00 min
IDF Curve	= CS-IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 138,402 cuft



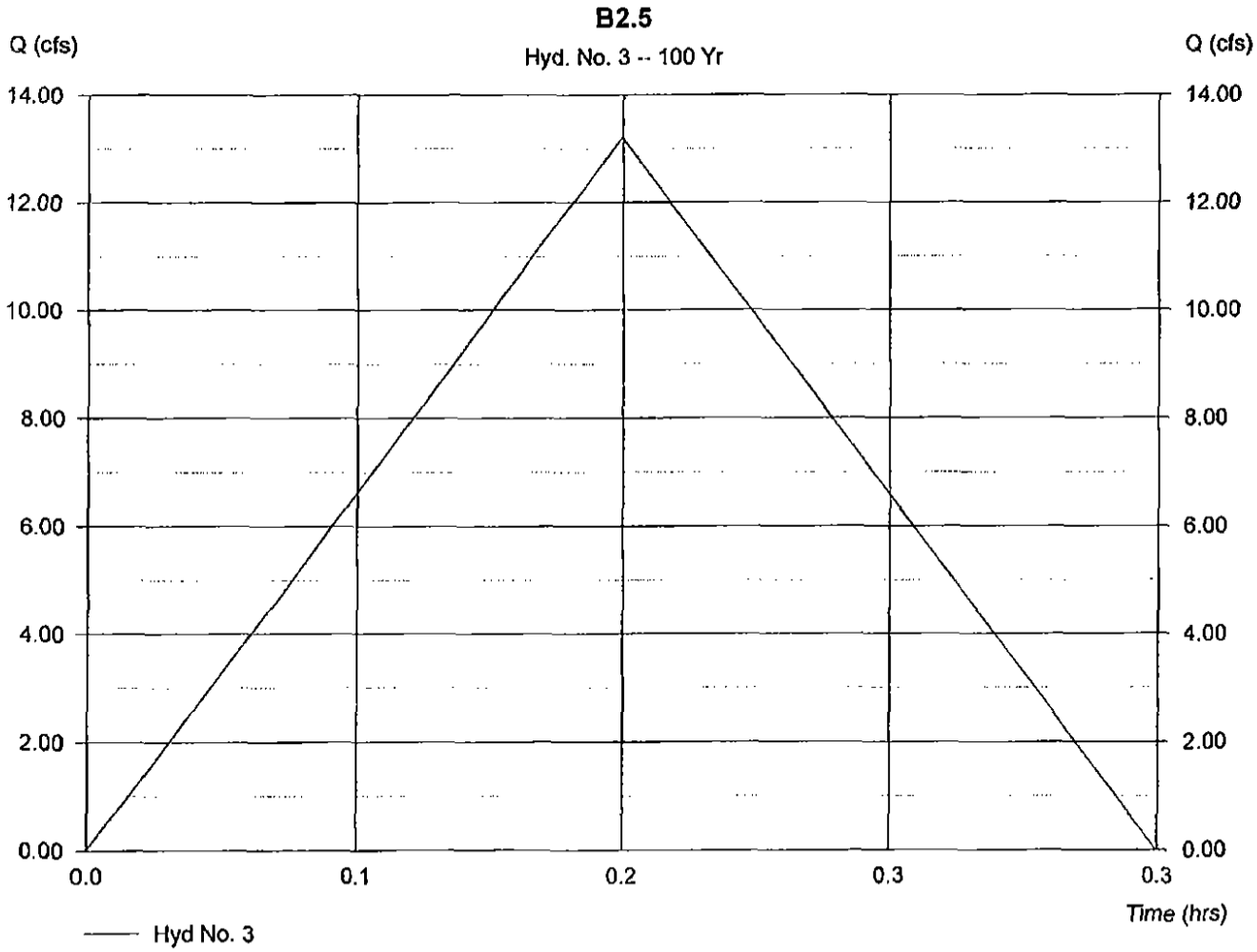
Hydrograph Plot

Hyd. No. 3

B2.5

Hydrograph type	= Rational	Peak discharge	= 13.21 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 2.300 ac	Runoff coeff.	= 0.78
Intensity	= 7.366 in/hr	Tc by User	= 10.00 min
IDF Curve	= CS-IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 7,928 cuft



