June 2024 | Final Environmental Impact Report
State Clearinghouse No. 2023110328

ONTARIO REGIONAL SPORTS COMPLEX

for City of Ontario

Prepared for:

City of Ontario
Contact: Thomas Grahn, Senior Planner
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PLACEWORKS

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APPENDICES

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1. Introduction

1.1 INTRODUCTION

This Final Environmental Impact Report (FEIR) has been prepared in accordance with the California Environmental Quality Act (CEQA) as amended (Public Resources Code §§ 21000 et seq.) and CEQA Guidelines (California Code of Regulations §§ 15000 et seq.).

According to the CEQA Guidelines, Section 15132, the FEIR shall consist of:

(a) The Draft Environmental Impact Report (DEIR) or a revision of the Draft;

(b) Comments and recommendations received on the DEIR either verbatim or in summary;

(c) A list of persons, organizations, and public agencies comments on the DEIR;

(d) The responses of the Lead Agency to significant environmental points raised in the review and consultation process; and

(e) Any other information added by the Lead Agency.

This document contains responses to comments received on the DEIR for the Ontario Regional Sports Complex during the public review period, which began April 4, 2024, and closed May 20, 2024. This document has been prepared in accordance with CEQA and the CEQA Guidelines and represents the independent judgment of the Lead Agency. This document and the circulated DEIR comprise the FEIR, in accordance with CEQA Guidelines, Section 15132.

1.2 FORMAT OF THE FEIR

This document is organized as follows:

Section 1, Introduction. This section describes CEQA requirements and content of this FEIR.

Section 2, Response to Comments. This section provides a list of agencies and interested persons commenting on the DEIR; copies of comment letters received during the public review period, and individual responses to written comments. To facilitate review of the responses, each comment letter has been reproduced and assigned a number (A-1 through A-5 for letters received from agencies and tribes, and O-1 through O-2 for letters received from organizations; no comments from residents were received). Individual comments have been numbered for each letter and the letter is followed by responses with references to the corresponding comment number.

Section 3. Revisions to the Draft EIR. This section contains revisions to the DEIR text and figures as a result of the comments received by agencies and interested persons as described in Section 2, and/or errors and omissions discovered subsequent to release of the DEIR for public review.

The responses to comments contain material and revisions that will be added to the text of the FEIR. The City of Ontario has reviewed this material and determined that none of this material constitutes the type of significant new information that requires recirculation of the DEIR for further public comment under CEQA Guidelines Section 15088.5. None of this new material indicates that the project will result in a significant new environmental impact not previously disclosed in the DEIR. Additionally, none of this material indicates that there would be a substantial increase in the severity of a previously identified environmental impact that will not be mitigated, or that there would be any of the other circumstances requiring recirculation described in Section 15088.5.

1.3 CEQA REQUIREMENTS REGARDING COMMENTS AND RESPONSES

CEQA Guidelines Section 15204 (a) outlines parameters for submitting comments, and reminds persons and public agencies that the focus of review and comment of DEIRs should be "on the sufficiency of the document in identifying and analyzing possible impacts on the environment and ways in which significant effects of the project might be avoided or mitigated. Comments are most helpful when they suggest additional specific alternatives or mitigation measures that would provide better ways to avoid or mitigate the significant environmental effects. At the same time, reviewers should be aware that the adequacy of an EIR is determined in terms of what is reasonably feasible. …CEQA does not require a lead agency to conduct every test or perform all research, study, and experimentation recommended or demanded by commenters. When responding to comments, lead agencies need only respond to significant environmental issues and do not need to provide all information requested by reviewers, as long as a good faith effort at full disclosure is made in the EIR."

CEQA Guidelines Section 15204 (c) further advises, "Reviewers should explain the basis for their comments, and should submit data or references offering facts, reasonable assumptions based on facts, or expert opinion supported by facts in support of the comments. Pursuant to Section 15064, an effect shall not be considered significant in the absence of substantial evidence." Section 15204 (d) also states, "Each responsible agency and trustee agency shall focus its comments on environmental information germane to that agency's statutory responsibility." Section 15204 (e) states, "This section shall not be used to restrict the ability of reviewers to comment on the general adequacy of a document or of the lead agency to reject comments not focused as recommended by this section."

In accordance with CEQA, Public Resources Code Section 21092.5, copies of the written responses to public agencies will be forwarded to those agencies at least 10 days prior to certifying the environmental impact report. The responses will be forwarded with copies of this FEIR, as permitted by CEQA, and will conform to the legal standards established for response to comments on DEIRs.

2. Response to Comments

Section 15088 of the CEQA Guidelines requires the Lead Agency (City of Ontario) to evaluate comments on environmental issues received from public agencies and interested parties who reviewed the DEIR and prepare written responses.

This section provides all written responses received on the DEIR and the City of Ontario's responses to each comment.

Comment letters and specific comments are given letters and numbers for reference purposes. Where sections of the DEIR are excerpted in this document, the sections are shown indented. Changes to the DEIR text are shown in underlined text for additions and ~~strikeout~~ for deletions.

The following is a list of agencies and persons that submitted comments on the DEIR during the public review period.

Number Reference	Commenting Person/Agency	Date of Comment	Page No.
Agencies & Tribes			
A1	Agua Caliente Band of Cahuilla Indians	4/16/2024	2-3
A2	Rincon Band of Luiseño Indians	4/26/2024	2-7
A3	Department of California Highway Patrol	5/14/2024	2-11
A4	City of Eastvale	5/20/2024	2-15
A5	City of Chino	5/202024	2-19
Organizations			
O1	Michael Shonafelt on behalf of Pacific Communities Builder Inc.	5/20/2024	2-23
O2	Aidan P. Marshall on behalf of Californians Allied for a Responsible Economy (CARE CA)	5/20/2024	2-37

2. Response to Comments

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2. Response to Comments

LETTER A1 – Agua Caliente Band of Cahuilla Indians (1 page)

From:	Thomas Grahn
To:	Nicole Vermilion; Lexie Zimny
Cc:	Kimberly Ruddins
Subject:	FW: Ontario Regional Sports Complex EIR
Date:	Tuesday, April 16, 2024 10:44:13 AM
Attachments:	image002.png

From: THPO Consulting <ACBCI-THPO@aguacaliente.net>
Sent: Tuesday, April 16, 2024 9:05 AM
To: Thomas Grahn <TGrahn@ontarioca.gov>
Subject: Ontario Regional Sports Complex EIR

Greetings,

A records check of the Tribal Historic Preservation Office's cultural registry revealed that this project is not located within the Tribe's Traditional Use Area. Therefore, we defer to the other tribes in the area. This letter shall conclude our consultation efforts. A1-1

Thank you,

Xitlaly Madrigal
Cultural Resources Analyst
xmadrigal@aguacaliente.net
C: (760) 423-3485 | D: (760) 883-6829
5401 Dinah Shore Drive, Palm Springs, CA 92264

2. Response to Comments

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2. Response to Comments

A1. Response to Comments from Agua Caliente Band of Cahuilla Indians, Xitaly Madrigal, Cultural Resources Analyst, dated April 16, 2024.

A1-1 The City acknowledges the commenter's statement that the Proposed Project is not within the Agua Caliente Band of Cahuilla Indians' (Tribe) Traditional Use Area, that the Tribe defer to other tribes in the area, and that the comment letter concludes the Tribe's consultation efforts. This comment does not raise an issue with the analysis of the DEIR, and no further response is necessary.

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2. Response to Comments

LETTER A2 – Rincon Band of Luiseño Indians (1 page)

From: Deneen Pelton <DPelton@rincon-nsn.gov>
Sent: Friday, April 26, 2024 1:09 PM
To: Thomas Grahn <TGrahn@ontarioca.gov>
Cc: Cheryl Madrigal <CMadrigal@rincon-nsn.gov>; Shuuluk Linton <slinton@rincon-nsn.gov>
Subject: Ontario Regional Sports Complex EIR, City of Ontario

Greetings,

This email is written on behalf of Rincon Band of Luiseño Indians, ("Rincon Band" or "Band"), a federally recognized Indian Tribe and sovereign government.

The Band has received the notification for the above referenced project. The location identified within project documents is not within the Band's specific Area of Historic Interest (AHI). A2-1

At this time, we have no additional information to provide. We recommend that you directly contact a Tribe that is closer to the project and may have pertinent information.

Thank you for submitting this project for Tribal review. If you have additional questions or concerns, please do not hesitate to contact our office at your convenience at (760) 749-1092 or via electronic mail at crd@rincon-nsn.gov.

Thank you for the opportunity to protect and preserve our cultural assets.

Deneen Pelton
Cultural Resources Department Coordinator
Cultural Resources Department
Rincon Band of Luiseño Indians
1 West Tribal Road | Valley Center, CA 92082
Office: (760) 749 1092 ext. 323|Cell: 760-705-7304
Fax: 760-888-2016
Email: dpelton@rincon-nsn.gov

Rincon Band of Luiseño Indians
www.rincon-nsn.gov

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A2. Response to Comments Rincon Band of Luiseño Indians, Deneen Pelton, Cultural Resources Department Coordinator, dated April 29, 2024.

A2-1 The City acknowledges the Rincon Band of Luiseño Indians' (Tribe's) statement that the Proposed Project is not within the Tribe's specific Area of Historic Interest and that therefore, the Tribe does not have additional information to provide. This comment does not raise an issue with the analysis of the DEIR, and no further response is necessary.

2. Response to Comments

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2. Response to Comments

LETTER A3– Department of California Highway Patrol (1 page)

State of California-Transportation Agency GAVIN NEWSOM, Governor

DEPARTMENT OF CALIFORNIA HIGHWAY PATROL
9530 Pittsburg Avenue
Rancho Cucamonga, CA. 91730
(909) 980-0608
(800) 735-2929 (TT/TDD)
(800) 735-2922 (Voice)

May 14, 2024

File No.: 855.14652.16090

City of Ontario
303 East B Street
Ontario, CA. 91764

Subject: SCH# 2023110328

The Rancho Cucamonga Area of the California Highway Patrol received the "Notice of Completion" of the environmental document for the proposed Ontario Regional Sports Complex for State Clearinghouse (SCH#2023110328). The California Highway Patrol's (CHP) interest in commenting, surrounds our concern for the safe and legal operation of commercial truck trailer combination vehicles hauling construction equipment and materials, as well as that of the construction workers commuting to and from the worksite. Once construction is completed, there will also be an increase in civilian motor vehicle traffic accessing the sports complex.

A3-1

The Department's concerns with the potential impact of this project could include the following: increased traffic congestion, additional enforcement demands and increased incidents requiring emergency response during construction. Commercial truck trailer combination vehicle traffic on local roadways and freeway will increase as materials and products are transported to, and from the worksite. This project could have a negative impact on our operations due to the increased traffic congestion associated with the daily business and planed events at the sports complex, which would necessitate additional patrol and traffic control measures to mitigate the potential increase in traffic crashes. We are hopeful work project operators will diligently establish, monitor, and enforce work project rules related to vehicle safety as CHP personnel work to assure compliance with the California Vehicle Code provisions.

If you have any questions regarding these concerns, please contact Lieutenant Ronald Burch at (909) 980-3994.

Sincerely,

S. SUÀREZ, Captain
Commander
Rancho Cucamonga Area

cc: Special Projects Section

Safety, Service, and Security *An Internationally Accredited Agency*

2. Response to Comments

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2. Response to Comments

A3. Response to Comments from Department of California Highway Patrol, S. Suàrez, Captain Commander, Rancho Cucamonga Area, dated May 14, 2024.

A3-1 The Draft EIR, Section 5.17, *Transportation*, evaluated transportation impacts associated with both the construction phase and operational phase of the Proposed Project while Section 5.15, *Public Services*, evaluated the potential impacts to emergency services, including police service. It should be noted that Senate Bill 743 eliminated auto delay, level of service, and similar measures of vehicular capacity or traffic congestion as the sole basis for determining significant impacts under CEQA.

Temporary construction traffic impacts of the Proposed Project are identified on page 5.17-20, including the potential for oversized vehicles, construction worker trips, vendor trips, and haul trips. Mitigation Measure TRAF-3 requires that construction contractors prepare a construction management plan that would require coordination with the applicable emergency response agencies, including the California Highway Patrol (CHP), to minimize construction traffic conflicts.

Police service impacts of the Proposed Project are addressed on page 5.15-7. While the number of people in and around the ORSC site would fluctuate, the general increase in activity under the ORSC would result in periodic increases in demands for police protection by Ontario Police Department (OPD). It is not anticipated that there would be a demand for additional service by the CHP as no impacts to Caltrans facilities were identified (see page 5.17-20).

Nonetheless, operation of the Proposed Project would generate a substantial increase in VMT (see page 5.17-19 through 5.17-21). To reduce vehicle trips, TRAF-1 requires that the operators of the commercial/hospitality, stadium, and city facilities prepare a Transportation Demand Management Plan. In addition, TRAF-2 requires that the City prepare a Parking and Event Traffic Management Plan to optimize access to and from the ORSC site to improve safety, minimize conflicts with ride sharing, facilitate the safe and efficient flow of vehicle traffic during events, etc. Mitigation Measure TRAF-2 also requires that the City establish an operational oversight group made up of transportation agencies and third-party operators that could be impacted by events. The CHP may wish to participate in this oversight group.

As requested by the Commenter, the City will work with the CHP to monitor and enforce rules related to vehicle safety and the California Vehicle Code provisions.

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2. Response to Comments

LETTER A4 – City of Eastvale (2 pages)

CITY OF EASTVALE
12363 Limonite Avenue | Suite 910 | Eastvale, CA 91752
951.361.0900

May 20, 2024

Thomas Grahn, Senior Planner
Ontario Planning Department
303 East "B" Street
Ontario, CA 91764

Sent via email to: tgrahn@ontarioca.gov

RE: NOTICE OF AVAILABILITY (NOA) FOR THE ONTARIO REGIONAL SPORTS COMPLEX DRAFT ENVIRONMENTAL IMPACT REPORT

Dear Mr. Grahn:

Thank you for the opportunity to comment on the Notice of Availability (NOA) for the Ontario Regional Sport Complex Draft Environmental Impact Report (DEIR). Eastvale values its relationship with neighboring jurisdictions and is not opposed to development of this site; however, this project has the potential to generate traffic and air quality impacts in Ontario and Eastvale. The City of Eastvale offers the following comments for your consideration: Intro

- The City of Eastvale adopted its Eastvale 2040 General Plan in March 2024 which will guide future development over the next several decades. This plan includes future growth assumptions and changes to the General Plan land use plan. Such updates may be appropriate to consider in evaluating cumulative impacts in the ORSC DEIR.
- Table 4-1, Cumulative Projects within a Three-Mile Radius, of the DEIR identifies the list of cumulative projects considered which are in various stages (i.e., entitled, under construction, etc.). The following table does not identify the Leal Master Plan property which is located approximately 2.8 miles of the subject project site. It is recommended that the City of Ontario consider the appropriateness of whether to include the Leal Master Plan development (and/or Eastvale Civic Center being constructed in the near future) in evaluating cumulative impacts in the ORSC DEIR. A4-1
- Although previously submitted in response to the Notice of Preparation issued on November 15, 2023, for the ORSC DEIR, the following comments remain pertinent to the project beyond the scope of CEQA (ORSC DEIR):

  Area to be Studied – According to the Riverside County Transportation Department's Traffic Impact Analysis (TIA) Guidelines, *the minimum area to be studied shall include any intersection of "Collector" or higher classification street, with "Collector" or higher classification streets, at which the proposed project will add 50 or more peak hour trips, not exceeding a 5-mile radius from the project site. The Transportation Department may require deviation from these requirements based on area conditions. Please view the attached exhibit illustrating the intersections that the City of Eastvale requests be included as part of the study area within the TIA. In addition, contribution of fair share costs for any mitigations needed for the applicable intersections (as provided in the attached exhibit), shall also be considered.* A4-2

  Given the defined project study area shown in Figure 2a, it is unclear whether the requested intersections were considered in defining the study area. Confirmation that such intersections were indeed considered, and subsequently eliminated from further study, based upon the methodologies applied in defining the appropriate study area for the Traffic Impact Study (TIS) should be provided.

2. Response to Comments

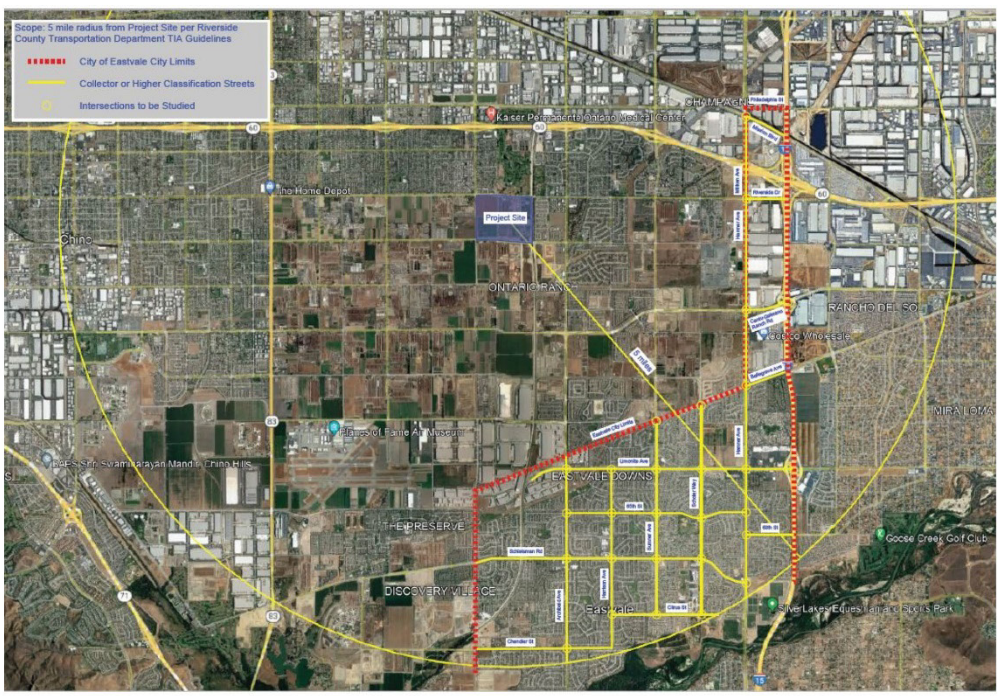
Eastvale staff would like to request a meeting to discuss these comments, potential solutions that address concerns for both cities, and initiate dialogue concerning fare share costs for any mitigations. Please contact me at (951) 703-0488 or dmurray@eastvaleca.gov to set a date and time to meet.

We look forward to working cooperatively with the City of Ontario on regional issues that affect our respective communities. A4-3

Sincerely,

David Murray
City Planner

Exhibit:



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A4. Response to Comments from David Murray, City Planner, City of Eastvale, dated May 20, 2024.

Intro Response to Comments from the City of Eastvale on the ORSC are provided in responses A4-1 through A4-3 below.

A4-1 The Draft EIR, Section 5.17, *Transportation*, details the methodology used to develop Vehicle Miles Traveled (VMT) estimates for the Proposed Project. The locally validated and calibrated travel demand model (SBTAM) was updated to be consistent with The Ontario Plan (TOP) 2050 land use assumptions. Outside the City of Ontario, land use is consistent with SCAG's 2016 Regional Transportation Plan / Sustainable Communities Strategy (RTP/SCS) with updated land use for pending and approved development projects within a three-mile radius.

As described in Appendix L2, *Traffic Impact Analysis*, in the Draft EIR, the transportation analysis accounted for pending and approved development projects within a three-mile radius of the ORSC site that would have a potential impact on study intersections. The list of projects is provided in Appendix E of the Traffic Impact Analysis, found on page L2-364 in Appendix L2 of the Draft EIR. Development in the Leal Specific Plan and other active Eastvale development projects were included in this analysis.

At the request of the Commenter, Draft EIR Table 4-1, *Cumulative Projects within a Three-Mile Radius*, has been updated to be consistent with the list of cumulative projects used in the traffic impact analysis (see Chapter 3, *Revisions to the Draft EIR*)

A4-2 See response to Comment A4-1. The Draft EIR, Section 5.17, *Transportation*, evaluated transportation impacts associated with the Proposed Project. Senate Bill 743 (SB 743) eliminated auto delay, level of service (LOS), and similar measures of vehicular capacity or traffic congestion as the sole basis for determining significant impacts under CEQA. As such, the Draft EIR evaluates transportation impacts based on VMT metrics.

Appendix L2, *Traffic Impact Analysis*, of the Draft EIR, included an evaluation of vehicle delay at intersections within the traffic study area per the City of Ontario's General Plan Circulation Element LOS policy to plan for future infrastructure needs. A discussion of the LOS analysis methodology can be found on pages L2-13 through L2-20 in Appendix L2 of the Draft EIR. As identified in this section, the LOS analysis study area included collector or higher roadway intersections where the Proposed Project would generate 50 or more peak hour trips, consistent with the requirements in the *County of Riverside Transportation Department Transportation Analysis Guidelines for Level of Service and Vehicle Miles Traveled* (December 2020) and the *San Bernardino County Transportation Impact Study Guidelines* (July 2019).

The regional nature of the ORSC suggests most trips to and from the ORSC site will utilize regional highways (e.g. Interstate 15, State Route 60), with less than three percent

2. Response to Comments

of trips utilizing local roadways south of Ontario Ranch Road (see the discussion on trip distribution and assignment on pages L2-44 through L2-52 in Appendix L2 of the Draft EIR). The ORSC also provides additional recreational facilities for the region, which could relieve congestion impacts at existing recreation facilities within and bordering the City of Eastvale (e.g. Silverlakes Soccer Complex).

A4-3 The City of Ontario values the interest of neighboring jurisdictions and their support in managing transportation impacts collaboratively. Mitigation Measure TRAF-2 requires that the City establish an event operational oversight group made up of transportation agencies and third-party operators that could be impacted by events. The City of Eastvale may wish to participate in this oversight group.

2. Response to Comments

LETTER A5 – City of Chino (1 page)

EUNICE M. ULLOA
Mayor

KAREN C. COMSTOCK
Mayor Pro Tem

CURTIS BURTON
CHRISTOPHER FLORES
MARC LUCIO
Council Members

DR. LINDA REICH
City Manager

CITY of CHINO

May 17, 2024

Thomas Grahn
City of Ontario Planning Department
303 East "B" Street
Ontario, CA 91764

Re: Notice of Availability (NOA) of a Draft Environmental Impact Report (State Clearinghouse No. 2023110328)

Dear Thomas,

This letter is in response to the Notice of Availability (NOA) for Ontario Regional Sports Complex Draft Environmental Impact Report (EIR), made available on April 4, 2024. The City's comments are outlined below: Intro

Traffic / Transportation

1) The projects Traffic Impact Analysis should include the LOS analysis of any intersections and roadway segments expected to have 50 or more peak hour trips added by the project. The peak hour should not only include the typical morning and afternoon peak periods but an analysis of anticipated event arrival and dismissal peak periods for major events including weekends. A worse-case scenario should be included in the analysis. Impacts to adjacent facilities should be identified and mitigation measures recommended and conditioned upon the project. A5-1

2) As the project is expected to attract regional use, impacts to regional facilities such as freeways, major arterials and public transportation systems should be included to determine anticipated needs for services and impacts to the transportation system to ensure regional movement of traffic is not significantly impacted. A5-2

If you have any questions, please contact me by email at ccortez@cityofchino.org, or you can call me at 909-334-3525.

Sincerely,

Chris Cortez, Assistant Planner

cc: Andrea Gilbert, City Planner
Dennis Ralls, Transportation Manager

13220 Central Avenue, Chino, California 91710
Mailing Address: P.O. Box 667, Chino, California 91708-0667
(909) 334-3250 • (909) 334-3720 Fax
Web Site: www.cityofchino.org

2. Response to Comments

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A5. Response to Comments from Chris Cortez, Assistant Planner, City of Chino, dated May 17, 2024.

Intro Responses to Comments from the City of Chino on the ORSC are provided in responses A5-1 through A5-2 below.

A5-1 The Draft EIR, Section 5.17, *Transportation*, evaluated transportation impacts of the Proposed Project. Senate Bill 743 (SB 743) eliminated auto delay, level of service (LOS), and similar measures of vehicular capacity or traffic congestion as the sole basis for determining significant impacts under CEQA. As such, the Draft EIR evaluates transportation impacts based on vehicle miles traveled (VMT) metrics.

Appendix L2, *Traffic Impact Analysis*, of the Draft EIR, included an evaluation of vehicle delay at intersections within the traffic study area per the City of Ontario's General Plan Circulation Element LOS policy to plan for future infrastructure needs. A discussion of the LOS analysis methodology can be found on pages L2-13 through L2-20 in Appendix L2 of the Draft EIR. As identified in this section, the LOS analysis study area included collector or higher roadway intersections where the Proposed Project would generate 50 or more peak hour trips. An analysis of roadway segments was not conducted as the City of Ontario measures delay based on intersection turning movements. Also, intersections typically constrain the roadway system, not roadway segments; and are therefore, more appropriate for detailed assessment such as that completed for the Proposed Project.

As identified on page L2-34 of Appendix L2 in the Draft EIR, the intent of the Traffic Impact Analysis was to evaluate typical daily traffic and commonly occurring events to appropriately size transportation infrastructure. Worst-case events, such as multiple tournaments during a stadium event occur infrequently; and therefore, would not warrant the infrastructure to be designed for this worst-case scenario. For a day with both tournament and stadium events, traffic would be managed through implementation of the Parking and Event Traffic Management Plans in accordance with Mitigation Measures TRAF-1a through TRAF-1c and TRAF-2, which requires that the City prepare an Event Traffic Management Plan to optimize access to and from the ORSC site to improve safety, minimize conflicts with ride sharing, facilitate the safe and efficient flow of vehicle traffic during events, etc. Mitigation Measure TRAF-2 also requires that the City establish an operational oversight group made up of transportation agencies and third-party operators that could be impacted by events. The City of Chino may wish to participate in this oversight group.

A5-2 See response to Comment A5-1 regarding congestion-based metrics pursuant to SB 743. Section 5.17, *Transportation*, of the Draft EIR evaluated potential transportation impacts to regional facilities, major arterials, and the public transportation system. As identified on page 5.17-21, storage capacities for State Route 60 (SR-60) and Interstate 15 (I-15) offramps were evaluated; and the Proposed Project is not anticipated to affect the freeway mainline (see Appendix L2, Table 11). Likewise, the Proposed Project would not conflict with the City's multimodal plans, including transit service (see Draft EIR page 5.17-17).

LETTER O1 – Newmeyer Dillion, on behalf of Pacific Communities Builder, Inc. (PCB) (10 pages)

NEWMEYER DILLION

Newmeyer & Dillion LLP
895 Dove Street
Second Floor
Newport Beach, CA 92660
(949) 854-7000

May 20, 2024

Michael W. Shonafelt
Michael.Shonafelt@ndlf.com

VIA EMAIL

Thomas Grahn
Senior Planner
City of Ontario Planning Department, 303
East "B" Street, Ontario, CA 91764
tgrahn@ontarioca.gov

Re: Preliminary Comment Letter re City of Ontario Regional Sports Park DEIR (SCH 2023110328)

Dear Mr. Grahn,

This office represents Pacific Communities Builder, Inc. ("PCB"), owner of four parcels of real property (APNs 0218-101-03-0-000 through 0218-101-06-0-000) (collectively, "Property") located at the southeast corner of Vineyard Avenue and Riverside Drive in the City of Ontario ("City"). This letter responds to the City's April 4, 2024, Notice of Availability of the Ontario Regional Sports Complex Draft Environmental Impact Report (SCH 2023110328) ("DEIR"), which purports to examine the potential environmental impacts of the Ontario Regional Sports Complex ("Sports Complex" or "Project") pursuant to the California Environmental Quality Act (Pub. Resources Code, § 21000, et seq.) ("CEQA"). PCB presents this comment letter during the public comment period on the DEIR without waiver of its rights to supplement these comments as the Sports Complex project progresses through the required approval process, up to the final public hearing. (See, e.g., *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1200 [CEQA comments to be considered up to final project hearing].) Intro

1. INTRODUCTION AND BACKGROUND.

PCB is a particularly interested party since the Sports Complex is proposed for construction on PCB's Property and, for that reason, the City has commenced eminent domain proceedings for a full take of the Property to facilitate the rezone from Low Density Residential (LDR) and Medium Density Residential (MDR) to Open Space. To make matters more urgent, PCB has already proposed a 455-unit residential development project with both affordable and market-rate units ("PCB Project") on the Property by submittal to the City of a Preliminary Application on April 8, 2024, pursuant to Government Code sections 65941.1 and 65589.5, as amended by SB 330 O1-1

5416.104 / 15732560.1

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newmeyerdillion.com

2. Response to Comments

Thomas Grahn
May 20, 2024
Page 2

("Preliminary Application"). Discussion of the PCB Project is glaringly absent from the DEIR. Such an omission constitutes a material defect in the DEIR because, as discussed more thoroughly below, the submittal of the Preliminary Application gave rise to a vested right to lock in the current MDR and LDR zoning on the Property and to proceed with the PCB Project. (See Gov. Code, § 65589.5, subd. (k)(1)(A)(i)(III)(a).) The Sports Complex proceeds in the face of this legal obstacle. O1-1 cont'd

2. PCB HAS A VESTED RIGHT TO THE CURRENT ZONING.

The date of the submittal of the Preliminary Application is a critical event that is overlooked by the DEIR. That is because a preliminary application for a housing development shall be subject only "to the ordinances, policies, and standards adopted and in effect" when the preliminary application is submitted. (Gov. Code, §§§ 65589.5 , subd. (o)(1).) The freezing in place of the regulatory state of affairs at the time of preliminary application submittal is a central feature of the Housing Accountability Act (Gov. Code, § 65589.5) ("HAA"). (See *id.*, subds. (d)(2), (d)(5), (j)(1) [fixing regulatory scheme based on "deemed complete" date].) The vesting afforded by the HAA ensures the development community's ability to rely on the state of the regulatory regime in place when vesting is effected so that it can safely and confidently commit resources to development. Accordingly, in the HAA context, "the private sector should be able to rely" on a preliminary application "prior to expending resources and incurring liabilities without the risk of having the project frustrated by subsequent action by the approving local agency . . . ." (*Kaufman & Broad Central Valley, Inc. v. City of Modesto* (1994) 25 Cal.App.4th 1577, 1588, citing Gov. Code, § 66498.9, subd. (b).) O1-2

The upshot of the submittal of the Preliminary Application is that the City is not free to rezone the Property, as anticipated by the DEIR, without unlawfully infringing on PCB's vested rights and without foreclosing the ability of PCB to develop its project. That is because "[o]nce a landowner has secured a vested right the government may not, by virtue of a change in the zoning laws, prohibit construction authorized by the permit upon which he relied." (*Avco Community Developers, Inc. v. South Coast Regional Com.* (1976) 17 Cal.3d 785, 791.) That vested right extends not only to the existing zoning, but also the PCB Project, which, as a residential development project, is subject to the HAA, as amended by the Housing Crisis Act of 2019 (SB 330) ("HCA").

3. THE PCB PROJECT IS PROTECTED BY THE HOUSING ACCOUNTABILITY ACT, AS AMENDED BY THE HOUSING CRISIS ACT.

A. Standards for Denying a Project Under the HAA.

In 2019, the State Legislature enacted the HCA. The keystone of the HCA is a legislatively declared, statewide housing crisis -- a housing crisis of "historic proportions." The HCA features a number of urgent declarations. The following are especially relevant here: O1-3

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(1) "The lack of housing, including emergency shelters, is a ***critical problem*** that threatens the economic, environmental, and social quality of life in California."

(2) "The excessive cost of the state's housing supply is partially caused by activities and policies of ***many local governments that limit the approval of housing***, increase the cost of land for housing, and require that high fees and exactions be paid by producers of housing."

(3) "Many local governments do not give adequate attention to the economic, environmental, and social costs of decisions that result in disapproval of housing development projects, reduction in density of housing projects, and excessive standards for housing development projects."

(4) "The consequences of failing to effectively and aggressively confront this crisis are hurting millions of Californians, robbing future generations of the chance to call California home, stifling economic opportunities for workers and businesses, worsening poverty and homelessness, and undermining the state's environmental and climate objectives." O1-3 cont'd

(5) The crisis has grown so acute in California that supply, demand, and affordability fundamentals are characterized in the negative: underserved demands, constrained supply, and protracted unaffordability.

(6) According to reports and data, California has accumulated an unmet housing backlog of nearly 2,000,000 units and must provide for at least 180,000 new units annually to keep pace with growth through 2025.

(7) California's housing picture has reached a crisis of historic proportions despite the fact that, for decades, the Legislature has enacted numerous statutes intended to significantly increase the approval, development, and affordability of housing for all income levels, including this section.

(SB 330, § 2, subd. (a), emphasis added.) Of further relevance are the Legislatures statements of intent:

(1) "The Legislature's intent in enacting this section in 1982 and in expanding its provisions since then was to ***significantly increase the approval and construction of new housing for all economic segments of California's communities by meaningfully and effectively curbing the capability of local governments to deny, reduce the density for, or render infeasible housing development projects*** … ."

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(2) "It is the policy of the state that this section ***be interpreted and implemented in a manner to afford the fullest possible weight to the interest of, and the approval and provision of, housing***."

The above legislative admonitions served as the impetus for several provisions adding additional teeth to the HAA, including provisions intended to prevent delays in processing permits for housing projects and to lower the barriers to approval of housing projects. The purpose of the HAA is to limit the ability of local governments to "reject or make infeasible housing developments ... without a thorough analysis of the economic, social, and environmental effects of the action...." (*Id.*, subd. (b).) Subdivision (j) of the statute provides that

> When a proposed housing development project complies with applicable, objective general plan, zoning, and subdivision standards and criteria, including design review standards, in effect at the time that the application was deemed complete, but the local agency proposes to disapprove the project or ***to impose a condition that the project be developed at a lower density***, the local agency ***shall*** base its decision regarding the proposed housing development project upon written findings supported by ***a preponderance of the evidence on the record*** that both of the following conditions exist:
>
> (A) The housing development project would have ***a specific, adverse impact*** upon the public health or safety unless the project is disapproved or approved upon the condition that the project be developed at a lower density. As used in this paragraph, a "specific, adverse impact" means a ***significant, quantifiable, direct, and unavoidable impact, based on objective, identified written public health or safety standards, policies, or conditions as they existed on the date the application was deemed complete***.
>
> (B) There is no feasible method to satisfactorily mitigate or avoid the adverse impact identified pursuant to paragraph (1), other than the disapproval of the housing development project or the approval of the project upon the condition that it be developed at a lower density.

O1-3 cont'd

(Gov. Code, § 65589.5, subd. (j), emphasis added.) "Specific, adverse impact," means "a significant, quantifiable, direct, and unavoidable impact, based on objective, identified

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written public health or safety standards, policies, or conditions as they existed on the date the application was deemed complete." (Gov. Code § 65589.5, subd. (d)(2).) Notably, "[i]nconsistency with the zoning ordinance or general plan land use designation" does not constitute a specific, adverse impact. (*Id.*, § 65589.5, subd. (d)(2)(A).) Further, the Legislature clearly intends for these findings to be taxing, stringent and difficult to make:

> It is the intent of the Legislature that the conditions that would have a specific, adverse impact upon the public health and safety, as described in paragraph (2) of subdivision (d) . . . arise ***infrequently***.

O1-3 cont'd

(*Id.*, § 65589.5 subd. (a)(3), emphasis added.) Subdivision (d) further requires that each of the five subdivision (d) exceptions must be supported by "written findings, based upon a preponderance of the evidence in the record . . . ." (*Id.*, § 65589.5, subd. (d).)

B. The Sports Complex Project and Associated Rezone Foreclose the PCB Project at the Application Stage, in Violation of the HAA.

By proceeding with a rezone of the Property from LDR and MDR to open space, the City seeks to erase a major residential area currently dedicated to helping achieve the City's Regional Housing Needs Allocation ("RHNA") commitments to the State of California. Those RHNA units (1,470 of them) are inventoried in the City's Sixth Cycle Housing Element Update, which was approved by the Housing and Community Development Department on October 7, 2022. (See City of Ontario Housing Element, Table B-2 [Housing Sites Inventory] (March 1, 2024).) To offset this loss, 94 acres of property directly south of the Project is planned to be upzoned from LDR (Low Density Residential) to MDR (Medium Density Residential) and added to the Housing Element's sites inventory. (See DEIR, Figure ES-6, below.) A portion of the Vineyard corridor area will also include an affordable housing overlay: O1-4

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A. The DEIR Fails to Mitigate Significant Agricultural Impacts

1. The DEIR Fails to Meaningfully Consider Agricultural Conservation Easements as Mitigation

Development of the ORSC Project site would convert 53 acres of Prime Farmland and development of the proposed General Plan Amendment and Rezone would convert 45.8 acres of Prime Farmland.[25] Accordingly, the DEIR recognizes that the proposed project would result in a significant impact on agricultural resources due to the permanent conversion of Prime Farmland to nonagricultural use.[26] CEQA requires that all feasible and reasonable mitigation be reviewed and applied to projects identifying significant impacts.[27] The DEIR identifies this impact as significant and unavoidable.[28] But the DEIR fails to meaningfully evaluate the feasibility and effectiveness of agricultural conservation easements ("ACEs") as mitigation for this Project's impacts. ACEs can either include the outright purchase of easements or the donation of mitigation fees to a local, regional, or statewide organization or agency whose purpose includes the acquisition and stewardship of agricultural easements.[29] O2-4

The DEIR suggests that ACEs are legally infeasible, stating that it is "speculative as to whether replacement of agricultural resources off-site meets the additionality requirements of CEQA."[30] The DEIR also states that an offsite fee mitigation program would not avoid the loss of farmland; would not minimize the effect of the Proposed Project; would not repair, rehabilitate, or restore the affected farmland; and, absent a viable fee program, would not replace affected farmland with substitute farmland.[31] In support of this reasoning, the DEIR cites to the Fifth District Court of Appeal's decision in *King and Gardiner Farms, LLC et al. v County of Kern et al.*[32]

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[25] DEIR, pg. 5.2-9.
[26] DEIR, pg. 5.2-7.
[27] Cal. Code Regs. tit. 14 § 15364. *Covington, supra,* at 883.
[28] DEIR, pg. 5.2-12.
[29] *See* California Civil Code Section 815; Cal. Code Regs., tit. 14, § 15370 [mitigation includes "compensating for the impact by replacing or providing substitute resources or environments, including through permanent protection of such resources in the form of conservation easements."]; Department of Conservation, Agricultural Conservation Easements, https://www.conservation.ca.gov/dlrp/grant-programs/Pages/ACE_Overview.aspx.
[30] DEIR, pg. 5.2-11.
[31] DEIR, pg. 5.2-12.
[32] (2020) 45 Cal.App.5th 814.

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4. THE DEIR'S SILENCE REGARDING THE PCB PROJECT RENDERS MULTIPLE SECTIONS OF THE DEIR INADQUATE.

A. The Project Description Proceeds Upon Misplaced Assumptions Regarding the City's Ability to Freely Rezone the Property.

The keystone of the environmental impact report (referred to herein as an "EIR") is the project description. If an EIR proceeds on the basis of an incomplete or inaccurate project description, the entire document is subject to question. As one court observed:

> A curtailed or distorted project description may stultify the objectives of the reporting process. Only through an accurate view of the project may affected outsiders and public decision-makers balance the proposal's benefit against its environmental cost, consider mitigation measures, assess the advantage of terminating the proposal (i.e., the "no project" alternative) and weigh other alternatives in the balance. An accurate, stable and finite project description is the sine qua non of an informative and legally sufficient EIR. O1-5

(*County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 192-193.)

In this case, the non-negotiable element of the project description in the DEIR is the rezoning of 20 parcels of land, including the Property, as defined above, from low and medium density residential to OS-R ("Open Space – Parkland") and HOS ("Hospitality"). (DEIR, Project Description, p. 3-72.) The entire project hinges on the City's ability to effect the proposed rezone. Without the rezone, the Sports Complex cannot get past "go," and is a nullity. As described above, the City does not enjoy the usual degree of deference afforded to local governments in their legislative prerogatives. Instead, the City is tightly circumscribed by the stringent standards of the HAA, described above. Additionally, due to the vested rights that have matured through submittal of the Preliminary Application, any rezoning would result in a taking of vested real property rights. The DEIR mistakenly assumes that the City Council of the City of Ontario carries its usual broad authority to undertake zone changes and general plan amendments. That is not the case here, and the DEIR fails to account for that reality.

B. The Land Use Analysis Fails to Account for the PBC Project and Vesting.

The DEIR's analysis of land use impacts (chapter 5.11) must analyze, among other things, "land use incompatibilities; division of neighborhoods or communities; or interference with other land use plans." (DEIR, p. 5.11-1.) The DEIR identifies the Armstrong Ranch Specific Plan as an existing land use plan and the uprooting of over O1-6

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1,470 potential residential dwelling units through removal of all residential zoning on the site in favor of open space and hospitality uses. The DEIR's blanket fix for this impact is to upzone 94 acres further south along the Vineyard Corridor from LDR to MDR. (DEIR, p. 5.11-8.)

Notably, the land use impacts chapter fails to disclose and analyze the effects of precluding development of a residential development project of 455 units, which not only is in the queue but is vested. Vesting locks this project in the ground and therefore must be included in the environmental baseline under CEQA. (CEQA Guidelines, § 15125.) It is not enough, therefore, simply to waive a wand and shift RHNA units down the street. An analysis of the implication of disrupting a vested project under the HAA, SB330 and the State Density Bonus Law must be included in this chapter. O1-6 cont'd

C. The DEIR Improperly Defers the Project's Environmental Review in Violation of CEQA.

An EIR should be prepared as early as feasible in the planning process to enable environmental considerations to influence project program and design and yet late enough to provide meaningful information for environmental assessment. (*Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 395.) Environmental review which comes too early may be too generalized to be useful; review that comes too late runs the risk of simply presenting a burdensome reconsideration of decisions already made and becoming the sort of post hoc rationalization to support action already taken. (*Berkeley Keeps Jets Over the Bay Committee v. Board of Port Commissioners of the City of Oakland* (2001) 91 Cal.App.4th 1344, 1359.) This is especially the case where the public agency prepares and approves the EIR for its own project. (*Id.*, at p. 395.) CEQA forbids piecemeal or deferred review of the significant environmental impacts of a project or truncating an analysis by burying it under a lower level of review. (*Banning Ranch Conservancy v. City of Newport Beach* (2012) 211 Cal.App.4th 1209, 1271.) The California Supreme Court set forth the proper standard of review in *Laurel Heights*, stating: O1-7

> We hold that an EIR must include an analysis of the environmental effects of future expansion or other action if (1) it is a reasonably foreseeable consequence of the initial project; and (2) the future expansion or action will be significant in that it will likely change the scope or nature of the initial project or its environmental effects. Under this standard, the facts of each case will determine whether and to what extent an EIR must analyze future expansion or other action.

(*Laurel Heights Improvement Assn. v. Regents of University of California*, *supra*, 47 Cal.3d at p. 396.)

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In this case, the DEIR presents a hybrid of both project-level and programmatic environmental review. (See, e.g., DEIR at p. 1-5.) The project-level analysis focuses on the actual development of the Sports Complex at the Project site whereas the rezoning of the Vineyard Corridor to accommodate lost RHNA units is presented as a programmatic analysis. This gives rise to a problem. Programmatic EIRs generally defer more detailed, ground-level environmental review to later, specific projects as they are proposed by specific developers. (See *Al Larson Board Shop, Inc. v. Board of Harbor Commissioners* (1993) 18 Cal.App.4th 729, 741; See also CEQA Guidelines, § 15168, subd. (a).) With this in mind, the City short-shrifts the analysis of the Project's specific impacts on the Vineyard Corridor by analyzing the TOP and zoning amendments in a programmatic fashion, placing heavy reliance on future project-by-project environmental review which may never happen. Notably, improper piecemealing can occur when the reviewed project legally compels or practically presumes completion of another action. (*Nelson v. County of Kern* (2010) 190 Cal.App.4th 252, 272, [EIR for reclamation plan should have included mining operations that necessitated it].) The allocation of density within the Vineyard Corridor is a legal necessity to meet both SB 330 and SB 166 requirements. (DEIR, at p. 3-75.) The TOP amendment and rezone are not only reasonably foreseeable in the future, but are necessary to address the displacement of 1,470 RHNA units. (DEIR, 3-76.)

By failing to provide further environmental review beyond a programmatic EIR level, the DEIR improperly piecemeals and/or defers the environmental analysis for the Project, failing to evaluate the Project's inherent and specific impacts to the Vineyard Corridor. Denser development within the Vineyard Corridor area (originally zoned for lower density residential) is now a foregone conclusion as a direct result of the upzoning of the parcels to meet the SB 330 and SB 116 requirements for the Project. The general plan amendments now contemplate transferring 1,471 units originally spread over 199 acres to an area which could only accommodate 474 total units per the SEIR. (DEIR, p. 5.11-8.) The DEIR now envisions a density of 2075 units within 94 acres -- an approximately 300 percent increase for that area. O1-7 cont'd

Further, the programmatic evaluation relies heavily upon a 2022 Certified EIR for 2050 TOP ("SEIR") and proceeds to incorporate the entire SEIR by reference. (DEIR, p. 3-77.) TOP did not contemplate the housing and population increases to accommodate the Project rezone and does not evaluate whether the SEIR reviewed the same specifically for the Vineyard Corridor area. (DEIR, p. 5.14-11.) The City appears to conclude that the shifting of housing units on land that is half the size to accommodate the Project would not result in direct physical impacts to the City as whole. (DEIR, p. 3-77.) Yet, this future concentrated development will likely have a significant effect on the nearby surrounding areas within and around the Vineyard Corridor, including the Project site itself. Such drastic changes to the landscape should be evaluated now, not later.

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Analyzing the TOP amendment and zone changes at a programmatic level also leaves open the possibility of the lack of future environmental analysis. (*Citizens for Responsible Equitable Environmental Development v. City of San Diego Redevelopment Agency* (2005) 134 Cal.App.4th 598, [programmatic EIR must adequately analyze potential environmental impacts to be relied upon for a subsequently proposed project].) The programmatic evaluation opens the door for a future project proponent to rely upon DEIR's surface-level environmental impacts on the Vineyard Corridor, leaving project-level effects ignored. CEQA therefore mandates further specific analysis on the Project's impacts to the Vineyard corridor. (*Laurel Heights Improvement Assn. v. Regents of University of California*, *supra*, 47 Cal.3d, at 399 citing CEQA Guidelines § 15144, ["Drafting an EIR ... involves some degree of forecasting. While foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can].") O1-7 cont'd

5. CONCLUSION.

PCB's analysis of the DEIR remains ongoing. PCB therefore reserves its right to supplement these comments to the DEIR up until the close of final public hearings on the Project and, if approved, a notice of determination is filed. (Pub. Res. Code, § 21177, subds. (a) and (b); see also, *Galante Vineyards v. Monterey Peninsula Water Management District* (1997) 60 Cal.App.4th 1109, 1117-1121 [submission of written objections to after the close of public comment period on the draft of final environmental impact report but prior to the close of public hearing on the project before the issuance of a notice of determination satisfies CEQA's statutory exhaustion requirements].)

O1-8

In the meantime, the City is bound by the Permit Streamlining Act (Gov. Code, § 65920, et seq.), the HAA -- and by theories established by case law -- to process applications for housing development projects like this. (See, e.g., *Building Industry Legal Defense Foundation v. City of San Juan Capistrano* (1999) 72 Cal.App.4th 1410 [mandatory duty to process submitted applications].) PCB therefore will continue to request that the City seriously consider the principles set forth in this letter and accept and process the PCB Project so that it is properly disposed for presentation to the decision-maker capable of making findings based on a written record.

If you have any questions about this letter, please do not hesitate to call me.

Very truly yours,

Michael W. Shonafelt

cc: Henry K. Noh, Planning Director, HNoh@ontarioca.gov
Nelson Chung, President, Pacific Communities Builder

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O1. Response to Comments from Michael W. Shonafelt, Newmeyer Dillion, on behalf of Pacific Communities Builder, Inc. (PCB), dated May 20, 2024.

Intro Responses to comments written on behalf of Pacific Communities Building, Inc., (PCB) are provided in responses O1-1 through O1-8 below. The City disagrees with the Commenter that the Draft EIR fails to comply with CEQA.

O1-1 This Comment concerns the commenter's opinions regarding PCB's preliminary application to the City with regard to residential development. However, this Comment does not provide any comments regarding the Draft EIR, which analyzes the ORSC project. As this Comment does not address the content of the Draft EIR, no further response is necessary.

O1-2 See response to Comment O1-1. This Comment does not provide any comments regarding the Draft EIR, which analyzes the ORSC project. As this Comment does not address the content of the Draft EIR, no further response is necessary.

O1-3 See responses to Comments O1-1 and O1-2. This Comment does not provide any comments regarding the Draft EIR, which analyzes the ORSC project. As this Comment does not address the content of the Draft EIR, no further response is necessary.

O1-4 The Draft EIR for the Proposed Project was circulated for public review on April 4, 2024, while the PCB's application was submitted on April 8, 2024 (which was found to be incomplete, email dated May 7, 2024). Because the release of the Draft EIR for the ORSC predates the PCB application, the City disagrees with the claim that the Draft EIR intentionally omits references to what is a previously unknown proposed residential project within the ORSC site. Furthermore, this Draft EIR analyzes impacts of the Proposed Project and includes consideration of residential development along Vineyard Avenue at the ORSC site as a potential alternative to the Proposed Project.

O1-5 See responses to Comments O1-1 through O1-4 above. This Comment does not address the content of the Draft EIR; and therefore, no further response is necessary.

O1-6 See responses to Comments O1-1 through O1-4 above. CEQA Guidelines Section 15125(a)(1) states that, "the lead agency should describe physical environmental conditions as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective." Section 15125(a)(3) further states that, "an existing conditions baseline shall not include hypothetical conditions, such as those that might be allowed, but have never actually occurred, under existing permits or plans, as the baseline." Consistent with these provisions of the CEQA Guidelines, Chapter 4, *Environmental Setting*, of the Draft EIR describes the existing conditions of the ORSC site, which serves as the baseline for the analysis of impacts in the Draft EIR.

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As described in detail in Section 3.3.4, *General Plan Amendment and Rezone*, in Chapter 3, *Project Description,* of the Draft EIR, the Proposed Project would necessitate a general plan amendment to implement the ORSC. This action triggers a concurrent General Plan Amendment and Rezone on Vineyard Corridor (GPA and Rezone) to comply with State requirements under Senate Bills 330 and 166 to replace the residential housing capacity designated for the site in The Ontario Plan (TOP).

The PCB project application was submitted to the City after the Draft EIR was circulated for public review. As such, the City disagrees with the Commenter that the PCB proposed project was required to be considered as an existing or pending project for land use compatibility in Section 5.11, *Land Use and Planning*, of the Draft EIR. The application for the residential project would, at most, represent an alternative to the Proposed Project rather than a project component. Chapter 7, *Alternatives to the Proposed Project*, contemplates an alternative development plan that would retain the residential corridor along Vineyard Avenue (see section 7.6, *Vineyard Avenue Residential Corridor Alternative,* and Figure 7-2*, Vineyard Avenue Residential Corridor Alternative*) and would allow for up to 1,267 dwelling units.

O1-7 As acknowledged by the Comment, the Draft EIR analyzes the impacts of the proposed off-site GPA and Rezone at a programmatic-level throughout Chapter 5, *Environmental Analysis*, of the Draft EIR. The programmatic-level review included in the Draft EIR is appropriate for the SB 330 and SB 166 GPA and Rezone action associated with the Proposed Project.

As stated on page 3-77, Section 3.3.4.3, *Environmental Effects of Off-Site TOP Amendments and Zone Changes,* "future, site-specific, development consistent with the off-site GPA and Rezone are not evaluated at a project-level because these actions are solely for compliance with SB 330 and SB 166." Section 3.3.4.3 further provides that the potential impacts associated with these programmatic land use changes are compared to the impacts the Supplemental EIR certified in 2022 for TOP 2050, which was incorporated by reference in the Draft EIR. At the time of drafting the Draft EIR and its circulation for public review, no development application was proposed for projects in the Vineyard Corridor; and therefore, the Draft EIR disclosed that the proposed changes "would not result in direct physical impacts to the environment that would warrant a project-level analysis." (pg. 3-77, paragraph 3, of the Draft EIR). Since no specific development has been proposed in the Vineyard Corridor, no project-level details are known. Therefore, a project-level analysis of the Vineyard Corridor GPA and Rezone would be speculative. The level of known detail for a project determines the level of specificity required in the Draft EIR (*Citizens for a Sustainable Treasure Island v. City and County of San Francisco (2014) 227 Cal.App.4th 1036*).

The Comment does not provide any comments with regard to the environmental analysis for the proposed GPA and Rezone in Chapter 5, instead noting only that the density allowed in the area would increase. The Draft EIR acknowledges that the GPA and Rezone would result in denser development within the Vineyard Corridor when compared to the level of development allowed under the parcels' existing land uses in TOP 2050 and this assumption of maximum development under the proposed density increase forms the basis for the analysis in each topical section of Chapter 5 of the Draft EIR. Therefore, the City disagrees with the Commenter that the Draft EIR improperly piecemeals and/or defers the environmental analysis of the GPA and Rezone. The Proposed Project has independent utility from any potential future residential development of the Vineyard Corridor so there is no piecemealing.

The City also disagrees with the Commenter that the TOP 2050 SEIR did not contemplate the housing and population increase of the Proposed Project. The Proposed Project triggers SB 330 and SB 166 because current TOP identifies the ORSC site for residential land uses. This action triggers the need to upzone property offsite to make up for the potential loss in housing capacity within the City. The GPA and Rezone area is directly south of the ORSC site on Vineyard Avenue, which was already identified for residential uses in TOP. There is no change in housing capacity compared to that evaluated in TOP 2050 SEIR because the increase in density within the GPA and Rezone area corresponds to the decrease in residential density on the ORSC site. Based on the analysis in Chapter 5 of the Draft EIR, there are no significant impacts associated with this change to the surrounding area and landscape.

The City also disagrees with the Commenter's assertions that the Draft EIR would preclude future environmental review for a development application for residential uses within the GPA and Rezone area. The Draft EIR provides project-level environmental clearance for the ORSC project. However, the GPA and Rezone triggered by SB 330 and SB 166 was evaluated at the same program-level of review conducted for TOP 2050. Discretionary approval for development projects within the City, including the GPA and Rezone area, would be subject to CEQA.

O1-8 See responses to Comments O1-1 through O1-7 above. This Comment does not address the content of the Draft EIR; and therefore, no further response is necessary.

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LETTER O2 – Adams Broadwell Joseph & Cardoza, on behalf of Californias Allied for a Responsible Economy (CARE CA) (54 pages)

Please note that the two resumes originally part of this comment letter are provided as Appendix E to this FEIR.

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May 20, 2024

Via Overnight Mail and Email
Thomas Grahn, Senior Planner
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Email: TGrahn@ontarioca.gov

Re: Comments on the Draft Environmental Impact Report for Ontario Regional Sports Complex (SCH No. 2023110328)

Dear Mr. Grahn:

We are writing on behalf of Californians Allied for a Responsible Economy ("CARE CA") to provide comments on the Draft Environmental Impact Report ("DEIR") prepared by the City of Ontario ("City") for the Ontario Regional Sports Complex (SCH No. 2023110328) ("Project").

The Project proposes to construct a 6,000-capacity, semipro, Minor League Baseball stadium with supportive retail/hospitality uses, as well as new regional park and community recreation facilities, including a new recreational center, aquatics center, and baseball, softball, and soccer fields. The Project would result in development of 540,750 square feet ("SF") of commercial building space, 450,000 SF of stadium space, and 272,000 SF of parking structures. The Project site is located on the southeast corner of Vineyard Avenue and Riverside Drive in the Armstrong Ranch Specific Plan area in the City of Ontario, San Bernardino County, California. Intro

We reviewed the DEIR and its technical appendices with the assistance of air quality expert Dr. James Clark, PhD,[1] and noise expert Ani Toncheva.[2] We reserve

[1] Dr. Clark's technical comments and curricula vitae are attached hereto as Exhibit A.
[2] Ms. Toncheva's technical comments and curricula vitae are attached hereto as Exhibit B.

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the right to supplement these comments at a later date, and at any later proceedings related to this Project.[3]

CARE CA's review of the DEIR and supporting documentation demonstrates that the DEIR fails to comply with the requirements of the California Environmental Quality Act ("CEQA")[4]. As explained in these comments, the DEIR lacks substantial evidence to support its conclusions with regard to the Project's impacts relating to agricultural resources, air quality, health risks, hazardous materials, and noise. The City may not approve the Project until the City revises and recirculates the Project's DEIR to accurately analyze the Project's significant impacts, and incorporates all feasible mitigation measures to avoid or minimize these impacts to the greatest extent feasible. Intro cont'd

I. STATEMENT OF INTEREST

CARECA is an unincorporated association of individuals and labor organizations that may be adversely affected by the potential public and worker health and safety hazards, and the environmental impacts of the Project. The coalition includes the District Council of Ironworkers, Southern California Pipe Trades DC 16, California State Association of Electrical Workers, along with their members, their families, and other individuals who live and work in the City of Ontario.

Individual members of CARE CA include City of Ontario residents Daniel Brewer, David Audelo, Carlos Mendez, and Rober Rubio. These individuals live in the City of Ontario, and work, recreate, and raise their families in the City and surrounding communities. Accordingly, they would be directly affected by the Project's environmental and health, and safety impacts. Individual members may also work on the Project itself. They will be first in line to be exposed to any health and safety hazards that exist on site. O2-1

CARECA advocates for protecting the environment and the health of their communities' workforces. CARECA seeks to ensure a sustainable construction industry over the long-term by supporting projects that offer genuine economic and employment benefits, and which minimize adverse environmental and other impacts on local communities.

[3] Gov. Code § 65009(b); PRC § 21177(a); *Bakersfield Citizens for Local Control v. Bakersfield* ("*Bakersfield*") (2004) 124 Cal. App. 4th 1184, 1199-1203; see *Galante Vineyards v. Monterey Water Dist.* (1997) 60 Cal. App. 4th 1109, 1121.
[4] Pub. Resources Code §§ 21000 et seq.; 14 Cal. Code Regs ("CEQA Guidelines") §§ 15000 et seq. ("CEQA Guidelines").

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In addition, CARECA has an interest in enforcing environmental laws that encourage sustainable development and ensure a safe working environment for its members. Environmentally detrimental projects can jeopardize future jobs by making it more difficult and more expensive for business and industry to expand in the region, and by making the area less desirable for new businesses and new residents. Indeed, continued environmental degradation can, and has, caused construction moratoriums and other restrictions on growth that, in turn, reduce future employment opportunities. O2-1 cont'd

II. LEGAL BACKGROUND

CEQA requires public agencies to analyze the potential environmental impacts of their proposed actions in an EIR.[5] "The foremost principle under CEQA is that the Legislature intended the act to be interpreted in such manner as to afford the fullest possible protection to the environment within the reasonable scope of the statutory language."[6]

CEQA has two primary purposes. First, CEQA is designed to inform decisionmakers and the public about the potential significant environmental effects of a project.[7] "Its purpose is to inform the public and its responsible officials of the environmental consequences of their decisions before they are made. Thus, the EIR 'protects not only the environment but also informed self-government.'"[8] The EIR has been described as "an environmental 'alarm bell' whose purpose it is to alert the public and its responsible officials to environmental changes before they have reached ecological points of no return."[9] As the CEQA Guidelines explain, "[t]he EIR serves not only to protect the environment but also to demonstrate to the public that it is being protected."[10] O2-2

[5] PRC § 21100.
[6] *Laurel Heights Improvement Assn. v. Regents of Univ. of Cal ("Laurel Heights I")* (1988) 47 Cal.3d 376, 390 (internal quotations omitted).
[7] Pub. Resources Code § 21061; CEQA Guidelines §§ 15002(a)(1); 15003(b)-(e); *Sierra Club v. County of Fresno* (2018) 6 Cal.5th 502, 517 ("[T]he basic purpose of an EIR is to provide public agencies and the public in general with detailed information about the effect [that] a proposed project is likely to have on the environment; to list ways in which the significant effects of such a project might be minimized; and to indicate alternatives to such a project.").
[8] *Citizens of Goleta Valley,* 52 Cal.3d at p. 564 (quoting *Laurel Heights I*, 47 Cal.3d at 392).
[9] *County of Inyo v. Yorty* (1973) 32 Cal.App.3d 795, 810; *see also Berkeley Keep Jets Over the Bay v. Bd. of Port Comm'rs.* (2001) 91 Cal.App.4th 1344, 1354 ("*Berkeley Jets*") (purpose of EIR is to inform the public and officials of environmental consequences of their decisions *before* they are made).
[10] CEQA Guidelines § 15003(b).

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Second, CEQA requires public agencies to avoid or reduce environmental damage when "feasible" by requiring consideration of environmentally superior alternatives and adoption of all feasible mitigation measures.[11] The EIR serves to provide agencies and the public with information about the environmental impacts of a proposed project and to "identify ways that environmental damage can be avoided or significantly reduced."[12] If the project will have a significant effect on the environment, the agency may approve the project only if it finds that it has "eliminated or substantially lessened all significant effects on the environment" to the greatest extent feasible and that any unavoidable significant effects on the environment are "acceptable due to overriding concerns."[13]

O2-2 cont'd

While courts review an EIR using an "abuse of discretion" standard, "the reviewing court is not to 'uncritically rely on every study or analysis presented by a project proponent in support of its position. A clearly inadequate or unsupported study is entitled to no judicial deference."[14] As the courts have explained, a prejudicial abuse of discretion occurs "if the failure to include relevant information precludes informed decision-making and informed public participation, thereby thwarting the statutory goals of the EIR process."[15] "The ultimate inquiry, as case law and the CEQA guidelines make clear, is whether the EIR includes enough detail 'to enable who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project.'"[16]

III. THE DEIR FAILS TO DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS

An EIR must fully disclose all potentially significant impacts of a Project and implement all feasible mitigation to reduce those impacts to less than significant

O2-3

[11] CEQA Guidelines § 15002(a)(2), (3); *see also Berkeley Jets*, 91 Cal.App.4th at 1354; *Citizens of Goleta Valley*, 52 Cal.3d at p. 564.
[12] CEQA Guidelines § 15002(a)(2).
[13] PRC § 21081(a)(3), (b); CEQA Guidelines §§ 15090(a), 15091(a), 15092(b)(2)(A), (B); *Covington v. Great Basin Unified Air Pollution Control Dist.* (2019) 43 Cal.App.5th 867, 883.
[14] *Berkeley Jets*, 91 Cal.App.4th at p. 1355 (emphasis added) (quoting *Laurel Heights I*, 47 Cal.3d at 391, 409, fn. 12).
[15] *Berkeley Jets*, 91 Cal.App.4th at p. 1355; *see also San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 722 (error is prejudicial if the failure to include relevant information precludes informed decision making and informed public participation, thereby thwarting the statutory goals of the EIR process); *Galante Vineyards*, 60 Cal.App.4th at p. 1117 (decision to approve a project is a nullity if based upon an EIR that does not provide decision-makers and the public with information about the project as required by CEQA); *County of Amador v. El Dorado County Water Agency* (1999) 76 Cal.App.4th 931, 946 (prejudicial abuse of discretion results where agency fails to comply with information disclosure provisions of CEQA).
[16] *Sierra Club*, 6 Cal.5th at p. 516 (quoting *Laurel Heights I*, 47 Cal.3d at 405).

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levels. The lead agency's significance determination with regard to each impact must be supported by accurate scientific and factual data.[17] An agency cannot conclude that an impact is less than significant unless it produces rigorous analysis and concrete substantial evidence justifying the finding.[18]

Even when the substantial evidence standard is applicable to agency decisions to certify an EIR and approve a project, reviewing courts will not 'uncritically rely on every study or analysis presented by a project proponent in support of its position. A clearly inadequate or unsupported study is entitled to no judicial deference.'"[19]

Moreover, the failure to provide information required by CEQA is a failure to proceed in the manner required by CEQA.[20] Challenges to an agency's failure to proceed in the manner required by CEQA, such as the failure to address a subject required to be covered in an EIR or to disclose information about a project's environmental effects or alternatives, are subject to a less deferential standard than challenges to an agency's factual conclusions.[21] In reviewing challenges to an agency's approval of an EIR based on a lack of substantial evidence, the court will "determine de novo whether the agency has employed the correct procedures, scrupulously enforcing all legislatively mandated CEQA requirements."[22]

O2-3 cont'd

Additionally, CEQA requires agencies to commit to all feasible mitigation measures to reduce significant environmental impacts.[23] In particular, the lead agency may not make required CEQA findings, including finding that a project impact is significant and unavoidable, unless the administrative record demonstrates that it has adopted all feasible mitigation to reduce significant environmental impacts to the greatest extent feasible.[24]

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[17] CEQA Guidelines § 15064(b).
[18] *Kings Cty. Farm Bur. v. Hanford* (1990) 221 Cal.App.3d 692, 732.
[19] *Berkeley Jets*, 91 Cal.App.4th at 1355.
[20] *Sierra Club v. State Bd. Of Forestry* (1994) 7 Cal.4th 1215, 1236.
[21] *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 435.
[22] *Id., Madera Oversight Coal., Inc. v. County of Madera* (2011) 199 Cal. App. 4th 48, 102.
[23] CEQA Guidelines § 15002(a)(2).
[24] PRC § 21081(a)(3), (b); CEQA Guidelines §§ 15090, 15091; *Covington v. Great Basin Unified Air Pollution Control Dist.* (2019) 43 Cal.App.5th 867, 883.

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A. The DEIR Fails to Mitigate Significant Agricultural Impacts

1. The DEIR Fails to Meaningfully Consider Agricultural Conservation Easements as Mitigation

Development of the ORSC Project site would convert 53 acres of Prime Farmland and development of the proposed General Plan Amendment and Rezone would convert 45.8 acres of Prime Farmland.[25] Accordingly, the DEIR recognizes that the proposed project would result in a significant impact on agricultural resources due to the permanent conversion of Prime Farmland to nonagricultural use.[26] CEQA requires that all feasible and reasonable mitigation be reviewed and applied to projects identifying significant impacts.[27] The DEIR identifies this impact as significant and unavoidable.[28] But the DEIR fails to meaningfully evaluate the feasibility and effectiveness of agricultural conservation easements ("ACEs") as mitigation for this Project's impacts. ACEs can either include the outright purchase of easements or the donation of mitigation fees to a local, regional, or statewide organization or agency whose purpose includes the acquisition and stewardship of agricultural easements.[29] O2-4

The DEIR suggests that ACEs are legally infeasible, stating that it is "speculative as to whether replacement of agricultural resources off-site meets the additionality requirements of CEQA."[30] The DEIR also states that an offsite fee mitigation program would not avoid the loss of farmland; would not minimize the effect of the Proposed Project; would not repair, rehabilitate, or restore the affected farmland; and, absent a viable fee program, would not replace affected farmland with substitute farmland.[31] In support of this reasoning, the DEIR cites to the Fifth District Court of Appeal's decision in *King and Gardiner Farms, LLC et al. v County of Kern et al.*[32]

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[25] DEIR, pg. 5.2-9.
[26] DEIR, pg. 5.2-7.
[27] Cal. Code Regs. tit. 14 § 15364. *Covington, supra,* at 883.
[28] DEIR, pg. 5.2-12.
[29] *See* California Civil Code Section 815; Cal. Code Regs., tit. 14, § 15370 [mitigation includes "compensating for the impact by replacing or providing substitute resources or environments, including through permanent protection of such resources in the form of conservation easements."]; Department of Conservation, Agricultural Conservation Easements, https://www.conservation.ca.gov/dlrp/grant-programs/Pages/ACE_Overview.aspx.
[30] DEIR, pg. 5.2-11.
[31] DEIR, pg. 5.2-12.
[32] (2020) 45 Cal.App.5th 814.

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The City's interpretation of the holding of *King and Gardiner Farms* was specifically rejected in a published portion of the Fifth District Court of Appeal's decision in *V Lions Farming, LLC v. County of Kern, et al.*[33] The decision explains that "ACE's are a type of compensatory mitigation for the conversion of agricultural [land] even though, operating by themselves, they do not replace the converted land or otherwise result in no net loss of agricultural land," citing to *Sierra Club v. County of Fresno*,[34] which held that "mitigation measures must be at least partially effective, even if they cannot mitigate significant impacts to less than significant levels." The Court concluded: "[t]herefore, based on the issue actually presented and decided in *King & Gardiner* [citation] we conclude the County construed the opinion too broadly and mistakenly concluded the opinion established the principle that ACE's 'do not provide an effective means of even partial mitigation for agricultural conversion impacts.'"[35] The Court's decision is consistent with other caselaw recognizing ACEs as feasible mitigation such as *Masonite Corporation Dist. v. County of Mendocino, et al*,[36] which held that ACEs constitute legally feasible mitigation for the direct loss of prime farmland.[37] Thus, the City's reasoning in dismissing ACEs is not supported by CEQA caselaw. O2-4 cont'd

The DEIR also does not contain substantial evidence showing that ACEs are not technically feasible or effective. The DEIR states that because creation of additional Farmland in the City is contrary to the City's land use policies, there is no suitable replacement acreage within the City to mitigate for loss of Farmland.[38] The DEIR does not consider preservation of farmland outside of the City because "it is the policy of Ontario to mitigate impacts within the City boundaries because this is the area the City has direct jurisdictional control over."[39] O2-5

The DEIR's reasoning is flawed. First, there is no reason given why farmland must be replaced within the City's borders. The DEIR's allusion to a policy against replacing or preserving farmland outside of the City's borders is unsubstantiated, as the DEIR fails to cite any specific policy. Further, while a laudable mitigation goal,

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[33] (2024) Cal.App.5th
[34] (2018) 6 Cal.5th 502, 523.
[35] *V Lions Farming, LLC v. County of Kern, et al.* (2024) Cal.App.5th
[36] (First Dist. 2013) 218 Cal.App.4th 230
[37] *See Save the Hill Group v. City of Livermore* (2022) 76 Cal.App.5th 1092, 1117 (explaining that CEQA does not require mitigation measures that completely eliminate the environmental impacts of a project); see *Friends of Kings River v. County of Fresno* (2014) 232 Cal.App.4th 105, 124–126 ("offsite preservation of habitats for endangered species, which is functionally similar to an agricultural conservation easement, is an accepted means of mitigating impacts on biological resources").
[38] DEIR, pg. 5.2-9, 10.
[39] DEIR, pg. 5.2-10.

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agricultural replacement within City borders is not determinative of whether ACEs would otherwise be effective at reducing impacts. Loss of farmland is a statewide issue that would be partially mitigated by ACEs outside the City's borders. The State Legislature has declared that conversion of agricultural land is a significant concern and that the preservation of agricultural land is a significant goal of the State.[40] The Legislature has further stated that CEQA shall play an important role in the preservation of agricultural lands.[41] The court's decision in *V Lions Farming, LLC* confirms that ACEs may be considered as potentially feasible mitigation for these impacts. Thus, even if the City's land use plans do not call for preservation of farmland within the City, loss of farmland is a statewide issue that must be mitigated in the DEIR. O2-5 cont'd

Second, the suggestion that the City would not be able to enforce an ACE outside of the City's borders is unsupported by substantial evidence, as the City would have contractual rights under any agreement establishing an ACE.

A revised and recirculated DEIR must contain a full discussion of the feasibility of ACEs or purchasing credits from a mitigation bank.

B. The DEIR Fails to Adequately Analyze and Mitigate Significant Air Quality Impacts

1. The DEIR Underestimates the Project's Air Quality Impacts by Erroneously Assuming Use of Tier 4 Final Equipment

The DEIR's analysis of the Project's significant air quality and health risk impacts would be reduced to a less-than-significant level by imposition of Mitigation Measure ("MM") AQ-1.[42] MM AQ-1 requires use of Tier 4 construction equipment only "if available": O2-6

> Use construction equipment rated by the United States Environmental Protection Agency as having Tier 4 (model year 2008 or newer) Final or stricter emission limits for all off-road construction equipment. If Tier 4 Final

[40] Gov. Code, § 51220 (Williamson Act findings that agricultural preservation is valuable and necessary); Civ. Code, § 815 (legislative declaration that preservation of agricultural lands "is among the most important environmental assets of California"); Pub. Resources Code, § 10200, et seq. (California Farmland Conservancy Program Act, promoting the establishment of agricultural easements as a means to preserve agricultural land).
[41] This language was used as the finding behind amendments to Pub. Resources Code sections 21060.1, 21061.2 and 21095 in 1993 (Stats. 1993, ch. 812, §1, subd. (d)).
[42] DEIR, pg. 1-26.

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equipment is not available, the applicant shall provide documentation (e.g., rental inventory requests), to the City's satisfaction, or otherwise demonstrate its unavailability to the City of Ontario prior to the issuance of any construction permits.[43]

The DEIR's air study assumes that "[m]itigated emissions incorporate Tier 4 Final emission control standards for all off-road construction equipment."[44] The assumption that all of the Project's offroad construction equipment will meet Tier 4 Final standards is unjustified because MM AQ-1 does not commit the Applicant to using Tier 4 Final equipment. Merely requiring use of Tier 4 Final equipment "if available" is too vague to bind the Applicant to this level of mitigation. Mitigation measures must be fully enforceable to be valid under CEQA.[45]

Further, it is unlikely that MM AQ-1 would result in the actual use of Tier 4 Final equipment for all construction activities, as assumed in the DEIR, because it is unlikely that the Project will be able to obtain an entire off-road construction equipment fleet that meets Tier 4 Final emissions. Dr. Clark reviewed public records in the California Air Resources Board's ("CARB") Diesel Off-Road Online Reporting System ("DOORS") and found that the availability of Tiered construction equipment is highly dependent on the type of equipment.[46] O2-6 cont'd

Table 1: Percent of Equipment in California DOORS Database by Emission Tier Level

	U.S. EPA Emission Tier Level					
Equipment Type (> 50 hp)	**T0**	**T1**	**T2**	**T3**	**T4F**	**T4I**
Aerial Lifts	1.63%	4.67%	14.86%	4.08%	**48.64%**	**26.12%**
Boom	0.15%	0.77%	5.22%	1.59%	**76.20%**	**16.06%**
Bore/Drill Rigs	11.53%	15.42%	16.86%	21.76%	**17.72%**	**14.34%**
Bucket	8.33%	18.33%	10.00%	6.67%	**33.33%**	**23.33%**
Concrete Mixer	0.00%	0.00%	0.00%	14.29%	**85.71%**	**0.00%**
Concrete Pump	1.30%	7.79%	40.26%	1.30%	**32.47%**	**16.88%**
Crane 35ton or more	5.57%	4.41%	5.37%	18.81%	**37.62%**	**27.45%**
Crane less than 35ton	20.37%	2.47%	6.79%	12.35%	**38.27%**	**19.75%**
Cranes	27.84%	11.49%	9.13%	26.60%	**10.82%**	**11.80%**
Crawler Tractors	26.56%	13.31%	13.11%	13.70%	**22.39%**	**10.93%**

[43] *Id.*
[44] Appendix D1, PDF pg. 44.
[45] 14 CCR §15126.4(a)(2).
[46] Clark Comments, pg. 14-16.

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Equipment Type (> 50 hp)	U.S. EPA Emission Tier Level					
	T0	T1	T2	T3	T4F	T4I
Crushing/Processing Equipment	0.00%	0.78%	2.34%	14.06%	**74.22%**	**8.59%**
Drill Rig	7.09%	4.14%	8.86%	12.56%	**45.79%**	**17.87%**
Drill Rig (Mobile)	11.51%	8.71%	11.51%	17.26%	**30.95%**	**14.77%**
Excavators	5.24%	8.34%	13.95%	7.29%	**48.67%**	**16.50%**
Forklifts	9.57%	10.57%	13.82%	7.99%	**40.45%**	**17.46%**
Garbage Refuse	0.00%	0.00%	8.70%	8.70%	**43.48%**	**39.13%**
Garbage Transfer	0.00%	0.00%	0.00%	33.33%	**66.67%**	**0.00%**
Graders	29.78%	14.12%	12.89%	15.27%	**17.40%**	**10.52%**
Hopper Tractor Trailer	0.00%	0.00%	0.00%	0.00%	**50.00%**	**50.00%**
Mower	2.44%	7.27%	13.58%	1.10%	**54.40%**	**21.22%**
Nurse Rig Aircraft Supply	0.00%	0.00%	0.00%	0.00%	**100.00%**	**0.00%**
Nurse Rig Other	0.00%	0.00%	0.00%	100.00%	**0.00%**	**0.00%**
Off Highway Tractors	3.55%	6.28%	6.01%	8.74%	**65.30%**	**10.11%**
Off Highway Trucks	1.69%	3.87%	11.14%	5.81%	**62.23%**	**15.25%**
Off-Highway Tractors	18.25%	17.06%	20.98%	10.02%	**17.18%**	**16.31%**
Off-Highway Trucks	16.96%	12.96%	17.54%	20.81%	**16.13%**	**13.99%**
Other Construction Equipment	16.35%	14.20%	17.11%	10.53%	**24.03%**	**17.19%**
Other General Industrial Equipment	13.18%	16.56%	27.57%	8.61%	**13.80%**	**19.84%**
Other Material Handling Equipment	10.84%	11.39%	19.25%	15.55%	**26.63%**	**16.26%**
Other Truck	15.64%	10.34%	5.31%	13.41%	**36.87%**	**11.45%**
Pavers	12.11%	21.18%	16.99%	14.97%	**23.34%**	**11.41%**
Paving Equipment	6.49%	12.80%	12.74%	12.44%	**38.17%**	**17.05%**
Railcars or Track Cars	16.33%	8.16%	0.00%	14.29%	**51.02%**	**10.20%**
Rollers	14.09%	15.93%	18.30%	6.46%	**30.61%**	**14.59%**
Rough Terrain Forklifts	3.95%	9.32%	15.89%	8.11%	**41.94%**	**20.80%**
Rubber Tired Dozers	41.04%	10.02%	9.44%	19.65%	**15.22%**	**4.62%**
Rubber Tired Loaders	16.74%	12.71%	13.56%	14.94%	**29.29%**	**12.76%**
Scrapers	28.91%	10.98%	15.47%	30.41%	**10.15%**	**4.04%**
Skid Steer Loaders	3.70%	10.02%	15.81%	3.20%	**54.69%**	**12.58%**
Spray Truck	5.56%	4.17%	19.44%	2.78%	**34.72%**	**26.39%**
Spreader Tractor Trailer	0.00%	14.29%	28.57%	0.00%	**42.86%**	**14.29%**
Spreader Truck	4.17%	0.00%	4.17%	37.50%	**16.67%**	**25.00%**
Surfacing Equipment	15.38%	14.25%	10.18%	23.08%	**19.23%**	**17.65%**

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Equipment Type (> 50 hp)	U.S. EPA Emission Tier Level					
	T0	T1	T2	T3	T4F	T4I
Sweepers/Scrubbers	11.02%	20.84%	16.57%	6.61%	**25.75%**	**19.06%**
Tank Truck	4.05%	6.76%	8.11%	27.03%	**37.84%**	**16.22%**
Tanker Truck Trailer	0.00%	18.18%	0.00%	0.00%	**63.64%**	**18.18%**
Telescopic Handler	1.33%	0.00%	2.67%	0.00%	**80.00%**	**16.00%**
Tow Tractor	0.00%	100.00%	0.00%	0.00%	**0.00%**	**0.00%**
Tractors/Loaders/Backhoes	13.53%	16.50%	18.73%	8.96%	**29.23%**	**13.05%**
Trenchers	21.86%	19.57%	20.87%	3.28%	**21.86%**	**12.57%**
Vacuum Truck	2.21%	18.38%	15.44%	25.00%	**13.24%**	**14.71%**
Water Truck	21.79%	8.21%	16.43%	16.07%	**23.57%**	**13.57%**
Workover Rig (Mobile)	5.99%	15.14%	9.78%	17.35%	**7.10%**	**13.56%**
Yard Goat	4.40%	4.58%	9.41%	18.31%	**41.71%**	**21.33%**

Dr. Clark observes that equipment such as Tier 4 Final crawler tractors, loaders, and cranes make up a small portion of the registered fleet in California and are in short supply. Thus, the City's assumption that all off-road equipment will meet Tier 4 Final emission control standards is not supported by substantial evidence. O2-6 cont'd

Finally, MM AQ-1 does not require *any* alternative form of emissions control equipment to provide equivalent emissions reductions if Tier 4 Final equipment is determined to be unavailable, rendering MM AQ-1 wholly ineffective. Examples of equivalent measures could be requiring lower tier construction equipment outfitted with Best Available Control Technology ("BACT") devices which provide equivalent emission reductions, including but not limited to CARB-certified Level 3 Diesel Particulate Filters ("DPF"). The emissions from construction equipment depend on the "tier" of the engine. Tier 1 equipment has the highest emissions and Tier 4 Final the lowest emissions.[47] As drafted, Measure AQ-1 would allow the applicant to select all Tier 1-3 equipment to construct the Project if they determine that Tier 4 Final equipment is unavailable. If the applicant selected all Tier 1-3 construction equipment, emissions would be significantly higher than calculated in the DEIR.

As a result, the City underestimates the emissions of criteria air pollutants and toxic air contaminants. For example, the DEIR identifies significant emissions of reactive organic gases ("ROGs") and oxides of nitrogen ("NOx") but finds that these impacts would be reduced to a less-than-significant level.[48] Dr. Clark explains

[47] See, e.g., DieselNet, Emission Standards, United States: Nonroad Diesel Engines, https://dieselnet.com/standards/us/nonroad.php.
[48] Clark Comments, pg. 13-14.

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that the 70.75% reduction in emissions of ROGs and 65.02% reduction in emissions of NOx are primarily associated with the use of Tier 4 Final technology.[49] Thus, air quality and health risk impacts may exceed thresholds without a binding commitment to only use Tier 4 Final construction equipment. Regarding health risk, the DEIR finds that the Project's significant 12.5 in one million cancer risk, which exceeds the South Coast Air Quality Management District's ("SCAQMD's") 10 in one million threshold, is reduced to 3.25 in one million via use of exclusively Tier 4 equipment.[50] This health risk impact may not be reduced to this extent due to the limited availability of Tier 4 Final equipment and may still exceed the 10 in one million significance threshold. O2-6 cont'd

The DEIR must be revised to include binding Tier 4 Final mitigation or equivalent emissions reductions which demonstrate that the Project's significant impacts would be reduced to a less-than-significant level without exclusive use of Tier 4 Final equipment.

2. The DEIR Omits Analysis of Backup Generator Emissions

The Project could result in the installation and operation of stationary sources of emissions such as generators, boilers, or fire pumps.[51] The DEIR states that because "the quantity, type, size, location, fuel type, maximum daily operating hours, and annual average operating hours for potential stationary source equipment are unknown at this time, no emissions associated with stationary sources have been included in the DEIR's analysis."[52] The DEIR states that it is speculative to include stationary source equipment with unknown parameters.[53] But evidence in the record shows that use of backup generators is reasonably foreseeable, requiring a reasonable estimate of likely annual use of generators. O2-7

In *East Oakland Stadium Alliance v. City of Oakland*,[54] the Court of Appeal upheld an EIR's analysis of emissions from backup generators. The EIR's analysis assumed that generators would operate for 50 hours of testing and maintenance annually, while allocating no time for actual emergency use. In discussing the lead agency's duty to analyze backup generator emissions, the Court stated that "if the annual need for emergency generator use is reasonably foreseeable, the EIR was not entitled to disregard such use merely because it would occur at unpredictable

[49] Clark Comments, pg. 14.
[50] DEIR, Appendix D2, pg. D2-16.
[51] DEIR, pg. 5.3-34.
[52] *Id.*
[53] *Id.*
[54] (2023) 889 Cal. App. 5th 1226.

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times."[55] The Court explained that use of a generator was reasonably foreseeable because, "[a]s noted in the EIR, some parts of the Bay Area are subject to predictable, sustained power outages undertaken to reduce the risk of fire."[56] Thus, "[t]he EIR was required to make neither a generally applicable nor a worst-case assumption; rather it was required to make a reasonable estimate of likely annual use of the generators at the project site."[57]

Similarly to *East Oakland Stadium Alliance*, the DEIR identifies back-up generators as a possible Project component but omits analysis of backup generators in the Project's air quality, health risk, and greenhouse gas analyses. The DEIR acknowledges in its noise analysis that the "hotel, stadium, recreation center, and Chicken N Pickle may each have emergency generators for use during main power failures."[58] As in *East Oakland Stadium Alliance*, back-up generators are a reasonably foreseeable consequence of the Project due to increasingly common Public Safety Power Shutoff ("PSPS") events and extreme heat events. Extreme heat events ("EHE") are defined as periods where in the temperatures throughout California exceed 100 degrees Fahrenheit.[59] From January 2019 through December 2019, Southern California Edison reported 158 of their circuits underwent a PSP event.[60] In Los Angeles County, two circuits had 4 PSPS events during that period, lasting an average of 35 to 38 hours. The total duration of the PSPS events lasted between 141 hours to 154 hours in 2019. According to the California Public Utilities Commission (CPUC) de-energization report[61] in October 2019, there were almost 806 PSPS events that impacted almost 973,000 customers (~7.5% of households in California) of which ~854,000 of them were residential customers. The California Air Resources Board estimates that with 973,000 customers impacted by PSPS events in October 2019, approximately 125,000 back-up generators were used by customers to provide electricity during power outage.[62] The widespread use of back-up generators to adapt to PSPS and EHE events suggests that back-up generators are a reasonably foreseeable consequence of the Project.

O2-7 cont'd

[55] *Id.* at 1252.
[56] *Id.* at 1253.
[57] *Id.*
[58] DEIR, pg. 5.13-53.
[59] Governor of California. 2021. Proclamation of a state of emergency. June 17, 2021.
[60] SCAQMD. 2020. Proposed Amendment To Rules (PARS) 1110.2, 1470, and 1472. Dated December 10, 2020. http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1110.2/1110-2_1470_1472/par1110-2_1470_wgm_121020.pdf?sfvrsn=6.
[61] https://www.cpuc.ca.gov/deenergization/ as cited in CARB, 2020. Potential Emission Impact of Public Safety Power Shutoff (PSPS), Emission Impact: Additional Generator Usage associated With Power Outage..
[62] California Air Resources Board, Emission Impact: Additional Generator Usage Associated with Power Outage (January 30, 2020), available at https://ww2.arb.ca.gov/resources/documents/emissions-impact-generator-usage-during-psps.

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Per *East Oakland Stadium Alliance*, the City must make a reasonable estimate of the Project's backup generator use. California Air Resources Board rules allow a stationary diesel generator to operate up to 100 hours per year for maintenance and testing purposes – which could represent a reasonable minimum estimate of the Project's actual backup generator use.[63]

Use of backup generators is associated with air quality, health risk, and greenhouse gas impacts not reflected in the DEIR. Generators can emit criteria air pollutants, greenhouse gases, and toxic air contaminants. Backup generators commonly rely on fuels such as natural gas or diesel,[64] and thus can significantly impact public health through DPM emissions.[65] Diesel back-up generators emit significant amounts of Nitrogen Oxides (NOx), sulfur dioxides (SO2), particulate matter (PM10), carbon dioxide (CO2), carbon monoxide (CO), and volatile organic compounds (VOC).[66] Omission of a generator system results in an underestimation of the Project's air quality, greenhouse gas, and health risk impacts. O2-7 cont'd

[63] CARB's 100-hour estimate is more likely to account for some actual operational time than SCAQMD Rule 1470, which limits testing and maintenance of BUGs to 50 hours.
[64] SCAQMD, Fact Sheet on Emergency Backup Generators, http://www.aqmd.gov/home/permits/emergency-generators ("Most of the existing emergency backup generators use diesel as fuel").
[65] California Air Resources Board, Emission Impact: Additional Generator Usage Associated with Power Outage (January 30, 2020), available at https://ww2.arb.ca.gov/resources/documents/emissions-impact-generator-usage-during-psps (showing that generators commonly rely on gasoline or diesel, and that use of generators during power outages results in excess emissions); California Air Resources Board, Use of Back-up Engines for Electricity Generation During Public Safety Power Shutoff Events (October 25, 2019), available at https://ww2.arb.ca.gov/resources/documents/use-back-engines-electricity-generation-during-publicsafety-power-shutoff ("When electric utilities de-energize their electric lines, the demand for back-up power increases. This demand for reliable back-up power has health impacts of its own. Of particular concern are health effects related to emissions from diesel back-up engines. Diesel particulate matter (DPM) has been identified as a toxic air contaminant, composed of carbon particles and numerous organic compounds, including over forty known cancer-causing organic substances. The majority of DPM is small enough to be inhaled deep into the lungs and make them more susceptible to injury. Much of the back-up power produced during PSPS events is expected to come from engines regulated by CARB and California's 35 air pollution control and air quality management districts (air districts)").
[66] University of California, Riverside Bourns College of Engineering—Center for Environmental Research and Technology, Air Quality Implications Of Backup Generators In California, (March 2005), pg. 8, available at https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=84c8463118e4813a117db3d768151a8622c4bf6b; South Coast AQMD, Fact Sheet on Emergency Backup Generators ("Emissions of Nitrogen Oxides (NOx) from diesel-fired emergency engines are 200 to 600 times greater, per unit of electricity produced, than new or controlled existing central power plants fired on natural gas. Diesel-fired engines also produce significantly greater amounts of fine particulates and toxics emissions compared to natural gas fired equipment."), available at http://www.aqmd.gov/home/permits/emergency-generators#Fact2.

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To adequately evaluate the Project's impacts, the City must prepare a revised DEIR that reasonably estimates backup generator use. O2-7 cont'd

3. The DEIR Fails to Adequately Analyze and Mitigate Potentially Significant Odor Impacts

The Project would replace the existing dairy farm and agricultural fields, which would involve the removal of an estimated 122,437 cubic yards of animal manure across Planning Areas 1 through 5.[67] Excavation and removal of the manure in Planning Areas 1-3 would take place over 30 working days and removal of manure in Planning Areas 4 and 5 would take place 28 working days.[68]

The DEIR briefly states that exposure to noxious odors from the hauling of manure would be less-than-significant because impacts would be temporary and intermittent.[69] This brief statement is inconsistent with the fact that sensitive receptors may be exposed these emissions for a period of approximately two months (58 days). Regarding proximity of sensitive receptors to activities generating noxious odors, the DEIR states that noxious odors would be confined to the immediate vicinity of the construction equipment but fails address exposure to odors from manure removal activities. The DEIR does not furnish scientific evidence or agency guidance in support of its claims. In sum, the DEIR's statements are conclusory, fail to address all sources of noxious odors, and are unsupported by substantial evidence. O2-8

The DEIR suggests that odor impacts would be less-than-significant because the Project would comply with South Coast AQMD Rule 402.[70] Rule 402 merely defines significant odor impacts as a nuisance, allowing members of the public to submit complaints to SCAQMD. If a considerable number of individuals complain to SCAQMD of odors, an inspector may be dispatched to investigate such complaints in order to determine whether an alleged source is jeopardizing the public health, safety, or welfare, or creating local property damage.[71] Thus, Rule 402 does not prevent significant odor impacts from occurring – it provides that significant impacts would subsequently be addressed through public nuisance law.

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[67] DEIR, pg. 5.3-44.
[68] DEIR, pg. 3-50.
[69] DEIR, pg. 5.3-44.
[70] *Id.*
[71] SCAQMD, Visible Emissions, Public Nuisance & Fugitive Dust, https://www.aqmd.gov/home/rules-compliance/compliance/inspection-process/visible-emissions-public-nuisance-fugitive-dust.

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The DEIR's reliance on Rule 402 to claim that odor impacts would be less-than-significant fails to meet CEQA's purpose of informing the public and its responsible officials of the environmental consequences of their decisions *before* they are made.[72] The DEIR must be revised to fully analyze whether odor impacts would exceed the significance thresholds in Rule 402 and identify mitigation. O2-8 cont'd

C. The City Fails to Analyze and Mitigate Potentially Significant Hazards Impacts

1. The City Impermissibly Defers Analysis of Soil Contamination

The DEIR finds that project construction activities may disturb contaminants in the soil associated with the site's former agricultural uses and could create a significant hazard to the public or the environment.[73] This conclusion is based on seven Phase I Environmental Site Assessments ("ESAs") and a Phase II ESA (for a limited portion of the Project site.[74] The DEIR states that any significant impacts would be reduced to a less-than-significant level via imposition of MM HAZ-1.[75] MM HAZ-1 requires that a Phase II ESA be prepared prior to issuance of construction permits. This is improperly deferred analysis. O2-9

CEQA requires that an EIR disclose the severity of a project's impacts and the probability of their occurrence *before* a project can be approved.[76] In *Sundstrom v. County of Mendocino*,[77] the First District Court of Appeal rejected a mitigation measure that required the applicant to submit hydrological studies subject to review and approval by a planning commission and county environmental health department.[78] The Court explained that the deferred analysis of hydrological conditions fails to meet CEQA's requirement that an environmental impact should be assessed as early as possible in government planning:

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[72] *Citizens of Goleta Valley,* 52 Cal.3d at pg. 564.
[73] DEIR, pg. 1-41.
[74] DEIR, pg. 5.9-36, 37.
[75] *Id.*
[76] 14 CCR §§ 15143, 15162.2(a); *Cal. Build. Indust. Ass'n v. BAAQMD* (2015) 62 Cal.4th 369, 388-90 ("*CBIA v. BAAQMD*") (disturbance of toxic soil contamination at project site is potentially significant impact requiring CEQA review and mitigation); *Madera Oversight Coalition v. County of Madera* (2011) 199 Cal. App. 4th 48, 82; *Berkeley Keep Jets Over the Bay Com. v. Bd. of Port Comrs. ("Berkeley Jets")* (2001) 91 Cal.App.4th 1344, 1370-71; CEQA Guidelines, Appendix G.
[77] (1988) 202 Cal.App.3d 296.
[78] *Id.* at 306.