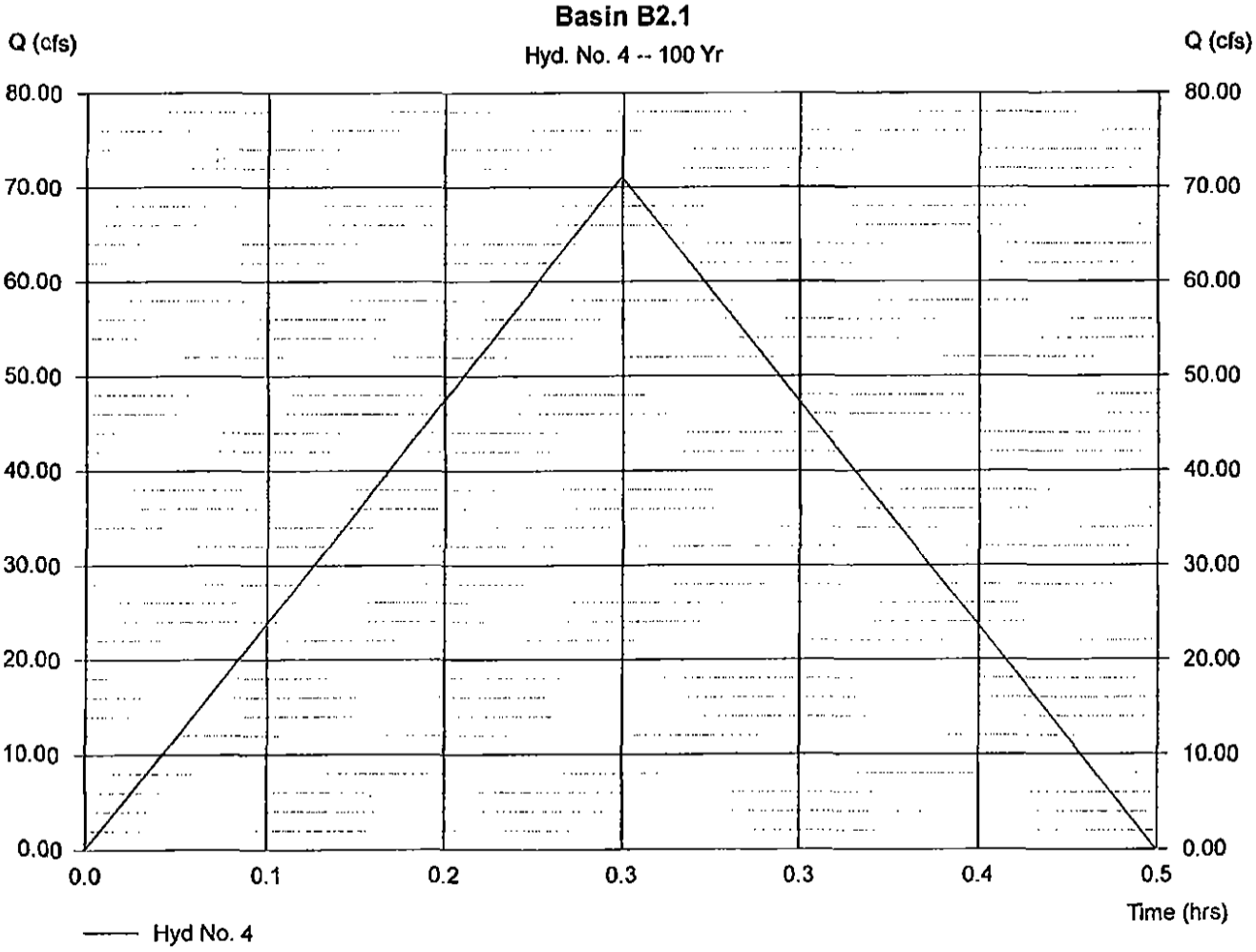
Hydrograph Plot

Hyd. No. 4

Basin B2.1

Hydrograph type	= Rational	Peak discharge	= 71.13 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 13.920 ac	Runoff coeff.	= 0.83
Intensity	= 6.157 in/hr	Tc by User	= 15.00 min
IDF Curve	= CS-IDF	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 64,018 cuft



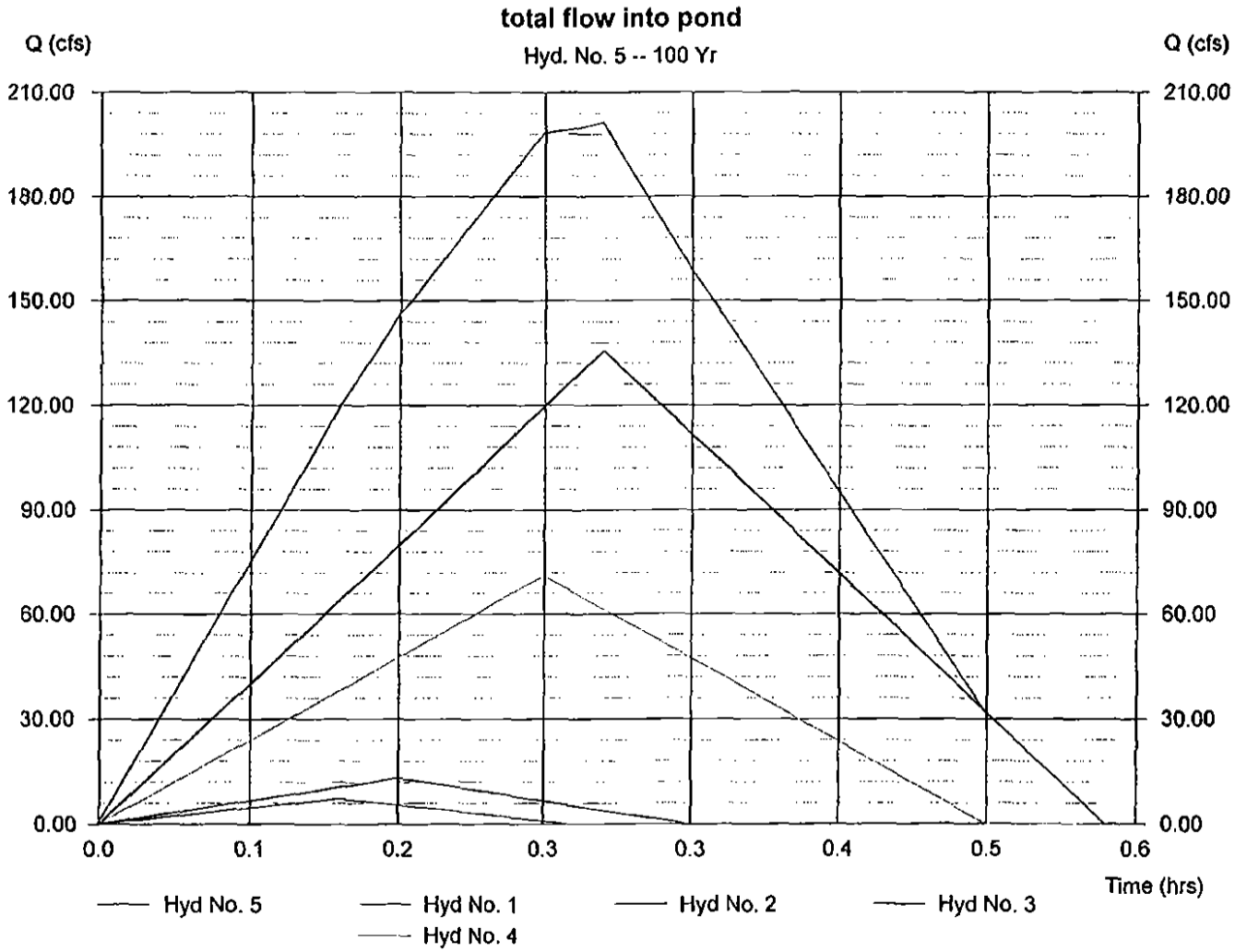
Hydrograph Plot

Hyd. No. 5

total flow into pond

Hydrograph type	= Combine	Peak discharge	= 201.30 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyds.	= 1, 2, 3, 4		