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> By deferring environmental assessment to a future date, the conditions run counter to that policy of CEQA which requires environmental review at the earliest feasible stage in the planning process. (See Pub. Resources Code, § 21003.1; *No Oil, Inc. v. City of Los Angeles, supra,* 13 Cal. 3d 68, 84.) In *Bozung v. Local Agency Formation Com., supra,* 13 Cal. 3d 263, 282, the Supreme Court approved "the principle that the environmental impact should be assessed as early as possible in government planning." Environmental problems should be considered at a point in the planning process "'where genuine flexibility remains.'" (*Mount Sutro Defense Committee v. Regents of University of California, supra,* 77 Cal. App. 3d 20, 34.) A study conducted after approval of a project will inevitably have a diminished influence on decision-making. Even if the study is subject to administrative approval, it is analogous to the sort of post hoc rationalization of agency actions that has been repeatedly condemned in decisions construing CEQA. (Id. at p. 35; *No Oil, Inc. v. City of Los Angeles*, supra, 13 Cal. 3d 68, 81; *Environmental Defense Fund, Inc. v. Coastside County Water Dist.* (1972) 27 Cal. App. 3d 695, 706 [104 Cal. Rptr. 197].)

O2-9 cont'd

Here, the DEIR fails to establish why it is infeasible to conduct a Phase II ESA at this time and include the results in the DEIR. This Project site largely consists of agricultural land, making collection of soil samples currently feasible. In fact, a Phase II ESA was conducted in December 2023 for a portion of the site.[79] There is no clear evidence in the record explaining why a Phase II ESA on the other portions of the Project site would be infeasible at this time. Given that the Phase I ESAs identified potentially significant soil contamination on the Project site, and the December 2023 Phase II ESA identified significant levels of Total Petroleum Hydrocarbons ("TPHs") on a portion of the site,[80] the City's decision to defer a complete analysis of the Project site until after Project approval is contrary to CEQA's purposes and informational requirements.

2. The City Impermissibly Defers Formulation of Mitigation Measures

The DEIR states that the Project's significant soil contamination impacts would be reduced to a less-than-significant level via imposition of MM HAZ-1, which requires that a Phase II ESA be prepared prior to issuance of construction permits.[81] MM HAZ-1 further provides: "[i]f the site is found to be impacted with potential contaminants of concern at levels exceeding applicable regulatory

O2-10

[79] DEIR, pg. 5.9-37.
[80] *Id;* Appendix H, pg. H-332.
[81] DEIR, pg. 5.9-37.

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thresholds, the project applicant shall remediate all contaminated media, under the oversight and in accordance with state and local agency requirements."[82] This measure improperly defers formulation of mitigation measures to a future date.

CEQA Guidelines Section 15126.4 states that formulation of mitigation measures shall not be deferred until some future time. The Guidelines permit an agency to develop the "specific details of a mitigation measure" after project approval "when it is impractical or infeasible to include those details during the project's environmental review."[83] In such circumstances, deferral of mitigation details is permitted if the agency "(1) commits itself to the mitigation, (2) adopts specific performance standards the mitigation will achieve, and (3) identifies the type(s) of potential action(s) that can feasibly achieve that performance standard and that will [be] considered, analyzed, and potentially incorporated in the mitigation measure."[84] Compliance with a regulatory permit or other similar process may be identified as mitigation if compliance would result in implementation of measures that would be reasonably expected, based on substantial evidence in the record, to reduce the significant impact to the specified performance standards.[85] O2-10 cont'd

MM HAZ-1 does not meet the standards of CEQA Guidelines Section 15126.4. As explained earlier, the City does not provide substantial evidence demonstrating that a Phase II ESA for the entire Project site is infeasible prior to Project approval. Thus, it is not "impractical or infeasible" to identify contamination and formulate specific mitigation measures during the project's environmental review.[86] MM HAZ-1 also fails to adopt specific performance standards that the remediation will achieve (such as whether contamination will be reduced to commercial or residential levels). The mitigation also fails to specify the scope of contaminants that will be tested in the future Phase II ESA. The Phase I ESAs recommend actions that would be taken in a future Phase II ESA, but there is no indication which of those recommendations will actually be implemented in the City's binding mitigation. MM HAZ-1 appears to suggest that the City will seek oversight in its analysis and remediation efforts, but the measure is vague and nonbinding: "[i]f the site is found to be impacted with potential contaminants of concern at levels exceeding applicable regulatory thresholds, the project applicant shall remediate all contaminated media, under the oversight and in accordance with state and local

[82] *Id.*
[83] Guidelines, § 15126.4, subd. (a)(1)(B) (Section 15126.4).
[84] Section 15126.4, subd. (a)(1)(B); *see Save Our Capitol! v. Department of General Services* (2022) 85 Cal.App.5th 1101, 1134 (*Save Our Capitol!*).)
[85] *Id.*
[86] Guidelines, § 15126.4, subd. (a)(1)(B) (Section 15126.4).

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agency requirements (California Department of Toxic Substances Control, Regional Water Quality Control Board, Ontario Fire Department, etc.)." The measure does not state that any particular agency will exercise oversight – it merely provides that the City will comply with the law. In sum, none of the factors that justify deferred mitigation are present here.

The December 2023 Phase II ESA identifies levels of Diesel Range Total Petroleum Hydrocarbons ("TPH-d") in excess of commercial and residential screening levels.[87] The Phase II ESA recommends that "shallow soils impacted with THP-D in the vicinity of the hazardous material storage area (sample location H5) at concentrations exceeding the residential screening level be removed from the Site and disposed of at an appropriate facility."[88] Despite this clear identification of a significant impact and proposed mitigation measure, the DEIR fails to include a measure specifically mitigating this impact in MM HAZ-1. Such a measure must require remediation of this specific impact and set specific performance standards. The City cannot make the findings necessary under Guidelines Section 15126.4 to defer formulation of this mitigation. O2-10 cont'd

MM HAZ-1 must be revised in a recirculated DEIR in order to comply with CEQA.

3. MM HAZ-1 Incorrectly Cites the ASTM Standard for Subsurface Investigations

MM HAZ-1 states that the "Phase II ESA shall be prepared by an Environmental Professional in accordance with the American Society of Testing and Materials (ASTM) Standard E: 1527-21 Environmental Site Assessment Standard Practice (ASTM E1527-21)." Dr. Clark observes that the measure cites an applicable ASTM standard.[89] ASTM Standard E: 1527-21 is designed for Phase I Environmental Assessments as opposed to the subsurface investigation of conditions at a site required in a Phase II.[90] MM HAZ-1 must be revised in order to constitute effective and binding mitigation requiring subsurface investigation. O2-11

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[87] DEIR, Appendix H, pg. H-332.
[88] *Id.* at H-332.
[89] Clark Comments, pg. 16-17.
[90] *Id.*

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4. The DEIR Fails to Disclose and Mitigate Potentially Significant Valley Fever Impacts

The DEIR fails to disclose, analyze, and mitigate exposure to *Coccidiodes Immitis* (Valley Fever cocci) on the Project site. Dr. Clark explains that when soil containing the cocci spores are disturbed by construction activities, the fungal spores become airborne, exposing construction workers and other nearby sensitive receptors.[91] Valley fever is the initial form of coccidioidomycosis infection, and can develop into a more serious disease, including chronic and disseminated coccidioidomycosis.[92] Since 2015, the number of cases of Valley Fever in San Bernardino County has increased from 29 in 2015 to **229** in 2019, as reported by the California Department of Public Health.[93] In 2021, 231 cases were recorded in San Bernardino County,[94] eight times as many as the amounts reported in 2015. For the first 3 months of 2024, San Bernardino County reported 89 cases (equal to an annual rate of 356), even more than the rate reported for previous two years.[95] O2-12

Despite the fact that the Project anticipates development on an approximately 199-acre agricultural site, no disclosure is made of potential Valley Fever risks to construction workers or nearby residents. The DEIR fails to identify what measures would be taken to reduce exposure to Valley Fever. The City also cannot assume that compliance with standard fugitive dust mitigation measures is adequate to protect construction workers and nearby sensitive receptors from this risk. Dr. Clark explains that conventional dust control measures do not prevent the spread Valley Fever because they largely focus on visible dust or larger dust particles—the PM_{10} fraction—not the very fine particles where the Valley Fever spores are found.[96] Dr. Clark proposes feasible and effective mitigation measures that must be considered in a revised DEIR that acknowledges the potentially significant risk of exposure to Valley Fever.

5. The DEIR Fails to Analyze Exposure to Hazardous Materials Associated with the Movement of Large Quantities of Manure

The Project would replace the existing dairy farm and agricultural fields, which would involve the removal of an estimated 122,437 cubic yards of animal O2-13

[91] Clark Comments, pg. 6.
[92] *Id.* at 7.
[93] Clark Comments, pg. 8.
[94] *Id.* at 8-9.
[95] *Id.*
[96] Clark Comments, pg. 9.

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manure.[97] The DEIR fails to disclose health risks from exposure resulting from removal of manure.

Dr. Clark explains that the mass grading of soils may cause an exposure to particulate matter which can cause asthma, irregular heartbeats, difficulty breathing, and premature death in people with heart or lung disease.[98] Decomposing manure generates a number of volatile compounds, including methane (a greenhouse gas) and hydrogen sulfide, which can impair a person's respiratory and nervous systems, can also form as manure decomposes.[99] The DEIR also does not address the potential health impacts from the exposure to bacteria present in the manure that will be disturbed in the removal process and can transport offsite into the community. Dr. Clark discusses scientific studies that demonstrate that airborne micro-organisms and microbial by-products from manure impacted soils are a potential health risk to workers and individuals in nearby communities.[100] O2-13 cont'd

The DEIR fails as an information document because potential health impacts from these agents are not disclosed. There is also no indication that these health impacts are reflected in the DEIR's Health Risk Analysis. The DEIR also fails to identify mitigation for this impact. There is no evidence that MM HAZ-1, which requires future study and mitigation of hazardous materials, would require analysis and mitigation of this particular impact. The DEIR must be revised to analyze and mitigate this potentially significant impact.

D. The DEIR Fails to Adequately Analyze and Mitigate Significant Noise Impacts

1. The DEIR Fails to Adequately Establish the Environmental Setting

The DEIR fails to establish accurate baseline noise levels at sensitive receptors. CEQA requires that a lead agency include a description of the physical environmental conditions, or "baseline," in the vicinity of the project as they exist at the time environmental review commences.[101] As many courts have held, the impacts of a project must be measured against the "real conditions on the O2-14

[97] DEIR, pg. 5.3-44.
[98] Clark Comments, pg. 11.
[99] *Id.*
[100] Clark Comments, pg. 12.
[101] 14 CCR § 15125(a); *Communities for a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal. 4th 310, 321 ("*CBE v. SCAQMD*").

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ground."[102] The description of the environmental setting constitutes the "baseline" physical conditions against which the lead agency assesses the significance of a project's impacts.[103]

Here, existing noise was only measured at two locations, mid-block on the east and west side of the project (LT-1 and LT-2).[104] The DEIR states that the locations are "representative of noise-sensitive land uses exposed to traffic noise along roadways adjacent to the ORSC site," but Ms. Toncheva explains that this claim is erroneous.[105] Ms. Toncheva observes that there are no sensitive receptors or traffic on the LT-2 side of the site and, while LT-1 is representative of the homes along the east side of the Project, neither location captures the traffic along E. Riverside Drive and Chino Avenue.[106] Homes to the north or south of the Project would be exposed to traffic noise along those roads.[107] As no measurements were taken at these receptor locations, Ms. Toncheva concludes that there is no baseline against which to accurately assess Project-related impacts (either construction or operation).[108] O2-14 cont'd

The DEIR must be revised to properly document ambient noise levels near all sensitive receptors to accurately determine impacts from operational and construction noise.

2. The DEIR's Daytime Construction Noise Significance Threshold is Unsupported by Substantial Evidence

The DEIR finds that noise impacts from daytime construction activities would be less than significant because they would not exceed a daytime Leq 8-hour noise level limit of 80 dBA.[109] The City does not have an established construction noise threshold, so claims this significance threshold is supported by Federal Transit Administration ("FTA") Guidelines and the City of Los Angeles' proposed guidelines.[110] The DEIR fails to support its sole reliance on an 80 dBA maximum threshold with substantial evidence, as Appendix G of the CEQA Guidelines provides that the Project would cause a significant noise impact if it would result in O2-15

[102] *CBE v. SCAQMD*, 48 Cal. 4th at 321; *Save Our Peninsula Com. v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 121-22; *City of Carmel-by-the-Sea v. Bd. of Supervisors of Monterey County* (1986) 183 Cal.App.3d 229, 246.
[103] 14 CCR § 15125(a); *CBE v. SCAQMD*, 48 Cal. 4th at 321.
[104] DEIR pg. 5.13-11.
[105] DEIR pg. 5.13-8
[106] Toncheva Comments, pg. 3.
[107] *Id.*
[108] *Id.*
[109] DEIR, pg. 5.13-25.
[110] DEIR, pg. 5.13-15.

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"[g]eneration of a *substantial temporary or permanent increase in ambient noise* levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies."

California courts have clearly held that "the lead agency should consider both the increase in noise level and the absolute noise level associated with a project."[111] The courts have held that reliance on a maximum noise level as the sole threshold of significance for noise impacts violates CEQA because it fails to consider whether the magnitude of changes in noise levels is significant.[112] In *Keep our Mountains Quiet v. County of Santa Clara*,[113] neighbors of a wedding venue sued over the County of Santa Clara's failure to prepare an EIR for a proposed project to allow use permits for wedding and other party events at a residential property abutting an open space preserve. Neighbors and their noise expert contended that previous events at the facility had caused significant noise impacts that reverberated in neighbors' homes and disrupted the use and enjoyment of their property.[114] Similar to the DEIR's daytime construction noise threshold in this case, the County's EIR relied on the noise standards set forth in its noise ordinance as its thresholds for significant noise exposure from the project, deeming any increase to be insignificant so long as the absolute noise level did not exceed those standards.[115] The Court examined a long line of CEQA cases which have uniformly held that conformity with land use regulations is not conclusive of whether or not a project has significant noise impacts[116] in holding that the County's reliance on the project's compliance with noise regulations did not constitute substantial evidence supporting the County's finding of no significant impacts.[117] O2-15 cont'd

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[111] *Keep Our Mountains Quiet v. County of Santa Clara* (2015) 236 Cal.App.4th 714, 733; see *King and Gardiner Farms, LLC v. County of Kern* (2020) 45 Cal.App.5th 814, 894 (citing *Keep Our Mountains Quiet*).
[112] *King & Gardiner Farms, LLC*, 45 Cal.App.5th at 865.
[113] *Keep our Mountains Quiet v. County of Santa Clara* (2015) 236 Cal.App.4th 714.
[114] *Id.* at 724.
[115] *Id.* at 732.
[116] *Id., citing Citizens for Responsible & Open Government v. City of Grand Terrace* (2008) 160 Cal.App.4th 1323, 1338; *Oro Fino Gold Mining Corp. v. County of El Dorado* (1990) 225 Cal.App.3d 872, 881–882; *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359, 1416 (project's effects can be significant even if "they are not greater than those deemed acceptable in a general plan"); *Environmental Planning & Information Council v. County of El Dorado* (1982) 131 Cal.App.3d 350, 354, ("CEQA nowhere calls for evaluation of the impacts of a proposed project on an existing general plan").
[117] *Id.* at 732-734; see also *King & Gardiner Farms, LLC v. County of Kern* (2020) 45 Cal.App.5th 814, 893, as modified on denial of rehearing (Mar. 20, 2020).

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In *King and Gardiner Farms, LLC v. County of Kern*,[118] the Court of Appeal cited *Keep our Mountains Quiet* and decisions cited therein when it rejected the use of a single "absolute noise level" threshold of significance (construction and operational noise impacts were only deemed significant if they exceeded 65 dBA CNEL) on the grounds that the sole use of such a threshold fails to consider the magnitude or severity of increases in noise levels attributable to the project in different environments. The Court explained the lead agency failed to "refer to evidence showing why the magnitude of an increase was irrelevant in determining the significance of a change in noise."[119]

Here, the DEIR's daytime construction noise threshold violates CEQA's requirement that the lead agency consider both the increase in noise level and the absolute noise level associated with a project. The construction noise threshold is a maximum noise threshold that fails to consider the magnitude of increases in noise over ambient levels. Under the City's single threshold, the increase in noise is irrelevant so long as the overall levels do not exceed a particular level. But, as in *King and Gardiner Farms*, the DEIR fails to refer to substantial evidence showing why the magnitude of an increase was irrelevant in determining the significance of a change in noise. Per *Keep our Mountains Quiet*, conformity with land use regulations, Federal Transit Administration ("FTA") Guidelines, or the City of Los Angeles' proposed guidelines is not conclusive of whether or not a project has significant noise impacts. O2-15 cont'd

Ms. Toncheva also explains that the City misinterprets these guidelines as recommending an 80 dBA threshold. The FTA guidelines cited by the City actually discourages agencies against using its absolute noise criteria values without consideration of local conditions, yet the City has not provided evidence that local conditions make consideration of the noise increase over ambient levels inapplicable.[120] Ms. Toncheva notes that the draft City of Los Angeles noise guidelines cited in the DEIR have not been adopted. The DEIR must be revised to apply a legally adequate daytime construction noise threshold.

a) Construction Noise Impacts are Potentially Significant

The Project's estimated construction noise levels in Table 5.13-14 exceed the measured ambient by over 30 dBA.[121] An increase of over 30 dBA likely constitutes O2-16

[118] *King and Gardiner Farms, LLC, supra,* 45 Cal.App.5th 814.
[119] *Id.* at 894.
[120] Toncheva Comments, pg. 3.
[121] DEIR page 5.13-26; Toncheva Comments, pg. 3.

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"generation of a substantial temporary or permanent increase in ambient noise levels."[122] For example, the City of Los Angeles' longstanding noise significance threshold is 10 dBA for construction activities lasting more than one day.[123] This potentially significant impact must be adequately analyzed and mitigated in a revised and recirculated DEIR.

Daytime construction noise impacts may be significant even under the City's 80 dBA threshold. Ms. Toncheva explains that neither the DEIR nor the Noise Study provide the usage factors and combinations of equipment used to calculate the noise levels presented in Table 5.13-14 of the DEIR (Predicted Daytime Cumulative Construction Noise Level).[124] The distance from construction activities to sensitive receptors is also not provided.[125] These factors affect the calculation of construction noise, and erroneous inputs into the calculation may drastically underestimate impacts. O2-16 cont'd

3. The DEIR's Operational Noise Significance Threshold is Unsupported by Substantial Evidence

To evaluate the significance of the noise generated by the Project's operational activities (including Minor League games, concerts, athletic field activities), the noise from these activities was calculated at each noise-sensitive receptor and compared to the City's exterior noise limits in the noise code.[126] In Table 5.13-19 (Stadium Average Hourly Noise Levels: Regular Weekday Minor League Baseball Game), the DEIR finds that stadium noise would not exceed the City's exterior noise limits at sensitive receptors.[127] These maximum-level significance thresholds are inconsistent with CEQA's requirement to consider both the increase in noise level and the absolute noise level associated with a project.[128] As in *King and Gardiner Farms*, the DEIR fails to refer to substantial evidence showing why the magnitude of an increase was irrelevant in determining the significance of a change in noise. Per *Keep our Mountains Quiet*, conformity with the City's noise code is not conclusive of whether a project has significant noise impacts. The DEIR must be revised to apply a legally adequate operational noise threshold. O2-17

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[122] Appendix G of the CEQA Guidelines.
[123] City of Los Angeles, L.A. CEQA Thresholds Guide, pg. 1.1-3, available at https://planning.lacity.gov/eir/CrossroadsHwd/deir/files/references/A07.pdf.
[124] DEIR, pg. 5.13-26.
[125] Toncheva Comments, pg. 3-4.
[126] DEIR, pg. 5.13-34, 5.13-16.
[127] DEIR, pg. 5.13-37
[128] *Keep Our Mountains Quiet v. County of Santa Clara* (2015) 236 Cal.App.4th 714, 733; see *King and Gardiner Farms, LLC v. County of Kern* (2020) 45 Cal.App.5th 814, 894 (citing *Keep Our Mountains Quiet*).

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a) Noise Generated by Operations Would Be Potentially Significant

The predicted noise levels shown for stadium noise[129] and athletic fields[130] exceed the measured daytime ambient levels by 10 dB.[131] An increase of 10 dBA likely constitutes "generation of a substantial temporary or permanent increase in ambient noise levels."[132] These potentially significant impacts must be adequately analyzed and mitigated in a revised and recirculated DEIR.

Ms. Toncheva also comments that noise from concerts at the stadium is underestimated. The DEIR assumes noise from live concerts at the stadium would be 75 dBA,[133] which is much lower than the predictions shown for games in the stadium.[134] Ms. Toncheva explains that the 75 dBA reference level is inappropriately low, as concerts at sports facilities of this size (450,000 square feet according to the DEIR Table ES-1) can produce sound power levels as high as 135 dB.[135] This noise level would result in predicted Leqs as high as 93 dBA at Receptor Group 5.[136] Such a noise level would be 28 dBA above the Municipal Noise Code and 45 dBA above measured evening noise levels, and would thus be significant.[137] Ms. Toncheva identifies additional issues with the City's operational noise study, which fails to disclose what meteorological conditions were assumed in the model. O2-18

The Project's potentially significant operational noise impacts must be accurately analyzed and mitigated in a revised DEIR.

IV.CONCLUSION

For the reasons discussed above, the DEIR for the Project remains wholly inadequate under CEQA. It must be thoroughly revised to provide legally adequate analysis of, and mitigation for, all of the Project's potentially significant impacts. These revisions will necessarily require that the DEIR be recirculated for public review. Until the DEIR has been revised and recirculated, as described herein, the City may not lawfully approve the Project. O2-19

[129] DEIR pg. 5.13-37.
[130] DEIR pg. 5.13-43
[131] Toncheva Comments, pg. 4.
[132] Appendix G of the CEQA Guidelines.
[133] Toncheva Comments, pg. 4; Stadium Noise Study page J3-17.
[134] Toncheva Comments, pg. 4.
[135] *Id.*
[136] *Id.*
[137] *Id.*

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Thank you for your attention to these comments. Please include them in the record of proceedings for the Project. O2-19 cont'd

Sincerely,

Aidan P. Marshall

Attachments
APM:acp

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EXHIBIT A

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May 20, 2024

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Attn: Mr. Aidan Marshall

Subject: Comments On Draft Environmental Impact Report (DEIR) Ontario Regional Sports Complex, City of Ontario, CA File Nos. PGPA23-002 & PZC23-004 SCH No: 2023110328

At the request of Adams Broadwell Joseph & Cardozo (ABJC), Clark and Associates (Clark) has reviewed materials related to the April 2024 City of Ontario (the City) DEIR of the above referenced project.

Clark's review of the materials in no way constitutes a validation of the conclusions or materials contained within the plan. If we do not comment on a specific item this does not constitute acceptance of the item.

Project Description:

According to the project description, the Ontario Regional Sports Complex Project (Proposed Project or ORSC) would allow for the development of a variety of recreation-oriented and supporting uses O2-20
including a semi-professional Minor League baseball stadium, commercial retail area, a new City recreation center and aquatics center surrounded by a variety of baseball/softball, soccer, and multi-use fields on an approximately 199 gross acre site in the City of Ontario. The Proposed Project would result in the development of 540,750 square feet of commercial building space, 450,000 square feet of stadium space, and 272,000 square feet of parking structures. The Proposed Project is on the southeast corner of Vineyard Avenue and Riverside Drive. The Proposed Project would also require street widening and intersection improvements, with half-width to potentially full-width

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improvements along Vineyard Avenue, Riverside Drive, and Chino Avenue. Furthermore, it would involve the re-designating and rezoning of the site to Hospitality/Convention Center Support Retail and Open Space (OS-P)/Open Space-Recreation. The overall development is summarized in the table below

		Building Square Feet			Number of Amenities
		Commercial	Parking	Stadium	
PA 1 BASEBALL STADIUM	**16.01**	**—**	**185,000**	**450,000**	**6,000 Capacity 1,600 Parking Spaces**
Baseball Field Facility	11.33	—	—	—	6,000 capacity
Conditioned Space	—	—	—	110,000	—
Unconditioned Space	—	—	—	340,000	—
Parking Structure A (3-stories)	4.68	—	185,000	—	1,600 parking spaces
PA 2 COMMERCIAL RETAIL	**19.62**	**45,000**	**—**	**—**	**1,500 Parking Spaces**
Retail/Commercial, East	5.06	45,000	—	—	—
Surface Parking, East	14.56	—	—	—	1,500 parking spaces
PA 3 BASEBALL STADIUM RETAIL Stadium Retail and Hospitality	**4.58**	**91,000**	**—**	**—**	**100 Rooms**
Retail/Commercial	2.17	21,000	—	—	—
Hotel	2.41	70,000	—	—	100 Rooms
PA 4 BASEBALL STADIUM RETAIL and Hospitality South	**8.54**	**114,000**	**—**	**—**	**250 Parking Spaces**
Retail/Commercial	6.54	114,000	—	—	—
Surface Parking, South	2.00	—	—	—	250 Parking Spaces
PA 5 CITY PARK, Active Fields	**110.90**	**23,300**		**—**	**2,000 Parking Spaces**
Multipurpose Fields (Soccer/Football)	41.13	—	—	—	13 Fields
Multiuse Fields (Baseball/Softball/Little League)	45.11	—	—	—	8 Fields
Park	10.87	23,300	—	—	—
Parking Structure B (4 stories)	3.59	—	87,000	—	1,000 Parking Spaces
Surface Parking, South	10.2	—	—	—	1,000 Parking Spaces
PA 6 CITY PARK, Indoor Athletic Facility	**7.58**	**159,450**	**—**	**—**	**388 Parking Spaces**
Indoor Athletic Facility	4.46	159,450	—	—	16 max. Courts
Surface Parking	3.12	—	—	—	388 Parking Spaces
PA 7 COMMUNITY RECREATION CENTER	**15.68**	**108,000**	**—**	**—**	**525 Parking Spaces**
Community Center/ Admin Building	3.46	70,000	—	—	—
Activity Area	8.05	38,000	—		1 Field/8 Courts
Recreation Surface Parking	4.17	—	—	—	525 parking spaces
Right-of-Way	*16.10*	—	—	—	—
TOTAL	**199.01**	**540,750**	**272,000**	**450,000**	**6,000 Capacity 100 Rooms 6,263 Parking Spaces**

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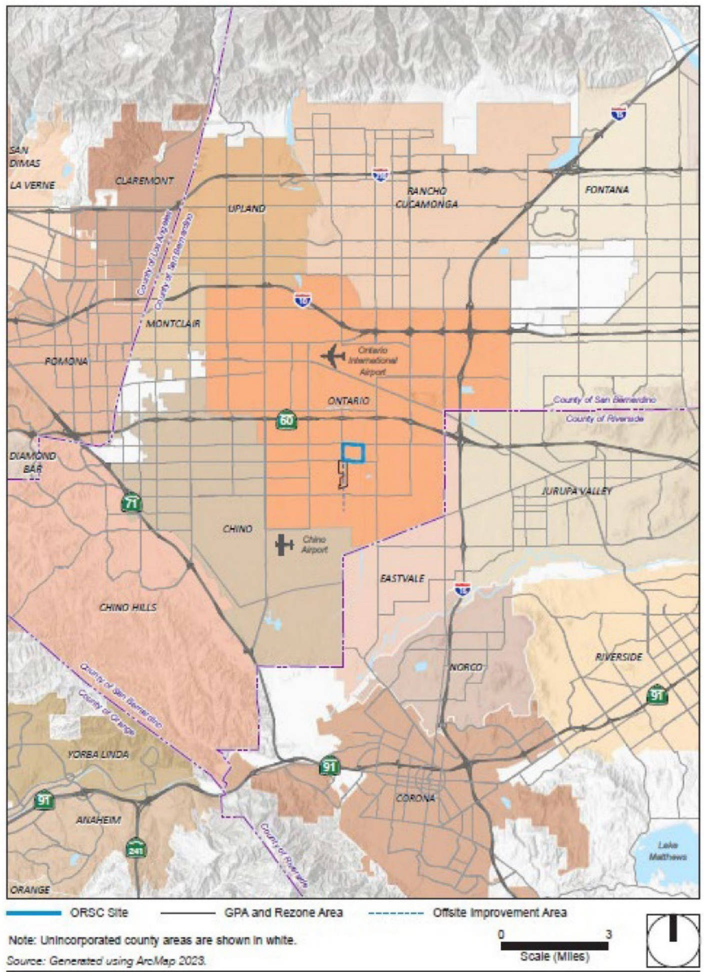

Figure 1: Regional Location Map

The Proposed Project will be located in the southern portion of Ontario, which is known as the Ontario Ranch. The ORSC site is on the southeast corner of Vineyard Avenue and Riverside Drive. The ORSC site is bounded to the north by Riverside Drive, to the south by Chino Avenue, to the west by the unimproved right-of-way (ROW) for Vineyard Avenue, and to the east by the Cucamonga Creek Flood Control Channel. Ontario

O2-20 cont'd

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is in the southwestern portion of San Bernardino County and is surrounded by the cities of Chino and Montclair and unincorporated San Bernardino County to the west; the cities of Upland and Rancho Cucamonga to the north; the City of Fontana and unincorporated San Bernardino County to the east; and the cities of Eastvale and Jurupa Valley to the south.

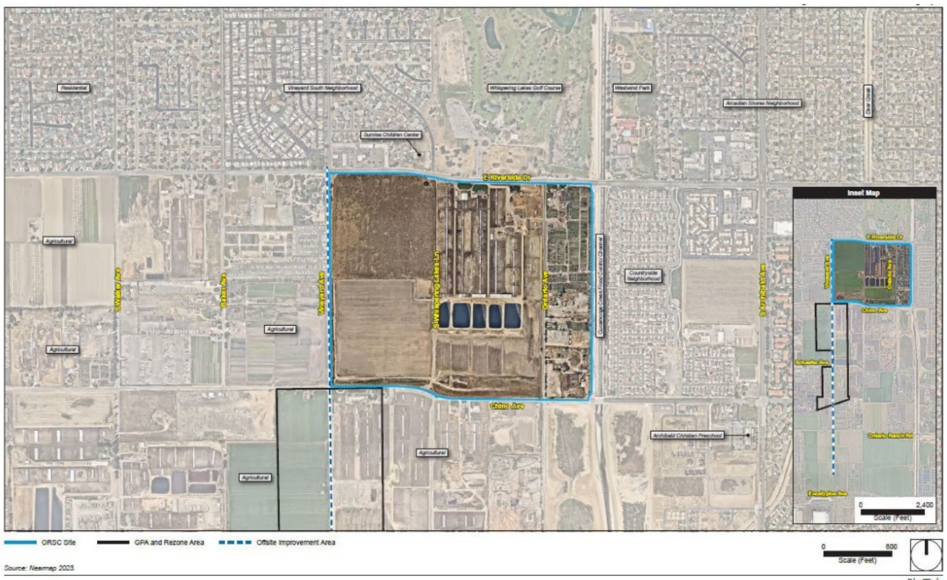

Figure 2: Current Project Site Conditions

Much of the ORSC site is currently vacant and had primarily been used for agricultural purposes, including the raising of livestock and dairy farming. Other land uses on the ORSC site include a nursery east of Ontario Avenue. Vineyard Avenue currently terminates at Riverside Drive. The ORSC site consists of mostly flat topography. O2-20 cont'd

Existing agricultural and industrial/commercial land uses abut the ORSC site to the west and south, including Madre Tierra Nursery, Mountain View RV and Boat Storage, Infinity Recycling, Artesia Sawdust Products, and several dairy farms. Whispering Lakes Golf Course and Westwind Park are north and northeast of the site, respectively, across Riverside Drive. A commercial center is at the northeast corner of Vineyard Avenue and East Riverside Drive. Residential land uses surrounding the ORSC site include the Countryside residential community to the east, separated from the ORSC site by the concrete channel; Whispering Lakes Apartment Complex and single-

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family residential uses in the Vineyard South neighborhood across Riverside Drive and adjacent to the Whispering Lakes Golf Course; residential uses to the northeast in the Arcadian Shores residential neighborhood; and rural residential uses associated with existing agricultural uses on Baker Avenue to the west. Other sensitive land uses include the Sunrise Children Center across Riverside Drive and the Archibald Christian Preschool at Chino Avenue and Archibald Avenue to the southeast.

A summary of surrounding land uses is provided below:

- **North:** Single-family and multifamily residential, neighborhood shopping center, and park and recreational facilities (Whispering Lakes Golf Course and Westwind Park).
- **East:** Cucamonga Creek Flood Control Channel and residential uses.
- **South:** Agricultural/industrial uses.
- **West**: Agricultural/industrial uses.

O2-20 cont'd

Figure 3: Conceptual Site Plan

Construction Phasing

Phasing for the ORSC is as follows:

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- **Phase 1A:** Mass Grading and Utilities (Planning Areas 1 to 3)
- **Phase 1B:** Planning Areas 1, 2, and 3
- **Phase 2:** Planning Areas 4 and 5
- **Phase 3:** Planning Area 6
- **Phase 4:** Planning Area 7

O2-20 cont'd

The DEIR concludes that potentially significant adverse impacts from hazardous wastes are mitigated and that unavoidable significant adverse impacts from air quality issues have been considered and that overriding considerations outweigh the adverse effects. Those conclusions are not born out in the analysis of DEIR.

Specific Comments

1. The DEIR Fails To Address Impacts from Exposure to *Coccidiodes Immitis* (Valley Fever Cocci) From Particulate Matter Released From Site During Construction Activities of The Project.

O2-21

The DEIR fails to adequately address the known presence/issue of *Coccidiodes Immitis* (Valley Fever Cocci) in Southern California. Dust exposure is one of the primary risk factors for contracting Valley Fever (via *Coccidiodes imimitis (cocci)* exposure). When soil containing the *cocci* spores are disturbed by construction activities, the fungal spores become airborne, exposing construction workers and other nearby sensitive receptors.

The fungus lives in the top 2 to 12 inches of soil. When soil containing this fungus is disturbed by activities such as digging, vehicles, construction activities, dust storms, or during earthquakes, the fungal spores become airborne. The most at-risk populations are construction and agricultural workers.[1] Here, construction workers are the very population that would be most directly exposed by the Project. A refereed journal article on occupational exposures notes that

[1] Lawrence L. Schmelzer and R. Tabershaw, Exposure Factors in Occupational Coccidioidomycosis, *American Journal of Public Health and the Nation's Health*, v. 58, no. 1, 1968, pp. 107–113, Table 3; available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1228046/?page=1.

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"[l]abor groups where occupation involves close contact with the soil are at greater risk, especially if the work involves dusty digging operations."[2]

The potentially exposed population in surrounding areas is much larger than construction workers because the nonselective raising of dust during Project construction will carry the very small spores, 0.002–0.005 millimeters ("mm"), into nonendemic areas, potentially exposing large non-Project-related populations.[3],[4] These very small particles are not controlled by conventional construction dust control mitigation measures.

Valley fever is the initial form of coccidioidomycosis infection. The acute form of Valley Fever can develop into a more serious disease, including chronic and disseminated coccidioidomycosis. The initial, or acute, form of coccidioidomycosis is often mild, with few or no symptoms. Signs and symptoms occur one to three weeks after exposure. They tend to be similar to flu symptoms. Symptoms can range from minor to severe, including:

- Fever
- Cough
- Tiredness
- Shortness of breath
- Headache
- Chills
- Night sweats
- Joint aches and muscle soreness
- Red, spotty rash, mainly on lower legs but sometimes on the chest, arms and back

If the initial coccidioidomycosis infection doesn't completely resolve, it may progress to a chronic form of pneumonia. This complication is most common in people with weakened immune systems. Signs and symptoms of chronic coccidioidomycosis include:

O2-21 cont'd

[2] *Ibid.*, p. 110.

[3] Schmelzer and Tabershaw, 1968, p. 110; Pappagianis and Einstein, 1978

[4] Pappagianis and Einstein, 1978, p. 527 ("The northern areas were not directly affected by the ground level windstorm that had struck Kern County but the dust was lifted to several thousand feet elevation and, borne on high currents, the soil and arthrospores along with some moisture were gently deposited on sidewalks and automobiles as 'a mud storm' that vexed the residents of much of California." The storm originating in Kern County, for example, had major impacts in the San Francisco Bay Area and Sacramento).

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- Low-grade fever
- Weight loss
- Cough
- Chest pain
- Blood-tinged sputum (matter discharged during coughing)
- Nodules in the lungs

The most serious form of the disease, disseminated coccidioidomycosis, is uncommon. It occurs when the infection spreads (disseminates) beyond the lungs to other parts of the body. Most often these parts include the skin, bones, liver, brain, heart, and the membranes that protect the brain and spinal cord (meninges). Signs and symptoms of disseminated disease depend on the body parts affected and may include:

- Nodules, ulcers and skin lesions that are more serious than the rash that sometimes occurs with initial infection
- Painful lesions in the skull, spine or other bones
- Painful, swollen joints, especially in the knees or ankles
- Meningitis — an infection of the membranes and fluid surrounding the brain and spinal cord

O2-21 cont'd

Given the wide range of public health impacts from coccidioidomycosis infection/exposure it is clear that an evaluation of the Valley Fever potential from the Project is required.

Since 2015, the number of cases of Valley Fever in San Bernardino County has increased from 29 in 2015 to 229 in 2019, as reported by the California Department of Public Health (CDPH).[5] In 2021, 231 cases were recorded in San Bernardino County,[6] eight times as many as the amounts

[5] CDPH. 2019. Epidemiologic Summary of Valley Fever (Coccidiodomycosis) In California, 2019. Surveillance and Statistics Section, Infection Diseases Branch, Division of Communicable Disease Control, Center For Infectious Diseases, California Department of Public Health. https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/CocciEpiSummary2019.pdf

[6] CDPH. 2023. Coccidiodomycosis In California, Provisional Monthly Report, January – November 2023 (as of November 30, 2023). Surveillance and Statistics Section, Infection Diseases Branch, Division of Communicable Disease Control, Center For Infectious Diseases, California Department of Public Health. https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/CocciinCAProvisionalMonthlyReport.pdf

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reported in 2015. For the first 3 months of 2024, San Bernardino County reported 89 cases (equal to an annual rate of 356), even more than the rate reported for previous two years. [7]

Standard fugitive dust mitigation measures are not adequate to protect construction workers and nearby sensitive receptors from this risk. Conventional dust control measures do nothing to prevent the spread of *Coccidiodes immitis*, (*cocci*) and are not effective at controlling Valley Fever[8] because they largely focus on visible dust or larger dust particles—the PM_{10} fraction—not the very fine particles where the Valley Fever spores are found. The use of PM_{10} and visible dust as a measure of the potential exposure to *Coccidiodes immitis*, (*cocci*) fails to consider the size of the spores (5 times smaller than the visible dust). The larger PM_{10} particles will settle out of the air column much quicker than the very fine spores. This fact allows the spores to spread in over a much greater area than the dust particles. Standard Air Quality Mitigation Measures such as watering of soils would not provide sufficient protection to on-site workers nor would they prevent the spread of *Coccidiodes immitis* from the site to receptors farther away. Compliance with SCAQMD Rule 403 would still fail to prevent the exposure of workers on- and off-site to *Coccidiodes immitis* impacted soils. Sampling for and removal of impacted soils is the best solution to *Coccidiodes immitis* spores. Since *Coccidiodes immitis* resides in soils and are not subject to degradation, entrainment of the potentially impacted soils may cause additional issues to further development of the site. O2-21 cont'd

The City should require measures from the Proponent to actively suppress the spread of VF by:

1. Include specific requirements in the Project's Injury and Illness Prevention Program (as required by Title 8, Section 3203) regarding safeguards to prevent Valley Fever.
2. Control dust exposure:
    - Apply chemical stabilizers at least 24-hours prior to high wind event;
    - Apply water to all disturbed areas a minimum of three times per day. Watering frequency should be increased to a minimum of four times per day if there is any

[7] CDPH. 2024. Coccidiodomycosis In California, Provisional Monthly Report, January – March 2024 (as of March 31, 2024). Surveillance and Statistics Section, Infection Diseases Branch, Division of Communicable Disease Control, Center For Infectious Diseases, California Department of Public Health. https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/CocciinCAProvisionalMonthlyReport.pdf

[8] See, e.g., Cummings and others, 2010, p. 509; Schneider et al., 1997, p. 908 ("Primary prevention strategies (e.g., dust-control measures) for coccidioidomycosis in endemic areas have limited effectiveness.").

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evidence of visible wind-driven fugitive dust;

- Provide National Institute for Occupational Safety and Health (NIOSH)-approved respirators for workers with a prior history of Valley Fever.
- Half-face respirators equipped with a minimum N-95 protection factor for use during worker collocation with surface disturbance activities. Half-face respirators equipped with N-100 or P-100 filters should be used during digging activities. Employees should wear respirators when working near earth-moving machinery.
- Prohibit eating and smoking at the worksite, and provide separate, clean eating areas with hand-washing facilities.
- Avoid outdoor construction operations during unusually windy conditions or in dust storms.
- Consider limiting outdoor construction during the fall to essential jobs only, as the risk of cocci infection is higher during this season. O2-21 cont'd

3. Prevent transport of cocci outside endemic areas:
   - Thoroughly clean equipment, vehicles, and other items before they are moved off-site to other work locations.
   - Prevent spillage or loss of bulk material from holes or other openings in the cargo compartment's floor, sides, and/or tailgate;
   - Load all haul trucks such that the freeboard is not less than six inches when material is transported on any paved public access road and apply water to the top of the load sufficient to limit VDE to 20 percent opacity; or cover haul trucks with a tarp or other suitable cover.
   - Provide workers with coveralls daily, lockers (or other systems for keeping work and street clothing and shoes separate), daily changing and showering facilities.
   - Clothing should be changed after work every day, preferably at the work site.
   - Train workers to recognize that cocci may be transported offsite on contaminated equipment, clothing, and shoes; alternatively, consider installing boot-washing.
   - Post warnings onsite and consider limiting access to visitors, especially those without adequate training and respiratory protection.
4. Improve medical surveillance for employees:

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- Employees should have prompt access to medical care, including suspected work-related illnesses and injuries.
- Work with a medical professional to develop a protocol to medically evaluate employees who have symptoms of Valley Fever.
- Consider preferentially contracting with 1-2 clinics in the area and communicate with the health care providers in those clinics to ensure that providers are aware that Valley Fever has been reported in the area. This will increase the likelihood that ill workers will receive prompt, proper and consistent medical care.
- Respirator clearance should include medical evaluation for all new employees, annual re-evaluation for changes in medical status, and annual training, and fit-testing. O2-21 cont'd
- Skin testing is not recommended for evaluation of Valley Fever.[9]
- If an employee is diagnosed with Valley Fever, a physician must determine if the employee should be taken off work, when they may return to work, and what type of work activities they may perform.

The mitigation measures identified in this comment, based on actual experience during construction of solar and wind projects in endemic areas, should be required for the Project. The City must include concrete measures like the ones listed above in a revised EIR of the Project.

2. The DEIR Fails To Address The Potentially Significant Health Concerns (Exposure To Bacteria) With The Movement Of Large Quantities of Manure.

According to the DEIR,[10] "Mass grading would require removing organic matter (manure) from historical dairy operations. The majority of high-organic-content soils are associated with the dairy farm. Approximately two to three feet of material require excavation and removal—that is, approximately 66,437 cubic yards from the site in Phase 1A (Planning Areas 1 to 3) over 30 working O2-22

[9] Short-term skin tests that produce results within 48 hours are now available. See Kerry Klein, NPR for Central California, New Valley Fever Skin Test Shows Promise, But Obstacles Remain, November 21, 2016; available at http://kvpr.org/post/new-valley-fever-skin-test-shows-promise-obstacles-remain.
[10] PlaceWorks. 2024. Draft Environmental Impact Report State Clearinghouse No. 2023110328 Ontario Regional Sports Complex For City of Ontario. Prepared April 2024. Pg 3-50

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days and another 56,000 cubic yards removed during Phase 2 (Planning Areas 4 and 5) over 28 working days, for a total of 122,437 cubic yards of manure removal" The mass grading of soils will cause an exposure to particulate matter which can cause asthma, irregular heartbeats, difficulty breathing, and premature death in people with heart or lung disease. Decomposing manure generates a number of volatile compounds, including methane (a greenhouse gas) and hydrogen sulfide, which can impair a person's respiratory and nervous systems, and can also form as manure decomposes. The potential health impacts from exposure to these agents are not directly addressed in the DEIR.

The DEIR also does not address the potential health impacts from the exposure to bacteria present in the manure that will be disturbed in the removal process and can transport offsite into the community. Studies of bioaerosol formation[11,12] and bacterial transport[13] from soils have demonstrated that airborne micro-organisms and microbial by-products from manure impacted soils are a potential health risk to workers and individuals in nearby communities. Commercial livestock, the source of manure in the Project Site that needs to be removed, carry an increased microbial load in their gastrointestinal system, they are often reservoirs of zoonotic pathogens (temporarily or permanently), which can be transmitted to the environment in untreated manures.[14,15] Those pathogens can include Gram-negative bacteria, *Listeria monocytogenes* (causing listeriosis), *Mycobaterium bovis and tuberculosis* (causing tuberculosis), *H1N1* viruses (causing influenza), *SARS coronavirus* (causing acute respiratory syndromes), and *Cryptosporidium parvum* (causing cryptosporidiosis).

O2-22 cont'd

As noted above, conventional dust control measures do nothing to prevent the spread of small particles (bioaerosols and impacted soils) because they largely focus on visible dust or larger dust particles—the PM_{10} fraction—not the very fine particles where the bacteria and viruses are found.

[11] Thiel, n. et al. 2020. Airborne bacterial Emission Fluxes From Manure-Fertilized Agricultural Soil. *Microbial Biotechnology* 13(5): 1631–1647

[12] Dungan. R.S. 2010. BOARD-INVITED REVIEW: Fate And Transport Of Bioaerosols Associated With Livestock Operations And Manures. *J. Animal Science.* 88:3693–3706

[13] Pfister, H. et al. 2018. Factors Determining The Exposure Of Dairy Farmers To Thoracic Organic Dust. *Environmental Research* 165:286-293

[14] Gerba, C. P., and J. E. Smith. 2005. Sources of pathogenic micro- organisms and their fate during land application of wastes. *J.Environ. Qual.* 34:42–48. As cited in Dungan, 2010.

[15] Venglovsky, J., N. Sasakova, and I. Placha. 2009. Pathogens and antibiotic residues in animal manures and hygienic and eco- logical risks related to subsequent land application. *Bioresour.Technol.* 100:5386–5391. As cited in Dungan, 2010/

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The use of PM_{10} and visible dust as a measure of the potential exposure to biological agents fails to consider the size of the viruses and bacteria (5-10 times smaller than the visible dust). Standard Air Quality Mitigation Measures such as watering of soils would not provide sufficient protection to on-site workers nor would they prevent the spread of viruses and bacteria from the site to receptors farther away. The City must assess the potential impacts from the biological agents in the manure impacted soils in a revised EIR before allowing the soils to be disturbed. O2-22 cont'd

3. Mitigation Measure AQ-1 Relies On The Use Of Tier 4 Final Off-Road Equipment To Reduce Criteria Pollutant Emissions From Potentially Significant To Less Than Significant Levels And Does Not Assess The Relative Availability Of The Equipment.

According the DEIR, after mitigation the criteria pollutants and exhaust emissions would not exceed the SCAQMD significance thresholds if Mitigation Measure AQ-1 is implemented. Specifically, AQ-1 states[16] "Use construction equipment rated by the United States Environmental Protection Agency as having Tier 4 (model year 2008 or newer) Final or stricter emission limits for all off-road construction equipment. If Tier 4 Final equipment is not available, the applicant shall provide documentation (e.g., rental inventory requests), to the City's satisfaction, or otherwise unavailability to the City of Ontario prior to the issuance of any construction permits." O2-23

Regional Emissions Impact Analysis

Parameter	Maximum Daily Emissions (lbs/day)							
	TOG	ROG	NOx	CO	SO_2	PM_{10} Exhaust	PM_{10} Dust	PM
Year 2024: Maximum Daily Emissions (lbs/day)	11.09	9.48	168.88	244.05	0.65	2.65	20.23	
Year 2025: Maximum Daily Emissions (lbs/day)	17.63	81.90	223.82	406.25	0.62	5.15	14.82	
Year 2026: Maximum Daily Emissions (lbs/day)	6.71	41.58	72.21	138.70	0.49	1.76	7.37	
Year 2027: Maximum Daily Emissions (lbs/day)	3.14	17.59	27.84	42.39	0.08	0.82	1.49	
Overall: Maximum Daily Emissions (lbs/day)	17.63	81.90	223.82	406.25	0.65	5.15	20.23	
South Coast AQMD Regional Significance Threshold	N/A	75	100	550	150	N/A	N/A	
Exceeds Threshold?	No	Yes	Yes	No	No	No	No	

Figure 4: Unmitigated Overlapping Construction Activities Maximum Daily Emissions

[16] PlaceWorks. 2024. Draft Environmental Impact Report State Clearinghouse No. 2023110328 Ontario Regional Sports Complex For City of Ontario. Prepared April 2024. Pg 1-26

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Mitigated Regional Emissions Impact Analysis

Parameter	Maximum Daily Emissions (lbs/day)							
	TOG	ROG	NOx	CO	SO_2	PM_{10} Exhaust	PM_{10} Dust	PM
Year 2024: Maximum Daily Emissions (lbs/day)	9.89	5.51	73.84	260.70	0.65	1.59	20.23	2
Year 2025: Maximum Daily Emissions (lbs/day)	11.34	23.95	78.29	431.16	0.61	1.38	14.82	1
Year 2026: Maximum Daily Emissions (lbs/day)	4.81	11.95	28.15	150.06	0.16	0.45	7.06	7
Year 2027: Maximum Daily Emissions (lbs/day)	1.15	4.19	9.09	51.04	0.08	0.18	1.49	1
Maximum Daily Emissions (lbs/day)	11.34	23.95	78.29	431.16	0.65	1.59	20.23	2
South Coast AQMD Regional Significance Threshold	N/A	75	100	550	150	N/A	N/A	[illegible]
Exceeds Threshold?	No	No	No	No	No	No	No	
Unmitigated Maximum Daily Emissions (lbs/day)	17.63	81.90	223.82	406.25	0.65	5.15	20.23	2
Mitigated Maximum Daily Emissions (lbs/day)	11.34	23.95	78.29	431.16	0.65	1.59	20.23	2
Reduction (%)	35.70%	70.75%	65.02%	-6.13%	0.00%	69.02%	0.00%	4.

Figure 5: Mitigated Overlapping Construction Activities Maximum Daily Emissions

The DEIR's assumed reduction in reactive organic gases (ROGs) and oxides of nitrogen (NOx) are primarily associated with the use of Tier 4 Final technology. The failure to use that technology will result in higher emissions than disclosed in the DEIR and create unwanted regional air quality issues in an already impaired region of the Southern California Air Basin (SCAB).

It is clear from the language of the mitigation measure (i.e., to the City's satisfaction), that the assumption that Tier 4 Final equipment will always be used is not correct. Based upon a review of public records of the California Air Resources Board's (CARB) Diesel Off-Road Online Reporting System (DOORS), it is evident that the availability of Tiered construction equipment is highly dependent on the type of equipment and the contractors may not be able to achieve the reductions if the equipment is not available. O2-23 cont'd

Table 1: Percent of Equipment in California DOORS Database by Emission Tier Level

Equipment Type (> 50 hp)	U.S. EPA Emission Tier Level					
	T0	T1	T2	T3	T4F	T4I
Aerial Lifts	1.63%	4.67%	14.86%	4.08%	**48.64%**	**26.12%**
Boom	0.15%	0.77%	5.22%	1.59%	**76.20%**	**16.06%**
Bore/Drill Rigs	11.53%	15.42%	16.86%	21.76%	**17.72%**	**14.34%**
Bucket	8.33%	18.33%	10.00%	6.67%	**33.33%**	**23.33%**
Concrete Mixer	0.00%	0.00%	0.00%	14.29%	**85.71%**	**0.00%**
Concrete Pump	1.30%	7.79%	40.26%	1.30%	**32.47%**	**16.88%**
Crane 35ton or more	5.57%	4.41%	5.37%	18.81%	**37.62%**	**27.45%**
Crane less than 35ton	20.37%	2.47%	6.79%	12.35%	**38.27%**	**19.75%**
Cranes	27.84%	11.49%	9.13%	26.60%	**10.82%**	**11.80%**
Crawler Tractors	26.56%	13.31%	13.11%	13.70%	**22.39%**	**10.93%**
Crushing/Processing Equipment	0.00%	0.78%	2.34%	14.06%	**74.22%**	**8.59%**
Drill Rig	7.09%	4.14%	8.86%	12.56%	**45.79%**	**17.87%**
Drill Rig (Mobile)	11.51%	8.71%	11.51%	17.26%	**30.95%**	**14.77%**

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2. Response to Comments

Equipment Type (> 50 hp)	U.S. EPA Emission Tier Level					
	T0	T1	T2	T3	T4F	T4I
Excavators	5.24%	8.34%	13.95%	7.29%	**48.67%**	**16.50%**
Forklifts	9.57%	10.57%	13.82%	7.99%	**40.45%**	**17.46%**
Garbage Refuse	0.00%	0.00%	8.70%	8.70%	**43.48%**	**39.13%**
Garbage Transfer	0.00%	0.00%	0.00%	33.33%	**66.67%**	**0.00%**
Graders	29.78%	14.12%	12.89%	15.27%	**17.40%**	**10.52%**
Hopper Tractor Trailer	0.00%	0.00%	0.00%	0.00%	**50.00%**	**50.00%**
Mower	2.44%	7.27%	13.58%	1.10%	**54.40%**	**21.22%**
Nurse Rig Aircraft Supply	0.00%	0.00%	0.00%	0.00%	**100.00%**	**0.00%**
Nurse Rig Other	0.00%	0.00%	0.00%	100.00%	**0.00%**	**0.00%**
Off Highway Tractors	3.55%	6.28%	6.01%	8.74%	**65.30%**	**10.11%**
Off Highway Trucks	1.69%	3.87%	11.14%	5.81%	**62.23%**	**15.25%**
Off-Highway Tractors	18.25%	17.06%	20.98%	10.02%	**17.18%**	**16.31%**
Off-Highway Trucks	16.96%	12.96%	17.54%	20.81%	**16.13%**	**13.99%**
Other Construction Equipment	16.35%	14.20%	17.11%	10.53%	**24.03%**	**17.19%**
Other General Industrial Equipment	13.18%	16.56%	27.57%	8.61%	**13.80%**	**19.84%**
Other Material Handling Equipment	10.84%	11.39%	19.25%	15.55%	**26.63%**	**16.26%**
Other Truck	15.64%	10.34%	5.31%	13.41%	**36.87%**	**11.45%**
Pavers	12.11%	21.18%	16.99%	14.97%	**23.34%**	**11.41%**
Paving Equipment	6.49%	12.80%	12.74%	12.44%	**38.17%**	**17.05%**
Railcars or Track Cars	16.33%	8.16%	0.00%	14.29%	**51.02%**	**10.20%**
Rollers	14.09%	15.93%	18.30%	6.46%	**30.61%**	**14.59%**
Rough Terrain Forklifts	3.95%	9.32%	15.89%	8.11%	**41.94%**	**20.80%**
Rubber Tired Dozers	41.04%	10.02%	9.44%	19.65%	**15.22%**	**4.62%**
Rubber Tired Loaders	16.74%	12.71%	13.56%	14.94%	**29.29%**	**12.76%**
Scrapers	28.91%	10.98%	15.47%	30.41%	**10.15%**	**4.04%**
Skid Steer Loaders	3.70%	10.02%	15.81%	3.20%	**54.69%**	**12.58%**
Spray Truck	5.56%	4.17%	19.44%	2.78%	**34.72%**	**26.39%**
Spreader Tractor Trailer	0.00%	14.29%	28.57%	0.00%	**42.86%**	**14.29%**
Spreader Truck	4.17%	0.00%	4.17%	37.50%	**16.67%**	**25.00%**
Surfacing Equipment	15.38%	14.25%	10.18%	23.08%	**19.23%**	**17.65%**
Sweepers/Scrubbers	11.02%	20.84%	16.57%	6.61%	**25.75%**	**19.06%**
Tank Truck	4.05%	6.76%	8.11%	27.03%	**37.84%**	**16.22%**
Tanker Truck Trailer	0.00%	18.18%	0.00%	0.00%	**63.64%**	**18.18%**
Telescopic Handler	1.33%	0.00%	2.67%	0.00%	**80.00%**	**16.00%**
Tow Tractor	0.00%	100.00%	0.00%	0.00%	**0.00%**	**0.00%**
Tractors/Loaders/Backhoes	13.53%	16.50%	18.73%	8.96%	**29.23%**	**13.05%**
Trenchers	21.86%	19.57%	20.87%	3.28%	**21.86%**	**12.57%**

2. Response to Comments

Equipment Type (> 50 hp)	U.S. EPA Emission Tier Level					
	T0	T1	T2	T3	T4F	T4I
Vacuum Truck	2.21%	18.38%	15.44%	25.00%	**13.24%**	**14.71%**
Water Truck	21.79%	8.21%	16.43%	16.07%	**23.57%**	**13.57%**
Workover Rig (Mobile)	5.99%	15.14%	9.78%	17.35%	**7.10%**	**13.56%**
Yard Goat	4.40%	4.58%	9.41%	18.31%	**41.71%**	**21.33%**

It is clear from the CARB data that Tier 4 Final certified equipment necessary for the construction phase is in short supply in the State. In particular, Tier 4 crawler tractors, loaders, and cranes make up a small portion of the registered fleet in California. Mitigation Measure AQ-1 provides an exception if Tier 4 Final equipment is not available during Project construction which simply allows the applicant to "provide documentation" demonstrating the unavailability of Tier 4 Final equipment. The measure fails to require any alternative engine tier or equivalent engine retrofits in the event Tier 4 Final equipment is unavailable. O2-23 cont'd

The emissions from construction equipment depend on the "tier" of the engine. Tier 1 equipment has the highest emissions and Tier 4 Final the lowest emissions.[17] As drafted, Measure AQ-1 would allow the applicant to select all Tier 1-3 equipment to construct the Project if they determine that Tier 4 Final equipment is unavailable. If the applicant selected all Tier 1-3 construction equipment, emissions would be significantly higher than calculated.

Without a binding commitment to only use Tier 4 Final construction equipment or equivalent emissions controls for all phases of Project construction, the applicant may use low-tier equipment which does not achieve the emissions reductions assumed in the DEIR. As a result, actual emissions from the construction phasemay exceed SCAQMD's thresholds and create unmitigated adverse air quality and health outcomes for the community. The DEIR fails to analyze emissions levels in the event Tier 4 Final equipment is determined by the City to be unavailable. The DEIR's air quality analysis is therefore incomplete and must be corrected in a revised EIR for the Project.

[17] See, e.g., DieselNet, Emission Standards, United States: Nonroad Diesel Engines, https://dieselnet.com/standards/us/nonroad.php.

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4. The City Incorrectly Cites The ASTM Standard For Subsurface Investigations Of ORSC Sites.

According the DEIR,[18] "Prior to the issuance of grading permits for individual development projects in the ORSC site, the project applicant/developer shall submit a Phase II Environmental Site Assessment (ESA) to the City of Ontario. The Phase II ESA shall be prepared by an Environmental Professional in accordance with American Society for Testing and Materials (ASTM) Standard E: 1527-21 Environmental Site Assessment Standard Practice (ASTM E1527-21)."

Attached to this comment letter is ASTM Standard E: 1527-21. ASTM Standard E: 1527-21 is clearly designed for Phase I Environmental Assessments. Under the uses section of the Standard it is noted that "This practice is intended for use on a voluntary basis by parties who wish to assess the environmental condition of commercial real estate taking into account commonly known and reasonably ascertainable information." The Standard is not designed for the subsurface investigation of conditions at a site rather the investigation of existing information supplied to federal, tribal, state, or local regulatory agencies regarding past or present releases of hazardous substance or petroleum products.[19] The City of citing the wrong standard in its HAZ-1 mitigation measure. The correct standard for Phase II investigations, i.e., intended for use on a voluntary basis by parties who wish to evaluate known releases or likely release areas identified by the user or Phase II Assessor, and/or to assess the presence or likely presence of substances in the environment, is ASTM Standard E1903-19. The City must correct this flawed Mitigation Measure in a revised EIR. O2-24

5. The Air Quality Analysis Of Operational Emissions Is Incomplete And Fails To Include Emissions From Stationary Sources (e.g., The Fire Pump System and Generators) That Will Be Installed Onsite.

According to the DEIR[20] "The ORSC could result in the installation and operation of stationary sources, such as generators, boilers, or fire pumps. The quantity, type, size, location, fuel type, O2-25

[18] PlaceWorks. 2024. Draft Environmental Impact Report State Clearinghouse No. 2023110328 Ontario Regional Sports Complex For City of Ontario. Prepared April 2024. Pg 1-41

[19] ASTM 2021. Standard E1527-21. Pg 12

[20] PlaceWorks. 2024. Draft Environmental Impact Report State Clearinghouse No. 2023110328 Ontario Regional Sports Complex For City of Ontario. Prepared April 2024. Pg 5.3-34

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2. Response to Comments

maximum daily operating hours, and annual average operating hours for potential stationary source equipment are unknown at this time; thus, no emissions associated with stationary sources have been included in this analysis." The DEIR clearly is missing significant sources of criteria and toxic air contaminants (TACs) that will be installed onsite but are not accounted for in the analysis.

The Air Quality Analysis prepared for the Project, proposes mitigated regional operational emissions based on the CalEEMOD (Version 2022.1) software. Included in the analysis are area source emissions and mobile source emissions. Not included in the analysis are emissions from the stationary sources that will be installed onsite.

Mitigated Regional Operation Emissions Worksheet

[1] CalEEMod, Version 2022.1

[2] Includes incorporation of Mitigation Measure AQ-2, which requires the use of zero-emission landscaping equipment.

Mitigated Proposed Project (On-site & Off-site) Maximum Daily Worst-Case Day Scenario

	ROG	NOx	CO	SO2	PM10 Total	PM2.5 Total
Summer						
Mobile[1]	86.00	39.20	735.00	1.48	156.00	39.90
Area	24.20	0.00	0.00	0.00	0.00	0.00
Energy	0.18	3.32	2.79	0.02	0.25	0.25
Total	**110.38**	**42.52**	**737.79**	**1.50**	**156.25**	**40.15**
Winter						
Mobile[1]	81.00	43.00	622.00	1.36	156.00	39.90
Area	24.20	0.00	0.00	0.00	0.00	0.00
Energy	0.18	3.32	2.79	0.02	0.25	0.25
Total	**105.38**	**46.32**	**624.79**	**1.38**	**156.25**	**40.15**
Max Daily						
Mobile	86	43	735	1	156	40
Area	24	0	0	0	0	0
Energy	0	3	3	0	0	0
Total	**110**	**46**	**738**	**2**	**156**	**40**
Regional Thresholds (lb/day)	**55**	**55**	**550**	**150**	**150**	**55**
Exceeds Thresholds?	Yes	No	Yes	No	Yes	No

O2-25 cont'd

Figure 6: Mitigated Regional Operation Emissions

The table above clearly demonstrates that emissions from the stationary sources (e.g., required fire system and backup generators) have not been accounted for in the Air Quality Analysis of the DEIR. The City's analysis is therefore incomplete and must be corrected in revised EIR for the Project.

Conclusion

The facts identified and referenced in this comment letter lead me to reasonably conclude that the Project could result in significant impacts if allowed to proceed. A revised draft environmental impact report should be prepared to address these substantial concerns. O2-26

Sincerely,

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EXHIBIT B

2. Response to Comments

WILSON IHRIG
ACOUSTICS, NOISE & VIBRATION

CALIFORNIA
WASHINGTON
NEW YORK

WI #24-001

May 17, 2024

Mr. Aidan P. Marshall
Adam Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080

SUBJECT: Ontario Regional Sports Complex Project
Ontario, California
Review and Comment on Noise Study

Dear Mr. Marshall,

Per your request, Wilson Ihrig has reviewed the information and noise impact analysis in the following documents:

Ontario Regional Sports Complex
Draft Environmental Impact Report (DEIR)
Appendix J1: Construction Noise (Construction Noise Study)
Appendix J2: Traffic Noise (Traffic Noise Study)
Appendix J3: Stadium Noise (Stadium Noise Study)
Appendix J4: Athletic Field Noise (Athletic Field Noise Study)
Appendix J5: Commercial Miscellaneous Noise (Commercial Noise Study)
April 2024

The Ontario Regional Sports Complex Project (Project) would involve the development of approximately 199 acres of land for a variety of recreational activities - from a semi-professional Minor League Baseball stadium, retail, and hospitality area to a new City recreation center and aquatics center surrounded by a variety of baseball/softball, soccer, and multiuse fields. The project is surrounded by commercial uses to the west, residences to the east, residences and a daycare center to the north, and residences and a cattle farm to the south. O2-27

This letter reports our comments on the Noise Analysis in Section 5.13 of the Draft Environmental Impact Report (DEIR) and Appendices J1 through J5 (referred to as "Noise Study"). Wilson Ihrig, Acoustical Consultants, has practiced exclusively in the field of acoustics since 1966. During our 57 years of operation, we have prepared hundreds of noise studies for Environmental Impact Reports and Statements. We have one of the largest technical laboratories in the acoustical consulting industry. We also utilize industry-standard acoustical programs such as Roadway Construction Noise Model (RCNM), SoundPLAN, and CADNA. In short, we are well qualified to prepare environmental noise studies and review studies prepared by others.

5900 HOLLIS STREET, SUITE T1 | EMERYVILLE, CA 94608 | (510) 658-6719 | WWW.WILSONIHRIG.COM

2. Response to Comments

Adverse Effects of Noise[1]

Although the health effects of noise are not taken as seriously in the United States as they are in other countries, they are real and, in many parts of the country, pervasive.

Noise-Induced Hearing Loss. If a person is repeatedly exposed to loud noises, he or she may experience noise-induced hearing impairment or loss. In the United States, both the Occupational Health and Safety Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH) promote standards and regulations to protect the hearing of people exposed to high levels of industrial noise.

Speech Interference. Another common problem associated with noise is speech interference. In addition to the obvious issues that may arise from misunderstandings, speech interference also leads to problems with concentration fatigue, irritation, decreased working capacity, and automatic stress reactions. For complete speech intelligibility, the sound level of the speech should be 15 to 18 dBA higher than the background noise. Typical indoor speech levels are 45 to 50 dBA at 1 meter, so any noise above 30 dBA begins to interfere with speech intelligibility. The common reaction to higher background noise levels is to raise one's voice. If this is required persistently for long periods of time, stress reactions and irritation will likely result. O2-27 cont'd

Sleep Disturbance. Noise can disturb sleep by making it more difficult to fall asleep, by waking someone after they are asleep, or by altering their sleep stage, e.g., reducing the amount of rapid eye movement (REM) sleep. Noise exposure for people who are sleeping has also been linked to increased blood pressure, increased heart rate, increase in body movements, and other physiological effects. Not surprisingly, people whose sleep is disturbed by noise often experience secondary effects such as increased fatigue, depressed mood, and decreased work performance.

Cardiovascular and Physiological Effects. Human's bodily reactions to noise are rooted in the "fight or flight" response that evolved when many noises signaled imminent danger. These include increased blood pressure, elevated heart rate, and vasoconstriction. Prolonged exposure to acute noises can result in permanent effects such as hypertension and heart disease.

Impaired Cognitive Performance. Studies have established that noise exposure impairs people's abilities to perform complex tasks (tasks that require attention to detail or analytical processes) and it makes reading, paying attention, solving problems, and memorizing more difficult. This is why there are standards for classroom background noise levels and why offices and libraries are designed to provide quiet work environments.

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[1] More information on these and other adverse effects of noise may be found in *Guidelines for Community Noise*, eds B Berglund, T Lindvall, and D Schwela, World Health Organization, Geneva, Switzerland, 1999. (https://www.who.int/docstore/peh/noise/Comnoise-1.pdf)

2. Response to Comments

Baseline Noise is Not Properly Established

The manner in which the Noise Study has determined the existing noise environment at sensitive receptors is unsupported. As shown in Figure 5.15-1, existing noise was only measured at two locations, mid-bock on the east and west side of the project [DEIR page 5.13-11]. The DEIR incorrectly states that the locations are "representative of noise-sensitive land uses exposed to traffic noise along roadways adjacent to the ORSC site" [DEIR page 5.13-8]. There are no sensitive receptors or traffic on the LT-2 side of the site and, while LT-1 is representative of the homes along the east side of the project, neither location captures the traffic along E. Riverside Drive and Chino Avenue. The lack of street traffic is why, as shown the Traffic Noise Study, levels during the 24-hour measurement period were very steady at the two sites during daytime and nighttime hours and nighttime levels were slightly higher than daytime levels. Traffic noise is time-variable and higher during the day. No noise measurements were done to represent the homes to the north or south of the project, which would be exposed to traffic noise along those roads. As no measurements were taken at these receptor locations, there is no baseline against which to properly assess Project-related impacts (either construction or operation). **The Project should conduct properly documented ambient measurements near all sensitive receptors, that capture the worst case (quietest) baseline conditions, to determine impact for operational and construction noise.** O2-28

Potentially Significant Construction Noise Impacts

The DEIR compares estimated construction noise levels to the FTA Manual threshold of 80 dBA [page 5.13-15]. The cited FTA document is a guidance document, and it discourages projects against using its absolute noise criteria values without consideration of local conditions [FTA page 179, see Figure 1 below]. The DEIR further cites a proposed updated to the City of Los Angeles construction noise and vibration thresholds, which recommends using 80 dBA Leq, 8-hr for daytime construction noise [DEIR 5.13-15]. This proposal has not been implemented in Los Angeles. O2-29

No standardized criteria have been developed for assessing construction noise impact. Consequently, criteria must be developed on a project-specific basis unless local ordinances apply. As stated earlier in this section, local noise ordinances are typically not very useful in evaluating construction noise. They usually relate to nuisance and hours of allowed activity, and sometimes specify limits in terms of maximum levels, but are generally not practical for assessing the impact of a construction project. Project construction noise criteria should account for the existing noise environment, the absolute noise levels during construction activities, the duration of the construction, and the adjacent land

Figure 1 FTA Noise and Vibration Impact Assessment, Section on Construction Noise and Vibration (page 179)

The California Environmental Quality Act Guidelines cited in the report clearly state that impacts to noise would be significant if the proposed project would result in "generation of a substantial temporary or permanent increase in ambient noise levels" [DIER page 5.13-10]. The estimated construction noise levels in report Table 5.13-14 exceed the measured ambient by over 30dB [DEIR page 5.13-26]. **The Project should address this exceedance.**

Further, neither the DEIR nor the Construction Noise Study provide the usage factors and combinations of equipment used to calculate the levels presented in Table 5.13-14 and does not show where equipment was assumed to be operating within each work zone shown in Figure 5.13-3. O2-30

2. Response to Comments

Homes in Receptor Groups 2 and 6 are within 80 feet of the Phase 1A site and homes in Receptor Group 5 are within 150 feet of the Phase 1B site [DEIR page 5.13-29]. It is not clear if the ranges shown in Table 5.13-14 represent the closest equipment distance or the whole span of the work zone. Noise levels from a single scraper or dump truck (the two noisiest pieces of equipment shown in the Construction Noise Study Table 2) operating 40% of the time at 80 feet from residences, for example, would be 84 dBA and would exceed the 80 dBA criteria. **The Project should address this exceedance.** O2-30 cont'd

The DEIR does use an ambient-based threshold for nighttime construction and shows predicted nighttime construction levels in Table 5.13-15 ranging from 47 to 60 dBA [DEIR page 5.13-28]. As indicated in the text, these levels exceed the measured nighttime ambient by more than 5 dB. The DEIR posits that the levels at sensitive receivers will be reduced below the threshold with the installation of a noise barrier around the site [DIER page 5.13-63]. The DEIR does not indicate what distance was used for these calculations. Depending on the distance assumed, levels could be 16-22 dBA higher at closest receiver to site distances and would exceed threshold criteria with current mitigation measures. **The Project should address this exceedance.** O2-31

Potentially Significant Operational Noise Impacts

The DEIR uses the City of Ontario Municipal Code for assessing operational noise. It does not address if operational noise will result in the "generation of a substantial temporary or permanent increase in ambient noise levels." The predicted noise levels shown for Stadium noise [DEIR page 5.13-37], and Athletic fields [DEIR page 5.13-43] are up to 10 dB above the measured daytime ambient levels. **The Project should address these exceedances.** O2-32

Table 5.13-21 in the DEIR predicts that live concert noise at the Stadium will range from 5 to 35 dBA at nearby sensitive residences, with the highest levels in Group 5 [DEIR page 5.13-38]. These levels are much lower than the predictions shown for games in the Stadium. According to the Stadium Noise Study, the concert noise was calculated using a source sound power level from SoundPLAN for public festivals of 75 dB [Stadium Noise Study page J3-17]. This reference level is inappropriately low. It is a common issue for concerts in Stadiums with professionally amplified sound to produce high noise levels that cause annoyance in the community.[2][3] Concerts at sports facilities of this size (450,000 square feet according to the DEIR Table ES-1) can produce sound power levels as high as 135 dB.[4] This would increase the SoundPLAN predictions shown in DIER Table 5.13-21 by 60 dB, resulting in predicted Leqs as high as 93 dBA at Receptor Group 5 (28 dBA above the Municipal Noise Code and 45 dBA above measured evening noise levels). The Stadium Noise Study does not address what meteorological conditions were assumed in the model. Temperature inversion effects could produce even higher increases. **The Project should address this error.** O2-33

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[2] https://www.sfgate.com/bayarea/article/Levi-s-Stadium-and-AT-T-Park-How-the-noise-12256700.php

[3] https://www.nydailynews.com/2023/12/13/residents-sue-forest-hills-stadium-over-concert-series-noise-complaints/

[4] https://www.vdi.de/en/home/vdi-standards/details/vdi-3770-characteristic-noise-emission-values-of-sound-sources-facilities-for-recreational-and-sporting-activities

2. Response to Comments

Incomplete Traffic Study and HVAC Noise Analysis

As stated above, the measurement locations chosen do not represent existing traffic along E. Riverside Drive and Chino Avenue. It is not clear from the discussion in the DEIR and the Traffic Noise Study how the Traffic Noise Model was verified without existing noise measurements of roadway noise. O2-34

The DEIR states that HVAC equipment shall be designed to meet the City of Ontario Municipal Code nighttime criteria of 45 dBA [DEIR page 5.13-63]. It does not address what the anticipated noise levels are based on the needs of the planned facilities or the feasibility of achieving the threshold criteria.

Conclusion

The Project may result in potentially significant construction and operational noise impacts. The DEIR uses an inappropriately low reference level for Stadium concerts, resulting in predictions much lower than expected for a venue of this size. The DEIR relies on an inadequate baseline because ambient measurements do not represent all sensitive buildings or existing noise sources near the site. Finally, the DEIR contains several operational noise omissions that may result in underestimated noise impacts. 02-35

Please feel free to contact me with any questions on this information.

Very truly yours,
WILSON IHRIG

Ani Toncheva
Senior Consultant

ontario sports - comments on noise analysis.docx

2. Response to Comments

The resumes included in Comment Letter O2 do not require responses and are omitted here. They are provided as Appendix E to this Final Environmental Impact Report.

2. Response to Comments

O2. Response to Comments from Aidan P. Marshall, Adams Broadwell Joseph & Cardoza, on behalf of Californias Allied for a Responsible Economy (CARE CA), dated May 20, 2024.

Intro Responses to specific comments regarding agricultural resources, air quality, health risk, hazardous materials, and noise, are provided in responses O2-4 through O2-34. City staff has reviewed the EIR and determined that none of this material constitutes significant new information requiring recirculation of the DEIR under CEQA Guidelines Section 15088.5. None of the comments contain substantial evidence that the Proposed Project will result in a significant new environmental impact not previously disclosed in the DEIR, a significant increase in the severity of a previously identified environmental impact that will not be mitigated, or that there would be any of the other circumstances requiring recirculation described in Section 15088.5 of the CEQA Guidelines. No further response is necessary.

O2-1 This comment provides a description of the organization, the Commenter's interest in the Proposed Project, and who they represent. No response is necessary.

O2-2 This comment describes Commenter's review of the legal background of CEQA and its purpose. No response is necessary.

O2-3 This comment further describes Commenter's view of the legal responsibility of the lead agency to disclose and analyze significant impacts of the Proposed Project and adopt all feasible mitigation under CEQA. No response is necessary.

O2-4 The City's reasoning for rejecting the "Establishment of Conservation Easement or Preserves" mitigation measure includes additional considerations beyond the legal feasibility of mitigation measure. Feasible means "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors." (Public Resources Code Section 21061.1; see also CEQA Guidelines, Section 15364 [same definition but with addition of "legal" factors].) As discussed on page 5.2-11 in Section 5.2, *Agricultural Resources*, of the Draft EIR, the establishment of agricultural land and/or conservation easements within the City would require comprehensive amendment to TOP, resulting in potential conflicts with local and regional land use plans/policies like the Southern California Association of Government's Regional Transportation Plan/Sustainable Communities Strategy and the City's adopted Housing Element, which facilitate the development of City's remaining agricultural land. The Commenter's proposed mitigation strategy could also result in potentially adverse environmental impacts including, but not limited to, impacts to biological resources, hydrology/water quality, air quality, greenhouse gas emissions, and land use and planning.

O2-5 The City does not dispute that Agricultural Conservation Easements (ACE) can partially mitigate for loss of agricultural land in certain circumstances. However, the City finds that ACEs are not feasible mitigation at this time because there are no current ACEs within

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the City or San Bernardino County that meet the additionality requirements under CEQA that would provide for mitigation at a 1:1 ratio.

The Draft EIR outlines why ACEs are not a feasible measure for the Proposed Project. While mitigation via the use of ACEs may be a possibility for future CEQA projects in the Central Valley, there are currently no ACE banks within the City of Ontario, or San Bernardino County, that would be available for purchase for CEQA projects in the Ontario Ranch. The Commenter has not identified a mitigation banking program in San Bernardino County that has ACE available for purchase within the development timeframe of the Proposed Project that would provide for substitute Farmland resources. Based on information from the American Farmland Trust, the only Purchase of Agricultural Conservation Easement (PACE) banking available in California are in the City of Davis, Sonoma County, and San Deigo County.

The Commenter asserts that lack of ACE banks or substitute farmland within City borders or in San Bernardino County is not, in its opinion, a basis for the City to find ACEs to be infeasible as mitigation for the Proposed Project. However, Resolution No. 2010-003, adopted by the City on January 27, 2010, details the City's existing policy. Specifically, the Resolution found that that the replacement of agricultural resource off-site, including via establishment of conservation easements or preserves, would, given the lack of viability of such mitigation within the City, only be possible in parcels in another portion of the state. It further found that "such distant mitigation would not reduce impacts because these mitigation parcels could have no bearing or relationship on the loss of agricultural lands within the City and this mitigation strategy would cause no net change in Important Farmland conversion within the state because new Important Farmland cannot be created." It is these findings, adopted by the City over 14 years ago, which constitute the City's existing policy regarding the City's requirement for local availability of agricultural lands to serve as mitigation for any impacts to agricultural resources.

Payment into an ACE mitigates not the loss of agricultural production itself but the loss of sites that have the potential to be viable for farming. Agricultural land under the California Department of Conservation (CDC) Farmland Mapping and Monitoring Program (FMMP) in 1982 established the Farmland standards based on soil quality and irrigation status. As identified in the 2022 SEIR for TOP 2050, between 2014 and 2016 in the County of San Bernardino there was a loss of 1,244 Farmland acres. Given the urbanization in Ontario and the greater San Bernardino County, there are unlikely to be "new" suitable sites in San Bernardino that are not already under agricultural production that would offset Farmland acres acreage loss to zero. Because mitigation for ACE needs to be additional for it to be mitigation under CEQA, and, per City policy (as discussed above) needs to be within the City or surrounding County, given the absence of an existing ACEs available to offset the loss of Farmland, ACE is determined to be infeasible as mitigation for the Proposed Project.

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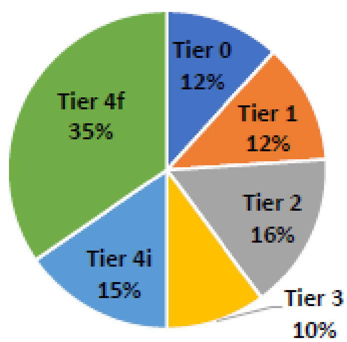
O2-6 The US Environmental Protection Agency (EPA) signed the final rule to introduce Tier 4 emissions standard on May 11, 2004. Because equipment with these emissions standards were phased in between 2008 through 2015 by the EPA, construction equipment with engines with 50 horsepower and more that meet Tier 4 emissions are readily available in construction fleets throughout California.

Additionally, South AQMD in their comment letters to lead agencies frequently recommends use of Tier 4 construction equipment. In South Coast AQMD's 2022 Air Quality Management Plan Policy Brief's indicates that Tier 4 equipment comprises 50 percent of all off-road equipment in California, and Tier 4 Final comprised 35 percent of all equipment in California in year 2021.[1]



(b) Off-road Equipment[6]

The City has determined this mitigation measure to be feasible. Therefore, Mitigation Measure AQ-1 is effective at mitigating the Proposed Project's potentially significant construction impacts, and Commenter's speculation that it would be infeasible due to the lack of availability of Tier 4 equipment is without support. However, it is reasonable that specialized equipment needed for specific tasks during project construction could see limited availability. Considering the time-sensitive nature of the Proposed Project's construction schedule, and at the request of the Commenter, Mitigation Measure AQ-1 was modified to include alternative emission control equipment to ensure emission reductions in the unlikely event that Tier 4 Final equipment not be available (see Chapter 3, *Revisions to the Draft EIR*). In addition, Mitigation Measure AQ-1 was modified to further define that "commercially available" constitutes the availability of Tier 4 engines similar to the availability for other large-scale construction projects in the City occurring at the same time and taking into consideration factors such as potential significant delays to

1 South Coast Air Quality Management District. 2022, May. Draft 2022 Air Quality Management Plan. Policy Briefs; Black Box Measures. http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/combined-bb-measures.pdf?sfvrsn=8

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critical-path timing of construction and geographic proximity to the project site of Tier 4 equipment.

O2-7 Stationary source emissions were not included in the emissions modeling in the Draft EIR because the quantity, location, fuel type, horsepower, annual operating hours, daily operating hours, and emission control specifications of stationary equipment are unknown; and thus, determined to be speculative.

Additionally, stationary equipment, such as emergency generators require permits from South Coast AQMD to ensure that the equipment incorporates the Best Available Control Technology and do not exceed the emissions thresholds, consistent with District Regulations IX, *Standards of Performance for New Stationary Sources (NSPS)*, and XIII, *New Source Review*. Accordingly, the potential air quality impacts of such equipment must be less than significant pursuant to a rule of general application.

While the equipment parameters for potential stationary sources are wholly unknown at this time, the Commenter is recommending that diesel-fired backup generators be included in the emissions modeling. At the request of the Commenter, Section 5.3, *Air Quality*, and Section 5.8, *Greenhouse Gas Emissions*, was modified to incorporate emissions from up to four backup generators (see Chapter 3, *Revisions to the Draft EIR*). Four backup generators were assumed for this additional emissions assessment to account for the potential for stadium, hotel, recreational center, and Chicken N' Pickle buildings to need backup power source. Each generator is assumed to be 100 horsepower, operate 100 hours annually, and operate one hour daily (see Final EIR Appendix F). As shown therein, the addition of four generators would not cause an exceedance of the South Coast AQMD thresholds or substantially increase impacts evaluated in the Draft EIR.

O2-8 Section 5.3, *Air Quality*, page 5.3-44 discusses the potential for manure haul activities to result in odors affecting a substantial number of people. The City's expert disagrees that the Draft EIR's evaluation of potential odors from construction activities, such as manure haul, is not supported by substantial evidence, conclusory, or fails to address all sources of odors.

The ORSC site previously operated as a dairy farm; and therefore, the existing baseline conditions include odors from onsite manure and the haul of animal manure off-site in accordance with the San Bernadino Regional Water Quality Board, which requires dairy farms to comply with all requirements pertaining to Concentrated Animal Feeding Operations (CAFO Permit)[2] which includes manure to be removed periodically (180 days) to minimize potential impacts to water quality. Therefore, the haul of manure offsite during construction of the Proposed Project would not constitute a change from existing conditions as it relates to odor impacts to nearby receptors. Additionally, the Proposed

2 Santa Ana Regional Water Quality Control Board *General Waste Discharge Requirements for Concentrated Animal Feeding Operations (Dairies and Related Facilities)* (Order No. R8-2018-0001).

Project would permanently remove manure from the ORSC site, thereby resulting in a long-term improvement in odors in the local vicinity during operation of the Proposed Project.

Furthermore, there are no known air quality complaints from the historic manure removal operations in the Ontario Ranch; and no known violations under South Coast AQMD Rule 403 from existing operations on the ORSC site.

Manure haul associated with the Proposed Project would also be subject to the dust control restrictions of South Coast AQMD District Rule 403, which too would reduce the prevalence of manure dust generated during material movement activities.

The Commenter further states that Rule 402 is insufficient in ensuring less-than-significant odor impacts; however, it is not clear whether the Commenter is referring to potential odor impacts during construction or operation. Page 5.3-44 of the Draft EIR cites Rule 402 as to ongoing operations analysis rather than the construction odor analysis because Rule 402 provides a regulatory mechanism by which odors can be mitigated in the community should the public complain about odors. Further, an odor complaint itself does not necessarily indicate that odors affect a substantial number of people and are significant under CEQA. The operational analysis concludes that typically only large facilities such as wastewater treatment plants, compost facilities, landfills, solid waste transfer stations, fiberglass manufacturing facilities, paint/coating operations (e.g., auto body shops), dairy farms, petroleum refineries, asphalt batch plants, chemical manufacturing, and food manufacturing facilities are the type of facilities that have the potential to affect a substantial number of people. The Proposed Project is not one of these project types; and therefore, as concluded on page 5.3-44, would not have significant odor impacts.

O2-9 The City disagrees that Mitigation Measure HAZ-1 constitutes improper deferral of mitigation. Phase I environmental site assessments (ESAs) were conducted for the entire ORSC site. While the Phase I ESAs recommend a Phase II be conducted, conducting Phase II ESAs prior to project approval would be impractical given the potential phasing and timing of the different components of the Proposed Project and the fact that some components of the Proposed Project are city-initiated components (e.g., stadium, sports complex, community center) and other components would be developer initiated (e.g., commercial/hospitality uses). Additionally, not all parcels within the ORSC site are currently owned by the City of Ontario, making the Phase II ESA for these parcels infeasible. A Phase II was conducted for the limited portion of the site that is owned by the City and would be constructed first (phase 1). Therefore, the EIR includes Mitigation Measure HAZ-1 to ensure that Phase II ESAs are conducted prior to grading activities for each project component and provides detailed performance standards to ensure that the requirements of the Phase II ESAs are adhered to. However, at the request of the

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Commenter, revisions to Mitigation Measure HAZ-1 have been made (see Chapter 3, *Revisions to the Draft EIR*).

O2-10 The City disagrees that Mitigation Measure HAZ-1 constitutes improper deferral of mitigation. See response to Comment O2-9 substantiating that Phase II ESAs are infeasible currently and that including them as a mitigation measure subject to detailed performance standards is not improper deferral under CEQA.

Mitigation Measure HAZ-1 includes performance standards for the preparation of the Phase II ESAs based on the Environmental Site Assessment Standard Practice (ASTM). The Mitigation Measure states that "If the site is found to be impacted with potential contaminants of concern at levels exceeding applicable regulatory thresholds, the project applicant shall remediate all contaminated media, under the oversight and in accordance with state and local agency requirements (California Department of Toxic Substances Control, Regional Water Quality Control Board, Ontario Fire Department, etc.)." The performance standards for remediation are the regulatory thresholds for the local agency with oversight. Mitigation Measure HAZ-1 also identifies actions that achieve that performance standard. The Mitigation Measure requires that, "If the site is found to be impacted with potential contaminants of concern at levels exceeding applicable regulatory thresholds, the project applicant shall remediate all contaminated media, under the oversight and in accordance with state and local agency requirements (California Department of Toxic Substances Control, Regional Water Quality Control Board, Ontario Fire Department, etc.)."

Mitigation Measure HAZ-1 also requires that documentation of compliance with this measure be provided to the City of Ontario. Therefore, the City of Ontario is the oversight agency that would ensure compliance. However, the agencies with oversight authority also include the California Department of Toxic Substances Control, Regional Water Quality Control Board, Ontario Fire Department.

Additionally, revisions to Mitigation Measure HAZ-1 have been made (see Chapter 3, Revisions to the Draft EIR) to incorporate the recommendations identified in the Phase I ESAs and the Phase II ESA from December 2023. The agencies with oversight over the required recommendations have been identified. Additional performance standards and actions that have also been included.

City staff has reviewed the EIR and determined that none of this material constitutes the type of significant new information that requires recirculation of the DEIR for further public comment under CEQA Guidelines Section 15088.5. None of this new material indicates that the Proposed Project will result in a significant new environmental impact not previously disclosed in the DEIR. Additionally, none of this material indicates that there would be a significant increase in the severity of a previously identified environmental impact that will not be mitigated, or that there would be any of the other

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circumstances requiring recirculation described in Section 15088.5 of the CEQA Guidelines

O2-11 At the request of the Commenter, the ASTM standard has been revised in Mitigation Measure HAZ-1 (see Chapter 3, *Revisions to the Draft EIR*).

O2-12 The Comment describes the occurrence of *Coccidiodes Immitis* (Valley Fever cocci) in San Bernardino County, which includes over 20,000 square miles predominantly in the Inland Empire, east of the San Bernardino National Forest. The ORSC site is separated from the arid region of the Inland Empire by a mountain range, resulting in low occurrence of Valley Fever cocci in the Inland Empire. The California Department of Public Health prepared a Valley Fever Fact Sheet in 2021 that identifies the density of reported cases of Valley Fever in 2018, which ranges from fewer than 5 cases per 100,000 people to greater than 100 cases per 100,000 people. According to the California Department of Public Health's Valley Fever Fact Sheet, San Bernardino County experienced fewer than 5 reported cases of Valley Fever per 100,000 people in 2018, which corresponds with the category for the lowest reported case density in the Valley Fever Fact Sheet.[3] Therefore, the potential for Valley Fever cocci to be present with the ORSC site is very low.

Transmission of Valley Fever cocci occurs mostly through naturally occurring winds, as well as dust storms blowing "infected" dust (dust containing Valley Fever fungus spores) into new areas. The cause of Valley Fever is most prevalent in undisturbed soils. Since the ORSC site was historically used for dairy farming, the risk of Valley Fever cocci on disturbed agricultural land is considered low.[4]

Additionally, implementation of South Coast AQMD Rule 403 for fugitive dust control further reduces the potential for Valley Fever. The Proposed Project would trigger the large grading requirements of South Coast AQMD, which includes application chemical stabilizers, frequent watering, avoiding construction activity during high winds, and cleaning of equipment. Similarly, measures that include preventing spillage or bulk material loss, securing sufficient freeboard space, and covering transported materials are already required by the California Vehicle Code for material transport during project construction.

Nonetheless, Mitigation Measure AQ-1 has been modified to include measures that would further minimize any potential worker exposure to Valley Fever cocci at the ORSC site (see Chapter 3, *Revisions to the Draft EIR*).

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3 California Department of Public Health. 2021. June. Valley Fever Fact Sheet. https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/ValleyFeverFactSheet.pdf.

4 California Department of Public Health. 2013. June. Preventing Work-Related Coccidioidomycosis (Valley Fever). https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/CocciFact.pdf.

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O2-13 See also response to Comment 02-8. The City's expert disagrees with the Commenter's conclusion that the construction emissions analysis fails to disclose air quality impacts from removal of manure. Section 5.3, *Air Quality*, includes an evaluation of localized construction impacts and a construction health risk assessment (HRA), which includes the manure haul phase in the emissions modeling (see page 5.3-32 through 5.3-34). As shown in Figures 5.3-2a through 5.3-2d of the Draft EIR, off-site haul routes were included as emission sources in the dispersion modeling for the construction HRA.

It should be noted that the ORSC site previously operated as a dairy farm; and therefore, the existing baseline conditions include decomposing manure onsite.

Furthermore, Manure haul associated with the Proposed Project would be subject to the dust control restrictions of South Coast AQMD District Rule 403, which would reduce the prevalence of manure dust generated during material movement activities.

No changes to the EIR are warranted because the Proposed Project would not generate new sources of manure. Manure from historical dairy operations would be removed from the ORSC site; thereby resulting in an improvement in air quality/odors from historic decomposition of existing manure.

O2-14 The City's expert disagrees with the Commenter's conclusion that the noise impact analysis in Section 5.13, *Noise*, does not provide an adequate assessment of the baseline noise conditions in the vicinity of the ORSC site. The ambient noise survey conducted for the Proposed Project (see pages 5.13-8 through 5.13-9) provides a conservative assessment of noise levels on the ORSC site and vicinity as described below.