Hydrograph Volume = 213,860 cuft



APPENDIX D – DETENTION POND & WATER QUALITY CALCULATIONS

Hydrograph Plot

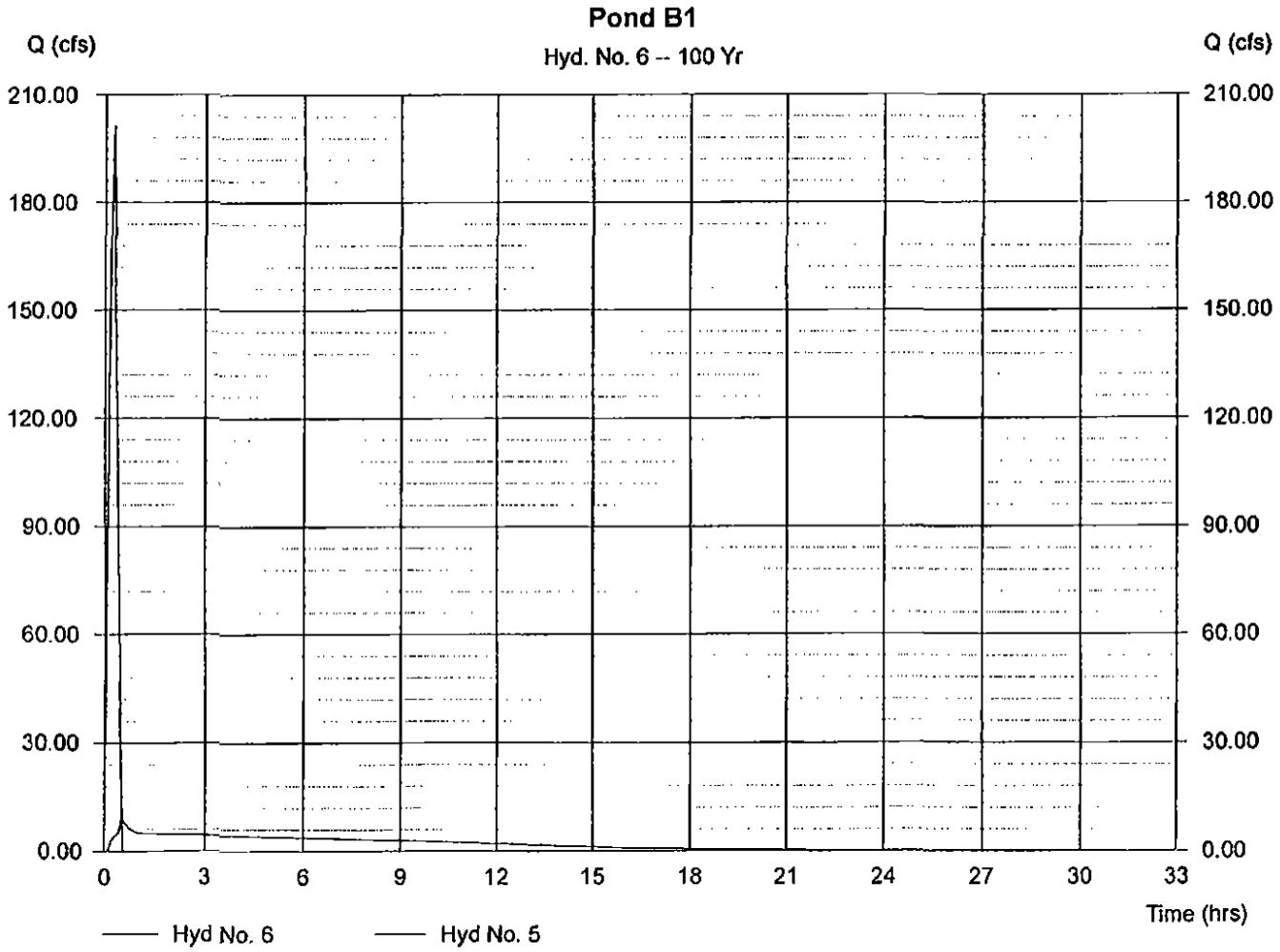
Hyd. No. 6

Pond B1

Hydrograph type	= Reservoir	Peak discharge	= 9.081 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyd. No.	= 5	Max. Elevation	= 5712.71 ft
Reservoir name	= Pond B1	Max. Storage	= 267,870 cuft

Storage Indication method used. Wet pond routing start elevation = 5708.20 ft.

Hydrograph Volume = 199,491 cuft



Pond Report

Hydraflow Hydrographs by Intellsolve — Monday, Sep 1 2014, 5:7 PM

Pond No. 1 - Pond B1

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	5706.00	00	0	0
1.00	5707.00	34,450	17,225	17,225
2.00	5708.00	37,600	36,025	53,250
3.00	5709.00	40,850	39,225	92,475
4.00	5710.00	44,198	42,524	134,999
5.00	5711.00	47,653	45,926	180,925
6.00	5712.00	51,212	49,433	230,357
7.00	5713.00	54,870	53,041	283,398
8.00	5714.00	58,640	56,755	340,153
9.00	5715.00	62,500	60,570	400,723

Culvert / Orifice Structures

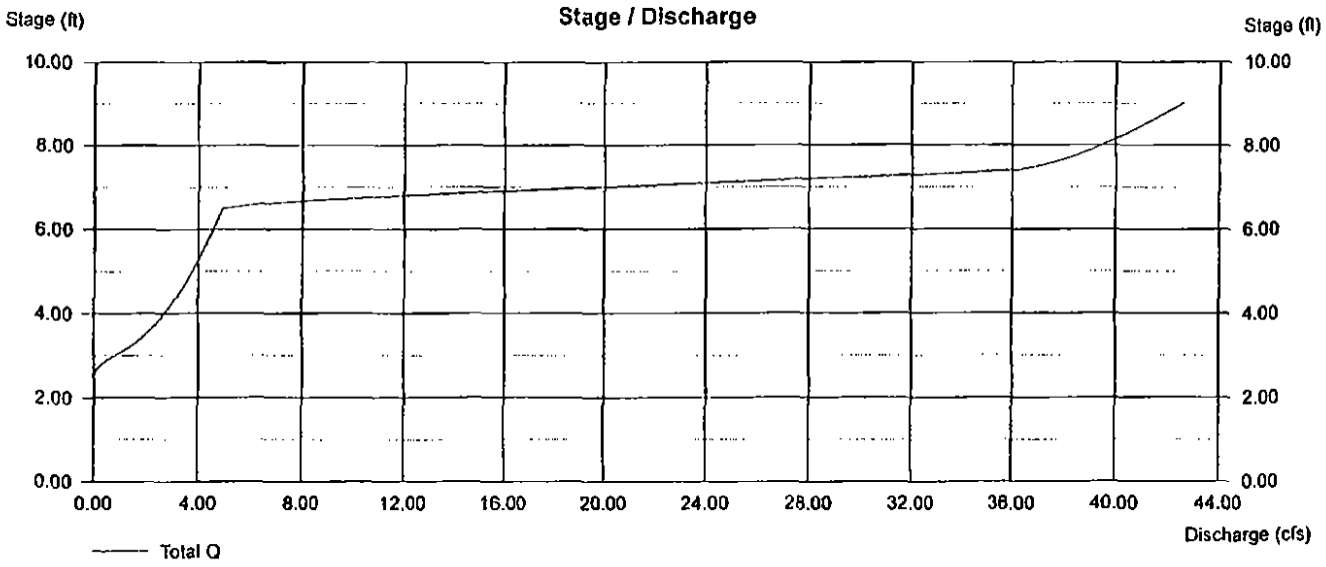
	[A]	[B]	[C]	[D]
Rise (in)	= 24.00	10.00	0.00	0.00
Span (in)	= *24.00*	*10.00*	*0.00*	*0.00*
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 5706.00	5708.50	0.00	0.00
Length (ft)	= 50.00	0.00	0.00	0.00
Slope (%)	= *0.50*	*0.00*	*0.00*	*0.00*
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

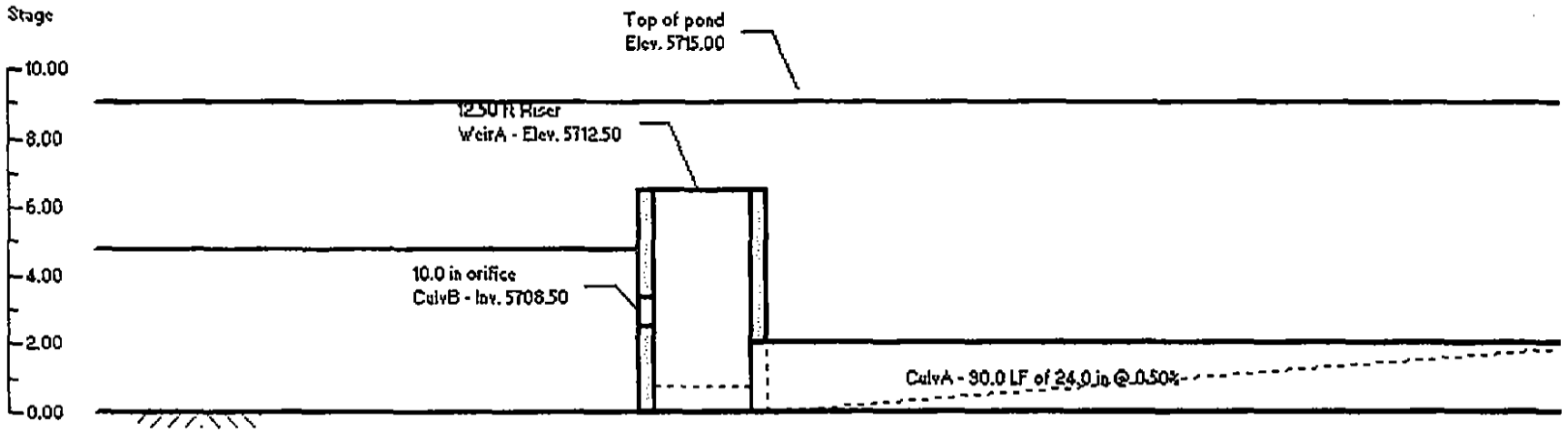
	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.50	0.00	0.00	0.00
Crest El. (ft)	= *5712.50*	*0.00*	*0.00*	*0.00*
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Pond B1



Section

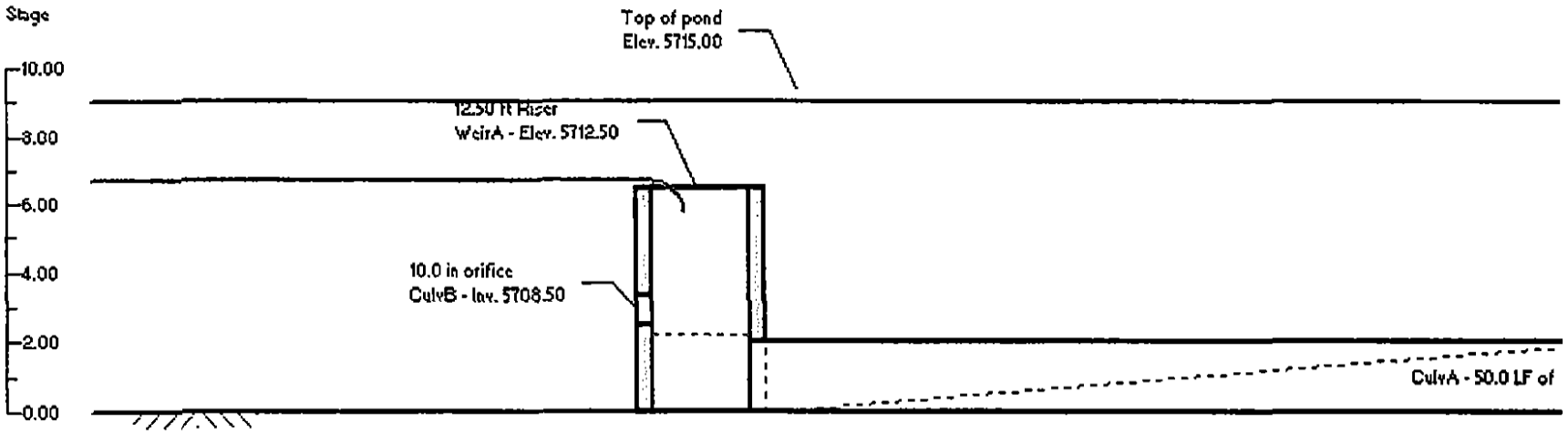
NTS

* Side slope estimated average from contours

(5 yr)

Schematic only. Not for construction.

Pond B1



Section

NTS

*Side slope estimated average from contours

(100 yr)

Schematic only. Not for construction.

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer: **Richard Schindler**
Company: **Core Engineering Group**
Date: **March, 2015**
Project: **Pioneer Landing 2 at Lorson Ranch**
Location: **Pond B1**

1. Basin Storage Volume			
A) Tributary Area's Imperviousness Ratio (i = I_a / 100)	I_a =	65.00	%
	i =	0.65	
B) Contributing Watershed Area (Area)	Area =	51.24	acres
C) Water Quality Capture Volume (WQCV) (WQCV =1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I))	WQCV =	0.25	watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area * 1.2	Vol =	1.302	acre-feet
2. Outlet Works			
A) Outlet Type (Check One)		X	Orifice Plate
			Perforated Riser Pipe
			Other:
B) Depth at Outlet Above Lowest Perforation (H)	H =	2.00	feet
C) Required Maximum Outlet Area per Row, (A_o)	A_o =	2.77	square inches
D) Perforation Dimensions **(enter one only)**:			
i) Circular Perforation Diameter **OR**	D =	1.7500	inches, **OR**
ii) 2" Height Rectangular Perforation Width	W =		inches
E) Number of Columns (nc, See Table 6a-1 For Maximum)	nc =	1	number
F) Actual Design Outlet Area per Row (A_o)	A_o =	2.41	square inches
G) Number of Rows (nr)	nr =	6	number
H) Total Outlet Area (A_{ot})	A_{ot} =	14.43	square inches
3. Trash Rack			
A) Needed Open Area: A_t = 0.5 * (Figure 7 Value) * A_{ot}	A_t =	447	square inches
B) Type of Outlet Opening (Check One)		X	≤ 2" Diameter **Round**
			2" High **Rectangular**
			Other:
C) For 2", or Smaller, **Round Opening** (Ref.: Figure 6a):			
i) Width of Trash Rack and Concrete Opening (W_{conc}) from Table 6a-1	W_{conc} =	18	inches
ii) Height of Trash Rack Screen (H_{TR})	H_{TR} =	48	inches