The noise consultant completed two long-term (24-hour) measurements near and within the ORSC site to characterize the existing conditions at homes and land uses in the area. As identified by the Commenter, homes closer to the roadway are exposed to higher sound levels. However, existing roadway noise was captured in the existing traffic noise model (see page 5.13-9). For other analyses, such as that for concerts and sporting events, the measured baseline level is used since it is more conservative when assessing ambient degradation. Therefore, the baseline noise monitoring survey and the traffic noise modeling, included in Section 5.13.1.3, *Existing Conditions*, reflect the baseline noise conditions in the ORSC vicinity. For these reasons, no additional noise measurements are warranted to establish baseline conditions.

O2-15 At the request of the Commenter, Harris Miller Miller & Hanson Inc. (HMMH) conducted an ambient degradation analysis to disclose the net increase in noise levels that might occur with the Proposed Project. The construction noise analysis has been supplemented with a comparison of the construction noise levels compared to existing environmental conditions (see Appendix D1 of the Final EIR and Chapter 3, *Revisions to the Draft EIR*).

While the measured existing noise levels establish the baseline noise conditions, an increase in ambient noise levels for the Proposed Project is not applicable to construction activities. This type of threshold only identifies whether the noise is audible or clearly audible, whereas the use of an absolute threshold determines when such activities have the potential to be annoying to a substantial number of people. The use of an absolute significance threshold for construction noise determines whether temporary construction noise has become loud enough to become annoying above the background noise.

The 80 decibel (dBA) Leq 8-hour noise limit for daytime construction activities has been documented nationally[5], and within California as an absolute noise threshold suitable for construction activities. As cited in the City of Los Angeles construction noise threshold guidance[6], the 80 dBA absolute threshold would be similar to a noise increase of approximately 10 dBA (based on an existing 70 dBA ambient noise level, a typical noise level along major roadways) to 25 dBA (based on an existing 55 dBA ambient noise level, a typical noise level in a quieter residential neighborhood) over the ambient noise level, which is a similar setting as the City of Ontario where noise sensitive land uses are located. This is documented in Table 5.13-6, *Existing Traffic Noise Levels by Receptor Group,* as well as through ambient noise monitoring in Table 5.13-4, *Summary of Long-Term Noise Measurement Result: LT-01 (Cucamonga Channel Walking Path)*, and Table 5.13-5, *Summary of Long-Term Noise Measurement Results: LT-02 (South Whispering Lakes Lane)*.

For example, ambient noise levels for residential areas north of Riverside Drive closer to the ORSC site equate to 72 dBA Community Noise Equivalent Level (CNEL) (see Table 5.13-5) while receptors to the east have an ambient sound level of 59 dBA CNEL (see Table 5.13-4). As stated above, using the City of Los Angeles's construction noise threshold of 80 dBA would equate to a 10 dBA and 25 dBA increase in ambient sound levels for sensitive receptors surrounding the ORSC site. Therefore, based on the data and project setting, the City of Ontario has chosen to use the recommended Los Angeles construction noise threshold of 80 dBA, rather than an incremental increase from existing conditions to evaluate potential noise impact during the Proposed Project construction activities.

Pursuant to Section 15064(b)(2) of the CEQA Guidelines, "Lead agencies may also use thresholds on a case-by-case basis". Therefore, CEQA does not require that significance threshold be adopted and allows for use of significance thresholds so long as they are supported by substantial evidence. The City of Los Angeles's significance thresholds need

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5 The 80 dBA Leq(8-hour) absolute threshold is used by the Federal Transit Administration (FTA) for construction noise near residential uses during daytime hours. Federal Transit Administration. 2018. Transit Noise and Vibration Impact Assessment Manual. https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf

6 Los Angeles, City of. 2023. December. Construction Noise and Vibration, Proposed Updates to Thresholds and Methodology. https://planning.lacity.gov/odocument/fba26ae5-ca95-48c3-aace-ae3bf0cb43b1/Construction%20Noise%20and%20Vibration%20-%20Proposed%20Updates%20to%20Thresholds%20and%20Methodology%20&%20Attachments.pdf

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not be adopted to provide the substantial evidence needed for environmental impact evaluations. In fact, the Los Angeles construction noise and vibration guidance was based on input from expert stakeholders in environmental noise.[7]

O2-16 See response to Comment A2-15. As identified above, the 80 dBA absolute threshold for construction noise significance threshold is supported by substantial evidence and already considers an increase in ambient from construction activities of approximately 10 dBA increase in ambient along major roadways or 25 dBA increase in ambient in residential areas. As noted above, the 80 dBA construction noise threshold is supported by a preponderance of evidence in California and nationally.

It should be noted that because the construction analysis was modeled using SoundPlan, construction activities were modeled as area sources, which include multiple pieces of equipment. Figures 5.13-2 through 5.13-4 in the Draft EIR graphically show the distance from construction activities on the ORSC site to offsite sensitive receptors.

O2-17 At the request of the Commenter, the operational noise analysis has been supplemented with a comparison of the operational noise levels compared to existing environmental conditions (see Appendix D1 of the Final EIR and Chapter 3, *Revisions to the Draft EIR*).

While the existing noise levels establish the baseline noise conditions, the increase in ambient noise levels for the project is not applicable to construction activities, which only identify whether the noise is audible or clearly audible. The use of an absolute threshold determines when such activities have the potential to be annoying to a substantial number of people. In comparison an absolute significance threshold based on the municipal code determines whether long-term noise has become loud enough to become annoying. Therefore, the City has chosen to utilize the noise limits identified in the City's Municipal Code rather than an incremental increase from existing conditions as the threshold of significance for construction noise. The noise limits in the City's Municipal Code have been adopted via ordinance.

O2-18 The City disagrees with the Commenter's assertion that a 10 dB increase in ambient noise is a threshold of significance under CEQA. The Commenter has not provided substantial evidence as to why a 10 dB increase in ambient noise would be a threshold of significance for long-term operational noise under CEQA. The stadium noise and athletic field noise analysis is evaluated based on the hourly thresholds in the City's Municipal Code and is not a CNEL threshold that considers 24-hour average noise levels, with penalties for noise in the evening and nighttime hours. Stadium and athletic events within the ORSC site would not occur in the nighttime hours (defined by the City of Ontario as 10 PM – 7 AM)

7 Public feedback is an integral part of determining community noise level criteria. The City of Los Angeles also conducted a hearing to hear and consider public testimony on the thresholds on December 20, 2023, as part of the threshold update.

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when people are more sensitive to noise as most events would end by 9-10 PM during the evening period (7 PM – 10 PM).

The City disagrees with the soundpower reference level cited by the Comment. The sports facility referenced by the Commenter is for a stadium concert at a substantially larger venue than the Proposed Project (e.g., 68,500-to-82,500-person capacity compared to the Proposed Project's 6,000-person capacity). The input used in SoundPLAN assumed lower output quieter environment such as an acoustic band or easy listening music as a "festival concert" setting based on default source terms included in the SoundPLAN propagation software. This was selected based on feedback from the City on what types of concerts would take place at the future stadium. The Proposed Project is a 6,000-person capacity stadium that would not have heavy metal, rap, or rock concerts such as those that might be observed at larger stadiums like Santa Clara Stadium (62,500 capacity) or Giants Stadium (82,500 capacity), associated with sound power levels similar to those mentioned by the commentor of approximately 135 dB LwA. However, to provide an even more conservative analysis of concert noise, a more conservative concert source level has also been modeled at 100 dB LwA which is based on a small concert using source terms in the default SoundPLAN library (see Appendices D1 and D2 of the Final EIR and Chapter 3, *Revisions to the Draft EIR*). The result of this updated analysis resulted in incremental increases in the sound levels that are still well below the City of Ontario noise thresholds.

O2-19 This Comment serves as a conclusion to the statements provided in this Comment Letter. As discussed in the responses above, revisions have been made to the Draft EIR (see Chapter 3, *Revisions to the Draft EIR*), as appropriate, to address issues raised in this Comment Letter. City staff has reviewed the EIR and determined that none of this material constitutes the type of significant new information that requires recirculation of the DEIR for further public comment under CEQA Guidelines Section 15088.5. None of this new material indicates that the Proposed Project will result in a significant new environmental impact not previously disclosed in the DEIR. Additionally, none of this material indicates that there would be a significant increase in the severity of a previously identified environmental impact that will not be mitigated, or that there would be any of the other circumstances requiring recirculation described in Section 15088.5 of the CEQA Guidelines.

O2-20 The Comment summarizes information from the project description of the Draft EIR. Responses to the specific concerns raised are provided in the responses to Comments O2-21 through O2-26.

O2-21 See response to Comment O2-12. Mitigation Measure AQ-1 has been modified to include measures that would further minimize any potential worker exposure to Valley Fever cocci at the ORSC site (see Chapter 3, *Revisions to the Draft EIR*).

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O2-22 See response to Comment O2-13. No changes to the EIR are warranted because the Proposed Project would not generate new sources of manure. Manure from historical dairy operations would be removed from the ORSC site; thereby resulting in an improvement in air quality/odors from historic decomposition of existing manure.

O2-23 See response to Comment O2-6. The City has determined Mitigation Measure AQ-1 to be effective at mitigating the Proposed Project's potentially significant construction impacts and the Commenter's speculation that it may be infeasible due to the lack of availability of Tier 4 equipment is without support. However, at the request of the Commenter, Mitigation Measure AQ-1 was modified to define what "commercially available" would constitute for securing Tier 4 equipment and include alternative emission control equipment to ensure emission reductions in the unlikely event that Tier 4 Final equipment not be available (see Chapter 3, *Revisions to the Draft EIR*).

O2-24 See response to Comment O2-10 and O2-11. At the request of the Commenter, the ASTM standard has been revised in Mitigation Measure HAZ-1 (see Chapter 3, *Revisions to the Draft EIR*).

O2-25 See response to Comment O2-7. Emissions from backup generators are speculative as this information is currently unknown. However, at the request of the Commenter, Section 5.3, *Air Quality*, and Section 5.8, *Greenhouse Gas Emissions*, was modified to incorporate emissions from up to four backup generators (see Chapter 3, *Revisions to the Draft EIR*). The addition of four generators would not cause an exceedance of the South Coast AQMD thresholds or substantially increase impacts evaluated in the Draft EIR.

O2-26 The Comment concludes that the Proposed Project could result in significant impacts if allowed to proceed. No response is necessary.

O2-27 The Comment summarizes the Commenter's qualifications for the review of the Proposed Project's noise analysis and provides information about health effects caused by noise. The specific issues raised by the Commenter are provided in response to Commenter O2-28 through O2-34.

O2-28 See response to Comment O2-14. The City's expert disagrees with the Commenter's conclusion that the noise impact analysis in Section 5.13, *Noise*, does not provide an adequate assessment of the baseline noise conditions in the vicinity of the ORSC site. The ambient noise survey conducted for the Proposed Project (see pages 5.13-8 through 5.13-9) provides a conservative assessment of noise levels on the ORSC site and vicinity. Additionally, the ambient noise survey was supplemented by traffic noise modeling (see page 5.13-9). The baseline noise monitoring survey and the traffic noise modeling included in Section 5.13.1.3, *Existing Conditions*, reflect the baseline noise conditions in the ORSC vicinity.

O2-29 See response to Comments O2-15 and O2-16. The 80 dBA construction noise threshold is supported by a preponderance of evidence in California and nationally. Pursuant to Section 15064(b)(2) of the CEQA Guidelines, "Lead agencies may also use thresholds on a case-by-case basis". Therefore, CEQA does not require that significance threshold be adopted and allows for use of significance thresholds so long as they are supported by substantial evidence.

It should be noted that because the construction analysis was modeled using SoundPlan, construction activities were modeled as area sources, which include multiple pieces of equipment. Figures 5.13-2 through 5.13-4 in the Draft EIR graphically show the distance from construction activities on the ORSC site to offsite sensitive receptors.

O2-30 Construction noise levels were predicted using area sources in SoundPLAN. The area sources represent the entire proposed work area for each work phase and mirror the phase boundaries and ORSC areas within the report figures. The source levels used for each area source incorporate all projected equipment types, quantities, and estimated used for each construction phase. The predicted construction noise levels assume a worst-case scenario where all equipment would be operating simultaneously under the usage factor assigned in Roadway Construction Noise Model (RCNM). This assumption is conservative because it is unlikely that all equipment would operate simultaneously for the entire construction effort at a given construction area.

O2-31 See response to Comment O2-15. A supplemental memorandum has been completed to compare construction noise levels to the measured, ambient conditions (see Final EIR Appendix D1). Mitigated construction noise levels utilize a conservative noise level reduction of 5 dB from noise blankets.

O2-32 See response to Comments O2-17 and O2-18. The stadium noise and athletic field noise analysis is evaluated based on the hourly thresholds in the City's Municipal Code and is not a CNEL threshold that considers 24-hour average noise levels, with penalties for noise in the evening and nighttime hours. Stadium and athletic events within the ORSC site would not occur in the nighttime hours (defined by the City of Ontario as 10 PM – 7 AM) when people are more sensitive to noise as most events would end by 9-10 PM which is within the evening period (defined as 7 PM – 10 PM)..

At the request of the Commenter, the operational noise analysis has been supplemented with a comparison of the operational noise levels compared to existing environmental conditions (see Appendix D of the Final EIR and Chapter 3, *Revisions to the Draft EIR*). The result of this updated analysis resulted in incremental increases in the sound levels that are still well below the City of Ontario noise thresholds.

O2-33 See response to Comment O2-18 regarding concert noise. The City disagrees with the soundpower reference level cited by the Commenter. The sports facility referenced by the Commenter is for a stadium concert at a substantially larger venue than the Proposed

2. Response to Comments

Project (e.g., 68,500-to-82,500-person capacity compared to the Proposed Project's 6,000-person capacity). At the request of the Commenter, the stadium concert noise scenario has been supplemented with an additional noise modeling scenario that considers a "Pavilion with band (minor electroacoustic amplification)" concert event with a sound power level of 100 dBA (see Appendices D1 and D2 of the Final EIR and Chapter 3, *Revisions to the Draft EIR*). The result of this updated analysis resulted in incremental increases in the sound levels that are still well below the City of Ontario noise thresholds.

O2-34 See response to Comment O2-14 and O2-28 related to the baseline noise measurements.

Page J5-13 of Appendix J5, Commercial/Miscellaneous Noise Technical Report, details the information related to the HVAC analysis. The report indicates recommended design noise levels for the HVAC equipment for each facility to ensure noise impact will not occur at nearby noise sensitive land uses. Additionally, the design recommendations for HVAC noise to achieve the municipal code limits were included as Mitigation Measures N-2 and N-3.

O2-35 The Comment summarizes the issues raised in the preceding comments within this letter, which are addressed in the responses to Comments O2-28 through O2-34, above.

3. Revisions to the Draft EIR

3.1 INTRODUCTION

This section contains revisions to the DEIR based upon (1) additional or revised information required to prepare a response to a specific comment; (2) applicable updated information that was not available at the time of DEIR publication; and/or (3) typographical errors. This section also includes additional mitigation measures to fully respond to commenter concerns as well as provide additional clarification to mitigation requirements included in the DEIR.

None of the revisions to the DEIR require recirculation of the document. Recirculation is only required when significant new information is added. Information is not significant unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect or a feasible way to mitigate or avoid such an effect. Recirculation is not required where the new information merely clarifies, amplifies, or makes insignificant modifications. (CEQA Guidelines Section 15088.5.) As explained below, none of the changes adds any new significant information and recirculation is not required.

3.2 DEIR REVISIONS IN RESPONSE TO WRITTEN COMMENTS

The following text has been revised in response to comments received on the DEIR. Revisions are shown in double underline for additions and ~~strikeout~~ for subtractions.

Pages 4-17 through 4-18, Table 4-1, *Cumulative Projects within a Three-Mile Radius*, Chapter 4, *Environmental Setting*. The following table has been revised in response to Comment A4-1 from Eastvale to ensure that Table 4-1 includes the complete list of cumulative projects included in the Traffic Impact Analysis in Appendix L2 (page L2-364) of the Draft EIR.

Table 4-1 Cumulative Projects Within a Three-Mile Radius

Project/Applicant Name	Location	Project Type/Size	Status
Piemonte/Airport Area (City of Ontario)			
File No. PDEV20-008 – Industrial Development	Northeast corner of Airport Drove/Haven Avenue	200,291 SF of industrial building space	Entitled
File No. PDEV 19-025 Palmer Apartments / Commercial Retail	Southeast corner of Vineyard and Inland Empire Blvd	950 residential units 5,000 SF of commercial building space	Entitled, under construction
File PDEV19-067: Hyatt Dual Hotel 265 Rooms	Southeast corner of Archibald/Inland Empire	157,370 SF of commercial building space	Entitled
File No. PDEV19-054-Townhomes	Southwest corner of Via Alba/Via Villagio	72 residential units	Entitled, under construction

3. Revisions to the Draft EIR

Table 4-1 Cumulative Projects Within a Three-Mile Radius

Project/Applicant Name	Location	Project Type/Size	Status
File No. PDEV19-061 - Townhomes	Northeast corner of Ontario Center Parkway/ Via Alba	110 residential units	Entitled, under construction
File No. 21-013 - Retail Shopping Center	Southeast corner of Haven Ave. and 4th Street	91,163 SF of commercial building space	Entitled, under construction
File No. PDEV17-016 - Cambria Hotel- 124 Rooms	535 N Turner Avenue	83,500 SF of commercial building space	Entitled
PDEV21-018 - Industrial Development	Southeast corner of Jurupa/Milliken	168,172 SF of industrial building space	Entitled
PDEV22-014 Residential/Commercial Development	Southeast and Southwest corners of Via Piemonte and Via Villagio	694 residential units 63,655 SF of commercial building space	Entitled
File No. PDEV21-047 - Industrial	East of Haven Avenue, west of Doubleday and Dupont Avenues, north of Jurupa Street and south of Airport Drive	4,263,454 SF of industrial building space	Entitled
File No. PDEV19-057- Industrial	Northeast corner of Haven Ave. and 60FWY	281,000 SF of industrial building space	Entitled, in process
File PDEV18-031 - Commercial/Industrial	Southwest corner of Riverside Drive and Hamner	52,000 SF of commercial building space 968,092 SF of industrial building space	Entitled, in process
File No. PDEV19-059- Industrial	Northwest corner of Riverside Drive and Milliken Avenue	5,552 SF of commercial building space 295,991 SF of industrial building space	Entitled, in process
File No. PDEV21-003- Industrial	1486 East Holt	26,000 SF of industrial building space	Entitled, in process
File No. PDEV22-009- Industrial	Southeast corner of Sultana Avenue and Mission Blvd	79,323 SF of industrial building space	Entitled
File No. PDEV21-035- Industrial	Southeast corner of Sultana Avenue and Belmont Street	59,984 SF of industrial building space	Entitled
File No. PDEV21-037- Industrial	1516 South Bon View Avenue	167,400 SF of industrial building space	Entitled
File No. PDEV22-012 - Commercial	West side of Archibald Avenue approximately 300 feet south of Philadelphia Street	7,225 SF of commercial building space	Entitled
File No. PDEV21-045 - Commercial	2575 South Archibald Avenue	1,796 SF of commercial building space	Entitled
TOTAL		**1,826** residential units **783,590** SF of commercial space **6,509,707** SF of industrial space	
Additional Cumulative Projects in the Traffic Study Area			
PDEV21-018 - Industrial Development	SE Corner Jurupa Ave/Milliken Ave	Industrial Park: 168,170 SF	Approved
File No. PDEV19-057- Industrial	NE Corner Haven Ave/SR-60	Industrial Park: 2,810 SF	In Review

3. Revisions to the Draft EIR

Table 4-1 Cumulative Projects Within a Three-Mile Radius

Project/Applicant Name	Location	Project Type/Size	Status
File PDEV18-031 - Commercial/Industrial	SE Corner Riverside Drive/Hamner Ave	Shopping Plaza (40,000-150,000): 520 SF	In Review
File PDEV18-031 - Commercial/Industrial	SE Corner Riverside Drive/Hamner Ave	Industrial Park: 968,030 SF	In Review
File No. PDEV19-059- Industrial	NE Corner Riverside Drive/Milliken Ave	Strip Retail Plaza (<40,000): 5,550 SF	In Review
File No. PDEV19-059- Industrial	NE Corner Riverside Drive/Milliken Ave	Industrial Park: 295,990 SF	In Review
File No. PDEV21-037- Industrial	1516 South Bon View Avenue	Industrial Park: 167,400 SF	In Review
Industrial Building(s)	SW corner of Milliken and SR-60	Industrial Park: 39,330 SF	Approved
Ontario Ranch Business Park SP	NE Corner Merrill Ave/Euclid Ave	Warehousing/Business Park: 1,905,030 SF	Approved
Merrill Commerce Center SP	Eucalyptus Ave/Grove Ave	Warehousing/Mixed Use: 8,455,000 SF	Approved
South Ontario Logistics Center SP	Eucalyptus Ave/Campus Ave	Warehousing: 5,333.52 SF	Approved
Ontario Ranch Business Park SP Expansion	NE Corner Merrill Ave/Euclid Ave	Warehousing/Business Park: 1,640,690 SF	Approved
Rich Haven Specific Plan Commercial	Riverside Drive/Haven Ave	Shopping Center (>150,000): 204,500 SF	Approved
Portion of Grand Park SP	SE Corner Ontario Ranch Rd/Archibald Ave	SF Attached Housing: 362 dwelling units	Approved
Edenglen	Riverside Drive/Mill Creek Ave	MF Housing (Low Rise): 108 dwelling units	Approved
Rich Haven	Twinkle Ave/Moonlight St	MF Housing (Low Rise): 120 dwelling units	Approved
The Avenue	Ontario Ranch Road/Mill Creek Ave	SF Detached Housing: 106 dwelling units	Approved
The Avenue School	Ontario Ranch Road/Mill Creek Ave	Elementary School: 800 students	Approved
Parkside Specific Plan (SF)	Ontario Ranch Road/Archibald Ave	SF Detached Housing: 540 dwelling units	Approved
Parkside Specific Plan (MF)	Ontario Ranch Road/Archibald Ave	MF Housing (Low Rise): 508 dwelling units	Approved
Commercial	Hellman Ave and Eucalyptus Ave	Shopping Center (>150,000): 2,100 SF	Approved
SF Residential	SE Corner Eucalyptus Ave/Haven Ave	SF Detached Housing: 3,733 dwelling units	Approved
Commercial	SE Corner Eucalyptus Ave/Haven Ave	Shopping Plaza (40,000-150,000): 870 SF	Approved
Elementary School	Ontario Ranch Area TBD	Elementary School: 800 students	Approved
Middle School	Ontario Ranch Area TBD	Middle School: 1,200 students	Approved

3. Revisions to the Draft EIR

Table 4-1 Cumulative Projects Within a Three-Mile Radius

Project/Applicant Name	Location	Project Type/Size	Status
Total Preserve SP - SF Res	Pine Ave and Hellmann Ave	SF Detached Housing: 1,791 dwelling units	Approved
Total Preserve SP - MF Res	Pine Ave and Hellmann Ave	MF Housing (Low Rise): 2,675 dwelling units	Approved
Majestic Chino Logistics Center	SE Mountain Ave/Bickmore Ave	Various: 2,082,750 SF	Approved
Industrial Building(s)	13404 Yorba Ave	Industrial Park: 325,000 SF	Approved
Preserve SP Business Park	Pine Ave and Hellmann Ave	Various: 7,980,000 SF	Approved
Altitude Business Center (Preserve SP)	Kimball Avenue and Terminal Court	Industrial Park: 50,000 SF	Approved
SF/MF Housing	West of Meadowhouse/Desert Holly	MF Housing (Low Rise): 149 dwelling units	Approved
Preserve SP - Industrial	Pine Ave and Hellmann Ave	Industrial Park: 925,360 SF	Approved
Commercial	NE Corner of Euclid Ave and Schafer Ave	Shopping Plaza (40,000-150,000): 71,360 SF	In Review
Industrial Building(s)	13610 Yorba Ave	Industrial Park: 305,000 SF	In Review
FedEx	SW corner of Fern Ave and Bickmore Ave	Industrial Park: 476,290 SF	Approved
El Pollo Loco	6981 Schaefer Ave	Fast Food Restaurant with Drive Through: 2,000 SF	Approved
Goodman-Commerce Center Offices	SW Corner Bickmore Ave and San Antonio Ave	Business Park: 160,000 SF	Approved
Goodman-Commerce Center Shopping Center	SW Corner Bickmore Ave and San Antonio Ave	Shopping Plaza (40,000-150,000):63,000 SF	Approved
Commercial	5985 Eucalyptus Ave	Shopping Plaza (40,000-150,000): 50,630 SF	In Review
Church	5985 Eucalyptus Ave	Church: 27,000 SF	In Review
Commercial	6312 Riverside Drive	Strip Retail Plaza (<40,000): 6,440 SF	In Review
Restaurant	6312 Riverside Drive	Fast Food Restaurant with Drive Through: 2,310 SF	In Review
Car Wash	6312 Riverside Drive	Automatic Car Wash: 3,610 SF	In Review
Leal SP - 168 units	NE Corner of Hamner Ave/Limonite Ave	MF Housing (Low Rise): 168 dwelling units	In Review
Leal SP - 102 units	NE Corner of Hamner Ave/Limonite Ave	MF Housing (Low Rise): 102 dwelling units	In Review
Leal SP - 94 units	NE Corner of Hamner Ave/Limonite Ave	SF Detached Housing: 94 dwelling units	In Review
Leal SP - 74 units	NE Corner of Hamner Ave/Limonite Ave	SF Detached Housing: 74 dwelling units	In Review
Leal SP - 320 units	NE Corner of Hamner Ave/Limonite Ave	MF Housing (Low Rise): 320 dwelling units	In Review

3. Revisions to the Draft EIR

Table 4-1 Cumulative Projects Within a Three-Mile Radius

Project/Applicant Name	Location	Project Type/Size	Status
Restaurant Building	SE Corner of Hamner Ave and Schleisman Rd	High Turnover Sit Down Restaurant: 7,760 SF	Approved
Business Park	NE Corner of Hamner Ave and Goodman Way	Business Park: 249,970 SF	Approved
Fast Food Pad	NW Corner of Archibald Ave and Chandler Ave	Fast Food Restaurant with Drive Through: 2,210 SF	Approved
Walmart Eastvale	14100 Limonite Ave	Commercial/Gas Station: 177 SF; 16 gas pumps	Approved
Homestead	Archibald Ave and Limonite Ave	Industrial Park: 1,080,600 SF	Approved
TOTAL TRAFFIC STUDY AREA		**27,732,791 Commercial/Industrial Square Feet** **10,850 Dwelling Units** **2,800 Students** **16 gas pumps**	

Pages 5.1-27, Section 5.1, *Aesthetics*. Information regarding the parking lot lighting has been added.

As discussed above, for the purposes of this analysis, a standard of 0.9 foot-candle was used for a significance determination because this standard considers both the type of adjacent land uses as well as the time of day the lights would be on. The spill light and light trespass from the proposed lighting at the 0.9 fc contour is shown on Figure 5.1-7a, *Sports Field and Stadium Lighting Spill (0.9 Foot-Candle Threshold).* Additionally, the light spill at the 0.5 fc and 0.3 fc contours is provided in Figures 5.1-7b, *Sports Field and Stadium Lighting Spill (0.5 Foot-Candle Threshold),* and 5.1-7c, *Sports Field and Stadium Lighting Spill (0.3 Foot-Candle Threshold)*, respectively. Parking lots would also have light poles that range in height from 25-30 feet. However, the potential for light spillage from parking lot areas is lower than that of the Stadium and City Park facilities because the light poles would not be as tall (i.e., 25 to 30 feet compared to 99 to 110 feet for the stadium and sports fields). Lighting for parking lot areas would comply with Municipal Code Section 4-11which requires a minimum of one footcandle of light on the parking surface during the hours of darkness. Parking lots would not directly abut adjacent residential areas and would fall below the 0.9 fc contour lighting threshold.

3. Revisions to the Draft EIR

Pages 5.3-31 through 5.3-32, Table 5.3-11, *Ontario Regional Sports Complex Regional Operation Emissions: Worst Case Saturday with Events,* Table 5.3-12, *Ontario Regional Sports Complex Regional Operation Emissions: Average Weekday*, and Table 5.3-13, *ORSC Overlapping Construction and Operational Phase Emissions*, Section 5.3, *Air Quality*. Potential stationary source emissions from backup generators have been incorporated into the emissions modeling tables in response to Comments O2-7 from CARE CA.

Table 5.3-11 Ontario Regional Sports Complex Regional Operation Emissions: Worst Case Saturday with Events

Source	Maximum Daily Emissions (lbs./day)					
	VOC	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
ORSC						
Mobile	86	43	735	1	156	40
Area	33	<1	54	<1	<1	<1
Energy	<1	3	3	<1	<1	<1
Stationary Sources (Generators)	1	2	2	≤1	≤1	≤1
Total	**~~119~~ 120**	**~~46~~ 48**	**~~792~~ 794**	**2**	**156**	**40**
South Coast AQMD Regional Threshold	**55**	**55**	**550**	**150**	**150**	**55**
Exceeds Threshold?	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**

Source: CalEEMod Version 2022.1. Highest winter or summer emissions are reported. (see Appendix D1)
Notes: lbs. = Pounds.

Table 5.3-12 Ontario Regional Sports Complex Regional Operation Emissions: Average Weekday

Source	Maximum Daily Emissions (lbs./day)					
	VOC	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
ORSC						
Mobile	59	31	535	1	115	30
Area	33	0	54	<1	<1	<1
Energy	<1	3	3	<1	<1	<1
Stationary Sources (Generators)	1	2	2	≤1	≤1	≤1
Total	**~~92~~ 93**	**~~34~~ 36**	**~~592~~ 594**	**1**	**116**	**30**
South Coast AQMD Regional Threshold	**55**	**55**	**550**	**150**	**150**	**55**
Exceeds Threshold?	**Yes**	**No**	**Yes**	**No**	**No**	**No**

Source: CalEEMod Version 2022.1. Highest winter or summer emissions are reported. (see Appendix D1)
Notes: lbs. = Pounds.

3. Revisions to the Draft EIR

Table 5.3-13 ORSC Overlapping Construction and Operational Phase Emissions

Source	Maximum Daily Emissions (lbs/Day)					
	VOC	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Construction Phase	82	224	406	1	23	7
ORSC Operational Phase	~~119~~ 120	~~46~~ 48	~~792~~ 794	2	156	40
Total Combined Maximum Daily	**~~201~~ 202**	**~~270~~ 272**	**~~1,198~~ 1,200**	**3**	**179**	**47**

Source: CalEEMod Version 2022.1. Highest winter or summer emissions are reported. (see Appendix D1)
Note: lbs = Pounds.

Page 5.3-43, Table 5.3-16, *ORSC Localized On-Site Operational Emissions*, Section 5.3, *Air Quality*. Potential stationary source emissions from backup generators have been incorporated into the emissions modeling tables in response to Comments O2-7 from CARE CA.

Table 5.3-16 ORSC Localized On-Site Operational Emissions

Source	Onsite Pollutants (lbs/day)			
	NO_X	CO	PM_{10}	$PM_{2.5}$
Area Sources	<1	54	<1	<1
Energy Sources	3	3	<1	<1
Stationary Sources (Generators)	2	2	≤1	≤1
Total	**~~6~~ 4**	**~~57~~ 59**	**<1**	**<1**
South Coast AQMD Screening-Level LST[1]	270	2,193	4	2
Exceeds Screening-Level LST?	**No**	**No**	**No**	**No**

Sources: CalEEMod Version 2022.1; South Coast AQMD 2009.
Notes: In accordance with South Coast AQMD methodology, only on-site stationary sources and mobile equipment on the ORSC site are included in the analysis.
[1] Operational LSTs are based on a 5-acre site and sensitive receptors within 82 meters (25 feet) in SRA 33.

Page 5.3-48, Section 5.3, *Air Quality*. The following mitigation measure has been amended in response to Comments O2-6, O2-12, and O2-23 from CARE CA.

AQ-1 The City of Ontario shall require the construction contractor to incorporate the following to reduce air pollutant emissions during construction activities:

- Use construction equipment rated by the United States Environmental Protection Agency as having Tier 4 (model year ~~2008~~ 2015 or newer) Final or stricter emission limits for all off-road construction equipment. If Tier 4 Final equipment is not commercially available for a specific piece of equipment, the applicant shall provide documentation (e.g., rental inventory requests), to the City's satisfaction, or otherwise demonstrate its unavailability to the City of Ontario prior to the issuance of any construction permits and replacement equipment used by the contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine as defined by the California Air Resources Board regulations.

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- If Tier 4 Final equipment is not available, the construction contractor(s) and subcontractor(s) affected shall use Tier 4 Interim equipment.
- If Tier 4 Interim equipment is not available, the construction contractor(s) and subcontractor(s) affected shall use then Tier 3 equipment outfitted with a level 3 diesel particulate filter.
- For purposes of this mitigation measure, "commercially available" shall mean the availability of Tier 4 engines similar to the availability for other large-scale construction projects in the City occurring at the same time and taking into consideration factors such as (i) potential significant delays to critical-path timing of construction and (ii) geographic proximity to the project site of Tier 4 equipment.

■ During construction, the construction contractor shall maintain a list of all operating equipment in use on the construction site for verification by the City of Ontario. The construction equipment list shall state the makes, models, Equipment Identification Numbers, Engine Family Numbers, and number of construction equipment on-site.

■ Use paints with a VOC content that meets the South Coast Air Quality Management District Super Compliant architectural coatings standard of 10 grams per liter (g/L) or less (i.e.,) for coating architectural surfaces.

■ Comply with South Coast Air Quality Management District Rule 403, including the following measures:

- Provide National Institute for Occupational Safety and Health (NIOSH)-approved respirators for workers with a prior history of Valley Fever.
- Half-face respirators equipped with a minimum N-95 protection factor for use during worker collocation with surface disturbance activities. Half-face respirators equipped with N-100 or P-100 filters should be used during digging activities. Employees should wear respirators when working near earth-moving machinery.
- Post warnings onsite and consider limiting access to visitors, especially those without adequate training and respiratory protection.

These identified measures shall be incorporated into all appropriate construction documents (e.g., construction management plans) submitted to and verified by the City.

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Page 5.3-52, Tables 5.3-18, *Mitigated Ontario Regional Sports Complex Regional Operation Emissions: Worst Case Saturday*, and Table 5.3-19, *Mitigated Ontario Regional Sports Complex Site Regional Operation Emissions: Average Weekday,* Section 5.3, *Air Quality*. Potential stationary source emissions from backup generators have been incorporated into the emissions modeling tables in response to Comments O2-7 from CARE CA.

Table 5.3-18 Mitigated Ontario Regional Sports Complex Regional Operation Emissions: Worst Case Saturday

Source	Maximum Daily Emissions (lbs./day)					
	VOC	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
ORSC						
Mobile	86	43	735	1	156	40
Area[1]	24	0	0	0	0	0
Energy	0	3	3	0	0	0
Stationary Sources (Generators)	1	2	2	<1	<1	<1
Total	**~~110~~ 111**	**~~46~~ 48**	**~~738~~ 740**	**2**	**156**	**40**
South Coast AQMD Regional Threshold	**55**	**55**	**550**	**150**	**150**	**55**
Exceeds Threshold?	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Unmitigated Emissions	~~119~~ 120	~~46~~ 48	~~792~~ 794	2	156	40
Mitigated Emissions	~~110~~ 111	~~46~~ 48	~~738~~ 740	2	156	40
Percent Reduction	**8%**	**0%**	**7%**	**0%**	**0%**	**0%**

Source: CalEEMod Version 2022.1. Highest winter or summer emissions are reported. (see Appendix D1)
Notes: lbs. = Pounds.
1 Includes implementation of Mitigation Measure AQ-2.

Table 5.3-19 Mitigated Ontario Regional Sports Complex Site Regional Operation Emissions: Average Weekday

Source	Maximum Daily Emissions (lbs./day)					
	VOC	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
ORSC						
Mobile	59	31	535	1	115	30
Area[1]	24	0	0	0	0	0
Energy	0	3	3	0	0	0
Stationary Sources (Generators)	1	2	2	<1	<1	<1
Total	**~~83~~ 84**	**~~34~~ 36**	**~~538~~ 540**	**1**	**115**	**30**
South Coast AQMD Regional Threshold	**55**	**55**	**550**	**150**	**150**	**55**
Exceeds Threshold?	**Yes**	**No**	**No**	**No**	**No**	**No**
Unmitigated Emissions	~~92~~ 93	~~34~~ 36	~~592~~ 594	1	116	30
Mitigated Emissions	~~83~~ 84	~~34~~ 36	~~538~~ 540	1	115	30
Percent Reduction	**10%**	**0%**	**9%**	**0%**	**1%**	**0%**

Source: CalEEMod Version 2022.1. Highest winter or summer emissions are reported. (see Appendix D1)
Notes: lbs. = Pounds.
1 Includes implementation of Mitigation Measure AQ-2.

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Page 5.8-23, Table 5.8-5, *Ontario Regional Sports Complex Operational GHG Emissions,* Section 5.8, *Greenhouse Gas Emissions*. Potential stationary source emissions from backup generators have been incorporated into the emissions modeling tables in response to Comments O2-7 from CARE CA.

Table 5.8-5 Ontario Regional Sports Complex Operational GHG Emissions

Source	ORSC $MTCO_2e$
Mobile	17,369
Area	25
Energy	4,149
Stationary Sources (Generators)	15
Water	120
Solid Waste	94
Refrigerants	20
Total Emissions	~~21,777~~ 21,792
Exceeds No Net Increase Threshold	**Yes**

Source: CalEEMod v. 2022.1. (see Appendix D1)

Page 5.8-25 to 5.8-26, Section 5.8, *Greenhouse Gas Emissions*. The following text has been revised to ensure internal consistency with the overall significance conclusions on page 5.8-33 for consistency with the SCS for Impact 5.8-2. This change does not add any new significant information as Impact 5.8-2 is identified as a significant impact in the Draft EIR, including in Section 5.8-2 on page 5.8-33.

Connect SoCal does not require that local general plans, proposed projects, or zoning be consistent with the SCS, but provides incentives for consistency to governments and developers. It is anticipated that long-term and short-term (i.e., construction) jobs would be absorbed by the local and regional labor force, which would contribute to minimizing passenger vehicle VMT. However, as discussed in Section 5.17, *Transportation*, the ORSC would continue to result in a substantial increase in total VMT in the city and would exceed the City's VMT threshold. Therefore, while the ORSC would be generally consistent with Connect SoCal, it would remain inconsistent with the underlying VMT-reducing goals of SCAG's Connect SoCal; and therefore, and impacts related to consistency with SCAG's Connect SoCal would be ~~less than~~ potentially significant.

Page 5.8-33, Table 5.8-8, *Mitigated Ontario Regional Sports Complex Site Operational GHG Emissions,* Section 5.8, *Greenhouse Gas Emissions*. Potential stationary source emissions from backup generators have been incorporated into the emissions modeling tables in response to Comments O2-7 from CARE CA.

Table 5.8-8 Mitigated Ontario Regional Sports Complex Site Operational GHG Emissions

Source	ORSC $MTCO_2e$
Mobile	17,369
Area	0
Energy	4,154
Stationary Sources (Generators)	15
Water	120
Solid Waste	94
Refrigerants	20
Total Emissions[1]	~~21,757~~ 21,772
Exceeds No Net Increase Threshold	**Yes**

Source: CalEEMod v. 2022.1. (See Appendix D1)
[1] Includes Mitigation Measures GHG-1 and GHG-2 and Mitigation Measure AQ-2.

Page 5.9-40 through 5.9-41, Section 5.9, *Hazards and Hazardous Materials*. The following mitigation measure has been amended in response to Comments O2-9 through O2-11 from CARE CA.

HAZ-1 Prior to the issuance of demolition permits or grading permits, whichever is issued first, for individual development projects in the ORSC site, the project applicant/developer shall submit a Phase II Environmental Site Assessment (ESA) to the City of Ontario prepared under the responsible charge of a Professional Geologist or Professional Engineer. The Phase II ESA shall be prepared ~~by an Environmental Professional~~ in accordance with the American Society of Testing and Materials (ASTM) ~~Standard E: 1527-21 Environmental Site Assessment Standard Practice (ASTM E1527-21)~~ Designation: E1903-19, *Standard Practice for Environmental Site Assessments (ESA): Phase II Environmental Site Assessment Process* (ASTM, E 1903-19). ~~The purpose of the Phase II ESA is to evaluate the presence of Recognized Environmental Conditions (RECs) in connection with the site. The term Recognized Environmental Conditions is defined in Section 1.1.1 of the ASTM Standard Practice as the presence or likely presence of any hazardous substances or petroleum products in, at or on a property due to any release to the environment; under conditions indicative of a release to the environment; or under conditions that pose a material threat of a future release to the environment.~~ If the site is found to be impacted with potential contaminants of concern at levels exceeding applicable regulatory thresholds, the project applicant shall remediate all contaminated media, under the oversight and in accordance with state and local agency requirements of the ~~(~~California Department of Toxic Substances Control (DTSC), Regional Water Quality Control Board, Ontario Fire Department and/or County of San Bernardino, as applicable to their oversight jurisdictions~~, etc.)~~. For minor issues the Project Environmental Consultant may self-

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certify with approval from the City. All contaminated soils and/or material encountered shall be disposed of at a regulated site and in accordance with applicable laws and regulations prior to the completion of grading.

Prior to the issuance of building permits, a report documenting the field activities, results, and any additional recommendations shall be provided to the City of Ontario evidencing that all site remediation activities have been completed inclusive of environment oversight agency document of no further action determinations, as applicable.

Additionally, the following specific conditions shall be adhered to:

- **Pesticides.** Prior to the issuance of a demolition permit for any building or structure or the issuance of a grading permit, whichever is issued first, the construction contractor shall provide proof to the City that there are no pesticides on the site that exceed Environmental Protection Agency Regional Screening Levels (EPA RSLs) or Water Board Environmental Screening Levels (ESLs), whichever is more stringent. If on-site pesticides exceed the applicable screening levels, measures shall be taken in compliance with all applicable local, State and federal regulations to either remediate the pesticides on-site, or remove and properly dispose of the pesticides and proof shall be provided to the City of their safe remediation or removal as permitted by law along with agency oversight documentation of no further action determination by DTSC.
- **Methane.** The construction contractor shall submit a subsurface methane soil gas report to the City Building Department, in general accordance with their methane ordinance, to screen for the presence of elevated levels of methane gas prior to installation of building foundations. The recommendations in the subsurface methane soil gas report to remove or remediate any soils with methane gas levels that exceed accepted regulatory levels shall be implemented in accordance with all applicable laws and regulations as determined by the City Building Department.
- **Stained Soil – Pietersma Family Trust.** Prior to the issuance of a demolition permit for any building or structure or the issuance of a grading permit, whichever is issued first, shallow soils impacted with Diesel Range Total Petroleum Hydrocarbons (TPH-d) in excess of commercial and residential screening levels adjacent to the aboveground storage tanks in the hazardous materials storage area of the Pietersma Family Trust (parcels 0218-101-01, 0218-101-02, 0218-101-07, 0218-101-08, 0218-102-10, and 0218-102-11) shall be removed and disposed of in accordance with current regulations. Confirmation sampling shall be conducted as required by current regulations after removal to verify that the impacted soil has been adequately removed from the site or treated *insitu* (in place) as deemed appropriate by the Project Environmental Consultant at the discretion of the City. If during grading activities hydrocarbon (TPH) stained soil areas are discovered, grading within the area shall be temporarily halted and redirected around the area until the appropriate evaluation and follow-up measures are implemented. TPH stained soil shall be removed and transported off-site at a State approved disposal site under the

observation of the Project Environmental Consultant and confirmation samples collected from the sidewalls and bottom of each excavation area. The confirmation samples shall be transported to a state certified laboratory and analyzed for TPH in accordance with EPA Methods 8015M and 8015B, to ensure that TPH stained soil has been adequately removed from the site. Based on the laboratory results and at the discretion of the City, the San Bernardino County Fire Department, the Project Environmental Consultant, or the City shall determine when the area of the site is suitable for grading activities to resume.

- **Underground Storage Tanks (UST) – 15 Dairy LLC**. Prior to the issuance of a demolition permit for any building or structure or the issuance of a grading permit, whichever is issued first, subsurface sampling shall be performed in the vicinity of the structures in the northern portion of the 15 Dairy LLC (parcels 0218-111-08, 0218-111-11, 0218-111-12, 0218-111-49, and 0218-111-50) where hazardous materials were likely stored according to historical inspection reports. A geophysical survey should be completed to determine whether any Underground Storage Tanks (USTs) are present at the property. Exploratory trenching is required to address and identify anomalies prior to soil sampling. Should USTs be discovered, subsurface sampling in the vicinity of the UST(s) is recommended to assess for any potential releases that have impacted subsurface soils. All contaminated soils and/or material encountered shall be disposed of at a regulated site and in accordance with applicable laws and regulations prior to the completion of grading. The San Bernardino County Fire Department shall be the lead environmental oversight agency for UST removal activities.
- **Soil Vapor Testing – JCLIN Investment, LP.** Soil vapor sampling in the northern portion of JCLIN Investment, LP (parcels 0218-101-03, 0218-101-04, 0218-101-05, and 0218-101-06) shall be conducted to evaluate whether historical possible drycleaning activities off-site have impacted the subsurface soil vapor beneath the property. The San Bernardino County Fire Department or Department of Toxic Substances Control shall be the lead agency.

3. Revisions to the Draft EIR

Page 5.13-21, Table 5.13-13, *Concert Source Levels*, Section 5.13, *Noise*. The following table been amended in response to Comments O2-14 through O2-18 and Comments O2-28 through O2-34 from CARE CA.

Table 5.13-13 Concert Source Levels

Source	Lw[1]
Public Festivals (Band)	75.0 dB
Scenario 2: Band on Pavilion	100.0 dB
Spectators	73.0 dBA

Source: HMMH 2024c.
[1] Public festivals and spectators sound power levels (Lw) on a decibel per meter squared for area sources.

Page 5.13-33, Section 5.13, *Noise*. The following discussion has been amended in response to Comments O2-14 through O2-18 and Comments O2-28 through O2-34 from CARE CA.

Ambient Noise Degradation Analysis: Construction

Daytime

Table 5.13-18, *Daytime Construction Noise Degradation Analysis*, summarizes the change in ambient noise levels due to construction of the Proposed Project during the daytime. This analysis is provided for informational purposes and indicates that the change in daytime ambient noise associated with the ORSC construction activities would range from <1 dBA to 30 dBA Leq.

Table 5.13-18 Daytime Construction Noise Degradation Analysis

	Construction Noise - Increases over Daytime Ambient Noise Levels					
Month/Year	Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
09/24	2-20	2-27	11-21	8-11	1-19	2-21
10/24	1-23	0-30	13-24	10-14	0-22	0-24
11/24	1-21	0-27	13-23	11-14	0-22	2-25
12/24	2-20	0-27	13-22	11-14	0-21	2-21
01/25	2-21	0-28	13-22	10-13	0-21	7-21
02/25	1-22	0-29	13-23	10-14	0-20	3-21
03/25	1-22	0-29	13-22	9-13	0-20	2-21
04/25	0-20	0-27	12-21	9-13	0-20	1-21
05/25	0-20	0-27	12-21	9-13	0-20	8-22
06/25	0-20	0-27	11-21	9-12	0-19	9-23
07/25	0-20	0-27	11-21	8-12	0-19	2-22

Table 5.13-18 Daytime Construction Noise Degradation Analysis

Month/Year	Construction Noise - Increases over Daytime Ambient Noise Levels					
	Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
08/25	0-20	0-27	11-21	8-12	0-19	2-21
09/25	0-20	0-27	12-21	8-12	0-19	3-21
10/25	0-20	0-27	12-21	9-12	0-20	2-22
11/25	0-20	0-27	11-21	8-12	0-19	3-21
12/25	0-20	0-27	11-21	7-11	0-19	1-21
01/26	0-20	0-27	11-21	7-11	0-19	1-21
02/26	0-20	0-27	11-21	8-12	0-19	1-21
03/26	0-20	0-27	11-21	7-11	0-19	0-21
04/26	0-20	0-27	10-21	7-11	0-19	0-21
05/26	0-20	0-27	10-21	7-11	0-19	0-21
06/26	0-20	0-27	10-21	7-11	0-19	1-21
07/26	0-20	0-27	10-21	7-11	0-19	0-21
08/26	0-20	0-27	10-21	7-11	0-19	0-21
09/26	0-20	0-27	10-21	7-11	0-19	0-21
10/26	0-20	0-27	10-21	7-11	0-19	0-21
11/26	0-20	0-27	10-21	7-11	0-19	0-21
12/26	0-20	0-27	10-21	7-11	0-19	0-21
01/27	0-20	0-27	10-21	7-11	0-19	0-21
02/27	0-20	0-27	10-21	7-11	0-19	0-21
03/27	0-20	0-27	10-21	7-11	0-19	0-21
04/27	0-20	0-27	10-21	7-11	0-19	0-21
05/27	0-20	0-27	10-21	7-11	0-19	0-21
06/27	0-20	0-27	10-21	7-11	0-19	0-21
07/27	0-20	0-27	10-21	7-11	0-19	0-21
08/27	0-20	0-27	10-21	7-11	0-19	0-21
09/27	0-20	0-27	10-21	7-11	0-19	0-21

Source: Final EIR Appendix D1.

Nighttime

Table 5.13-19, *Nighttime Construction Noise Degradation Analysis*, summarizes the change in nighttime ambient noise levels due to construction of the Proposed Project. This analysis is provided for informational purposes and indicates that the change in ambient noise associated with the ORSC construction activities occurring at night would range from <1 dBA to 7 dBA Leq.

3. Revisions to the Draft EIR

Table 5.13-19 Nighttime Construction Noise Degradation Analysis

Project Component	Construction Noise - Increases over Ambient Nighttime Noise Levels					
	Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
Parking Structure A	0	0-2	1-4	0-1	0-2	0
Parking Structure B	0-2	0-4	0-1	0	0	0-1
Stadium and ORSC Site	0-1	0-4	0-7	0-2	0-3	0

Source: Final EIR Appendix D1.

Page 5.13-34, Section 5.13, *Noise*. The table numbering has been revised in response to the addition of new tables requested by CARE CA.

Transportation Noise

This section summarizes the evaluation of noise levels due to traffic along the off-site roadways surrounding the ORSC site. See Figure 5.13-5, *Future Traffic Noise Levels with the Ontario Regional Sports Complex*. Table ~~5.13-18~~ 5.13-20, *Summary of the Ontario Regional Sports Complex Traffic-Noise Levels by Receptor Group*, provides the TNM-computed traffic noise levels and changes traffic noise for the with– and without–ORSC and scenarios compared to existing conditions. A total of two noise-sensitive receptors, located in Receptor Group 1 and Receptor Group 3, are predicted to experience traffic-noise levels that exceed the allowable increases in ambient noise levels under the future with-ORSC conditions. Increases in traffic-noise levels are predicted to range between 0 and 5.6 decibels, with the greatest increase occurring in Receptor Group 1. Therefore, traffic noise impacts are considered potentially significant.

Table 5.13-~~18~~20 Summary of the Ontario Regional Sports Complex Traffic-Noise Levels by Receptor Group

Receptor Group	Range of Predicted Traffic Noise Levels (dBA CNEL)			Changes in Traffic Noise Levels	Number of Impacted Receptors
	Existing	Future Without the ORSC	Future With the ORSC		
1	46–72	49–76	49–76	1.2–5.6	1
2	40–72	43–75	44–76	0.7–5.0	0
3	47–73	50–75	50–76	1.7–5.3	1
4	48–69	51–73	51–73	2.4–5.0	0
5	36–67	38–70	39–71	0.1–4.6	0
6	45–57	48–60	49–61	2.3–4.6	0
Total	—	—	—	—	2

Source: HMMH 2023a (Appendix J2).
Note: Attachment C of Appendix J2 lists the computed sound levels at all modeled receptors included in the traffic-noise assessment.

Page 5.13-37, Section 5.13, *Noise*. The table numbering has been revised in response to the addition of new tables requested by CARE CA.

Average Hourly Noise Levels

Table ~~5.13-19~~ 5.13-21, *Stadium Average Hourly Noise Levels: Regular Weekday Minor League Baseball Game*, summarizes the range of predicted average hourly noise level (Leq[h]) by receptor group and land use categories for receptors in the noise study area. Figure 5.13-6, *Stadium Average Hourly Noise Levels: Regular Weekday Minor League Baseball Game*, illustrates average hourly noise level contours for baseball games. As shown in Table ~~5.13-19~~5.13-21, the highest predicted Leq(h) for each category of land use would be below the corresponding limit in the City's code. For this reason, noise impacts would be considered less than significant.

Table 5.13-~~19~~21 Stadium Average Hourly Noise Levels: Regular Weekday Minor League Baseball Game

Noise Zone[1]	Land Use	Daytime[2] Exterior Leq Criteria (dBA)	Predicted Leq(h) (dBA) Range for Baseball Games[1, 2]					
			Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
I	Single-Family Residential	65	19–32	21–43	NA	43–47	22–50	13–19
II	Multi-Family Residential, Mobile Home Parks	65	18–36	21–43	NA	NA	NA	NA
V	Manufacturing and industrial, other uses	70	NA	NA	40–55	45–50	39–50	NA

Source: HMMH 2024c (Appendix J3).
Notes: Attachment C of Appendix J3 includes a table of predicted sound levels for each modeled receptor.
See Table 5.13-6 for locations of receptor groups.
1 Pursuant to Section 5-29.11, the maximum permissible noise level limit established for Noise Zone I also applies to the exterior of schools, daycare centers, hospitals or other similar healthcare institutions, churches, libraries, or museums during hours of use.
2 The City of Ontario's noise code includes both "daytime" (7:00 am–10:00 pm) and "nighttime" (10:00 pm–7:00 am) limits. Since the ORSC is only operational between 8:00 am and 10:00 pm, the "nighttime" limits do not apply.

Page 5.13-37, Section 5.13, *Noise*. The table numbering has been revised in response to the addition of new tables requested by CARE CA.

Peak Noise Levels

Table ~~5.13-20~~5.13-22, *Stadium Maximum Noise Levels: Regular Weekday Minor League Baseball Game*, summarizes the range in predicted hourly Lmax for each "noise zone" in each receptor group based on definitions in the City's noise code. As shown in this table, the highest predicted Lmax would be well below applicable criteria for each land use category. For this reason, noise would be considered less than significant.

3. Revisions to the Draft EIR

Table 5.13-~~20~~22 Stadium Average Hourly Noise Levels: Regular Weekday Minor League Baseball Game

Noise Zone[1]	Land Use	Daytime Exterior Lmax Criteria (dBA)	Predicted Lmax (dBA) Range for Baseball Games					
			Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
I	Single-Family Residential	85	27–46	30–56	NA	50–55	28–58	21–26
II	Multi-Family Residential, Mobile Home Parks	85	26–50	31–54	NA	NA	NA	NA
V	Manufacturing and industrial, other uses	90	NA	NA	51–66	53–56	46–58	NA

Source: HMMH 2024c (Appendix J3).
Notes: Attachment C of Appendix J3 includes a table of predicted sound levels for each modeled receptor.
See Table 5.13-6 for locations of receptor groups.

Pages 5.13-37 to 5.13-38, Section 5.13, *Noise*. The following discussion has been amended in response to Comments O2-14 through O2-18 and Comments O2-28 through O2-34 from CARE CA.

Ambient Noise Degradation Analysis

Table 5.13-23, *Stadium Noise Degradation Analysis*, summarizes the change in ambient noise levels due to the Proposed Project for the stadium. This analysis is provided for informational purposes and indicates that the change in ambient noise associated with the ORSC would range from <1 dBA to 2 dBA Leq.

Table 5.13-23 Stadium Noise Degradation Analysis

Receiver Group		Predicted Leq(h) (dBA) Range					
		Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
Ambient	Day	53	53	52	52	52	53
	Evening	52	52	51	51	51	52
	Night	51	51	53	53	53	51
Total	Day	52-52	52-53	53-54	52-53	52-53	52-52
	Evening	51-52	51-52	52-53	51-52	51-52	51-51
	Night	53-53	53-54	53-54	53-54	53-54	53-53
Increase	Day	0	0-1	1-2	0-1	0-1	0
	Evening	0-1	0-1	1-2	0-1	0-1	0
	Night	0	0-1	0-1	0-1	0-1	0

Source: Final EIR Appendix D1.

3. Revisions to the Draft EIR

Page 5.13-38, Section 5.13, *Noise*. The following discussion has been amended in response to Comments O2-14 through O2-18 and Comments O2-28 through O2-34 from CARE CA. In addition the new Figure has been added to Appendix D2 that corresponds to the Concert Scenario 2.

Average Hourly Noise Levels

Table ~~5.13-21~~ 5.13-24, *Stadium Average Hourly Noise Levels: Concerts*, and Table 5.13-25, *Stadium Average Hourly Noise Levels: Concerts Scenario 2*, summarizes the range of predicted average hourly noise levels (Leq[h]) by receptor group and land use categories for receptors in the noise study area. Figure 5.13-7a, *Stadium Average Hourly Noise Levels: Concerts*, and Figure 5.13-7b, *Stadium Average Hourly Noise Levels: Concerts Scenario 2*, illustrates average hourly noise level contours for two different types of concerts at the stadium. As shown in Tables ~~5.13-21~~ 5.13-24 and 5.13-25, the highest predicted Leq(h) for each category of land use would be below the corresponding limit in the City's code. For this reason, Scenario 2 noise impacts would be considered less than significant.

Table 5.13-~~21~~24 Stadium Average Hourly Noise Levels: Concerts

Noise Zone[1]	Land Use	Daytime[2] Exterior Leq Criteria (dBA)	Predicted Leq(h) (dBA) Range for Concerts[1, 2]					
			Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
I	Single-Family Residential	65	7–19	14–29	NA	27–30	8–33	5–8
II	Multi-Family Residential, Mobile Home Parks	65	10–22	14–35	NA	NA	NA	NA
V	Manufacturing and industrial, other uses	70	NA	NA	29–40	28–35	21–33	NA

Source: HMMH 2024c (Appendix J3). Based on a festival soundpower level of 75 dBA Lwa.
Notes: Attachment C of Appendix J3 includes a table of predicted sound levels for each modeled receptor.
See Table 5.13-6 for locations of receptor groups.
1 Pursuant to Section 5-29.11, the maximum permissible noise level limit established for Noise Zone I also applies to the exterior of schools, daycare centers, hospitals or other similar healthcare institutions, churches, libraries, or museums during hours of use.
2 The City of Ontario's noise code includes both "daytime" (7:00 am–10:00 pm) and "nighttime" (10:00 pm–7:00 am) limits. Since the ORSC is only operational between 8:00 am and 10:00 pm, the "nighttime" limits do not apply.

3. Revisions to the Draft EIR

Table 5.13-25 Stadium Average Hourly Noise Levels: Concerts Scenario 2

Noise Zone[1]	Land Use	Daytime[2] Exterior Leq Criteria (dBA)	Predicted Leq(h) (dBA) Range for Concerts[1, 2]					
			Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
I	Single-Family Residential	65	17 - 27	17 - 38	NA	30 - 32	10 - 36	19 - 22
II	Multi-Family Residential, Mobile Home Parks	65	14 - 34	16 - 37	NA	NA	NA	NA
V	Manufacturing and industrial, other uses	70	NA	NA	35 - 41	30 - 36	30 - 36	NA

Source: Final EIR Appendix D1. Based on a band pavilion of 100 dBA Lwa.
Notes: Attachment C of Appendix J3 includes a table of predicted sound levels for each modeled receptor.
See Table 5.13-6 for locations of receptor groups.
1 Pursuant to Section 5-29.11, the maximum permissible noise level limit established for Noise Zone I also applies to the exterior of schools, daycare centers, hospitals or other similar healthcare institutions, churches, libraries, or museums during hours of use.
2 The City of Ontario's noise code includes both "daytime" (7:00 am–10:00 pm) and "nighttime" (10:00 pm–7:00 am) limits. Since the ORSC is only operational between 8:00 am and 10:00 pm, the "nighttime" limits do not apply.

Page 5.13-38, Section 5.13, *Noise*. The following discussion has been amended in response to Comments O2-14 through O2-18 and Comments O2-28 through O2-34 from CARE CA.

Ambient Noise Degradation Analysis

Table 5.13-26, *Concert Noise Degradation Analysis*, summarizes the change in ambient noise levels due to the Proposed Project for concerts. This analysis is provided for informational purposes and indicates that the change in ambient noise associated with the ORSC would range from <1 dBA to 2 dBA Leq.

Table 5.13-25 Concert Noise Degradation Analysis

Receiver Group		Predicted Leq(h) (dBA) Range					
		Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
Ambient	Day	53	53	52	52	52	53
	Evening	52	52	51	51	51	52
	Night	51	51	53	53	53	51
Total	Day	52-52	52-53	53-54	52-53	52-53	52-52
	Evening	51-52	51-52	52-53	51-52	51-52	51-51
	Night	53-53	53-54	53-54	53-54	53-54	53-53
Increase	Day	0	0-1	1-2	0-1	0-1	0
	Evening	0-1	0-1	1-2	0-1	0-1	0
	Night	0-0	0-1	0-1	0-1	0-1	0

Source: Final EIR Appendix D1. Based on a band pavilion of 100 dBA Lwa.

3. Revisions to the Draft EIR

Page 5.13-43, Section 5.13, *Noise*. The table numbering has been revised in response to the addition of new tables requested by CARE CA.

Scenario 1: Weekday Practice

The weekday practice scenario includes the least amount of activity at the multipurpose and baseball/softball fields with the least intensity. Weekday youth soccer and baseball/softball practices were assumed to commence at 5:00 pm and end by 10:00 pm. All other outdoor public amenities were assumed to be in use during park operating hours, generally from 8:00 am to 9:00 pm, with lights out by 10:00 pm. Table ~~5.13-22~~5.13-27, *Sports Fields Average Hourly Noise Levels: Weekday Practice*, summarizes the range in predicted hourly Leq(h) for each "noise zone" that exists within each receptor group based on definitions in the City's noise code. Figure 5.13-8, *Sports Fields Average Hourly Noise Levels: Weekday Practice*, illustrates the hourly noise level contours, representing weekday youth soccer and baseball/softball practice with other outdoor amenities in use.

Table 5.13-~~22~~27 Sports Fields Average Hourly Noise Levels: Weekday Practice

Noise Zone[1]	Land Use	Daytime[2] Exterior Leq Criteria (dBA)	Predicted Leq(h) (dBA) Range for Weekday Practice[1, 2]					
			Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
I	Single-Family Residential	65	37–51	36–56	NA	41–45	31–53	29–39
II	Multi-Family Residential, Mobile Home Parks	65	36–52	32–45	NA	NA	NA	NA
V	Manufacturing and industrial, other uses	70	NA	NA	44–55	42–47	46–54	NA

Source: HMMH 2024c.
Note: Attachment C in Appendix J4 includes a table of predicted sound levels for each modeled receptor. See Table 5.13-6 for locations of receptor groups.
1 Pursuant to Section 5-29.11, the maximum permissible noise level limit established for Noise Zone I also applies to the exterior of schools, daycare centers, hospitals or other similar healthcare institutions, churches, libraries, or museums during hours of use.
2 The City of Ontario's noise code includes both "daytime" (7:00 am–10:00 pm) and "nighttime" (10:00 pm–7:00 am) limits. Since the ORSC is only operational between 8:00 am and 10:00 pm, the "nighttime" limits do not apply.

Page 5.13-44, Section 5.13, *Noise*. The table numbering has been revised in response to the addition of new tables requested by CARE CA.

Scenario 2: Weekend Regular Season Games

Regular season games are anticipated to occur on weekends (Saturdays and Sundays) for both youth soccer and baseball/softball. Both sports would include regular fall and spring seasons, lasting 12 weeks per season for soccer, 11 weeks for fall baseball/softball, and 14 weeks for spring baseball/softball. As described in Chapter 3, weekend games were assumed to commence at 8:00 am and end by 6:00 p.m. However, all other outdoor public amenities were assumed to be in use during park operating hours, generally from 8:00 am to 9:00 pm, except the pool, which would close by 3:00 pm on weekends, following the recreation center hours.

3. Revisions to the Draft EIR

Table ~~5.13-23~~5.13-28, *Sports Fields Average Hourly Noise Levels: Weekend Games,* summarizes the range in predicted hourly Leq(h) for each "noise zone" that exists within each receptor group based on definitions in the municipal noise code. Figure 5.13-9, *Sports Fields Average Hourly Noise Levels: Weekend Games,* shows predicted Leq(h) noise level contours, representing regular season youth soccer and baseball/softball games with other outdoor amenities in use.

Table 5.13-~~23~~28 Sports Fields Average Hourly Noise Levels: Weekend Games

Noise Zone[1]	Land Use	Daytime[2] Exterior Leq Criteria (dBA)	Predicted Leq(h) (dBA) Range for Weekend Games[1, 2]					
			Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
I	Single-Family Residential	65	36–50	35–55	NA	41–45	31–53	28–39
II	Multi-Family Residential, Mobile Home Parks	65	35–51	32–45	NA	NA	NA	NA
V	Manufacturing and industrial, other uses	70	NA	NA	44–55	42–47	46–54	NA

Source: HMMH 2024c.
Notes: Attachment C in Appendix J4 includes a table of predicted sound levels for each modeled receptor.
See Table 5.13-6 for locations of receptor groups.
1 Pursuant to Section 5-29.11, the maximum permissible noise level limit established for Noise Zone I also applies to the exterior of schools, daycare centers, hospitals or other similar healthcare institutions, churches, libraries, or museums during hours of use.
2 The City of Ontario's noise code includes both "daytime" (7:00 am–10:00 pm) and "nighttime" (10:00 pm–7:00 am) limits. Since the ORSC is only operational between 8:00 am and 10:00 pm, the "nighttime" limits do not apply.

Pages 5.13-49 to 5.13-50, Section 5.13, *Noise*. The table numbering has been revised in response to the addition of new tables requested by CARE CA.

Scenario 3: Tournament Weekends

Youth soccer and baseball/softball tournaments are anticipated to occur on weekends (Saturdays and Sundays). Soccer tournaments would occur for 26 weeks of the year, while baseball/softball tournaments would occur for 25 weeks. As described in Chapter 3, tournaments were assumed to commence at 8:00 am and end by 10:00 pm before lights out at the facility. All other outdoor public amenities were assumed to be in use during park operating hours, generally from 8:00 am to 9:00 pm, except the community pool, which would close by 3:00 pm on weekends, following the recreation center hours. Table ~~5.13-24~~5.13-29, *Sports Fields Average Hourly Noise Levels: Tournament Weekends,* summarizes the range in predicted hourly Leq(h) for each "noise zone" that exists within each receptor group based on definitions in the municipal noise code. Figure 5.13-10, *Sports Fields Average Hourly Noise Levels: Tournament Weekends,* shows predicted Leq(h) noise level contours, representing regular season youth soccer and baseball/softball games with other outdoor amenities in use.

Table 5.13-~~24~~29 Sports Fields Average Hourly Noise Levels: Tournament Weekends

Noise Zone[1]	Land Use	Daytime[2] Exterior Leq Criteria (dBA)	Predicted Leq(h) (dBA) Range for Tournament Weekends[1, 2]					
			Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
I	Single-Family Residential	65	36–50	35–55	NA	41–45	31–53	28–39
II	Multi-Family Residential, Mobile Home Parks	65	35–51	32–45	NA	NA	NA	NA
V	Manufacturing and industrial, other uses	70	NA	NA	44–55	42–47	46–54	NA

Source: HMMH 2024c (Appendix J4).
Notes: Attachment C in Appendix J4 includes a table of predicted sound levels for each modeled receptor.
See Table 5.13-6 for locations of receptor groups.
1 Pursuant to Section 5-29.11, the maximum permissible noise level limit established for Noise Zone I also applies to the exterior of schools, daycare centers, hospitals or other similar healthcare institutions, churches, libraries, or museums during hours of use.
2 The City of Ontario's noise code includes both "daytime" (7:00 am–10:00 pm) and "nighttime" (10:00 pm–7:00 am) limits. Since the ORSC is only operational between 8:00 am and 10:00 pm, the "nighttime" limits do not apply.

As shown in Table ~~5.13-24~~5.13-29, the maximum hourly predicted at any residential land use type within the six receptor groups is 55 dBA. This noise level is predicted within Receptor Group 2 to the north of the ORSC site and across from the youth multipurpose fields. The second highest Leq(h) predicted at residential receptors is 53 dBA within Receptor Group 5 to the east of the ORSC site. The maximum hourly noise levels for recreational land uses, which is included in noise zone 'V', is 55 dBA on the green at the Whispering Lake Golf Course in Receptor Group 3.

Page 5.13-50, Section 5.13, *Noise*. The following discussion has been amended in response to Comments O2-14 through O2-18 and Comments O2-28 through O2-34 from CARE CA.

Ambient Noise Degradation Analysis

Table 5.13-30, *Athletic Field Games Noise Degradation Analysis*, Table 5.13-31, *Athletic Field Practice Noise Degradation Analysis*, and Table 5.13-32, *Athletic Field Tournaments Noise Degradation Analysis*, summarize the change in ambient noise levels due to the Proposed Project for the games, practices, and tournaments at the athletic fields, respectively. This analysis is provided for informational purposes and indicates that the change in ambient noise associated with the ORSC would range from <1 dBA to 6 dBA Leq.

3. Revisions to the Draft EIR

Table 5.13-30 Athletic Field Games Noise Degradation Analysis

Receiver Group		Predicted Leq(h) (dBA) Range					
		Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
Ambient	Day	53	53	52	52	52	53
	Evening	52	52	51	51	51	52
	Night	51	51	53	53	53	51
Total	Day	52-52	52-53	53-54	52-53	52-53	52-52
	Evening	51-52	51-52	52-53	51-52	51-52	51-51
	Night	53-53	53-54	53-54	53-54	53-54	53-53
Increase	Day	0	0-1	1-2	0-1	0-1	0
	Evening	0-1	0-1	1-2	0-1	0-1	0
	Night	0	0-1	0-1	0-1	0-1	0

Source: Final EIR Appendix D1.

Table 5.13-31 Athletic Field Practice Noise Degradation Analysis

Receiver Group		Predicted Leq(h) (dBA) Range					
		Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
Ambient	Day	53	53	52	52	52	53
	Evening	52	52	51	51	51	52
	Night	51	51	53	53	53	51
Total	Day	53-55	53-57	53-57	52-53	52-56	53-53
	Evening	52-55	52-57	52-57	51-52	51-56	52-52
	Night	51-54	51-57	54-57	53-54	53-56	51-51
Increase	Day	0-2	0-4	1-5	0-1	0-4	0
	Evening	0-3	0-5	1-6	0-1	0-5	0
	Night	0-3	0-6	1-4	0-1	0-3	0

Source: Final EIR Appendix D1.

Table 5.13-32 Athletic Field Tournaments Noise Degradation Analysis

Receiver Group		Predicted Leq(h) (dBA) Range					
		Receptor Group 1	Receptor Group 2	Receptor Group 3	Receptor Group 4	Receptor Group 5	Receptor Group 6
Ambient	Day	53	53	52	52	52	53
	Evening	52	52	51	51	51	52
	Night	51	51	53	53	53	51
Total	Day	53-55	53-57	53-57	52-53	52-56	53-53
	Evening	52-55	52-57	52-57	51-52	51-55	52-52
	Night	51-54	51-56	54-57	53-54	53-56	51-51
Increase	Day	0-2	0-4	1-5	0-1	0-4	0
	Evening	0-3	0-5	1-6	0-1	0-4	0
	Night	0-3	0-5	1-4	0-1	0-3	0

Source: Final EIR Appendix D1.

Pages 5.13-63 to 5.13-64, Section 5.13, *Noise*. The table numbering has been revised in response to the addition of new tables requested by CARE CA.

Impact 5.13-1

Nighttime construction noise impacts are predicted to occur for sensitive receptors in Receptor Group 2, Receptor Group 3, and Receptor Group 5. To reduce construction noise impacts during nighttime hours to below the significant impact threshold, Mitigation Measure N-1 requires installation of temporary noise barriers around the work site that have sufficient heights to block the direct line-of-sight between the onsite construction areas and off-site noise sensitive receptors. With typical installation, temporary noise barriers can provide 5 decibels of noise level reduction to adjacent receptors. Table ~~5.13-25~~5.13-33, *Predicted Nighttime Cumulative Ontario Regional Sports Complex Construction Noise Levels with Mitigation*, summarizes the ranges of construction-noise levels with the implementation of temporary noise barriers.

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Table 5.13-~~25~~33 Predicted Nighttime Cumulative Ontario Regional Sports Complex Construction Noise Levels with Mitigation

ORSC Component		Work Phase	Range of Predicted Nighttime (10pm–7 am) Construction Noise Levels by Receptor Group (L_{eq} dBA)[1]					
			1	2	3[4]	4	5	6
Nighttime Ambient (7pm–7am)[2]			**47**	**47**	**48**	**48**	**48**	**47**
Impact Threshold (Cannot Exceed)			**52**	**52**	**53**	**53**	**53**	**52**
Parking Structure	Parking Structure A	Phase 1B	42–43	42–46	45–51	44–45	43–47	42–42
	Parking Structure B	Phase 2	42–45	42–49	43–44	43–44	43–44	42–44
Stadium	All Activities	Phase 1B	42–44	42–48	44–55	44–47	43–49	42–42

Source: HMMH 2023a
Notes: Attachment A of Appendix J1 includes a table that summarizes predicted nighttime construction noise levels at all analyzed receptors for the proposed work phases and activities.
See Table 5.13-6 for locations of receptor groups.
1 Construction equipment noise levels conservatively assume all equipment would be utilized at the same time and at all hours of an 8-hour period, both of which are unlikely.
2 Long-term noise measurements were conducted in and around the site in October 2023. The ambient noise level is comprised of the measured L90. Refer to The Ontario Regional Sports Complex EIR Traffic Noise Technical Report for detailed information on the noise measurement program.
3 **Bold** numbers indicate noise levels that exceed 5 dBA over the measured ambient noise level.
4 Receptors predicted to experience nighttime construction noise levels include recreational use that would not be considered to have nighttime sensitivity (green at Whispering Lakes Golf Course and Cucamonga Channel Walking Trail). Therefore, these locations would not be considered to be impacted during nighttime construction of the ORSC. Noise level ranges are provided for informational purposes.

Page 12-3, Chapter 12, *Qualifications of Persons Preparing EIR*. The following typo has been corrected.

Brian Wolfe, Transportation Engineer/Planner

Page 1-26, Table ES-3, *Summary of Environmental Impacts, Mitigation Measures and Levels of Significance After Mitigation*, Chapter 1, *Executive Summary*. The following mitigation measure has been amended in response to Comments O2-6, O2-12, and O2-23 from CARE CA.

Table ES-3 Summary of Environmental Impacts, Mitigation Measures and Levels of Significance After Mitigation

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures		Level of Significance After Mitigation
5.3 AIR QUALITY				
Impact 5.3-2: Construction activities associated with the ORSC would generate short-term emissions that exceed South Coast AQMD's significance thresholds and would cumulatively contribute to the nonattainment designations of the SoCAB.	Potentially significant	AQ-1	The City of Ontario shall require the construction contractor to incorporate the following to reduce air pollutant emissions during construction activities: • Use construction equipment rated by the United States Environmental Protection Agency as having Tier 4 (model year ~~2008~~ 2015 or newer) Final or stricter emission limits for all off-road construction equipment. If Tier 4 Final equipment is not commercially available for a specific piece of equipment, the applicant shall provide documentation (e.g., rental inventory requests), to the City's satisfaction, or otherwise demonstrate its unavailability to the City of Ontario prior to the issuance of any construction permits and replacement equipment used by the contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine as defined by the California Air Resources Board regulations. ▪ If Tier 4 Final equipment is not available, the construction contractor(s) and subcontractor(s) affected shall use Tier 4 Interim equipment. ▪ If Tier 4 Interim equipment is not available, the construction contractor(s) and subcontractor(s) affected shall use then Tier 3 equipment outfitted with a level 3 diesel particulate filter. ▪ For purposes of this mitigation measure, "commercially available" shall mean the availability of Tier 4 engines similar to the availability for other large-scale construction projects in the City occurring at the same time and taking into consideration factors such as (i) potential significant delays to critical-path timing of construction and (ii) geographic proximity to the project site of Tier 4 equipment.	Less than significant

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Table ES-3 Summary of Environmental Impacts, Mitigation Measures and Levels of Significance After Mitigation

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation

		• During construction, the construction contractor shall maintain a list of all operating equipment in use on the construction site for verification by the City of Ontario. The construction equipment list shall state the makes, models, Equipment Identification Numbers, Engine Family Numbers, and number of construction equipment on-site.
		• Use paints with a VOC content that meets the South Coast Air Quality Management District Super Compliant architectural coatings standard of 10 grams per liter (g/L) or less (i.e.,) for coating architectural surfaces.
		• Comply with South Coast Air Quality Management District Rule 403, including the following measures:
		  • Provide National Institute for Occupational Safety and Health (NIOSH)-approved respirators for workers with a prior history of Valley Fever.
		  • Half-face respirators equipped with a minimum N-95 protection factor for use during worker collocation with surface disturbance activities. Half-face respirators equipped with N-100 or P-100 filters should be used during digging activities. Employees should wear respirators when working near earth-moving machinery.
		  • Post warnings onsite and consider limiting access to visitors, especially those without adequate training and respiratory protection.
		These identified measures shall be incorporated into all appropriate construction documents (e.g., construction management plans) submitted to and verified by the City.	

Page 1-41, Table ES-3, *Summary of Environmental Impacts, Mitigation Measures and Levels of Significance After Mitigation*, Chapter 1, *Executive Summary*. The following mitigation measure has been amended in response to Comments O2-9 through O2-11 from CARE CA.

Table ES-3 Summary of Environmental Impacts, Mitigation Measures and Levels of Significance After Mitigation

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures		Level of Significance After Mitigation
5.9 HAZARDS AND HAZARDOUS MATERIALS				
Impact 5.9-2: Project construction activities may disturb contaminants in the soil associated with the site's former agricultural uses and could create a significant hazard to the public or the environment.	Potentially significant	HAZ-1	Prior to the issuance of demolition permits or grading permits, whichever is issued first, for individual development projects in the ORSC site, the project applicant/developer shall submit a Phase II Environmental Site Assessment (ESA) to the City of Ontario prepared under the responsible charge of a Professional Geologist or Professional Engineer. The Phase II ESA shall be prepared ~~by an Environmental Professional~~ in accordance with the American Society of Testing and Materials (ASTM) ~~Standard E: 1527-21 Environmental Site Assessment Standard Practice (ASTM E1527-21)~~ Designation: E1903-19, *Standard Practice for Environmental Site Assessments (ESA): Phase II Environmental Site Assessment Process* (ASTM, E 1903-19). ~~The purpose of the Phase II ESA is to evaluate the presence of Recognized Environmental Conditions (RECs) in connection with the site. The term Recognized Environmental Conditions is defined in Section 1.1.1 of the ASTM Standard Practice as the presence or likely presence of any hazardous substances or petroleum products in, at or on a property due to any release to the environment; under conditions indicative of a release to the environment; or under conditions that pose a material threat of a future release to the environment.~~ If the site is found to be impacted with potential contaminants of concern at levels exceeding applicable regulatory thresholds, the project applicant shall remediate all contaminated media, under the oversight and in accordance with state and local agency requirements of the ~~(~~California Department of Toxic Substances Control (DTSC), Regional Water Quality Control Board, Ontario Fire Department and/or County of San Bernardino, as applicable to their oversight jurisdictions~~, etc.)~~. For minor issues the Project Environmental Consultant may self-certify with approval from the City. All contaminated soils and/or material encountered shall be disposed of at a regulated site and in accordance with applicable laws and regulations prior to the completion of grading.	Less than significant

3. Revisions to the Draft EIR

Table ES-3 Summary of Environmental Impacts, Mitigation Measures and Levels of Significance After Mitigation

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
		Prior to the issuance of building permits, a report documenting the field activities, results, and any additional recommendations shall be provided to the City of Ontario evidencing that all site remediation activities have been completed inclusive of environment oversight agency document of no further action determinations, as applicable. Additionally, the following specific conditions shall be adhered to: • **Pesticides.** Prior to the issuance of a demolition permit for any building or structure or the issuance of a grading permit, whichever is issued first, the construction contractor shall provide proof to the City that there are no pesticides on the site that exceed Environmental Protection Agency Regional Screening Levels (EPA RSLs) or Water Board Environmental Screening Levels (ESLs), whichever is more stringent. If on-site pesticides exceed the applicable screening levels, measures shall be taken in compliance with all applicable local, State and federal regulations to either remediate the pesticides on-site, or remove and properly dispose of the pesticides and proof shall be provided to the City of their safe remediation or removal as permitted by law along with agency oversight documentation of no further action determination by DTSC. • **Methane.** The construction contractor shall submit a subsurface methane soil gas report to the City Building Department, in general accordance with their methane ordinance, to screen for the presence of elevated levels of methane gas prior to installation of building foundations. The recommendations in the subsurface methane soil gas report to remove or remediate any soils with methane gas levels that exceed accepted regulatory levels shall be implemented in accordance with all applicable laws and regulations as determined by the City Building Department. • **Stained Soil – Pietersma Family Trust.** Prior to the issuance of a demolition permit for any building or structure or the issuance of a grading permit, whichever is issued first, shallow soils impacted with Diesel Range Total Petroleum Hydrocarbons (TPH-d) in excess of commercial and residential screening levels adjacent to the aboveground storage tanks in the hazardous materials storage area of	

Table ES-3 Summary of Environmental Impacts, Mitigation Measures and Levels of Significance After Mitigation

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
		the Pietersma Family Trust (parcels 0218-101-01, 0218-101-02, 0218-101-07, 0218-101-08, 0218-102-10, and 0218-102-11) shall be removed and disposed of in accordance with current regulations. Confirmation sampling shall be conducted as required by current regulations after removal to verify that the impacted soil has been adequately removed from the site or treated *insitu* (in place) as deemed appropriate by the Project Environmental Consultant at the discretion of the City. If during grading activities hydrocarbon (TPH) stained soil areas are discovered, grading within the area shall be temporarily halted and redirected around the area until the appropriate evaluation and follow-up measures are implemented. TPH stained soil shall be removed and transported off-site at a State approved disposal site under the observation of the Project Environmental Consultant and confirmation samples collected from the sidewalls and bottom of each excavation area. The confirmation samples shall be transported to a state certified laboratory and analyzed for TPH in accordance with EPA Methods 8015M and 8015B, to ensure that TPH stained soil has been adequately removed from the site. Based on the laboratory results and at the discretion of the City, the San Bernardino County Fire Department, the Project Environmental Consultant, or the City shall determine when the area of the site is suitable for grading activities to resume. • **Underground Storage Tanks (UST) – 15 Dairy LLC.** Prior to the issuance of a demolition permit for any building or structure or the issuance of a grading permit, whichever is issued first, subsurface sampling shall be performed in the vicinity of the structures in the northern portion of the 15 Dairy LLC (parcels 0218-111-08, 0218-111-11, 0218-111-12, 0218-111-49, and 0218-111-50) where hazardous materials were likely stored according to historical inspection reports. A geophysical survey should be completed to determine whether any Underground Storage Tanks (USTs) are present at the property. Exploratory trenching is required to address and identify anomalies prior to soil sampling. Should USTs be discovered, subsurface sampling in the vicinity of the UST(s) is recommended to assess for any potential releases that have impacted subsurface soils. All contaminated soils and/or material encountered shall be disposed of at a regulated site and	

3. Revisions to the Draft EIR

Table ES-3 Summary of Environmental Impacts, Mitigation Measures and Levels of Significance After Mitigation

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
		in accordance with applicable laws and regulations prior to the completion of grading. The San Bernardino County Fire Department shall be the lead environmental oversight agency for UST removal activities. • **Soil Vapor Testing – JCLIN Investment, LP.** Soil vapor sampling in the northern portion of JCLIN Investment, LP (parcels 0218-101-03, 0218-101-04, 0218-101-05, and 0218-101-06) shall be conducted to evaluate whether historical possible drycleaning activities off-site have impacted the subsurface soil vapor beneath the property. The San Bernardino County Fire Department or Department of Toxic Substances Control shall be the lead agency.	

Appendix A1. Parking Traffic Demand Management Plan

Appendix

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DRAFT Ontario Regional Sports Complex

Stadium and Athletic Facilities Parking and Transportation Demand Management Plan

Prepared for:
City of Ontario

May 2024

OC20-0741

FEHR PEERS

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Appendices

Appendix A: Ontario Regional Sports Complex Parking Study

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1. Introduction

1.1 Purpose and Objectives

This Parking and Transportation Demand Management (TDM) Plan provides details on the operations and monitoring of proposed parking management and TDM strategies at the Ontario Regional Sports Complex (ORSC) in the City of Ontario. VMT mitigation strategies identified in the Environmental Impact Report are further explained in this plan, including implementation and oversight procedures.

The purpose of the Parking and TDM Plan is to:

- Improve access to and circulation within the ORSC site for all travel modes
- Provide guidance on parking operations at the ORSC site, including pricing, enforcement, and managing parking for different land uses
- Identify strategies for minimizing parking impacts on surrounding roadways and neighborhoods
- Complement the Event Traffic Management Plan (TMP) in managing event traffic
- Outline implementation of project related TDM measures to reduce single-occupancy vehicle trips to/from the Project
- Define measures of effectiveness (MOEs) that can be used to evaluate project TDM measures
- Explain procedures for updating parking and TDM measures

This report was prepared during the environmental review phase of the Project when specific information such as a detailed site plan and operational arrangements were not yet determined. This document is expected to be updated as additional information is made available and after the Project opens. Chapter 5 includes details on how parking management and TDM measures shall be periodically reviewed.

1.2 Report Organization

The remainder of this report is organized into the following chapters:

- Chapter 2 (Project Description) – includes details on the proposed land use, event programming, parking supply, and expected parking demand at the Project site
- Chapter 3 (Parking Management) – explains proposed parking operational procedures at the Project site including parking assignment, rates, and enforcement
- Chapter 4 (Transportation Demand Management) – explains proposed measures to reduce Project-related vehicle trips and facilitate access to and from the Project site by public transportation, walking, and cycling
- Chapter 5 (Program Monitoring) – outlines procedures for ensuring parking management and TDM measures are being implemented in an efficient and effective manner, including describing how programs can be modified if necessary

1.3 Coordination with Event Transportation Management Plan

An Event Traffic Management Plan (TMP) was prepared alongside the Parking and TDM plan to support event operations. The purpose of the TMP is to manage access and guide implementation of traffic control measures during events, which will support implementation of the Parking and TDM measures. Specifically, the TMP will complement parking and TDM measures by:

- Outlining access routes and pick up/drop off locations for public transportation and ride share
- Identifying pedestrian/cyclist routes and internal circulation
- Supporting efforts to distribute vehicle traffic to multiple entrance/exit points
- Managing parking queues and inbound/outbound traffic during events

It is anticipated that if parking and/or TDM measures are updated, the TMP will need to be updated and vice versa.

2. Project Description

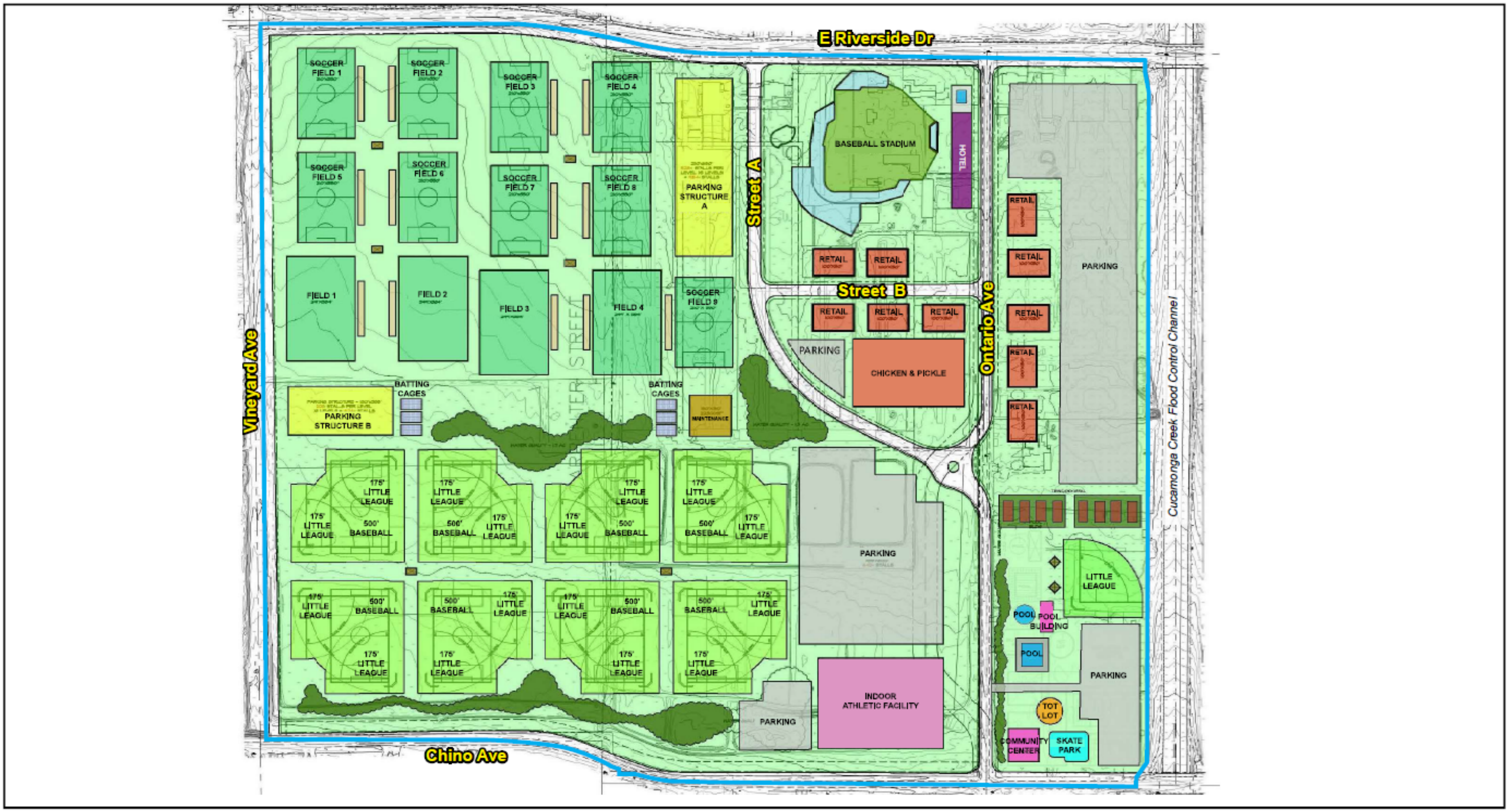
2.1 Overview

The proposed Project is a 199-acre sports complex with a mix of uses. The Project site is bounded by Riverside Drive to the north, Chino Avenue to the south, Cucamonga Creek Flood Control Channel to the east, and Vineyard Avenue to the west, as shown in **Figure 1**.

The Project will consist of the following land uses:

- Planning Area (PA) 1: Semi-professional Minor League Baseball Stadium (6,000-person capacity)
- PA 2-4: Commercial Retail, Baseball Stadium Retail, Retail and Hospitality Areas
- PA 5: City Park (Outdoor Baseball/Softball, Soccer, and Multi-use Fields)
- PA 6: City Park (Indoor Athletic Facility)
- PA 7: Community Recreation Center

Development of the Project will be completed over multiple phases, with Project components opening between Spring 2025 and Fall 2027. The Project site can be accessed through Vineyard Avenue, Riverside Drive, and Chino Avenue. Vineyard Avenue and Ontario Avenue will extend through the Project site to provide access and internal circulation.



Project Boundary

0 500
Scale (Feet)

Source: *RUM Design Group 2023; Ontario 2023.*

Figure 1

Proposed Site Plan

2.2 Proposed Event Programming

In addition to the retail, hospitality, and public park uses that are expected to remain in consistent use year-round, various events and sports programming will take place periodically that will drive visitation to and from the Project site. The frequency and daily trip generation and attendee estimates for each event are provided in **Table 1**. Event frequencies and sizes were developed from information provided by the City of Ontario available during the environmental review period of the project and is subject to change. Additional special events (e.g. Fourth of July, Trunk-or-Treat, etc.) may also take place on the Project site, which can employ parking management and TDM strategies as needed.

Table 1: Summary of Proposed Event Programming

Land Use	Event Description	No. of Days/ Year	Daily Vehicle Trip Generation Estimate	Average Daily Attendees
Baseball Stadium	Regular Season Games	66	803 to 2,038	1,300 - 3,400
	Postseason Games	≤5	2,038	6,000
	Small Event (100 attendees)	4	58	100
	Small Event (200 attendees)	2	116	200
	Small Event (500 attendees)	7	289	500
	Medium Event (2,000 attendees)	9	1,157	2,000
	Medium Event (3,000 attendees)	4	1,735	3,000
	Medium Event (4,000 attendees)	16	2,314	4,000
	Large Event (5,000 attendees)	2	2,892	5,000
	Large Event (6,000 attendees)	2	3,470	6,000
Soccer Fields	Typical Games	48	4,549	2,000 - 5,000
	Tournaments	16	6,755	5,000 – 8,000
Baseball/Softball Fields	Typical Games	50	3,055	1,400 – 4,000
	Tournaments	16	3,727	4,000 – 6,000
Indoor Basketball/Volleyball Athletic Center	Basketball Games	20	1,112	2,000
	Volleyball Games	54	1,334	2,500

Source: City of Ontario, 2023. Fehr & Peers, 2024.

2.3 Proposed Parking Supply

The Project will include the construction of 6,263 parking spaces, distributed across seven parking structures/lots (see **Table 2**). Parking is distributed throughout the site to ensure convenient access to different land uses and minimize congestion impacts during periods with high traffic volumes. Parking can be accessed through the Project access intersections on Riverside Drive, Vineyard Avenue, and Chino Avenue. **Figure 1** shows the locations of the parking lots and structures on the Project site.

Table 2: Proposed Parking Supply

Planning Area	Structure/Lot	Supply (number of parking spaces)
PA 1 Baseball Stadium	Parking Structure A	1,600
PA 2 Commercial Retail	Lot C (Surface Parking, East)	1,500
PA 3 Baseball Stadium Retail and Hospitality	-	-
PA 4 Baseball Stadium Retail and Hospitality South	Lot D (Surface Parking, South)	250
PA 5 City Park, Active Fields	Parking Structure B	1,000
	Lot E (Surface Parking, South)	1,000
PA 6 City Park, Indoor Athletic Facility	Lot F (Surface Parking, Southwest)	388
PA 7 Community Recreation Center	Lot G (Surface Parking, Southeast)	525
	TOTAL:	**6,263**

Source: City of Ontario, 2023.

2.4 Expected Parking Demand

Parking demand was estimated for multiple event scenarios in the *Ontario Regional Sports Complex Parking Assessment*, provided in **Appendix A**. Under typical and peak scenarios, the Project is expected to have adequate parking supply to meet demand. However, parking management strategies are still recommended during events to manage traffic around the Project area, minimize impacts on neighborhoods, and maintain access for employees and retail visitors. **Table 3** summarizes the expected parking demand for various event types and scenarios.

Table 3: Expected Parking Demand

Scenario	Maximum Total Hourly Parking Demand	Peak Parking Demand Hour
Weekday with Baseball/Soccer Practice	2,261	6:00 PM
Weekday with Minor League Baseball Game and Baseball/Soccer Practice	2,946	7:00 PM
Weekend with Minor Leage Baseball Game and Baseball/Soccer Games	3,255	7:00 PM
Weekend with Minor League Baseball Game and Baseball/Soccer Tournaments	4,005	7:00 PM
Weekend with Sell-Out Stadium Event and Baseball/Soccer Games	4,271	6:00 PM
Weekend with Sell-Out Stadium Event and Baseball/Soccer Tournaments	5,022	6:00 PM

Source: Fehr & Peers, 2024.

3. Parking Management

This section outlines parking management strategies and operational procedures that can be implemented to:

- Minimize impacts on adjacent roadways and neighborhoods
- Better accommodate event parking demand
- Promote carpooling and non-auto trips to the Project

Parking management strategies are expected to be employed during most events, and anytime when event traffic may impact parking supply for other uses on the Project site. As the primary operator of the ORSC, the City of Ontario shall review each event and determine the appropriate level of parking management required. It is expected that days with stadium events and those with more than 5,000 combined event attendees will require parking management (i.e. most weekends).

3.1 Recommended Parking Management Strategies

Consistent with the identified VMT impact mitigation measures, several parking management strategies are proposed for the Project.

Paid Visitor Parking

This strategy prices parking in a designated area for visitors. Increasing the cost of parking increases the total cost of driving to a location, incentivizing shifts to other modes, increasing carpooling, and decreasing total VMT. Pricing can be adjusted to manage demand during periods of high visitation and would apply to most stadium, athletic facility event, and hotel visitors. Potential pricing models are discussed in Section 3.3.

Retail and Recreation Center Parking Validation

This strategy complements the paid visitor parking strategy to ensure that stadium and athletic facility attendees do not use free retail parking unless visiting retail establishments. Parking validation maintains parking supply for businesses and can be implemented digitally using the latest parking technology. Validation typically covers a set time (e.g. two hours).

Parking Time Limits

This strategy sets the maximum amount of time a parking space can be occupied by a single vehicle. Parking time limits promote parking turnover and may prevent event attendees from using parking spaces intended for retail, restaurant, or public park spaces (as event attendees will likely require parking for an extended period). A parking time limit can also be applied to validation, such that validation will only cover up to a specified time limit.

Discounted Parking Fees for Ultra-HOV Vehicles (HOV 5+)

This strategy promotes carpooling by providing a discounted parking rate for vehicles with five or more occupants during games, tournaments, and stadium events. The high-occupancy-vehicle threshold is set to five or more to encourage ridesharing between multiple households. Implementation of this measure is described in Section 3.3.

Employee Parking Cash Out

Employers will be required to offer employees a cash payment equivalent to or greater than the cost of providing a parking space for employees. This program would be managed through employee parking permits, which the City would sell to employers. Employers can provide parking passes to employees or offer a cash-out equivalent to the cost of the parking permit. Implementation is described in Section 3.2.

Table 4 lists the parking management strategies for each land use.

Table 4: Parking Management Strategies by Land Use

Strategy	Stadium	Athletic Facilities	Retail and Restaurant	Hotel	Public Park
Paid Visitor Parking	Yes	Yes[1]	No[2]	Yes	No[2]
Retail Parking Validation	No	No	Available	No	Available
Parking Time Limits	No	No	Yes[2]	No	Yes[2]
Discounted Parking Fees for Ultra-HOV Vehicles	Yes	Yes	No	No	N/A
Employee Parking Cash-Out	Yes	N/A	Yes	Yes	Yes

Notes:
1.) Athletic Facility parking will only be charged during games and tournaments. Practice/weekday parking will not be subject to pricing unless on days with stadium events and staying longer than two hours.
2.) Retail and public park visitors staying less than two hours will not need to purchase parking. Visitors staying beyond the two-hour period will be responsible for any additional parking costs, but can receive a discount validation code from retailers or the community recreation center.

3.2 Parking Facility Allocation

During typical operations, all parking facilities will remain open for all users; visitors will be able to park in any available parking area. When parking management is in effect during larger events (>10,000 combined daily event attendees), some parking facilities may be designated as "event only" or for the specific event use (e.g. one parking area for athletic fields, another parking area for stadium events). The purpose of this is to utilize all available parking supply and distribute event traffic to multiple entrance/exit points. Specific parking locations for each land use will be identified during the final design phase and incorporated into the Event Transportation Management Plan. Depending on event size, the number of parking facilities/spaces reserved for events may change.

3.2.1 Stadium Parking

Stadium Parking should be provided near the entrance of the stadium, generally in the northeast corner of the Project site. Multiple parking facilities should be designated for stadium attendees to distribute event traffic across the Project site access intersections on Riverside Drive and Chino Avenue. During most games, parking facilities can be shared with retail operations; however, larger events (e.g. summer weekends, post-season) may warrant designated "event only" parking facilities to guarantee supply for event attendees.

3.2.2 Athletic Facility Parking

During larger-scale weekend games and tournaments, parking facilities may be designated exclusively for soccer field, baseball/softball field, and indoor basketball/volleyball court attendees. Multiple parking facilities should be provided to distribute traffic and allow visitors to park closer to their destination. During periods where multiple sports are occurring simultaneously, the City may designate specific lots/spaces for each sport or event.

Parking for athletic facilities should be provided west of Street A to the maximum extent possible, reducing pedestrian-vehicle conflicts on Street A.

3.2.3 Retail and Hospitality Parking

Parking for the retail, restaurant, entertainment, and hotel uses should be provided near these establishments, generally in the northeast corner of the Project site. Parking for these uses may be shared with other uses (e.g. stadium parking) and will only be managed during events. During major events, retail parking may be consolidated into specific lots to provide sufficient parking supply for event attendees.

3.2.4 Public Park Parking

Parking for the community center, skate park, public pool, little league field, and public tennis/pickleball courts should be provided in the southeast corner of the Project site in a designated parking area. To discourage event visitors from utilizing this lot, the same parking fee structure is expected to be used, which will provide free parking for park visitors staying less than two hours (see Section 3.3).

3.2.5 Employee Parking

The City should sell employee parking permits to the stadium operator, and retail businesses which they manage and issue to employees. These permits can be managed electronically by having employees register their license plate. License plate-based permits also allows for streamlined enforcement, utilizing license plate recognition (LPR) cameras.

Alternatively, employees are also eligible to forego their provided parking pass and receive a cash-out payment from their employer. This is intended to incentivize commute mode shift away from single-passenger automobiles.

During typical operations, employees can utilize any available parking space, provided they have an issued employee parking permit. During major events, specific parking areas can be designated as “employee parking only” to maintain parking access during events.

3.3 Parking Pricing and Validation

Paid parking is intended to increase the overall cost of driving, thereby encouraging carpooling or other modes of transportation to and from the Project site. This can reduce the number of trips and VMT generated by the Project. The Project proposes to implement paid parking for stadium event attendees and visitors of athletic facility games and tournaments. Parking is expected to remain accessible for employees and most retail and public park visitors to reduce financial burdens for employees and maintain business access.

3.3.1 Pricing Model

The City shall work with sporting event operators and the commercial developer to determine a final parking pricing model. For consistency and clarity, it is recommended that only one parking pricing model be used for all special event parking on the Project site.

Fehr & Peers recommends the use of a hybrid free and paid parking model where parking is free for the first two hours, after which a flat special event fee will apply. This effectively results in free parking for most visitors of retail/restaurant venues and athletic practices (average stay less than two hours) and paid parking for most stadium and athletic game/tournament visitors (average stay greater than two hours).

Compared to other pricing models such as time-based rates, the free two hour plus flat rate parking model has several benefits:

- Ease of understanding for visitors
- Ease of enforcement with Parking Management System
- Allows parking facilities to be shared between uses
- Integrates well with HOV 5+ discount
- Reduced exit queueing as parking rates do not need to be calculated for each vehicle

3.3.2 Potential Pricing Levels

Pricing levels should be determined by the City of Ontario prior to opening day. Rates should be set to minimize confusion and simplify collection but can vary depending on demand (e.g. lower parking rate during weekday events vs. weekend events). Rates should be set that they encourage some drivers to consider alternative modes of travel (e.g. carpooling, public transportation); however, they should not be prohibitively expensive that they result in impacts on surrounding neighborhoods. Over time, if demand for parking is found to be consistently high, the City should consider increasing the parking fee. However, if parking demand is consistently low, the City should only consider decreasing the parking fee if parking spills over to the surrounding neighborhoods.

Table 5 summarizes the current parking rates at adjacent minor league sports venues, youth recreation facilities, and entertainment venues. These rates can be used to inform parking rate development for the Project. Generally, market rates at similar facilities average a flat rate of $10-$20 per vehicle. While higher rates are observed at other facilities, they tend to be in isolated areas without nearby neighborhoods or business parking lots, unlike ORSC.

Table 5: Parking Pricing at Existing Regional Facilities

Peer Facility	Facility Type	Parking Cost
Loanmart Stadium, Rancho Cucamonga	Minor League Baseball Stadium	All Events: $6/car
Toyota Arena, Ontario	Minor League Hockey Stadium	All Events: $15/car
San Manuel Stadium, San Bernardino	Minor League Baseball Stadium	All Events: $10/car
Acrisure Arena, Palm Desert	Minor League Hockey Stadium	Variable Pricing by Event $17 - $50/car
Silverlakes Sports Complex, Norco	Soccer Complex	Weekend Parking Rates: $12/car $25/RV or Bus
SoCal Sports Complex, Oceanside	Soccer and Event Complex	Weekends: $15/car
Momentous Sports Center, Irvine	Indoor Basketball/Volleyball Sports Complex	Weekends: $20/car
Orange County Regional Parks (various), Orange County	Outdoor Recreation Facility	Weekdays: $3/car Weekends: $5/car

Source: Fehr & Peers, 2024.

3.3.3 Retail and Recreation Center Validation

Most visitors of retail establishments, restaurants, and the recreation center will not need to pay for or validate parking as most of these visits are less than two hours. However, the City may work with the third-party parking operator to provide full or partial validation for retail and recreation center visitors staying longer than two hours. Retail establishments could issue validations, which would be managed by the parking operator.

3.3.4 HOV 5+ Parking Discount

The purpose of providing a discount for carpools with five or more occupants is to encourage carpooling to the Project site between multiple households. Carpooling, particularly for regional draw events, is an effective strategy to lower visitor VMT. The discount threshold is set to five or more as most vehicles are expected to have multiple occupants in them, making lower thresholds less effective. The threshold will be reviewed after the first year of operations to determine if it is achieving intended vehicle trip reduction goals.

To ensure compliance with this policy, parking facility entrances would need to be staffed by parking enforcement officers that verify and register vehicles with five or more occupants. Specific priority parking area(s) can be designated as “HOV 5+ parking only” to minimize the number of staff required for enforcement while also encouraging carpooling. Vehicles that are confirmed with five or more occupants would be registered in the Parking Management System to receive a discounted parking rate.

3.4 Technology and Enforcement

The City should contract a third-party parking management service to operate, manage, staff, and enforce parking on the Project site. The specific technology used to manage parking will depend on the selected contractor but should consider the technologies listed below to improve enforcement and operational efficiency.

3.4.1 Recommended Technologies

Gateless Parking

To limit queueing and delays upon entrance/exit, it is recommended that all the facilities be gateless. This removes the need for standard parking gates at the entrance and exit of parking facilities and requires less maintenance than gate arms, improving system reliability. Parking can be enforced with automated license plate recognition cameras installed at parking lot entrances and exits that measure the duration of a parking session and assist with enforcement.

Digital Payments

Advanced digital payment systems utilize license plates and mobile apps/websites to issue parking permits to vehicles. Visitors can use their smart phones to pay for parking by registering their license plate. Signage, like those shown in **Figure 2**, can be installed throughout the parking facilities informing drivers of parking rates and providing information/QR codes on how to pay.

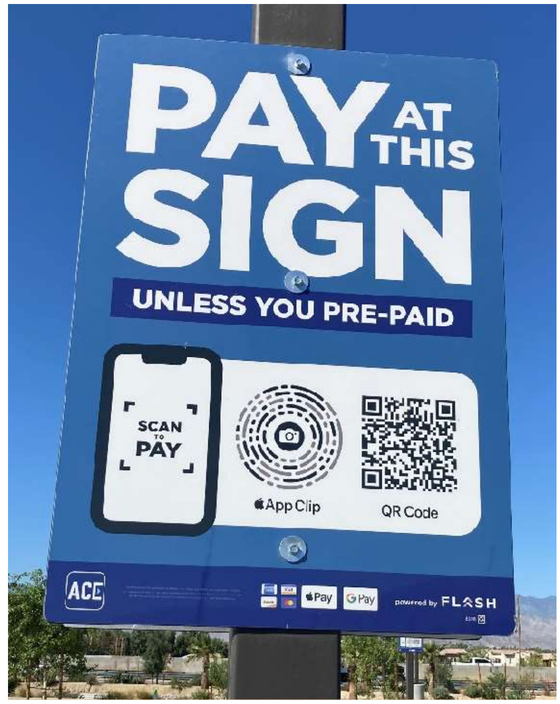


Figure 2: Example of Parking Payment Signage, Acrisure Arena, Palm Desert, CA

Parking Management Software

Parking Management Software can be used by the parking vendor to verify vehicles are paying for parking and/or are within parking time limits. This system provides parking enforcement officers with the payment status and parking duration for each vehicle, identifying those that have exceeded the free parking limit and have not paid for event parking.

The Parking Management Software can also be used by stationed parking enforcement officers at the entrance to parking facilities to register vehicles that are eligible for the HOV 5+ parking discount. Retail validation codes can also be handled through this software.

3.4.2 Enforcement

The City of Ontario Police Department will be responsible for enforcing parking management policies, specifically parking fees and time limits. The City may coordinate with the third-party vendor to assist with enforcement.

3.5 Neighborhood Impact Mitigation

Mitigation measures are recommended to limit potential event traffic impacts on neighborhood streets. The purpose of these measures is to limit event parking in neighborhoods to the extent possible and maintain access for residents and businesses in the Project area.

Temporary and/or permanent warning signage should be installed on adjacent neighborhood streets to remind drivers that event parking is strongly discouraged outside of Project parking facilities. Periodic informational campaigns can include stationing a parking enforcement officer on neighborhood streets informing drivers that event attendees should not utilize street parking. Enforcement of no parking zones would require development of a residential parking permit program and adoption of new City ordinances, which should be considered only if neighborhoods experience repeated parking impacts.

4. Transportation Demand Management

This section details the transportation demand management (TDM) strategies for Project. In addition to the parking related strategies described in the previous section, a series of non-auto strategies are identified to promote mode shift towards carpooling, public transportation, and walking/cycling. These strategies were identified during the Project environmental review period and focus on reducing home-based-work (HBW) and visitor VMT.

4.1 Nearby Transportation Services

The success of TDM strategies relies on a robust multi-modal transportation network. The Project Site is served by existing public transit services and pedestrian and bicycle facilities. As the Ontario Ranch area develops, additional multi-modal transportation infrastructure is expected to increase access to the Project Site. The available transportation services are described below.

4.1.1 Transit Service

Omnitrans provides local and express services to San Bernardino County, which includes the City of Ontario. Bus stops are provided along Riverside Drive at Whispering Lakes Lane and Ontario Avenue. The Project site is served by Route 87, which connects to Rancho Cucamonga, Downtown Ontario, and Eastvale via Vineyard Avenue, Riverside Drive, and Archibald Avenue. Connections to other Omnitrans bus routes can be made at the Ontario Civic Center and Chino Transit Centers and to Riverside Transit Agency in the City of Eastvale.

Table 6 outlines the current hours of operation and service frequency for Route 87.

Table 6: Omnitrans Route 87 Frequency and Hours of Operation

	Frequency	Hours of Operation
Weekday	60 minutes	5:00 am – 9:45 pm
Saturday	60 minutes	5:30 am – 8:30 pm
Sunday	No Service	No Service

Source: Omnitrans, 2023.

The Project proposes bus stop improvements including bus pullouts and other amenities at the intersection of Riverside Drive and Street A, immediately adjacent to the baseball stadium entrance. Future transit services may be considered along other corridors as the Ontario Ranch area develops.

4.1.2 Pedestrian Facilities

Pedestrian facilities in the Project area include sidewalks, crosswalks, pedestrian signals, and multi-use trails. Most of the roadways are underdeveloped in the Ontario Ranch area and do not include pedestrian facilities. Surrounding the Project, the only pedestrian sidewalks are provided along the north side of Riverside Drive.

New sidewalks are proposed along Vineyard Avenue, Chino Avenue, and the south side of Riverside Avenue as part of the Project. Additional pedestrian facilities will be constructed during the development process of Ontario Ranch.

Within the Project site, sidewalks and pedestrian trails will be provided to facilitate internal circulation and travel between different land uses (e.g. between the stadium and retail/hospitality area). During the final design process of internal roadways and parking lots, pedestrian crossings will be identified along Ontario Avenue, Street A, and Street B. Additionally, the Event Traffic Management Plan will identify temporary road closures that can support pedestrian circulation during events when pedestrian volumes are expected to be higher.

4.1.3 Bicycle Facilities

The Ontario Plan Circulation Element identifies several proposed Class I (off street multi-purpose trails) and Class II (bike lane) facilities that will directly serve the project site. These include:

- Proposed Class I Multipurpose Trails:
    - Euclid Avenue between Merril Avenue and Riverside Drive
    - Campus Avenue between Merril Avenue and Riverside Drive
    - Grove Avenue between Merril Avenue and Riverside Drive
    - Vineyard Avenue between Merril Avenue and Riverside Drive
    - Cucamonga Channel Multipurpose Trail
    - Archibald Avenue between Eastvale City Limits and Riverside Drive
    - Haven Avenue between Eastvale City Limits and Riverside Drive
    - Hamner Avenue between Eastvale City Limits and I-15
    - Chino Avenue between Euclid Avenue and Hamner Avenue
    - Schaefer Avenue between Euclid Avenue and Archibald Avenue
    - Edison Avenue between Euclid Avenue and Vineyard Avenue
    - Eucalyptus Avenue between Euclid Avenue and Vineyard Avenue
    - Additional internal Class I trails as part of the Ontario Ranch development
- Proposed Class II On Street Bike Lanes
    - Merril Avenue between Euclid Avenue and Haven Avenue
    - Eucalyptus Avenue between Vineyard Avenue and Hamner Avenue
    - Edison Avenue between Vineyard Avenue and Cucamonga Channel
    - Ontario Ranch Road between Cucamonga Channel and Hamner Avenue

- Schaefer Avenue between Archibald Avenue and Haven Avenue
- Riverside Drive between Euclid Avenue and Milliken Avenue/Hamner Avenue
- Campus Avenue between Riverside Drive and North of SR-60
- Grove Avenue between Riverside Drive and North of SR-60 (buffered bike lane)
- Vineyard Avenue between Riverside Drive and SR-60 (buffered bike lane)
- Archibald Avenue between Riverside Drive and SR-60
- Haven Avenue between Riverside Drive and SR-60

As part of roadway improvements for the Project, a Class I multi-use trail is planned for the west side of Vineyard Avenue and Class II bike lanes are planned along Riverside Drive between Vineyard Avenue and the Cucamonga Channel. Internal roadways will also include bicycle facilities

4.2 Recommended TDM Strategies

As identified in the Project Environmental Impact Report, a series of non-parking TDM measures are proposed for the Project:

Voluntary Commute Trip Reduction Program for Employees

This measure works to discourage employee single-occupancy vehicle trips and encourage alternative modes of transportation such as carpooling, taking transit, walking, and biking. Mode shift can help reduce commute based (HBW) VMT. The program would be implemented by all uses on the Project site, but no enforceable performance metrics will be established.

Potential measures related to this strategy include:

- Coordinating an employee rideshare/carpooling program
- Providing discounted transit passes for employees
- Incentivizing alternative travel modes (e.g. competitions with prizes)
- Providing infrastructure for non-auto travel modes (e.g. bike parking, showers)
- Sharing information, coordinating, and marketing for the above services

The City shall develop and implement these programs for recreation and stadium staff. The City shall require the retail/hospitality developer to prepare a specific TDM plan identifying commute trip reduction programs for retail, restaurant, and hospitality employees. Existing regional TDM programs operated by the San Bernardino County Transportation Authority, including *IE Commuter* can be used to satisfy this requirement.

Discounted Vanpool/Bus Rental Program for Tournament Attendees

This measure would aim to reduce VMT for large sports tournaments that draw visitors regionally by requiring sporting event operators (e.g. AYSO, Little League Baseball, etc.) to provide information and discounts for van rentals to visiting sports teams. Event operators can partner with van rental companies to rent passenger vans and other high-capacity vehicles to sports teams attending the ORSC at a discounted rate. The discount can be set such that the total cost of rental, when paired with discounted parking, is less than the cost of each team member driving separately.

Extended Transit Network Coverage or Hours

This measure would require the City to work with Omnitrans to consider adding or modifying the existing Omnitrans bus service to serve the Project site, particularly during events and weekends when demand is expected to be consistently high. Coverage can be expanded to cover Sunday and/or later into the evening.

Reduced Transit Fares

This measure would require the City and stadium event operators to work with Omnitrans to consider reducing transit fares for transit lines serving the Project, including bundling the cost of transit fares into admission tickets for stadium events (i.e. ride for free with proof of admission). Reducing transit fares creates incentives to shift travel to transit from single-occupancy vehicles.

On-Demand Shuttle

This measure would require the hotel operator to provide an on-demand shuttle service for guests that serves nearby transportation hubs like the East Ontario Metrolink station and Ontario International Airport. The shuttle can also provide service to other destinations (e.g. restaurants, entertainment, etc.) within a specified radius. The purpose of this measure is to reduce visitor VMT and reliance on vehicle trips between the airport or train station and the hotel. The shuttle service would operate on-demand to ensure the vehicle is being utilized. Details on implementation will be provided in the Retail/Hospitality TDM Plan, prepared by the retail center developer.

Table 7 lists the TDM strategies for each land use.

Table 7: TDM Strategies by Land Use

Strategy	Stadium	Athletic Facilities	Retail and Restaurant	Hotel	Public Park
Voluntary Commute Trip Reduction Program for Employees	Yes	N/A	Yes	Yes	Yes
Discounted Vanpool/Bus Rental Program	N/A	Yes	N/A	N/A	N/A
Extended Transit Network Coverage or Hours	Yes	Yes	Yes	Yes	Yes
Reduced Transit Fares	Yes	No	No	No	No

Strategy	Stadium	Athletic Facilities	Retail and Restaurant	Hotel	Public Park
On-Demand Shuttle	No	No	No	Yes	No

Source: Fehr & Peers, 2024.

4.3 TDM Strategy Implementation

4.3.1 TDM Program Coordinator

The City shall appoint a TDM Program Coordinator within the Transportation Division to support implementation of the TDM measures described in the plan. They will help facilitate communication between Project stakeholders, Omnitrans, and other agencies. They will also manage marketing efforts for TDM measures and support Project stakeholders with implementing communication strategies for TDM measures to visitors and employees.

The City may leverage existing TDM programs and staff to support Project specific TDM measures.

4.3.2 Marketing

Marketing of TDM strategies will focus on informing visitors and employees of available alternatives to driving. This could include:

- Webpages on City, stadium, and sporting event operator websites describing TDM programs and transportation options to/from Project site
- Advertisements during events describing transportation options
- Information provided to employees explaining TDM measures and parking-cash out program (e.g. employee breakroom signs)
- Social media posts describing TDM programs and transportation options

4.3.3 Coordination with Omnitrans

Implementation of public transit related TDM measures will require coordination with Omnitrans, which is expected to take place as the Ontario Ranch area develops. The TDM Program Coordinator on behalf of the City shall regularly meet with Omnitrans to review provided transit services and consider changes to better support Project operations. Additional arrangements (e.g. free fares for stadium attendees) will require memoranda of understanding between relative parties, which can be coordinated as needed.

5. Program Monitoring

Program monitoring includes reviewing the effectiveness of parking and TDM measures and making modifications as necessary to support Project operations.

5.1 Monitoring

The TDM Program Coordinator and other relevant stakeholders should work to establish goals and measures of effectiveness to determine how successful proposed TDM measures are at the Project site. Some sample measures of effectives that are appropriate for the Project include:

Parking

- Setting a goal percentage of employees who opt for the parking cash-out option (7-15%)
- Setting a goal percentage of visitors who receive the HOV 5+ parking discount (5-10%)

Mode Split

- Setting a goal for number/percent of stadium visitors using public transportation (1.4-2.8%)
- Setting a goal percentage of employee trips by mode (2-5% walking/biking)

Program Utilization

- Setting a goal number of page visits for webpages with transportation options (>500 visits/month)
- Setting a goal number of vanpool rentals for sporting events (40-80 van rentals/tournament)
- Setting a goal number of transit riders who use their stadium admission ticket as proof of fare on transit (30-100 riders per game)

These measures can be evaluated by collecting data on Project operations (e.g. share of vehicles with HOV 5+ parking discounts, number of transit passengers at Project bus stops) or through surveys administered to employees and visitors at events.

5.2 Program Modification

Parking and TDM measures should be regularly reviewed to ensure they are achieving VMT reduction goals and complement Project operations. The TDM Program Coordinator should be regularly monitoring these measures and their effectiveness and make minor changes as needed.

A comprehensive review of the Project's parking and TDM measures should take place annually, particularly during the first year of operation. This review will involve analyzing program operations (utilization, cost, etc.) and consistency with the measures of effectiveness. The TDM Program Coordinator shall solicit feedback from all relevant stakeholders including the City of Ontario Police Department, Fire Department, Department of Public Works, Recreation and Community Services, the minor-league baseball team franchise, retail establishments, and sports league/tournament operators. This review can be conducted during the review of the Event Transportation Management Plan. Substantial program changes should be documented by the TDM Program Coordinator and submitted to City Council for review and approval.

Appendix A: Ontario Regional Sports Complex Parking Study

FEHR & PEERS

Memorandum

Date: March 19, 2024

To: Jay Bautista, P.E., City of Ontario Traffic/Transportation Manager

From: Spencer Reed, P.E.
Paul Herrmann, P.E.
Brian Wolfe

Subject: Ontario Regional Sports Complex Parking Assessment

OC20-0741

Fehr & Peers conducted a parking assessment of the Ontario Ranch Sports Park (Project) to confirm that the proposed parking supply is sufficient for the estimated peak parking demand. The Project's unique uses and location adjacent to high volume roadways has resulted in the City of Ontario requesting that enough parking be provided on site to limit off-site parking and people walking into the site. The assessment concludes that the proposed parking supply is adequate for typical and peak demand operations. The following details the analysis and findings.

Project Description

The proposed Project is a 199-acre sports complex with an associated mixture of commercial and recreation uses. The Project site is bounded by Riverside Drive to the north, Chino Avenue to the south, Cucamonga Creek Flood Control Channel to the east, and Vineyard Avenue to the west, as shown in **Figure 1** below. A total of 6,263 parking spaces are proposed across a variety of surface parking lots and parage garages. The uses within the Project include:

- Retail – 40,000 sf (square feet)
- Fast Casual Restaurant – 140,000 sf
    - 100,000 sf of fast casual restaurant will be for Chicken 'N Pickle
- Park (Skate Park, Tot Lot, Picnic Area) – 11.21 acres
- Hotel – 100 rooms
- Soccer Fields – 13 fields
- Baseball Fields – 9 fields
- Batting Cages – 12 cages
- Indoor Athletic Center – 8 basketball courts or 16 volleyball courts
- Tennis Courts/Pickle Ball Courts – 8 courts
- Swimming Pool – 8 lanes with splash area
- Recreation Community Center – 70,000 sf community use and 25,000 sf office

- Minor League Baseball Stadium – 4,500 attendee baseball game attendance and 6,000 attendee special event attendance with a 20,000 sf office

Figure 1 – Site Plan

Source: City of Ontario, 2023.

Approach

Parking demand estimates were developed for each land use based on the availability of existing data. Parking data and analysis methodologies from *Shared Parking, 3rd Edition* (Urban Land Institute [ULI], 2020) was applied to the following land uses:

- Retail – 40,000 sf
- Fast Casual Restaurant – 40,000 sf
- Park (Skate Park, Tot Lot, Picnic Area) – 11.21 acres
- Hotel – 100 rooms

- Recreation Community Center – 70,000 sf community use and 25,000 sf office
- Minor League Baseball Stadium – 4,500 attendee baseball game and 20,000 sf office

Parking demand estimates for the Chicken 'N Pickle entertainment complex were calculated separately from the shared parking analysis. This tenant has existing locations in Texas, Kansas, Missouri, Oklahoma, and Arizona. The parking demand estimate for the Chicken 'N Pickle restaurant was analyzed separately using empirical data and usage characteristics for a current location in San Antonio, Texas. The use of the empirical data provides a better estimation of parking demand based on the unique aspects of the restaurant and its operational characteristics.

Parking demand estimates for the sports fields, batting cages, indoor athletic center, swimming pool, and 6,000 attendee special event were also calculated separately from the shared parking analysis data as these land uses are not identified in *Shared Parking, 3rd Edition*. The parking demand estimates were developed based on prior parking data, usage characteristic, and professional judgment.

The typical parking demand estimates for the standard ULI data uses and custom data uses were combined to develop a total parking demand for the Project.

SCENARIOS

The operations of the Project will result in various scenarios with different levels of activity between the commercial and recreational components., The following scenarios were identified for consideration of parking demand analysis:

Weekday

- Weekday Baseball/Soccer Practice
    - Parking demand for weekday with baseball/soccer fields used for practice only. Typical parking demand conditions for commercial uses.
- Weekday Minor League Baseball Game with Baseball/Soccer Practice
    - Parking demand for a weekday minor league baseball game with baseball/soccer fields used for practice only. Typical parking demand conditions for commercial uses.

Weekend

- Weekend Minor League Baseball Game with Baseball/Soccer Practice
    - Parking demand for a weekend minor league baseball game with baseball/soccer fields used for practice only. Typical parking demand conditions for commercial uses.

- Weekend Minor League Baseball Game with Baseball/Soccer Games
    - Parking demand for a weekend minor league baseball game with baseball/soccer fields used for games only. Typical parking demand conditions for commercial uses.
- Weekend Minor League Baseball Game with Baseball/Soccer Tournaments
    - Parking demand for a weekend minor league baseball game with the baseball/soccer fields used for tournaments. Typical parking demand conditions for commercial uses.
- Weekend Special Event with Baseball/Soccer Practice
    - Parking demand for a 6,000-attendee weekend special event with baseball/soccer fields used for practice only. Typical parking demand for commercial uses.
- Weekend Special Event with Baseball/Soccer Games
    - Parking demand for a 6,000-attendee weekend special event with baseball/soccer fields used for games only. Typical parking demand conditions for commercial uses.
- Weekend Special Event with Baseball/Soccer Tournaments
    - Parking demand for a 6,000-attendee weekend special event with the baseball/soccer fields used for tournaments. Typical parking demand conditions for commercial uses.

Methodology and Assumptions

Parking demand analysis was conducted for each scenario identified. It was determined that the Weekend Special Event with Baseball/Soccer Tournaments scenario would generate the highest peak parking demand. The methodology and assumptions associated with the estimation of parking demand and the comparison to proposed parking supply is presented below.

LAND USES WITH STANDARD ULI PARKING DATA

A shared parking analysis was conducted using methodologies and assumptions provided in *Shared Parking, 3rd Edition*. The ULI sponsored a national study in 1984 that established a basic methodology for analyzing parking demand in mixed-use developments and developed averages for parking rates by land use. The analysis presented in this memorandum utilizes the data from the updated *Shared Parking, 3rd Edition* report published in 2020.

The shared parking methodology establishes the base parking rate, parking demand reductions, and hourly/monthly demand patterns for each land use. The overall parking demand is calculated by considering the parking demand patterns and parking demand reductions (potential for non-auto modes and internal capture) for each component of the project being analyzed.

Parking Rates

The shared parking analysis for the Project used base parking rates for visitors and employees as determined by ULI. **Table 1** presents the parking rates for both visitors/customers and employees and demonstrates the typical parking needs for some of the Projects land uses.

Table 1: Parking Demand Rates by Land Use

		Weekday		Weekend	
ULI Land Use	Unit	Visitor	Employee	Visitor	Employee
Retail	ksf	2.90	0.70	3.20	0.80
Fast Casual	ksf	12.40	2.00	12.40	2.00
Park	acre	4.00	0.40	5.00	0.50
Hotel	rooms	1.00	0.15	1.00	0.15
Recreation Center	ksf	1.70	0.10	1.71	0.08
Recreation Center Office	ksf	0.30	3.50	0.03	0.35
Baseball Stadium	seats	0.31	0.01	0.34	0.01
Baseball Stadium Office	ksf	0.30	3.50	0.03	0.35

Source: *Shared Parking, 3rd Edition* (Urban Land Institute)

Separate rates were used for weekdays and weekend and for each user. The derived rates use the daily/hourly/seasonal patterns for calculating the parking demand based on the unique travel characteristics of the project being analyzed.

Adjustments were made for two travel factors in accordance with the ULI shared parking methodology: the potential for non-auto modes and estimated internal capture of parking between the land uses in the area.

Parking Demand Reductions

The shared parking analysis allows for adjustment in the base parking rate due to factors such as mode split/walk-in and non-captive ratio. These factors are based on the mix of uses in the project, size of the uses, and location of the project.

- Mode Adjustment – One factor that affects the overall parking demand at a particular development is the number of visitors and employees that arrive by automobile. The alternatives considered in the analysis account for the effects of pedestrian, bicycle, drop-off, and transit access to the site.
- Noncaptive Ratio – Also known as trip internalization. Based on data from empirical studies through sources such as ULI, it is known that a certain percentage of trips in mixed-use

developments (depending on the mix of land uses in the project) are trips moving between the land uses on site, i.e., they were internally captured on the site. Adjustments were made to the analysis to account for trip internalization.

Table 2 documents the adjustment percentages applied to each of the land uses for visitors and employees for different periods of the day. The non-captive ratio was applied based on the mix and size of the uses in the Project. It is assumed that some patrons will only park a vehicle once, but they will visit multiple components of the Project.

Table 2: Shared Parking Model Reductions

	Mode Adjustment		Noncaptive Ratio			
			Weekday		Weekend	
ULI Land Use	Weekday	Weekend	Daytime	Evening	Daytime	Evening
Retail						
- Visitor	1.0	1.0	0.98	0.99	0.99	0.99
- Employee	1.0	1.0	1.0	1.0	1.0	1.0
Fast Casual						
- Visitor	1.0	1.0	0.89	0.90	0.92	0.91
- Employee	1.0	1.0	1.0	1.0	1.0	1.0
Park						
- Visitor	1.0	1.0	0.96	0.96	0.96	0.96
- Employee	1.0	1.0	1.0	1.0	1.0	1.0
Hotel						
- Visitor	1.0	1.0	1.0	1.0	1.0	1.0
- Employee	1.0	1.0	1.0	1.0	1.0	1.0
Recreation Center						
- Visitor	1.0	1.0	0.96	0.96	0.96	0.96
- Employee	1.0	1.0	1.0	1.0	1.0	1.0
Recreation Center Office						
- Visitor	1.0	1.0	1.0	1.0	1.0	1.0
- Employee	1.0	1.0	1.0	1.0	1.0	1.0
Baseball Stadium						
- Visitor	1.0	1.0	0.95	.99	1.0	1.0
- Employee	1.0	1.0	1.0	1.0	1.0	1.0
Baseball Stadium Office						
- Visitor	1.0	1.0	1.0	1.0	1.0	1.0
- Employee	1.0	1.0	1.0	1.0	1.0	1.0

Source: *Shared Parking, 3rd Edition* (Urban Land Institute)

The mode split adjustment was applied based on the location of the Project and the ability of visitors and employees to travel to the Project by a mode other than automobile which they would have to park (i.e., walking or biking). A factor of 1.0 was selected for visitors and employees to represent a conservative estimate (highest) of parking demand. The non-captive ratio adjustment was applied based on data provided in *Shared Parking, 3rd Edition*. The mix of uses with the Project will result in some internalization and the values presented in *Shared Parking, 3rd Edition* represent an appropriate level of parking reduction due to the mix of uses.

Parking Demand Patterns

The shared parking analysis uses monthly adjustment factors and time-of-day adjustment factors to account for the variation in parking demand for different land uses. Based on the anticipated land uses and parking demand reductions applied, monthly adjustment factors are applied based on the month that will result in the greatest parking demand (peak month). The time-of-day factors were applied based on the peak month of demand to determine the estimated parking demand throughout the day. **Appendix A** documents the Project standard ULI land uses weekday and weekend peak month adjustment and time-of-day adjustment for visitors and employees and documents the estimated peak hour parking demand for those land uses.

Shared Parking Demand

Table 3 presents the weekday shared parking demand results for the Project. **Table 4** presents the weekend shared parking demand results for the Project.

Table 3: Weekday Parking Demand for Standard ULI Land Uses

ULI Land Use	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Retail	3	8	18	40	67	84	106	106	102	94	94	94	98	90	75	51	22	9	0
Fast Casual Restaurant	38	60	112	164	303	455	521	521	473	321	291	322	449	427	270	165	113	60	38
Park	1	3	6	13	25	33	42	46	48	46	44	34	44	48	48	48	40	25	5
Hotel	49	52	60	55	50	50	48	48	50	50	48	51	49	46	48	51	51	52	51
Recreation Center	0	0	0	2	27	64	81	85	90	90	85	89	94	89	85	62	9	0	0
Recreation Center Office	3	13	43	80	91	87	72	74	87	83	72	51	21	13	4	3	1	0	0
Baseball Stadium	0	5	5	22	22	22	80	80	80	80	80	83	184	738	1,432	1,432	1,224	358	5
Baseball Stadium Office	1	6	19	36	41	39	32	33	39	37	32	23	9	6	2	1	0	0	0

Table 4: Weekend Parking Demand for Standard ULI Land Uses

ULI Land Use	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Retail	4	9	38	66	87	108	114	119	119	114	110	99	91	86	80	63	39	13	0
Fast Casual Restaurant	35	63	117	172	316	476	546	546	495	336	304	331	462	439	277	170	116	62	39
Park	0	0	1	2	21	39	47	55	59	61	60	53	44	50	61	61	58	33	10
Hotel	49	52	60	55	50	50	48	48	50	50	48	51	49	46	48	51	51	52	51
Recreation Center	0	0	0	1	26	62	80	84	89	89	84	89	93	89	84	61	9	0	0
Recreation Center Office	0	2	6	8	9	10	9	8	6	4	2	1	0	0	0	0	0	0	0
Baseball Stadium	0	0	0	2	2	2	2	2	2	2	9	415	796	1,418	1,570	1,570	1,570	45	45
Baseball Stadium Office	0	1	3	4	4	5	4	4	3	2	1	0	0	0	0	0	0	0	0

LAND USES WITH CUSTOM PARKING DATA

Parking demand estimates for the Chicken ‘N Pickle casual restaurant, sports fields, batting cages, indoor athletic center, swimming pool, and 6,000 attendee special event was calculated separately from the shared parking analysis as the land uses are either not represented in the ULI data or empirical data for a comparable site was available and utilized to prepare a parking demand estimate.

Chicken ‘N Pickle Casual Restaurant

While the casual restaurant land use is identified in ULI, the unique nature of the proposed tenant and the availability of empirical data resulted in not using the shared parking data. The proposed tenant, Chicken N Pickle, is an indoor/outdoor entertainment complex including a casual restaurant and sports bar that boasts pickle ball courts and a variety of yard games. There are currently existing locations in Texas, Kansas, Missouri, Oklahoma, and Arizona.

Daily trip generation data for an existing 78,000 sf location in San Antonio, Texas was utilized to estimate weekday and weekend parking demand for that site by reviewing and in and out driveway split for a 24-hour period. As the Project location is proposing a 100,000 sf facility, the weekday and weekend parking demand information from the San Antonio, Texas location was factored according to the difference in the square footage to estimate parking demand for the Project location. To prepare a conservative estimate of parking demand, no credits for mode adjustment or internalization were applied to this use. The weekday and weekend hourly parking demand for the Chicken ‘N Pickle, along with the other custom uses is provided in **Table 5** and **Table 6**, respectively.

Sports Fields

The sports fields consist of both soccer and baseball fields. The days and time periods of use will vary depending on what activities are occurring. Assumptions regarding the activities, time of use, participants, and parking demand are provided.

Soccer Fields

It was determined that the soccer fields could be used for practices, regular games, and tournament games. It was assumed that practices will occur on weekdays from 4:00 PM to 8:00 PM and regular games and tournaments will occur on weekends from 8:00 AM to 8:00 PM.

The following parking assumptions for each type of activity are presented below:

- Practice
  - One team of 15 players, 15 spectators, and 1 coach
  - Average vehicle occupancy of 1.6 players/spectators per vehicle and 1 coach per vehicle
  - Resulting in parking demand of 20 spaces per field
- Regular Game
  - Two teams of 15 players and 1 coach each (30 players and 2 coaches total) and 75 spectators
  - Average vehicle occupancy of 3.2 players/spectators per vehicle and 1 coach per vehicle
  - Resulting in parking demand of 35 spaces per field
- Tournament Game
  - Two teams of 15 players and 1 coach each (30 players and 2 coaches total) and 75 spectators
  - Average vehicle occupancy of 3 players/spectators per vehicle and 1 coach per vehicle
  - Resulting in parking demand of 37 spaces per field

Weekday peak parking demand was determined to be 20 spaces per field resulting in a peak demand of 260 parking spaces per hour.

Weekend parking demand was determined to be higher with the tournament games than regular games. Tournament style games typically have a larger attendance and therefore represent a higher parking demand per field than practices or regular games. Additionally, practices were assumed to have a lower average vehicle occupancy rate than soccer games and tournaments as some parents drop off/pick up their kids. The use of all 13 soccer fields for tournament play on weekends between the hours of 8:00 AM and 8:00 PM represents a conservative parking demand estimate of 481 parking spaces per hour for the soccer fields.

To account for additional tournament soccer teams and spectators that may not be actively using the fields during a given hour, the 481-parking space demand for players and spectators was factored by an average vehicle occupancy rate of 3.0 to represent a greater demand for parking.

The weekday and weekend hourly parking demand for the soccer fields, along with the other custom uses is provided in **Table 5** and **Table 6**, respectively.

Baseball Fields

It was determined that the baseball fields could be used for practices, regular games, and tournament games. It was assumed that practices will occur on weekdays from 4:00 PM to 8:00 PM and regular games and tournaments will occur on weekends from 8:00 AM to 8:00 PM.

The following parking assumptions for each type of activity are presented below:

- Practice
  - One team of 20 players,20 spectators, and 1 coach,
  - Average vehicle occupancy of 1.5 players/spectators per vehicle and 1 coach per vehicle
  - Resulting in parking demand of 27 spaces per field
- Regular Game
  - Two teams of 20 players and 1 coach each (40 players and 2 coaches total) and 20 spectators
  - Average vehicle occupancy of 2.5vehicles per player/spectator and 1 coach per vehicle
  - Resulting in parking demand of 34 spaces per field
- Tournament Game
  - Two teams of 20 players and 1 coach each (40 players and 2 coaches total) and 20 spectators
  - Parking demand of 2.9 vehicles per player/spectator and 1 coach per vehicle
  - Resulting in parking demand of 30 spaces per field

Weekday peak parking demand was determined to be 27 spaces per field resulting in a peak demand of 243 parking spaces per hour.

Weekend parking demand was determined to be higher with the tournament games than regular games. Tournament style games typically have a larger attendance and therefore represent a higher parking demand per field than practices or regular games. Additionally, practices were assumed to have a lower average vehicle occupancy rate than soccer games and tournaments as some parents drop off/pick up their kids. The use of all 9 baseball fields for tournament play on weekends between the hours of 8:00 AM and 8:00 PM represents a conservative parking demand estimate of 270 parking spaces per hour for the baseball fields.

To account for additional tournament baseball teams and spectators that may not be actively using the fields during a given hour, the 270-parking space demand for players and spectators was factored by 2.9 to represent a greater demand of parking.

The weekday and weekend hourly parking demand for the baseball fields, along with the other custom uses is provided in **Table 5** and **Table 6**, respectively.

Batting Cages

The batting cages are anticipated to be an ancillary use to the baseball fields and only accessible to programs that use the baseball fields. To provide a conservative estimate of parking demand, it was assumed that the batting cages could have a separate parking demand from the baseball fields. In addition, it was assumed that the batting cages would be utilized during the same periods of time as the baseball fields, on weekdays from 4:00 PM to 8:00 PM and on weekends from 8:00 AM to 8:00 PM. The following parking assumptions were made for the batting cages:

- 4 persons per batting cage
- Parking demand of 0.5 spaces per person
- Resulting in parking demand of 2 spaces per batting cage

Weekday and weekend peak parking demand was determined to be 2 spaces per batting cage resulting in a peak demand of 24 parking spaces per hour. The weekday and weekend hourly parking demand for the batting cages, along with the other custom uses is provided in **Table 5** and **Table 6**, respectively.

Indoor Athletic Center

The indoor athletic center could be configured to operate up to 8 basketball courts, up to 16 volleyball courts, or a combination of both. Given the number of players per volleyball team (assumed 14 players per volleyball team versus 12 players per basketball team) and the higher number of volleyball courts, it was determined that the configuration of 16 volley courts would result in a higher parking demand.

It was assumed that use of the volleyball courts will occur on weekdays and weekends from 8:00 AM to 8:00 PM. The following parking assumptions were made for the volleyball courts:

- Two teams of 14 players and 1 coach each with 14 spectators for practice and 56 spectators for games
- Average vehicle occupancy of 1.3 players/spectators per vehicle and 1 coach per vehicle for practices and an average vehicle occupancy of 2.1 players/spectators per vehicle and 1 coach per vehicle for games
- Resulting in parking demand of 23 spaces per volleyball court for practices and 42 spaces per volleyball court for games

Weekday and weekend peak parking demand was determined to be 23 spaces per volleyball court for practices and 42 spaces per volleyball court for games resulting in a peak demand of 368 parking spaces per hour and 672 parking spaces per hour for practices and games respectively. The weekday and weekend hourly parking demand for the volleyball court, along with the other custom uses is provided in **Table 5** and **Table 6**, respectively.

Tennis/Pickle Ball Court

The tennis/pickle ball courts will consist of 8 courts that can accommodate tennis or pickle ball. It was assumed that use of the tennis/pickle ball courts will operate on weekdays and weekends from 8:00 AM to 8:00 PM. The following parking assumptions were made for the tennis/pickle ball courts:

- Two teams of 2 players each
- Two additional teams of 2 players waiting to play per court
- Parking demand of 1 space per player
- Resulting in parking demand of 8 spaces per tennis/pickle ball court

Given the increase in popularity of pickle ball, the addition of waiting teams was included in this parking demand estimate. Weekday and weekend peak parking demand was determined to be 8 spaces per tennis/pickle ball court resulting in a peak demand 64 parking spaces per hour. The weekday and weekend hourly parking demand for the tennis/pickle ball, along with the other custom uses is provided in **Table 5** and **Table 6**, respectively.

Swimming Pool

The swimming pool will consist of 8 lanes for lap swimming. It was assumed that use of the swimming pool will occur on weekdays and weekends from 8:00 AM to 8:00 PM. The following parking assumptions were made for the swimming pool:

- 2 swimmers per lane
- Parking demand of 1 space per swimmer
- Resulting in parking demand of 2 spaces per lane

Weekday and weekend peak parking demand was determined to be 2 spaces per lane resulting in a peak demand of 16 parking spaces per hour. The weekday and weekend hourly parking demand for the swimming pool, along with the other custom uses is provided in **Table 5** and **Table 6**, respectively.

Special Event

The minor league baseball stadium can be utilized for special events such as concerts or other performances with up to 6,000 attendees. It was assumed that special events would only occur on weekends from 5:00 PM to 12:00 AM (midnight). The following parking assumptions were made for the special event:

- 6,000 attendees
- Parking demand of 2.5 people per vehicle
- Resulting in parking demand of 2,400 spaces

Weekend peak parking demand was determined to be 2,400 spaces per hour. This analysis is taking a conservative approach by assuming a longer time period than typical concerts (6 hours versus 3 hours). This longer time period does not account for any buildup or drawdown of parking demand but rather assumes the peak parking demand is present for the entirety of the 6-hour period. The weekend hourly parking demand for the special event, along with the other custom uses is provided in **Table 5** and **Table 6**, respectively.

It should be noted that the minor league baseball stadium cannot be used at the same time for a baseball game and special event. As the special event has a greater seat capacity and parking demand than the minor league baseball game, the special event scenario will result in the higher parking demand for the Project.

Table 5: Weekday Parking Demand for Custom Land Uses

ULI Land Use	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Chicken 'N Pickle	0	3	54	69	50	53	69	90	85	77	158	194	218	210	176	136	96	35	0
Soccer Fields (Practice)											260	260	260	260					
Baseball Fields (Practice)											243	243	243	243					
Batting Cages											24	24	24	24					
Indoor Athletic Center (Volleyball)			368	368	368	368	368	368	368	368	368	368	368	368					
Tennis/Pickle Ball Court			64	64	64	64	64	64	64	64	64	64	64	64					
Swimming Pool			16	16	16	16	16	16	16	16	16	16	16	16					
Special Event																			

Table 6: Weekend Parking Demand for Custom Land Uses

ULI Land Use	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Chicken 'N Pickle	1	8	81	167	127	81	133	151	206	219	241	321	355	351	368	329	253	153	0
Soccer Fields (Tournament)			481	481	481	481	481	481	481	481	481	481	481	481					
Baseball Fields (Tournament)			270	270	270	270	270	270	270	270	270	270	270	270					
Batting Cages			24	24	24	24	24	24	24	24	24	24	24	24					
Indoor Athletic Center (Volleyball)			672	672	672	672	672	672	672	672	672	672	672	672					
Tennis/Pickle Ball Court			64	64	64	64	64	64	64	64	64	64	64	64					
Swimming Pool			16	16	16	16	16	16	16	16	16	16	16	16					
Special Event												2,400	2,400	2,400	2,400	2,400	2,400	2,400	

Findings

Combining the weekday parking demand of the standard ULI land uses in **Table 3** and the custom land uses in **Table 5** results in a peak weekday parking demand of 2,642 spaces at 7:00 PM as presented in **Table 7**. A graphical representation of the weekday parking demand is presented in **Figure 2**.

Combining the weekend parking demand of the standard ULI land uses in **Table 4** and the custom land uses in **Table 6** results in a peak weekend parking demand of 5,021 paces at 6:00 PM as presented in **Table 8**. A graphical representation of the weekday parking demand is presented in **Figure 3**.

Graphical representations of all the scenarios considered in this analysis are presented in **Appendix B**.

The state of the practice considers a parking supply buffer of 5% - 15% appropriate to account for turnover and parking inefficiencies. As documented by the Urban Land Institute (ULI) in *Shared Parking, Third Edition* (2020), "“A parking facility will be perceived as full at somewhat less than its actual capacity, generally in the rate of 85 to 95 percent occupancy” (p. 15). The parking spaces associated with this factor provide a cushion of parking supply to account for mis-parked vehicles, vehicle maneuvers, and vacancies associated with reserved spaces. As a result of this consideration the Project could be considered full when parking spaces are 90% utilized. It is recommended that the peak parking demand of 5,021 spaces not exceed 90% utilization of the total parking supply. Therefore, a minimum of 5,579 (5,021 ÷ 0.90 = 5,579) parking spaces should be provided. As the Project is proposing a parking supply of 6,293 spaces there is sufficient parking supply to accommodate the peak parking demand of the Project.

Table 7: Weekday Parking Demand for Minor League Baseball Game with Baseball/Soccer Practice

ULI Land Use	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Retail	3	8	18	40	67	84	106	106	102	94	94	94	98	90	75	51	22	9	0
Casual Restaurant	38	60	112	164	303	455	521	521	473	321	291	322	449	427	270	165	113	60	38
Park	1	3	6	13	25	33	42	46	48	46	44	34	44	48	48	48	40	25	5
Hotel	49	52	60	55	50	50	48	48	50	50	48	51	49	46	48	51	51	52	51
Recreation Center	0	0	0	2	27	64	81	85	90	90	85	89	94	89	85	62	9	0	0
Recreation Center Office	3	13	43	80	91	87	72	74	87	83	72	51	21	13	4	3	1	0	0
Baseball Stadium	0	5	5	22	22	22	80	80	80	80	80	83	184	738	1,432	1,432	1,224	358	5
Baseball Stadium Office	1	6	19	36	41	39	32	33	39	37	32	23	9	6	2	1	0	0	0
Chicken 'N Pickle	0	3	54	69	50	53	69	90	85	77	158	194	218	210	176	136	96	35	0
Soccer Fields (Practice)											260	260	260	260					
Baseball Fields (Practice)											243	243	243	243					
Batting Cages											24	24	24	24					
Indoor Athletic Center (Volleyball)			368	368	368	368	368	368	368	368	368	368	368	368					
Tennis/Pickle Ball Court			64	64	64	64	64	64	64	64	64	64	64	64					
Swimming Pool			16	16	16	16	16	16	16	16	16	16	16	16					
Special Event																			
Total	95	150	765	929	1,124	1,335	1,499	1,531	1,502	1,326	1,879	1,916	2,141	2,642	2,140	1,949	1,556	539	99
Total with 10% Buffer	105	165	842	1022	1236	1469	1649	1684	1652	1459	2067	2108	2355	2906	2354	2144	1712	593	109
Supply	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263
Difference	6,158	6,098	5,421	5,241	5,027	4,794	4,614	4,579	4,611	4,804	4,196	4,155	3,908	3,357	3,909	4,119	4,551	5,670	6,154

Figure 2 – Weekday Minor League Baseball Game with Baseball/Soccer Practice

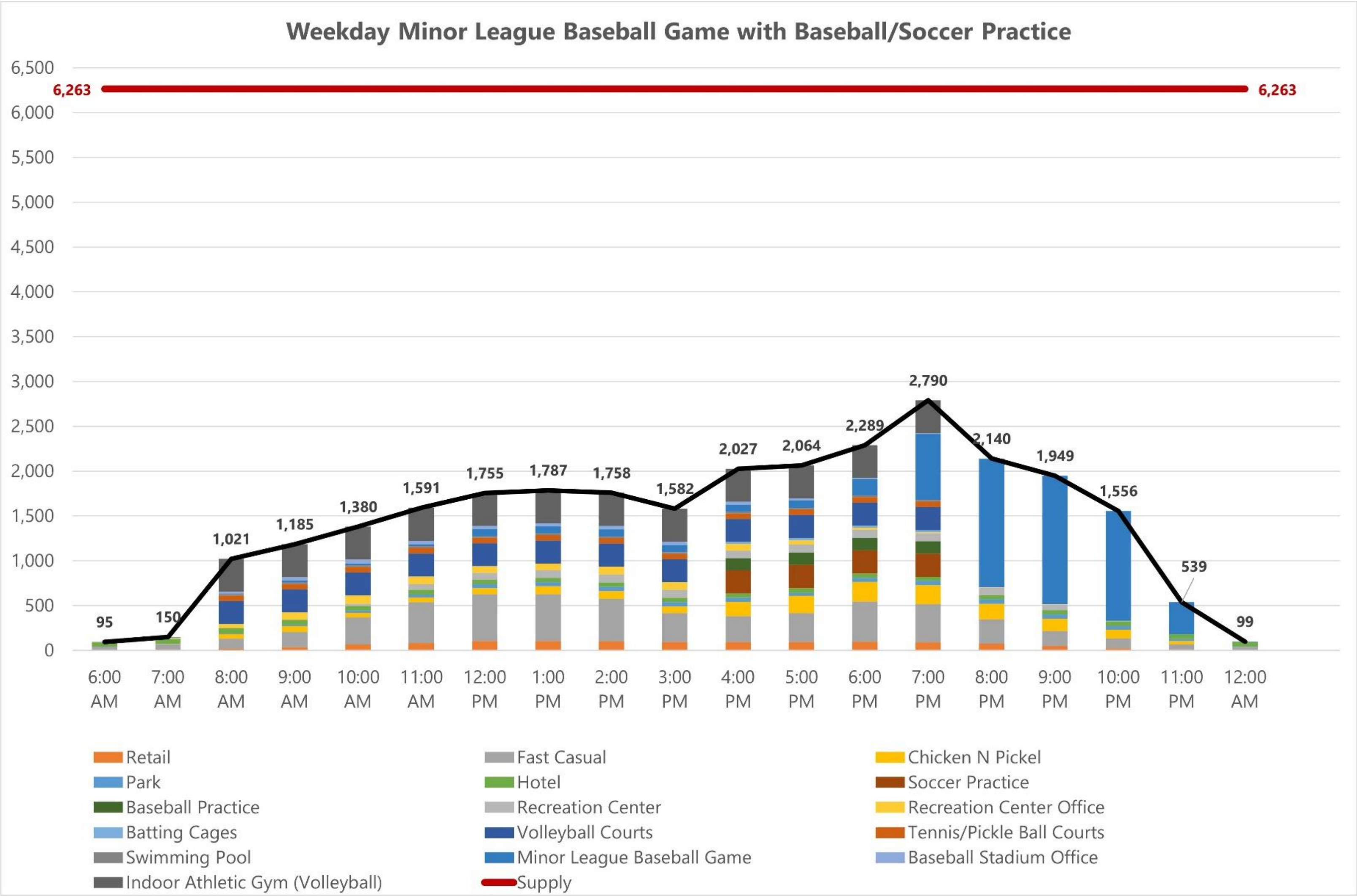
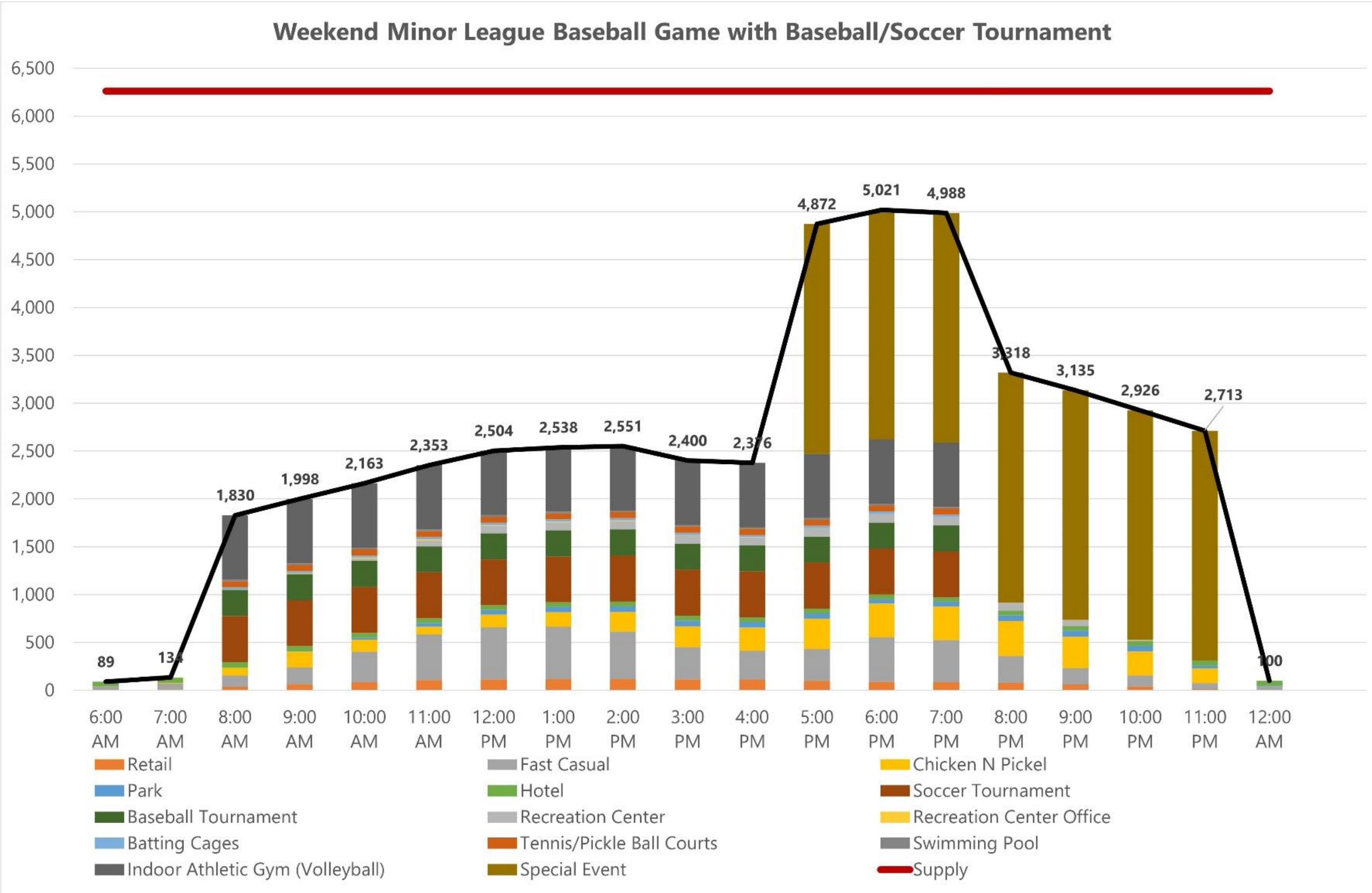


Table 8: Weekend Parking Demand

ULI Land Use	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Retail	4	9	38	66	87	108	114	119	119	114	110	99	91	86	80	63	39	13	0
Casual Restaurant	35	63	117	172	316	476	546	546	495	336	304	331	462	439	277	170	116	62	39
Park	0	0	1	2	21	39	47	55	59	61	60	53	44	50	61	61	58	33	10
Hotel	49	52	60	55	50	50	48	48	50	50	48	51	49	46	48	51	51	52	51
Recreation Center	0	0	0	1	26	62	80	84	89	89	84	89	93	89	84	61	9	0	0
Recreation Center Office	0	2	6	8	9	10	9	8	6	4	2	1	0	0	0	0	0	0	0
Baseball Stadium																			
Baseball Stadium Office	0	1	3	4	4	5	4	4	3	2	1	0	0	0	0	0	0	0	0
Chicken 'N Pickle	1	8	81	167	127	81	133	151	206	219	241	321	355	351	368	329	253	153	0
Soccer Fields (Tournament)			481	481	481	481	481	481	481	481	481	481	481	481					
Baseball Fields (Tournament)			270	270	270	270	270	270	270	270	270	270	270	270					
Batting Cages			24	24	24	24	24	24	24	24	24	24	24	24					
Indoor Athletic Center (Volleyball game)			672	672	672	672	672	672	672	672	672	672	672	672					
Tennis/Pickle Ball Court			64	64	64	64	64	64	64	64	64	64	64	64					
Swimming Pool			16	16	16	16	16	16	16	16	16	16	16	16					
Special Event													2,400	2,400	2,400	2,400	2,400	2,400	
Total	89	134	1,830	1,998	2,163	2,353	2,504	2,538	2,551	2,400	2,376	4,872	5,021	4,988	3,318	3,135	2,926	2,713	100
Total with 10% Buffer	98	147	2,013	2,197	2,379	2,588	2,754	2,791	2,806	2,640	2,613	5,359	5,524	5,487	3,650	3,449	3,219	2,984	110

Supply	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263
Difference	6,165	6,116	4,250	4,066	3,884	3,675	3,509	3,472	3,457	3,623	3,650	904	739	776	2,613	2,814	3,044	3,279	6,153

Figure 3 – Weekend Minor League Baseball Game with Baseball/Soccer Tournament



Appendix A

Table 1: Project ULI Land Uses Weekday Peak Month

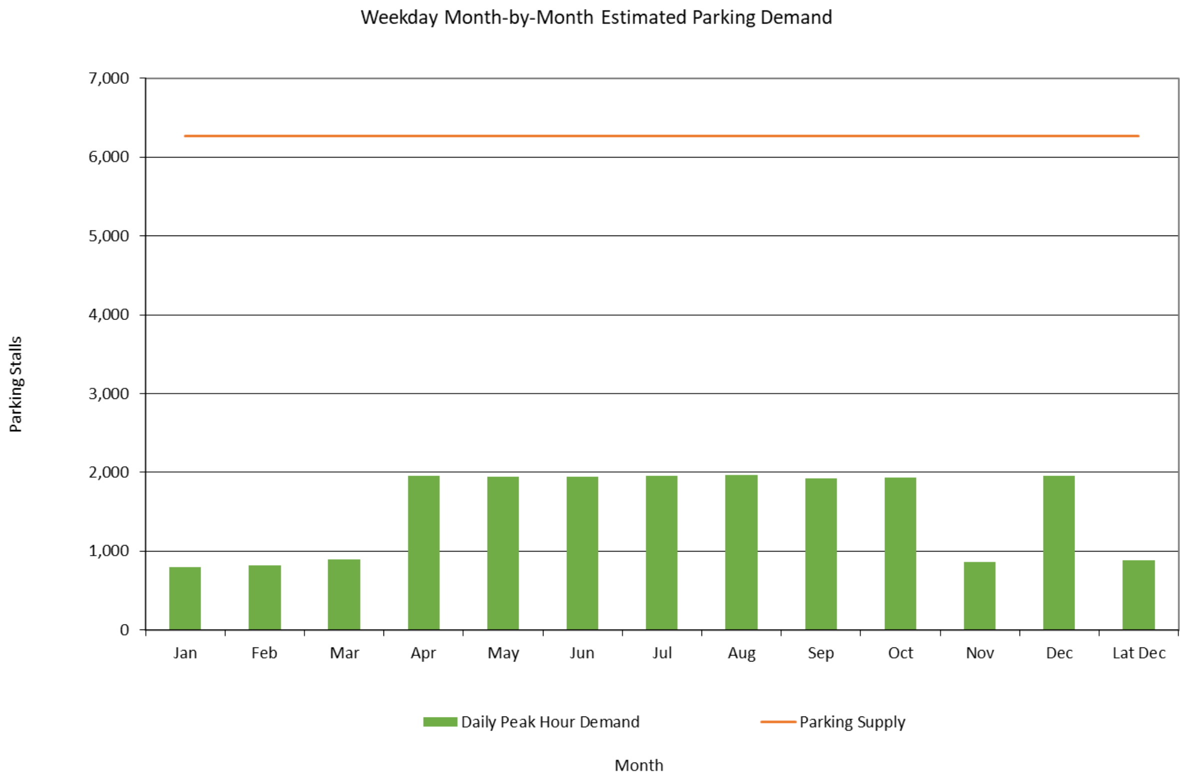


Table 2: Project ULI Land Uses Weekend Peak Month

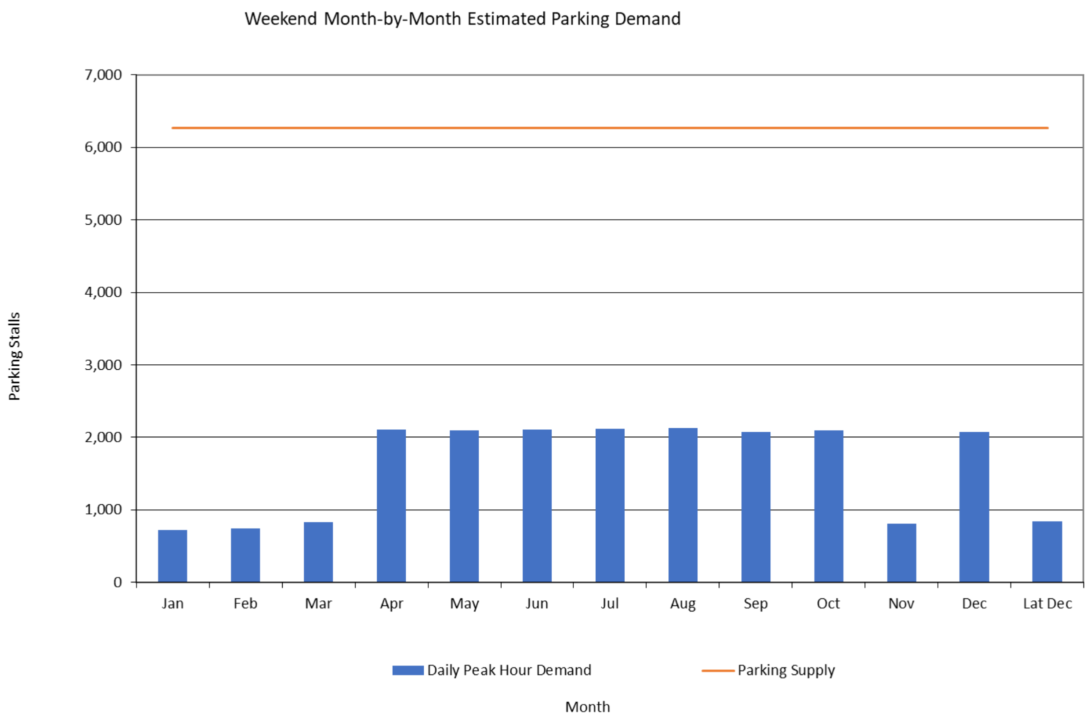


Table 3: Project ULI Land Uses Weekday Peak Hour

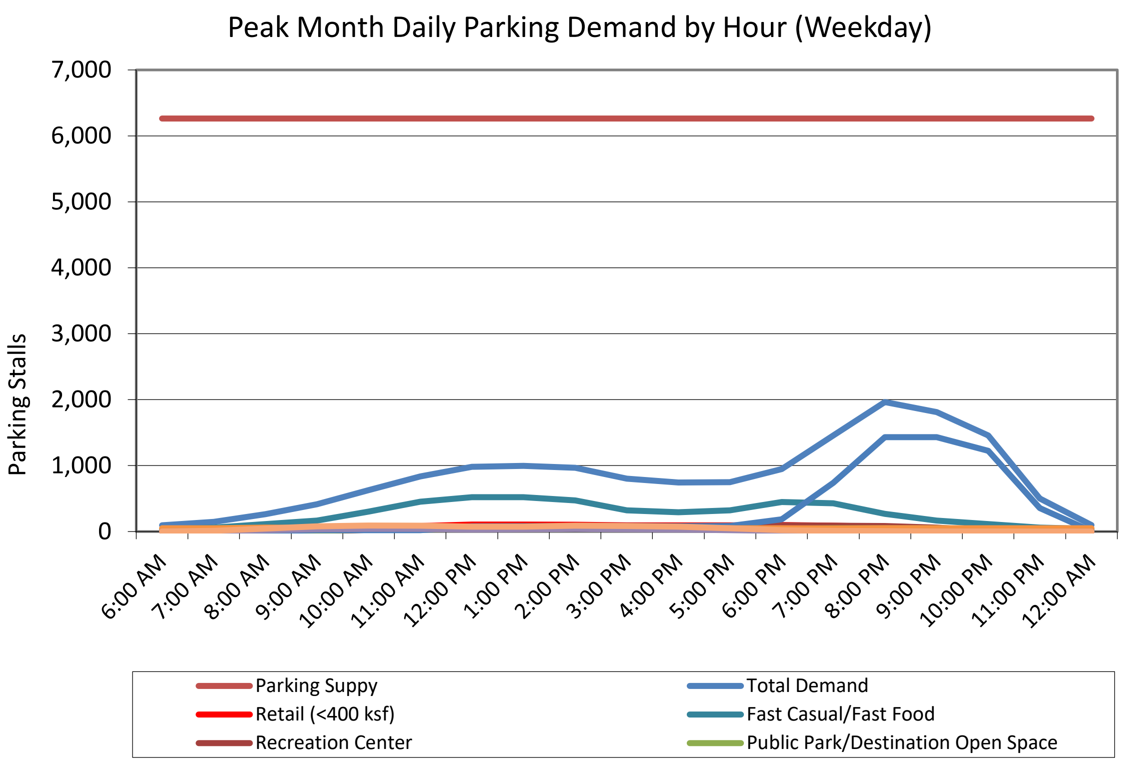
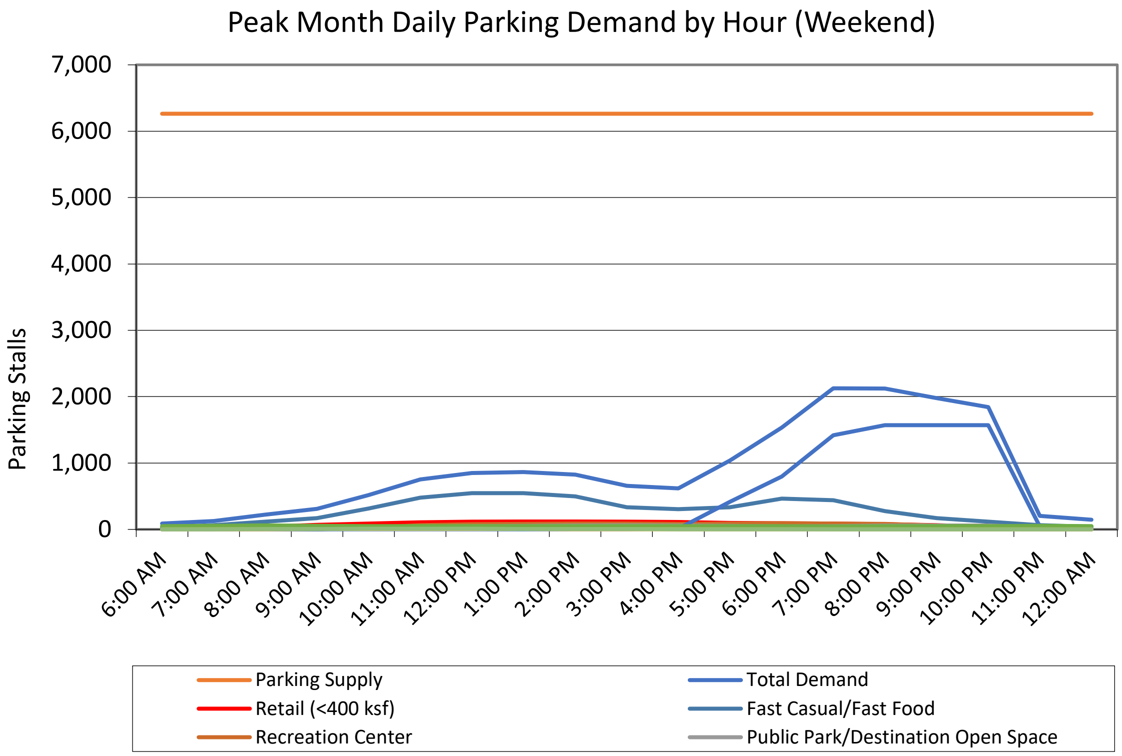
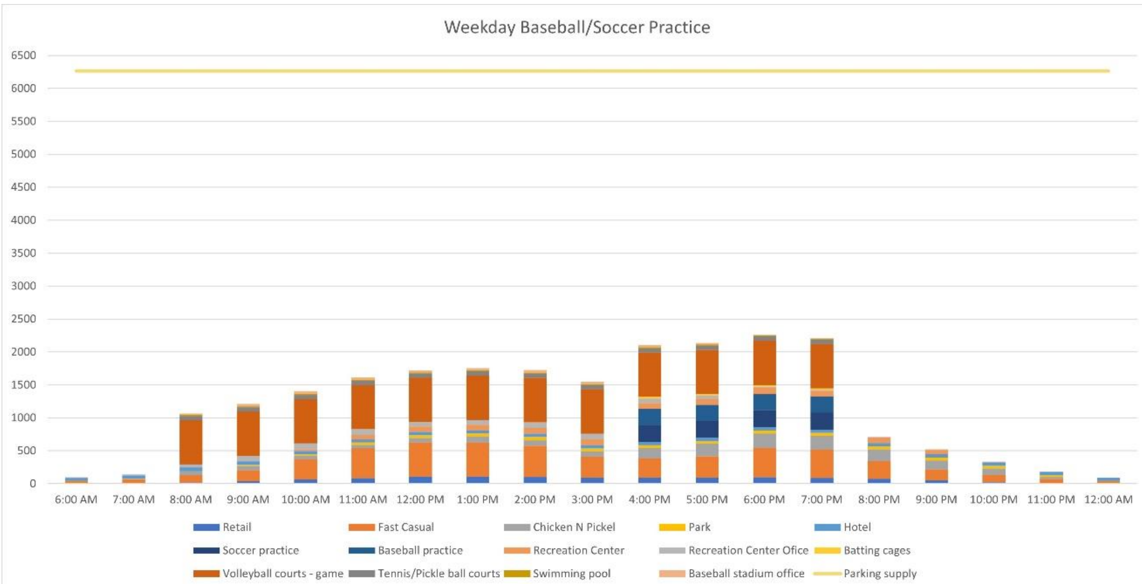


Table 4: Project ULI Land Uses Weekend Peak Hour

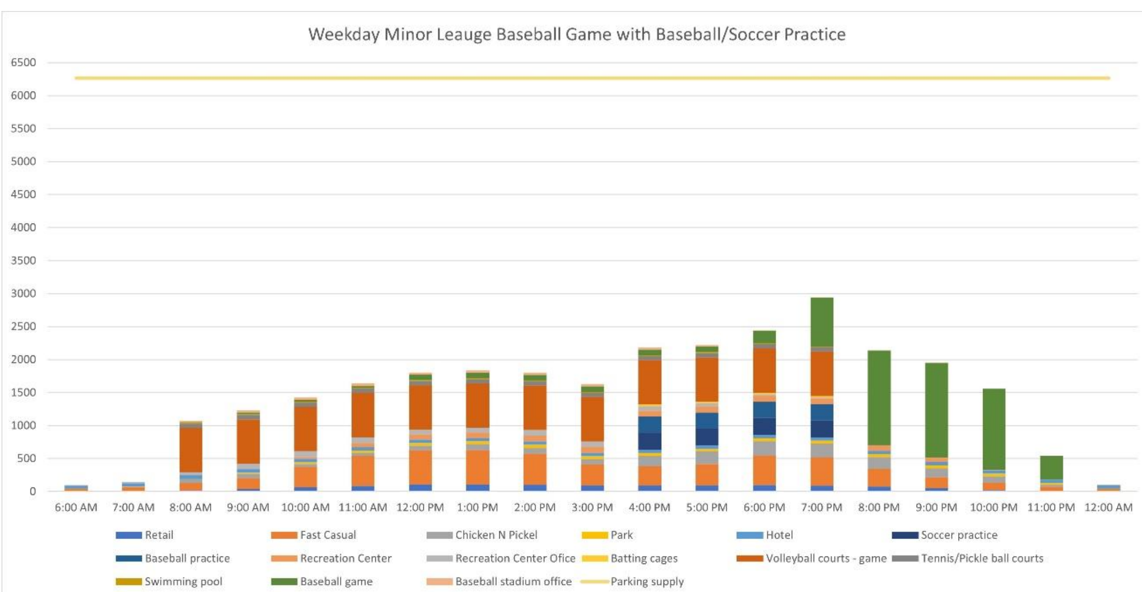


Appendix B

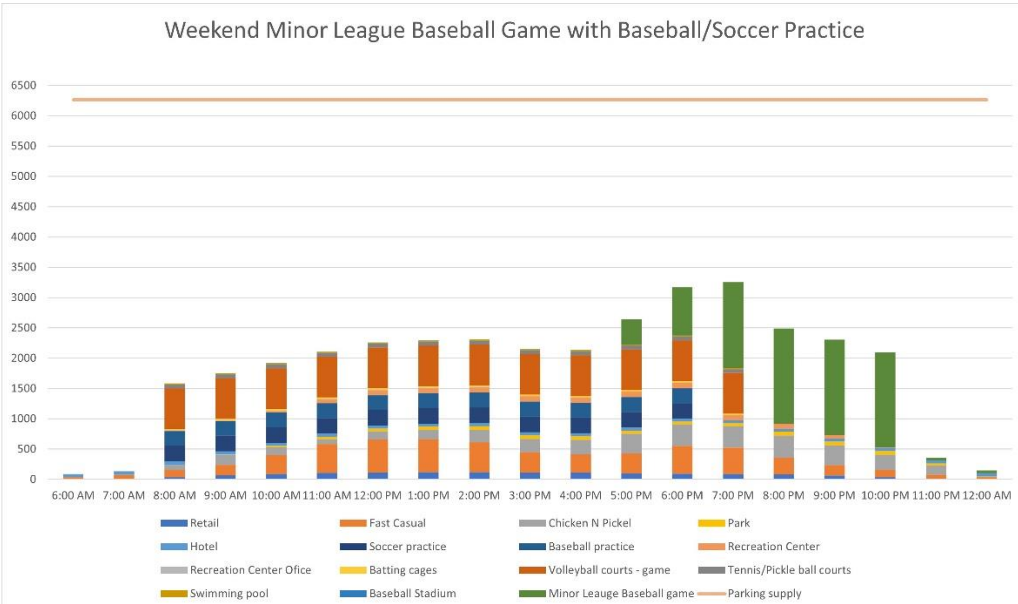
Scenario 1: Weekday Baseball/Soccer Practice



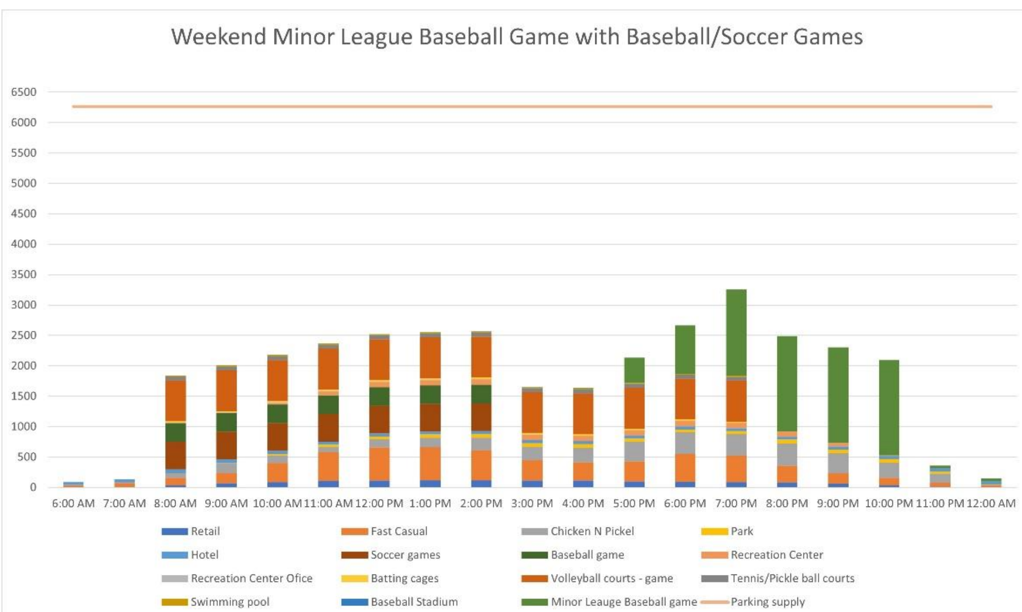
Scenario 2: Weekday Minor League Baseball Game with Baseball/Soccer Practice



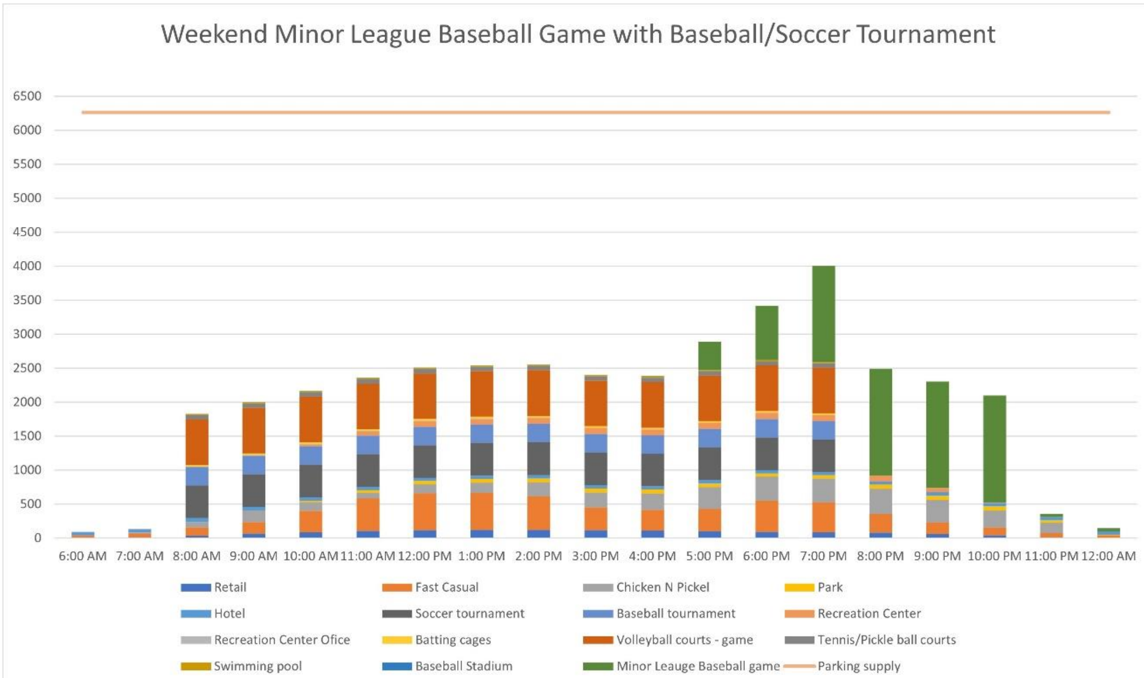
Scenario 3: Weekend Minor League Baseball Game with Baseball/Soccer Practice



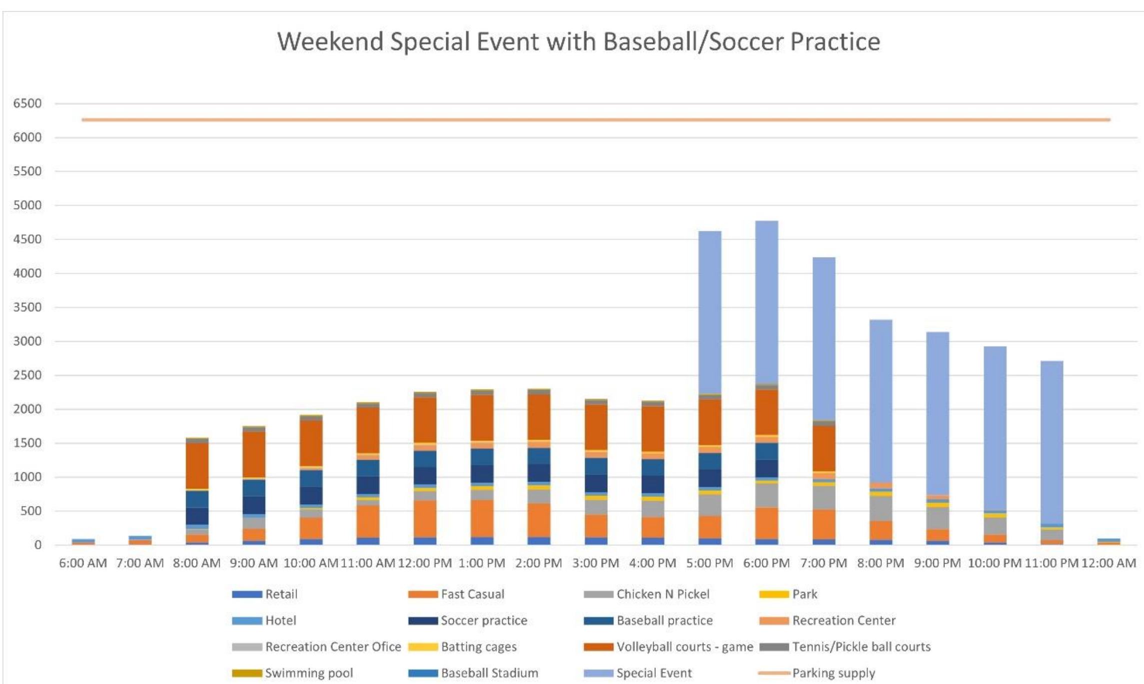
Scenario 4: Weekend Minor League Baseball Game with Baseball/Soccer Games



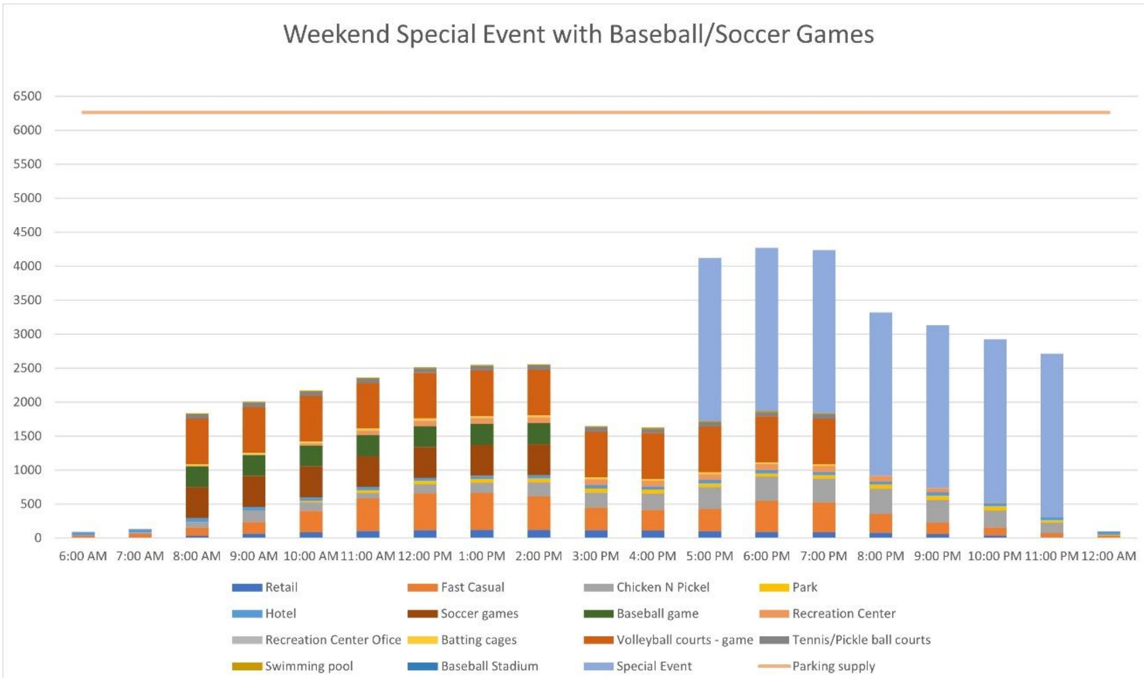
Scenario 5: Weekend Minor League Baseball Game with Baseball/Soccer Tournaments



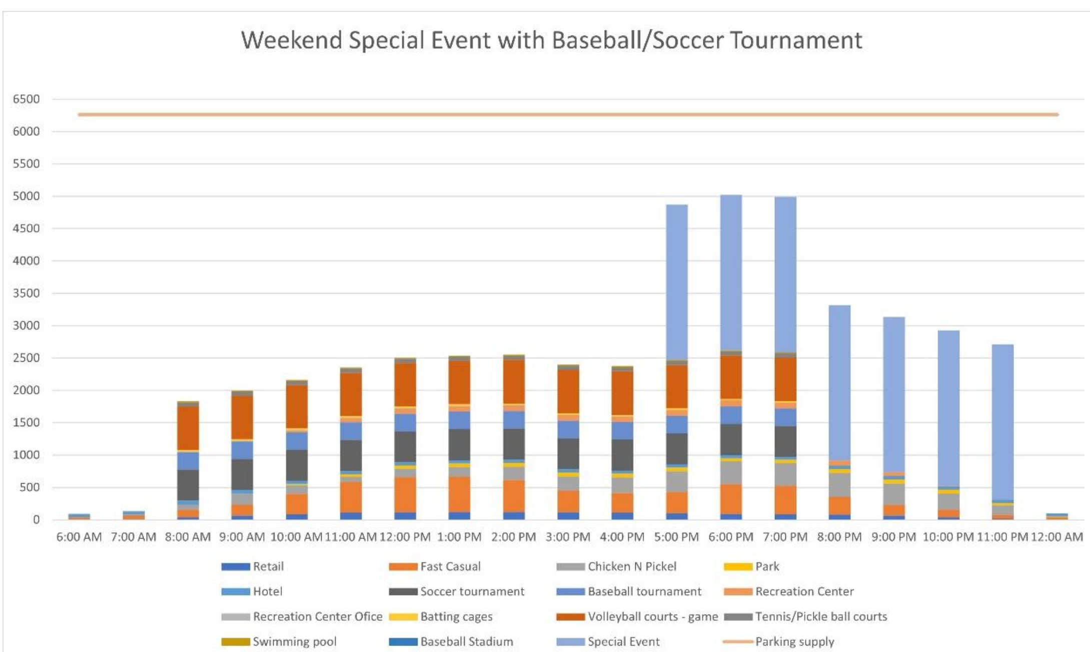
Scenario 6: Weekend Special Event with Baseball/Soccer Practice



Scenario 7: Weekend Special Event with Baseball/Soccer Games



Scenario 8: Weekend Special Event with Baseball/Soccer Tournament



Appendix A2. Preliminary Event Traffic Management Plan

Appendix

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DRAFT Ontario Regional Sports Complex

Event Transportation Management Plan (TMP)

Prepared for:
City of Ontario

June 2024

OC20-0741

FEHR PEERS

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1. Introduction

1.1 Purpose and Objectives

This Event Transportation Management Plan (TMP) outlines strategies and procedures to provide convenient and efficient access for all modes of travel to and from the proposed stadium and recreational uses at the Ontario Regional Sports Complex (ORSC). This plan provides high-level guidance for managing access and circulation to, within, and from the Project Site. The TMP is intended to be a flexible document that can be amended by the City as conditions change and based on the unique needs of each event that employs the TMP.