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer: Richard Schindler
Company: Core Engineering Group
Date: March, 2015
Project: Pioneer Landing 2 at Lorson Ranch
Location: Pond B1

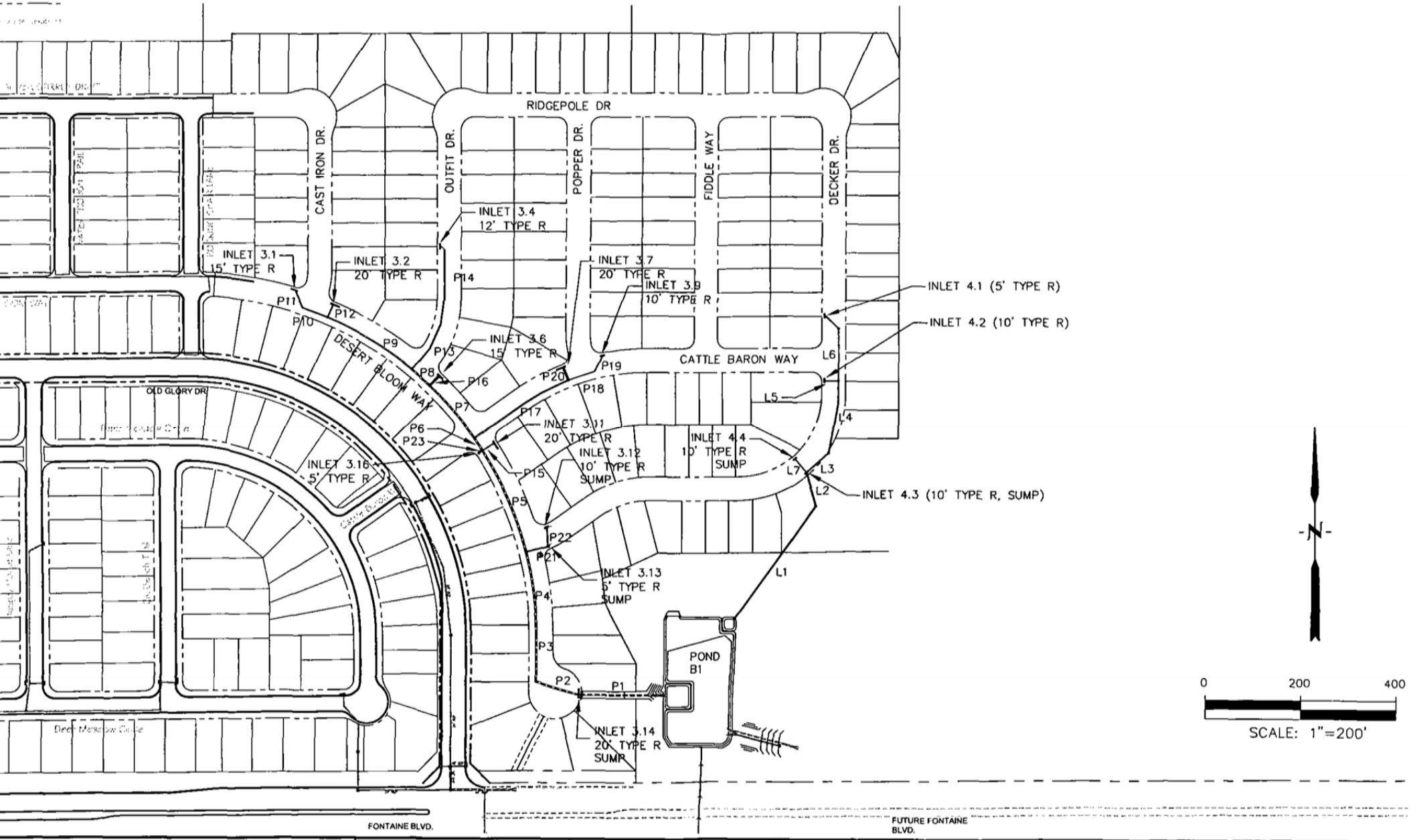
iii) Type of Screen (Based on Depth H), Describe if "Other"	X S.S. #93 VEE Wire (US Filter) Other:
iv) Screen Opening Slot Dimension, Describe if "Other"	X 0.139" (US Filter) Other:
v) Spacing of Support Rod (O.C.) Type and Size of Support Rod (Ref.: Table 6a-2)	1.00 inches **TE 0.074 in. x 0.50 in.**
vi) Type and Size of Holding Frame (Ref.: Table 6a-2)	**0.75 in. x 1.00 in. angle**
D) For 2" High **Rectangular Opening** (Refer to Figure 6b):	
I) Width of Rectangular Opening (W)	W = inches
ii) Width of Perforated Plate Opening (W_{conc} = W + 12")	W_{conc} = inches
iii) Width of Trashrack Opening ($W_{opening}$) from Table 6b-1	$W_{opening}$ = inches
iv) Height of Trash Rack Screen (H_{TR})	H_{TR} = inches
v) Type of Screen (based on depth H) (Describe if "Other")	Klemp™ KPP Series Aluminum Other:
vi) Cross-bar Spacing (Based on Table 6b-1, Klemp™ KPP Grating). Describe if "Other"	inches Other:
vii) Minimum Bearing Bar Size (Klemp™ Series, Table 6b-2) (Based on depth of WQCV surcharge)	
4. Detention Basin length to width ratio	2.00 (L/W)
5 Pre-sedimentation Forebay Basin - Enter design values	
A) Volume (5 to 10% of the Design Volume in 1D)	0.065 acre-feet
B) Surface Area	0.082 acres — 1 at 45'x45' 1 at 20'x20'
C) Connector Pipe Diameter (Size to drain this volume in 5-minutes under inlet control)	8 inches — (2 each)
D) Paved/Hard Bottom and Sides	no yes/no — rip rap

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer: **Richard Schindler**
Company: **Core Engineering Group**
Date: **March, 2015**
Project: ***Pioneer Landing 2 at Lorson Ranch***
Location: **Pond B1**

6. Two-Stage Design	
A) Top Stage (D_{WQ} = 2' Minimum)	D_{WQ} = 2.00 feet Storage= 1.430 acre-feet
B) Bottom Stage (D_{BS} = D_{WQ} + 1.5' Minimum, D_{WQ} + 3.0' Maximum, Storage = 5% to 15% of Total WQCV)	D_{BS} = 3.50 feet Storage= 0.100 acre-feet Surf. Area= 0.029 acres
C) Micro Pool (Minimum Depth = the Larger of 0.5 * Top Stage Depth or 2.5 Feet)	Depth= 2.50 feet Storage= 0.001 acre-feet Surf. Area= 0.001 acres
D) Total Volume: Vol_{tot} = Storage from 5A + 6A + 6B Must be ≥ Design Volume in 1D	Vol_{tot} = 1.595 acre-feet
7. Basin Side Slopes (Z, horizontal distance per unit vertical) Minimum Z = 3, Flatter Preferred	Z = 4.00 (horizontal/vertical)
8. Dam Embankment Side Slopes (Z, horizontal distance) per unit vertical) Minimum Z = 3, Flatter Preferred	Z = 4.00 (horizontal/vertical)
9. Vegetation (Check the method or describe "Other")	X Native Grass Irrigated Turf Grass Other:

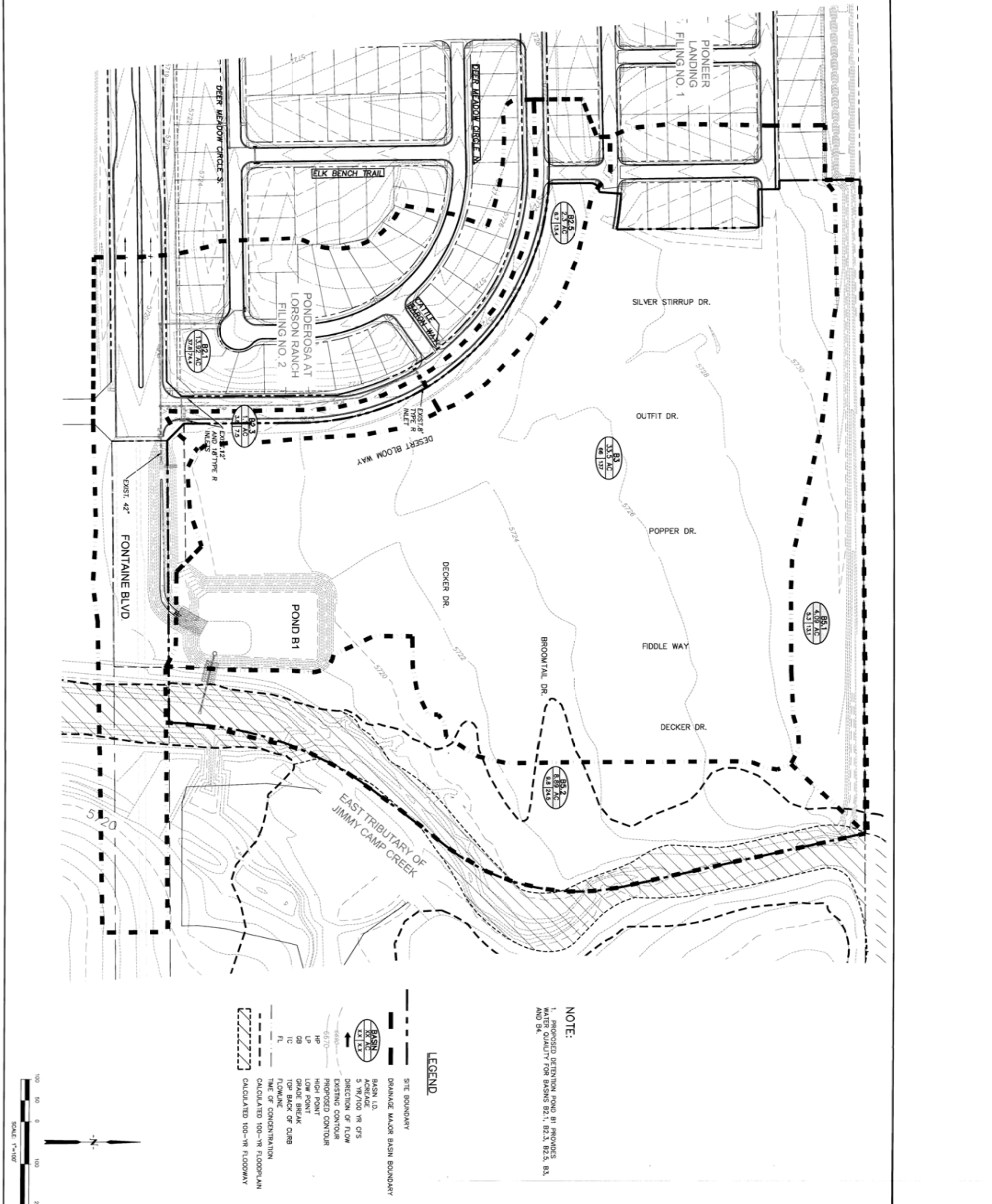
Notes:



CORE
ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

PIONEER LANDING FIL. 2
STORM SEWER SCHEMATIC LAYOUT

SCALE:	DATE:	FIGURE NO.
1"=200'	May, 2016	1



EXISTING CONDITIONS AND DETENTION/WQ AREA PIONEER LANDING FILING NO. 2

DATE: JUNE 30, 2016
PROJECT NO. 100.028
SHEET NUMBER 1
TOTAL SHEETS: 1

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

NO.	DESCRIPTION	DATE

PROJECT:
PIONEER LANDING FILING 2
FONTAINE BLVD. – OLD GLORY DRIVE
EL PASO COUNTY, COLORADO

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

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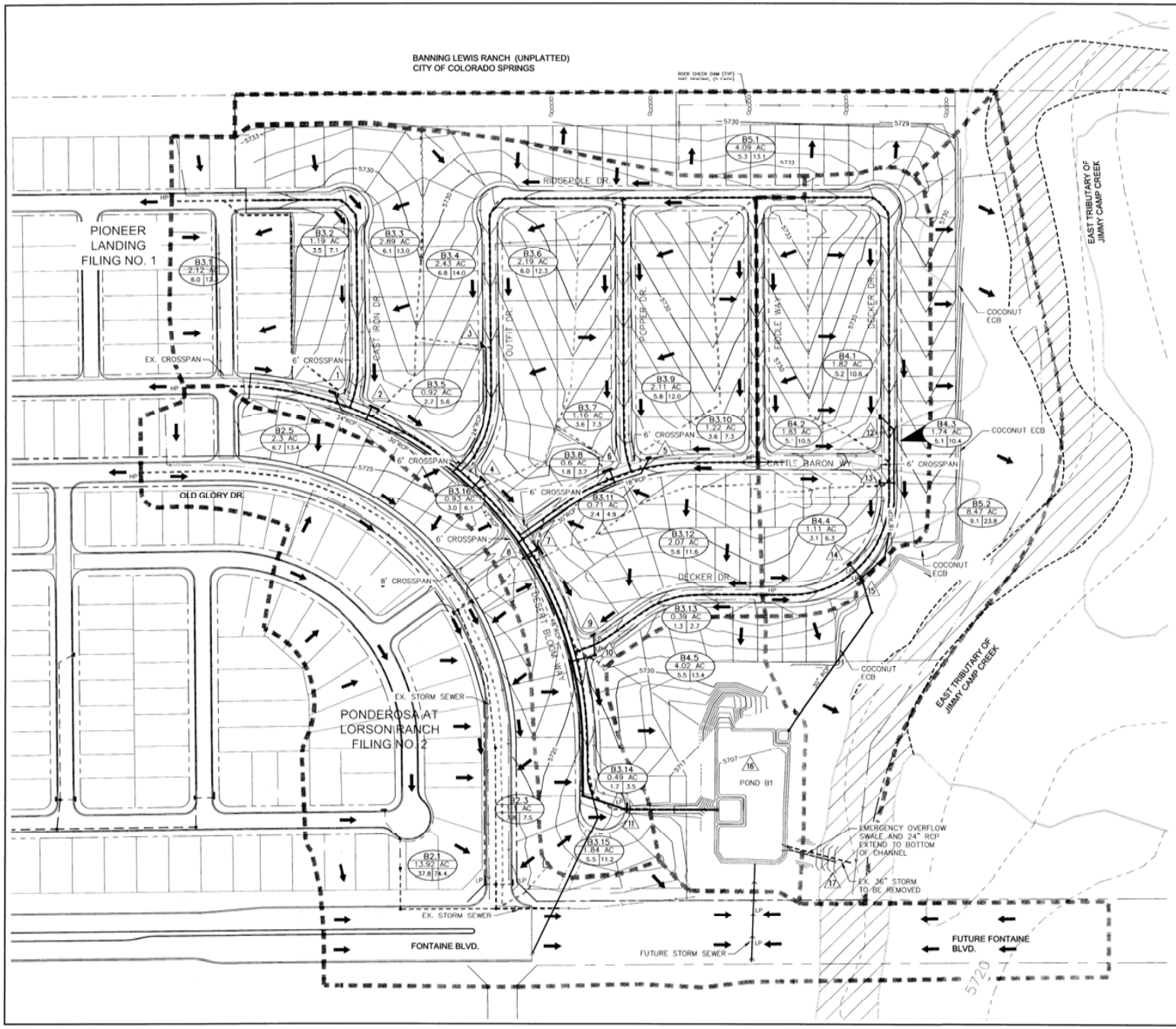
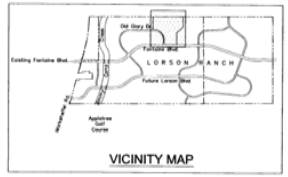
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com





VICINITY MAP

DESIGN POINT SUMMARY TABLE				
DP	Q_5	Q_{100}	COMMENTS	INLET SIZE
1	6.0	12.3	BASIN FLOW	15' TYPE R
2	9.6	20.1	BASIN FLOW	20' TYPE R
3	6.8	14.0	BASIN FLOW	12' TYPE R
4	8.7	17.9	BASIN FLOW	15' TYPE R
5	3.6	7.3	BASIN FLOW	10' TYPE R
6	9.4	17.3	BASIN FLOW	20' TYPE R
7	4.2	8.6	BASIN FLOW	20' TYPE R
8	3.0	6.1	BASIN FLOW	5' TYPE R
9	5.6	11.6	BASIN FLOW	10' TYPE R
10	1.3	2.7	BASIN FLOW	5' TYPE R
11	7.2	14.7	BASIN FLOW	20' TYPE R
11	48	107	FLOW IN 48" RCP INTO POND	15' TYPE R
				15' TYPE R
12	5.2	10.6	BASIN FLOW	5' TYPE R
13	5.1	10.5	BASIN FLOW	10' TYPE R
14	3.1	6.3	BASIN FLOW	10' TYPE R
15	5.1	10.4	BASIN FLOW	10' TYPE R
15	17	36	FLOW IN 30" RCP INTO POND	10' TYPE R
16	99	201	TOTAL FLOW INTO POND B1 INCLUDING OLD GLORY/FONTAINE AND PONDEROSA FILING NO. 2	
17	4	9	OUTFLOW FROM POND INTO E. TRIB	

DRAINAGE MAJOR BASIN BOUNDARY
DRAINAGE MINOR BASIN BOUNDARY
DRAINAGE BASIN DESIGN POINT
BASIN I.D.
ACREAGE
5 YR/100 YR CFS
DIRECTION OF FLOW
EXISTING CONTOUR
6670 PROPOSED CONTOUR
HP HIGH POINT
LP LOW POINT
TIME OF CONCENTRATION
100-YR FEMA FLOODPLAIN
100-YR FEMA FLOODWAY
100-YR FEMA FLOODPLAIN

SCALE: 1"=100'

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MONUMENT, CO 80132
PH: 719.520.1100
FAX: 719.520.1186
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: RichB@cegi.com

NO. | DESCRIPTION | DATE

PREPARED FOR:
LORSON RANCH
212 N. WAHSATCH AVE., SUITE 201
COLORADO SPRINGS, CO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
PIONEER LANDING FIL. 2
FONTAINE BLVD. - OLD GLORY RD.
EL PASO COUNTY, COLORADO

DRAWN: AZM
DESIGNED: LAB
CHECKED: LAB

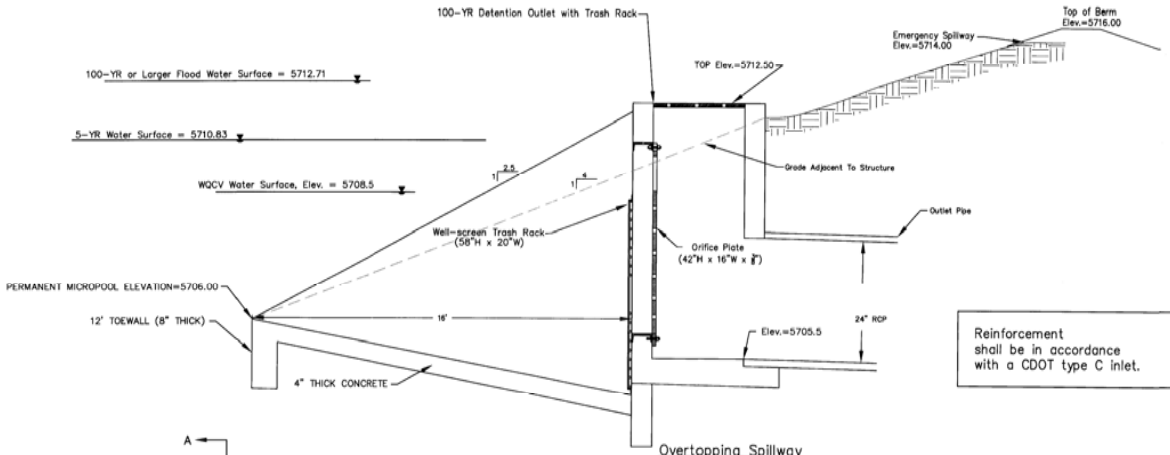
DEVELOPED CONDITIONS DRAINAGE PLAN
PIONEER LANDING FILING NO. 2

DATE
MARCH, 2015

PROJECT NO.
100.028

SHEET NUMBER
1

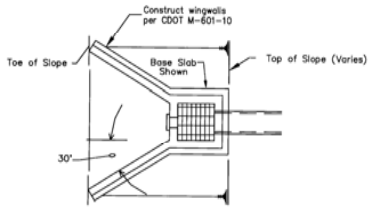
TOTAL SHEETS: 1



Overtopping Spillway

Figure 2
Typical WQCV Outlet Structure Profiles
Including 5-Year and 100-Year Detention

Reinforcement shall be in accordance with a CDOT type C inlet.



For either a Vertical or Adverse-Slope Trash Rack a handrail may be required.

Plan View-Flared Wingwall

Figure 3
Typical WQCV Outlet Structure
Wingwall Configurations

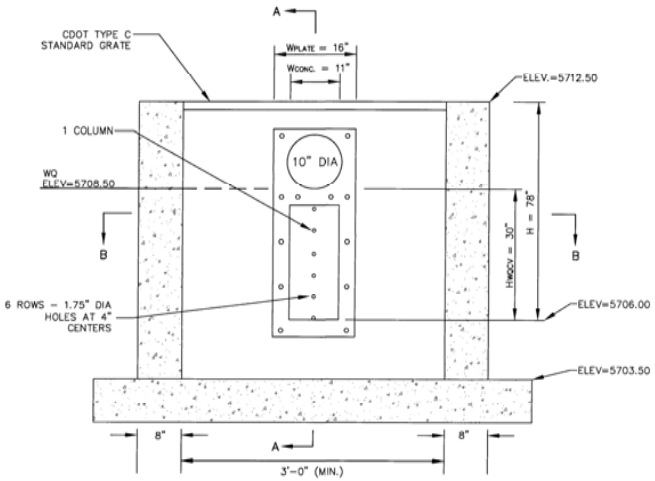
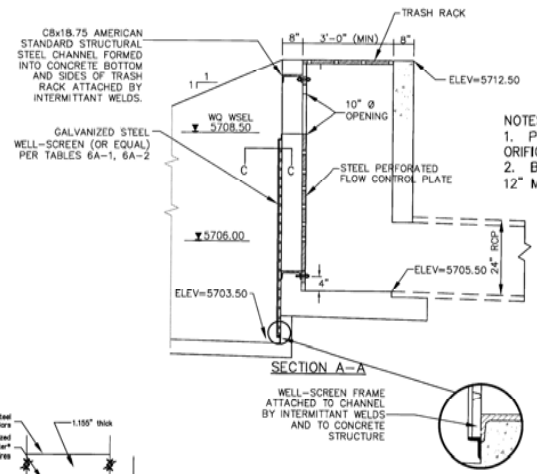
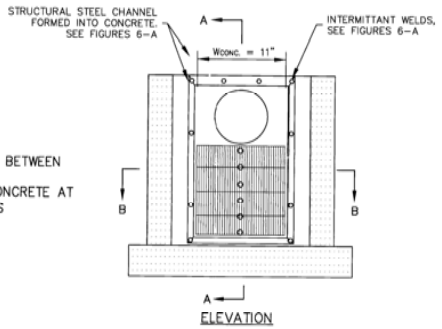


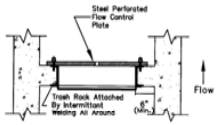
FIGURE 4:
ORIFICE PERFORATION DETAILS
SCALE: NTS



NOTES:
1. PROVIDE GASKET MATERIAL BETWEEN ORIFICE PLATE AND CONCRETE
2. BOLT ORIFICE PLATE TO CONCRETE AT 12" MAX. SPACING ON CENTERS

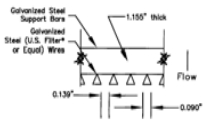


ELEVATION



Section B-B - Plan View

From Figure 6, Circular Openings Only
Limits for this Standardized Design:
1. All outlet plate openings are circular.
2. Maximum diameter of opening = 2 inches.
*U.S. Filter, St. Paul, Minnesota, USA



Section C-C

From Figure 6, Circular Openings Only
R Value = (net open area)/(gross rack area) = 0.60

Figure 6-a
Standardized Trash Rack and Outlet
Design For WQCV Outlets With
Circular Openings

POND DATA TABLE				
	INFLOW (CFS)	DISCHARGE (CFS)	WSEL	STORAGE (AC FT)
WQCV	--	--	5708.50	1.6
5-YR	99	4	5710.83	3.9
100-YR	201	9	5712.71	6.15

WQCV Trash Racks:

1. Well-screen trash racks shall be galvanized steel and shall be attached by intermittant welds along the edge of the mounting frame.
2. Bar grate trash racks shall be aluminum and shall be bolted using galvanized steel hardware.
3. Trash Rack widths are for specified trash rack material. Finer well-screen or mesh size than specified is acceptable, however, trash rack dimensions need to be adjusted for materials having a different open area/gross area ratio (R value)
4. Structural design of trash rack shall be based on full hydrostatic head with zero head downstream of the rack.

Overflow Trash Racks:

1. All trash racks shall be mounted using galvanized steel hardware and provided with hinged and lockable or boltable access panels.
2. Trash racks shall be galvanized steel, aluminum, or steel. Steel trash racks shall be hot dip galvanized and may be hot powder painted after galvanizing.
3. Trash Racks shall be designed such that the diagonal dimension of each opening is smaller than the diameter of the outlet pipe.
4. Structural design of trash rack shall be based on full hydrostatic head with zero head downstream of the rack.

Outlet Structure Details
Scale: NTS

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PREPARED FOR: LORSON, LLC.
2172 W. NEVADA AVE., SUITE 301
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(719) 635-3200
CONTACT: JEFF MARK

PROJECT: PIONEER LANDING FILING 2
FONTAINE BLVD. - O.O. GLORY DRIVE
EL PASO COUNTY, COLORADO

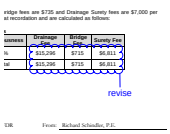
DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND B1
OUTLET STRUCTURE DETAILS

DATE: JUNE 30, 2016
PROJECT NO.: 100.028
SHEET NUMBER: C7.6
TOTAL SHEETS: 24

Markup Summary

dsdrice (5)



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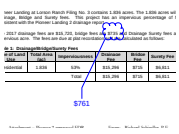

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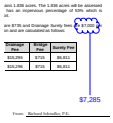

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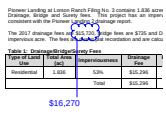

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