The key objectives of the TMP are to:

- Minimize single occupancy auto mode share and reduce vehicle trips and parking demand generated by the project to the maximum extent practicable
- Facilitate and promote use of non-automobile transportation by people attending and supporting games, events, and other uses on-site
- Facilitate a high-quality walking experience to the stadium from adjacent hospitality land uses in Planning Areas (PAs) 2, 3, and 4 by identifying key walking routes and major street crossing locations so that wayfinding, infrastructure improvements, and/or personnel (e.g., traffic control officers, parking control officers, or other personnel acceptable to the City) can be placed at critical points to manage the interaction of pedestrians and vehicles during medium and large events
- Improve safety for all transportation users at key locations in and around the ORSC site during event ingress and egress
- Minimize conflicts between ridesharing (i.e., Lyft, Uber), taxi operations, transit, walking, and biking near the ORSC site
- Designate specific rideshare/taxi pick-up and drop-off zones on public streets
- Facilitate the safe and efficient flow of vehicle traffic into and out of the site and the adjacent neighborhoods during event conditions
- Minimize event-related vehicular, bicycle, and pedestrian impacts to surrounding residential and commercial areas
- Minimize impacts to through traffic on adjacent arterial streets by separating project traffic to the extent possible

This version of the TMP was prepared during the environmental review stage of the Project when final site plan and operational procedures have not yet been established. It is anticipated that this document will be updated periodically to account for changes in operations and as information becomes available. Chapter 7 identifies a formal review process and event oversight committee that will regularly review procedures outlined in the TMP.

1.2 Roles and Responsibilities

Table 1 describes the roles and responsibilities for key agencies and entities that would play important roles in implementing the TMP.

This document does not identify specific entities which will carry out certain actions because contractual, logistical, and other details have not yet been finalized. In many instances, the responsibilities are assigned to "the City or Stadium operator," reflecting that several City departments (e.g. Police, Public Works) may have responsibility; alternatively the responsibility could be placed on the Stadium operator or other subcontractor. As proposed programming is finalized for the facilities on the Project Site it is anticipated that roles and responsibilities would be more clearly defined.

Table 1: Key Agency Roles and Responsibilities

Agency or Entity	Roles and Responsibilities
City of Ontario Department of Public Works (DPW)	DPW has jurisdiction over the City's public right-of-way (ROW), traffic operations, and parking. It manages all surface transportation infrastructure and systems in the City (roads, sidewalks, parking lots, etc.). DPW will assist in managing parking facilities and reviewing and implementing temporary traffic control as needed
City of Ontario Police Department (Ontario PD)	Ontario PD is responsible for emergency response, preparation/implementation of traffic control plans, and incident management. Ontario PD may assist in managing event traffic (e.g. through traffic control officers). Ontario PD will also coordinate with OFD and other agencies as needed.
City of Ontario Fire Department (OFD)	OFD provides fire suppression and emergency medical services for residents, visitors, and employees within the City of Ontario.
City of Ontario Recreation & Community Services Department (ORCSD)	ORCSD will operate and maintain the public recreation and athletic facilities on the Project site, review event permits, and manage major event programming to ensure compliance with established rules and guidelines.
Minor Leage Baseball Team Franchise/Stadium Event Operators	The baseball team franchise and other event operators will be responsible for reviewing event characteristics and assisting in the implementation of Transportation Demand Management (TDM) strategies and the TMP as needed for events.
Sports Leagues/Tournament Operators	Sports leagues and tournament operators will be responsible for coordinating with ORCSD to complete event permitting and assist in the implementation of the TMP and Project TDM strategies.

Agency or Entity	Roles and Responsibilities
Omnitrans	Omnitrans is the public transportation provider for southwest San Bernardino County. Omnitrans could work with the City to manage public transportation access during events and implement TDM measures.

1.3 Report Organization

The remainder of this report is organized into the following chapters:

- Chapter 2 (Project Description) – describes the ORSC Project Site including the location, project site plan, proposed land uses, and anticipated annual activities
- Chapter 3 (Travel Characteristics) – explains the expected number of trips, mode share, and major travel routes to and from the Project Site under different event scenarios
- Chapter 4 (Traffic Element) – discusses planned personal auto access to and from the site during events
- Chapter 5 (Transit and Rideshare Element) – discusses planned public transportation and ride-share access to and from the site during events
- Chapter 6 (Active Transportation Element) – discusses planned bicycle and pedestrian access to and from the site during events
- Chapter 7 (Emergency Access Element) – discusses planned emergency vehicle access to and from the site during events
- Chapter 8 (Monitoring) – presents a set of performance standards and a monitoring plan that should be implemented once the Project is operational

1.4 Coordination with Parking and Transportation Demand Management Plan

The City has developed a Parking and Transportation Demand Management (TDM) Plan to provide strategies to reduce the number of vehicle trips to/from the Project site and explain how these strategies will be implemented. Specifically, the Parking and TDM Plan supports the TMP by:

- Explaining parking management measures for events and different land uses
- Identifying potential ways these measures will be enforced
- Promoting non-automotive modes of travel to access the Project

It is anticipated that if the TMP is updated, parking/TDM measures will need to be reviewed and vice versa.

2. Project Description

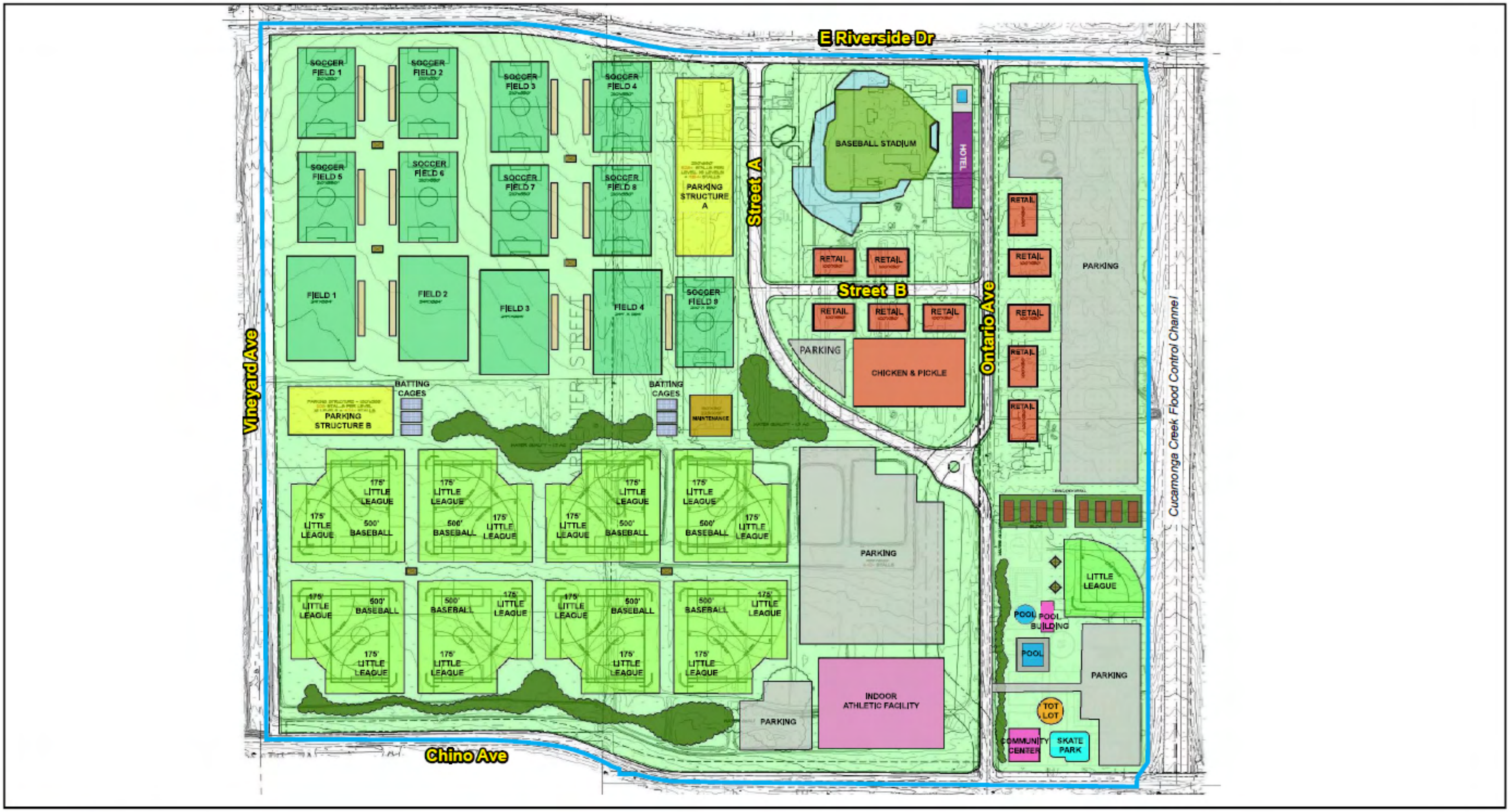
2.1 Overview

The proposed Project is a 199-acre sports complex with a mix of uses. The Project site is bounded by Riverside Drive to the north, Chino Avenue to the south, Cucamonga Creek Flood Control Channel to the east, and Vineyard Avenue to the west, as shown in **Figure 1**.

The Project will consist of the following land uses:

- Planning Area (PA) 1: Semi-professional Minor League Baseball Stadium (6,000-person capacity)
- PAs 2-4: Commercial Retail, Baseball Stadium Retail, Retail and Hospitality Areas
- PA 5: City Park (Outdoor Baseball/Softball, Soccer, and Multi-use Fields)
- PA 6: City Park (Indoor Athletic Facility)
- PA 7: Community Recreation Center

Development of the Project will be completed over multiple phases, with Project components anticipated to open between Spring 2025 and Fall 2027.



Project Boundary

0 500 Scale (Feet)

Source: RUM Design Group 2023; Ontario 2023.

Figure 1

Proposed Site Plan

2.2 Proposed Event Programming

In addition to the retail, hospitality, and public park uses that are expected to have consistent use year-round, various events and sports programming will take place periodically that will increase visitation to and from the Project site. The frequency, daily trip generation, and attendee estimates for each event are provided in **Table 1**. Event frequencies and sizes were developed from information provided by the City of Ontario during the environmental review period of the project and is subject to change. Additional special events (e.g. Fourth of July, Trunk-or-Treat, etc.) may also take place on the Project site, which can employ the TMP as needed.

Table 1: Summary of Proposed Event Programming

Land Use	Event Description	No. of Days/ Year	Daily Vehicle Trip Generation Estimate	Average Daily Attendees
Baseball Stadium	Regular Season Games	66	803 to 2,038	1,300 - 3,400
	Postseason Games	≤5	2,038	6,000
	Small Event (100 attendees)	4	58	100
	Small Event (200 attendees)	2	116	200
	Small Event (500 attendees)	7	289	500
	Medium Event (2,000 attendees)	9	1,157	2,000
	Medium Event (3,000 attendees)	4	1,735	3,000
	Medium Event (4,000 attendees)	16	2,314	4,000
	Large Event (5,000 attendees)	2	2,892	5,000
	Large Event (6,000 attendees)	2	3,470	6,000
Soccer Fields	Typical Games	48	4,549	2,000 - 5,000
	Tournaments	16	6,755	5,000 – 8,000
Baseball/Softball Fields	Typical Games	50	3,055	1,400 – 4,000
	Tournaments	16	3,727	4,000 – 6,000
Indoor Basketball/Volleyball Athletic Center	Basketball Games	20	1,112	2,000
	Volleyball Games	54	1,334	2,500

Source: City of Ontario, 2023. Fehr & Peers, 2024.

2.3 Project Access and Circulation

The Project site can be accessed from four signalized intersections:

1. Riverside Drive & Street A
2. Riverside Drive & Ontario Avenue
3. Vineyard Avenue & Parking Structure B
4. Chino Avenue & Ontario Avenue

Ontario Avenue will extend through the Project site to provide access and internal circulation with a right-of-way (ROW) of 88 feet. Two additional internal streets are proposed: Street A and Street B, with 88-foot and 66-foot ROWs, respectively. Driveways, internal multi-use pathways, and sidewalks will also support the movement of visitors on site.

Additional details regarding internal roadways and circulation will be made available during the final design phase of the Project.

3. Travel Characteristics

This section describes the anticipated travel volumes and modes to be used by visitors and employees. It also discusses expected travel origin/destinations, which will influence planning for event traffic. This information is consistent with findings in the *Ontario Regional Sports Complex (ORSC) Transportation Impact Study*.

3.1 Project Scenarios

Project operations are expected to vary throughout the year, depending on the number and scale of events. The scenarios summarized in **Table 2** were developed in coordination with City staff to analyze event traffic operations.

Table 2: Typical and Peak Project Event Scenarios

Scenario	Description	Frequency
Weekday with Practices, No Stadium Events	• Soccer, baseball/softball, and volleyball/ basketball practices • Regular weekday operations at retail, restaurants, and hotel • Regular weekday operations at public park facility	Most Weekdays, Fall-Spring
Weekday with Practices, Regular Stadium Event	• Soccer, baseball/softball, and volleyball/ basketball practices • Regular stadium event (<4,000 attendees) • Regular weekday operations at retail, restaurants, and hotel • Regular weekday operations at public park facility	Most Weekdays, Summer
Weekend with Regular Games, Regular Stadium Event	• Non-tournament soccer, baseball/softball, and volleyball/ basketball games • Regular stadium event (<4,000 attendees) • Regular weekend operations at retail, restaurants, and hotel • Regular weekend operations at public park facility	Most Weekends

Scenario	Description	Frequency
Weekend with One Tournament, No Stadium Event	• One soccer or baseball/softball tournament (5,000+ attendees) • Regular non-tournament games for other sports • Regular weekend operations at retail, restaurants, and hotel • Regular weekend operations at public park facility	Up to 32 Days/Year
Weekend with Two Tournaments, No Stadium Event	• One soccer tournament (5,000+ attendees) • One baseball/softball tournament (4,000+ attendees) • Regular non-tournament basketball/volleyball games • Regular weekend operations at retail, restaurants, and hotel • Regular weekend operations at public park facility	Up to 16 Days/Year
Weekend with Regular Games, Sell Out Stadium Event	• Non-tournament soccer, baseball/softball, and volleyball/ basketball games • Sell-Out stadium event (6,000 attendees) • Regular weekend operations at retail, restaurants, and hotel • Regular weekend operations at public park facility	Up to 7 Days/Year

Source: City of Ontario, 2023. Fehr & Peers, 2024.

While additional scenarios are possible, such as a concurrent tournament and a sell-out stadium event, these are expected to be infrequent and would require additional event traffic management. The City should work to manage the overall activity on the Project site by avoiding scheduling multiple large events on the same day.

3.2 Trip Generation

Trip generation refers to the process of estimating the amount of vehicular traffic a project would add to the surrounding roadway system. Estimates for the Project scenarios were created for the daily condition and for the peak one-hour period when traffic volumes on the adjacent streets are typically the highest. On weekdays, the peak one-hour period occurs during the morning and evening commutes. On weekends, the peak one-hour period occurs around midday on tournament weekends and in the evening on days with stadium events.

Trip generation estimates were prepared using the Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 11th Edition (ITE, 2021),* custom trip generation rates derived from traffic counts at similar facilities, and custom trip generation rates derived from a big-data source (Streetlight Zone Activity Data). Detailed information on trip generation development is documented in the *Ontario Regional Sports Complex Transportation Impact Study*.

The daily and peak hour trip generation estimates for the six Project scenarios are provided in **Table 3**.

Table 3: Daily and Peak Hour Project Vehicle Trip Generation Estimates

Scenario	Daily Vehicle Trip Generation Estimates	Peak Hour Vehicle Trip Generation Estimates		
		In	Out	Total
Weekday PM with Practices, No Stadium Event	15,944	866	661	1,527
Weekday PM with Practices, Regular Stadium Event	16,477	887	659	1,546
Weekend PM with Regular Games, Regular Stadium Event	20,956	1,170	1,193	2,364
Weekend Midday with One Tournament, No Stadium Event	21,286	1,200	1,240	2,441
Weekend Midday with Two Tournaments, No Stadium Event	21,958	1,222	1,260	2,483
Weekend PM with Regular Games, Sell-Out Stadium Event	22,310	1,217	1,245	2,463

Note: Peak Hour of adjacent streets used to show impact on overall transportation system. PM Peak Hour is typically from 5:00pm-6:00pm, Midday Peak Hour is typically from 12:00pm-1:00pm.

3.3 Trip Distribution

Project trip distribution refers to the directions of approach and departure that vehicles would use to travel to and from the Project site. Local knowledge of the study area, travel pattern data and statistics, The Ontario Plan travel demand model (SBTAM), and professional judgment were used to develop a Project trip distribution for the respective trip generators. Detailed information on Project trip distribution is documented in the *Ontario Regional Sports Complex Transportation Impact Study (Fehr & Peers, March 2024)*.

For the purposes of the TMP, Project trips were grouped to originate from one of four areas:

1. Northwest – trips utilizing Riverside Drive west or Vineyard Avenue north, including trips to SR-60.
2. Northeast – trips utilizing Riverside Drive east or Archibald Avenue north, including trips to SR-60.

3. Southwest – trips utilizing Chino Avenue west or Vineyard Avenue south, including trips to Euclid Avenue (SR-83).
4. Southeast – trips utilizing Chino Avenue east or Archibald Avenue south, including trips to Ontario Ranch Road and I-15.

The Project trip distribution is shown in **Figures 2a and 2b**. Note that trip distribution is expected to change between opening year (2026) and cumulative year (2050) as the Ontario Ranch and surrounding areas develop.

3.4 Triggers for TMP Deployment

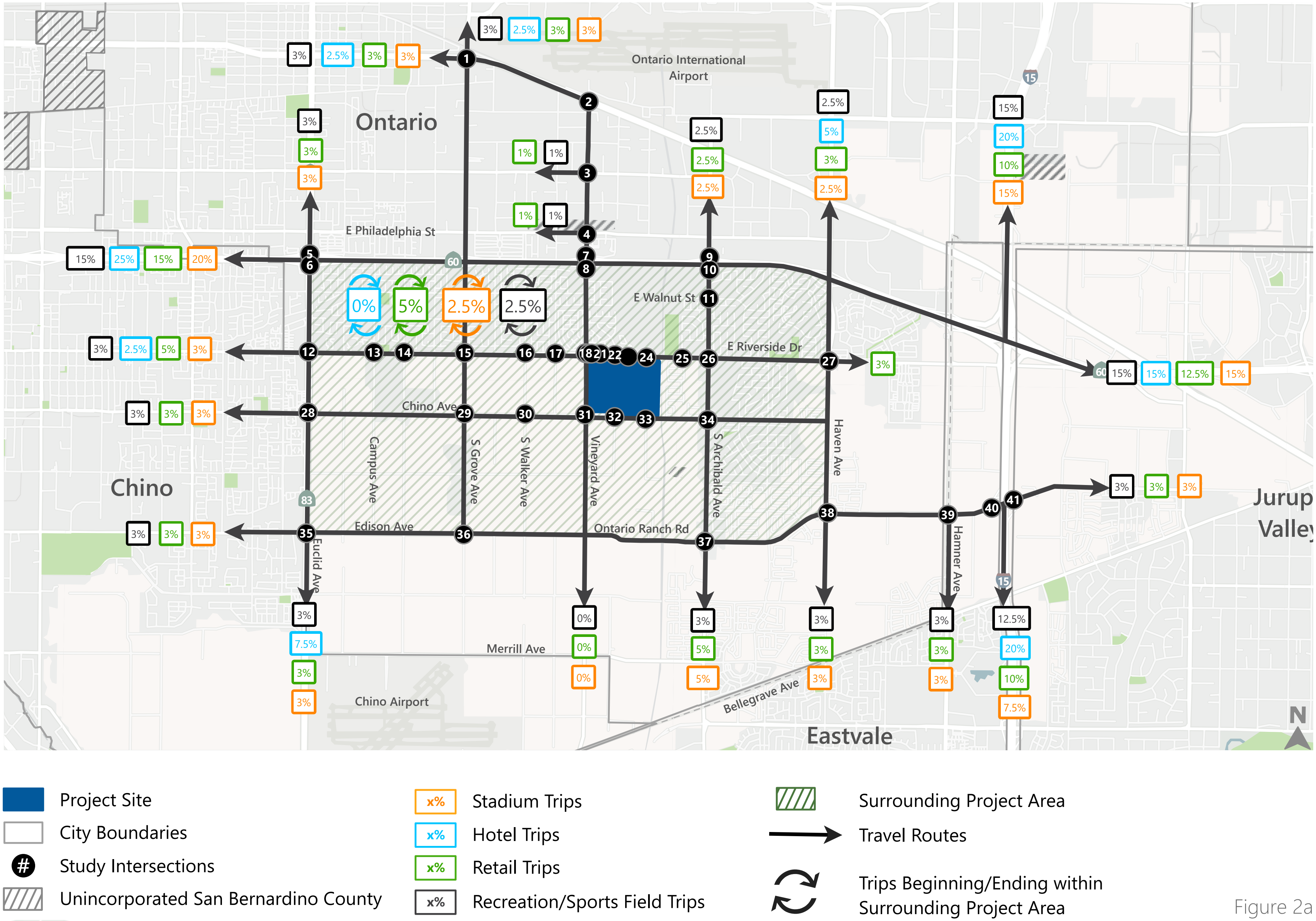
Measures in the TMP are expected to be deployed for most medium to large event days (>5,000 attendees). The degree of implementation will depend on the size of events, event types, and whether the site will be hosting multiple events in one day. When determining which TMP measures to employ, the City should review attendance levels, expected arrival/departure times, and event characteristics (e.g. single in/out vs all-day access).

Table 4 lists the attendee and event thresholds for deploying standard TMP measures. The City shall review event programming and determine the appropriate level of traffic control required for an event. Irregular special events (e.g. Fourth of July, post-season baseball games, etc.) may require additional traffic control measures not identified in this report, which should be determined by the City Engineer. These triggers will be reviewed and may be amended following initial operations.

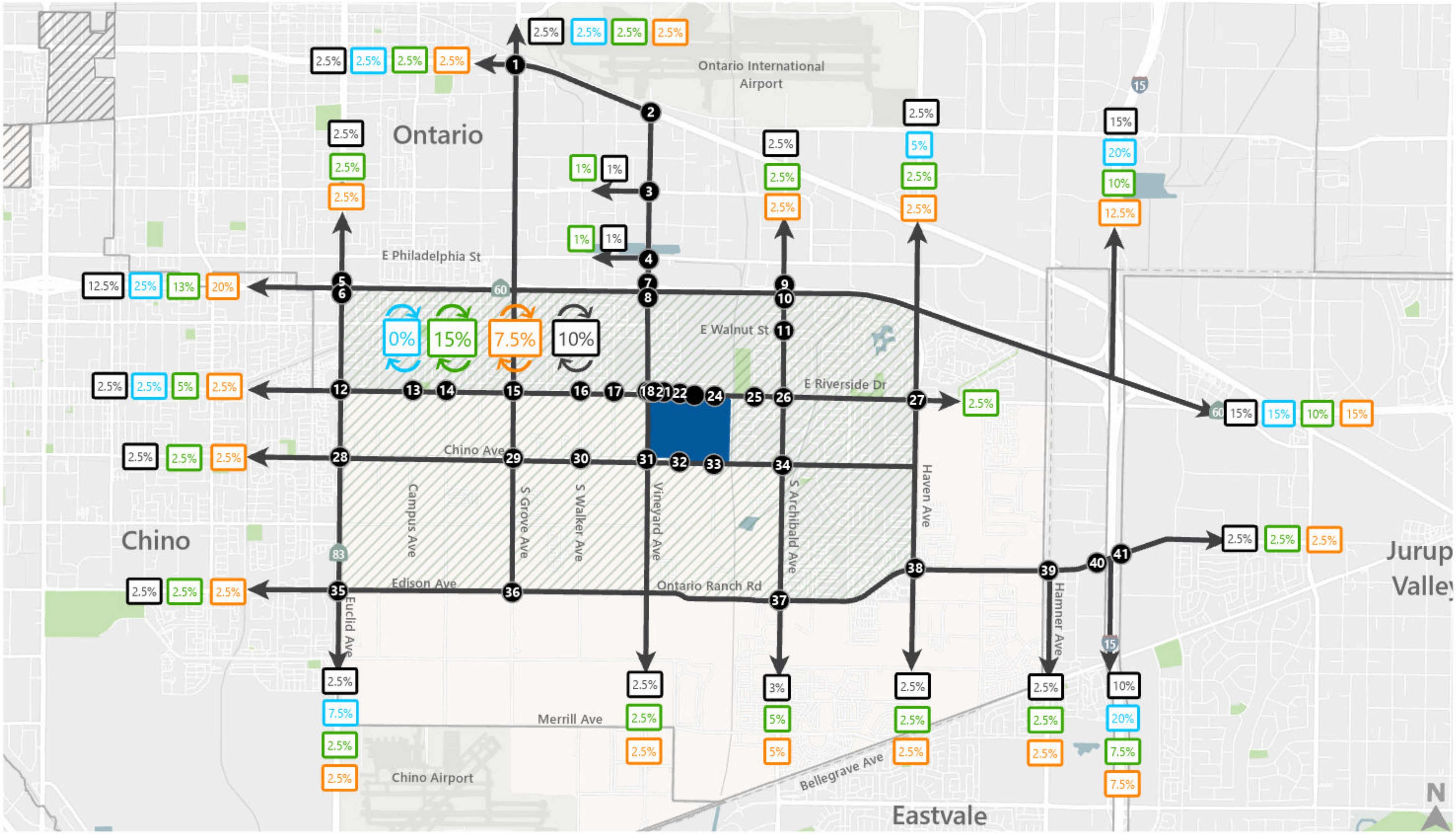
Table 4: Triggers for TMP Deployment

Measure	Threshold
Traffic Control at Intersections 1, 2, and 4	• >5,000 combined daily event attendees
Traffic Control at Intersection 3	• >4,000 athletic facility daily event attendees
Additional traffic control officers at: • Riverside Drive & Street A • Riverside Drive & Ontario Avenue • Vineyard Avenue & Parking Structure B • Chino Avenue & Ontario Avenue	• >8,000 combined daily event attendees
Designated Parking Areas for Different Events	• 2+ Daily Events • Each Event with >2,000 attendees • >2 hours of overlap
Prepare Event-Specific TMP	• >10,000 combined daily event attendees

Note: Detailed traffic control plan recommendations are provided in Chapter 4 and Figures 4a-7b.



Ontario Sports Park Trip Distribution (Opening Year, 2026)



Project Site
City Boundaries
Study Intersections
Unincorporated San Bernardino County
x% Stadium Trips
x% Hotel Trips
x% Retail Trips
x% Recreation/Sports Field Trips
Surrounding Project Area
Travel Routes
Trips Beginning/Ending within Surrounding Project Area

Figure 2b

Ontario Sports Park Trip Distribution (Cumulative Year, 2050)

4. Traffic Element

This section describes proposed access and circulation for cars and other private vehicles during events. Temporary traffic management is expected to be employed during most medium to large events to minimize impacts on adjacent roadways. The specific level of traffic management will vary for each event depending on the expected number of attendees or other conditions (e.g. construction, duration of event, etc.). Additionally, concurrent events may require changes to standard procedures to better accommodate event traffic. The City shall review event characteristics and determine the appropriate level of traffic management for each event.

4.1 Vehicle Access Routes

Project vehicle access is provided from Riverside Drive, Vineyard Avenue, Chino Avenue, and Ontario Avenue. Redundant access points allow traffic to be distributed across multiple intersections and avoid unnecessary mixing of traffic on adjacent streets prior to and after events.

Preliminary vehicle access routes have been identified to encourage attendees to enter/exit from the general area they are coming from/going to and to limit internal traffic volumes as described below. Traffic is also being distributed to avoid overloading the Riverside Drive access intersections. These routes will be encouraged through temporary and permanent signage on approach streets. Routes are expected to be refined and updated as additional site plan details become available.

The Project should encourage ingress access along routes with limited left turns to maximize operational efficiency at intersections. During major events, traffic control plans should consider restricting some left turn access.

During concurrent events, temporary signage may be used to separate traffic by event and direct vehicles to the designated parking location(s) for each event. These plans shall be reviewed on a case-by-case basis by event operators, DPW, and Ontario PD.

Traffic from/to the Northwest (Vineyard Avenue North, Riverside Drive West)

- Athletic field traffic should be directed to use the Vineyard Avenue entrance
- Stadium and retail/entertainment traffic should be directed to use the Riverside Drive/Street A or Riverside Drive/Ontario Avenue entrances

Traffic from/to the Northeast (Archibald Avenue North, Riverside Drive East)

- Stadium and retail/entertainment traffic should be directed to use the Riverside Drive/Ontario Avenue entrance
- Athletic field traffic should be directed to use the Riverside Drive/Street A entrance

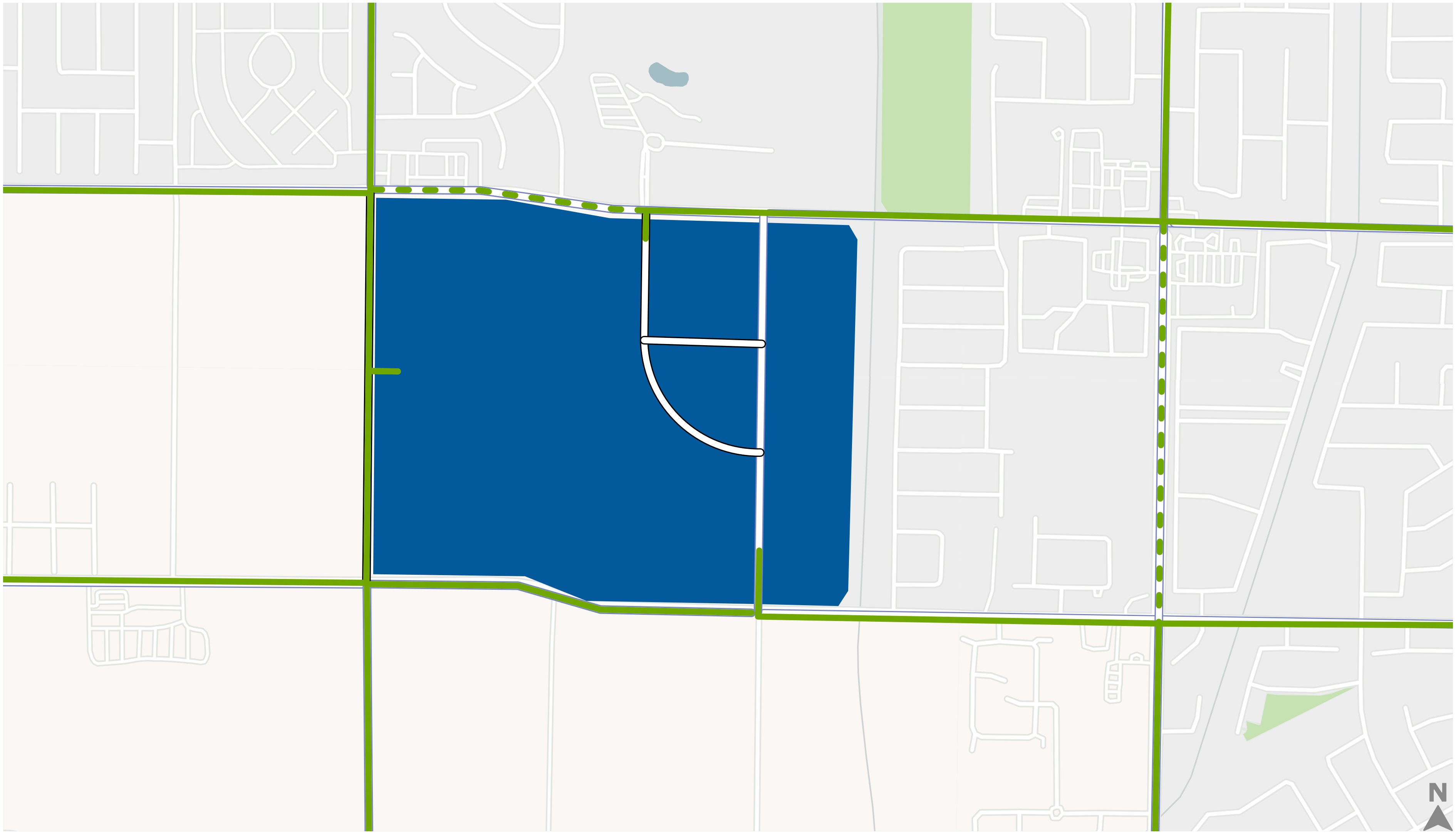
Traffic from/to the Southwest (Vineyard Avenue South, Chino Avenue West)

- Athletic field traffic should be directed to use the Vineyard Avenue entrance
    - Alternative access can be provided at the Chino Avenue/Ontario Avenue entrance
- Stadium and retail/entertainment traffic should be directed to use the Chino Avenue/Ontario Avenue entrance

Traffic from/to the Southeast (Archibald Avenue South, Chino Avenue East)

- All traffic should be directed to use the Chino Avenue/Ontario Avenue entrance
- Alternative access can be provided at the Vineyard Avenue or Riverside Drive/Ontario Avenue entrances

The recommended vehicle access routes are depicted in **Figures 3a and 3b**.



Project Site

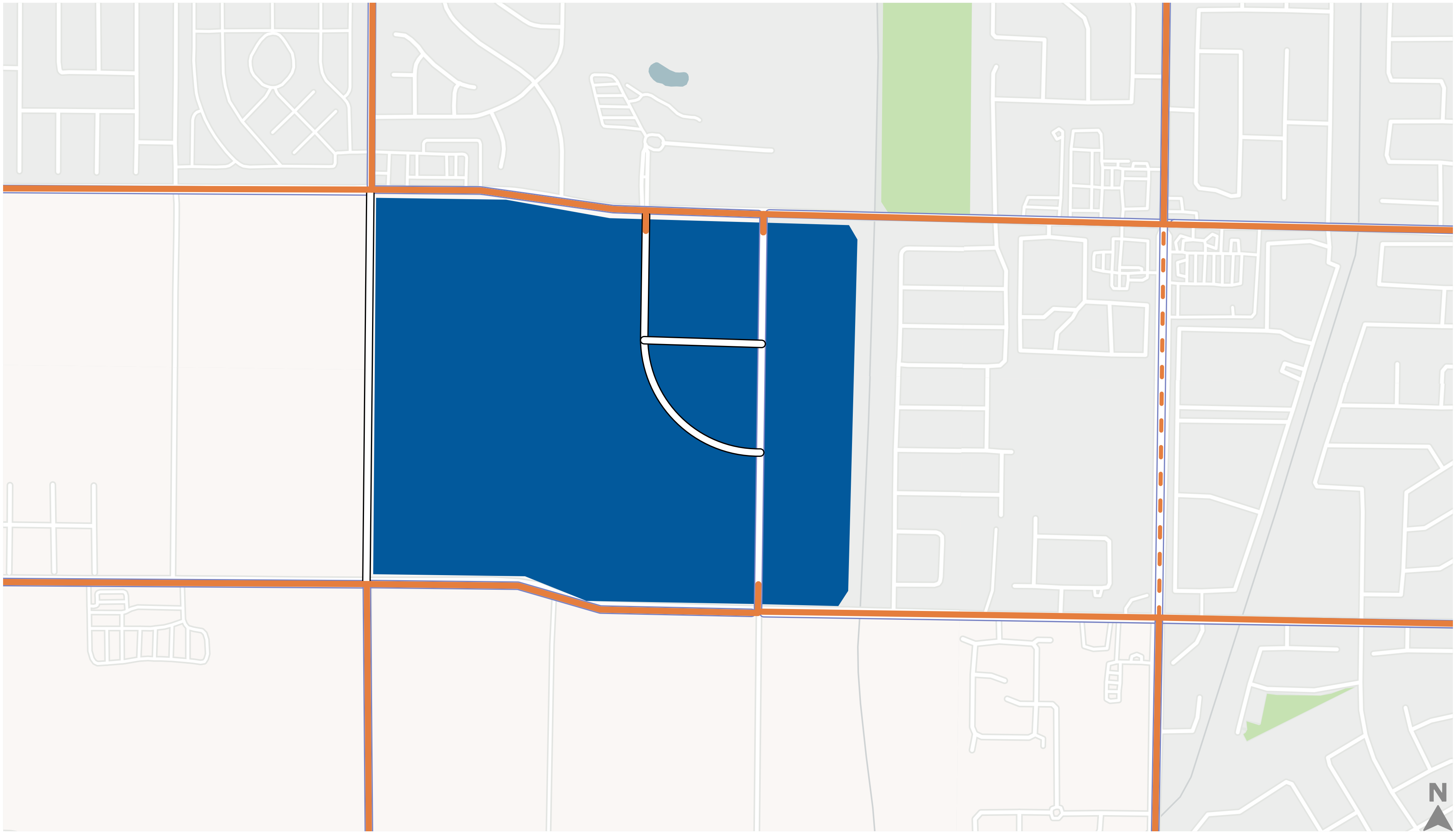
Roadways

Recommended Athletic Facility Access Routes

Alternate Athletic Facility Access Routes

Figure 3a

Ontario Regional Sports Park
Recommended Athletic Facility Access Routes



Project Site

Roadways

Recommended Stadium and Retail Access Routes

Alternate Stadium and Retail Access Routes

Figure 3b

Ontario Regional Sports Park

Recommended Stadium/Retail Access Routes

4.2 Access Intersections

Additional traffic control is recommended for the four access intersections, especially during periods of high pedestrian activity and high inflow/outflow traffic. The purpose of these measures is to improve intersection safety, facilitate efficient ingress/egress, and reduce potential queueing impacts along Riverside Drive, Chino Avenue, and Vineyard Avenue.

The temporary traffic measures outlined below are intended to be used for events with highly unidirectional traffic (e.g. stadium events, concerts, single game tournaments). Some events, particularly athletic field events, see bi-directional traffic throughout the day and will warrant a different set of temporary traffic control, as described in Section 4.2.3.

Pre-Event measures would typically begin 90-120 minutes prior to the event's start time. Post-event measures would be in place approximately 30 minutes prior to the event's conclusion and typically remain in place for 45 to 60 minutes afterward (depending on how long it takes for vehicles, pedestrians, etc. to clear the area).

Figures 4a through 7b present the pre- and post- event traffic control recommendations for the Project area.

4.2.1 Pre-Event Traffic Control

Riverside Drive/Street A (see Figure 4a)

- Provide two inbound lanes by coning off the dedicated northbound left turn lane on Street A
- Continue the two inbound lanes to the Parking Structure to provide additional queueing space away from Riverside DriveRemaining northbound lane will become a shared left/through/right turn lane
- Prohibit northbound left turn into Parking Structure
- Implement leading pedestrian interval to improve pedestrian safety
- Prohibit pedestrian crossing along Street A between Riverside Drive and the Parking Structure driveway
- Extend westbound left turn phase. Monitor traffic signal operations from the City's Traffic Management Center (TMC)
- Position a traffic control officer at the intersection of Street A and Parking Structure A to facilitate pedestrian crossings and ensure vehicles do not block the intersection

Riverside Drive/Ontario Avenue (see Figure 5a)

- Provide two inbound lanes by coning off the dedicated northbound left turn lane on Ontario Avenue
- Continue the two inbound lanes to the Parking Lot entrance to provide additional queueing space away from Riverside Drive

- Prohibit northbound left turns by placing temporary “No Left Turn” signage on Ontario Avenue. The remaining northbound lane will become a right turn only lane
- Use a two-phase event traffic signal timing plan:
    - Phase 1: Eastbound/westbound through traffic on Riverside Drive, Ontario Avenue pedestrian crossing
    - Phase 2: Westbound left turn, northbound right turn (overlap), Riverside Drive pedestrian crossing
    - Ensure overlap signal heads are furnished and installed during traffic signal construction
- Monitor traffic signal operations from the City’s TMC
- Implement leading pedestrian interval to improve pedestrian safety
- Prohibit pedestrian crossing along Ontario Avenue between Riverside Drive and Parking Lot driveway
- Position a traffic control officer at the intersection of Ontario Avenue and the Parking Lot to facilitate left turns, pedestrian crossings, and ensure vehicles do not block the intersection

Vineyard Avenue/Parking Structure B (see Figure 6a)

- Provide two inbound lanes by coning off the dedicated westbound left turn lane on the Parking Structure Driveway
- Continue the two inbound lanes to the Parking Structure
- Remaining westbound lane becomes a shared left/right turn lane
- Extend southbound left turn phase. Monitor traffic control signal operations from the City’s TMC
- Implement leading pedestrian interval to improve pedestrian safety

Chino Avenue/Ontario Avenue (see Figure 7a)

- Provide two inbound lanes by coning off the dedicated southbound left turn lane on Ontario Avenue
- Continue the two inbound lanes to the Parking Lot in Planning Area 5
- Remaining southbound lane becomes a shared left/through/right turn lane
- Prohibit southbound left turn into public park parking lot
- Prohibit eastbound left turn out of PA 5 Parking Lot and operate as right turn only
- Monitor traffic control signal operations for the City’s TMC
- Implement leading pedestrian interval to improve pedestrian safety
- Provide a marked crosswalk at the Ontario Avenue and Public Park Parking Lot driveway intersection. Position a traffic control officer at this intersection to facilitate pedestrian crossings and manage traffic
- Position a traffic control officer at the intersection of Ontario Avenue and PA 5 Parking Lot to facilitate left turns and ensure vehicles do not block the intersection

Adjacent Intersections

- The following intersections should be monitored from the City’s TMC during pre-event periods:
    - Riverside Drive/Vineyard Avenue

- Riverside Drive/Archibald Avenue
- Chino Avenue/Vineyard Avenue
- Chino Avenue/Archibald Avenue

4.2.2 Post-Event Traffic Control

Riverside Drive/Street A (see Figure 4b)

- Provide two outbound lanes on Street A between Parking Structure A and Riverside Drive (one dedicated left turn lane and one dedicated through/right turn lane)
- Prohibit westbound left turn movements on Riverside Drive by installing temporary "No Left Turn" signage and coning off the left turn lane
- Consider limiting access to Whispering Lakes Golf Course during late evening events when golf course is closed
- Extend northbound left turn signal phase. Monitor traffic signal operations from the City's TMC
- Implement leading pedestrian interval to improve pedestrian safety
- Prohibit pedestrian crossing along Street A between Riverside Drive and the Parking Structure driveway
- Position a traffic control officer at the intersection of Street A and Parking Structure A to facilitate left turns, pedestrian crossings, and ensure vehicles do not block the intersection

Riverside Drive/Ontario Avenue (see Figure 5b)

- Provide two outbound lanes on Ontario Avenue (one dedicated left turn lane and one dedicated right turn lane)
- Prohibit southbound left turn into Parking Lot
- Prohibit westbound left turn out of Parking Lot. Operate as right turn only.
- Extend northbound signal phase. Monitor traffic signal operations from the City's TMC
- Implement leading pedestrian interval to improve pedestrian safety
- Prohibit pedestrian crossing along Ontario Avenue between Riverside Drive and Parking Lot driveway
- Position a traffic control officer at the intersection of Ontario Avenue and the Parking Lot to facilitate outbound traffic, pedestrian crossings, and ensure vehicles do not block the intersection

Vineyard Avenue/Parking Structure B (see Figure 6b)

- Provide two outbound lanes from the Parking Structure (one dedicated left turn lane and one dedicated right turn lane)
- Consider prohibiting southbound left turn to improve operations
- Extend westbound signal phase. Monitor traffic control signal operations from the City's TMC
- Implement leading pedestrian interval to improve pedestrian safety

Chino Avenue/Ontario Avenue (see Figure 7b)

- Provide two outbound lanes on Ontario Avenue between PA 5 Parking Lot and Chino Avenue (one dedicated left turn lane and one through/right turn lane)
- Restrict PA 5 Parking Lot driveway to right-out only and prohibit inbound traffic
- Prohibit southbound left turns into Public Park parking lot
- Allow westbound left and right turns out of Public Park parking lot.
- Extend southbound left turn phase and consider operating in split phase. Monitor traffic control signal operations for the City's TMC
- Implement leading pedestrian interval to improve pedestrian safety
- Provide a marked crosswalk at the Ontario Avenue and Public Park Parking Lot driveway intersection. Position a traffic control officer at this intersection to facilitate pedestrian crossings and manage traffic
- Position a traffic control officer at the intersection of Ontario Avenue and PA 5 Parking Lot to facilitate pedestrian movement and outbound traffic

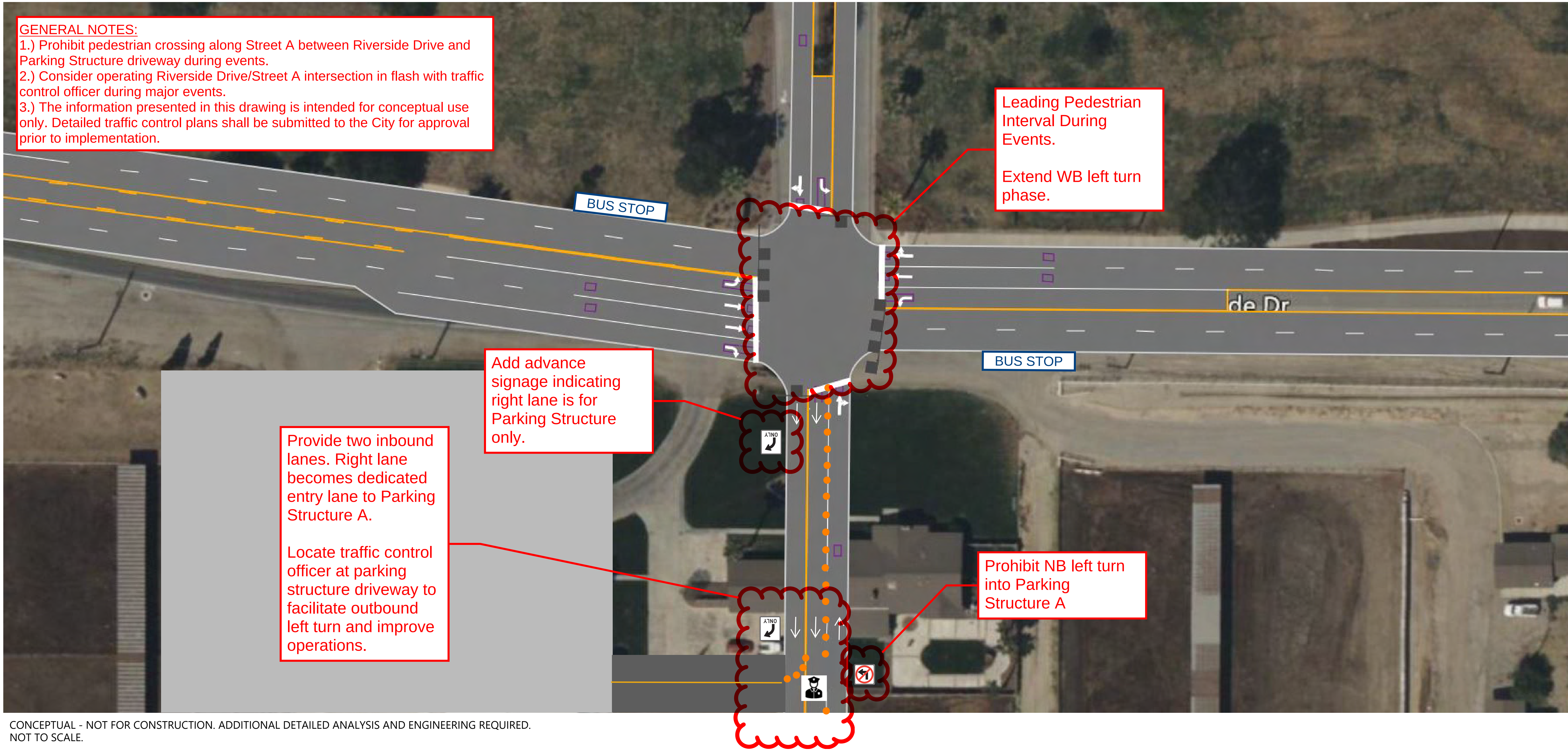
Adjacent Intersections

- The following intersections should be monitored from the City's TMC during post-event periods:
    - Riverside Drive/Vineyard Avenue
    - Riverside Drive/Archibald Avenue
    - Chino Avenue/Vineyard Avenue
    - Chino Avenue/Archibald Avenue

4.2.3 All Day Event Traffic Control

Events with bidirectional traffic flow should employ all the above traffic control described above, except for the contraflow inbound/outbound lanes. Traffic conditions should be monitored, and additional traffic control officers may be required at internal intersections to improve safety and intersection operations.

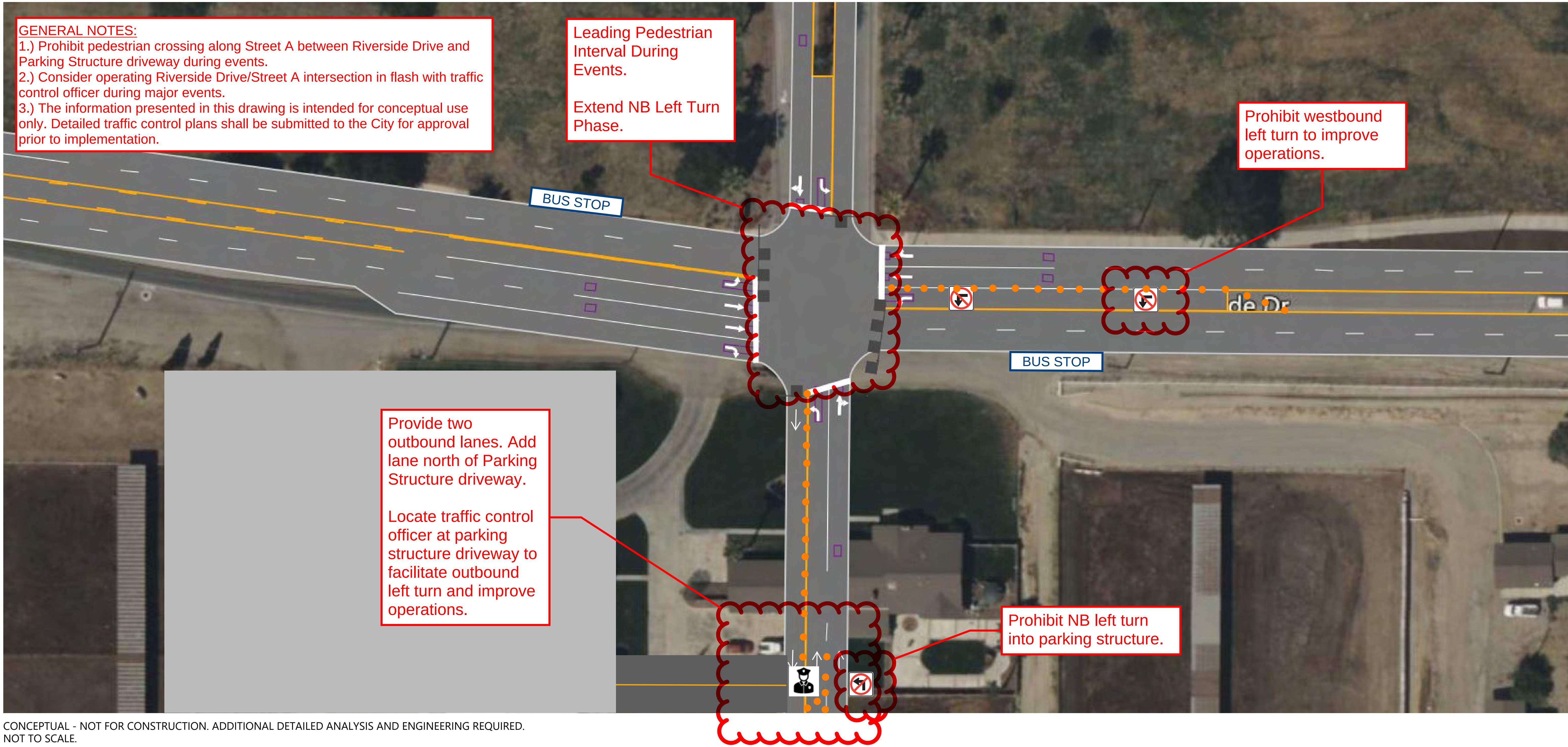
Days with concurrent events (e.g. morning athletic field games and evening stadium events) should be carefully planned to avoid traffic conflicts. Potential strategies include staggering event start/end times to prevent overlapping traffic, designating specific entrances or areas for each event, and promoting alternative modes of travel.



CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL DETAILED ANALYSIS AND ENGINEERING REQUIRED.
NOT TO SCALE.

Figure 4a

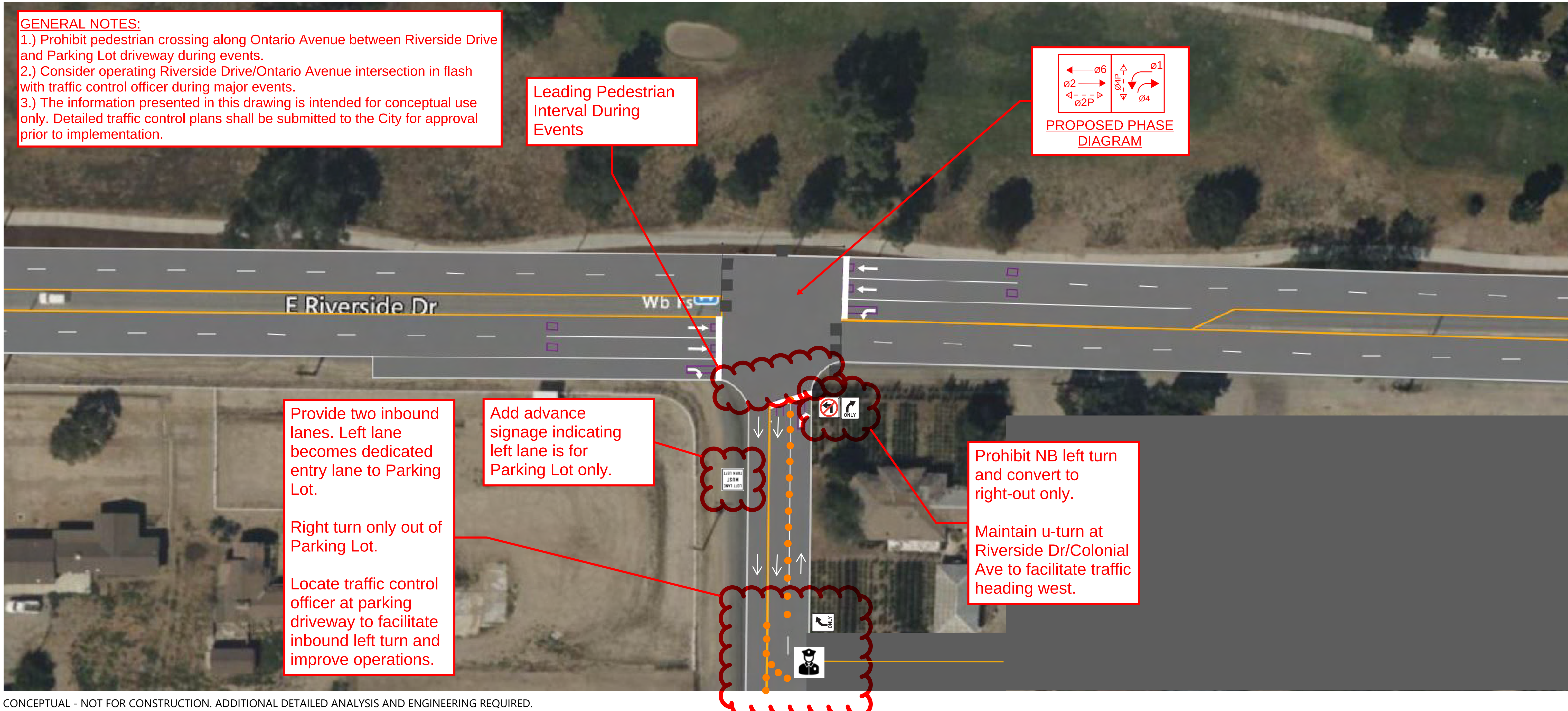
Ontario Regional Sports Park Pre-Event Conditions
Riverside Drive and Street A



CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL DETAILED ANALYSIS AND ENGINEERING REQUIRED.
NOT TO SCALE.

Figure 4b

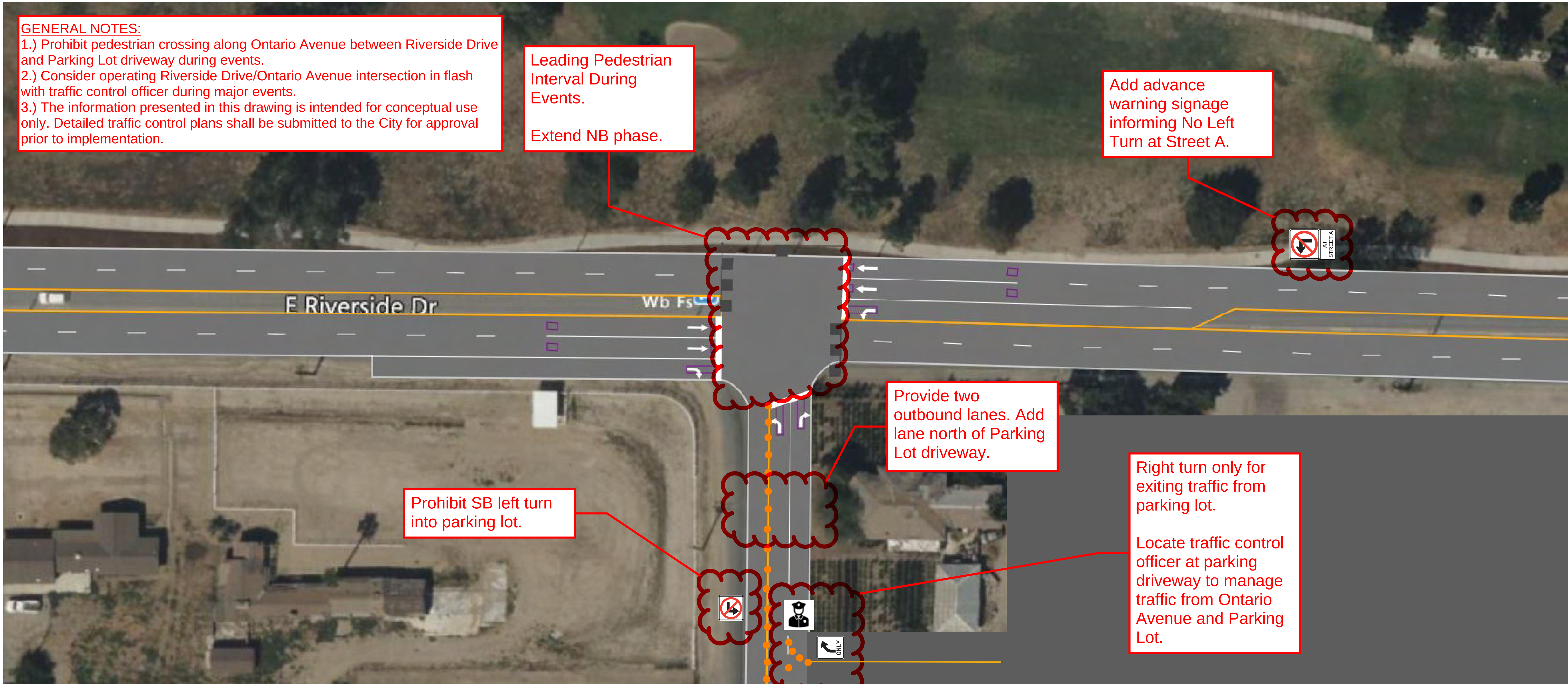
Ontario Regional Sports Park Post-Event Conditions
Riverside Drive and Street A



CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL DETAILED ANALYSIS AND ENGINEERING REQUIRED.
NOT TO SCALE.

Figure 5a

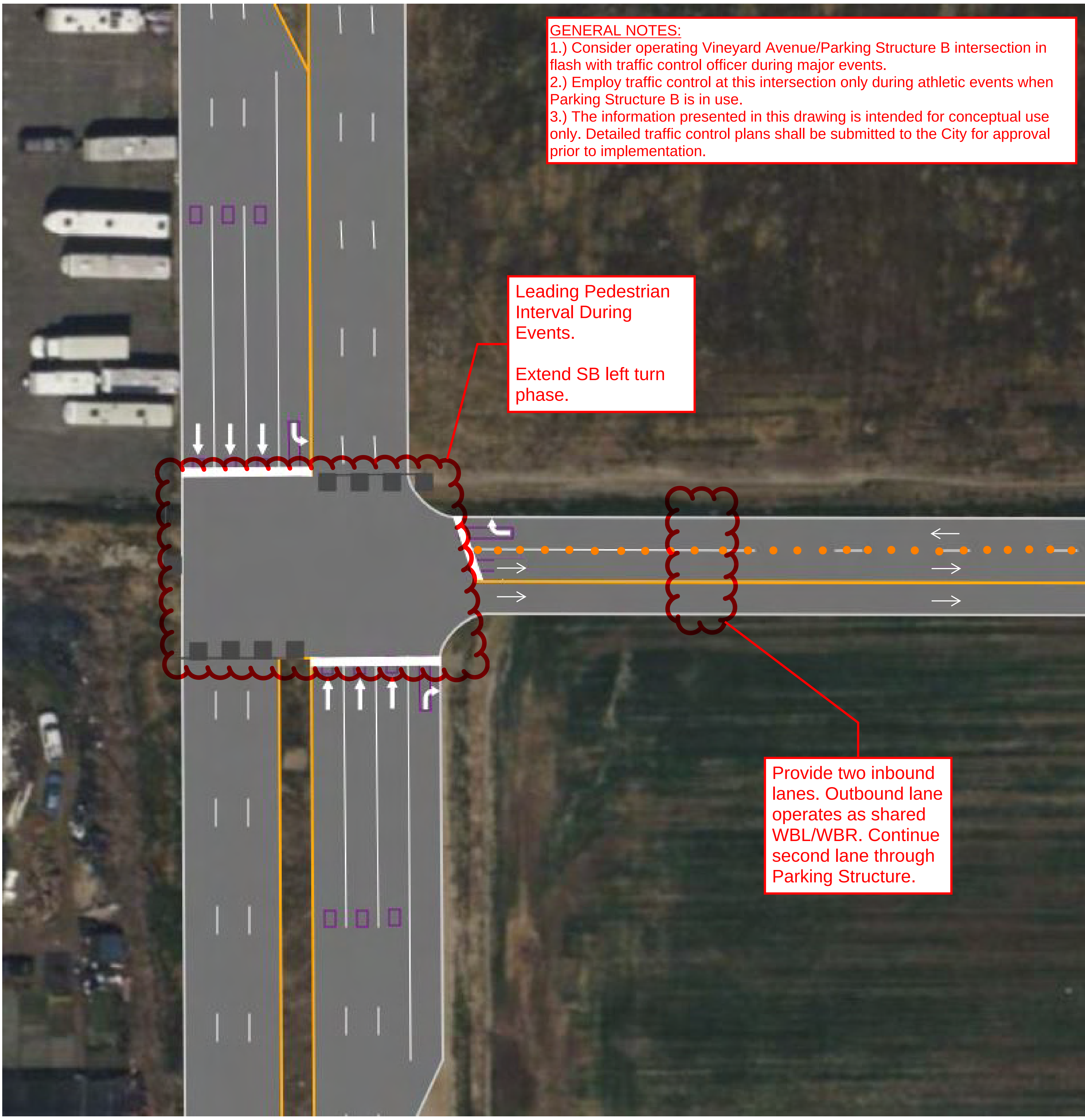
Ontario Regional Sports Park Pre-Event Conditions
Riverside Drive and Ontario Avenue



CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL DETAILED ANALYSIS AND ENGINEERING REQUIRED.
NOT TO SCALE.

Figure 5b

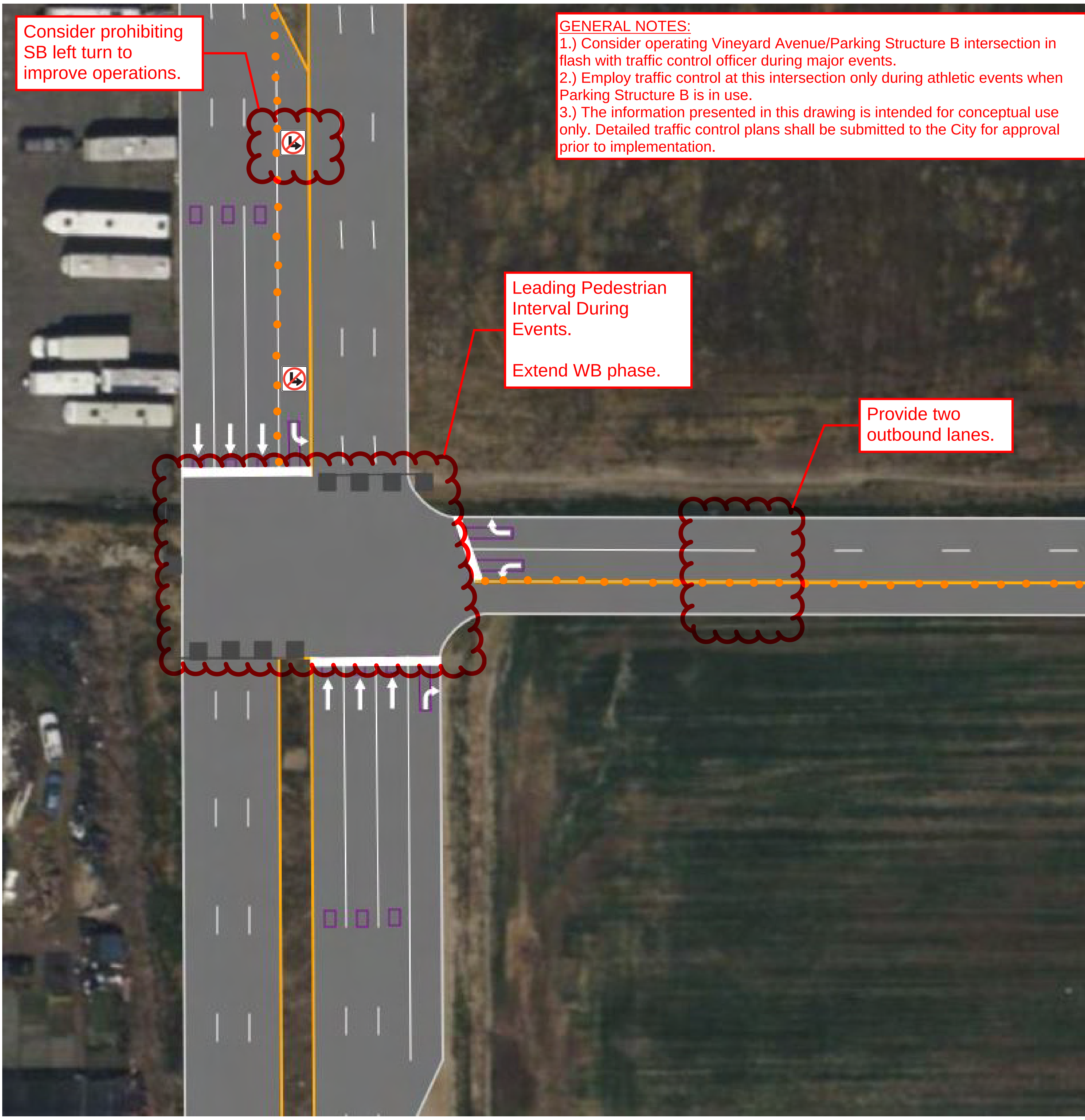
Ontario Regional Sports Park Post-Event Conditions
Riverside Drive and Ontario Avenue



CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL DETAILED ANALYSIS AND ENGINEERING REQUIRED.
NOT TO SCALE.

Figure 6a

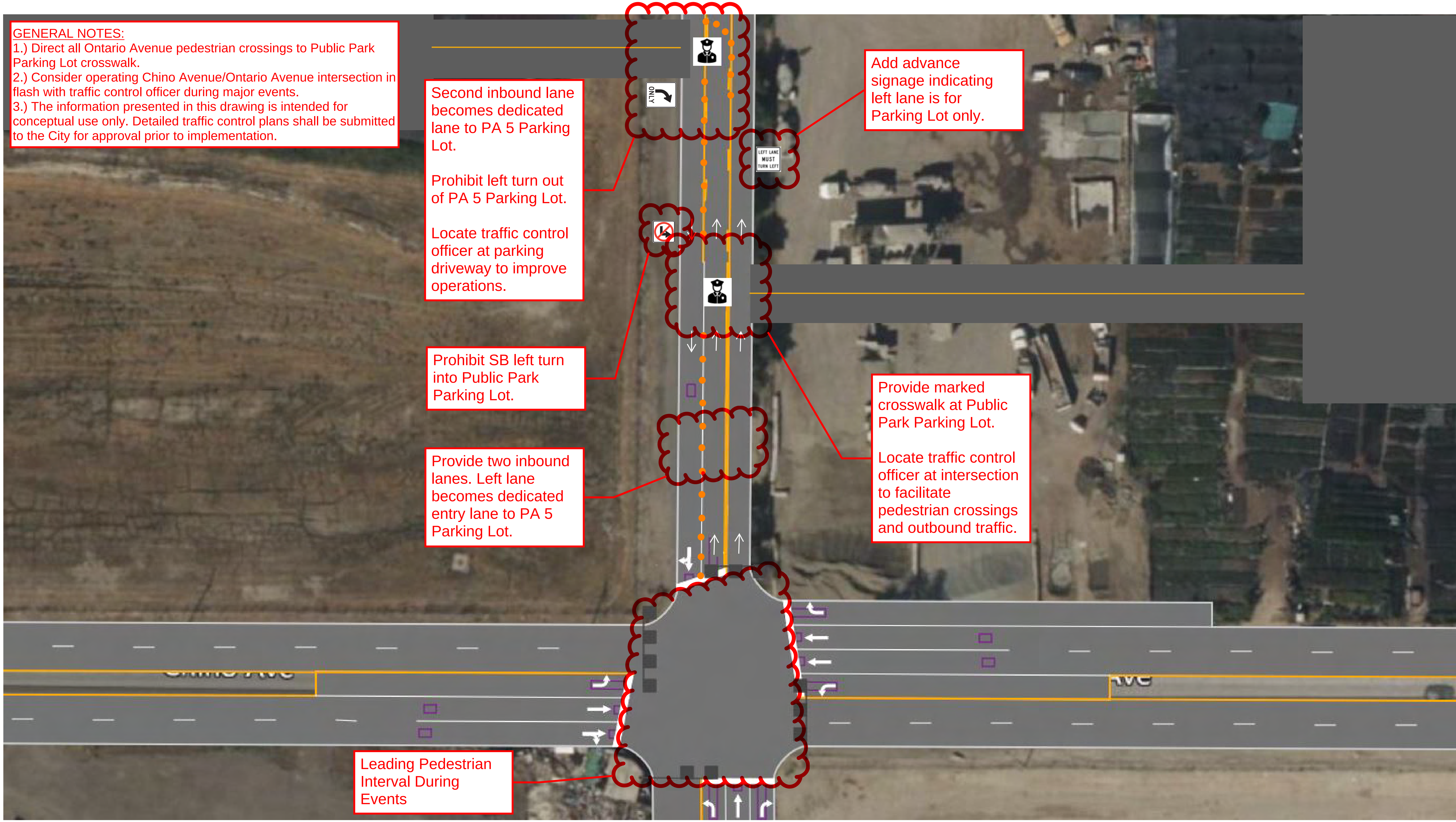
Ontario Regional Sports Complex Pre-Event Conditions
Vineyard Avenue and Parking Structure B



CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL DETAILED ANALYSIS AND ENGINEERING REQUIRED.
NOT TO SCALE.

Figure 6b

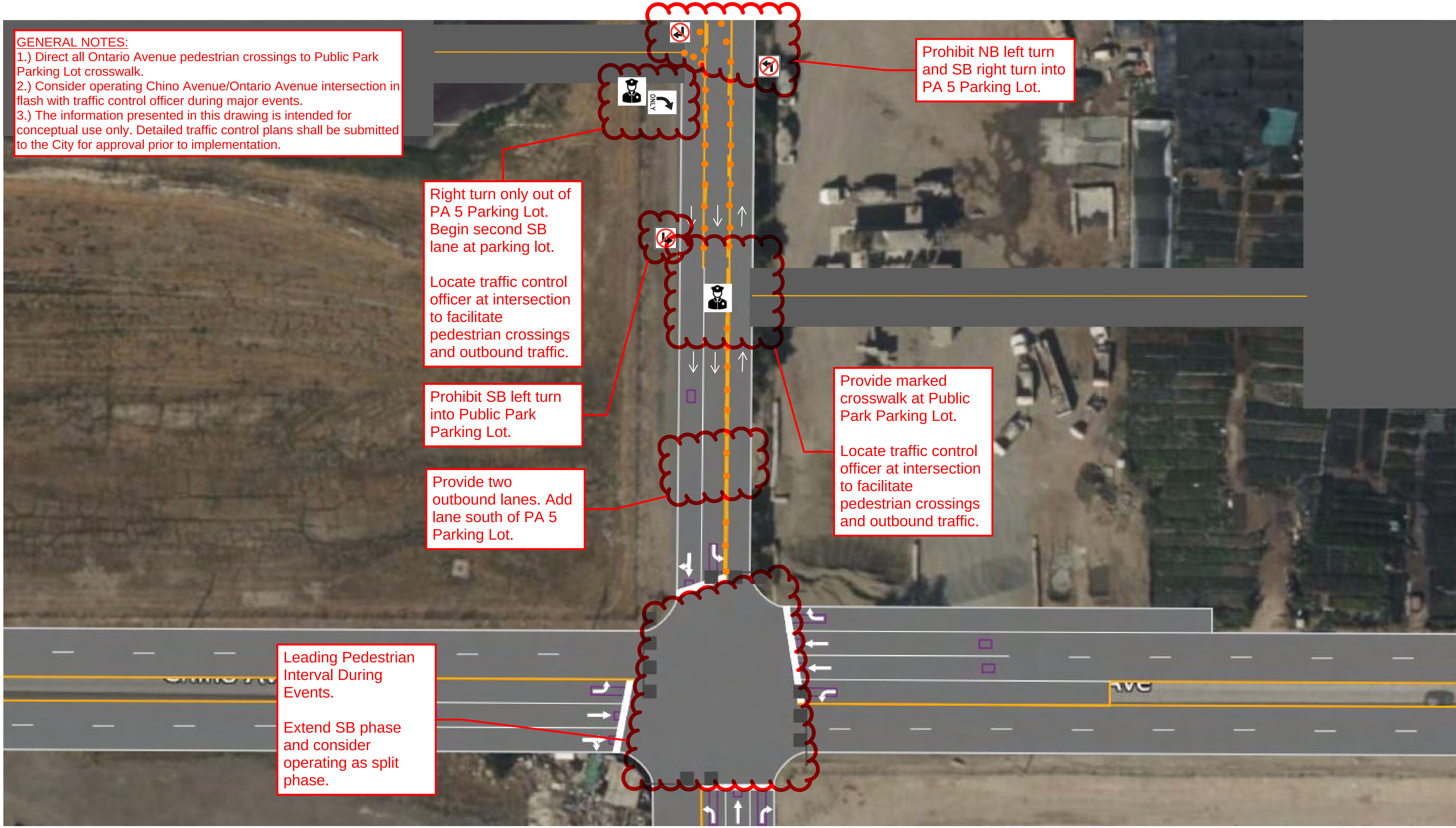
Ontario Regional Sports Complex Post-Event Conditions
Vineyard Avenue and Parking Structure B



CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL DETAILED ANALYSIS AND ENGINEERING REQUIRED.
NOT TO SCALE.

Figure 7a

Ontario Regional Sports Complex Pre-Event Conditions
Chino Avenue and Ontario Avenue



CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL DETAILED ANALYSIS AND ENGINEERING REQUIRED.
NOT TO SCALE.

Figure 7b

Ontario Regional Sports Complex Post-Event Conditions
Chino Avenue and Ontario Avenue

4.3 Vehicle Queueing

Adequate vehicle queueing space between access intersections and parking lots shall be provided to ensure that event traffic does not impact safety or operations on arterial streets. The Project Transportation Impact Study identified turn lane recommendations at the access intersections, which can be used for vehicle queueing, if necessary:

- Riverside Drive/Street A
  - Dedicated eastbound right turn lane
  - Dedicated westbound left turn lane
- Riverside Drive/Ontario Avenue
  - Dedicated eastbound right turn lane
  - Dedicated westbound left turn lane
- Vineyard Avenue/Parking Structure B
  - Dedicated northbound right turn lane
  - Dedicated southbound left turn lane
- Chino Avenue/Ontario Avenue
  - Dedicated eastbound left turn lane
  - Dedicated westbound right turn lane

Parking structure driveways can operate with dual entry lanes during pre-event activities and dual-exit lanes during post-event activities to provide additional capacity in the peak direction. If dual-lane configurations are utilized, the traffic control described in Section 4.2 may need to be modified.

Proposed parking management strategies outlined in the Parking Management Plan, including gateless parking and digital payments, work to minimize potential queueing. Traffic control officers should also monitor intersections during events and signal timing can be extended from the TMC as needed to clear vehicle queues.

4.4 Signage

In addition to the temporary signage described in Section 4.2, temporary and permanent signage is recommended along adjacent arterials to provide visitors with information on site access, temporary traffic controls, and other roadway conditions.

4.4.1 No Stopping Zones

Permanent "No Stopping Anytime" signs are recommended along Riverside Drive, Vineyard Avenue, and Chino Avenue to discourage passenger drop-off/pick-up along arterial streets and improve safety. These signs shall be placed at regular intervals along the Project frontage. It will be important to monitor and enforce these zones frequently.

4.4.2 Event Traffic Wayfinding Signs

Temporary and/or permanent wayfinding signs are recommended along Vineyard Avenue, Riverside Drive, Archibald Avenue, and Chino Avenue to provide visitors with information on preferred access routes to/from the Project site. These signs will provide directions for the different land uses and work to distribute traffic. Temporary signage can be installed during events to provide additional directions.

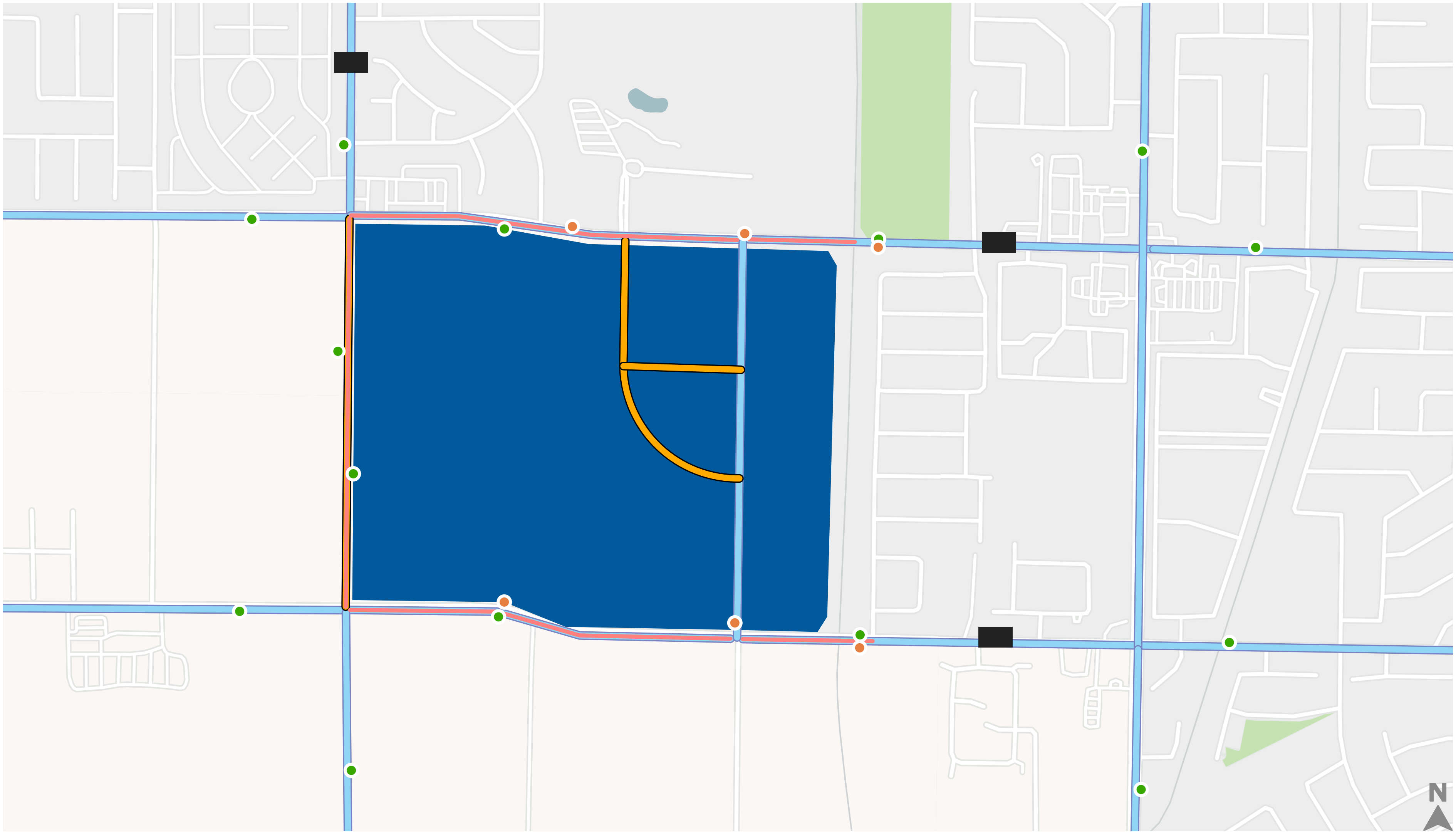
4.4.3 Changeable Message Signs

Changeable message signs can be installed along adjacent arterials to provide visitors with real-time event traffic information, such as preferred routes, designated parking areas for specific events, or road closures.

Figure 8 shows the recommended locations for signage.

4.5 Internal Circulation

During events, portions of the internal roadway network including Street A, Street B, and Ontario Avenue may be closed to limit through traffic and improve pedestrian safety and connectivity. The specific location of road closures has not yet been identified but shall be determined prior to opening day after event operations and design are finalized.



Project Site
Existing Roadways
Proposed Roadways
Proposed No Stopping Zones
Entry Directional Signs
Exit Directional Signs
Changeable Message Signs (Temporary or Permanent)

Figure 8

Ontario Regional Sports Park Recommended Signage

5. Public Transportation and Rideshare Element

5.1 Existing Transit Service

Omnitrans provides local and express services to San Bernardino County, which includes the City of Ontario. Bus stops are provided along Riverside Drive at Whispering Lakes Lane and Ontario Avenue. The Project site is served by Route 87, which connects to Rancho Cucamonga, Downtown Ontario, and Eastvale via Vineyard Avenue, Riverside Drive, and Archibald Avenue. Connections to other Omnitrans bus routes can be made at the Ontario Civic Center and Chino Transit Centers and to Riverside Transit Agency in the City of Eastvale.

Table 5 outlines the current hours of operation and service frequency for Route 87.

Table 5: Omnitrans Route 87 Frequency and Hours of Operation

	Frequency	Hours of Operation
Weekday	60 minutes	5:00 am – 9:45 pm
Saturday	60 minutes	5:30 am – 8:30 pm
Sunday	No Service	No Service

Source: Omnitrans, 2023.

As part of the Project, bus stop improvements are proposed along Riverside Drive including bus pull outs and sidewalks. The City will work with Omnitrans to expand service during events at the Project site.

5.2 Transit Access

Bus stops along Riverside Drive are located adjacent to the stadium and retail area and will serve as the main access location for visitors using public transportation. Crosswalks will be provided at Riverside Drive/Street A and Riverside Drive/Ontario Avenue to allow passengers to access the Project site. Wayfinding signage should be installed to inform transit passengers of the preferred routes to/from bus stops.

Paratransit passengers can utilize passenger pick-up/drop-off locations on-site or accessible parking spaces.

5.3 Future Transit Service

The Parking and TDM Plan identified measures to increase transit options, service times, and frequency by working with Omnitrans and Metrolink as the Project develops the demand for transit. As new transit services are provided, this section should be updated accordingly.

The Project also plans for shuttles to be integrated into the hotel/retail uses. Specifics of those plans should be added to this plan as final site plans are developed.

5.4 Rideshare and Passenger Pick-Up/Drop-Off Access

Designated rideshare and passenger pick up/drop off areas should be provided throughout the Project site to safely facilitate the loading and unloading of passengers. When considering the location of these loading/unloading areas, the City should:

- Avoid locating near major driveways or intersections where traffic volumes are higher
- Ensure loading vehicles will not block travel lanes, bike lanes, crosswalks, or intersections
- Avoid areas with higher levels of pre- and post-event pedestrian activity, particularly Steet B or other internal roadways that may be closed off during events
- Provide adequate staging and queueing locations for vehicles waiting for passengers

Pick-up/drop-off zones can be managed by strategies including:

- Curb Space Management: Install signage and striping to clearly designate pick-up/drop-off areas and create a more predictable environment for passengers
- Time Limits: Loading/unloading time limits can be established to minimize vehicle queuing in pick-up/drop-off areas
- Routing Algorithm Modifications: Rideshare companies can update their mapping/routing algorithms during events to restrict traffic from certain streets
- Geofencing: A geofence is a geographic area where typical pick-up and/or drop-off activities are regulated by controlling streets/curbs rideshare vehicles can operate from

As final site plans are developed, this plan should be updated to map designated pick-up and drop off zones.

6. Active Transportation Element

6.1 Pedestrian and Bicycle Infrastructure

Pedestrian Infrastructure

New sidewalks are proposed along Vineyard Avenue, Chino Avenue, and the south side of Riverside Avenue as part of the Project. Additional pedestrian facilities will be constructed during the development process of Ontario Ranch.

Within the Project site, sidewalks and pedestrian trails will be provided to facilitate internal circulation and travel between different land uses (e.g. between the stadium and retail/hospitality area). During the final design process of internal roadways and parking lots, pedestrian crossings will be identified along Ontario Avenue, Street A, and Street B.

Bicycle Infrastructure

The Project site will be directly served by several Class I (off street multi-use trails) and Class II (bike lane) facilities. These include:

- Class I Multi-use Trails
    - Vineyard Avenue (between Merril Avenue and Riverside Drive)
    - Cucamonga Channel Multi-use Trail
    - Chino Avenue (between Euclid Avenue and Hamner Avenue)
- Class II On Street Bike Lanes
    - Riverside Drive (between Euclid Avenue and Hamner Avenue)
    - Vineyard Avenue (between Riverside Drive and SR-60)

Additional Class I and Class II facilities are proposed for other streets in the City of Ontario, according to The Ontario Plan Circulation Element. It is anticipated that these facilities will be completed as development in the Ontario Ranch area occurs.

6.2 Pedestrian and Bicycle Access

Pedestrians and cyclists will be able to utilize any of the four access intersections to enter/exit the Project site. Each intersection will include marked crosswalks, and traffic control officers will help facilitate pedestrian and cyclist movement through intersections during events. Bicycle parking should also be provided at multiple locations.

To improve pedestrian safety and intersection operations during events, some crosswalks may be temporarily closed. Full access shall be maintained at all intersections to accommodate all modes of travel. Additional safety measures such as leading pedestrian interval, temporary no right turn on red, crossing guards, etc. can be considered to improve safety and separate pedestrian and vehicle movements.

6.3 Internal Circulation

Pedestrian routes, crosswalks, and event pedestrian-only zones shall be identified to improve pedestrian safety and separate vehicle traffic with pedestrian traffic where possible. When determining these locations, the City should:

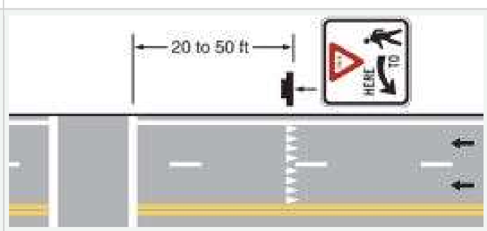
- Consider planned operations at the stadium, retail area, and athletic facilities that may impact pedestrian flows (e.g. pre-event pedestrian queue space at stadium entry gates)
- Provide direct routes to improve wayfinding and compliance
- Minimize the number of times pedestrians must cross major internal streets (e.g. Ontario Avenue, Street A)
- Limit the number of vehicle through trips on internal roadways by closing off portions of Street A, Street B, and Ontario Avenue where pedestrian activity is expected to be higher
- Provide regular crossing opportunities with mid-block crosswalks along internal roadways

As the Project is currently in the environmental review stage and final site design and operational characteristics are not yet known, it is premature to establish specific locations for internal street closures, crosswalks, or walkways. These should be established prior to the opening of the stadium and will be reviewed as part of the process outlined in Section 7.

6.4 Recommended Pedestrian Treatments

Enhanced pedestrian infrastructure is recommended due to the high pedestrian volumes expected during events. Measures in **Table 6** should be considered as part of the final design process and can be added following Project opening as warranted to improve pedestrian safety and movement.

Table 6: Recommended Pedestrian Treatments

Treatment	Description	Example
Improved Crosswalk Visibility	High-visibility crosswalk markings, street lighting, signage, and parking restrictions on crosswalk approaches improve awareness of crosswalks.	
Advanced Yield Line	Additional yield markings 20 to 50 feet before marked crosswalks to provide distance between vehicles and pedestrians (commonly known as "shark's teeth").	

Treatment	Description	Example
Raised Crosswalk	Ramped speed tables that place the crosswalk flush with the sidewalk and reduce vehicle speeds.	
Additional/In-Street Pedestrian Crossing Signs	Signage used at mid-block crossings to remind road users to yield to pedestrians.	
Widened Sidewalks/ Curb Extensions	Shifting the curb inward at crosswalks to reduce crossing distances and improve pedestrian visibility (commonly known as a "bulb out"). Sidewalks can also be widened for additional capacity during major events by installing temporary barriers or bollards.	
Pedestrian Refuge Island	A median installed at a crosswalk to allow pedestrians to cross in two stages. Pedestrian Refuge Islands also promote slower vehicle speeds.	

Treatment	Description	Example
Rectangular Rapid-Flashing Beacon (RRFB)	Pedestrian activated warning lights that flash with high frequency to improve visibility. Recommended for roadways with speed limits less than 40 mph.	
Crossing Guard	Locating traffic control officers at crosswalks with high pedestrian volumes during events to control pedestrian movements and provide regular breaks in traffic.	

Source: Federal Highway Administration Highway Safety Programs Proven Safety Countermeasures, 2021.

7. Monitoring

This section presents the performance standards against which Project operations will be measured. This section also describes the monitoring methods to be undertaken during the first year of operations.

7.1 Performance Standards

The TMP identifies various performance measures that can be used to evaluate operations and identify potential deficiencies to the surrounding multi-modal transportation system. Should any of these performance measures not be achieved, the City should work to update procedures to ensure that the standards are met.

Vehicle Circulation Standards

1. Event vehicle queues do not regularly extend past provided turn pockets on Riverside Drive, Vineyard Avenue, and Chino Avenue
2. Post-event traffic can clear the Project site within 45 minutes with no major delays in parking lots
3. Project access intersections are functioning acceptably with traffic distributed to all four intersections when possible

Public Transportation and Rideshare Standards

1. Public transportation buses can access transit stops with limited event congestion impacts
2. Pedestrian routes between bus stops and event venues are clearly indicated
3. Passenger pick-up/drop-off areas are clearly designated and not impacting other traffic on the Project site
4. Passenger pick-up/drop-off is not occurring along Riverside Drive, Vineyard Avenue, or Chino Avenue

Active Transportation Standards

1. Access intersections provide for full pedestrian movement during events
2. Major pedestrian routes on site are clearly defined and separated from vehicles, except at marked crosswalks
3. Bicycle parking is adequately supplied and clearly defined through signage

7.2 Monitoring Activities and Documentation

The following monitoring activities will occur during the first full year of operations.

Initial Event Monitoring Plan

A focused review of the first two regular season baseball stadium games and the first large soccer or baseball/softball tournament will be conducted. The purpose of this review is to identify initial weaknesses that should be addressed as soon as possible.

Observational data will be collected on site to assess which elements of the TMP need to be modified. The following elements will be reviewed:

- Pre- and Post-Event Traffic Management
- Pedestrian Circulation
- Bicycle Parking and Access
- Transit Loading/Unloading and Access
- Vehicle Pick-up/Drop-off
- Traffic Congestion and Queuing
- Wayfinding/Signage
- Parking Management
- Staffing
- General Safety/Security

Prior to the initial events, a meeting will be held with the City and stadium operator to identify specific monitoring locations, durations, and staffing. A follow-up meeting will occur after each initial event to discuss observations and determine if modifications need to be made.

Proposed modifications will be documented, reviewed, and implemented by the City for all remaining events in the season.

Ongoing Event Monitoring Plan

Following the first month of operations, up to five additional event days should be reviewed to understand "normal" operations. A range of event types and scenarios should be chosen, including days where multiple events are occurring simultaneously.

The City will meet with the stadium and event operators prior to the event date to determine the scope of review. The monitoring effort will focus on how the TMP achieves the performance standards identified in Section 7.1. The monitoring effort will include both observational and empirical data collection.

Findings from ongoing event operations observations will be documented in a "Year One Travel Monitoring Report" which will summarize site operations and ongoing challenges. Specific recommendations will be provided to address deficiencies, which will be reviewed by the operational oversight group (see Section 7.3) and approved by Ontario DPW.

7.3 Revision Process

The TMP is expected to be updated as site operations change and following initial events to address any deficiencies. Revisions will be reviewed by an operational oversight group, which will meet at least once annually and consist of members from:

- Ontario Department of Community Development – Planning and Engineering
- Ontario Department of Public Works
- Ontario Recreation and Community Services Department
- Ontario Fire Department
- Ontario Police Department
- Representatives from Minor League Baseball Franchise
- Representatives from Sports Leagues/Tournament Operators
- Retail/Hospitality Center Operator
- Representatives from on-site business establishments
- Representatives from Whispering Lakes and Ontario Ranch residential neighborhood associations

Revisions proposed and approved by the committee will be incorporated into the TMP. The City of Ontario Department of Public Works, Ontario Fire Department, and Ontario Police Department will have final approval authority over any changes. Changes to the TMP will also require a review of on-site parking management and TDM measures, which are described in the Parking and TDM Plan.

Atypical events (e.g. special tournaments, Fourth-of-July, etc.) may warrant additional traffic management, which will be carefully reviewed by the City prior to these events. Supplemental traffic management plans may be warranted, which will be determined by the City.

7.4 Revision Log

Version Number	Date of Revision	Description of Revision(s)
1.0	June 12, 2024	Initial Version

									AM						PM					
MasterID	City	Status	Project Description	Location	Land Use	Qty	Units	Source	In %	Out %	Rate	In	Out	Total	In %	Out %	Rate	In	Out	Total
1	Ontario	Approved	PDEV21-018 - Industrial Development	SE Corner Jurupa Ave/Milliken Ave	Industrial Park	168.17	KSF	ITE Code 130	81%	19%	0.34	46	11	57	22%	78%	0.34	10	47	57
2	Ontario	In Review	File No. PDEV19-057-Industrial	NE Corner Haven Ave/SR-60	Industrial Park	281.00	KSF	ITE Code 130	81%	19%	0.34	78	18	96	22%	78%	0.34	16	80	96
3	Ontario	In Review	File PDEV18-031 - Commercial/Industrial	SE Corner Riverside Drive/Hamner Ave	Shopping Plaza (40-150k)	52.00	KSF	ITE Code 821 Pass by	62%	38%	1.73	33	21	54	49%	51%	5.19	79	83	162
4	Ontario	In Review	File PDEV18-031 - Commercial/Industrial	SE Corner Riverside Drive/Hamner Ave	Industrial Park	968.03	KSF	ITE Code 130	81%	19%	0.34	266	63	329	22%	78%	0.34	56	273	329
5	Ontario	In Review	File No. PDEV19-059-Industrial	NE Corner Riverside Drive/Milliken Ave	Strip Retail Plaza (<40k)	5.55	KSF	ITE Code 822 Pass by	60%	40%	2.36	5	3	8	50%	50%	6.59	11	11	22
6	Ontario	In Review	File No. PDEV19-059-Industrial	NE Corner Riverside Drive/Milliken Ave	Industrial Park	295.99	KSF	ITE Code 130	81%	19%	0.34	82	19	101	22%	78%	0.34	17	84	101
7	Ontario	In Review	File No. PDEV21-037-Industrial	1516 South Bon View Avenue	Industrial Park	167.40	KSF	ITE Code 130	81%	19%	0.34	46	11	57	22%	78%	0.34	10	47	57
8	Ontario	Approved	Industrial Building(s)	SW corner of Milliken and SR-60	Industrial Park	393.33	KSF	ITE Code 130	81%	19%	0.34	109	25	134	22%	78%	0.34	23	111	134
9	Ontario	Approved	Ontario Ranch Business Park SP	NE Corner Merrill Ave/Euclid Ave	Warehousing/Business Park	1905.03	KSF	See Project TIA	See Project TIA			267	75	342	See Project TIA			100	292	392
10	Ontario	Approved	Merrill Commerce Center SP	Eucalyptus Ave/Grove Ave	Warehousing/Mixed Use	8455.00	KSF	See Project TIA	See Project TIA			1120	300	1420	See Project TIA			433	1269	1701
11	Ontario	Approved	South Ontario Logistics Center SP	Eucalyptus Ave/Campus Ave	Warehousing	5333.52	KSF	See Project TIA	See Project TIA			782	209	991	See Project TIA			283	853	1136
12	Ontario	Approved	Ontario Ranch Business Park SP Expansion	NE Corner Merrill Ave/Euclid Ave	Warehousing/Business Park	1640.69	KSF	See Project TIA	See Project TIA			216	58	274	See Project TIA			83	240	323
13	Ontario	Approved	Rich Haven Specific Plan Commerical	Riverside Drive/Haven Ave	Shopping Center (>150k)	204.50	KSF	ITE Code 820 Pass by	62%	38%	0.84	76	46	122	48%	52%	3.4	237	257	494
14	Ontario	Approved	Portion of Grand Park SP	SE Corner Ontario Ranch Rd/Archibald Ave	SF Attached Housing	362.00	DU	ITE Code 215	25%	75%	0.48	44	130	174	59%	41%	0.57	122	84	206
15	Ontario	Approved	Edenglen	Riverside Drive/Mill Creek Ave	MF Housing (Low Rise)	108.00	DU	ITE Code 220	24%	76%	0.4	10	33	43	63%	37%	0.51	35	20	55
16	Ontario	Approved	Rich Haven	Twinkle Ave/Moonlight St	MF Housing (Low Rise)	120.00	DU	ITE Code 220	24%	76%	0.4	12	36	48	63%	37%	0.51	38	23	61
17	Ontario	Approved	The Avenue	Ontario Ranch Road/Mill Creek Ave	SF Detached Housing	106.00	DU	ITE Code 210	25%	75%	0.7	19	55	74	63%	37%	0.94	63	37	100
18	Ontario	Approved	The Avenue School	Ontario Ranch Road/Mill Creek Ave	Elementary School	800.00	Students	ITE Code 520	54%	46%	0.74	320	272	592	46%	54%	0.16	59	69	128
19	Ontario	Approved	Parkside Specific Plan (SF)	Ontario Ranch Road/Archibald Ave	SF Detached Housing	540.00	DU	ITE Code 210	25%	75%	0.7	95	283	378	63%	37%	0.94	320	188	508
20	Ontario	Approved	Parkside Specific Plan (MF)	Ontario Ranch Road/Archibald Ave	MF Housing (Low Rise)	508.00	DU	ITE Code 220	24%	76%	0.4	49	154	203	63%	37%	0.51	163	96	259
21	Ontario	Approved	Commercial (Ontario Ranch)	Hellman Ave and Eucalyptus Ave	Shopping Center (>150k)	210.00	KSF	ITE Code 820 Pass by	62%	38%	0.84	78	47	125	48%	52%	3.4	243	264	507
22	Ontario	Approved	SF Residential (Ontario Ranch)	SE Corner Eucalyptus Ave/Haven Ave	SF Detached Housing	3733.00	DU	ITE Code 210	25%	75%	0.7	653	1960	2613	63%	37%	0.94	2211	1298	3509
23	Ontario	Approved	Commercial (Ontario Ranch)	SE Corner Eucalyptus Ave/Haven Ave	Shopping Plaza (40-150k)	87.00	KSF	ITE Code 821 Pass by	62%	38%	1.73	56	34	90	49%	51%	5.19	133	138	271
24	Ontario	Approved	Elementary School (Ontario Ranch)	Ontario Ranch Area TBD	Elementary School	800.00	Students	ITE Code 520	54%	46%	0.74	320	272	592	46%	54%	0.16	59	69	128
25	Ontario	Approved	Middle School (Ontario Ranch)	Ontario Ranch Area TBD	Middle School	1200.00	Students	ITE Code 522	54%	46%	0.67	434	370	804	48%	52%	0.15	86	94	180
26	Chino	Approved	Total Preserve SP - SF Res	Pine Ave and Hellmann Ave	SF Detached Housing	1791.00	DU	ITE Code 210	25%	75%	0.7	314	940	1254	63%	37%	0.94	1061	623	1684
27	Chino	Approved	Total Preserve SP - MF Res	Pine Ave and Hellmann Ave	MF Housing (Low Rise)	2675.00	DU	ITE Code 220	24%	76%	0.4	257	813	1070	63%	37%	0.51	859	505	1364
28	Chino	Approved	Majestic Chino Logistics Center	SE Conrer Montain Ave/Bickmore Ave	Var.	2082.75	KSF	See Project TIA	See Project TIA			195	57	252	See Project TIA			95	243	338
29	Chino	Approved	Industrial Building(s)	13404 Yorba Ave	Industrial Park	325.00	KSF	ITE Code 130	81%	19%	0.34	90	21	111	22%	78%	0.34	19	92	111
30	Chino	Approved	Preserve SP Business Park	Pine Ave and Hellmann Ave	Var.	798.00	KSF	See Project TIA	See Project TIA			540	95	635	See Project TIA			137	343	480
31	Chino	Approved	Altitude Business Center (Preserve SP)	Kimball Avenue and Terminal Court	Industrial Park	50.00	KSF	ITE Code 130	81%	19%	0.34	14	3	17	22%	78%	0.34	3	14	17
32	Chino	Approved	SF/MF Housing	West of Meadowhouse/Desert Holly	MF Housing (Low Rise)	149.00	DU	ITE Code 220	24%	76%	0.4	14	46	60	63%	37%	0.51	48	28	76
33	Chino	Approved	Preserve SP - Industrial	Pine Ave and Hellmann Ave	Industrial Park	925.36	KSF	ITE Code 130	81%	19%	0.34	255	60	315	22%	78%	0.34	54	261	315
34	Chino	In Review	Commercial	NE Corner of Euclid Ave and Schafer Ave	Shopping Plaza (40-150k)	71.36	KSF	ITE Code 821 Pass by	62%	38%	1.73	46	28	74	49%	51%	5.19	109	113	222
35	Chino	In Review	Industrial Building(s)	13610 Yorba Ave	Industrial Park	305.00	KSF	ITE Code 130	81%	19%	0.34	84	20	104	22%	78%	0.34	18	86	104
36	Chino	Approved	FedEx	SW corner of Fern Ave and Bickmore Ave	Industrial Park	476.29	KSF	ITE Code 130	81%	19%	0.34	131	31	162	22%	78%	0.34	28	134	162
37	Chino	Approved	El Pollo Loco	6981 Schaefer Ave	Fast Food Restaurant with Drive Through	2.00	KSF	ITE Code 934 Pass By	51%	49%	44.61	23	22	45	52%	48%	33.03	16	14	30
38	Chino	Approved	Goodman-Commerce Center Offices	SW Corner Bickmore Ave and San Antonio Ave	Business Park	160.00	KSF	ITE Code 770	85%	15%	1.35	184	32	216	26%	74%	1.22	51	144	195
39	Chino	Approved	Goodman-Commerce Center Shopping Center	SW Corner Bickmore Ave and San Antonio Ave	Shopping Plaza (40-150k)	63.00	KSF	ITE Code 821 Pass by	62%	38%	1.73	40	25	65	49%	51%	5.19	96	100	196
40	Chino	In Review	Commercial (5985 Eucalyptus Ave)	5985 Eucalyptus Ave	Shopping Plaza (40-150k)	50.63	KSF	ITE Code 821 Pass by	62%	38%	1.73	33	20	53	49%	51%	5.19	77	81	158
41	Chino	In Review	Church (5985 Eucalyptus Ave)	5985 Eucalyptus Ave	Church	27.00	KSF	ITE Code 560	62%	38%	0.32	6	3	9	44%	56%	0.49	6	7	13
42	Chino	In Review	Commercial (6312 Riverside Drive)	6312 Riverside Drive	Strip Retail Plaza (<40k)	6.44	KSF	ITE Code 822 Pass by	60%	40%	2.36	5	4	9	50%	50%	6.59	13	12	25
43	Chino	In Review	Restaurant (6312 Riverside Drive)	6312 Riverside Drive	Fast Food Restaurant with Drive Through	2.31	KSF	ITE Code 934 Pass By	51%	49%	44.61	27	25	52	52%	48%	33.03	18	16	34
44	Chino	In Review	Car Wash (6312 Riverside Drive)	6312 Riverside Drive	Automatic Car Wash	3.61	KSF	ITE Code 948	50%	50%	14.2	26	25	51	50%	50%	14.2	26	25	51
45	Eastvale	In Review	Leal SP - 168 units	NE Corner of Hamner Ave/Limonite Ave	MF Housing (Low Rise)	168.00	DU	ITE Code 220	24%	76%	0.4	16	51	67	63%	37%	0.51	54	32	86
46	Eastvale	In Review	Leal SP - 102 units	NE Corner of Hamner Ave/Limonite Ave	MF Housing (Low Rise)	102.00	DU	ITE Code 220	24%	76%	0.4	10	31	41	63%	37%	0.51	33	19	52
47	Eastvale	In Review	Leal SP - 94 units	NE Corner of Hamner Ave/Limonite Ave	SF Detached Housing	94.00	DU	ITE Code 210	25%	75%	0.7	17	49	66	63%	37%	0.94	55	33	88
48	Eastvale	In Review	Leal SP - 74 units	NE Corner of Hamner Ave/Limonite Ave	SF Detached Housing	74.00	DU	ITE Code 210	25%	75%	0.7	13	39	52	63%	37%	0.94	44	26	70
49	Eastvale	In Review	Leal SP - 320 units	NE Corner of Hamner Ave/Limonite Ave	MF Housing (Low Rise)	320.00	DU	ITE Code 220	24%	76%	0.4	31	97	128	63%	37%	0.51	103	60	163
50	Eastvale	Approved	Restaurant Building	SE Corner of Hamner Ave and Schleisman Rd	High Turnover Sit Down Restaurant	7.76	KSF	ITE Code 932	55%	45%	9.57	41	33	74	61%	39%	9.05	43	27	70
51	Eastvale	Approved	Business Park	NE Corner of Hamner Ave and Goodman Way	Business Park	249.97	KSF	ITE Code 770	85%	15%	1.35	286	51	337	26%	74%	1.22	79	226	305
52	Eastvale	Approved	Fast Food Pad	NW Corner of Archibald Ave and Chandler Ave	Fast Food Restaurant with Drive Through	2.21	KSF	ITE Code 934 Pass By	51%	49%	44.61	25	24	49	52%	48%	33.03	17	16	33
53	Eastvale	Approved	Walmart Eastvale	14100 Limonite Ave	Commercial/Gas Station	177, 16	KSF, Gas Pumps	See Project TIA	See Project TIA			490	370	860	See Project TIA			526	533	1058
54	Eastvale	Approved	Homestead	Archibald Ave and Limonite Ave	Industrial Park	1080.60	KSF	ITE Code 130	81%	19%	0.34	297	70	367	22%	78%	0.34	62	305	367
											Totals	**8726**	**7590**	**16316**			**Totals**	**8640**	**10145**	**18783**

The following projects were reviewed and determined to be far enough from the project to not add significant traffic to study intersections:

MasterID	City	Status	Project Description	Location	Land Use	Qty	Units
55	Ontario	Approved	File No. PDEV20-008 – Industrial Development	Northeast corner of Airport Drove/Haven Avenue	Industrial	200.30	KSF
56	Ontario	Construction	File No. PDEV 19-025 Palmer Apartments / Commercial Retail	Southeast corner of Vineyard and Inland Empire Blvd	Residential and Commercial	950 5	DU KSF
57	Ontario	Approved	File PDEV19-067: Hyatt Dual Hotel 265 Rooms	Southeast corner of Archibald/Inland Empire	Hotel	265.00	Rooms
58	Ontario	Construction	File No. PDEV19-054- Townhomes	Southwest corner of Via Alba/Via Villagio	Residential	72.00	DU
59	Ontario	Construction	File No. PDEV19-061 - Townhomes	Northeast corner of Ontario Center Parkway/ Via Alba	Residential	110.00	DU
60	Ontario	Construction	File No. 21-013 - Retail Shopping Center	Southeast corner of Haven Ave. and 4th Street	Commercial	91.16	KSF
61	Ontario	Approved	File No. PDEV17-016 -Cambria Hotel- 124 Rooms	535 N Turner Avenue	Hotel	124.00	Rooms
62	Ontario	Approved	PDEV22-014 Residential/Commercial Development	Southeast and Southwest corners of Via Piemonte and Via Villagio	Residential and Commercial	694 63.66	DU KSF
63	Ontario	Approved	File No. PDEV21-047 - Industrial	East of Haven Avenue, west of Doubleday and Dupont Avenues, north of Jurupa Street and south of Airport Drive	Industrial	4263.45	KSF
64	Ontario	Construction	File No. PDEV21-003-Industrial	1486 East Holt	Industrial	26.00	KSF
65	Ontario	Approved	File No. PDEV22-009-Industrial	Southeast corner of Sultana Avenue and Mission Blvd	Industrial	79.32	KSF
66	Ontario	Approved	File No. PDEV21-035-Industrial	Southeast corner of Sultana Avenue and Belmont Street	Industrial	59.98	KSF
67	Ontario	Approved	File No. PDEV21-037-Industrial	1516 South Bon View Avenue	Industrial	167.40	KSF
68	Ontario	Approved	File No. PDEV22-012 -Commercial	West side of Archibald Avenue approximately 300 feet south of Philadelphia Street	Commercial	7.23	KSF
69	Ontario	Approved	File No. PDEV21-045 -Commercial	2575 South Archibald Avenue	Commercial	1.80	KSF

Appendix B1. Rough Grading Phase I and 2 Hydrology Study

Appendix

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700 Flower Street, Suite 2100 Los Angeles, CA 90017 213.418.0201 kpff.com

HYDROLOGY REPORT

for

Ontario Ballpark Project
Rough Grading Phase 1 & 2 Permit Package

CITY OF ONTARIO, CALIFORNIA

April 12, 2024

Prepared By:

Julian Dela Cruz
KPFF Consulting Engineers
700 Flower Street, Suite 2100
Los Angeles, CA 9001

Table of Contents

Introduction

The purpose of this study is to evaluate the proposed hydrology conditions for the Ontario Ballpark resulting from the Phase I and II Rough Grading Permit and demonstrate that the proposed conditions comply with the City of Ontario Master Plan of Drainage (MPD). The project site is located on 9375 East Riverside Drive, Ontario, CA 91761. The project site is bounded by Riverside Drive to the north, Vineyard Avenue to the west, Chino Avenue to the south, and an unnamed road between Ontario Avenue and S Newton Avenue to the east.

The hydrology study will determine the proposed site's permeability and compare it with the design assumptions made in the MPD to demonstrate that the proposed project site will not be modified in such a way as to generate a higher runoff volume or peak flow than what was analyzed in the MPD and therefore the City's existing downstream storm drain infrastructure will not be adversely impacted by the work proposed as part of this permit.

Methodology

The purpose of the 2012 MPD is to update the previous 1999 MPD to include the New Model Colony and the Old Model Colony. The previous 1999 MPD included only the area within the city limits at the time, which came to be known as the "Old Model Colony". The current 2012 MPD now includes the "New Model Colony", which represents an area of approximately 8,200 acres annexed by the City of Ontario from the San Bernardino County Agricultural Preserve Area.

The current 2012 MPD has incorporated both the Old and New Model Colonies based on the latest Land Use Plan adopted by the City Council on January 27, 2010, as part of The Ontario Plan. The MPD is primarily used to "present preliminary sizes, alignments and construction cost estimates for recommended city-owned backbone storm drain facilities needed to upgrade the existing systems to provide adequate flood protection and support future built-out conditions and is comprised of the following:

- Update and evaluation of inventory and capacities of the existing city-owned storm drain facilities.
- Preparation of hydrology studies to quantify peak flow rates for runoffs during major storm events, for built-out conditions based on the Land Use Plan
- Identification and quantification of upgrades to existing City-owned storm drain systems to provide adequate flood protection and mitigate development impacts, based on the City's latest policies and goals
- Evaluation of alternatives to provide adequate flood protection utilizing the existing facilities to the maximum extent.
- Development of a master plan that establishes preliminary alignment and sizes for recommended backbone drainage facilities that will ensure adequate flood protection in the study area"

(City of Ontario Master Plan of Drainage, March 2012).

Per the hydrology and storm drain facility design criteria outlined in Section III of the MPD, the flood protection goals of the MPD are as follows:

For Arterial and Collector Streets:

1. Peak runoff during 25-year return frequency storm events shall be contained within curb-to-curb capacity of the street.
2. Peak runoff during 100-year return frequency storm events shall be contained within the limits of street rights-of-way, and the water surface elevation of the street flows shall be at least one foot lower than the lowest finished floor elevation of adjacent inhabitable structures.

For Local and Residential Streets:

1. Peak runoff during 10-year return frequency storm events shall be contained within curb-to-curb capacity of the street.
2. Peak runoff during 100-year frequency storm events shall be contained within the limits of street rights-of-way, and the water surface elevation of the street flows shall be at least one foot lower than the lowest finished floor elevation of adjacent inhabitable structures.

Special Flood Protection Consideration:

1. The best possible and practical flood protection shall be provided for high pedestrian areas (such as schools, hospital, retail centers, public parks, etc.), and emergency facilities.

The MPD has also been prepared using the following hydrology design criteria:

- San Bernardino County Hydrology Manual, 1986 Revision
- Rational Method or Unit Hydrograph method for peak runoff storms of 10, 25, and 100-year return frequencies (Q10, Q25 and Q100)
- Run-off coefficients based on surface/sub-surface characteristics of the watershed:
    - Per Exhibit 6 – Soils Map in the MPD:
        - Sand and sandy loam, classified as Soil Groups A and B
    - Per MPD Land Use Plan:
        - Urban Landscaped cover
        - Average antecedent moisture condition (AMC II)
- Hydraulic capacities of existing storm drains based on design flow data shown on as-builts, when available
    - For storm drains with no as-builts available, preliminary hydraulic calculations were performed to estimate capacities using 80% of the general ground surface slope as the gradient of the mainline Hydraulic Grade Line
- Hydraulic capacities of streets to convey surface flows were calculated using Street Capacity Curves included in Appendix A of the MPD
- All master-planned storm drains and appurtenances should be designed to conform with City's Flood Protection Goals using the latest City Standards
- Facilities located in the State or County R/W shall conform to Caltrans or San Bernardino County Flood Control District's standards and criteria

In order to verify whether or not the work proposed under this permit will result in an increase in runoff volume and/or peak flows relative to what was evaluated by the MPD, the proposed site characteristics were reviewed relative to the site inputs considered in the MPD. The only characteristic expected to differ is the proposed permeability.

The project site is located in the NMC-West, or New Model Colony-West and the OMC, or Old Model Colony and designated as "Low Density Residential" (see Exhibit B: City of Ontario Master Plan of Drainage: Land Use Plan), although the hydrology calculations for the site use a blended land use consisting of a majority Low Density Residential (5-7 Dwellings/Acre) with some Commercial Use and Public Park. The Pervious Area Fraction (Ap) associated with each land use is based on San Bernardino County Hydrology Manual, Figure C-4, replicated in part below. For a full version of Figure C-4, see Exhibit F: City of Ontario Master Plan of Drainage: Figure C-4 Actual Impervious Cover for Developed Areas. The site is split between two drainage areas, Drainage Areas IV and XI (see Exhibit C: City of Ontario Master Plan of Drainage: Drainage Area Map). Within the two drainage areas, the project site includes portions of subdrainage area G47 and the entirety of G48 in Drainage Area IV and subdrainage area F (divided into two subdrainage areas both labeled "F") in Drainage Area XI. See Exhibit D: City of Ontario Master Plan of Drainage: Hydrology Map Old Model Colony-West and Exhibit E: City of Ontario Master Plan of Drainage: Hydrology Map New Model Colony for drainage areas and see Appendix A: City of Ontario Master Plan of Drainage Appendix C – Basin IV and Appendix B: City of Ontario Master Plan of Drainage Appendix E – Basin XI for hydrology calculations.

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

(Figure C-4, Actual Impervious Cover for Developed Area, San Bernardino County Hydrology Manual, 1986)

The proposed site condition at the conclusion of rough grading will be 100% permeable, as shown in Exhibit A: Proposed Permeability Map.

Hydrology Calculations: Master Plan Appendix C – Drainage Areas I, II, III, IV

Master Plan Appendix C – Drainage Areas I, II, III, and IV include subdrainage areas G47 and G48 in Basin IV, which account for the western portion of the project site. The hydrology calculations were performed using Advanced Engineering Software (AES) by Hunsaker & Associates in 2011.

Calculations for subdrainage area G47 (Node 346) include:

- Time of concentration (min.): 29.08
- 10-year rainfall intensity (in/hr): 1.390
- Subarea area (ac): 80.40
- Total area (ac): 733.2
- Q10 Peak Flow Rate (cfs): 673.62
- Subarea Loss Rate Data (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.00	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	70.00	1.33	0.500	17
COMMERCIAL	A	9.40	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.448
SUBAREA AREA(ACRES) = 80.40

"Excerpt from Master Plan Appendix C"

Where:

- Ap = pervious area fraction (permeability)
- Fp = infiltration rate for pervious area
- SCS SN = Soil Conservation Service Curve Number

Calculations for subdrainage area G48 (Node 347) include:

- Time of concentration (min.): 32.17
- 10-year rainfall intensity (in/hr): 1.308
- Subarea area (ac): 147.10
- Total area (ac): 880.3
- Q10 Peak Flow Rate (cfs): 762.93
- Subarea Loss Rate Data (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.80	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	144.30	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.492
* RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
* IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
SUBAREA AREA(ACRES) = 147.10

"Excerpt from Master Plan Appendix C"

Where:

- Ap = pervious area fraction (permeability)
- Fp = infiltration rate for pervious area
- SCS SN = Soil Conservation Service Curve Number

Hydrology Calculations: Master Plan Appendix E – Drainage Areas X, XI, XII, XIII, XIV

Master Plan Appendix E – Drainage Areas X, XI, XII, XIII, XIV include subdrainage areas F (broken into two subdrainage areas labeled “F”) in Basin XI, which account for the eastern portion of the project site. The hydrology calculations were performed using Advanced Engineering Software (AES) by Hunsaker & Associates in 2011.

Calculations for subdrainage area F (Nodes 1000-1002) include:

- Time of concentration (min.): 16.008
- 10-year rainfall intensity (in/hr): 1.768
- Subarea area (ac): 9.45
- Total area (ac): 9.45
- Q10 Peak Flow Rate (cfs): 10.89
- Subarea Loss Rate Data (AMC I):

```
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp        Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
RESIDENTIAL
"5-7 DWELLINGS/ACRE"        A        9.45      0.98     0.500    32   16.01
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
SUBAREA RUNOFF(CFS) =     10.89
TOTAL AREA(ACRES) =      9.45   PEAK FLOW RATE(CFS) =     10.89
```

"Excerpt from Master Plan Appendix E"

Where:

- Ap = pervious area fraction (permeability)
- Fp = infiltration rate for pervious area
- SCS SN = Soil Conservation Service Curve Number

Calculations for subdrainage area F (Nodes 1012) include:

- Time of concentration (min.): 16.72
- 10-year rainfall intensity (in/hr): 1.722
- Subarea area (ac): 34.82
- Total area (ac): 39.2
- Q10 Peak Flow Rate (cfs): 38.79
- Subarea Loss Rate Data (AMC I):

```
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp        Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        1.87      0.98     0.100    32
 PUBLIC PARK                A        2.10      0.98     0.850    32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.497
SUBAREA AREA(ACRES) =    3.97      SUBAREA RUNOFF(CFS) =    4.42
EFFECTIVE AREA(ACRES) =     34.82   AREA-AVERAGED Fm(INCH/HR) =  0.48
AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.50
TOTAL AREA(ACRES) =       39.2       PEAK FLOW RATE(CFS) =      38.79
======================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =       39.2  TC(MIN.) =     16.72
EFFECTIVE AREA(ACRES) =     34.82  AREA-AVERAGED Fm(INCH/HR)=  0.48
AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap = 0.497
PEAK FLOW RATE(CFS)    =      38.79
```

"Excerpt from Master Plan Appendix E"

Where:

- Ap = pervious area fraction (permeability)
- Fp = infiltration rate for pervious area
- SCS SN = Soil Conservation Service Curve Number

Conclusion

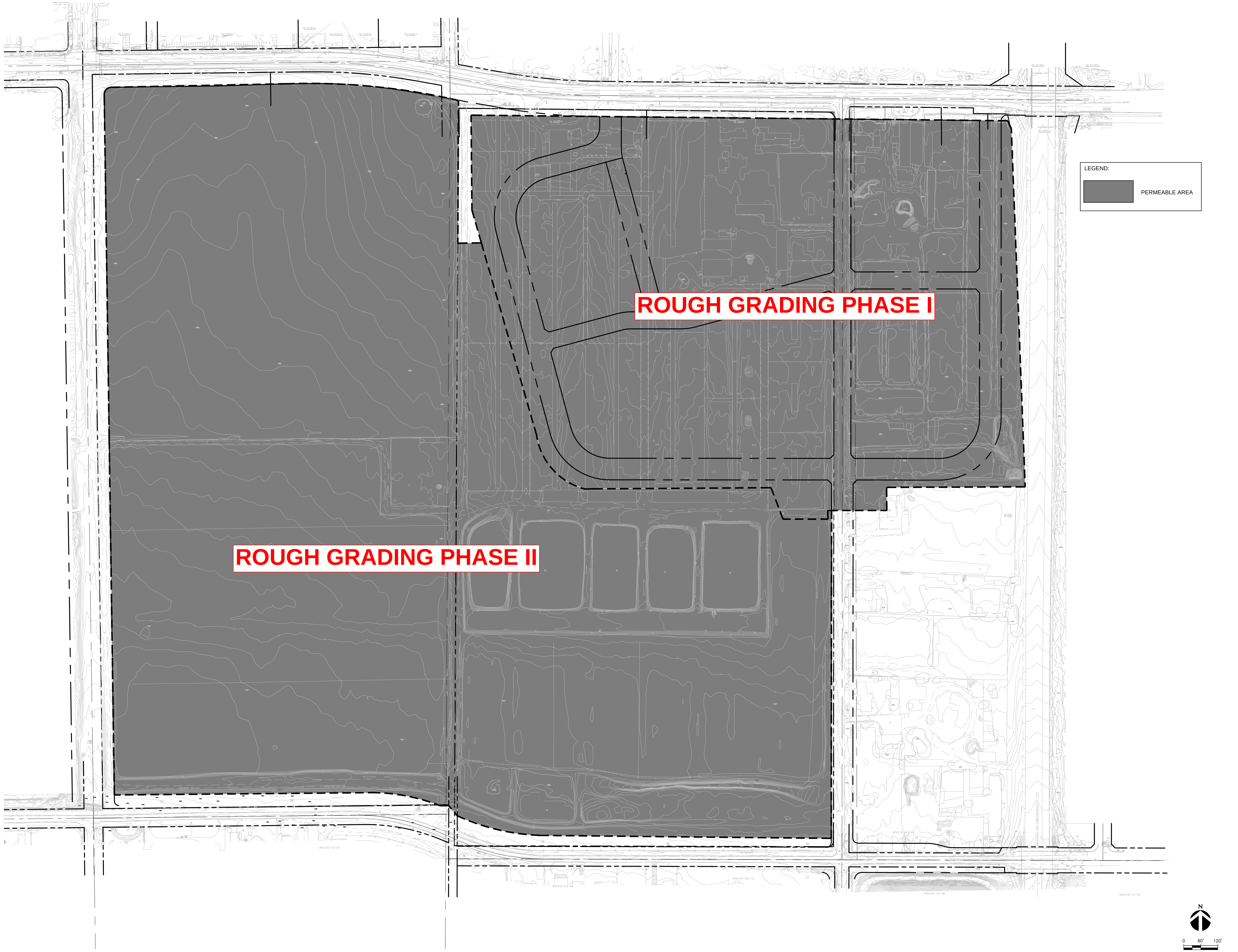
The scope of work for the proposed rough grading permit includes rough grading only, and therefore 100% of the site will qualify as "natural" per the Hydrology Manual Figure C-4, which translates to an impervious percentage of 0, or an Ap of 1.0. All other inputs are expected to remain constant.

Drainage Area	Ap (MPD)	Ap (Proposed Permit)	Runoff Impact
G47	0.448	1.0	Reduction
G48	0.492	1.0	Reduction
F (9.5 ac)	0.500	1.0	Reduction
F (39.2 ac)	0.497	1.0	Reduction

Table 1 – Perviousness Comparison Table

Because all runoff generated by the proposed work is anticipated to be less than the runoff values analyzed as part of the MPD, no impact to the City's downstream infrastructure is anticipated to occur as a result of the proposed work.

Exhibit A: Proposed Permeability Map



B1-12

POPULOUS

Architecture - Interior Design - Landscape Design
Brand Activation - Wayfinding - Product Design
Event - Urban Design - Populous Design Build

ARCHITECTURE + INTERIORS
Populous
304 S. Broadway, Suite 206
Lost Angeles, CA 90013
816-221-1500

LIFE SAFETY
Howe Engineers
141 Longwater Drive, Suite 110
Norwell, MA 02061
(781) 878-3500

MEPFT Engineering
Henderson Engineers
510 W. 6th Street, Suite 800
Los Angeles, CA 90014
(213) 254-4726

CIVIL
KPFF Consulting Engineers
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Los Angeles, CA 90017
(213) 418-0201

LANDSCAPE ARCHITECTURE
KTUA
3916 Normal Street
San Diego, CA 92103
(619) 294-4477

STRUCTURAL ENGINEERING
Walter P. Moore
707 Wilshire Boulevard, Suite 2100
Los Angeles, CA 90017
(213) 292-6583

FOOD SERVICE
Duray J.F. Duncan Industries, Inc
510 W. 6th Street, Suite 800
Los Angeles, CA 90014
(213) 254-4726

REGISTERED PROFESSIONAL ENGINEER
REZA ZAHIR
No. C62048
Exp. 9/30/25
CIVIL
STATE OF CALIFORNIA

CITY OF ONTARIO SOUTHERN CALIFORNIA

REVISIONS

NO.	DATE	DESCRIPTION

PROJECT NAME

ONTARIO BALLPARK

9375 East Riverside Drive
Ontario, CA 91761

ISSUED NAME
DESIGN DEVELOPMENT PACKAGE

ISSUED DATE	ISSUED BY
03/15/2024	POPULOUS

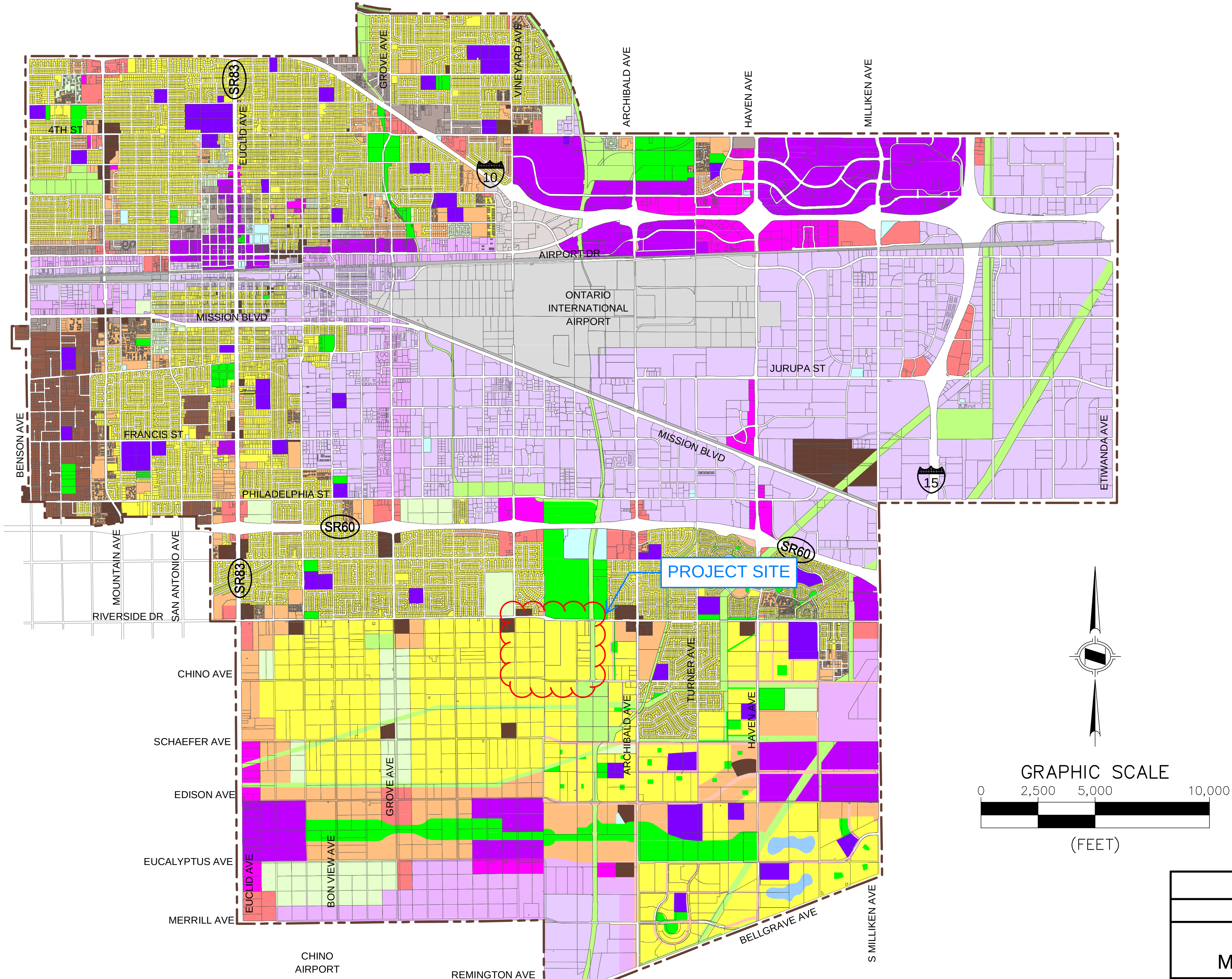
PROJECT NUMBER	PAPER SIZE
23.5836	E1

SHEET NAME

2300478-C-EXHB-HYDR-SITE - 30x42

SHEET NUMBER

Exhibit B: City of Ontario Master Plan of Drainage – Land Use Plan



Residential

- Rural
- Low Density
- Low - Medium Density
- Medium Density
- High Density

Retail/Service

- Neighborhood Commercial
- General Commercial
- Office Commercial
- Hospitality

Employment

- Business Park
- Industrial

Other

- Open Space - Non Recreation
- Open Space - Parkland
- Open Space - Water
- Public Facility
- Public School
- Airport
- Rail
- Landfill

Mixed Use

- Mixed Use

*ADOPTED BY CITY COUNCIL ON JANUARY 27, 2010

03/10/2012

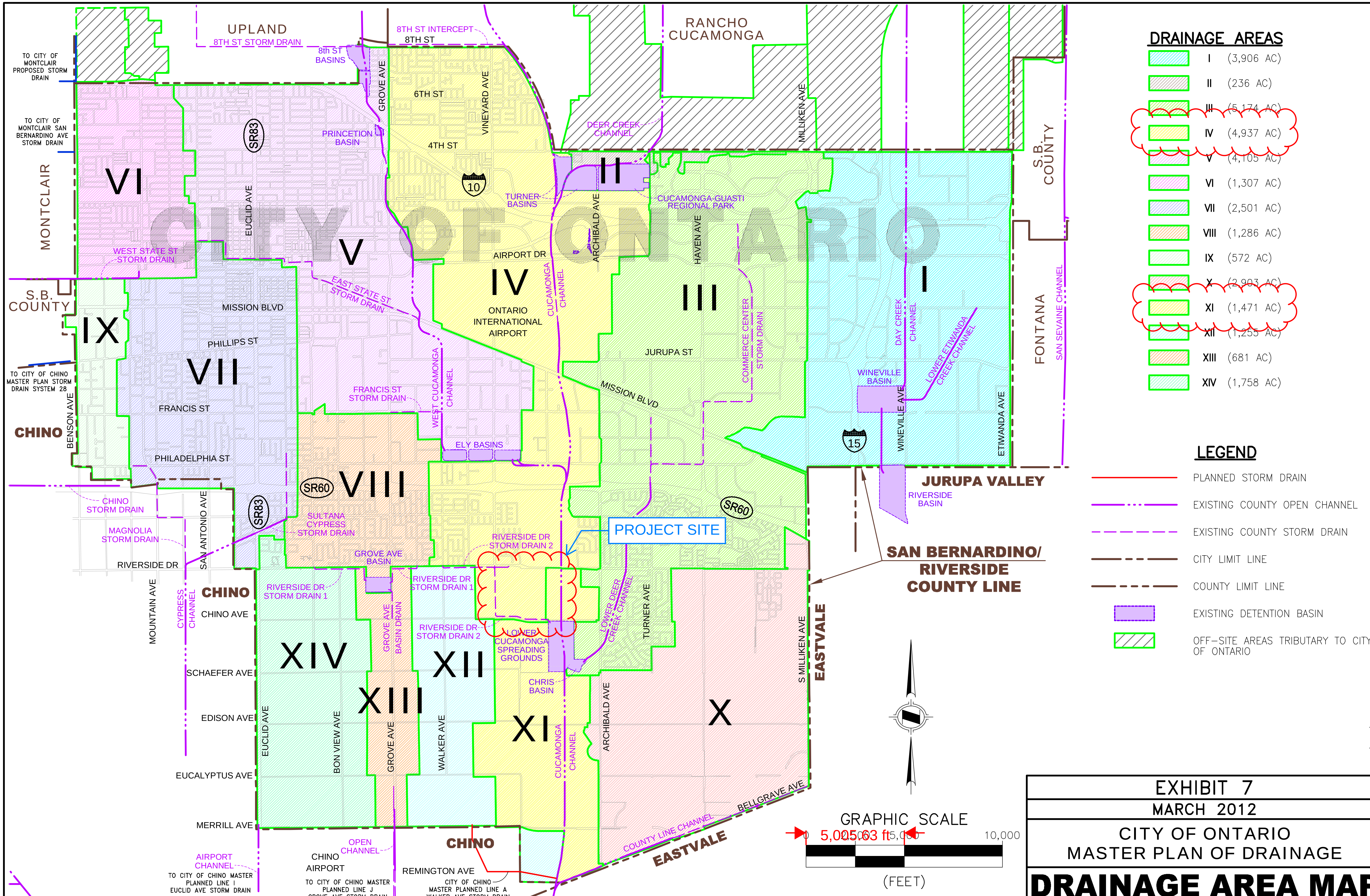
EXHIBIT 4

MARCH 2012

CITY OF ONTARIO
MASTER PLAN OF DRAINAGE

LAND USE PLAN

Exhibit C: City of Ontario Master Plan of Drainage – Drainage Area Map



CITY OF ONTARIO
UPLAND
RANCHO CUCAMONGA
MONTCLAIR
S.B. COUNTY
CHINO
FONTANA
JURUPA VALLEY
EASTVALE
TO CITY OF MONTCLAIR PROPOSED STORM DRAIN
TO CITY OF MONTCLAIR SAN BERNARDINO AVE STORM DRAIN
TO CITY OF CHINO MASTER PLAN STORM DRAIN SYSTEM 28
8TH ST STORM DRAIN
8TH ST INTERCEPT
8th ST BASINS
8TH ST
6TH ST
4TH ST
PRINCETON BASIN
DEER CREEK CHANNEL
TURNER BASINS
CUCAMONGA-GUASTI REGIONAL PARK
WEST STATE ST STORM DRAIN
EAST STATE ST STORM DRAIN
AIRPORT DR
ONTARIO INTERNATIONAL AIRPORT
CUCAMONGA CHANNEL
MISSION BLVD
PHILLIPS ST
FRANCIS ST
FRANCIS ST STORM DRAIN
WEST CUCAMONGA CHANNEL
JURUPA ST
COMMERCE CENTER STORM DRAIN
DAY CREEK CHANNEL
LOWER ETIWANDA CREEK CHANNEL
WINEVILLE BASIN
SAN SEVAINE CHANNEL
PHILADELPHIA ST
ELY BASINS
CHINO STORM DRAIN
MAGNOLIA STORM DRAIN
SULTANA CYPRESS STORM DRAIN
RIVERSIDE DR STORM DRAIN 2
PROJECT SITE
RIVERSIDE BASIN
SAN BERNARDINO/ RIVERSIDE COUNTY LINE
GROVE AVE BASIN
RIVERSIDE DR
RIVERSIDE DR STORM DRAIN 1
CYPRESS CHANNEL
CHINO AVE
LOWER CUCAMONGA SPREADING GROUNDS
LOWER DEER CREEK CHANNEL
GROVE AVE BASIN DRAIN
SCHAEFER AVE
CHRIS BASIN
EDISON AVE
EUCALYPTUS AVE
MERRILL AVE
COUNTY LINE CHANNEL
BELLGRAVE AVE
AIRPORT CHANNEL
OPEN CHANNEL
CHINO AIRPORT
REMINGTON AVE
TO CITY OF CHINO MASTER PLANNED LINE I EUCLID AVE STORM DRAIN
TO CITY OF CHINO MASTER PLANNED LINE J GROVE AVE STORM DRAIN
CITY OF CHINO MASTER PLANNED LINE A WALKER AVE STORM DRAIN
GROVE AVE
VINEYARD AVE
EUCLID AVE
ARCHIBALD AVE
HAVEN AVE
MILLIKEN AVE
ETWIANDA AVE
WINEVILLE AVE
BENSON AVE
MOUNTAIN AVE
SAN ANTONIO AVE
BON VIEW AVE
WALKER AVE
TURNER AVE
S MILLIKEN AVE
SR83
SR60
10
15
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
XII
XIII
XIV
DRAINAGE AREAS
I (3,906 AC)
II (236 AC)
III (5,174 AC)
IV (4,937 AC)
V (4,105 AC)
VI (1,307 AC)
VII (2,501 AC)
VIII (1,286 AC)
IX (572 AC)
X (2,903 AC)
XI (1,471 AC)
XII (1,255 AC)
XIII (681 AC)
XIV (1,758 AC)
LEGEND
PLANNED STORM DRAIN
EXISTING COUNTY OPEN CHANNEL
EXISTING COUNTY STORM DRAIN
CITY LIMIT LINE
COUNTY LIMIT LINE
EXISTING DETENTION BASIN
OFF-SITE AREAS TRIBUTARY TO CITY OF ONTARIO
GRAPHIC SCALE
0 5,000 10,000
5,005.63 ft
(FEET)
03/10/2012
EXHIBIT 7
MARCH 2012
CITY OF ONTARIO
MASTER PLAN OF DRAINAGE
DRAINAGE AREA MAP

Exhibit D: City of Ontario Master Plan of Drainage – Hydrology Map Old Model Colony-West

F:\0641\Engineering\SY_SD Master Plan\Rpt_SD Master Plan\HYDROLOGY MAPS\HYDROLOGY MAP-OMC-ALL.dwg

Exhibit E: City of Ontario Master Plan of Drainage – Hydrology Map New Model Colony

PLOTTED 3/15/2012 10:26 AM

F:\0641\Engineering\SY_SD Master Plan\Rpt_SD Master Plan\HYDROLOGY MAPS\HYDROLOGY MAP-NMC-ALL-X-XIV.dwg

Exhibit F: City of Ontario Master Plan of Drainage – Figure C-4 Actual Impervious Cover for Developed Areas

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area shall always be made, and a review of aerial photos, where available, may assist in estimating the percentage of impervious cover in developed areas.

3. For typical equestrian subdivisions increase impervious area 5 percent over the values recommended in the table above.

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

ACTUAL IMPERVIOUS COVER FOR DEVELOPED AREAS

Figure C-4

Appendix A: City of Ontario Master Plan of Drainage Appendix C – Basin IV

```
 TOTAL AREA(ACRES) =      652.8
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     345.00 =     8240.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     345.00 TO NODE     345.00 IS CODE =  71
----------------------------------------------------------------------------
 >>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
 >>>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<
============================================================================
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
 S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT=  0.0%
          MOUNTAIN=  0.0%;FOOTHILL=  0.0%;DESERT(UNDEV.)=  0.0%
 Tc(HR) = 0.44; LAG(HR) = 0.35; Fm(INCH/HR) = 0.55; Ybar = 0.45
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC  I  CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 1.00; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =      652.8
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     345.00 =     8240.00 FEET.
  EQUIVALENT BASIN FACTOR APPROXIMATIONS:
  Lca/L=0.3,n=.0339; Lca/L=0.4,n=.0304; Lca/L=0.5,n=.0280;Lca/L=0.6,n=.0261
 TIME OF PEAK FLOW(HR) = 16.42  RUNOFF VOLUME(AF) =     135.92
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) =     659.78
 TOTAL PEAK FLOW RATE(CFS) =     659.78 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE(CFS) =      623.90
  (UPSTREAM NODE PEAK FLOW RATE(CFS) =      623.90)
 PEAK FLOW RATE(CFS) USED =     659.78

****************************************************************************
 FLOW PROCESS FROM NODE     345.00 TO NODE     346.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    770.00  DOWNSTREAM(FEET) =    752.00
 FLOW LENGTH(FEET) =  2560.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  96.0 INCH PIPE IS  75.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.50
 ESTIMATED PIPE DIAMETER(INCH) =  96.00     NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      659.78
 PIPE TRAVEL TIME(MIN.) =   2.75     Tc(MIN.) =   29.08
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     346.00 =    10800.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     346.00 TO NODE     346.00 IS CODE =  81  Subarea G47
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   29.08
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.390
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp        Ap       SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        1.00      1.33      0.100     17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"       A       70.00      1.33      0.500     17
 COMMERCIAL                 A        9.40      1.33      0.100     17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.448
 SUBAREA AREA(ACRES) =   80.40
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
 S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT=  0.0%
          MOUNTAIN=  0.0%;FOOTHILL=  0.0%;DESERT(UNDEV.)=  0.0%
 Tc(HR) = 0.48; LAG(HR) = 0.39; Fm(INCH/HR) = 0.56; Ybar = 0.45
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC  I  CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 1.00; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =      733.2
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     346.00 =    10800.00 FEET.
  EQUIVALENT BASIN FACTOR APPROXIMATIONS:
  Lca/L=0.3,n=.0303; Lca/L=0.4,n=.0271; Lca/L=0.5,n=.0249;Lca/L=0.6,n=.0233
 TIME OF PEAK FLOW(HR) = 16.42  RUNOFF VOLUME(AF) =     151.76
 UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) =     673.62
 TOTAL AREA(ACRES) =      733.2       PEAK FLOW RATE(CFS) =     673.62

****************************************************************************
 FLOW PROCESS FROM NODE     346.00 TO NODE     347.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    752.00  DOWNSTREAM(FEET) =    740.00
 FLOW LENGTH(FEET) =  2530.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN 108.0 INCH PIPE IS  78.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.63
 ESTIMATED PIPE DIAMETER(INCH) = 108.00     NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      673.62
 PIPE TRAVEL TIME(MIN.) =   3.09     Tc(MIN.) =   32.17
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     347.00 =    13330.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     347.00 TO NODE     347.00 IS CODE =  81  Subarea G48
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   32.17
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.308
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp        Ap       SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        2.80      1.33      0.100     17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"       A      144.30      1.33      0.500     17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.492
 * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
 * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
 SUBAREA AREA(ACRES) =  147.10
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
 S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT=  0.0%
```

```
          MOUNTAIN=  0.0%;FOOTHILL=  0.0%;DESERT(UNDEV.)=  0.0%
 Tc(HR) = 0.54; LAG(HR) = 0.43; Fm(INCH/HR) = 0.57; Ybar = 0.46
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC  I  CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =      880.3
 LONGEST FLOWPATH FROM NODE    360.00 TO NODE    347.00 =  13330.00 FEET.
  EQUIVALENT BASIN FACTOR APPROXIMATIONS:
  Lca/L=0.3,n=.0281; Lca/L=0.4,n=.0252; Lca/L=0.5,n=.0231;Lca/L=0.6,n=.0216
 TIME OF PEAK FLOW(HR) = 16.50  RUNOFF VOLUME(AF) =     178.61
 UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) =     762.93
 TOTAL AREA(ACRES) =      880.3       PEAK FLOW RATE(CFS) =     762.93
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =      880.3  TC(MIN.) =     32.17
 AREA-AVERAGED Fm(INCH/HR)=  0.57   Ybar =  0.46
 PEAK FLOW RATE(CFS)    =    762.93
============================================================================
============================================================================
 END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS
```

Appendix B: City of Ontario Master Plan of Drainage Appendix E – Basin XI

```
****************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
       (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
      (c) Copyright 1983-2011 Advanced Engineering Software (aes)
          Ver. 18.0  Release Date: 07/01/2011  License ID 1239

                        Analysis prepared by:

                        HUNSAKER & ASSOCIATES
                              Irvine,Inc
                  Planning * Engineering * Surveying
       Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************** DESCRIPTION OF STUDY **************************
* HELLMAN, NORTH OF CHINO                                                  *
* 10-YR STUDY                                                              *
* AREA 'F'                                                                 *
 **************************************************************************

  FILE NAME: HLM-U.DAT
  TIME/DATE OF STUDY: 17:33 10/16/2011
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.8000

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================= ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020  0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   1000.00 TO NODE   1002.00 IS CODE =  21    Subarea F
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   981.00
  ELEVATION DATA: UPSTREAM(FEET) =    777.00  DOWNSTREAM(FEET) =    769.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.008
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.768
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       A        9.45      0.98     0.500    32   16.01
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA RUNOFF(CFS) =     10.89
  TOTAL AREA(ACRES) =      9.45   PEAK FLOW RATE(CFS) =     10.89

****************************************************************************
  FLOW PROCESS FROM NODE   1002.00 TO NODE   1004.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    759.50  DOWNSTREAM(FEET) =   757.70
  FLOW LENGTH(FEET) =   755.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.97
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.89
  PIPE TRAVEL TIME(MIN.) =   3.17    Tc(MIN.) =   19.18
  LONGEST FLOWPATH FROM NODE   1000.00 TO NODE   1004.00 =    1736.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1004.00 TO NODE   1004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   19.18
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.586
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       A        7.87      0.98     0.500    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =    7.87      SUBAREA RUNOFF(CFS) =    7.78
  EFFECTIVE AREA(ACRES) =     17.32   AREA-AVERAGED Fm(INCH/HR) =  0.49
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.50
  TOTAL AREA(ACRES) =       17.3       PEAK FLOW RATE(CFS) =     17.12

****************************************************************************
  FLOW PROCESS FROM NODE   1004.00 TO NODE   1004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
=============================================================================
  MAINLINE Tc(MIN.) =   19.18
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.586
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        1.90      0.98     0.100    32
  PUBLIC PARK                A        1.78      0.98     0.850    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.463
  SUBAREA AREA(ACRES) =    3.68      SUBAREA RUNOFF(CFS) =    3.76
  EFFECTIVE AREA(ACRES) =     21.00   AREA-AVERAGED Fm(INCH/HR) =  0.48
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.49
  TOTAL AREA(ACRES) =       21.0       PEAK FLOW RATE(CFS) =      20.88

*****************************************************************************
  FLOW PROCESS FROM NODE   1004.00 TO NODE   1006.00 IS CODE =  31
-----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   757.70  DOWNSTREAM(FEET) =   730.00
  FLOW LENGTH(FEET) =  1204.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.75
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.88
  PIPE TRAVEL TIME(MIN.) =   1.87    Tc(MIN.) =   21.04
  LONGEST FLOWPATH FROM NODE   1000.00 TO NODE   1006.00 =    2940.00 FEET.

*****************************************************************************
  FLOW PROCESS FROM NODE   1006.00 TO NODE   1006.00 IS CODE =   1
-----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   21.04
  RAINFALL INTENSITY(INCH/HR) =   1.50
  AREA-AVERAGED Fm(INCH/HR) =  0.48
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.49
  EFFECTIVE STREAM AREA(ACRES) =      21.00
  TOTAL STREAM AREA(ACRES) =      21.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      20.88

*****************************************************************************
  FLOW PROCESS FROM NODE   1008.00 TO NODE   1010.00 IS CODE =  21
-----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   981.00
  ELEVATION DATA: UPSTREAM(FEET) =    764.30  DOWNSTREAM(FEET) =    755.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.815
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.780
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       A        9.29      0.98     0.500    32   15.81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA RUNOFF(CFS) =     10.81
  TOTAL AREA(ACRES) =      9.29   PEAK FLOW RATE(CFS) =     10.81

*****************************************************************************
  FLOW PROCESS FROM NODE   1010.00 TO NODE   1006.00 IS CODE =  31
-----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   746.30  DOWNSTREAM(FEET) =   730.00
  FLOW LENGTH(FEET) =   540.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.34
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.81
  PIPE TRAVEL TIME(MIN.) =   0.87    Tc(MIN.) =   16.69
  LONGEST FLOWPATH FROM NODE   1008.00 TO NODE   1006.00 =    1521.00 FEET.

*****************************************************************************
  FLOW PROCESS FROM NODE   1006.00 TO NODE   1006.00 IS CODE =  81
-----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=============================================================================
  MAINLINE Tc(MIN.) =   16.69
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.724
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       A        4.91      0.98     0.500    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =    4.91      SUBAREA RUNOFF(CFS) =    5.46
  EFFECTIVE AREA(ACRES) =     14.20   AREA-AVERAGED Fm(INCH/HR) =  0.49
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.50
  TOTAL AREA(ACRES) =       14.2       PEAK FLOW RATE(CFS) =      15.80

*****************************************************************************
  FLOW PROCESS FROM NODE   1006.00 TO NODE   1006.00 IS CODE =   1
-----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   16.69
  RAINFALL INTENSITY(INCH/HR) =   1.72
```

```
 AREA-AVERAGED Fm(INCH/HR) =  0.49
 AREA-AVERAGED Fp(INCH/HR) =  0.97
 AREA-AVERAGED Ap =  0.50
 EFFECTIVE STREAM AREA(ACRES) =      14.20
 TOTAL STREAM AREA(ACRES) =      14.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      15.80

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       20.88   21.04    1.500  0.97( 0.48) 0.49      21.0    1000.00
     2       15.80   16.69    1.724  0.97( 0.49) 0.50      14.2    1008.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       36.00   16.69    1.724  0.97( 0.48) 0.50      30.9    1008.00
     2       33.82   21.04    1.500  0.98( 0.48) 0.50      35.2    1000.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      36.00    Tc(MIN.) =     16.69
 EFFECTIVE AREA(ACRES) =      30.85   AREA-AVERAGED Fm(INCH/HR) =  0.48
 AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.50
 TOTAL AREA(ACRES) =      35.2
 LONGEST FLOWPATH FROM NODE   1000.00 TO NODE   1006.00 =    2940.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   1006.00 TO NODE   1012.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   730.00  DOWNSTREAM(FEET) =   726.00
 FLOW LENGTH(FEET) =    44.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  20.91
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.00
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   16.72
 LONGEST FLOWPATH FROM NODE   1000.00 TO NODE   1012.00 =    2984.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   1012.00 TO NODE   1012.00 IS CODE =  81  Subarea F
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   16.72
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.722
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A       1.87      0.98      0.100    32
 PUBLIC PARK                A       2.10      0.98      0.850    32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.497
 SUBAREA AREA(ACRES) =     3.97      SUBAREA RUNOFF(CFS) =    4.42
 EFFECTIVE AREA(ACRES) =     34.82   AREA-AVERAGED Fm(INCH/HR) =  0.48
 AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.50
 TOTAL AREA(ACRES) =      39.2      PEAK FLOW RATE(CFS) =      38.79
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       39.2  TC(MIN.) =     16.72
 EFFECTIVE AREA(ACRES) =     34.82  AREA-AVERAGED Fm(INCH/HR)=  0.48
 AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap = 0.497
 PEAK FLOW RATE(CFS)   =      38.79

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       38.79   16.72    1.722  0.97( 0.48) 0.50      34.8    1008.00
     2       35.77   21.08    1.499  0.98( 0.48) 0.50      39.2    1000.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

Appendix B2. ORSC Preliminary Water Quality Management Plan

Appendix

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CITY OF ONTARIO

Engineering Department

Preliminary Water Quality Management Plan (PWQMP)

For compliance with Santa Ana Regional Water Quality Control Board
Order Number R8-2010-0036 (NPDES Permit No. CAS618036)

Project Name:	Ontario Regional Sports Complex
Ontario Project #:	
Applicant Name:	City of Ontario
Applicant Address:	303 East B Street
Project Address:	
Project Size (acres):	199 acres
Project Description:	City of Ontario Regional Sports Complex

Submittal Date: 3/20/24

Preliminary Water Quality Management Plan (PWQMP)

1. Introduction

The Preliminary Water Quality Management Plan (PWQMP) is a planning tool to improve integration of required water quality elements, stormwater management, water conservation, rainwater harvesting and re-use, and flood management in land use planning and the City's development process. The Preliminary WQMP will assist project applicants and planners in properly designing and laying out project sites so that water quality may be incorporated in the most effective manner and at the lowest cost for the developer.

The San Bernardino County Municipal Separate Storm Sewer System Permit (MS4 Permit) requires project-specific Water Quality Management plans (WQMP) to be prepared for all priority new development and significant redevelopment projects listed in Section 2 of this document. The MS4 Permit stipulates that the City of Ontario require priority project applicants to submit a Preliminary project-specific WQMP, as early as possible, during the environmental review or planning phase of a development project and that the Preliminary WQMP be approved prior to the issuance of land use entitlement.

2. Priority Projects (requiring a Preliminary WQMP)

Land Use entitlement shall not be issued for any of the listed projects, below, until a Preliminary WQMP has been approved by the City's Engineering Department. For construction projects not going through entitlement, a Preliminary and Final project specific WQMP shall be approved, prior to the issuance of construction permits:

Check the appropriate project category below, for this project:

Check below	**Project Categories**
	1. All significant re-development projects. Significant re-development is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site subject to discretionary approval of the Permittee. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety. Where redevelopment results in an increase of less than fifty percent of the impervious surfaces of a previously existing developed site, and the existing development was not subject to WQMP requirements, the numeric sizing criteria discussed below applies only to the addition or replacement, and not to the entire developed site. Where redevelopment results in an increase of fifty percent or more of the impervious surfaces of a previously existing developed site, the numeric sizing criteria applies to the entire development (new and existing).
✔	2. New development projects that create 10,000 square feet or more of impervious surface (collectively over the entire project site) including commercial, industrial, residential housing subdivisions (i.e., detached single family home subdivisions, multi-family attached subdivisions or townhomes, condominiums, apartments, etc.), mixed-use, and public projects. This category includes development projects on public and private land, which fall under the planning and building authority of the permitting agency.

Check below	**Project Categories**
	3. Automotive repair shops (with SIC codes 5013, 5014, 5541, 7532- 7534, 7536-7539).
	4. Restaurants and Food Service Establishments where the land area of development is 5,000 square feet or more.
	5. Developments of 2,500 square feet of impervious surface or more adjacent to (within 200 feet) or discharging directly into environmentally sensitive areas (ESA's) such as areas designated in the Ocean Plan as areas of special biological significance or waterbodies listed on the CWA Section 303(d) list of impaired waters.
	6. Parking lots of 5,000 square feet or more exposed to storm water. Parking lot is defined as land area or facility for the temporary storage of motor vehicles.
	7. Retail Gasoline Outlets (RGOs) that are either 5,000 sq ft or more or have a projected average daily traffic of 100 or more vehicles per day.
	8. *This project is not covered under any of the categories listed above.

* If the development is not covered under any of the project categories listed in Section 2, the project is not required to design and install Site Design/LID BMPs or Treatment Control BMPs to treat the design storm event (Design Capture Volume) described in Section 4.

3. Preliminary WQMP Objectives

Through a combination of Site Design/LID BMPs (where feasible), Source Control, and/or Treatment Control BMPs, project-specific WQMPs shall address all identified pollutants and hydrologic conditions of concern from new development and significant re-development projects for the categories of projects (priority projects) listed in Section 2. Under each type of BMP, listed below, please indicate which BMPs are planned to be implemented and included in the Final WQMP for the project:

A. Site Design/LID (Low Impact Design) for Reducing Stormwater Runoff:

The MS4 Permit requires each priority development project to infiltrate, harvest and use, evapotranspire, or bio-treat the runoff from a 2-yr, 24-hour storm event (Design Capture Volume). If site conditions do not permit infiltration, harvest and use, evapotranspiration, and/or bio-treatment of the entire Design Capture Volume, at the project site, Site Design/LID techniques are required to be implemented to the Maximum Extent Practicable, at the project site, and the remainder of the DCV shall be infiltrated, harvested, bio-treated or treated by alternative measures. Project applicants shall submit a Preliminary WQMP that documents the LID/Site Design BMPs, proposed for the project. Please indicate, in the table below, which Site Design/LID BMPs will be utilized on this project to accomplish this requirement:

Site Design/LID Practice	Planned	Not Planned
Provide at least the minimum effective area required for LID BMPs, to comply with the WQMP (see Table 3-1 below).	✔	
Grade parking lot areas/drive aisles/roof drains to sheet flow runoff into landscaped swales, via curb cuts or zero-face curbs or otherwise disconnect direct drainage from MS4.	✔	
Design landscaped areas as swales and grade to accept runoff from building roofs, parking lots and project roadways.	✔	
Install surface retention basins or infiltration trenches to receive impervious area runoff.	✔	
Install pervious pavement in parking stalls, alleys, driveways, gutters, walkways, trails or patios.		✔
Install underground stormwater retention chambers where downstream landscaped areas are limited.		✔
Install approved Stormwater Drywells in detention areas.		✔
Construct streets, sidewalks, and parking lot stalls to the minimum widths necessary.	✔	
Install on-site Biotreatment basins/trenches with underdrains, where soil type is poorly draining.		✔
Install "Engineered Soil" to increase uptake/soil storage capacity and/or evapotranspiration.		✔
Install Rainwater Harvesting/Use Equipment.		✔
Regional LID BMP facilities are installed, off-site, with the capacity and conveyances to accept post-development storm water runoff from this project and reserved capacity allocation credits have been assigned to the project, in a Certificate or other legally binding document, attached herein	✔	

Table 3-1 Minimum Effective Area[1] Required for LID BMPs (surface + subsurface facilities) for Project WQMP to Demonstrate Infeasibility[2] (% of site)

Project Type	New Development	Re-Development
SF/MF Residential < 7 du/ac	10%	5%
SF/MF Residential < 7 - 18 du/ac	7%	3.5%
SF/MF Residential > 18 du/ac	5%	2.5%
Mixed Use, Commercial/Industrial w/FAR< 1.0	10%	5%
Mixed Use, Commercial/Industrial w/FAR 1.0-2.0	7%	3.5%
Mixed Use, Commercial/Industrial w/FAR> 2.0	5%	2.5%
Podium (parking under > 75% of project)	3%	1.5%
Zoning allowing development to property lines	2%	1%
Transit Oriented Development[3]	5%	2.5%
Parking	5%	2.5%

[1] "Effective area" is defined as land area which 1) is suitable for a retention/infiltration BMP (based on infeasibility criteria) and 2) is located down-gradient from building roof or paved areas, so that it may receive gravity flow runoff.
[2] Criteria only required if the project WQMP seeks to demonstrate that the full DCV cannot be feasibly managed on-site.
[3] Transit oriented development is defined as a project with development center within one half mile of a mass transit center.
Key: du/ac = dwelling units/acre, FAR = Floor Area Ratio = ratio of gross floor area of building to gross lot area, MF = Multi Family, SF = Single Family

B. Source Control BMPs – The following BMPs are designed to control stormwater pollutants and runoff water at the location where it is generated. Please indicate which of the listed BMPs are planned to be implemented for the project:

Source Control BMPs	Planned	Not Planned
Minimize non-stormwater site runoff through efficient irrigation system design and controllers.		
Minimize trash and debris in storm runoff through a regular parking lot, storage yard and roadway sweeping program.	✔	
Provide proper covers/roofs and secondary containment for outside material storage & work areas.		✔
Provide solid roofs over all trash enclosures.		
Site Owner(s)/Property Manager/HOA or POA will be familiar with the project WQMP and stormwater BMPs.	✔	
Owner or HOA or POA to provide Education/Training of site occupants and employees on stormwater BMPs.	✔	
Install stormwater placards/stenciled messages with a "No Dumping" message on all on-site/off-site storm drain inlets.	✔	
Provide contained equipment/vehicle wash rack areas that discharge to sanitary sewer.		

To be coordinated with on-site team and addressed at next submittal.

C. Treatment Control BMPs – The following BMPs are designed to control stormwater pollutants where it is not feasible to install on-site or off-site Site Design/LID BMPs, with the requisite capacity to treat the Design Capture Volume for identified Pollutants of Concern or where pretreatment of stormwater runoff is required, ahead of infiltration BMPs. Please indicate which of the listed BMPs are planned to be implemented for the project:

Treatment Control BMP	Planned	Not Planned
Gravity Separator devices for pretreatment of sediment, trash/litter or Oil & Grease	✔	
Proprietary Biofiltration vaults/devices		✔
Media Cartridge Filtration Vaults		✔
Proprietary Filter Inserts for on-site storm drain inlets or retention basin/trench overflow drains		

Filter inserts may be a consideration for catch basins along the roadways and on-site, to be evaluated.

4. Volume-based calculation (approximate) for sizing on-site or off-site Stormwater Retention/Infiltration, Harvest & Re-Use or Biotreatment facilities

1) After calculating the "Watershed Imperviousness Ratio", i, which is equal to the percent of impervious area in each Drainage Management Area, divided by 100, calculate the composite runoff coefficient C_{BMP} for the Drainage Area above using the following equation:

$$\mathbf{C_{BMP} = 0.858i^3 - 0.78i^2 + 0.774i + 0.04}$$

where: **C_{BMP}** = composite runoff coefficient; and,

i = watershed imperviousness ratio.

3) Determine the area-averaged "6-hour Mean Storm Rainfall", P_6, for the Drainage Area. This is calculated by multiplying the area averaged 2-year 1-hour value (0.5"-0.6") by the appropriate regression coefficient (1.4807). The 2-yr, 1-hr value for southern Ontario is approximately to 0.5" (P_6 = 0.5*1.4807 = 0.74 and northern Ontario is approximately 0.6" in/hr (P_6 = 0.6*1.4807 = 0.89).

4) Determine the appropriate drawdown time. Use the regression constant a = 1.582 for 24 hours and a = 1.963 for 48 hours. *Note: Regression constants are provided for both 24 hour and 48-hour drawdown times; however, 48-hour drawdown times should be used in most areas of California. Drawdown times in excess of 48 hours should be used with caution as vector breeding can be a problem after water has stood in excess of 72 hours. (Use of the 24-hour drawdown time should be limited to drainage areas with coarse soils (Class 'A' soils that readily drain.)*

5) Calculate the "Maximized Detention Volume", P_0, using the following equation:

$$\mathbf{P_0 = a \cdot C_{BMP} \cdot P_6}$$

where: **P_0** = Maximized Detention Volume, in inches

a = 1.582 for 24 hour and a = 1.963 for 48-hour drawdown,

C_{BMP} = composite runoff coefficient; and,

P_6 = 6-hour Mean Storm Rainfall, in inches

6) Calculate the "Target Capture Volume", V_0, using the following equation:

$$\mathbf{V_0 = (P_0 \cdot A) / 12}$$

where: **V_0** = Target Capture Volume, in acre-feet

P_0 = Maximized Detention Volume, in inches; and,

A = BMP Drainage Area, in acres

Project Volume-based calculation (approximate) for planned on-site or off-site Stormwater Retention/Infiltration, Harvest & Re-Use or Biotreatment facilities:

Variable	Factor/Formula	DA1, DMA A	DA1 DMA B	DA2 DMA A	DA2 DMA B
Impervious surface/total surface, ratio	(i)				
C_{BMP}= runoff coefficient	$0.858i^3 – 0.78i^2 + 0.774i + 0.04$				
P_6	$**P_6$ = 2-yr,1-hr depth*1.4807 =				
Detention Volume (acre inches)	$P_0 = a * C_{BMP} * P_6$ =				
Drawdown rate of basin/trench (a)	1.963 for 48-hr drawdown =				
Project Total Area (acre)	(A)				
Design Capture Volume in cu. ft.	$V_0 = [(P_0 * A)/12] *43560$ =				
Retention Volume provided in cubic feet.	Retention capacity of basins, trenches, underground storage or biotreatment basin				

**For P_6 value, use site coordinates and NOAA website to determine project's average 2-yr, 1-hr rainfall depth, at: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html .

5. **Flow-Based calculation (approximate) for sizing on-site or off-site Biotreatment facilities and proprietary treatment technology BMPs:**

   1) After calculating the "Watershed Imperviousness Ratio", i, which is equal to the percent of impervious area in each Drainage Management Area divided by 100, calculate the composite runoff coefficient C_{BMP} for the Drainage Area above using the following equation:

$$C_{BMP} = 0.858i^3 – 0.78i^2 + 0.774i + 0.04$$

where: C_{BMP} = composite runoff coefficient; and,

i = watershed imperviousness ratio.

2) Determine BMP design rainfall intensity, **I_{BMP}**, using the project site geo-coordinates and the NOAA website to determine project's average 2-yr, 1-hr rainfall intensity, at: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html .Multiply this value by 0.2787 (regression coefficient for Ontario) and a minimum safety factor of 2.

4) Calculate the target BMP flowrate, Q, using the following formula (for each DMA <50 acres*):

$$Q = C_{BMP} \cdot I_{BMP} \cdot A$$

Where: **Q** = flow in cfs (Cubic feet per second)
I_{BMP} = BMP design rainfall intensity, in/hr
A = Drainage Area in acres

*For DMAs >50 acres, with C_{BMP} <0.5, the project applicant shall use the unit hydrograph method specified in the San Bernardino County Hydrology Manual, using the design storm pattern with rainfall return frequency such that the peak 1-hr rainfall intensity equals the 85th percentile 1-hr rainfall, multiplied by 2.

Project Flow-based calculation (approximate) for planned on-site or off-site flow-based Biotreatment facilities or Stormwater Treatment BMPs:

Variable	Factor/Formula	DA1 DMA A	DA1 DMA B	DA2 DMA A	DA2 DMA B
Impervious surface/ total surface, ratio	(i)				
C_{BMP}= composite runoff coefficient	$0.858i^3 + 0.78i^2 + 0.774i + 0.04$				
I_{BMP}	I_{BMP} = 2-yr,1-hr storm intensity*0.2787*safety factor				
Drainage area (ac)	A = DMA sq ft/43,560				
Target BMP flowrate	Q = C_{BPM}* I_{BMP} * A				

6. Hydrologic Conditions of Concern (HCOC) and use of the on-line San Bernardino County HCOC Map for determining necessary mitigation steps necessary if there are HCOCs downstream of a project:

Project applicants may access the on-line HCOC Map at: http://permitrack.sbcounty.gov/WAP/. The map will indicate any hydrology concerns with downstream waterways that are hydraulically connected to the project and will indicate if there are any approved regional projects downstream that could be utilized for off-site mitigation of HCOCs. Please indicate here if the project will or will not be able to retain/infilter, harvest and use or biotreat and detain the DCV, on-site, as calculated in Section 4 and if there are HCOCs identified downstream of the project:

Retain or Harvest/Use the DCV on site?	Yes		No	
Biotreat the DCV but not infilter the runoff?	Yes		No	
HCOCs identified downstream of site?	Yes		No	

If the entire DCV will not be retained on site, the DCV is biotreated but not infiltered or additional detention capacity is needed to address identified HCOCs, downstream of the site, please list here, what additional mitigation measures will be utilized (on-site or off-site) to address HCOCs (see Section 4.2.1-4.2.3 of the SB County WQMP Technical Guidance):

____

____

7. Site Plan and Conceptual Grading/Drainage Plan requirements for submission with the Preliminary WQMP:

Provide a Site Plan and Conceptual Grading/Drainage Plan along with this Preliminary WQMP, which conceptually shows the proposed locations of buildings, homes, parking lots, parks, new paved roadways, landscaped areas, drainage patterns and drainage sub-areas, methods of conveyance, proposed retention/infiltration, harvest & use or biotreatment facilities that are planned for installation. Where it is determined to be infeasible to capture and detain design storm runoff volumes, on-site, please include other design features, as described in Section 3, above. Include numbered or lettered notes on the Site Plan with a legend detailing other BMPs, as described in Section 3.

8. BMP Maintenance and Funding Mechanism & Description:

City of Ontario

____

9. Acknowledgment:

As the property owner or developer, I understand that this project is required to install and implement permanent LID Storm Water Best Management Practices pursuant to the requirements of the San Bernardino County MS4 Permit and to document those BMPs in the submittal of a Water Quality Management Plan, which is binding on any current or successive owners of this property.

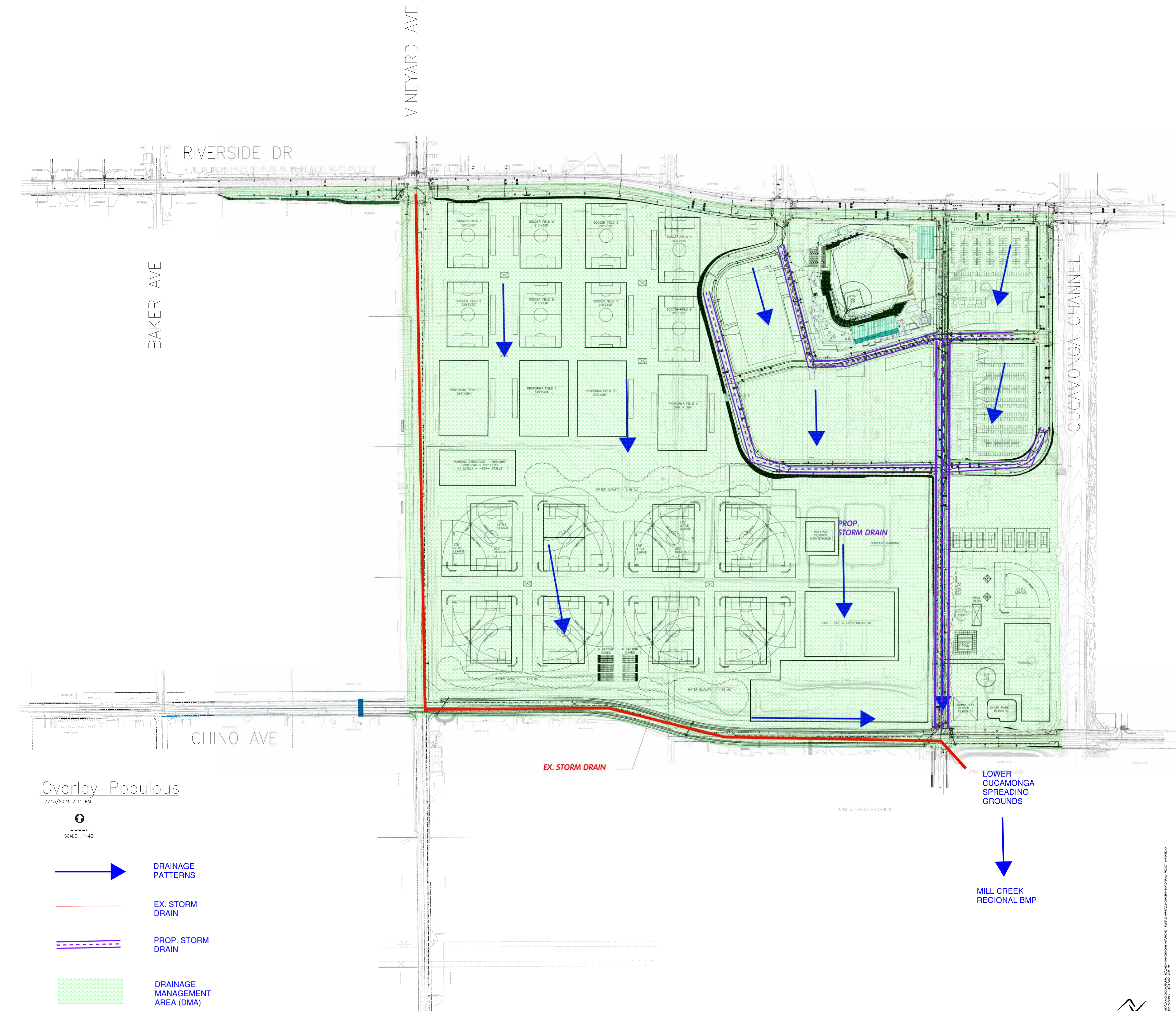
Yes		No	

10. Exemption Signature:

As the property owner or developer, I understand that this project is not required by the San Bernardino County MS4 Permit to install and implement permanent LID Storm Water Best Management Practices and will not be required to submit a Water Quality Management Plan.

______________________________ ____________________

Signature of Owner or Developer Date



NOTE:

DESIGN CAPTURE VOLUME OF THE DMA HAS BEEN ACCOUNTED FOR IN THE MILL CREEK REGIONAL BMP CAPACITY.

PRELIMINARY WQMP SITE PLAN

Appendix B3. ORSC Drainage Memorandum

Appendix

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Ontario Regional Sports Complex

Drainage Memorandum-90%

Prepared by

ARDURRA

MAY 2024

Table of Contents

0.0 EXECUTIVE SUMMARY

The Ontario Regional Sports Complex Project (Project) is being implemented by the City of Ontario (City) and proposes the development of approximately 205 acres of what is currently comprised of agricultural and vacant property. The Project will feature a regional sports complex to accommodate a Minor League baseball stadium, restaurants and entertainment, and a variety of amenities for the community to enjoy. The Project is located south of East Riverside Drive across from Whispering Lakes Golf Course, on property referred to as the Armstrong Ranch, which has been acquired by the City.

The development will necessitate a series of new storm drains, catch basins, and manholes. The new system will range from 24-inch reinforced concrete pipe (RCP) to 54-inch RCP and will generally span along Hellman Avenue beginning at C Street and outlet into the existing Riverside Drive Storm Drain at the intersection of Hellman Avenue and Chino Avenue. Several other catch basins will be proposed along Riverside Drive, Vineyard Avenue, and Chino Avenue and will connect to the existing Riverside Drive Storm Drain at various locations. In total, the Project proposes 46 catch basins and 7,656 linear feet of storm drain.

In addition to storm drain improvements, the Project proposes the widening and rehabilitation of Riverside Drive, Chino Avenue, and Hellman Avenue as well as the construction of Vineyard Avenue.

The Project will be completed in two phases with improvements to the northeast corner of the site, Riverside Drive, and Hellman Avenue completed as part of Phase I. Improvements to the remainder of the site, Vineyard Avenue, and Chino Avenue will be completed as part of Phase II. The Project also includes HMC Community Center and Gymnasium just north of Chino Avenue and Hellman Avenue.

1.0 PURPOSE

The following report provides the drainage analysis necessary to size the proposed drainage facilities and confirm adequate flood capacity for the improved streets for Phase I and II. It implements the hydrologic findings presented in the City's 2012 Drainage Master Plan. The secondary purpose of the report is to evaluate any adverse impact to the existing Riverside Dr Storm Drain 2. This report includes on-site hydrology analyses based on grading and drainage plans produced by the on-site civil consultant. Off-site hydrology related to the public right-of-way will be detailed in Section 3.

2.0 BACKGROUND

The site is comprised of 205 acres of agricultural and vacant property. The site is bounded by the Whispering Lakes Golf Course, a residential tract, and a retail plaza to the north; agricultural land and an RV park to the west; agricultural land to the south, and the Cucamonga Channel to the east. Once developed, the site will include recreational and commercial land uses. The site is within a sub-watershed encompassing 910 acres of land which drains into the Lower Cucamonga Spreading Grounds and ultimately into the Cucamonga Channel.

3.0 HYDROLOGY

3.1 Existing Conditions

Off-site hydrology was obtained from the Master Plan. Results presented in the Master Plan were obtained using the Advanced Engineering Software (AES) hydrology program, which is based on the procedures and standards set forth in the San Bernardino County Hydrology Manual, 1986 Revision (Hydrology Manual). Additionally, Rational method calculations were performed to find 10-, 25- and 100-year flow and volume outflow from each existing and proposed drainage area. However, the AES software method was the dominant method, and the Rational calculations were used as a back check.

Six nodes of interest in the Master Plan are: 324, 345, 346, 354, 364 and 347. Node 324 is the outlet for 151.5 acres of land that comprises the golf course and outlets to Riverside Drive. These flows continue along Riverside Drive and discharge into the Riverside Drive Lateral Storm Drain via a series of catch basins.

Flows continue onto Node 345 where they converge with 227.3 acres of residential and commercial area. Immediately downstream, these flows converge with flows from Node 354 and 364 which are generated by 274 acres of residential area. Flows from these 652.8 acres of land enter the Riverside Drive Storm Drain at various points along its alignment and continue to the Lower Cucamonga Spreading Grounds.

Node 346 is the outlet for 80.4 acres of agricultural land and an RV park. Of these 80.4 acres, approximately 15 acres are part of the Project site. The flows are conveyed as surface flows to the outlet. These flows continue along Chino Avenue before converging with 147.1 acres of undeveloped, previously agricultural land at Node 347. These 147.1 acres are also part of the Project site. The combined 227.5 acres discharge into the Lower Cucamonga Spreading Grounds as surface flows.

A small subarea of 29.7 acres comprises the remainder of the Project site, flowing directing into the Lower Cucamonga Spreading Grounds as surface flows. Note that the Master Plan did not identify a node for this subarea, and as such, the subarea identifier F will be utilized for the purpose of this analysis.

Figure 1 below demonstrates the above subareas and their outlet nodes.

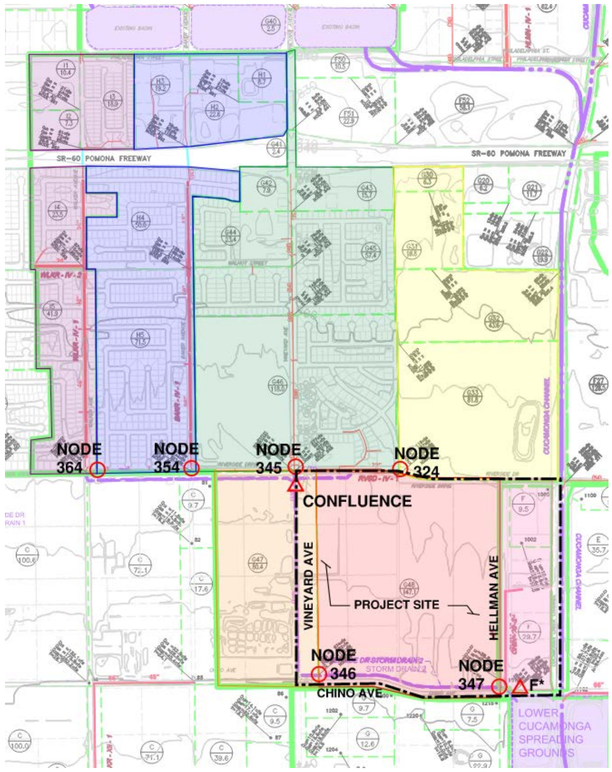

Figure 1. Drainage Subareas and Outlets

Peak flow rates for the 10-, 25-, and 100-year storm events for the 910-acre watershed were obtained for the above nodes and are summarized in cubic-feet-per-second (cfs) in **Table 3-1** below.

Table 3-1: Peak Flow Rates of Sub-Watershed

Node	Area	Q10	Q25	Q100
	ac	cfs	cfs	cfs
324	151.5	119	157	230
345	378.8	396	489	666
346	733.2	674	882	1,191
347	880.3	753	971	1,294
F*	29.7	38.8	48.6	66.8

3.2 Proposed Conditions

Proposed onsite hydrology was modeled using the Rational Method Hydrology program for San Bernardino County (RSBC) by CivilDesign© Corporation, which also uses all the procedures and standards from the San Bernardino County Hydrology Manual. Rainfall intensity and precipitation depth data were obtained from NOAA Atlas 14, Volume 6, Version 2 Point Precipitation Frequency Estimates, per the San Bernardino County Hydrology Manual Addendum (dated April 2010). The upper bounds of the rainfall intensity range in the 10-year, 60-minute, and 100-year, 60-minute rainfall event were input into the RSBC program to create an IDF curve used in all subsequent hydrology calculations. Drainage management areas (DMAs) were determined using obtained survey data, proposed site/civil/roadway design, and proposed storm drain infrastructure placement. Weighted C values were calculated by the RSBC program based on the proposed land use of each DMA provided. The land use criteria used in the model were as follows: the western portion of the site was considered as “Park,” and the eastern portion of the site was considered “Commercial.”

Onsite DMAs were given identification letters (A, B, C, D, E, F, G, H, I, R) based on the type of proposed land use. They were then further subdivided based on proposed grades and outflow locations. Refer to **Drainage Exhibit D1 in Appendix A** for a full onsite map of all DMAs.

A summary of all proposed DMAs and their land uses is listed in **Table 3-2** below:

Table 3-2: Summary of Proposed Drainage Management Areas & Land Use

DMA ID	DESCRIPTION
A	General parking lot for site accessible from Hellman; includes free open space
B	Whole western portion of the site; includes 10 soccer fields, 8 baseball fields, and an associate parking lot
C	Minor League baseball stadium
D	Proposed parking structure for Minor League baseball stadium
E	Proposed parking lot for Minor League baseball stadium
F	Proposed hotel and its associated parking lot
G	Proposed retail area and its associated parking lot
H	Proposed gymnasium and its associated parking lot
I	HMC Community Center amenities
R	Existing and proposed onsite roadways

The hydrology model follows two major streams, starting with Node 1.000 and Node 2.000, respectively. Node 1.000 begins the major stream in the hydrology model that follows the existing storm drain pipe, starting from the intersection of Riverside Drive and Vineyard Avenue and ultimately out-falling into the Cucamonga Spreading Grounds to the southeast. In this major stream, catch basins capture roadway runoff along parts of Riverside Drive, Vineyard Avenue, and Chino Avenue as the model travels downstream. In addition, it includes onsite flows from the proposed soccer fields, baseball fields, and associated parking lot proposed in Phase II as minor confluences. Runoff generated from the 42.5 acres of B2, B3, and B4 converge with the first main stream at Node 1.003. Further downstream, the flows from 22 acres and 23.8 acres of baseball fields converge into the main stream at Nodes 1.006 and 1.007, respectively. At Node 1.008, main stream 1 converges with main stream 2, before out-falling into the Spreading Grounds.

Node 2.000 begins at the intersection of Riverside Drive and Hellman Avenue and continues south until the confluence with main stream 1. At Node 2.001, two minor streams converge into the main stream that include areas from the proposed Minor League baseball stadium (DMA C), hotel (DMA F), and parking structure (DMA D). In total, runoff from 17.34 acres join main stream 2 at this junction. Node 2.002 picks the remaining flows upstream from the stadium parking lot (DMA E) and the retail area (DMA G), totaling 23.80 acres. From there, Node 2.003 converges with runoff from DMA A (totaling 14.90 acres) and continues further downstream until the confluence with main stream 1.

A total of 205 acres of surface flows contribute to the overall proposed hydrology model for the study area. Taking into account times of concentration and weighted runoff coefficients, the onsite peak flow generated at the ultimate out fall in the 100-year, 60-minute rainfall event is 367.86 cfs, while the existing condition flow 207 cfs. The existing condition flows discharging from the Riverside Storm drain 2 is 1505 cfs and the proposed condition outfall flows are 1540 cfs. All calculations related to the hydrology model can be found in **Appendix A**.

3.3 Comparison of the Proposed Conditions with the Masterplan Hydrology

The section compares the flows generated from the Proposed project site with the Masterplan flows for the 100-year storm. The Masterplan hydrology assumed the site to be developed mainly as residential (5 to 7 dwelling units per acre) with a small percentage as commercial. The project site is slightly larger than the original masterplan drainage area (G48) at Node 347. The project site comprises of the Masterplan Area G48 and some percentage of G47. The

Masterplan drainage area for G48 was 147.1 acres while the proposed project site has a gross area of 205.6 acres. The additional area is a portion of G47. However, for the purpose of this comparison, the modeling was performed for the same size of drainage area using the same model parameters in the Masterplan Hydrology. The proposed project site comprises of two phases, Phase 1 that is for the Ontario Regional Sports Complex and Phase 2 that comprises of soccer and baseball fields with a relatively smaller area for commercial. The drainage area is shown in Appendix A, Exhibit D6. The hydrology was modeled using the Rational Method Hydrology program for San Bernardino County (RSBC) by CivilDesign© Corporation, which also uses all the procedures.

Table 3-3: Comparison of Flows From Project Site and the Masterplan Flows for 100-Year

Watershed Condition	Drainage Area (ac)	Predominant Landuse Type	Average Pervious Area Fraction	100-Year Peak Flow (cfs)
Proposed	205.7	Sport Fields	0.654	204.8
Masterplan	205.7	Residential (5-7 Units per Acre)	0.500	212.5

This concludes that the proposed development does not increase the 100-Year flows when compared to the Masterplan flows. Therefore, the project will not have adverse impact on the existing Masterplan Drainage Infrastructure. The output for the hydrology models are given in Appendix A.

4.0 HYDRAULICS

The hydrology described in Section 3 above will be utilized for the sizing of proposed Project elements which include: catch basins, laterals, storm drain main lines, and street sections. All catch basins will be sized to capture a 10-year storm event, while the pipe Elements will be sized to adequately convey flows for the 10-, 25-, and/or 100-year storm events per City standards.

4.1 Storm Drain System Model

The existing storm drain system consists of storm drain pipe (72-inch diameter) along the Riverside Drive, which then continues south along Vineyard Avenue (120-inch diameter), that increases to 144-inch diameter along the Chino Avenue. After which the system outfalls into the Cucamonga Spreading Grounds and ultimately into the Cucamonga Channel. A copy of the As-built plan of the existing storm drain is shown in **Appendix D**.

In the proposed condition, new pipe networks will be added to the existing storm drain at the Hellman Avenue and at 3 other locations along the Chino Avenue and the Vineyard Avenue.

Existing and proposed models of the study area storm drain were modeled using the WSPG program. The existing network was built based on the as-built drawing of the current storm drain system. The flow at the ultimate outlet node was shown to be 1505 cfs.

Similarly, the proposed condition network model was created using the latest storm drain design and 100-year flow calculations for each catch basin. The model ran several different scenarios until appropriate pipe diameters were found and the simulation showed sufficient storm drain capacity. Results (**Appendix B**) show that the hydraulic grade line is below the ground elevation throughout the entire network and matched elevations shown on the As-built plans.

The flow at the ultimate outfall node was calculated to be 1543 cfs, which follows the hydrology calculations from the above section.

4.2 Catch Basins

All proposed catch basins were sized by the following criteria:

- Completely capture the 10-year flow, with no bypass
- 25-year storm event flow will be captured between the curb and the crown
- 100-year storm is contained within the right-of-way
- Curb opening catch basins per City of Ontario Design Details

All proposed catch basins were sized to capture 10-year flow using the Hydra Flow AutoCad tool and are shown in **Appendix B**.

All catch basins are of "Curb Opening" type and lengths of 7 feet. Longitudinal slopes for the road and identification as an "Inlet on grade" or "Inlet in sag" were obtained from the survey data. All curb heights were modeled as 6", as specified in the roadway plans. Remaining street section parameters were idealized as follows: 2-percent pavement cross-slope, 2-foot gutter width, 8.3-percent gutter cross-slope, and 0.013 Manning's Roughness coefficient.

4.2.1 Interior Streets

Catch basins located along interior streets of the Project site which include A Street, B Street, and C Street, were assessed using the flow rates calculated. (See **Appendix B**)

4.3 Laterals

Several laterals are proposed to convey flows from proposed catch basins to existing and proposed storm drain main lines. 8 Additional catch basins and lateral pipes are proposed for the Vineyard Avenue, while 6 additional catch basins and pipe laterals are proposed for the Chino Avenue. These improvements will **improve** the street capacity of the mentioned streets by conveying more water into the storm drain.

4.4 Main Line

A storm drain main line is proposed along Hellman Avenue to convey flows from the Project site into the existing Riverside Drive Storm Drain. The line ranges from 24-inch RCP on the upstream end to 54-inch RCP at the downstream end. The slope of the line generally matches the grade of the proposed street. The line has 4 major branches at A Street and C Street.

4.5 Street Capacity

Street Capacity at location in the proximity of each proposed catch basin was evaluated using the cross-section data and a 10-, 25- and 100-year flow at the location. Hydra Flow AutoCad program was used to find the water depth and the spread at each location and the results are shown in Appendix B.

The analysis showed that all streets are able to maintain the 10-year flows below the curb, 25-year flows stay below the crown and 100-year flows are contained within the right-of -way.

5.0 SUMMARY

The Ontario Regional Sports Complex Project is being implemented by the City of Ontario and proposed the development of approximately 205-acre site. The Project will feature storm drain and street improvements to accommodate storm runoff from the new development. Per this drainage study, the proposed catch basins and laterals will be adequately sized to convey the 10-year storm event and the Storm Drain main line and major laterals will be adequately sized to convey the 100-year storm event. The hydraulic grade line of the Riverside Storm Drain 2 will not be adversely impacted by the proposed development.

APPENDIX A - HYDROLOGY

A.1 – HYDROLOGY EXHIBITS

REVISIONS			
MARK	DATE	BY	APPROVED/RCE NO.

DESIGNED BY: LA
DATE: 04/04/2024
DRAWN BY: LA
DATE: 04/04/2024
CHECKED BY: RS
DATE CHECKED: 04/04/2024

CITY OF ONTARIO

RECOMMENDED BY: BRYAN LIRLEY P.E., ASSISTANT CITY ENGINEER — DATE

APPROVED BY: KHOI DO P.E., CITY ENGINEER — DATE

BENCH MARK NO. ###### ELEV. ###### FEET

LOCATION:####

ARDURRA
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3737 Birch St, Suite 250
Newport Beach, CA 92660
(949) 428-1500
www.Ardurra.com

SIGNATURE — C.E. NO. — DATE

DRAINAGE MANAGEMENT AREA EXHIBIT

M— ####

D1

SHEET 1 OF 6
CONTRACT ######
ACCOUNT ######
DWG. NO. ####

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REVISIONS			
MARK	DATE	BY	APPROVED/RCE NO.

DESIGNED BY: LA
DATE: 04/04/2024
DRAWN BY: LA
DATE: 04/04/2024
CHECKED BY: RS
DATE CHECKED: 04/04/2024

CITY OF ONTARIO

RECOMMENDED BY: ______ DATE
BRYAN LIRLEY P.E., ASSISTANT CITY ENGINEER

APPROVED BY: ______ DATE
KHOI DO P.E., CITY ENGINEER

BENCH MARK NO. ###### ELEV. ###### FEET
LOCATION:####

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DRAINAGE MANAGEMENT AREA W/ EXISTING GRADES

M– ####

D2

SHEET 2 OF 6
CONTRACT ######
ACCOUNT ######
DWG. NO. ####

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REVISIONS			
MARK	DATE	BY	APPROVED/RCE NO.

DESIGNED BY: LA
DATE: 04/04/2024
DRAWN BY: LA
DATE: 04/04/2024
CHECKED BY: RS
DATE CHECKED: 04/04/2024

CITY OF ONTARIO

RECOMMENDED BY: BRYAN LIRLEY P.E., ASSISTANT CITY ENGINEER DATE

APPROVED BY: KHOI DO P.E., CITY ENGINEER DATE

BENCH MARK NO. ###### ELEV. ###### FEET

LOCATION:####

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DRAINAGE MANAGEMENT AREAS W/ PROPOSED GRADES

M– ####

SHEET 3 OF 6
CONTRACT ######
ACCOUNT ######
DWG. NO. ####

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IMPERVIOUS AREA SUMMARY

DMA ID	TOTAL AREA (AC)	IMPERVIOUS AREA (AC)	TOTAL IMP. AREA
C	10.41	9.22	32.80
D	4.41	3.53	
E	10.52	9.47	
F	5.67	5.10	
G	6.09	5.48	
A	13.18	6.46	35.82
B	91.04	7.64	
H	14.44	10.69	
I	15.75	11.03	
ROAD	33.96	33.96	33.96
TOTAL	205.47	102.58	102.58

LEGEND

- PHASE I DRAINAGE MANAGEMENT AREAS
- PHASE II DRAINAGE MANAGEMENT AREAS
- ROADWAY DRAINAGE MANAGEMENT AREAS

D4

REVISIONS			
MARK	DATE	BY	APPROVED/RCE NO.

DESIGNED BY: LA
DATE: 04/04/2024
DRAWN BY: LA
DATE: 04/04/2024
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DATE CHECKED: 04/04/2024

CITY OF ONTARIO

RECOMMENDED BY: ____ BRYAN LIRLEY P.E., ASSISTANT CITY ENGINEER ____ DATE

APPROVED BY: ____ KHOI DO P.E., CITY ENGINEER ____ DATE

BENCH MARK NO. ###### ELEV. ###### FEET

LOCATION:####

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IMPERVIOUS AREA EXHIBIT

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SHEET 4 OF 6
CONTRACT ######
ACCOUNT ######
DWG. NO. ####

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D5

REVISIONS			
MARK	DATE	BY	APPROVED/RCE NO.

DESIGNED BY: LA
DATE: 04/04/2024
DRAWN BY: LA
DATE: 04/04/2024
CHECKED BY: RS
DATE CHECKED: 04/04/2024

CITY OF ONTARIO

RECOMMENDED BY: BRYAN LIRLEY P.E., ASSISTANT CITY ENGINEER — DATE
APPROVED BY: KHOI DO P.E., CITY ENGINEER — DATE

BENCH MARK NO. ###### ELEV. ###### FEET
LOCATION:####

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(949) 428-1500
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STORM DRAIN NETWORK EXHIBIT

M– ####

SHEET 5 OF 6
CONTRACT ######
ACCOUNT ######
DWG. NO. ####

REVISIONS			
MARK	DATE	BY	APPROVED/RCE NO.

DESIGNED BY: LA
DATE: 04/04/2024
DRAWN BY: LA
DATE: 04/04/2024
CHECKED BY: RS
DATE CHECKED: 04/04/2024

CITY OF ONTARIO

RECOMMENDED BY: BRYAN LIRLEY P.E., ASSISTANT CITY ENGINEER — DATE

APPROVED BY: KHOI DO P.E., CITY ENGINEER — DATE

BENCH MARK NO. ###### ELEV. ###### FEET

LOCATION:####

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LAND USE COMPARISON MAP

M— ####

SHEET 6 OF 6
CONTRACT ######
ACCOUNT ######
DWG. NO. ####

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A.2 – 10-YEAR HYDROLOGY MODEL

```
                San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2019 Version 9.1
        Rational Hydrology Study        Date: 05/16/24
------------------------------------------------------------------------
ORSC HYDROLOGY & HYDRAULICS
PROPOSED CONDITIONS
10-YEAR STORM EVENT

------------------------------------------------------------------------


Program License Serial Number 6639

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------
Rational hydrology study storm event year is    10.0
Computed rainfall intensity:
Storm year =    10.00   1 hour rainfall =     0.800 (In.)
Slope used for rainfall intensity curve b =  0.6000
Soil antecedent moisture condition (AMC) = 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       1.001
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   672.260(Ft.)
Top (of initial area) elevation =   750.000(Ft.)
Bottom (of initial area) elevation =   744.440(Ft.)
Difference in elevation =     5.560(Ft.)
Slope =    0.00827  s(%)=       0.83
TC = k(0.484)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.079 min.
Rainfall intensity =      1.700(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.460
Subarea runoff =      1.893(CFS)
Total initial stream area =        2.420(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.001 to Point/Station       1.001
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.0100     Max loss rate(Fm)=     0.010(In/Hr)
Time of concentration =    17.08 min.
Rainfall intensity =      1.700(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.588
Subarea runoff =      1.537(CFS) for    1.010(Ac.)
Total runoff =      3.430(CFS)
Effective area this stream =        3.43(Ac.)
Total Study Area (Main Stream No. 1) =        3.43(Ac.)
Area averaged Fm value =    0.589(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.001 to Point/Station       1.002
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   744.440(Ft.)
Downstream point/station elevation =   739.410(Ft.)
Pipe length  =   466.03(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.430(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.430(CFS)
Normal flow depth in pipe =    9.13(In.)
Flow top width inside pipe =   10.24(In.)
Critical Depth =    9.50(In.)
Pipe flow velocity =      5.35(Ft/s)
Travel time through pipe =    1.45 min.
Time of concentration (TC) =    18.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.002 to Point/Station       1.002
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    18.53 min.
Rainfall intensity =      1.619(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.522
Subarea runoff =      1.217(CFS) for    2.070(Ac.)
Total runoff =      4.647(CFS)
Effective area this stream =        5.50(Ac.)
Total Study Area (Main Stream No. 1) =        5.50(Ac.)
Area averaged Fm value =    0.680(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.002 to Point/Station       1.003
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   739.410(Ft.)
Downstream point/station elevation =   736.150(Ft.)
Pipe length  =   829.94(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.647(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     4.647(CFS)
Normal flow depth in pipe =   11.16(In.)
Flow top width inside pipe =   17.48(In.)
Critical Depth =    9.94(In.)
Pipe flow velocity =      4.04(Ft/s)
Travel time through pipe =    3.43 min.
Time of concentration (TC) =    21.96 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.003 to Point/Station       1.003
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    21.96 min.
Rainfall intensity =      1.462(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.448
Subarea runoff =      0.974(CFS) for    3.080(Ac.)
Total runoff =      5.621(CFS)
Effective area this stream =        8.58(Ac.)
Total Study Area (Main Stream No. 1) =        8.58(Ac.)
Area averaged Fm value =    0.734(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.003 to Point/Station       1.003
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
```

```
Stream flow area =      8.580(Ac.)
Runoff from this stream =      5.621(CFS)
Time of concentration =   21.96 min.
Rainfall intensity =     1.462(In/Hr)
Area averaged loss rate (Fm) =    0.7345(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7511


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.100 to Point/Station       1.110
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   261.290(Ft.)
Top (of initial area) elevation =   749.020(Ft.)
Bottom (of initial area) elevation =   747.710(Ft.)
Difference in elevation =     1.310(Ft.)
Slope =    0.00501  s(%)=       0.50
TC = k(0.484)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.935 min.
Rainfall intensity =      2.009(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.528
Subarea runoff =      5.511(CFS)
Total initial stream area =        5.200(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.110 to Point/Station       1.003
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   747.710(Ft.)
Downstream point/station elevation =   736.150(Ft.)
Pipe length  =  1096.21(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.511(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.511(CFS)
Normal flow depth in pipe =   10.44(In.)
Flow top width inside pipe =   13.80(In.)
Critical Depth =   11.41(In.)
Pipe flow velocity =      6.05(Ft/s)
Travel time through pipe =    3.02 min.
Time of concentration (TC) =    15.96 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.003 to Point/Station       1.003
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.9000     Max loss rate(Fm)=     0.880(In/Hr)
Time of concentration =    15.96 min.
Rainfall intensity =      1.771(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.456
Subarea runoff =     28.796(CFS) for   37.300(Ac.)
Total runoff =     34.307(CFS)
Effective area this stream =       42.50(Ac.)
Total Study Area (Main Stream No. 1) =       51.08(Ac.)
Area averaged Fm value =    0.874(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.003 to Point/Station       1.003
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     42.500(Ac.)
Runoff from this stream =     34.307(CFS)
Time of concentration =   15.96 min.
Rainfall intensity =     1.771(In/Hr)
Area averaged loss rate (Fm) =    0.8740(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8939
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1      5.62     8.580     21.96    0.734      1.462
2     34.31    42.500     15.96    0.874      1.771
Qmax(1) =
           1.000 *    1.000 *     5.621) +
           0.656 *    1.000 *    34.307) + =      28.123
Qmax(2) =
           1.424 *    0.727 *     5.621) +
           1.000 *    1.000 *    34.307) + =      40.124

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.621      34.307
Maximum flow rates at confluence using above data:
       28.123       40.124
```

```
Area of streams before confluence:
        8.580      42.500
Effective area values after confluence:
       51.080      48.736
Results of confluence:
Total flow rate =     40.124(CFS)
Time of concentration =    15.957 min.
Effective stream area after confluence =     48.736(Ac.)
Study area average Pervious fraction(Ap) =  0.870
Study area average soil loss rate(Fm) =    0.851(In/Hr)
Study area total (this main stream) =      51.08(Ac.)


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Process from Point/Station       1.003 to Point/Station       1.004
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   736.150(Ft.)
Downstream point/station elevation =   728.980(Ft.)
Pipe length  =   687.24(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    40.124(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    40.124(CFS)
Normal flow depth in pipe =   23.53(In.)
Flow top width inside pipe =   24.68(In.)
Critical Depth =   25.57(In.)
Pipe flow velocity =      9.72(Ft/s)
Travel time through pipe =    1.18 min.
Time of concentration (TC) =    17.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.004 to Point/Station       1.004
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     38.723(CFS)
therefore the upstream flow rate of Q =     40.124(CFS) is being used
Time of concentration =    17.14 min.
Rainfall intensity =      1.697(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.449
Subarea runoff =      0.000(CFS) for    2.060(Ac.)
Total runoff =     40.124(CFS)
Effective area this stream =       50.80(Ac.)
Total Study Area (Main Stream No. 1) =       53.14(Ac.)
```

```
Area averaged Fm value =    0.850(In/Hr)


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Process from Point/Station       1.004 to Point/Station       1.005
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   728.980(Ft.)
Downstream point/station elevation =   724.170(Ft.)
Pipe length  =   456.65(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    40.124(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    40.124(CFS)
Normal flow depth in pipe =   23.41(In.)
Flow top width inside pipe =   24.84(In.)
Critical Depth =   25.57(In.)
Pipe flow velocity =      9.76(Ft/s)
Travel time through pipe =    0.78 min.
Time of concentration (TC) =    17.92 min.


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Process from Point/Station       1.005 to Point/Station       1.005
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     37.803(CFS)
therefore the upstream flow rate of Q =     40.124(CFS) is being used
Time of concentration =    17.92 min.
Rainfall intensity =      1.652(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.437
Subarea runoff =      0.000(CFS) for    1.520(Ac.)
Total runoff =     40.124(CFS)
Effective area this stream =       52.32(Ac.)
Total Study Area (Main Stream No. 1) =       54.66(Ac.)
Area averaged Fm value =    0.849(In/Hr)


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Process from Point/Station       1.005 to Point/Station       1.006
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   724.170(Ft.)
Downstream point/station elevation =   720.970(Ft.)
Pipe length  =  1020.52(Ft.)   Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =    40.124(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    40.124(CFS)
Normal flow depth in pipe =   28.08(In.)
Flow top width inside pipe =   35.02(In.)
Critical Depth =   24.16(In.)
Pipe flow velocity =      6.28(Ft/s)
Travel time through pipe =    2.71 min.
Time of concentration (TC) =    20.63 min.


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Process from Point/Station       1.006 to Point/Station       1.006
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     33.100(CFS)
therefore the upstream flow rate of Q =     40.124(CFS) is being used
Time of concentration =    20.63 min.
Rainfall intensity =      1.518(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.397
Subarea runoff =      0.000(CFS) for    2.590(Ac.)
Total runoff =     40.124(CFS)
Effective area this stream =       54.91(Ac.)
Total Study Area (Main Stream No. 1) =       57.25(Ac.)
Area averaged Fm value =    0.848(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.006 to Point/Station       1.006
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     54.906(Ac.)
Runoff from this stream =     40.124(CFS)
Time of concentration =   20.63 min.
Rainfall intensity =     1.518(In/Hr)
Area averaged loss rate (Fm) =    0.8484(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8677


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Process from Point/Station       1.200 to Point/Station       1.201
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
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Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   171.480(Ft.)
Top (of initial area) elevation =   750.740(Ft.)
Bottom (of initial area) elevation =   749.880(Ft.)
Difference in elevation =     0.860(Ft.)
Slope =    0.00502  s(%)=       0.50
TC = k(0.484)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.929 min.
Rainfall intensity =      2.222(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.563
Subarea runoff =      4.145(CFS)
Total initial stream area =        3.310(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station       1.201 to Point/Station       1.006
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   749.880(Ft.)
Downstream point/station elevation =   720.970(Ft.)
Pipe length  =   821.99(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.145(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.145(CFS)
Normal flow depth in pipe =    6.84(In.)
Flow top width inside pipe =   11.88(In.)
Critical Depth =   10.32(In.)
Pipe flow velocity =      8.96(Ft/s)
Travel time through pipe =    1.53 min.
Time of concentration (TC) =    12.46 min.


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Process from Point/Station       1.006 to Point/Station       1.006
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    12.46 min.
Rainfall intensity =      2.055(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.536
```

```
Subarea runoff =     20.080(CFS) for   18.690(Ac.)
Total runoff =     24.224(CFS)
Effective area this stream =       22.00(Ac.)
Total Study Area (Main Stream No. 1) =       79.25(Ac.)
Area averaged Fm value =    0.831(In/Hr)


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Process from Point/Station       1.006 to Point/Station       1.006
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     22.000(Ac.)
Runoff from this stream =     24.224(CFS)
Time of concentration =   12.46 min.
Rainfall intensity =     2.055(In/Hr)
Area averaged loss rate (Fm) =    0.8311(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8500
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     40.12    54.906     20.63    0.848      1.518
2     24.22    22.000     12.46    0.831      2.055
Qmax(1) =
           1.000 *    1.000 *    40.124) +
           0.562 *    1.000 *    24.224) + =      53.729
Qmax(2) =
           1.801 *    0.604 *    40.124) +
           1.000 *    1.000 *    24.224) + =      67.864

Total of 2 streams to confluence:
Flow rates before confluence point:
      40.124      24.224
Maximum flow rates at confluence using above data:
       53.729       67.864
Area of streams before confluence:
       54.906       22.000
Effective area values after confluence:
       76.906       55.162
Results of confluence:
Total flow rate =     67.864(CFS)
Time of concentration =    12.457 min.
Effective stream area after confluence =     55.162(Ac.)
Study area average Pervious fraction(Ap) =  0.863
Study area average soil loss rate(Fm) =    0.843(In/Hr)
Study area total (this main stream) =      76.91(Ac.)
```

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Process from Point/Station       1.006 to Point/Station       1.007
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   720.970(Ft.)
Downstream point/station elevation =   716.610(Ft.)
Pipe length  =  1002.81(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    67.864(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    67.864(CFS)
Normal flow depth in pipe =   31.92(In.)
Flow top width inside pipe =   40.86(In.)
Critical Depth =   30.41(In.)
Pipe flow velocity =      8.11(Ft/s)
Travel time through pipe =    2.06 min.
Time of concentration (TC) =    14.52 min.


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Process from Point/Station       1.007 to Point/Station       1.007
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     53.566(CFS)
therefore the upstream flow rate of Q =     67.864(CFS) is being used
Time of concentration =    14.52 min.
Rainfall intensity =      1.874(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.495
Subarea runoff =      0.000(CFS) for    2.550(Ac.)
Total runoff =     67.864(CFS)
Effective area this stream =       57.71(Ac.)
Total Study Area (Main Stream No. 1) =       81.80(Ac.)
Area averaged Fm value =    0.843(In/Hr)


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Process from Point/Station       1.007 to Point/Station       1.007
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     57.712(Ac.)
Runoff from this stream =     67.864(CFS)
Time of concentration =   14.52 min.
Rainfall intensity =     1.874(In/Hr)
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Area averaged loss rate (Fm) =    0.8429(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8621


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Process from Point/Station       1.300 to Point/Station       1.301
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =    67.280(Ft.)
Top (of initial area) elevation =   750.300(Ft.)
Bottom (of initial area) elevation =   749.960(Ft.)
Difference in elevation =     0.340(Ft.)
Slope =    0.00505  s(%)=       0.51
TC = k(0.484)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.506 min.
Rainfall intensity =      2.785(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.631
Subarea runoff =      4.553(CFS)
Total initial stream area =        2.590(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station       1.301 to Point/Station       1.007
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   749.960(Ft.)
Downstream point/station elevation =   716.610(Ft.)
Pipe length  =   972.89(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.553(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.553(CFS)
Normal flow depth in pipe =    7.33(In.)
Flow top width inside pipe =   11.70(In.)
Critical Depth =   10.68(In.)
Pipe flow velocity =      9.06(Ft/s)
Travel time through pipe =    1.79 min.
Time of concentration (TC) =     9.30 min.


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Process from Point/Station       1.007 to Point/Station       1.007
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
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Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =     9.30 min.
Rainfall intensity =      2.449(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.595
Subarea runoff =     30.106(CFS) for   21.210(Ac.)
Total runoff =     34.659(CFS)
Effective area this stream =       23.80(Ac.)
Total Study Area (Main Stream No. 1) =      105.60(Ac.)
Area averaged Fm value =    0.831(In/Hr)


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Process from Point/Station        1.007 to Point/Station        1.007
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     23.800(Ac.)
Runoff from this stream =     34.659(CFS)
Time of concentration =    9.30 min.
Rainfall intensity =     2.449(In/Hr)
Area averaged loss rate (Fm) =    0.8311(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8500
Summary of stream data:

Stream Flow rate    Area    TC      Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     67.86    57.712     14.52    0.843      1.874
2     34.66    23.800      9.30    0.831      2.449
Qmax(1) =
           1.000 *    1.000 *    67.864) +
           0.645 *    1.000 *    34.659) + =      90.207
Qmax(2) =
           1.558 *    0.640 *    67.864) +
           1.000 *    1.000 *    34.659) + =     102.331

Total of 2 streams to confluence:
Flow rates before confluence point:
      67.864      34.659
Maximum flow rates at confluence using above data:
       90.207      102.331
Area of streams before confluence:
       57.712       23.800
Effective area values after confluence:
       81.512       60.748
```

```
Results of confluence:
Total flow rate =    102.331(CFS)
Time of concentration =     9.295 min.
Effective stream area after confluence =     60.748(Ac.)
Study area average Pervious fraction(Ap) =  0.859
Study area average soil loss rate(Fm) =    0.839(In/Hr)
Study area total (this main stream) =      81.51(Ac.)


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Process from Point/Station       1.007 to Point/Station       1.008
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   716.610(Ft.)
Downstream point/station elevation =   716.130(Ft.)
Pipe length  =   623.01(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   102.331(CFS)
Nearest computed pipe diameter  =     69.00(In.)
Calculated individual pipe flow  =   102.331(CFS)
Normal flow depth in pipe =   55.03(In.)
Flow top width inside pipe =   55.45(In.)
Critical Depth =   33.13(In.)
Pipe flow velocity =      4.61(Ft/s)
Travel time through pipe =    2.25 min.
Time of concentration (TC) =    11.55 min.


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Process from Point/Station       1.008 to Point/Station       1.008
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     91.472(CFS)
therefore the upstream flow rate of Q =    102.331(CFS) is being used
Time of concentration =    11.55 min.
Rainfall intensity =      2.150(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.549
Subarea runoff =      0.000(CFS) for   16.700(Ac.)
Total runoff =    102.331(CFS)
Effective area this stream =       77.45(Ac.)
Total Study Area (Main Stream No. 1) =      122.30(Ac.)
Area averaged Fm value =    0.838(In/Hr)


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Process from Point/Station       1.008 to Point/Station       1.008
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     77.448(Ac.)
Runoff from this stream =    102.331(CFS)
Time of concentration =   11.55 min.
Rainfall intensity =     2.150(In/Hr)
Area averaged loss rate (Fm) =    0.8377(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8567
Program is now starting with Main Stream No. 2


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Process from Point/Station       2.000 to Point/Station       2.001
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   660.350(Ft.)
Top (of initial area) elevation =   768.710(Ft.)
Bottom (of initial area) elevation =   760.300(Ft.)
Difference in elevation =     8.410(Ft.)
Slope =    0.01274  s(%)=       1.27
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.612 min.
Rainfall intensity =      2.400(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.863
Subarea runoff =      1.202(CFS)
Total initial stream area =        0.580(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.001 to Point/Station       2.001
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     9.61 min.
Rainfall intensity =      2.400(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.863
```

```
Subarea runoff =      9.885(CFS) for    4.770(Ac.)
Total runoff =     11.087(CFS)
Effective area this stream =        5.35(Ac.)
Total Study Area (Main Stream No. 2) =      127.65(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.001 to Point/Station       2.001
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      5.350(Ac.)
Runoff from this stream =     11.087(CFS)
Time of concentration =    9.61 min.
Rainfall intensity =     2.400(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.100 to Point/Station       2.101
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   402.250(Ft.)
Top (of initial area) elevation =   769.050(Ft.)
Bottom (of initial area) elevation =   767.100(Ft.)
Difference in elevation =     1.950(Ft.)
Slope =    0.00485  s(%)=       0.48
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.563 min.
Rainfall intensity =      2.408(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.863
Subarea runoff =      2.308(CFS)
Total initial stream area =        1.110(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.101 to Point/Station       2.101
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
```

```
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     9.56 min.
Rainfall intensity =      2.408(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.863
Subarea runoff =      9.085(CFS) for    4.370(Ac.)
Total runoff =     11.393(CFS)
Effective area this stream =        5.48(Ac.)
Total Study Area (Main Stream No. 2) =      133.13(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.101 to Point/Station       2.102
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   767.100(Ft.)
Downstream point/station elevation =   763.230(Ft.)
Pipe length  =   599.32(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.393(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    11.393(CFS)
Normal flow depth in pipe =   15.49(In.)
Flow top width inside pipe =   18.47(In.)
Critical Depth =   15.11(In.)
Pipe flow velocity =      5.99(Ft/s)
Travel time through pipe =    1.67 min.
Time of concentration (TC) =    11.23 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.102 to Point/Station       2.102
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    11.23 min.
Rainfall intensity =      2.186(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.860
Subarea runoff =      4.077(CFS) for    2.750(Ac.)
Total runoff =     15.470(CFS)
Effective area this stream =        8.23(Ac.)
Total Study Area (Main Stream No. 2) =      135.88(Ac.)
Area averaged Fm value =    0.098(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.102 to Point/Station       2.103
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   763.230(Ft.)
Downstream point/station elevation =   761.620(Ft.)
Pipe length  =   323.10(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.470(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    15.470(CFS)
Normal flow depth in pipe =   19.03(In.)
Flow top width inside pipe =   19.45(In.)
Critical Depth =   17.01(In.)
Pipe flow velocity =      5.79(Ft/s)
Travel time through pipe =    0.93 min.
Time of concentration (TC) =    12.16 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.103 to Point/Station       2.103
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    12.16 min.
Rainfall intensity =      2.084(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.858
Subarea runoff =     14.479(CFS) for    8.520(Ac.)
Total runoff =     29.949(CFS)
Effective area this stream =       16.75(Ac.)
Total Study Area (Main Stream No. 2) =      144.40(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.103 to Point/Station       2.001
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   761.620(Ft.)
Downstream point/station elevation =   760.300(Ft.)
Pipe length  =   107.08(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.949(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    29.949(CFS)
Normal flow depth in pipe =   19.50(In.)
Flow top width inside pipe =   24.19(In.)
Critical Depth =   22.76(In.)
```

```
Pipe flow velocity =      9.74(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    12.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.001 to Point/Station       2.001
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     16.750(Ac.)
Runoff from this stream =     29.949(CFS)
Time of concentration =   12.34 min.
Rainfall intensity =     2.066(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.200 to Point/Station       2.001
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =    81.220(Ft.)
Top (of initial area) elevation =   761.110(Ft.)
Bottom (of initial area) elevation =   760.300(Ft.)
Difference in elevation =     0.810(Ft.)
Slope =    0.00997  s(%)=       1.00
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    4.365 min.
Rainfall intensity =      3.855(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.877
Subarea runoff =      1.995(CFS)
Total initial stream area =        0.590(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.001 to Point/Station       2.001
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      0.590(Ac.)
Runoff from this stream =      1.995(CFS)
Time of concentration =    4.37 min.
```

```
Rainfall intensity =     3.855(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     11.09     5.350      9.61    0.098      2.400
2     29.95    16.750     12.34    0.098      2.066
3      1.99     0.590      4.37    0.098      3.855
Qmax(1) =
           1.000 *    1.000 *    11.087) +
           1.170 *    0.779 *    29.949) +
           0.613 *    1.000 *     1.995) + =      39.594
Qmax(2) =
           0.855 *    1.000 *    11.087) +
           1.000 *    1.000 *    29.949) +
           0.524 *    1.000 *     1.995) + =      40.470
Qmax(3) =
           1.631 *    0.454 *    11.087) +
           1.909 *    0.354 *    29.949) +
           1.000 *    1.000 *     1.995) + =      30.426

Total of 3 streams to confluence:
Flow rates before confluence point:
      11.087      29.949      1.995
Maximum flow rates at confluence using above data:
       39.594       40.470       30.426
Area of streams before confluence:
        5.350       16.750        0.590
Effective area values after confluence:
       18.982       22.690        8.943
Results of confluence:
Total flow rate =     40.470(CFS)
Time of concentration =    12.345 min.
Effective stream area after confluence =     22.690(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total (this main stream) =      22.69(Ac.)


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Process from Point/Station       2.001 to Point/Station       2.002
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   760.300(Ft.)
Downstream point/station elevation =   755.350(Ft.)
Pipe length  =   642.08(Ft.)   Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =    40.470(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    40.470(CFS)
Normal flow depth in pipe =   23.84(In.)
Flow top width inside pipe =   29.56(In.)
Critical Depth =   25.39(In.)
Pipe flow velocity =      8.81(Ft/s)
Travel time through pipe =    1.21 min.
Time of concentration (TC) =    13.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.001 to Point/Station       2.002
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.56 min.
Rainfall intensity =      1.953(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.855
Subarea runoff =      4.037(CFS) for    3.970(Ac.)
Total runoff =     44.507(CFS)
Effective area this stream =       26.66(Ac.)
Total Study Area (Main Stream No. 2) =      148.96(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.002 to Point/Station       2.002
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     26.660(Ac.)
Runoff from this stream =     44.507(CFS)
Time of concentration =   13.56 min.
Rainfall intensity =     1.953(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.300 to Point/Station       2.301
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
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```
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   656.930(Ft.)
Top (of initial area) elevation =   767.140(Ft.)
Bottom (of initial area) elevation =   763.850(Ft.)
Difference in elevation =     3.290(Ft.)
Slope =    0.00501  s(%)=       0.50
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.560 min.
Rainfall intensity =      2.149(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.859
Subarea runoff =      3.304(CFS)
Total initial stream area =        1.790(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.301 to Point/Station       2.301
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    11.56 min.
Rainfall intensity =      2.149(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.859
Subarea runoff =     10.799(CFS) for    5.850(Ac.)
Total runoff =     14.103(CFS)
Effective area this stream =        7.64(Ac.)
Total Study Area (Main Stream No. 2) =      156.60(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.301 to Point/Station       2.302
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   763.850(Ft.)
Downstream point/station elevation =   760.160(Ft.)
Pipe length  =   738.89(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.103(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    14.103(CFS)
Normal flow depth in pipe =   17.51(In.)
Flow top width inside pipe =   21.32(In.)
Critical Depth =   16.22(In.)
Pipe flow velocity =      5.74(Ft/s)
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Travel time through pipe =    2.14 min.
Time of concentration (TC) =    13.70 min.


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Process from Point/Station       2.302 to Point/Station       2.302
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.70 min.
Rainfall intensity =      1.940(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.855
Subarea runoff =     10.273(CFS) for    7.060(Ac.)
Total runoff =     24.376(CFS)
Effective area this stream =       14.70(Ac.)
Total Study Area (Main Stream No. 2) =      163.66(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.302 to Point/Station       2.002
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   760.160(Ft.)
Downstream point/station elevation =   755.350(Ft.)
Pipe length  =    76.19(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.376(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    24.376(CFS)
Normal flow depth in pipe =   13.64(In.)
Flow top width inside pipe =   15.42(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.95(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    13.78 min.


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Process from Point/Station       2.002 to Point/Station       2.002
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.700(Ac.)
Runoff from this stream =     24.376(CFS)
Time of concentration =   13.78 min.
Rainfall intensity =     1.934(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station       2.400 to Point/Station       2.401
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   544.320(Ft.)
Top (of initial area) elevation =   766.500(Ft.)
Bottom (of initial area) elevation =   763.780(Ft.)
Difference in elevation =     2.720(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.728 min.
Rainfall intensity =      2.247(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.861
Subarea runoff =      2.244(CFS)
Total initial stream area =        1.160(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.401 to Point/Station       2.401
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    10.73 min.
Rainfall intensity =      2.247(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.861
Subarea runoff =      7.913(CFS) for    4.090(Ac.)
Total runoff =     10.157(CFS)
Effective area this stream =        5.25(Ac.)
Total Study Area (Main Stream No. 2) =      168.91(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.401 to Point/Station       2.402
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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_____________________________________________________________________
Upstream point/station elevation =   763.780(Ft.)
Downstream point/station elevation =   761.070(Ft.)
Pipe length  =   541.68(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.157(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    10.157(CFS)
Normal flow depth in pipe =   15.66(In.)
Flow top width inside pipe =   18.29(In.)
Critical Depth =   14.24(In.)
Pipe flow velocity =      5.28(Ft/s)
Travel time through pipe =    1.71 min.
Time of concentration (TC) =    12.44 min.


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Process from Point/Station       2.402 to Point/Station       2.402
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    12.44 min.
Rainfall intensity =      2.056(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.857
Subarea runoff =      5.885(CFS) for    3.850(Ac.)
Total runoff =     16.042(CFS)
Effective area this stream =        9.10(Ac.)
Total Study Area (Main Stream No. 2) =      172.76(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.402 to Point/Station       2.002
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =   761.070(Ft.)
Downstream point/station elevation =   755.350(Ft.)
Pipe length  =    62.68(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.042(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    16.042(CFS)
Normal flow depth in pipe =   10.36(In.)
Flow top width inside pipe =   13.87(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.75(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    12.50 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.002 to Point/Station        2.002
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      9.100(Ac.)
Runoff from this stream =     16.042(CFS)
Time of concentration =   12.50 min.
Rainfall intensity =     2.051(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)



1     44.51    26.660     13.56    0.098      1.953
2     24.38    14.700     13.78    0.098      1.934
3     16.04     9.100     12.50    0.098      2.051
Qmax(1) =
           1.000 *    1.000 *    44.507) +
           1.010 *    0.984 *    24.376) +
           0.950 *    1.000 *    16.042) + =      83.976
Qmax(2) =
           0.990 *    1.000 *    44.507) +
           1.000 *    1.000 *    24.376) +
           0.940 *    1.000 *    16.042) + =      83.516
Qmax(3) =
           1.053 *    0.922 *    44.507) +
           1.064 *    0.907 *    24.376) +
           1.000 *    1.000 *    16.042) + =      82.741

Total of 3 streams to confluence:
Flow rates before confluence point:
      44.507      24.376      16.042
Maximum flow rates at confluence using above data:
       83.976       83.516       82.741
Area of streams before confluence:
       26.660       14.700        9.100
Effective area values after confluence:
       50.225       50.460       47.004
Results of confluence:
Total flow rate =     83.976(CFS)
Time of concentration =    13.559 min.
Effective stream area after confluence =     50.225(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
```

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Study area total (this main stream) =      50.46(Ac.)


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Process from Point/Station       2.002 to Point/Station       2.003
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   755.350(Ft.)
Downstream point/station elevation =   754.000(Ft.)
Pipe length  =   210.71(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    83.976(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    83.976(CFS)
Normal flow depth in pipe =   32.39(In.)
Flow top width inside pipe =   40.42(In.)
Critical Depth =   33.86(In.)
Pipe flow velocity =      9.87(Ft/s)
Travel time through pipe =    0.36 min.
Time of concentration (TC) =    13.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.003 to Point/Station       2.003
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.92 min.
Rainfall intensity =      1.923(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.854
Subarea runoff =     12.683(CFS) for    8.630(Ac.)
Total runoff =     96.659(CFS)
Effective area this stream =       58.86(Ac.)
Total Study Area (Main Stream No. 2) =      181.39(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.003 to Point/Station       2.003
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     58.855(Ac.)
Runoff from this stream =     96.659(CFS)
Time of concentration =   13.92 min.
Rainfall intensity =     1.923(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
```

```
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.500 to Point/Station       2.501
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   580.350(Ft.)
Top (of initial area) elevation =   777.930(Ft.)
Bottom (of initial area) elevation =   766.900(Ft.)
Difference in elevation =    11.030(Ft.)
Slope =    0.01901  s(%)=       1.90
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.426 min.
Rainfall intensity =      2.598(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.866
Subarea runoff =      8.550(CFS)
Total initial stream area =        3.800(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.501 to Point/Station       2.501
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     8.43 min.
Rainfall intensity =      2.598(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.866
Subarea runoff =     14.401(CFS) for    6.400(Ac.)
Total runoff =     22.951(CFS)
Effective area this stream =       10.20(Ac.)
Total Study Area (Main Stream No. 2) =      191.59(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.501 to Point/Station       2.502
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
```

```
Upstream point/station elevation =   766.900(Ft.)
Downstream point/station elevation =   759.860(Ft.)
Pipe length  =  1139.32(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.951(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    22.951(CFS)
Normal flow depth in pipe =   20.86(In.)
Flow top width inside pipe =   22.64(In.)
Critical Depth =   20.12(In.)
Pipe flow velocity =      6.96(Ft/s)
Travel time through pipe =    2.73 min.
Time of concentration (TC) =    11.15 min.


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Process from Point/Station       2.502 to Point/Station       2.502
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    11.15 min.
Rainfall intensity =      2.196(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.860
Subarea runoff =      5.181(CFS) for    4.700(Ac.)
Total runoff =     28.132(CFS)
Effective area this stream =       14.90(Ac.)
Total Study Area (Main Stream No. 2) =      196.29(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.502 to Point/Station       2.503
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   759.860(Ft.)
Downstream point/station elevation =   757.060(Ft.)
Pipe length  =   560.70(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.132(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    28.132(CFS)
Normal flow depth in pipe =   23.81(In.)
Flow top width inside pipe =   24.28(In.)
Critical Depth =   21.70(In.)
Pipe flow velocity =      6.73(Ft/s)
Travel time through pipe =    1.39 min.
Time of concentration (TC) =    12.54 min.
```

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Process from Point/Station        2.503 to Point/Station        2.003
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   757.060(Ft.)
Downstream point/station elevation =   754.000(Ft.)
Pipe length  =   616.83(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.132(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    28.132(CFS)
Normal flow depth in pipe =   23.91(In.)
Flow top width inside pipe =   24.14(In.)
Critical Depth =   21.70(In.)
Pipe flow velocity =      6.71(Ft/s)
Travel time through pipe =    1.53 min.
Time of concentration (TC) =    14.07 min.


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Process from Point/Station        2.003 to Point/Station        2.003
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.900(Ac.)
Runoff from this stream =     28.132(CFS)
Time of concentration =   14.07 min.
Rainfall intensity =     1.910(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     96.66    58.855     13.92    0.098      1.923
2     28.13    14.900     14.07    0.098      1.910
Qmax(1) =
           1.000 *    1.000 *    96.659) +
           1.007 *    0.989 *    28.132) + =     124.674
Qmax(2) =
           0.993 *    1.000 *    96.659) +
           1.000 *    1.000 *    28.132) + =     124.099

Total of 2 streams to confluence:
Flow rates before confluence point:
      96.659      28.132
Maximum flow rates at confluence using above data:
      124.674      124.099
```

```
Area of streams before confluence:
       58.855       14.900
Effective area values after confluence:
       73.587       73.755
Results of confluence:
Total flow rate =    124.674(CFS)
Time of concentration =    13.915 min.
Effective stream area after confluence =     73.587(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total (this main stream) =      73.76(Ac.)


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Process from Point/Station       2.003 to Point/Station       2.004
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   754.000(Ft.)
Downstream point/station elevation =   744.250(Ft.)
Pipe length  =  1083.36(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   124.674(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   124.674(CFS)
Normal flow depth in pipe =   36.09(In.)
Flow top width inside pipe =   41.46(In.)
Critical Depth =   40.24(In.)
Pipe flow velocity =     12.30(Ft/s)
Travel time through pipe =    1.47 min.
Time of concentration (TC) =    15.38 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.004 to Point/Station       2.004
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    15.38 min.
Rainfall intensity =      1.810(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.851
Subarea runoff =      1.610(CFS) for    8.350(Ac.)
Total runoff =    126.284(CFS)
Effective area this stream =       81.94(Ac.)
Total Study Area (Main Stream No. 2) =      204.64(Ac.)
Area averaged Fm value =    0.098(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.004 to Point/Station       1.008
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   744.250(Ft.)
Downstream point/station elevation =   716.130(Ft.)
Pipe length  =    46.30(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   126.284(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =   126.284(CFS)
Normal flow depth in pipe =   15.02(In.)
Flow top width inside pipe =   23.23(In.)
Critical depth could not be calculated.
Pipe flow velocity =     61.01(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    15.40 min.


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Process from Point/Station       1.008 to Point/Station       1.008
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     81.937(Ac.)
Runoff from this stream =    126.284(CFS)
Time of concentration =   15.40 min.
Rainfall intensity =     1.809(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    102.33    77.448     11.55    0.838      2.150
2    126.28    81.937     15.40    0.098      1.809
Qmax(1) =
           1.000 *    1.000 *   102.331) +
           1.199 *    0.750 *   126.284) + =     215.916
Qmax(2) =
           0.740 *    1.000 *   102.331) +
           1.000 *    1.000 *   126.284) + =     202.054

Total of 2 main streams to confluence:
Flow rates before confluence point:
     103.331     127.284
Maximum flow rates at confluence using above data:
      215.916      202.054
```

```
Area of streams before confluence:
       77.448       81.937
Effective area values after confluence:
      138.913      159.385


Results of confluence:
Total flow rate =    215.916(CFS)
Time of concentration =    11.550 min.
Effective stream area after confluence  =    138.913(Ac.)
Study area average Pervious fraction(Ap) =  0.468
Study area average soil loss rate(Fm) =    0.457(In/Hr)
Study area total =     159.38(Ac.)


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Process from Point/Station       1.008 to Point/Station       1.009
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   716.130(Ft.)
Downstream point/station elevation =   715.440(Ft.)
Pipe length  =   132.26(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   215.916(CFS)
Nearest computed pipe diameter  =     66.00(In.)
Calculated individual pipe flow  =   215.916(CFS)
Normal flow depth in pipe =   48.47(In.)
Flow top width inside pipe =   58.30(In.)
Critical Depth =   49.35(In.)
Pipe flow velocity =     11.54(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    11.74 min.
End of computations, Total Study Area =          204.64 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.553
Area averaged SCS curve number =  32.0
```

A.3 – 25-YEAR HYDROLOGY MODEL

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                San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2019 Version 9.1
        Rational Hydrology Study       Date: 05/16/24
------------------------------------------------------------------------
ORSC HYDROLOGY & HYDRAULICS
PROPOSED CONDITIONS
25-YEAR STORM EVENT

------------------------------------------------------------------------


Program License Serial Number 6639

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------
Rational hydrology study storm event year is    25.0
   10 Year storm 1 hour rainfall  =      0.800(In.)
  100 Year storm 1 hour rainfall  =      1.200(In.)
Computed rainfall intensity:
Storm year =    25.00   1 hour rainfall =     0.959 (In.)
Slope used for rainfall intensity curve b =  0.6000
Soil antecedent moisture condition (AMC) = 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       1.001
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   672.260(Ft.)
Top (of initial area) elevation =   750.000(Ft.)
Bottom (of initial area) elevation =   744.440(Ft.)
Difference in elevation =     5.560(Ft.)
Slope =    0.00827  s(%)=       0.83
TC = k(0.484)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.079 min.
Rainfall intensity =      2.039(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.533
Subarea runoff =      2.630(CFS)
Total initial stream area =       2.420(Ac.)
```

```
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.001 to Point/Station       1.001
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.0100     Max loss rate(Fm)=     0.010(In/Hr)
Time of concentration =    17.08 min.
Rainfall intensity =      2.039(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.640
Subarea runoff =      1.844(CFS) for    1.010(Ac.)
Total runoff =      4.474(CFS)
Effective area this stream =        3.43(Ac.)
Total Study Area (Main Stream No. 1) =        3.43(Ac.)
Area averaged Fm value =    0.589(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.001 to Point/Station       1.002
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   744.440(Ft.)
Downstream point/station elevation =   739.410(Ft.)
Pipe length  =   466.03(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.474(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.474(CFS)
Normal flow depth in pipe =    8.95(In.)
Flow top width inside pipe =   14.72(In.)
Critical Depth =   10.28(In.)
Pipe flow velocity =      5.85(Ft/s)
Travel time through pipe =    1.33 min.
Time of concentration (TC) =    18.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.002 to Point/Station       1.002
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    18.41 min.
```

```
Rainfall intensity =      1.949(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.586
Subarea runoff =      1.806(CFS) for    2.070(Ac.)
Total runoff =      6.280(CFS)
Effective area this stream =        5.50(Ac.)
Total Study Area (Main Stream No. 1) =        5.50(Ac.)
Area averaged Fm value =    0.680(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.002 to Point/Station       1.003
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   739.410(Ft.)
Downstream point/station elevation =   736.150(Ft.)
Pipe length  =   829.94(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.280(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     6.280(CFS)
Normal flow depth in pipe =   14.06(In.)
Flow top width inside pipe =   14.88(In.)
Critical Depth =   11.63(In.)
Pipe flow velocity =      4.24(Ft/s)
Travel time through pipe =    3.26 min.
Time of concentration (TC) =    21.67 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.003 to Point/Station       1.003
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    21.67 min.
Rainfall intensity =      1.767(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.526
Subarea runoff =      1.695(CFS) for    3.080(Ac.)
Total runoff =      7.976(CFS)
Effective area this stream =        8.58(Ac.)
Total Study Area (Main Stream No. 1) =        8.58(Ac.)
Area averaged Fm value =    0.734(In/Hr)


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Process from Point/Station       1.003 to Point/Station       1.003
**** CONFLUENCE OF MINOR STREAMS ****
```

```
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      8.580(Ac.)
Runoff from this stream =      7.976(CFS)
Time of concentration =   21.67 min.
Rainfall intensity =     1.767(In/Hr)
Area averaged loss rate (Fm) =    0.7345(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7511


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Process from Point/Station       1.100 to Point/Station       1.110
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   261.290(Ft.)
Top (of initial area) elevation =   749.020(Ft.)
Bottom (of initial area) elevation =   747.710(Ft.)
Difference in elevation =     1.310(Ft.)
Slope =    0.00501  s(%)=       0.50
TC = k(0.484)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.935 min.
Rainfall intensity =      2.408(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.589
Subarea runoff =      7.382(CFS)
Total initial stream area =        5.200(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station       1.110 to Point/Station       1.003
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   747.710(Ft.)
Downstream point/station elevation =   736.150(Ft.)
Pipe length  =  1096.21(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.382(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.382(CFS)
Normal flow depth in pipe =   10.93(In.)
Flow top width inside pipe =   17.58(In.)
Critical Depth =   12.63(In.)
Pipe flow velocity =      6.57(Ft/s)
Travel time through pipe =    2.78 min.
Time of concentration (TC) =    15.71 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.003 to Point/Station       1.003
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.9000     Max loss rate(Fm)=     0.880(In/Hr)
Time of concentration =    15.71 min.
Rainfall intensity =      2.143(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.533
Subarea runoff =     41.153(CFS) for   37.300(Ac.)
Total runoff =     48.535(CFS)
Effective area this stream =       42.50(Ac.)
Total Study Area (Main Stream No. 1) =       51.08(Ac.)
Area averaged Fm value =    0.874(In/Hr)


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Process from Point/Station       1.003 to Point/Station       1.003
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     42.500(Ac.)
Runoff from this stream =     48.535(CFS)
Time of concentration =   15.71 min.
Rainfall intensity =     2.143(In/Hr)
Area averaged loss rate (Fm) =    0.8740(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8939
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1      7.98     8.580     21.67    0.734      1.767
2     48.54    42.500     15.71    0.874      2.143
Qmax(1) =
           1.000 *    1.000 *     7.976) +
           0.704 *    1.000 *    48.535) + =      42.143
Qmax(2) =
           1.364 *    0.725 *     7.976) +
           1.000 *    1.000 *    48.535) + =      56.423

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.976      48.535
```

```
Maximum flow rates at confluence using above data:
       42.143       56.423
Area of streams before confluence:
        8.580       42.500
Effective area values after confluence:
       51.080       48.723
Results of confluence:
Total flow rate =     56.423(CFS)
Time of concentration =    15.714 min.
Effective stream area after confluence =     48.723(Ac.)
Study area average Pervious fraction(Ap) =  0.870
Study area average soil loss rate(Fm) =    0.851(In/Hr)
Study area total (this main stream) =      51.08(Ac.)


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Process from Point/Station       1.003 to Point/Station       1.004
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   736.150(Ft.)
Downstream point/station elevation =   728.980(Ft.)
Pipe length  =   687.24(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    56.423(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    56.423(CFS)
Normal flow depth in pipe =   24.98(In.)
Flow top width inside pipe =   33.18(In.)
Critical Depth =   29.22(In.)
Pipe flow velocity =     10.77(Ft/s)
Travel time through pipe =    1.06 min.
Time of concentration (TC) =    16.78 min.


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Process from Point/Station       1.004 to Point/Station       1.004
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     55.329(CFS)
therefore the upstream flow rate of Q =     56.423(CFS) is being used
Time of concentration =    16.78 min.
Rainfall intensity =      2.060(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.529
Subarea runoff =      0.000(CFS) for    2.060(Ac.)
Total runoff =     56.423(CFS)
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Effective area this stream =       50.78(Ac.)
Total Study Area (Main Stream No. 1) =       53.14(Ac.)
Area averaged Fm value =    0.850(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.004 to Point/Station       1.005
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   728.980(Ft.)
Downstream point/station elevation =   724.170(Ft.)
Pipe length  =   456.65(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    56.423(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    56.423(CFS)
Normal flow depth in pipe =   24.89(In.)
Flow top width inside pipe =   33.26(In.)
Critical Depth =   29.22(In.)
Pipe flow velocity =     10.81(Ft/s)
Travel time through pipe =    0.70 min.
Time of concentration (TC) =    17.48 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.005 to Point/Station       1.005
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     54.649(CFS)
therefore the upstream flow rate of Q =     56.423(CFS) is being used
Time of concentration =    17.48 min.
Rainfall intensity =      2.010(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.520
Subarea runoff =      0.000(CFS) for    1.520(Ac.)
Total runoff =     56.423(CFS)
Effective area this stream =       52.30(Ac.)
Total Study Area (Main Stream No. 1) =       54.66(Ac.)
Area averaged Fm value =    0.849(In/Hr)


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Process from Point/Station       1.005 to Point/Station       1.006
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   724.170(Ft.)
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Downstream point/station elevation =   720.970(Ft.)
Pipe length  =  1020.52(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    56.423(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    56.423(CFS)
Normal flow depth in pipe =   31.41(In.)
Flow top width inside pipe =   41.32(In.)
Critical Depth =   27.67(In.)
Pipe flow velocity =      6.86(Ft/s)
Travel time through pipe =    2.48 min.
Time of concentration (TC) =    19.96 min.


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Process from Point/Station       1.006 to Point/Station       1.006
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     49.801(CFS)
therefore the upstream flow rate of Q =     56.423(CFS) is being used
Time of concentration =    19.96 min.
Rainfall intensity =      1.856(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.489
Subarea runoff =      0.000(CFS) for    2.590(Ac.)
Total runoff =     56.423(CFS)
Effective area this stream =       54.89(Ac.)
Total Study Area (Main Stream No. 1) =       57.25(Ac.)
Area averaged Fm value =    0.848(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.006 to Point/Station       1.006
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     54.893(Ac.)
Runoff from this stream =     56.423(CFS)
Time of concentration =   19.96 min.
Rainfall intensity =     1.856(In/Hr)
Area averaged loss rate (Fm) =    0.8484(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8677


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Process from Point/Station       1.200 to Point/Station       1.201
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**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   171.480(Ft.)
Top (of initial area) elevation =   750.740(Ft.)
Bottom (of initial area) elevation =   749.880(Ft.)
Difference in elevation =     0.860(Ft.)
Slope =    0.00502  s(%)=       0.50
TC = k(0.484)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.929 min.
Rainfall intensity =      2.665(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.619
Subarea runoff =      5.462(CFS)
Total initial stream area =        3.310(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station       1.201 to Point/Station       1.006
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   749.880(Ft.)
Downstream point/station elevation =   720.970(Ft.)
Pipe length  =   821.99(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.462(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.462(CFS)
Normal flow depth in pipe =    8.25(In.)
Flow top width inside pipe =   11.12(In.)
Critical Depth =   11.25(In.)
Pipe flow velocity =      9.49(Ft/s)
Travel time through pipe =    1.44 min.
Time of concentration (TC) =    12.37 min.


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Process from Point/Station       1.006 to Point/Station       1.006
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    12.37 min.
Rainfall intensity =      2.473(In/Hr) for a    25.0 year storm
```

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.598
Subarea runoff =     27.056(CFS) for   18.690(Ac.)
Total runoff =     32.519(CFS)
Effective area this stream =       22.00(Ac.)
Total Study Area (Main Stream No. 1) =       79.25(Ac.)
Area averaged Fm value =    0.831(In/Hr)


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Process from Point/Station       1.006 to Point/Station       1.006
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     22.000(Ac.)
Runoff from this stream =     32.519(CFS)
Time of concentration =   12.37 min.
Rainfall intensity =     2.473(In/Hr)
Area averaged loss rate (Fm) =    0.8311(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8500
Summary of stream data:

Stream Flow rate    Area    TC      Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     56.42    54.893     19.96    0.848      1.856
2     32.52    22.000     12.37    0.831      2.473
Qmax(1) =
           1.000 *    1.000 *    56.423) +
           0.624 *    1.000 *    32.519) + =      76.725
Qmax(2) =
           1.612 *    0.620 *    56.423) +
           1.000 *    1.000 *    32.519) + =      88.901

Total of 2 streams to confluence:
Flow rates before confluence point:
      56.423      32.519
Maximum flow rates at confluence using above data:
       76.725       88.901
Area of streams before confluence:
       54.893       22.000
Effective area values after confluence:
       76.893       56.026
Results of confluence:
Total flow rate =     88.901(CFS)
Time of concentration =    12.373 min.
Effective stream area after confluence =     56.026(Ac.)
Study area average Pervious fraction(Ap) =  0.863
Study area average soil loss rate(Fm) =    0.843(In/Hr)
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Study area total (this main stream) =      76.89(Ac.)


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Process from Point/Station       1.006 to Point/Station       1.007
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   720.970(Ft.)
Downstream point/station elevation =   716.610(Ft.)
Pipe length  =  1002.81(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    88.901(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =    88.901(CFS)
Normal flow depth in pipe =   36.94(In.)
Flow top width inside pipe =   40.43(In.)
Critical Depth =   34.31(In.)
Pipe flow velocity =      8.57(Ft/s)
Travel time through pipe =    1.95 min.
Time of concentration (TC) =    14.32 min.


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Process from Point/Station       1.007 to Point/Station       1.007
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     74.996(CFS)
therefore the upstream flow rate of Q =     88.901(CFS) is being used
Time of concentration =    14.32 min.
Rainfall intensity =      2.266(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.565
Subarea runoff =      0.000(CFS) for    2.550(Ac.)
Total runoff =     88.901(CFS)
Effective area this stream =       58.58(Ac.)
Total Study Area (Main Stream No. 1) =       81.80(Ac.)
Area averaged Fm value =    0.843(In/Hr)


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Process from Point/Station       1.007 to Point/Station       1.007
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     58.576(Ac.)
Runoff from this stream =     88.901(CFS)
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```
Time of concentration =   14.32 min.
Rainfall intensity =     2.266(In/Hr)
Area averaged loss rate (Fm) =    0.8429(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8621


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.300 to Point/Station       1.301
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =    67.280(Ft.)
Top (of initial area) elevation =   750.300(Ft.)
Bottom (of initial area) elevation =   749.960(Ft.)
Difference in elevation =     0.340(Ft.)
Slope =    0.00505  s(%)=       0.51
TC = k(0.484)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.506 min.
Rainfall intensity =      3.339(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.676
Subarea runoff =      5.845(CFS)
Total initial stream area =        2.590(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station       1.301 to Point/Station       1.007
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   749.960(Ft.)
Downstream point/station elevation =   716.610(Ft.)
Pipe length  =   972.89(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.845(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.845(CFS)
Normal flow depth in pipe =    8.79(In.)
Flow top width inside pipe =   10.62(In.)
Critical depth could not be calculated.
Pipe flow velocity =      9.49(Ft/s)
Travel time through pipe =    1.71 min.
Time of concentration (TC) =     9.21 min.


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Process from Point/Station       1.007 to Point/Station       1.007
```

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**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =     9.21 min.
Rainfall intensity =      2.952(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.647
Subarea runoff =     39.581(CFS) for   21.210(Ac.)
Total runoff =     45.426(CFS)
Effective area this stream =       23.80(Ac.)
Total Study Area (Main Stream No. 1) =      105.60(Ac.)
Area averaged Fm value =    0.831(In/Hr)


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Process from Point/Station       1.007 to Point/Station       1.007
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     23.800(Ac.)
Runoff from this stream =     45.426(CFS)
Time of concentration =    9.21 min.
Rainfall intensity =     2.952(In/Hr)
Area averaged loss rate (Fm) =    0.8311(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8500
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     88.90    58.576     14.32    0.843      2.266
2     45.43    23.800      9.21    0.831      2.952
Qmax(1) =
           1.000 *    1.000 *    88.901) +
           0.676 *    1.000 *    45.426) + =     119.625
Qmax(2) =
           1.482 *    0.643 *    88.901) +
           1.000 *    1.000 *    45.426) + =     130.216

Total of 2 streams to confluence:
Flow rates before confluence point:
      88.901      45.426
Maximum flow rates at confluence using above data:
      119.625      130.216
Area of streams before confluence:
       58.576       23.800
```

```
Effective area values after confluence:
       82.376       61.485
Results of confluence:
Total flow rate =    130.216(CFS)
Time of concentration =     9.215 min.
Effective stream area after confluence =     61.485(Ac.)
Study area average Pervious fraction(Ap) =  0.859
Study area average soil loss rate(Fm) =    0.840(In/Hr)
Study area total (this main stream) =      82.38(Ac.)


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Process from Point/Station       1.007 to Point/Station       1.008
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   716.610(Ft.)
Downstream point/station elevation =   716.130(Ft.)
Pipe length  =   623.01(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   130.216(CFS)
Nearest computed pipe diameter  =     75.00(In.)
Calculated individual pipe flow  =   130.216(CFS)
Normal flow depth in pipe =   61.03(In.)
Flow top width inside pipe =   58.40(In.)
Critical Depth =   36.62(In.)
Pipe flow velocity =      4.87(Ft/s)
Travel time through pipe =    2.13 min.
Time of concentration (TC) =    11.35 min.


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Process from Point/Station       1.008 to Point/Station       1.008
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =    124.381(CFS)
therefore the upstream flow rate of Q =    130.216(CFS) is being used
Time of concentration =    11.35 min.
Rainfall intensity =      2.605(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.611
Subarea runoff =      0.000(CFS) for   16.700(Ac.)
Total runoff =    130.216(CFS)
Effective area this stream =       78.18(Ac.)
Total Study Area (Main Stream No. 1) =      122.30(Ac.)
Area averaged Fm value =    0.838(In/Hr)
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Process from Point/Station       1.008 to Point/Station       1.008
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     78.185(Ac.)
Runoff from this stream =    130.216(CFS)
Time of concentration =   11.35 min.
Rainfall intensity =     2.605(In/Hr)
Area averaged loss rate (Fm) =    0.8377(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8567
Program is now starting with Main Stream No. 2


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Process from Point/Station       2.000 to Point/Station       2.001
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   660.350(Ft.)
Top (of initial area) elevation =   768.710(Ft.)
Bottom (of initial area) elevation =   760.300(Ft.)
Difference in elevation =     8.410(Ft.)
Slope =    0.01274  s(%)=       1.27
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.612 min.
Rainfall intensity =      2.878(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.869
Subarea runoff =      1.451(CFS)
Total initial stream area =        0.580(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.001 to Point/Station       2.001
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     9.61 min.
Rainfall intensity =      2.878(In/Hr) for a    25.0 year storm
```

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.869
Subarea runoff =     11.936(CFS) for    4.770(Ac.)
Total runoff =     13.387(CFS)
Effective area this stream =        5.35(Ac.)
Total Study Area (Main Stream No. 2) =      127.65(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.001 to Point/Station       2.001
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      5.350(Ac.)
Runoff from this stream =     13.387(CFS)
Time of concentration =    9.61 min.
Rainfall intensity =     2.878(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station       2.100 to Point/Station       2.101
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   402.250(Ft.)
Top (of initial area) elevation =   769.050(Ft.)
Bottom (of initial area) elevation =   767.100(Ft.)
Difference in elevation =     1.950(Ft.)
Slope =    0.00485  s(%)=       0.48
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.563 min.
Rainfall intensity =      2.887(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      2.786(CFS)
Total initial stream area =        1.110(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.101 to Point/Station       2.101
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
```

```
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     9.56 min.
Rainfall intensity =      2.887(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.870
Subarea runoff =     10.970(CFS) for    4.370(Ac.)
Total runoff =     13.756(CFS)
Effective area this stream =        5.48(Ac.)
Total Study Area (Main Stream No. 2) =      133.13(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.101 to Point/Station       2.102
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   767.100(Ft.)
Downstream point/station elevation =   763.230(Ft.)
Pipe length  =   599.32(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.756(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    13.756(CFS)
Normal flow depth in pipe =   15.61(In.)
Flow top width inside pipe =   22.89(In.)
Critical Depth =   16.03(In.)
Pipe flow velocity =      6.36(Ft/s)
Travel time through pipe =    1.57 min.
Time of concentration (TC) =    11.13 min.


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Process from Point/Station       2.102 to Point/Station       2.102
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    11.13 min.
Rainfall intensity =      2.635(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =      5.039(CFS) for    2.750(Ac.)
Total runoff =     18.795(CFS)
Effective area this stream =        8.23(Ac.)
Total Study Area (Main Stream No. 2) =      135.88(Ac.)
Area averaged Fm value =    0.098(In/Hr)
```

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Process from Point/Station       2.102 to Point/Station       2.103
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   763.230(Ft.)
Downstream point/station elevation =   761.620(Ft.)
Pipe length  =   323.10(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.795(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    18.795(CFS)
Normal flow depth in pipe =   19.29(In.)
Flow top width inside pipe =   24.39(In.)
Critical Depth =   18.20(In.)
Pipe flow velocity =      6.18(Ft/s)
Travel time through pipe =    0.87 min.
Time of concentration (TC) =    12.00 min.


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Process from Point/Station       2.103 to Point/Station       2.103
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    12.00 min.
Rainfall intensity =      2.519(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.865
Subarea runoff =     17.702(CFS) for    8.520(Ac.)
Total runoff =     36.497(CFS)
Effective area this stream =       16.75(Ac.)
Total Study Area (Main Stream No. 2) =      144.40(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.103 to Point/Station       2.001
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   761.620(Ft.)
Downstream point/station elevation =   760.300(Ft.)
Pipe length  =   107.08(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    36.497(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    36.497(CFS)
Normal flow depth in pipe =   20.32(In.)
```

```
Flow top width inside pipe =   28.05(In.)
Critical Depth =   24.56(In.)
Pipe flow velocity =     10.31(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    12.18 min.


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Process from Point/Station       2.001 to Point/Station       2.001
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     16.750(Ac.)
Runoff from this stream =     36.497(CFS)
Time of concentration =   12.18 min.
Rainfall intensity =     2.497(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station       2.200 to Point/Station       2.001
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =    81.220(Ft.)
Top (of initial area) elevation =   761.110(Ft.)
Bottom (of initial area) elevation =   760.300(Ft.)
Difference in elevation =     0.810(Ft.)
Slope =    0.00997  s(%)=       1.00
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    4.365 min.
Rainfall intensity =      4.622(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.881
Subarea runoff =      2.402(CFS)
Total initial stream area =        0.590(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.001 to Point/Station       2.001
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      0.590(Ac.)
```

```
Runoff from this stream =      2.402(CFS)
Time of concentration =    4.37 min.
Rainfall intensity =     4.622(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     13.39     5.350      9.61    0.098      2.878
2     36.50    16.750     12.18    0.098      2.497
3      2.40     0.590      4.37    0.098      4.622
Qmax(1) =
           1.000 *    1.000 *    13.387) +
           1.159 *    0.789 *    36.497) +
           0.615 *    1.000 *     2.402) + =      48.244
Qmax(2) =
           0.863 *    1.000 *    13.387) +
           1.000 *    1.000 *    36.497) +
           0.530 *    1.000 *     2.402) + =      49.324
Qmax(3) =
           1.627 *    0.454 *    13.387) +
           1.885 *    0.358 *    36.497) +
           1.000 *    1.000 *     2.402) + =      36.960

Total of 3 streams to confluence:
Flow rates before confluence point:
      13.387      36.497       2.402
Maximum flow rates at confluence using above data:
       48.244       49.324       36.960
Area of streams before confluence:
        5.350       16.750        0.590
Effective area values after confluence:
       19.161       22.690        9.024
Results of confluence:
Total flow rate =     49.324(CFS)
Time of concentration =    12.177 min.
Effective stream area after confluence =     22.690(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total (this main stream) =      22.69(Ac.)


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Process from Point/Station       2.001 to Point/Station       2.002
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   760.300(Ft.)
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Downstream point/station elevation =   755.350(Ft.)
Pipe length  =   642.08(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    49.324(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    49.324(CFS)
Normal flow depth in pipe =   25.31(In.)
Flow top width inside pipe =   32.90(In.)
Critical Depth =   27.42(In.)
Pipe flow velocity =      9.29(Ft/s)
Travel time through pipe =    1.15 min.
Time of concentration (TC) =    13.33 min.


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Process from Point/Station       2.001 to Point/Station       2.002
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.33 min.
Rainfall intensity =      2.365(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.863
Subarea runoff =      5.084(CFS) for    3.970(Ac.)
Total runoff =     54.409(CFS)
Effective area this stream =       26.66(Ac.)
Total Study Area (Main Stream No. 2) =      148.96(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.002 to Point/Station       2.002
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     26.660(Ac.)
Runoff from this stream =     54.409(CFS)
Time of concentration =   13.33 min.
Rainfall intensity =     2.365(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station       2.300 to Point/Station       2.301
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
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USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   656.930(Ft.)
Top (of initial area) elevation =   767.140(Ft.)
Bottom (of initial area) elevation =   763.850(Ft.)
Difference in elevation =     3.290(Ft.)
Slope =    0.00501  s(%)=       0.50
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.560 min.
Rainfall intensity =      2.576(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.866
Subarea runoff =      3.993(CFS)
Total initial stream area =        1.790(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station        2.301 to Point/Station        2.301
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    11.56 min.
Rainfall intensity =      2.576(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.866
Subarea runoff =     13.050(CFS) for    5.850(Ac.)
Total runoff =     17.043(CFS)
Effective area this stream =        7.64(Ac.)
Total Study Area (Main Stream No. 2) =      156.60(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station        2.301 to Point/Station        2.302
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   763.850(Ft.)
Downstream point/station elevation =   760.160(Ft.)
Pipe length  =   738.89(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.043(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    17.043(CFS)
Normal flow depth in pipe =   17.91(In.)
Flow top width inside pipe =   25.52(In.)
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Critical Depth =   17.30(In.)
Pipe flow velocity =      6.08(Ft/s)
Travel time through pipe =    2.02 min.
Time of concentration (TC) =    13.58 min.


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Process from Point/Station       2.302 to Point/Station       2.302
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.58 min.
Rainfall intensity =      2.339(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.862
Subarea runoff =     12.604(CFS) for    7.060(Ac.)
Total runoff =     29.646(CFS)
Effective area this stream =       14.70(Ac.)
Total Study Area (Main Stream No. 2) =      163.66(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.302 to Point/Station       2.002
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   760.160(Ft.)
Downstream point/station elevation =   755.350(Ft.)
Pipe length  =    76.19(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.646(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    29.646(CFS)
Normal flow depth in pipe =   13.50(In.)
Flow top width inside pipe =   20.12(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.14(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    13.65 min.


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Process from Point/Station       2.002 to Point/Station       2.002
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.700(Ac.)
Runoff from this stream =     29.646(CFS)
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```
Time of concentration =   13.65 min.
Rainfall intensity =     2.331(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station       2.400 to Point/Station       2.401
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   544.320(Ft.)
Top (of initial area) elevation =   766.500(Ft.)
Bottom (of initial area) elevation =   763.780(Ft.)
Difference in elevation =     2.720(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.728 min.
Rainfall intensity =      2.695(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.867
Subarea runoff =      2.711(CFS)
Total initial stream area =        1.160(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.401 to Point/Station       2.401
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    10.73 min.
Rainfall intensity =      2.695(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =      9.559(CFS) for    4.090(Ac.)
Total runoff =     12.270(CFS)
Effective area this stream =        5.25(Ac.)
Total Study Area (Main Stream No. 2) =      168.91(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.401 to Point/Station       2.402
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   763.780(Ft.)
Downstream point/station elevation =   761.070(Ft.)
Pipe length  =   541.68(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.270(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    12.270(CFS)
Normal flow depth in pipe =   15.75(In.)
Flow top width inside pipe =   22.80(In.)
Critical Depth =   15.09(In.)
Pipe flow velocity =      5.61(Ft/s)
Travel time through pipe =    1.61 min.
Time of concentration (TC) =    12.34 min.


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Process from Point/Station       2.402 to Point/Station       2.402
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    12.34 min.
Rainfall intensity =      2.478(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.864
Subarea runoff =      7.224(CFS) for    3.850(Ac.)
Total runoff =     19.493(CFS)
Effective area this stream =        9.10(Ac.)
Total Study Area (Main Stream No. 2) =      172.76(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.402 to Point/Station       2.002
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   761.070(Ft.)
Downstream point/station elevation =   755.350(Ft.)
Pipe length  =    62.68(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.493(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    19.493(CFS)
Normal flow depth in pipe =   12.28(In.)
Flow top width inside pipe =   11.56(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.13(Ft/s)
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Travel time through pipe =    0.06 min.
Time of concentration (TC) =    12.39 min.


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Process from Point/Station       2.002 to Point/Station       2.002
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      9.100(Ac.)
Runoff from this stream =     19.493(CFS)
Time of concentration =   12.39 min.
Rainfall intensity =     2.471(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC      Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)



1     54.41    26.660     13.33    0.098      2.365
2     29.65    14.700     13.65    0.098      2.331
3     19.49     9.100     12.39    0.098      2.471
Qmax(1) =
           1.000 *    1.000 *    54.409) +
           1.015 *    0.976 *    29.646) +
           0.955 *    1.000 *    19.493) + =     102.415
Qmax(2) =
           0.985 *    1.000 *    54.409) +
           1.000 *    1.000 *    29.646) +
           0.941 *    1.000 *    19.493) + =     101.588
Qmax(3) =
           1.047 *    0.930 *    54.409) +
           1.062 *    0.908 *    29.646) +
           1.000 *    1.000 *    19.493) + =     101.027

Total of 3 streams to confluence:
Flow rates before confluence point:
      54.409      29.646      19.493
Maximum flow rates at confluence using above data:
      102.415      101.588      101.027
Area of streams before confluence:
       26.660       14.700        9.100
Effective area values after confluence:
       50.110       50.460       47.230
Results of confluence:
Total flow rate =    102.415(CFS)
Time of concentration =    13.330 min.
Effective stream area after confluence =     50.110(Ac.)
```

```
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total (this main stream) =      50.46(Ac.)


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Process from Point/Station       2.002 to Point/Station       2.003
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   755.350(Ft.)
Downstream point/station elevation =   754.000(Ft.)
Pipe length  =   210.71(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   102.415(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   102.415(CFS)
Normal flow depth in pipe =   35.30(In.)
Flow top width inside pipe =   42.35(In.)
Critical Depth =   36.79(In.)
Pipe flow velocity =     10.34(Ft/s)
Travel time through pipe =    0.34 min.
Time of concentration (TC) =    13.67 min.


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Process from Point/Station       2.003 to Point/Station       2.003
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.67 min.
Rainfall intensity =      2.330(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.862
Subarea runoff =     15.590(CFS) for    8.630(Ac.)
Total runoff =    118.006(CFS)
Effective area this stream =       58.74(Ac.)
Total Study Area (Main Stream No. 2) =      181.39(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.003 to Point/Station       2.003
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     58.740(Ac.)
Runoff from this stream =    118.006(CFS)
Time of concentration =   13.67 min.
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```
Rainfall intensity =     2.330(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station       2.500 to Point/Station       2.501
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   580.350(Ft.)
Top (of initial area) elevation =   777.930(Ft.)
Bottom (of initial area) elevation =   766.900(Ft.)
Difference in elevation =    11.030(Ft.)
Slope =    0.01901  s(%)=       1.90
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.426 min.
Rainfall intensity =      3.115(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.872
Subarea runoff =     10.318(CFS)
Total initial stream area =        3.800(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.501 to Point/Station       2.501
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     8.43 min.
Rainfall intensity =      3.115(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =     17.378(CFS) for    6.400(Ac.)
Total runoff =     27.696(CFS)
Effective area this stream =       10.20(Ac.)
Total Study Area (Main Stream No. 2) =      191.59(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.501 to Point/Station       2.502
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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   766.900(Ft.)
Downstream point/station elevation =   759.860(Ft.)
Pipe length  =  1139.32(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    27.696(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    27.696(CFS)
Normal flow depth in pipe =   21.42(In.)
Flow top width inside pipe =   27.11(In.)
Critical Depth =   21.54(In.)
Pipe flow velocity =      7.39(Ft/s)
Travel time through pipe =    2.57 min.
Time of concentration (TC) =    11.00 min.


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Process from Point/Station       2.502 to Point/Station       2.502
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    11.00 min.
Rainfall intensity =      2.655(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =      6.593(CFS) for    4.700(Ac.)
Total runoff =     34.289(CFS)
Effective area this stream =       14.90(Ac.)
Total Study Area (Main Stream No. 2) =      196.29(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.502 to Point/Station       2.503
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   759.860(Ft.)
Downstream point/station elevation =   757.060(Ft.)
Pipe length  =   560.70(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.289(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    34.289(CFS)
Normal flow depth in pipe =   24.89(In.)
Flow top width inside pipe =   28.41(In.)
Critical Depth =   23.38(In.)
Pipe flow velocity =      7.14(Ft/s)
Travel time through pipe =    1.31 min.
```

```
Time of concentration (TC) =    12.31 min.


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Process from Point/Station       2.503 to Point/Station       2.003
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   757.060(Ft.)
Downstream point/station elevation =   754.000(Ft.)
Pipe length  =   616.83(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.289(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    34.289(CFS)
Normal flow depth in pipe =   24.94(In.)
Flow top width inside pipe =   28.36(In.)
Critical Depth =   23.38(In.)
Pipe flow velocity =      7.12(Ft/s)
Travel time through pipe =    1.44 min.
Time of concentration (TC) =    13.75 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.003 to Point/Station       2.003
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.900(Ac.)
Runoff from this stream =     34.289(CFS)
Time of concentration =   13.75 min.
Rainfall intensity =     2.322(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    118.01    58.740     13.67    0.098      2.330
2     34.29    14.900     13.75    0.098      2.322
Qmax(1) =
           1.000 *    1.000 *   118.006) +
           1.004 *    0.994 *    34.289) + =     152.218
Qmax(2) =
           0.996 *    1.000 *   118.006) +
           1.000 *    1.000 *    34.289) + =     151.854

Total of 2 streams to confluence:
Flow rates before confluence point:
     118.006      34.289
```

```
Maximum flow rates at confluence using above data:
      152.218      151.854
Area of streams before confluence:
       58.740       14.900
Effective area values after confluence:
       73.551       73.640
Results of confluence:
Total flow rate =    152.218(CFS)
Time of concentration =    13.669 min.
Effective stream area after confluence =     73.551(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total (this main stream) =      73.64(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.003 to Point/Station       2.004
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   754.000(Ft.)
Downstream point/station elevation =   744.250(Ft.)
Pipe length  =  1083.36(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   152.218(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =   152.218(CFS)
Normal flow depth in pipe =   39.66(In.)
Flow top width inside pipe =   42.42(In.)
Critical Depth =   43.63(In.)
Pipe flow velocity =     12.85(Ft/s)
Travel time through pipe =    1.41 min.
Time of concentration (TC) =    15.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.004 to Point/Station       2.004
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    15.07 min.
Rainfall intensity =      2.197(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.860
Subarea runoff =      2.523(CFS) for    8.350(Ac.)
Total runoff =    154.741(CFS)
Effective area this stream =       81.90(Ac.)
Total Study Area (Main Stream No. 2) =      204.64(Ac.)
Area averaged Fm value =    0.098(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.004 to Point/Station       1.008
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   744.250(Ft.)
Downstream point/station elevation =   716.130(Ft.)
Pipe length  =    46.30(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   154.741(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =   154.741(CFS)
Normal flow depth in pipe =   17.44(In.)
Flow top width inside pipe =   21.39(In.)
Critical depth could not be calculated.
Pipe flow velocity =     63.30(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    15.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.008 to Point/Station       1.008
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     81.901(Ac.)
Runoff from this stream =    154.741(CFS)
Time of concentration =   15.09 min.
Rainfall intensity =     2.196(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    130.22    78.185     11.35    0.838      2.605
2    154.74    81.901     15.09    0.098      2.196
Qmax(1) =
           1.000 *    1.000 *   130.216) +
           1.195 *    0.752 *   154.741) + =     269.303
Qmax(2) =
           0.768 *    1.000 *   130.216) +
           1.000 *    1.000 *   154.741) + =     254.802

Total of 2 main streams to confluence:
Flow rates before confluence point:
     131.216     155.741
```

```
Maximum flow rates at confluence using above data:
      269.303      254.802
Area of streams before confluence:
       78.185       81.901
Effective area values after confluence:
      139.783      160.086


Results of confluence:
Total flow rate =    269.303(CFS)
Time of concentration =    11.347 min.
Effective stream area after confluence  =    139.783(Ac.)
Study area average Pervious fraction(Ap) =  0.470
Study area average soil loss rate(Fm) =    0.459(In/Hr)
Study area total =     160.09(Ac.)


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Process from Point/Station       1.008 to Point/Station       1.009
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   716.130(Ft.)
Downstream point/station elevation =   715.440(Ft.)
Pipe length  =   132.26(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   269.303(CFS)
Nearest computed pipe diameter  =     69.00(In.)
Calculated individual pipe flow  =   269.303(CFS)
Normal flow depth in pipe =   55.69(In.)
Flow top width inside pipe =   54.46(In.)
Critical Depth =   54.39(In.)
Pipe flow velocity =     11.99(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    11.53 min.
End of computations, Total Study Area =          204.64 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.553
Area averaged SCS curve number =  32.0
```

A.4 – 100-YEAR HYDROLOGY MODEL

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               San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2019 Version 9.1
        Rational Hydrology Study        Date: 05/16/24
------------------------------------------------------------------------
ORSC HYDROLOGY & HYDRAULICS
PROPOSED CONDITIONS
100-YEAR STORM EVENT

------------------------------------------------------------------------


Program License Serial Number 6639

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
   10 Year storm 1 hour rainfall  =      0.800(In.)
  100 Year storm 1 hour rainfall  =      1.200(In.)
Computed rainfall intensity:
Storm year =   100.00   1 hour rainfall =     1.200 (In.)
Slope used for rainfall intensity curve b =  0.6000
Soil antecedent moisture condition (AMC) = 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       1.001
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   672.260(Ft.)
Top (of initial area) elevation =   750.000(Ft.)
Bottom (of initial area) elevation =   744.440(Ft.)
Difference in elevation =     5.560(Ft.)
Slope =    0.00827  s(%)=       0.83
TC = k(0.484)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.079 min.
Rainfall intensity =      2.550(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.607
Subarea runoff =      3.744(CFS)
Total initial stream area =       2.420(Ac.)
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Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.001 to Point/Station       1.001
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.0100     Max loss rate(Fm)=     0.010(In/Hr)
Time of concentration =    17.08 min.
Rainfall intensity =      2.550(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.692
Subarea runoff =      2.309(CFS) for    1.010(Ac.)
Total runoff =      6.054(CFS)
Effective area this stream =        3.43(Ac.)
Total Study Area (Main Stream No. 1) =        3.43(Ac.)
Area averaged Fm value =    0.589(In/Hr)


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Process from Point/Station       1.001 to Point/Station       1.002
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   744.440(Ft.)
Downstream point/station elevation =   739.410(Ft.)
Pipe length  =   466.03(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.054(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.054(CFS)
Normal flow depth in pipe =   11.14(In.)
Flow top width inside pipe =   13.11(In.)
Critical Depth =   11.94(In.)
Pipe flow velocity =      6.19(Ft/s)
Travel time through pipe =    1.25 min.
Time of concentration (TC) =    18.33 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.002 to Point/Station       1.002
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    18.33 min.
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Rainfall intensity =      2.444(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.649
Subarea runoff =      2.677(CFS) for    2.070(Ac.)
Total runoff =      8.731(CFS)
Effective area this stream =        5.50(Ac.)
Total Study Area (Main Stream No. 1) =        5.50(Ac.)
Area averaged Fm value =    0.680(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.002 to Point/Station       1.003
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   739.410(Ft.)
Downstream point/station elevation =   736.150(Ft.)
Pipe length  =   829.94(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.731(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     8.731(CFS)
Normal flow depth in pipe =   15.28(In.)
Flow top width inside pipe =   18.70(In.)
Critical Depth =   13.17(In.)
Pipe flow velocity =      4.66(Ft/s)
Travel time through pipe =    2.97 min.
Time of concentration (TC) =    21.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.003 to Point/Station       1.003
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    21.30 min.
Rainfall intensity =      2.234(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.604
Subarea runoff =      2.846(CFS) for    3.080(Ac.)
Total runoff =     11.577(CFS)
Effective area this stream =        8.58(Ac.)
Total Study Area (Main Stream No. 1) =        8.58(Ac.)
Area averaged Fm value =    0.734(In/Hr)


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Process from Point/Station       1.003 to Point/Station       1.003
**** CONFLUENCE OF MINOR STREAMS ****
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________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      8.580(Ac.)
Runoff from this stream =     11.577(CFS)
Time of concentration =   21.30 min.
Rainfall intensity =     2.234(In/Hr)
Area averaged loss rate (Fm) =    0.7345(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7511


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.100 to Point/Station       1.110
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   261.290(Ft.)
Top (of initial area) elevation =   749.020(Ft.)
Bottom (of initial area) elevation =   747.710(Ft.)
Difference in elevation =     1.310(Ft.)
Slope =    0.00501  s(%)=       0.50
TC = k(0.484)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.935 min.
Rainfall intensity =      3.013(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.652
Subarea runoff =     10.212(CFS)
Total initial stream area =        5.200(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.110 to Point/Station       1.003
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   747.710(Ft.)
Downstream point/station elevation =   736.150(Ft.)
Pipe length  =  1096.21(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.212(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    10.212(CFS)
Normal flow depth in pipe =   13.97(In.)
Flow top width inside pipe =   15.01(In.)
Critical Depth =   14.75(In.)
Pipe flow velocity =      6.94(Ft/s)
Travel time through pipe =    2.63 min.
Time of concentration (TC) =    15.57 min.
```

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+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.003 to Point/Station       1.003
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.9000     Max loss rate(Fm)=     0.880(In/Hr)
Time of concentration =    15.57 min.
Rainfall intensity =      2.696(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.608
Subarea runoff =     59.490(CFS) for   37.300(Ac.)
Total runoff =     69.702(CFS)
Effective area this stream =       42.50(Ac.)
Total Study Area (Main Stream No. 1) =       51.08(Ac.)
Area averaged Fm value =    0.874(In/Hr)


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Process from Point/Station       1.003 to Point/Station       1.003
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     42.500(Ac.)
Runoff from this stream =     69.702(CFS)
Time of concentration =   15.57 min.
Rainfall intensity =     2.696(In/Hr)
Area averaged loss rate (Fm) =    0.8740(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8939
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     11.58     8.580     21.30    0.734      2.234
2     69.70    42.500     15.57    0.874      2.696
Qmax(1) =
           1.000 *    1.000 *    11.577) +
           0.746 *    1.000 *    69.702) + =      63.581
Qmax(2) =
           1.309 *    0.731 *    11.577) +
           1.000 *    1.000 *    69.702) + =      80.772

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.577      69.702
```

```
Maximum flow rates at confluence using above data:
       63.581       80.772
Area of streams before confluence:
        8.580       42.500
Effective area values after confluence:
       51.080       48.769
Results of confluence:
Total flow rate =     80.772(CFS)
Time of concentration =    15.566 min.
Effective stream area after confluence =     48.769(Ac.)
Study area average Pervious fraction(Ap) =  0.870
Study area average soil loss rate(Fm) =    0.851(In/Hr)
Study area total (this main stream) =      51.08(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.003 to Point/Station       1.004
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   736.150(Ft.)
Downstream point/station elevation =   728.980(Ft.)
Pipe length  =   687.24(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    80.772(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    80.772(CFS)
Normal flow depth in pipe =   30.56(In.)
Flow top width inside pipe =   32.12(In.)
Critical Depth =   33.85(In.)
Pipe flow velocity =     11.58(Ft/s)
Travel time through pipe =    0.99 min.
Time of concentration (TC) =    16.56 min.


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Process from Point/Station       1.004 to Point/Station       1.004
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     79.993(CFS)
therefore the upstream flow rate of Q =     80.772(CFS) is being used
Time of concentration =    16.56 min.
Rainfall intensity =      2.598(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.606
Subarea runoff =      0.000(CFS) for    2.060(Ac.)
Total runoff =     80.772(CFS)
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Effective area this stream =       50.83(Ac.)
Total Study Area (Main Stream No. 1) =       53.14(Ac.)
Area averaged Fm value =    0.850(In/Hr)


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Process from Point/Station       1.004 to Point/Station       1.005
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   728.980(Ft.)
Downstream point/station elevation =   724.170(Ft.)
Pipe length  =   456.65(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    80.772(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    80.772(CFS)
Normal flow depth in pipe =   30.42(In.)
Flow top width inside pipe =   32.31(In.)
Critical Depth =   33.85(In.)
Pipe flow velocity =     11.63(Ft/s)
Travel time through pipe =    0.65 min.
Time of concentration (TC) =    17.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.005 to Point/Station       1.005
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     79.595(CFS)
therefore the upstream flow rate of Q =     80.772(CFS) is being used
Time of concentration =    17.21 min.
Rainfall intensity =      2.539(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.599
Subarea runoff =      0.000(CFS) for    1.520(Ac.)
Total runoff =     80.772(CFS)
Effective area this stream =       52.35(Ac.)
Total Study Area (Main Stream No. 1) =       54.66(Ac.)
Area averaged Fm value =    0.849(In/Hr)


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Process from Point/Station       1.005 to Point/Station       1.006
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   724.170(Ft.)
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Downstream point/station elevation =   720.970(Ft.)
Pipe length  =  1020.52(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    80.772(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =    80.772(CFS)
Normal flow depth in pipe =   36.28(In.)
Flow top width inside pipe =   46.22(In.)
Critical Depth =   32.07(In.)
Pipe flow velocity =      7.49(Ft/s)
Travel time through pipe =    2.27 min.
Time of concentration (TC) =    19.48 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.006 to Point/Station       1.006
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     74.577(CFS)
therefore the upstream flow rate of Q =     80.772(CFS) is being used
Time of concentration =    19.48 min.
Rainfall intensity =      2.357(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.576
Subarea runoff =      0.000(CFS) for    2.590(Ac.)
Total runoff =     80.772(CFS)
Effective area this stream =       54.94(Ac.)
Total Study Area (Main Stream No. 1) =       57.25(Ac.)
Area averaged Fm value =    0.848(In/Hr)


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Process from Point/Station       1.006 to Point/Station       1.006
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     54.939(Ac.)
Runoff from this stream =     80.772(CFS)
Time of concentration =   19.48 min.
Rainfall intensity =     2.357(In/Hr)
Area averaged loss rate (Fm) =    0.8484(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8677


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Process from Point/Station       1.200 to Point/Station       1.201
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```
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   171.480(Ft.)
Top (of initial area) elevation =   750.740(Ft.)
Bottom (of initial area) elevation =   749.880(Ft.)
Difference in elevation =     0.860(Ft.)
Slope =    0.00502  s(%)=       0.50
TC = k(0.484)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.929 min.
Rainfall intensity =      3.334(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.676
Subarea runoff =      7.455(CFS)
Total initial stream area =        3.310(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.201 to Point/Station       1.006
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   749.880(Ft.)
Downstream point/station elevation =   720.970(Ft.)
Pipe length  =   821.99(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.455(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.455(CFS)
Normal flow depth in pipe =    8.51(In.)
Flow top width inside pipe =   14.86(In.)
Critical Depth =   13.04(In.)
Pipe flow velocity =     10.38(Ft/s)
Travel time through pipe =    1.32 min.
Time of concentration (TC) =    12.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.006 to Point/Station       1.006
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    12.25 min.
Rainfall intensity =      3.113(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.660
Subarea runoff =     37.731(CFS) for   18.690(Ac.)
Total runoff =     45.186(CFS)
Effective area this stream =       22.00(Ac.)
Total Study Area (Main Stream No. 1) =       79.25(Ac.)
Area averaged Fm value =    0.831(In/Hr)


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Process from Point/Station       1.006 to Point/Station       1.006
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     22.000(Ac.)
Runoff from this stream =     45.186(CFS)
Time of concentration =   12.25 min.
Rainfall intensity =     3.113(In/Hr)
Area averaged loss rate (Fm) =    0.8311(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8500
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     80.77    54.939     19.48    0.848      2.357
2     45.19    22.000     12.25    0.831      3.113
Qmax(1) =
           1.000 *    1.000 *    80.772) +
           0.668 *    1.000 *    45.186) + =     110.978
Qmax(2) =
           1.502 *    0.629 *    80.772) +
           1.000 *    1.000 *    45.186) + =     121.446

Total of 2 streams to confluence:
Flow rates before confluence point:
      80.772      45.186
Maximum flow rates at confluence using above data:
      110.978      121.446
Area of streams before confluence:
       54.939       22.000
Effective area values after confluence:
       76.939       56.543
Results of confluence:
Total flow rate =    121.446(CFS)
Time of concentration =    12.249 min.
Effective stream area after confluence =     56.543(Ac.)
Study area average Pervious fraction(Ap) =  0.863
Study area average soil loss rate(Fm) =    0.843(In/Hr)
```

```
Study area total (this main stream) =      76.94(Ac.)


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Process from Point/Station       1.006 to Point/Station       1.007
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   720.970(Ft.)
Downstream point/station elevation =   716.610(Ft.)
Pipe length  =  1002.81(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   121.446(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   121.446(CFS)
Normal flow depth in pipe =   41.44(In.)
Flow top width inside pipe =   45.63(In.)
Critical Depth =   38.94(In.)
Pipe flow velocity =      9.27(Ft/s)
Travel time through pipe =    1.80 min.
Time of concentration (TC) =    14.05 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.007 to Point/Station       1.007
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =    107.644(CFS)
therefore the upstream flow rate of Q =    121.446(CFS) is being used
Time of concentration =    14.05 min.
Rainfall intensity =      2.867(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.635
Subarea runoff =      0.000(CFS) for    2.550(Ac.)
Total runoff =    121.446(CFS)
Effective area this stream =       59.09(Ac.)
Total Study Area (Main Stream No. 1) =       81.80(Ac.)
Area averaged Fm value =    0.843(In/Hr)


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Process from Point/Station       1.007 to Point/Station       1.007
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     59.093(Ac.)
Runoff from this stream =    121.446(CFS)
```

```
Time of concentration =   14.05 min.
Rainfall intensity =     2.867(In/Hr)
Area averaged loss rate (Fm) =    0.8429(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8621


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Process from Point/Station       1.300 to Point/Station       1.301
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =    67.280(Ft.)
Top (of initial area) elevation =   750.300(Ft.)
Bottom (of initial area) elevation =   749.960(Ft.)
Difference in elevation =     0.340(Ft.)
Slope =    0.00505  s(%)=       0.51
TC = k(0.484)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.506 min.
Rainfall intensity =      4.177(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.721
Subarea runoff =      7.799(CFS)
Total initial stream area =        2.590(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station       1.301 to Point/Station       1.007
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   749.960(Ft.)
Downstream point/station elevation =   716.610(Ft.)
Pipe length  =   972.89(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.799(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.799(CFS)
Normal flow depth in pipe =    8.82(In.)
Flow top width inside pipe =   14.76(In.)
Critical Depth =   13.25(In.)
Pipe flow velocity =     10.38(Ft/s)
Travel time through pipe =    1.56 min.
Time of concentration (TC) =     9.07 min.


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Process from Point/Station       1.007 to Point/Station       1.007
```

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**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =     9.07 min.
Rainfall intensity =      3.729(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.699
Subarea runoff =     54.272(CFS) for   21.210(Ac.)
Total runoff =     62.070(CFS)
Effective area this stream =       23.80(Ac.)
Total Study Area (Main Stream No. 1) =      105.60(Ac.)
Area averaged Fm value =    0.831(In/Hr)


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Process from Point/Station        1.007 to Point/Station        1.007
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     23.800(Ac.)
Runoff from this stream =     62.070(CFS)
Time of concentration =    9.07 min.
Rainfall intensity =     3.729(In/Hr)
Area averaged loss rate (Fm) =    0.8311(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8500
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    121.45    59.093     14.05    0.843      2.867
2     62.07    23.800      9.07    0.831      3.729
Qmax(1) =
           1.000 *    1.000 *   121.446) +
           0.703 *    1.000 *    62.070) + =     165.053
Qmax(2) =
           1.426 *    0.645 *   121.446) +
           1.000 *    1.000 *    62.070) + =     173.806

Total of 2 streams to confluence:
Flow rates before confluence point:
     121.446      62.070
Maximum flow rates at confluence using above data:
      165.053      173.806
Area of streams before confluence:
       59.093       23.800
```

```
Effective area values after confluence:
       82.893      61.930
Results of confluence:
Total flow rate =    173.806(CFS)
Time of concentration =     9.067 min.
Effective stream area after confluence =     61.930(Ac.)
Study area average Pervious fraction(Ap) =  0.859
Study area average soil loss rate(Fm) =    0.840(In/Hr)
Study area total (this main stream) =      82.89(Ac.)


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Process from Point/Station       1.007 to Point/Station       1.008
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   716.610(Ft.)
Downstream point/station elevation =   716.130(Ft.)
Pipe length  =   623.01(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   173.806(CFS)
Nearest computed pipe diameter  =     84.00(In.)
Calculated individual pipe flow  =   173.806(CFS)
Normal flow depth in pipe =   67.41(In.)
Flow top width inside pipe =   66.89(In.)
Critical Depth =   41.15(In.)
Pipe flow velocity =      5.25(Ft/s)
Travel time through pipe =    1.98 min.
Time of concentration (TC) =    11.04 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.008 to Point/Station       1.008
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    11.04 min.
Rainfall intensity =      3.313(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.672
Subarea runoff =      1.339(CFS) for   16.700(Ac.)
Total runoff =    175.145(CFS)
Effective area this stream =       78.63(Ac.)
Total Study Area (Main Stream No. 1) =      122.30(Ac.)
Area averaged Fm value =    0.838(In/Hr)


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Process from Point/Station       1.008 to Point/Station       1.008
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**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     78.630(Ac.)
Runoff from this stream =    175.145(CFS)
Time of concentration =   11.04 min.
Rainfall intensity =     3.313(In/Hr)
Area averaged loss rate (Fm) =    0.8378(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8568
Program is now starting with Main Stream No. 2


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Process from Point/Station       2.000 to Point/Station       2.001
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   660.350(Ft.)
Top (of initial area) elevation =   768.710(Ft.)
Bottom (of initial area) elevation =   760.300(Ft.)
Difference in elevation =     8.410(Ft.)
Slope =    0.01274  s(%)=       1.27
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.612 min.
Rainfall intensity =      3.601(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.876
Subarea runoff =      1.829(CFS)
Total initial stream area =        0.580(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.001 to Point/Station       2.001
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     9.61 min.
Rainfall intensity =      3.601(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.876
Subarea runoff =     15.038(CFS) for    4.770(Ac.)
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Total runoff =     16.867(CFS)
Effective area this stream =        5.35(Ac.)
Total Study Area (Main Stream No. 2) =      127.65(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.001 to Point/Station       2.001
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      5.350(Ac.)
Runoff from this stream =     16.867(CFS)
Time of concentration =    9.61 min.
Rainfall intensity =     3.601(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.100 to Point/Station       2.101
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   402.250(Ft.)
Top (of initial area) elevation =   769.050(Ft.)
Bottom (of initial area) elevation =   767.100(Ft.)
Difference in elevation =     1.950(Ft.)
Slope =    0.00485  s(%)=       0.48
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.563 min.
Rainfall intensity =      3.612(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.876
Subarea runoff =      3.510(CFS)
Total initial stream area =        1.110(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.101 to Point/Station       2.101
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
```

```
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     9.56 min.
Rainfall intensity =      3.612(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.876
Subarea runoff =     13.820(CFS) for    4.370(Ac.)
Total runoff =     17.331(CFS)
Effective area this stream =        5.48(Ac.)
Total Study Area (Main Stream No. 2) =      133.13(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.101 to Point/Station       2.102
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   767.100(Ft.)
Downstream point/station elevation =   763.230(Ft.)
Pipe length  =   599.32(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.331(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    17.331(CFS)
Normal flow depth in pipe =   18.75(In.)
Flow top width inside pipe =   19.84(In.)
Critical Depth =   18.00(In.)
Pipe flow velocity =      6.59(Ft/s)
Travel time through pipe =    1.52 min.
Time of concentration (TC) =    11.08 min.


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Process from Point/Station        2.102 to Point/Station       2.102
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    11.08 min.
Rainfall intensity =      3.306(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.873
Subarea runoff =      6.436(CFS) for    2.750(Ac.)
Total runoff =     23.767(CFS)
Effective area this stream =        8.23(Ac.)
Total Study Area (Main Stream No. 2) =      135.88(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.102 to Point/Station       2.103
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   763.230(Ft.)
Downstream point/station elevation =   761.620(Ft.)
Pipe length  =   323.10(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.767(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    23.767(CFS)
Normal flow depth in pipe =   20.70(In.)
Flow top width inside pipe =   27.75(In.)
Critical Depth =   19.92(In.)
Pipe flow velocity =      6.58(Ft/s)
Travel time through pipe =    0.82 min.
Time of concentration (TC) =    11.90 min.


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Process from Point/Station       2.103 to Point/Station       2.103
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    11.90 min.
Rainfall intensity =      3.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =     22.519(CFS) for    8.520(Ac.)
Total runoff =     46.285(CFS)
Effective area this stream =       16.75(Ac.)
Total Study Area (Main Stream No. 2) =      144.40(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.103 to Point/Station       2.001
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   761.620(Ft.)
Downstream point/station elevation =   760.300(Ft.)
Pipe length  =   107.08(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    46.285(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    46.285(CFS)
Normal flow depth in pipe =   22.08(In.)
Flow top width inside pipe =   31.06(In.)
Critical Depth =   27.02(In.)
Pipe flow velocity =     10.95(Ft/s)
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Travel time through pipe =    0.16 min.
Time of concentration (TC) =    12.06 min.


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Process from Point/Station       2.001 to Point/Station       2.001
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     16.750(Ac.)
Runoff from this stream =     46.285(CFS)
Time of concentration =   12.06 min.
Rainfall intensity =     3.142(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station       2.200 to Point/Station       2.001
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =    81.220(Ft.)
Top (of initial area) elevation =   761.110(Ft.)
Bottom (of initial area) elevation =   760.300(Ft.)
Difference in elevation =     0.810(Ft.)
Slope =    0.00997  s(%)=       1.00
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    4.365 min.
Rainfall intensity =      5.782(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.885
Subarea runoff =      3.018(CFS)
Total initial stream area =        0.590(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.001 to Point/Station       2.001
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      0.590(Ac.)
Runoff from this stream =      3.018(CFS)
Time of concentration =    4.37 min.
Rainfall intensity =     5.782(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     16.87     5.350      9.61    0.098      3.601
2     46.29    16.750     12.06    0.098      3.142
3      3.02     0.590      4.37    0.098      5.782
Qmax(1) =
           1.000 *    1.000 *    16.867) +
           1.151 *    0.797 *    46.285) +
           0.616 *    1.000 *     3.018) + =      61.168
Qmax(2) =
           0.869 *    1.000 *    16.867) +
           1.000 *    1.000 *    46.285) +
           0.536 *    1.000 *     3.018) + =      62.562
Qmax(3) =
           1.623 *    0.454 *    16.867) +
           1.867 *    0.362 *    46.285) +
           1.000 *    1.000 *     3.018) + =      46.725

Total of 3 streams to confluence:
Flow rates before confluence point:
      16.867      46.285       3.018
Maximum flow rates at confluence using above data:
       61.168       62.562       46.725
Area of streams before confluence:
        5.350       16.750        0.590
Effective area values after confluence:
       19.289       22.690        9.082
Results of confluence:
Total flow rate =     62.562(CFS)
Time of concentration =    12.060 min.
Effective stream area after confluence =     22.690(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total (this main stream) =      22.69(Ac.)


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Process from Point/Station        2.001 to Point/Station        2.002
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   760.300(Ft.)
Downstream point/station elevation =   755.350(Ft.)
Pipe length  =   642.08(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    62.562(CFS)
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```
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    62.562(CFS)
Normal flow depth in pipe =   27.94(In.)
Flow top width inside pipe =   35.16(In.)
Critical Depth =   30.26(In.)
Pipe flow velocity =      9.83(Ft/s)
Travel time through pipe =    1.09 min.
Time of concentration (TC) =    13.15 min.


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Process from Point/Station       2.001 to Point/Station       2.002
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.15 min.
Rainfall intensity =      2.984(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =      6.681(CFS) for    3.970(Ac.)
Total runoff =     69.242(CFS)
Effective area this stream =       26.66(Ac.)
Total Study Area (Main Stream No. 2) =      148.96(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.002 to Point/Station       2.002
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     26.660(Ac.)
Runoff from this stream =     69.242(CFS)
Time of concentration =   13.15 min.
Rainfall intensity =     2.984(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station       2.300 to Point/Station       2.301
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
```

```
Initial subarea data:
Initial area flow distance =   656.930(Ft.)
Top (of initial area) elevation =   767.140(Ft.)
Bottom (of initial area) elevation =   763.850(Ft.)
Difference in elevation =     3.290(Ft.)
Slope =    0.00501  s(%)=       0.50
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.560 min.
Rainfall intensity =      3.223(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.873
Subarea runoff =      5.035(CFS)
Total initial stream area =        1.790(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.301 to Point/Station       2.301
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    11.56 min.
Rainfall intensity =      3.223(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.873
Subarea runoff =     16.455(CFS) for    5.850(Ac.)
Total runoff =     21.490(CFS)
Effective area this stream =        7.64(Ac.)
Total Study Area (Main Stream No. 2) =      156.60(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.301 to Point/Station       2.302
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   763.850(Ft.)
Downstream point/station elevation =   760.160(Ft.)
Pipe length  =   738.89(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.490(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    21.490(CFS)
Normal flow depth in pipe =   21.70(In.)
Flow top width inside pipe =   21.44(In.)
Critical Depth =   19.47(In.)
Pipe flow velocity =      6.27(Ft/s)
Travel time through pipe =    1.96 min.
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```
Time of concentration (TC) =    13.52 min.


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Process from Point/Station       2.302 to Point/Station       2.302
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.52 min.
Rainfall intensity =      2.934(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.870
Subarea runoff =     16.030(CFS) for    7.060(Ac.)
Total runoff =     37.520(CFS)
Effective area this stream =       14.70(Ac.)
Total Study Area (Main Stream No. 2) =      163.66(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.302 to Point/Station       2.002
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   760.160(Ft.)
Downstream point/station elevation =   755.350(Ft.)
Pipe length  =    76.19(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.520(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    37.520(CFS)
Normal flow depth in pipe =   16.22(In.)
Flow top width inside pipe =   17.61(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.82(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    13.59 min.


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Process from Point/Station       2.002 to Point/Station       2.002
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.700(Ac.)
Runoff from this stream =     37.520(CFS)
Time of concentration =   13.59 min.
Rainfall intensity =     2.925(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
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Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station       2.400 to Point/Station       2.401
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   544.320(Ft.)
Top (of initial area) elevation =   766.500(Ft.)
Bottom (of initial area) elevation =   763.780(Ft.)
Difference in elevation =     2.720(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.728 min.
Rainfall intensity =      3.371(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.874
Subarea runoff =      3.417(CFS)
Total initial stream area =        1.160(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.401 to Point/Station       2.401
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    10.73 min.
Rainfall intensity =      3.371(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.874
Subarea runoff =     12.049(CFS) for    4.090(Ac.)
Total runoff =     15.466(CFS)
Effective area this stream =        5.25(Ac.)
Total Study Area (Main Stream No. 2) =      168.91(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.401 to Point/Station       2.402
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
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Upstream point/station elevation =   763.780(Ft.)
Downstream point/station elevation =   761.070(Ft.)
Pipe length  =   541.68(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.466(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    15.466(CFS)
Normal flow depth in pipe =   18.98(In.)
Flow top width inside pipe =   19.52(In.)
Critical Depth =   17.01(In.)
Pipe flow velocity =      5.80(Ft/s)
Travel time through pipe =    1.56 min.
Time of concentration (TC) =    12.28 min.


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Process from Point/Station       2.402 to Point/Station       2.402
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    12.28 min.
Rainfall intensity =      3.108(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =      9.187(CFS) for    3.850(Ac.)
Total runoff =     24.654(CFS)
Effective area this stream =        9.10(Ac.)
Total Study Area (Main Stream No. 2) =      172.76(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.402 to Point/Station       2.002
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   761.070(Ft.)
Downstream point/station elevation =   755.350(Ft.)
Pipe length  =    62.68(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.654(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    24.654(CFS)
Normal flow depth in pipe =   11.93(In.)
Flow top width inside pipe =   17.02(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.84(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    12.34 min.
```

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Process from Point/Station       2.002 to Point/Station       2.002
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      9.100(Ac.)
Runoff from this stream =     24.654(CFS)
Time of concentration =   12.34 min.
Rainfall intensity =     3.100(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     69.24    26.660     13.15    0.098      2.984
2     37.52    14.700     13.59    0.098      2.925
3     24.65     9.100     12.34    0.098      3.100
Qmax(1) =
           1.000 *    1.000 *    69.242) +
           1.021 *    0.967 *    37.520) +
           0.961 *    1.000 *    24.654) + =     129.992
Qmax(2) =
           0.980 *    1.000 *    69.242) +
           1.000 *    1.000 *    37.520) +
           0.942 *    1.000 *    24.654) + =     128.573
Qmax(3) =
           1.040 *    0.938 *    69.242) +
           1.062 *    0.908 *    37.520) +
           1.000 *    1.000 *    24.654) + =     128.402

Total of 3 streams to confluence:
Flow rates before confluence point:
      69.242      37.520      24.654
Maximum flow rates at confluence using above data:
      129.992      128.573      128.402
Area of streams before confluence:
       26.660       14.700        9.100
Effective area values after confluence:
       49.982       50.460       47.455
Results of confluence:
Total flow rate =    129.992(CFS)
Time of concentration =    13.149 min.
Effective stream area after confluence =     49.982(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total (this main stream) =      50.46(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.002 to Point/Station       2.003
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   755.350(Ft.)
Downstream point/station elevation =   754.000(Ft.)
Pipe length  =   210.71(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   129.992(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =   129.992(CFS)
Normal flow depth in pipe =   40.13(In.)
Flow top width inside pipe =   41.78(In.)
Critical Depth =   40.72(In.)
Pipe flow velocity =     10.85(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    13.47 min.


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Process from Point/Station       2.003 to Point/Station       2.003
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    13.47 min.
Rainfall intensity =      2.940(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.870
Subarea runoff =     19.957(CFS) for    8.630(Ac.)
Total runoff =    149.950(CFS)
Effective area this stream =       58.61(Ac.)
Total Study Area (Main Stream No. 2) =      181.39(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.003 to Point/Station       2.003
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     58.612(Ac.)
Runoff from this stream =    149.950(CFS)
Time of concentration =   13.47 min.
Rainfall intensity =     2.940(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.500 to Point/Station       2.501
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   580.350(Ft.)
Top (of initial area) elevation =   777.930(Ft.)
Bottom (of initial area) elevation =   766.900(Ft.)
Difference in elevation =    11.030(Ft.)
Slope =    0.01901  s(%)=       1.90
TC = k(0.299)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.426 min.
Rainfall intensity =      3.897(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.877
Subarea runoff =     12.993(CFS)
Total initial stream area =        3.800(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station       2.501 to Point/Station       2.501
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     8.43 min.
Rainfall intensity =      3.897(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.877
Subarea runoff =     21.882(CFS) for    6.400(Ac.)
Total runoff =     34.875(CFS)
Effective area this stream =       10.20(Ac.)
Total Study Area (Main Stream No. 2) =      191.59(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.501 to Point/Station       2.502
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   766.900(Ft.)
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Downstream point/station elevation =   759.860(Ft.)
Pipe length  =  1139.32(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.875(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    34.875(CFS)
Normal flow depth in pipe =   23.13(In.)
Flow top width inside pipe =   30.22(In.)
Critical Depth =   23.59(In.)
Pipe flow velocity =      7.84(Ft/s)
Travel time through pipe =    2.42 min.
Time of concentration (TC) =    10.85 min.


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Process from Point/Station       2.502 to Point/Station       2.502
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    10.85 min.
Rainfall intensity =      3.349(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.874
Subarea runoff =      8.719(CFS) for    4.700(Ac.)
Total runoff =     43.594(CFS)
Effective area this stream =       14.90(Ac.)
Total Study Area (Main Stream No. 2) =      196.29(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station       2.502 to Point/Station       2.503
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   759.860(Ft.)
Downstream point/station elevation =   757.060(Ft.)
Pipe length  =   560.70(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    43.594(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    43.594(CFS)
Normal flow depth in pipe =   27.33(In.)
Flow top width inside pipe =   30.79(In.)
Critical Depth =   25.79(In.)
Pipe flow velocity =      7.57(Ft/s)
Travel time through pipe =    1.23 min.
Time of concentration (TC) =    12.08 min.
```

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Process from Point/Station       2.503 to Point/Station       2.003
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   757.060(Ft.)
Downstream point/station elevation =   754.000(Ft.)
Pipe length  =   616.83(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    43.594(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    43.594(CFS)
Normal flow depth in pipe =   27.42(In.)
Flow top width inside pipe =   30.67(In.)
Critical Depth =   25.79(In.)
Pipe flow velocity =      7.55(Ft/s)
Travel time through pipe =    1.36 min.
Time of concentration (TC) =    13.44 min.


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Process from Point/Station       2.003 to Point/Station       2.003
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.900(Ac.)
Runoff from this stream =     43.594(CFS)
Time of concentration =   13.44 min.
Rainfall intensity =     2.944(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    149.95    58.612     13.47    0.098      2.940
2     43.59    14.900     13.44    0.098      2.944
Qmax(1) =
           1.000 *    1.000 *   149.950) +
           0.999 *    1.000 *    43.594) + =     193.487
Qmax(2) =
           1.001 *    0.998 *   149.950) +
           1.000 *    1.000 *    43.594) + =     193.425

Total of 2 streams to confluence:
Flow rates before confluence point:
     149.950      43.594
Maximum flow rates at confluence using above data:
      193.487      193.425
Area of streams before confluence:
```

```
       58.612       14.900
Effective area values after confluence:
       73.512       73.390
Results of confluence:
Total flow rate =    193.487(CFS)
Time of concentration =    13.472 min.
Effective stream area after confluence =     73.512(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total (this main stream) =      73.51(Ac.)


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Process from Point/Station       2.003 to Point/Station       2.004
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   754.000(Ft.)
Downstream point/station elevation =   744.250(Ft.)
Pipe length  =  1083.36(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   193.487(CFS)
Nearest computed pipe diameter  =     57.00(In.)
Calculated individual pipe flow  =   193.487(CFS)
Normal flow depth in pipe =   42.19(In.)
Flow top width inside pipe =   50.00(In.)
Critical Depth =   47.96(In.)
Pipe flow velocity =     13.76(Ft/s)
Travel time through pipe =    1.31 min.
Time of concentration (TC) =    14.78 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.004 to Point/Station       2.004
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    14.78 min.
Rainfall intensity =      2.781(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.868
Subarea runoff =      4.192(CFS) for    8.350(Ac.)
Total runoff =    197.679(CFS)
Effective area this stream =       81.86(Ac.)
Total Study Area (Main Stream No. 2) =      204.64(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
Process from Point/Station       2.004 to Point/Station        1.008
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   744.250(Ft.)
Downstream point/station elevation =   716.130(Ft.)
Pipe length  =    46.30(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   197.679(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =   197.679(CFS)
Normal flow depth in pipe =   18.59(In.)
Flow top width inside pipe =   25.01(In.)
Critical depth could not be calculated.
Pipe flow velocity =     67.72(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    14.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.008 to Point/Station        1.008
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     81.862(Ac.)
Runoff from this stream =    197.679(CFS)
Time of concentration =   14.80 min.
Rainfall intensity =     2.780(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    175.14    78.630     11.04    0.838      3.313
2    197.68    81.862     14.80    0.098      2.780
Qmax(1) =
           1.000 *    1.000 *   175.145) +
           1.199 *    0.746 *   197.679) + =     352.033
Qmax(2) =
           0.785 *    1.000 *   175.145) +
           1.000 *    1.000 *   197.679) + =     335.095

Total of 2 main streams to confluence:
Flow rates before confluence point:
     176.145     198.679
Maximum flow rates at confluence using above data:
      352.033      335.095
Area of streams before confluence:
```

```
       78.630       81.862
Effective area values after confluence:
      139.734      160.492


Results of confluence:
Total flow rate =    352.033(CFS)
Time of concentration =    11.044 min.
Effective stream area after confluence  =    139.734(Ac.)
Study area average Pervious fraction(Ap) =  0.471
Study area average soil loss rate(Fm) =    0.460(In/Hr)
Study area total =     160.49(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.008 to Point/Station       1.009
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   716.130(Ft.)
Downstream point/station elevation =   715.440(Ft.)
Pipe length  =   132.26(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   352.033(CFS)
Nearest computed pipe diameter  =     78.00(In.)
Calculated individual pipe flow  =   352.033(CFS)
Normal flow depth in pipe =   59.53(In.)
Flow top width inside pipe =   66.32(In.)
Critical Depth =   60.39(In.)
Pipe flow velocity =     12.96(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    11.21 min.
End of computations, Total Study Area =          204.64 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.553
Area averaged SCS curve number =  32.0
```

A.5 – PROJECT ONSITE HYDROLOGY MODEL

```
                San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2019 Version 9.1
        Rational Hydrology Study        Date: 05/15/24
------------------------------------------------------------------------
ORSC PROPOSED LAND USE
100-YEAR


------------------------------------------------------------------------


Program License Serial Number 6639

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
   10 Year storm 1 hour rainfall  =      0.800(In.)
  100 Year storm 1 hour rainfall  =      1.200(In.)
Computed rainfall intensity:
Storm year =   100.00   1 hour rainfall =     1.200 (In.)
Slope used for rainfall intensity curve b =  0.6000
Soil antecedent moisture condition (AMC) = 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       1.010
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   582.850(Ft.)
Top (of initial area) elevation =   744.440(Ft.)
Bottom (of initial area) elevation =   740.610(Ft.)
Difference in elevation =     3.830(Ft.)
Slope =    0.00657  s(%)=       0.66
TC = k(0.483)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.852 min.
Rainfall intensity =      2.571(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.609
Subarea runoff =      1.613(CFS)
Total initial stream area =        1.030(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.010 to Point/Station       1.020
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   740.610(Ft.)
Downstream point/station elevation =   715.440(Ft.)
Pipe length  =  4731.14(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.613(CFS)
Given pipe size =    120.00(In.)
Calculated individual pipe flow  =     1.613(CFS)
Normal flow depth in pipe =    3.30(In.)
Flow top width inside pipe =   39.28(In.)
Critical depth could not be calculated.
Pipe flow velocity =      2.67(Ft/s)
Travel time through pipe =   29.53 min.
Time of concentration (TC) =    46.38 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.010 to Point/Station       1.020
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =    46.38 min.
Rainfall intensity =      1.400(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.366
Subarea runoff =     76.211(CFS) for  150.870(Ac.)
Total runoff =     77.824(CFS)
Effective area this stream =      151.90(Ac.)
Total Study Area (Main Stream No. 1) =      151.90(Ac.)
Area averaged Fm value =    0.831(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.020 to Point/Station       1.020
**** CONFLUENCE OF MAIN STREAMS ****
```

```
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    151.900(Ac.)
Runoff from this stream =     77.824(CFS)
Time of concentration =   46.38 min.
Rainfall intensity =     1.400(In/Hr)
Area averaged loss rate (Fm) =    0.8311(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8500
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       2.010
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   583.860(Ft.)
Top (of initial area) elevation =   772.970(Ft.)
Bottom (of initial area) elevation =   766.770(Ft.)
Difference in elevation =     6.200(Ft.)
Slope =    0.01062  s(%)=       1.06
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.642 min.
Rainfall intensity =      3.594(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.876
Subarea runoff =      1.951(CFS)
Total initial stream area =        0.620(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.010 to Point/Station       1.020
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   766.770(Ft.)
Downstream point/station elevation =   715.440(Ft.)
Pipe length  =  2643.85(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.951(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.951(CFS)
Normal flow depth in pipe =    6.35(In.)
```

```
Flow top width inside pipe =    8.20(In.)
Critical Depth =    7.63(In.)
Pipe flow velocity =      5.85(Ft/s)
Travel time through pipe =    7.53 min.
Time of concentration (TC) =    17.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.010 to Point/Station       1.020
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    17.17 min.
Rainfall intensity =      2.542(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.865
Subarea runoff =    116.315(CFS) for   53.140(Ac.)
Total runoff =    118.266(CFS)
Effective area this stream =       53.76(Ac.)
Total Study Area (Main Stream No. 2) =      205.66(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.020 to Point/Station       1.020
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     53.760(Ac.)
Runoff from this stream =    118.266(CFS)
Time of concentration =   17.17 min.
Rainfall intensity =     2.542(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC      Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     77.82   151.900     46.38    0.831      1.400
2    118.27    53.760     17.17    0.098      2.542
Qmax(1) =
```

```
           1.000 *    1.000 *    77.824) +
           0.533 *    1.000 *   118.266) + =     140.849
Qmax(2) =
           3.006 *    0.370 *    77.824) +
           1.000 *    1.000 *   118.266) + =     204.856

Total of 2 main streams to confluence:
Flow rates before confluence point:
      78.824     119.266
Maximum flow rates at confluence using above data:
      140.849      204.856
Area of streams before confluence:
      151.900       53.760
Effective area values after confluence:
      205.660      109.993


Results of confluence:
Total flow rate =    204.856(CFS)
Time of concentration =    17.171 min.
Effective stream area after confluence  =    109.993(Ac.)
Study area average Pervious fraction(Ap) =  0.654
Study area average soil loss rate(Fm) =    0.639(In/Hr)
Study area total =     205.66(Ac.)
End of computations, Total Study Area =          205.66 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.654
Area averaged SCS curve number =  32.0
```

A.6 – MASTERPLAN ONSITE HYDROLOGY MODEL

```
                San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2019 Version 9.1
        Rational Hydrology Study       Date: 05/15/24
------------------------------------------------------------------------
ORSC EXISTING CONDITION
100-YEAR


------------------------------------------------------------------------


Program License Serial Number 6639

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
   10 Year storm 1 hour rainfall  =      0.800(In.)
  100 Year storm 1 hour rainfall  =      1.200(In.)
Computed rainfall intensity:
Storm year =   100.00   1 hour rainfall =     1.200 (In.)
Slope used for rainfall intensity curve b =  0.6000
Soil antecedent moisture condition (AMC) = 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       1.010
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Initial subarea data:
Initial area flow distance =   582.850(Ft.)
Top (of initial area) elevation =   744.440(Ft.)
Bottom (of initial area) elevation =   740.610(Ft.)
Difference in elevation =     3.830(Ft.)
Slope =    0.00657  s(%)=       0.66
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.572 min.
Rainfall intensity =      2.927(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.750
Subarea runoff =      2.261(CFS)
Total initial stream area =        1.030(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.489(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.010 to Point/Station       1.020
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   740.610(Ft.)
Downstream point/station elevation =   715.440(Ft.)
Pipe length  =  4731.14(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.261(CFS)
Given pipe size =    120.00(In.)
Calculated individual pipe flow  =     2.261(CFS)
Normal flow depth in pipe =    3.87(In.)
Flow top width inside pipe =   42.38(In.)
Critical depth could not be calculated.
Pipe flow velocity =      2.96(Ft/s)
Travel time through pipe =   26.63 min.
Time of concentration (TC) =    40.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.010 to Point/Station       1.020
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Time of concentration =    40.21 min.
Rainfall intensity =      1.526(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.612
Subarea runoff =    139.494(CFS) for  150.870(Ac.)
Total runoff =    141.754(CFS)
Effective area this stream =      151.90(Ac.)
Total Study Area (Main Stream No. 1) =      151.90(Ac.)
Area averaged Fm value =    0.489(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.020 to Point/Station       1.020
**** CONFLUENCE OF MAIN STREAMS ****
```

```
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    151.900(Ac.)
Runoff from this stream =    141.754(CFS)
Time of concentration =   40.21 min.
Rainfall intensity =     1.526(In/Hr)
Area averaged loss rate (Fm) =    0.4889(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       2.010
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Initial subarea data:
Initial area flow distance =   583.860(Ft.)
Top (of initial area) elevation =   772.970(Ft.)
Bottom (of initial area) elevation =   766.770(Ft.)
Difference in elevation =     6.200(Ft.)
Slope =    0.01062  s(%)=       1.06
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.338 min.
Rainfall intensity =      3.100(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.758
Subarea runoff =      1.457(CFS)
Total initial stream area =        0.620(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.489(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.010 to Point/Station       1.020
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   766.770(Ft.)
Downstream point/station elevation =   715.440(Ft.)
Pipe length  =  2643.85(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.457(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.457(CFS)
Normal flow depth in pipe =    5.19(In.)
```

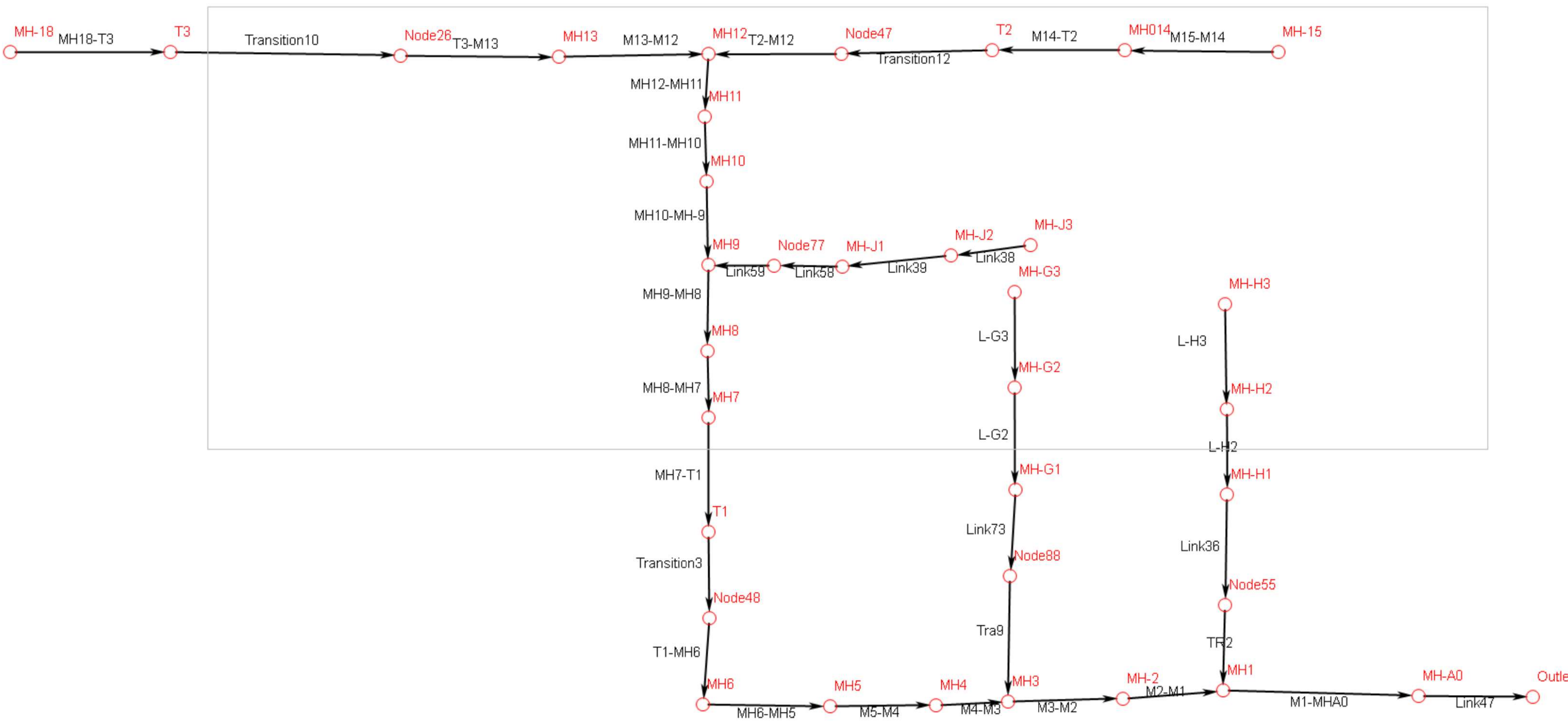
```
Flow top width inside pipe =    8.89(In.)
Critical Depth =    6.67(In.)
Pipe flow velocity =      5.52(Ft/s)
Travel time through pipe =    7.98 min.
Time of concentration (TC) =    20.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.010 to Point/Station       1.020
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Time of concentration =    20.32 min.
Rainfall intensity =      2.298(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.708
Subarea runoff =     86.061(CFS) for   53.140(Ac.)
Total runoff =     87.517(CFS)
Effective area this stream =       53.76(Ac.)
Total Study Area (Main Stream No. 2) =      205.66(Ac.)
Area averaged Fm value =    0.489(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.020 to Point/Station       1.020
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     53.760(Ac.)
Runoff from this stream =     87.517(CFS)
Time of concentration =   20.32 min.
Rainfall intensity =     2.298(In/Hr)
Area averaged loss rate (Fm) =    0.4889(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1    141.75   151.900     40.21    0.489      1.526
2     87.52    53.760     20.32    0.489      2.298
Qmax(1) =
```

```
            1.000 *    1.000 *   141.754) +
            0.573 *    1.000 *    87.517) + =     191.924
Qmax(2) =
            1.744 *    0.505 *   141.754) +
            1.000 *    1.000 *    87.517) + =     212.504

Total of 2 main streams to confluence:
Flow rates before confluence point:
     142.754      88.517
Maximum flow rates at confluence using above data:
      191.924      212.504
Area of streams before confluence:
      151.900       53.760
Effective area values after confluence:
      205.660      130.536


Results of confluence:
Total flow rate =    212.504(CFS)
Time of concentration =    20.322 min.
Effective stream area after confluence  =    130.536(Ac.)
Study area average Pervious fraction(Ap) =  0.500
Study area average soil loss rate(Fm) =    0.489(In/Hr)
Study area total =     205.66(Ac.)
End of computations, Total Study Area =          205.66 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged SCS curve number =  32.0
```

APPENDIX B - HYDRAULICS

B.1 – WSPG MODEL

WSPG Software Layout Chino Avenue



****
Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.1 19/04/2012
Innovyze www.innovyze.com
****

CHINO AVENUE STORM DRAIN

INPUT FILE
****
J:\2024 Jobs\224058 - 045.ONT.0016.01 Sports Complex\Drainage\30\Calcs\WSPG\Proposed_4-29\Proposed_Chino_SD.wsx
Computed 04/30/24 12:00:03

TITLE INFORMATION
****
ONTARIO CHINO
TEST
AP

WARNING SUMMARY
****
WARNING 25: Link type element Transition12 has different invert elevation than its upstream node.
WARNING 25: Link type element TR2 has different invert elevation than its upstream node.
WARNING 36: D/S processing stopped in junction MH12 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction MH11 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction MH9 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction MH3 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction MH1 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction MH-A0 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction MH-J2 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction MH-J1 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction MH-G2 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction MH-G1 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction MH-H2 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction MH-H1 because critical momentum is greater than maximum momentum.

RESULTS
****

==
Main Line
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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																	
"Outlet"	Outlet	0.00	715.44	755.00	727.500	12.060	1543.87	1	13.65	2.89	730.39	0.000	9.048	0.000	0.00000	0.000	Circular Pipe
	"i.p."	47.12	715.66	754.69	727.655	12.000	1543.87	1	13.65	2.89	730.55	0.000	9.048	0.060	0.00457	8.493	Circular Pipe
"Link47"	Reach	151.00	716.13	754.00	727.966	11.836	1543.87	1	13.69	2.91	730.88	0.000	9.048	0.379	0.00457	8.493	Circular Pipe

"MH-A0"	Junction	156.00	716.13	755.00	729.390	13.260	1345.34	1	11.90	2.20	731.59	0.000	8.449	0.000	0.00000	0.000	Circular Pipe
"M1-MHA0"	Reach	253.00	716.61	755.00	729.633	13.023	1345.34	1	11.90	2.20	731.83	0.000	8.449	0.000	0.00495	7.477	Circular Pipe
"MH1"	Join	258.00	716.61	755.00	730.070	13.460	1278.63	1	11.31	1.98	732.05	0.000	8.233	0.000	0.00000	0.000	Circular Pipe
"M2-M1"	Reach	729.50	718.91	760.00	731.136	12.226	1278.63	1	11.31	1.98	733.12	0.000	8.233	0.000	0.00488	7.263	Circular Pipe
"MH-2"	Junction	734.50	718.91	760.00	731.148	12.238	1278.53	1	11.30	1.98	733.13	0.000	8.233	0.000	0.00000	0.000	Circular Pipe
	"i.p."	832.95	719.37	760.00	731.370	12.000	1278.53	1	11.30	1.98	733.35	0.000	8.233	0.049	0.00467	7.365	Circular Pipe
"M3-M2"	Reach	1175.20	720.97	760.00	731.909	10.939	1278.53	1	11.82	2.17	734.08	0.000	8.233	0.523	0.00467	7.365	Circular Pipe
"MH3"	Join	1180.20	720.97	760.00	732.337	11.367	1229.09	1	11.09	1.91	734.25	0.000	8.068	0.000	0.00000	0.000	Circular Pipe
	"i.p."	1385.83	721.93	760.00	732.524	10.591	1229.09	1	11.63	2.10	734.63	0.000	8.068	0.554	0.00468	7.172	Circular Pipe
	"i.p."	1524.10	722.58	760.00	732.584	10.003	1229.09	1	12.20	2.31	734.90	0.000	8.068	0.641	0.00468	7.172	Circular Pipe
"M4-M3"	Reach	1624.20	723.05	760.00	732.580	9.530	1229.09	1	12.76	2.53	735.11	0.000	8.068	0.714	0.00468	7.172	Circular Pipe
HYDRAULIC JUMP at 1682.51 of length 0.10																	
	"i.p."	1682.51	723.32	758.69	732.556	9.234	1229.09	1	13.16	2.69	735.25	0.000	8.068	0.763	0.00466	7.183	Circular Pipe
	"i.p."	1682.51	723.32	758.69	730.343	7.021	1229.09	1	17.88	4.96	735.31	0.000	8.068	1.307	0.00466	7.183	Circular Pipe
	"i.p."	1757.90	723.67	756.99	730.658	6.984	1229.09	1	17.99	5.03	735.68	0.000	8.068	1.320	0.00466	7.183	Circular Pipe
"M5-M4"	Reach	2068.20	725.12	750.00	731.837	6.717	1229.09	1	18.87	5.53	737.37	0.000	8.068	1.422	0.00466	7.183	Circular Pipe
	"i.p."	2075.69	725.16	750.00	731.867	6.711	1229.09	1	18.89	5.54	737.41	0.000	8.068	1.425	0.00491	7.065	Circular Pipe
	"i.p."	2316.29	726.34	750.00	732.794	6.457	1229.09	1	19.82	6.10	738.89	0.000	8.068	1.534	0.00491	7.065	Circular Pipe
"MH6-MH5"	Reach	2494.20	727.21	750.00	733.426	6.216	1229.09	1	20.78	6.71	740.13	0.000	8.068	1.649	0.00491	7.065	Circular Pipe
"MH6"	Junction	2499.20	727.21	750.00	733.404	6.194	1228.99	1	20.87	6.77	740.17	0.000	8.068	0.000	0.00000	0.000	Circular Pipe
"T1-MH6"	Reach	2793.20	729.18	746.00	735.185	6.007	1228.99	1	21.70	7.31	742.50	0.000	8.068	1.760	0.00669	6.411	Circular Pipe
"Transiti"	Transition	2799.20	729.22	745.50	736.609	7.389	1228.99	1	19.75	6.06	742.67	0.000	8.373	1.308	0.00700	0.000	Circular Pipe
"MH7-T1"	Reach	2936.20	730.22	745.00	737.721	7.501	1228.99	1	19.45	5.87	743.59	0.000	8.373	1.268	0.00730	7.212	Circular Pipe
"MH8-MH7"	Reach	3430.20	733.51	752.00	741.247	7.737	1228.99	1	18.85	5.52	746.76	0.000	8.373	1.190	0.00666	7.491	Circular Pipe
	"i.p."	3770.45	735.63	756.02	743.581	7.950	1228.99	1	18.36	5.23	748.81	0.000	8.373	1.123	0.00623	7.714	Circular Pipe
"MH9-MH8"	Reach	3853.70	736.15	757.00	744.522	8.372	1228.99	1	17.50	4.76	749.28	0.000	8.373	1.000	0.00623	7.714	Circular Pipe
"MH9"	Join	3858.70	736.15	757.00	746.508	10.358	1149.10	1	14.63	3.32	749.83	0.000	8.131	0.000	0.00000	0.000	Circular Pipe
	"i.p."	4044.87	737.41	757.44	747.407	10.000	1149.10	1	14.63	3.32	750.73	0.000	8.131	0.073	0.00675	7.053	Circular Pipe
"MH10-MH-"	Reach	4282.20	739.01	758.00	748.214	9.204	1149.10	1	15.20	3.59	751.80	0.000	8.131	0.717	0.00675	7.053	Circular Pipe
HYDRAULIC JUMP at 4286.76 of length 0.10																	
	"i.p."	4286.76	739.04	758.06	748.222	9.181	1149.10	1	15.22	3.60	751.82	0.000	8.131	0.723	0.00676	7.051	Circular Pipe
	"i.p."	4286.76	739.04	758.06	746.200	7.159	1149.10	1	19.10	5.66	751.86	0.000	8.131	1.303	0.00676	7.051	Circular Pipe
	"i.p."	4558.91	740.88	761.87	748.264	7.383	1149.10	1	18.48	5.31	753.57	0.000	8.131	1.225	0.00676	7.051	Circular Pipe
	"i.p."	4682.95	741.72	763.60	749.456	7.737	1149.10	1	17.62	4.82	754.28	0.000	8.131	1.113	0.00676	7.051	Circular Pipe
"MH11-MH1"	Reach	4711.20	741.91	764.00	750.040	8.130	1149.10	1	16.80	4.38	754.42	0.000	8.131	1.000	0.00676	7.051	Circular Pipe
"MH11"	Junction	4716.20	741.91	764.00	754.619	12.709	818.10	1	10.42	1.68	756.30	0.000	6.892	0.000	0.00000	0.000	Circular Pipe
"MH12-MH1"	Reach	5095.10	744.44	766.00	755.546	11.106	818.10	1	10.42	1.68	757.23	0.000	6.892	0.000	0.00668	5.614	Circular Pipe
"MH12"	Join	5101.10	744.44	766.00	758.741	14.301	190.10	1	2.42	0.09	758.83	0.000	3.224	0.000	0.00000	0.000	Circular Pipe
"T2-M12"	Reach	5132.10	747.84	766.00	758.745	10.907	190.10	1	2.42	0.09	758.84	0.000	3.224	0.000	0.10961	1.275	Circular Pipe
"Transiti"	Transition	5138.10	746.88	766.00	758.263	11.383	190.10	1	6.72	0.70	758.96	0.000	3.765	0.000	-0.15967	0.000	Circular Pipe
"T2"	Junction	5143.10	746.88	766.00	758.275	11.395	190.00	1	6.72	0.70	758.98	0.000	3.764	0.000	0.00000	0.000	Circular Pipe
"M14-T2"	Reach	5332.70	747.96	770.00	758.656	10.696	190.00	1	6.72	0.70	759.36	0.000	3.764	0.000	0.00570	3.330	Circular Pipe
"M15-M14"	Reach	5757.60	750.00	770.00	759.511	9.511	190.00	1	6.72	0.70	760.21	0.000	3.764	0.000	0.00480	3.515	Circular Pipe
"MH-15"	Headwrk	5757.60	750.00	770.00	759.511	9.511	190.00	1	6.72	0.70	760.21	0.000	3.764	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

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MH12_Lateral1

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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																	
"Outlet/M"	Outlet	5101.10	744.44	766.00	757.144	12.704	628.00	1	8.00	0.99	758.14	0.000	6.012	0.000	0.00000	0.000	Circular Pipe
"M13-M12"	Reach	5280.40	745.63	775.00	757.402	11.772	628.00	1	8.00	0.99	758.39	0.000	6.012	0.000	0.00664	4.799	Circular Pipe
"MH13"	Junction	5285.40	745.63	775.00	757.490	11.860	615.00	1	7.83	0.95	758.44	0.000	5.947	0.000	0.00000	0.000	Circular Pipe
"T3-M13"	Reach	5315.40	745.85	775.00	757.532	11.682	615.00	1	7.83	0.95	758.48	0.000	5.947	0.000	0.00733	4.608	Circular Pipe
"Transiti"	Transition	5321.40	745.85	775.00	757.144	11.294	615.00	1	9.67	1.45	758.60	0.000	6.135	0.000	0.00000	0.000	Circular Pipe
"MH18-T3"	Reach	5651.40	748.20	776.00	757.945	9.745	615.00	1	9.67	1.45	759.40	0.000	6.135	0.000	0.00712	4.939	Circular Pipe
"MH-18"	Headwrk	5651.40	748.20	776.00	757.945	9.745	615.00	1	9.67	1.45	759.40	0.000	6.135	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

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MH9_Lateral1

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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																	
"Outlet/M"	Outlet	3858.70	736.15	757.00	745.515	9.365	79.89	1	1.04	0.02	745.53	0.000	2.065	0.000	0.00000	0.000	Circular Pipe
"Link59"	Transition	3864.70	738.50	755.00	743.985	5.485	79.89	1	11.30	1.98	745.97	0.000	2.769	0.000	0.39167	0.000	Circular Pipe
HYDRAULIC JUMP at 3909.21 of length 0.11																	
	"i.p."	3909.21	740.69	755.00	744.624	3.938	79.89	1	11.30	1.98	746.61	0.000	2.769	0.000	0.04911	1.571	Circular Pipe
	"i.p."	3909.21	740.69	755.00	742.617	1.931	79.89	1	16.62	4.29	746.90	0.000	2.769	2.264	0.04911	1.571	Circular Pipe
	"i.p."	3913.92	740.92	755.00	742.874	1.957	79.89	1	16.36	4.16	747.03	0.000	2.769	2.205	0.04911	1.571	Circular Pipe
	"i.p."	3925.36	741.48	755.00	743.520	2.041	79.89	1	15.60	3.78	747.30	0.000	2.769	2.032	0.04911	1.571	Circular Pipe
	"i.p."	3934.32	741.92	755.00	744.051	2.132	79.89	1	14.87	3.43	747.49	0.000	2.769	1.865	0.04911	1.571	Circular Pipe
	"i.p."	3941.35	742.26	755.00	744.494	2.230	79.89	1	14.18	3.12	747.62	0.000	2.769	1.704	0.04911	1.571	Circular Pipe
	"i.p."	3946.80	742.53	755.00	744.869	2.337	79.89	1	13.52	2.84	747.71	0.000	2.769	1.546	0.04911	1.571	Circular Pipe
	"i.p."	3950.85	742.73	755.00	745.189	2.457	79.89	1	12.89	2.58	747.77	0.000	2.769	1.387	0.04911	1.571	Circular Pipe
	"i.p."	3953.58	742.86	755.00	745.461	2.596	79.89	1	12.29	2.35	747.81	0.000	2.769	1.216	0.04911	1.571	Circular Pipe
"Link58"	Reach	3954.70	742.92	755.00	745.688	2.768	79.89	1	11.72	2.13	747.82	0.000	2.769	1.001	0.04911	1.571	Circular Pipe
"MH-J1"	Junction	3959.70	742.92	755.00	749.589	6.669	22.52	1	3.19	0.16	749.75	0.000	1.527	0.000	0.00000	0.000	Circular Pipe
"Link39"	Reach	4534.70	745.87	755.00	750.244	4.374	22.52	1	3.19	0.16	750.40	0.000	1.527	0.000	0.00513	1.449	Circular Pipe
"MH-J2"	Junction	4539.70	745.87	755.00	750.485	4.615	11.20	1	1.58	0.04	750.52	0.000	1.061	0.000	0.00000	0.000	Circular Pipe
	"i.p."	4882.03	747.58	757.72	750.582	3.000	11.20	1	1.58	0.04	750.62	0.000	1.061	0.020	0.00500	0.995	Circular Pipe
	"i.p."	4939.87	747.87	758.18	750.593	2.722	11.20	1	1.66	0.04	750.64	0.000	1.061	0.149	0.00500	0.995	Circular Pipe
	"i.p."	4973.02	748.04	758.44	750.597	2.560	11.20	1	1.74	0.05	750.64	0.000	1.061	0.176	0.00500	0.995	Circular Pipe
	"i.p."	5000.22	748.17	758.65	750.600	2.427	11.20	1	1.83	0.05	750.65	0.000	1.061	0.200	0.00500	0.995	Circular Pipe
	"i.p."	5023.97	748.29	758.84	750.602	2.311	11.20	1	1.92	0.06	750.66	0.000	1.061	0.222	0.00500	0.995	Circular Pipe
	"i.p."	5045.28	748.40	759.01	750.603	2.206	11.20	1	2.01	0.06	750.67	0.000	1.061	0.244	0.00500	0.995	Circular Pipe
	"i.p."	5064.71	748.50	759.17	750.604	2.109	11.20	1	2.11	0.07	750.67	0.000	1.061	0.267	0.00500	0.995	Circular Pipe

	"i.p."	5082.64	748.58	759.31	750.605	2.020	11.20	1	2.21	0.08	750.68	0.000	1.061	0.291	0.00500	0.995	Circular Pipe
	"i.p."	5099.27	748.67	759.44	750.605	1.938	11.20	1	2.32	0.08	750.69	0.000	1.061	0.315	0.00500	0.995	Circular Pipe
	"i.p."	5114.80	748.75	759.56	750.605	1.860	11.20	1	2.43	0.09	750.70	0.000	1.061	0.341	0.00500	0.995	Circular Pipe
	"i.p."	5129.34	748.82	759.68	750.605	1.787	11.20	1	2.55	0.10	750.71	0.000	1.061	0.368	0.00500	0.995	Circular Pipe
	"i.p."	5142.99	748.89	759.79	750.604	1.718	11.20	1	2.68	0.11	750.72	0.000	1.061	0.397	0.00500	0.995	Circular Pipe
	"i.p."	5155.83	748.95	759.89	750.603	1.652	11.20	1	2.81	0.12	750.73	0.000	1.061	0.428	0.00500	0.995	Circular Pipe
	"i.p."	5167.91	749.01	759.99	750.601	1.590	11.20	1	2.94	0.13	750.74	0.000	1.061	0.460	0.00500	0.995	Circular Pipe
"Link38"	Reach	5169.70	749.02	760.00	750.601	1.581	11.20	1	2.97	0.14	750.74	0.000	1.061	0.465	0.00500	0.995	Circular Pipe
"MH-J3"	Headwrk	5169.70	749.02	760.00	750.601	1.581	11.20	1	2.97	0.14	750.74	0.000	1.061	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

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MH3_Branch1
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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																	
"Outlet/M"	Outlet	1180.20	720.97	760.00	721.853	0.883	49.44	1	36.99	21.25	743.10	0.000	1.979	0.000	0.00000	0.000	Circular Pipe
"Tra9"	Transition	1186.20	724.87	755.00	725.627	0.757	49.44	1	35.34	19.39	745.02	0.000	2.289	8.499	0.65000	0.000	Circular Pipe
	"i.p."	1188.03	726.74	755.00	727.513	0.777	49.44	1	34.04	18.00	745.51	0.000	2.289	8.071	1.02000	0.550	Circular Pipe
	"i.p."	1190.09	728.84	755.00	729.641	0.804	49.44	1	32.46	16.36	746.00	0.000	2.289	7.555	1.02000	0.550	Circular Pipe
	"i.p."	1191.89	730.67	755.00	731.504	0.832	49.44	1	30.95	14.87	746.38	0.000	2.289	7.072	1.02000	0.550	Circular Pipe
	"i.p."	1193.47	732.28	755.00	733.145	0.860	49.44	1	29.51	13.52	746.67	0.000	2.289	6.618	1.02000	0.550	Circular Pipe
	"i.p."	1194.86	733.71	755.00	734.597	0.890	49.44	1	28.14	12.29	746.89	0.000	2.289	6.193	1.02000	0.550	Circular Pipe
	"i.p."	1196.10	734.97	755.00	735.888	0.922	49.44	1	26.83	11.17	747.06	0.000	2.289	5.794	1.02000	0.550	Circular Pipe
	"i.p."	1197.19	736.08	755.00	737.038	0.954	49.44	1	25.58	10.16	747.20	0.000	2.289	5.419	1.02000	0.550	Circular Pipe
	"i.p."	1198.17	737.08	755.00	738.066	0.987	49.44	1	24.39	9.24	747.30	0.000	2.289	5.068	1.02000	0.550	Circular Pipe
	"i.p."	1199.04	737.97	755.00	738.987	1.022	49.44	1	23.25	8.40	747.38	0.000	2.289	4.739	1.02000	0.550	Circular Pipe
	"i.p."	1199.81	738.76	755.00	739.815	1.059	49.44	1	22.17	7.63	747.45	0.000	2.289	4.430	1.02000	0.550	Circular Pipe
	"i.p."	1200.51	739.46	755.00	740.559	1.097	49.44	1	21.14	6.94	747.50	0.000	2.289	4.141	1.02000	0.550	Circular Pipe
	"i.p."	1201.12	740.09	755.00	741.228	1.136	49.44	1	20.15	6.31	747.54	0.000	2.289	3.869	1.02000	0.550	Circular Pipe
	"i.p."	1201.68	740.66	755.00	741.833	1.177	49.44	1	19.22	5.73	747.57	0.000	2.289	3.614	1.02000	0.550	Circular Pipe
	"i.p."	1202.17	741.16	755.00	742.378	1.220	49.44	1	18.32	5.21	747.59	0.000	2.289	3.375	1.02000	0.550	Circular Pipe
	"i.p."	1202.61	741.61	755.00	742.871	1.264	49.44	1	17.47	4.74	747.61	0.000	2.289	3.150	1.02000	0.550	Circular Pipe
	"i.p."	1203.00	742.01	755.00	743.316	1.311	49.44	1	16.66	4.31	747.62	0.000	2.289	2.939	1.02000	0.550	Circular Pipe
	"i.p."	1203.35	742.36	755.00	743.719	1.359	49.44	1	15.88	3.92	747.64	0.000	2.289	2.741	1.02000	0.550	Circular Pipe
	"i.p."	1203.66	742.67	755.00	744.084	1.410	49.44	1	15.14	3.56	747.64	0.000	2.289	2.556	1.02000	0.550	Circular Pipe
	"i.p."	1203.93	742.95	755.00	744.415	1.463	49.44	1	14.44	3.24	747.65	0.000	2.289	2.381	1.02000	0.550	Circular Pipe
	"i.p."	1204.17	743.20	755.00	744.715	1.519	49.44	1	13.77	2.94	747.66	0.000	2.289	2.217	1.02000	0.550	Circular Pipe
	"i.p."	1204.38	743.41	755.00	744.986	1.578	49.44	1	13.13	2.68	747.66	0.000	2.289	2.063	1.02000	0.550	Circular Pipe
	"i.p."	1204.56	743.59	755.00	745.233	1.639	49.44	1	12.51	2.43	747.66	0.000	2.289	1.918	1.02000	0.550	Circular Pipe
	"i.p."	1204.71	743.75	755.00	745.456	1.704	49.44	1	11.93	2.21	747.67	0.000	2.289	1.781	1.02000	0.550	Circular Pipe
	"i.p."	1204.84	743.89	755.00	745.659	1.772	49.44	1	11.38	2.01	747.67	0.000	2.289	1.652	1.02000	0.550	Circular Pipe
	"i.p."	1204.95	744.00	755.00	745.843	1.844	49.44	1	10.85	1.83	747.67	0.000	2.289	1.530	1.02000	0.550	Circular Pipe
	"i.p."	1205.04	744.09	755.00	746.010	1.921	49.44	1	10.34	1.66	747.67	0.000	2.289	1.415	1.02000	0.550	Circular Pipe

	"i.p."	1205.11	744.16	755.00	746.162	2.003	49.44	1	9.86	1.51	747.67	0.000	2.289	1.305	1.02000	0.550	Circular Pipe
	"i.p."	1205.16	744.21	755.00	746.299	2.090	49.44	1	9.40	1.37	747.67	0.000	2.289	1.200	1.02000	0.550	Circular Pipe
	"i.p."	1205.19	744.24	755.00	746.424	2.185	49.44	1	8.96	1.25	747.67	0.000	2.289	1.099	1.02000	0.550	Circular Pipe
"Link73"	Reach	1205.20	744.25	755.00	746.538	2.288	49.44	1	8.55	1.13	747.67	0.000	2.289	1.001	1.02000	0.550	Circular Pipe
"MH-G1"	Junction	1210.20	744.25	755.00	747.916	3.666	31.67	1	4.48	0.31	748.23	0.000	1.825	0.000	0.00000	0.000	Circular Pipe
HYDRAULIC JUMP at 1398.30 of length 0.03																	
	"i.p."	1308.85	745.14	755.27	748.138	3.000	31.67	1	4.48	0.31	748.45	0.000	1.825	0.055	0.00900	1.501	Circular Pipe
	"i.p."	1344.63	745.46	755.36	748.182	2.722	31.67	1	4.70	0.34	748.53	0.000	1.825	0.421	0.00900	1.501	Circular Pipe
	"i.p."	1362.91	745.62	755.41	748.185	2.560	31.67	1	4.93	0.38	748.56	0.000	1.825	0.499	0.00900	1.501	Circular Pipe
	"i.p."	1376.97	745.75	755.45	748.179	2.427	31.67	1	5.17	0.41	748.59	0.000	1.825	0.565	0.00900	1.501	Circular Pipe
	"i.p."	1388.42	745.85	755.48	748.165	2.311	31.67	1	5.42	0.46	748.62	0.000	1.825	0.628	0.00900	1.501	Circular Pipe
	"i.p."	1397.84	745.94	755.51	748.145	2.206	31.67	1	5.69	0.50	748.65	0.000	1.825	0.691	0.00900	1.501	Circular Pipe
	"i.p."	1398.30	745.94	755.51	748.144	2.200	31.67	1	5.70	0.50	748.65	0.000	1.825	0.694	0.00900	1.501	Circular Pipe
	"i.p."	1398.30	745.94	755.51	747.446	1.502	31.67	1	8.94	1.24	748.69	0.000	1.825	1.450	0.00900	1.501	Circular Pipe
	"i.p."	1443.09	746.35	755.63	747.850	1.504	31.67	1	8.93	1.24	749.09	0.000	1.825	1.448	0.00900	1.501	Circular Pipe
	"i.p."	1536.12	747.18	755.88	748.746	1.561	31.67	1	8.52	1.13	749.87	0.000	1.825	1.348	0.00900	1.501	Circular Pipe
	"i.p."	1562.44	747.42	755.95	749.043	1.622	31.67	1	8.12	1.02	750.07	0.000	1.825	1.253	0.00900	1.501	Circular Pipe
	"i.p."	1574.33	747.53	755.98	749.214	1.686	31.67	1	7.74	0.93	750.14	0.000	1.825	1.164	0.00900	1.501	Circular Pipe
	"i.p."	1579.71	747.58	756.00	749.330	1.753	31.67	1	7.38	0.85	750.18	0.000	1.825	1.080	0.00900	1.501	Circular Pipe
"L-G2"	Reach	1581.20	747.59	756.00	749.414	1.824	31.67	1	7.04	0.77	750.18	0.000	1.825	1.001	0.00900	1.501	Circular Pipe
"MH-G2"	Junction	1586.20	747.59	756.00	750.574	2.984	8.09	1	1.15	0.02	750.59	0.000	0.896	0.000	0.00000	0.000	Circular Pipe
HYDRAULIC JUMP at 1785.98 of length 0.02																	
	"i.p."	1615.81	747.86	756.76	750.576	2.719	8.09	1	1.20	0.02	750.60	0.000	0.896	0.108	0.00900	0.724	Circular Pipe
	"i.p."	1633.72	748.02	757.22	750.576	2.558	8.09	1	1.26	0.02	750.60	0.000	0.896	0.128	0.00900	0.724	Circular Pipe
	"i.p."	1648.45	748.15	757.60	750.576	2.426	8.09	1	1.32	0.03	750.60	0.000	0.896	0.145	0.00900	0.724	Circular Pipe
	"i.p."	1661.31	748.27	757.93	750.575	2.309	8.09	1	1.39	0.03	750.60	0.000	0.896	0.161	0.00900	0.724	Circular Pipe
	"i.p."	1672.87	748.37	758.23	750.574	2.204	8.09	1	1.45	0.03	750.61	0.000	0.896	0.177	0.00900	0.724	Circular Pipe
	"i.p."	1683.40	748.46	758.50	750.573	2.108	8.09	1	1.52	0.04	750.61	0.000	0.896	0.193	0.00900	0.724	Circular Pipe
	"i.p."	1693.12	748.55	758.75	750.571	2.019	8.09	1	1.60	0.04	750.61	0.000	0.896	0.210	0.00900	0.724	Circular Pipe
	"i.p."	1702.13	748.63	758.98	750.570	1.936	8.09	1	1.68	0.04	750.61	0.000	0.896	0.228	0.00900	0.724	Circular Pipe
	"i.p."	1710.53	748.71	759.20	750.568	1.859	8.09	1	1.76	0.05	750.62	0.000	0.896	0.247	0.00900	0.724	Circular Pipe
	"i.p."	1718.39	748.78	759.40	750.565	1.786	8.09	1	1.84	0.05	750.62	0.000	0.896	0.266	0.00900	0.724	Circular Pipe
	"i.p."	1725.76	748.85	759.59	750.563	1.717	8.09	1	1.93	0.06	750.62	0.000	0.896	0.287	0.00900	0.724	Circular Pipe
	"i.p."	1732.69	748.91	759.77	750.560	1.651	8.09	1	2.03	0.06	750.62	0.000	0.896	0.309	0.00900	0.724	Circular Pipe
	"i.p."	1739.20	748.97	759.93	750.556	1.589	8.09	1	2.13	0.07	750.63	0.000	0.896	0.333	0.00900	0.724	Circular Pipe
	"i.p."	1745.33	749.02	760.09	750.552	1.530	8.09	1	2.23	0.08	750.63	0.000	0.896	0.358	0.00900	0.724	Circular Pipe
	"i.p."	1751.10	749.07	760.24	750.548	1.474	8.09	1	2.34	0.09	750.63	0.000	0.896	0.384	0.00900	0.724	Circular Pipe
	"i.p."	1756.51	749.12	760.38	750.543	1.420	8.09	1	2.45	0.09	750.64	0.000	0.896	0.412	0.00900	0.724	Circular Pipe
	"i.p."	1761.60	749.17	760.51	750.538	1.369	8.09	1	2.57	0.10	750.64	0.000	0.896	0.443	0.00900	0.724	Circular Pipe
	"i.p."	1766.35	749.21	760.63	750.531	1.320	8.09	1	2.70	0.11	750.64	0.000	0.896	0.475	0.00900	0.724	Circular Pipe
	"i.p."	1770.80	749.25	760.75	750.525	1.273	8.09	1	2.83	0.12	750.65	0.000	0.896	0.509	0.00900	0.724	Circular Pipe
	"i.p."	1774.92	749.29	760.85	750.517	1.228	8.09	1	2.97	0.14	750.65	0.000	0.896	0.545	0.00900	0.724	Circular Pipe
	"i.p."	1778.72	749.32	760.95	750.508	1.185	8.09	1	3.12	0.15	750.66	0.000	0.896	0.584	0.00900	0.724	Circular Pipe
	"i.p."	1782.20	749.35	761.04	750.498	1.144	8.09	1	3.27	0.17	750.66	0.000	0.896	0.625	0.00900	0.724	Circular Pipe
	"i.p."	1785.34	749.38	761.12	750.486	1.104	8.09	1	3.43	0.18	750.67	0.000	0.896	0.669	0.00900	0.724	Circular Pipe
	"i.p."	1785.98	749.39	761.14	750.484	1.096	8.09	1	3.46	0.19	750.67	0.000	0.896	0.678	0.00900	0.724	Circular Pipe
	"i.p."	1785.98	749.39	761.14	750.112	0.724	8.09	1	6.15	0.59	750.70	0.000	0.896	1.514	0.00900	0.724	Circular Pipe
	"i.p."	1828.69	749.77	762.24	750.497	0.724	8.09	1	6.15	0.59	751.08	0.000	0.896	1.514	0.00900	0.724	Circular Pipe
	"i.p."	1880.61	750.24	763.57	750.970	0.730	8.09	1	6.08	0.57	751.54	0.000	0.896	1.491	0.00900	0.724	Circular Pipe
	"i.p."	1913.50	750.54	764.42	751.291	0.755	8.09	1	5.80	0.52	751.81	0.000	0.896	1.396	0.00900	0.724	Circular Pipe
	"i.p."	1925.10	750.64	764.71	751.421	0.781	8.09	1	5.53	0.47	751.90	0.000	0.896	1.307	0.00900	0.724	Circular Pipe
	"i.p."	1930.99	750.69	764.87	751.501	0.808	8.09	1	5.27	0.43	751.93	0.000	0.896	1.223	0.00900	0.724	Circular Pipe

	"i.p."	1934.18	750.72	764.95	751.558	0.836	8.09	1	5.03	0.39	751.95	0.000	0.896	1.145	0.00900	0.724	Circular Pipe
	"i.p."	1935.73	750.74	764.99	751.601	0.865	8.09	1	4.79	0.36	751.96	0.000	0.896	1.071	0.00900	0.724	Circular Pipe
"L-G3"	Reach	1936.20	750.74	765.00	751.635	0.895	8.09	1	4.57	0.32	751.96	0.000	0.896	1.002	0.00900	0.724	Circular Pipe
"MH-G3"	Headwrk	1936.20	750.74	765.00	751.636	0.896	8.09	1	4.56	0.32	751.96	0.000	0.896	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

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MH1_Branch1
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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																	
"Outlet/M"	Outlet	258.00	716.61	755.00	729.851	13.241	66.71	1	0.59	0.01	729.86	0.000	1.793	0.000	0.00000	0.000	Circular Pipe
"TR2"	Transition	974.57	716.57	755.00	732.335	15.767	66.71	1	9.44	1.38	733.72	0.000	2.611	0.000	-0.00006	0.000	Circular Pipe
HYDRAULIC JUMP at 980.18 of length 0.28																	
	"i.p."	980.18	722.61	755.00	732.392	9.779	66.71	1	9.44	1.38	733.77	0.000	2.611	0.000	1.07728	0.629	Circular Pipe
	"i.p."	980.18	722.61	755.00	723.513	0.901	66.71	1	37.36	21.68	745.19	0.000	2.611	8.172	1.07728	0.629	Circular Pipe
	"i.p."	980.72	723.19	755.00	724.097	0.907	66.71	1	36.99	21.25	745.35	0.000	2.611	8.059	1.07728	0.629	Circular Pipe
	"i.p."	982.98	725.63	755.00	726.566	0.939	66.71	1	35.27	19.32	745.89	0.000	2.611	7.539	1.07728	0.629	Circular Pipe
	"i.p."	984.96	727.76	755.00	728.734	0.972	66.71	1	33.63	17.56	746.30	0.000	2.611	7.052	1.07728	0.629	Circular Pipe
	"i.p."	986.70	729.64	755.00	730.648	1.006	66.71	1	32.07	15.97	746.61	0.000	2.611	6.594	1.07728	0.629	Circular Pipe
	"i.p."	988.25	731.30	755.00	732.345	1.042	66.71	1	30.57	14.51	746.86	0.000	2.611	6.165	1.07728	0.629	Circular Pipe
	"i.p."	989.61	732.78	755.00	733.856	1.079	66.71	1	29.15	13.20	747.05	0.000	2.611	5.763	1.07728	0.629	Circular Pipe
	"i.p."	990.83	734.09	755.00	735.205	1.118	66.71	1	27.79	12.00	747.20	0.000	2.611	5.385	1.07728	0.629	Circular Pipe
	"i.p."	991.91	735.25	755.00	736.411	1.158	66.71	1	26.50	10.91	747.32	0.000	2.611	5.031	1.07728	0.629	Circular Pipe
	"i.p."	992.88	736.29	755.00	737.494	1.200	66.71	1	25.27	9.91	747.41	0.000	2.611	4.698	1.07728	0.629	Circular Pipe
	"i.p."	993.74	737.22	755.00	738.466	1.244	66.71	1	24.09	9.01	747.48	0.000	2.611	4.387	1.07728	0.629	Circular Pipe
	"i.p."	994.51	738.05	755.00	739.342	1.289	66.71	1	22.97	8.19	747.53	0.000	2.611	4.094	1.07728	0.629	Circular Pipe
	"i.p."	995.20	738.79	755.00	740.130	1.337	66.71	1	21.90	7.45	747.58	0.000	2.611	3.819	1.07728	0.629	Circular Pipe
	"i.p."	995.81	739.46	755.00	740.842	1.387	66.71	1	20.88	6.77	747.61	0.000	2.611	3.561	1.07728	0.629	Circular Pipe
	"i.p."	996.36	740.05	755.00	741.485	1.439	66.71	1	19.91	6.16	747.64	0.000	2.611	3.319	1.07728	0.629	Circular Pipe
	"i.p."	996.85	740.57	755.00	742.065	1.493	66.71	1	18.98	5.60	747.66	0.000	2.611	3.091	1.07728	0.629	Circular Pipe
	"i.p."	997.28	741.04	755.00	742.591	1.550	66.71	1	18.10	5.09	747.68	0.000	2.611	2.877	1.07728	0.629	Circular Pipe
	"i.p."	997.67	741.46	755.00	743.066	1.611	66.71	1	17.26	4.62	747.69	0.000	2.611	2.676	1.07728	0.629	Circular Pipe
	"i.p."	998.01	741.82	755.00	743.497	1.674	66.71	1	16.45	4.20	747.70	0.000	2.611	2.486	1.07728	0.629	Circular Pipe
	"i.p."	998.31	742.15	755.00	743.887	1.740	66.71	1	15.69	3.82	747.71	0.000	2.611	2.307	1.07728	0.629	Circular Pipe
	"i.p."	998.57	742.43	755.00	744.241	1.811	66.71	1	14.96	3.47	747.72	0.000	2.611	2.139	1.07728	0.629	Circular Pipe
	"i.p."	998.80	742.68	755.00	744.561	1.885	66.71	1	14.26	3.16	747.72	0.000	2.611	1.979	1.07728	0.629	Circular Pipe
	"i.p."	999.00	742.89	755.00	744.852	1.965	66.71	1	13.60	2.87	747.72	0.000	2.611	1.827	1.07728	0.629	Circular Pipe
	"i.p."	999.17	743.07	755.00	745.116	2.049	66.71	1	12.97	2.61	747.73	0.000	2.611	1.683	1.07728	0.629	Circular Pipe
	"i.p."	999.30	743.21	755.00	745.355	2.141	66.71	1	12.36	2.37	747.73	0.000	2.611	1.545	1.07728	0.629	Circular Pipe
	"i.p."	999.41	743.33	755.00	745.572	2.240	66.71	1	11.79	2.16	747.73	0.000	2.611	1.411	1.07728	0.629	Circular Pipe
	"i.p."	999.49	743.42	755.00	745.769	2.348	66.71	1	11.24	1.96	747.73	0.000	2.611	1.279	1.07728	0.629	Circular Pipe
	"i.p."	999.55	743.48	755.00	745.948	2.470	66.71	1	10.72	1.78	747.73	0.000	2.611	1.145	1.07728	0.629	Circular Pipe
"Link36"	Reach	999.57	743.50	755.00	746.110	2.610	66.71	1	10.22	1.62	747.73	0.000	2.611	1.001	1.07728	0.629	Circular Pipe

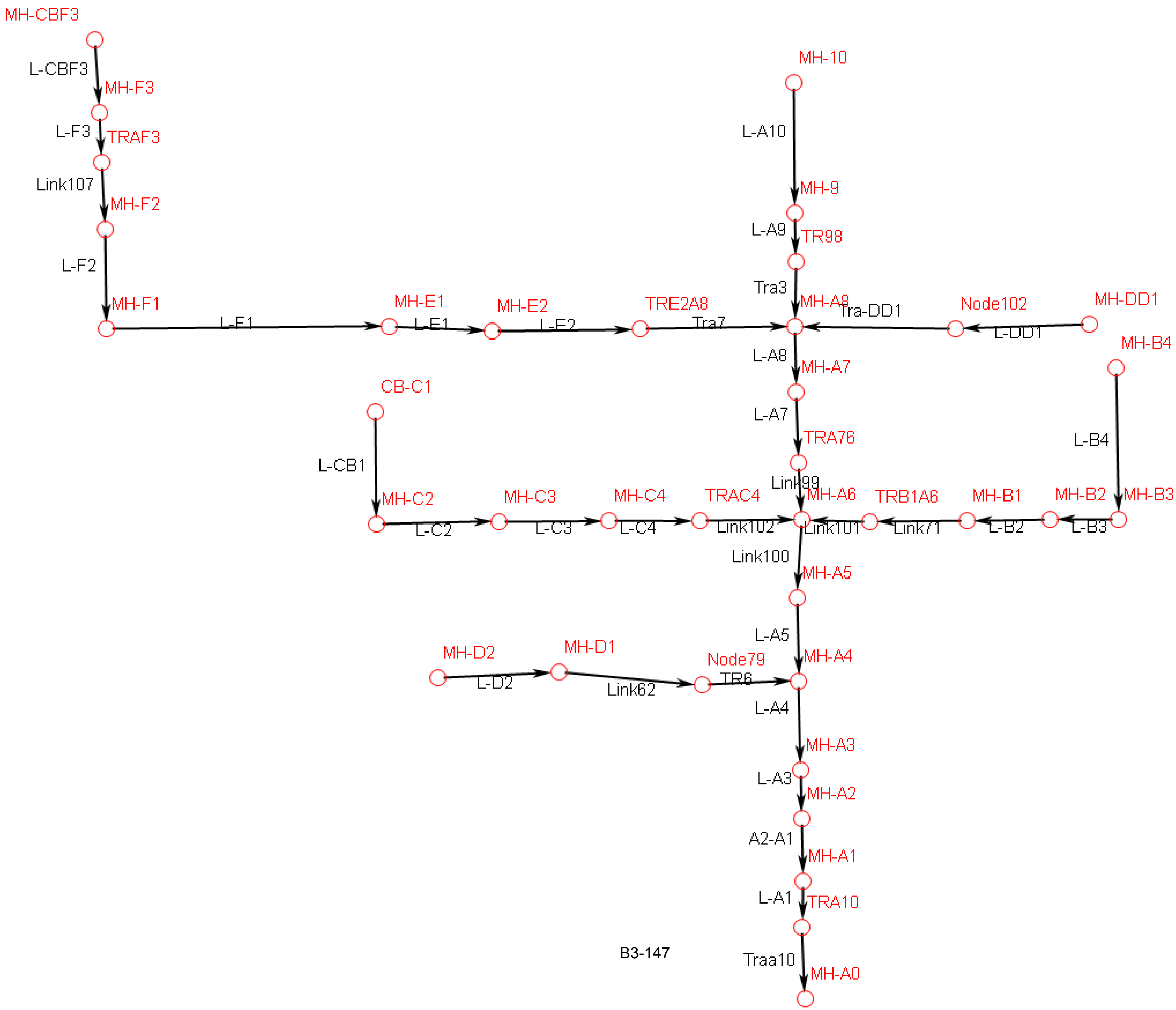
"MH-H1"	Junction	1004.57	743.50	755.00	748.511	5.011	33.87	1	4.79	0.36	748.87	0.000	1.890	0.000	0.00000	0.000	Circular Pipe
	"i.p."	1317.79	746.32	755.00	749.319	3.000	33.87	1	4.79	0.36	749.68	0.000	1.890	0.059	0.00900	1.562	Circular Pipe
	"i.p."	1354.55	746.65	755.00	749.372	2.722	33.87	1	5.03	0.39	749.76	0.000	1.890	0.450	0.00900	1.562	Circular Pipe
"L-H2"	Reach	1364.57	746.74	755.00	749.375	2.635	33.87	1	5.15	0.41	749.79	0.000	1.890	0.495	0.00900	1.562	Circular Pipe
"MH-H2"	Junction	1369.57	746.74	755.00	750.131	3.391	8.30	1	1.17	0.02	750.15	0.000	0.908	0.000	0.00000	0.000	Circular Pipe

HYDRAULIC JUMP at 1559.55 of length 0.02

	"i.p."	1404.74	747.14	755.11	750.136	3.000	8.30	1	1.17	0.02	750.16	0.000	0.908	0.014	0.01127	0.694	Circular Pipe
	"i.p."	1429.54	747.42	755.19	750.138	2.722	8.30	1	1.23	0.02	750.16	0.000	0.908	0.110	0.01127	0.694	Circular Pipe
	"i.p."	1443.85	747.58	755.24	750.137	2.560	8.30	1	1.29	0.03	750.16	0.000	0.908	0.131	0.01127	0.694	Circular Pipe
	"i.p."	1455.60	747.71	755.27	750.136	2.427	8.30	1	1.35	0.03	750.16	0.000	0.908	0.148	0.01127	0.694	Circular Pipe
	"i.p."	1465.86	747.82	755.30	750.135	2.311	8.30	1	1.42	0.03	750.17	0.000	0.908	0.165	0.01127	0.694	Circular Pipe
	"i.p."	1475.06	747.93	755.33	750.134	2.206	8.30	1	1.49	0.03	750.17	0.000	0.908	0.181	0.01127	0.694	Circular Pipe
	"i.p."	1483.44	748.02	755.36	750.132	2.109	8.30	1	1.56	0.04	750.17	0.000	0.908	0.198	0.01127	0.694	Circular Pipe
	"i.p."	1491.16	748.11	755.38	750.130	2.020	8.30	1	1.64	0.04	750.17	0.000	0.908	0.215	0.01127	0.694	Circular Pipe
	"i.p."	1498.31	748.19	755.41	750.128	1.938	8.30	1	1.72	0.05	750.17	0.000	0.908	0.234	0.01127	0.694	Circular Pipe
	"i.p."	1504.97	748.27	755.43	750.125	1.860	8.30	1	1.80	0.05	750.18	0.000	0.908	0.253	0.01127	0.694	Circular Pipe
	"i.p."	1511.20	748.34	755.45	750.122	1.787	8.30	1	1.89	0.06	750.18	0.000	0.908	0.273	0.01127	0.694	Circular Pipe
	"i.p."	1517.03	748.40	755.47	750.119	1.718	8.30	1	1.98	0.06	750.18	0.000	0.908	0.294	0.01127	0.694	Circular Pipe
	"i.p."	1522.50	748.46	755.48	750.115	1.652	8.30	1	2.08	0.07	750.18	0.000	0.908	0.317	0.01127	0.694	Circular Pipe
	"i.p."	1527.63	748.52	755.50	750.111	1.590	8.30	1	2.18	0.07	750.18	0.000	0.908	0.341	0.01127	0.694	Circular Pipe
	"i.p."	1532.45	748.58	755.52	750.106	1.531	8.30	1	2.29	0.08	750.19	0.000	0.908	0.367	0.01127	0.694	Circular Pipe
	"i.p."	1536.98	748.63	755.53	750.101	1.475	8.30	1	2.40	0.09	750.19	0.000	0.908	0.394	0.01127	0.694	Circular Pipe
	"i.p."	1541.21	748.67	755.54	750.095	1.421	8.30	1	2.52	0.10	750.19	0.000	0.908	0.423	0.01127	0.694	Circular Pipe
	"i.p."	1545.17	748.72	755.56	750.088	1.370	8.30	1	2.64	0.11	750.20	0.000	0.908	0.454	0.01127	0.694	Circular Pipe
	"i.p."	1548.86	748.76	755.57	750.081	1.321	8.30	1	2.77	0.12	750.20	0.000	0.908	0.486	0.01127	0.694	Circular Pipe
	"i.p."	1552.28	748.80	755.58	750.072	1.274	8.30	1	2.90	0.13	750.20	0.000	0.908	0.521	0.01127	0.694	Circular Pipe
	"i.p."	1555.44	748.83	755.59	750.063	1.229	8.30	1	3.05	0.14	750.21	0.000	0.908	0.558	0.01127	0.694	Circular Pipe
	"i.p."	1558.33	748.87	755.60	750.052	1.186	8.30	1	3.19	0.16	750.21	0.000	0.908	0.598	0.01127	0.694	Circular Pipe
	"i.p."	1559.55	748.88	755.60	750.047	1.167	8.30	1	3.26	0.17	750.21	0.000	0.908	0.617	0.01127	0.694	Circular Pipe
	"i.p."	1559.55	748.88	755.60	749.574	0.694	8.30	1	6.71	0.70	750.27	0.000	0.908	1.690	0.01127	0.694	Circular Pipe
	"i.p."	1590.87	749.23	755.70	749.927	0.694	8.30	1	6.71	0.70	750.63	0.000	0.908	1.690	0.01127	0.694	Circular Pipe
	"i.p."	1647.28	749.87	755.88	750.584	0.715	8.30	1	6.42	0.64	751.22	0.000	0.908	1.592	0.01127	0.694	Circular Pipe
	"i.p."	1664.81	750.07	755.93	750.806	0.740	8.30	1	6.12	0.58	751.39	0.000	0.908	1.491	0.01127	0.694	Circular Pipe
	"i.p."	1673.71	750.17	755.96	750.932	0.765	8.30	1	5.84	0.53	751.46	0.000	0.908	1.396	0.01127	0.694	Circular Pipe
	"i.p."	1678.98	750.23	755.98	751.017	0.792	8.30	1	5.57	0.48	751.50	0.000	0.908	1.307	0.01127	0.694	Circular Pipe
	"i.p."	1682.25	750.26	755.99	751.082	0.819	8.30	1	5.31	0.44	751.52	0.000	0.908	1.223	0.01127	0.694	Circular Pipe
	"i.p."	1684.21	750.28	756.00	751.132	0.847	8.30	1	5.06	0.40	751.53	0.000	0.908	1.145	0.01127	0.694	Circular Pipe
	"i.p."	1685.25	750.30	756.00	751.173	0.877	8.30	1	4.83	0.36	751.53	0.000	0.908	1.071	0.01127	0.694	Circular Pipe
"L-H3"	Reach	1685.57	750.30	756.00	751.207	0.907	8.30	1	4.60	0.33	751.54	0.000	0.908	1.002	0.01127	0.694	Circular Pipe
"MH-H3"	Headwrk	1685.57	750.30	756.00	751.208	0.908	8.30	1	4.59	0.33	751.54	0.000	0.908	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

WSPG Software Layout Hellman Avenue



HELLMAN AVENUE STORM DRAIN

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************************************
Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.1          19/04/2012
Innovyze              www.innovyze.com
************************************

INPUT FILE
************************************
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Computed  05/14/24  13:49:10

TITLE INFORMATION
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WARNING SUMMARY
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 WARNING 06: Upstream channel and downstream channel are the same for transition TR6. Use a reach instead?
 WARNING 06: Upstream channel and downstream channel are the same for transition Link101. Use a reach instead?
 WARNING 06: Upstream channel and downstream channel are the same for transition Link102. Use a reach instead?
 WARNING 06: Upstream channel and downstream channel are the same for transition Tra-DD1. Use a reach instead?
 WARNING 36: D/S processing stopped in junction MH-9 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-A8 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-A7 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-A6 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-A5 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-A4 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-A3 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-A2 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-A1 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-F3 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-F2 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-F1 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-E1 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-E2 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-D1 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-B3 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-B2 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-B1 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-C2 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-C3 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH-C4 because critical momentum is greater than maximum momentum.

RESULTS
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   Main Line
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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																	
"MH-A0"	Outlet	156.00	716.13	755.00	717.638	1.508	201.17	1	43.03	28.75	746.39	0.000	4.044	0.000	0.00000	0.000	Circular Pipe
"Traa10"	Reach	162.00	719.28	755.00	720.832	1.552	201.17	1	41.37	26.57	747.40	0.000	4.044	6.838	0.52500	1.142	Circular Pipe
	"i.p."	165.07	721.46	755.20	723.053	1.592	201.17	1	39.98	24.82	747.87	0.000	4.044	6.515	0.70941	1.059	Circular Pipe
	"i.p."	168.91	724.19	755.46	725.834	1.648	201.17	1	38.12	22.56	748.40	0.000	4.044	6.089	0.70941	1.059	Circular Pipe
	"i.p."	172.29	726.58	755.68	728.289	1.708	201.17	1	36.35	20.51	748.80	0.000	4.044	5.690	0.70941	1.059	Circular Pipe
	"i.p."	175.28	728.70	755.88	730.468	1.769	201.17	1	34.65	18.65	749.12	0.000	4.044	5.314	0.70941	1.059	Circular Pipe
	"i.p."	177.92	730.57	756.06	732.406	1.833	201.17	1	33.04	16.95	749.36	0.000	4.044	4.963	0.70941	1.059	Circular Pipe
	"i.p."	180.26	732.24	756.21	734.137	1.900	201.17	1	31.50	15.41	749.55	0.000	4.044	4.632	0.70941	1.059	Circular Pipe
	"i.p."	182.35	733.72	756.35	735.686	1.970	201.17	1	30.04	14.01	749.70	0.000	4.044	4.322	0.70941	1.059	Circular Pipe
	"i.p."	184.21	735.03	756.48	737.076	2.043	201.17	1	28.64	12.74	749.81	0.000	4.044	4.031	0.70941	1.059	Circular Pipe
	"i.p."	185.86	736.20	756.59	738.325	2.120	201.17	1	27.31	11.58	749.90	0.000	4.044	3.758	0.70941	1.059	Circular Pipe
	"i.p."	187.33	737.25	756.68	739.448	2.200	201.17	1	26.04	10.53	749.97	0.000	4.044	3.501	0.70941	1.059	Circular Pipe
	"i.p."	188.64	738.18	756.77	740.461	2.284	201.17	1	24.82	9.57	750.03	0.000	4.044	3.260	0.70941	1.059	Circular Pipe
	"i.p."	189.80	739.00	756.85	741.374	2.372	201.17	1	23.67	8.70	750.07	0.000	4.044	3.033	0.70941	1.059	Circular Pipe
	"i.p."	190.83	739.74	756.92	742.199	2.464	201.17	1	22.57	7.91	750.11	0.000	4.044	2.819	0.70941	1.059	Circular Pipe
	"i.p."	191.75	740.38	756.98	742.945	2.561	201.17	1	21.52	7.19	750.13	0.000	4.044	2.618	0.70941	1.059	Circular Pipe
	"i.p."	192.55	740.95	757.03	743.619	2.664	201.17	1	20.52	6.54	750.16	0.000	4.044	2.428	0.70941	1.059	Circular Pipe
	"i.p."	193.26	741.46	757.08	744.229	2.773	201.17	1	19.56	5.94	750.17	0.000	4.044	2.249	0.70941	1.059	Circular Pipe
	"i.p."	193.88	741.89	757.12	744.782	2.888	201.17	1	18.65	5.40	750.18	0.000	4.044	2.079	0.70941	1.059	Circular Pipe
	"i.p."	194.41	742.27	757.15	745.283	3.012	201.17	1	17.78	4.91	750.19	0.000	4.044	1.917	0.70941	1.059	Circular Pipe
	"i.p."	194.86	742.59	757.18	745.736	3.143	201.17	1	16.96	4.46	750.20	0.000	4.044	1.763	0.70941	1.059	Circular Pipe
	"i.p."	195.24	742.86	757.21	746.147	3.286	201.17	1	16.17	4.06	750.21	0.000	4.044	1.614	0.70941	1.059	Circular Pipe
	"i.p."	195.55	743.08	757.23	746.520	3.441	201.17	1	15.41	3.69	750.21	0.000	4.044	1.469	0.70941	1.059	Circular Pipe
	"i.p."	195.78	743.24	757.25	746.858	3.613	201.17	1	14.70	3.35	750.21	0.000	4.044	1.324	0.70941	1.059	Circular Pipe
	"i.p."	195.94	743.36	757.26	747.165	3.809	201.17	1	14.01	3.05	750.21	0.000	4.044	1.174	0.70941	1.059	Circular Pipe
"L-A1"	Reach	196.00	743.40	757.26	747.443	4.043	201.17	1	13.36	2.77	750.21	0.000	4.044	1.001	0.70941	1.059	Circular Pipe
"MH-A1"	Junction	201.00	743.40	757.26	748.006	4.606	196.63	1	12.36	2.37	750.38	0.000	4.013	0.000	0.00000	0.000	Circular Pipe
"A2-A1"	Reach	499.95	746.13	760.17	750.995	4.865	196.63	1	12.36	2.37	753.37	0.000	4.013	0.000	0.00913	3.911	Circular Pipe
"MH-A2"	Junction	504.95	746.13	760.17	751.050	4.920	196.53	1	12.36	2.37	753.42	0.000	4.012	0.000	0.00000	0.000	Circular Pipe
"L-A3"	Reach	863.25	749.40	763.05	754.628	5.228	196.53	1	12.36	2.37	757.00	0.000	4.012	0.000	0.00913	3.909	Circular Pipe
"MH-A3"	Junction	868.25	749.40	763.05	755.587	6.187	176.58	1	11.10	1.91	757.50	0.000	3.856	0.000	0.00000	0.000	Circular Pipe
"L-A4"	Reach	1150.61	752.19	765.92	757.864	5.674	176.58	1	11.10	1.91	759.78	0.000	3.856	0.000	0.00988	3.348	Circular Pipe
"MH-A4"	Join	1155.61	752.19	765.92	760.042	7.852	116.93	1	7.35	0.84	760.88	0.000	3.183	0.000	0.00000	0.000	Circular Pipe
"L-A5"	Reach	1468.88	754.85	769.38	761.150	6.300	116.93	1	7.35	0.84	761.99	0.000	3.183	0.000	0.00849	2.630	Circular Pipe
"MH-A5"	Junction	1473.88	754.85	769.22	761.325	6.475	111.29	1	7.00	0.76	762.09	0.000	3.104	0.000	0.00000	0.000	Circular Pipe
"Link100"	Reach	1501.48	755.38	769.22	761.413	6.033	111.29	1	7.00	0.76	762.17	0.000	3.104	0.000	0.01920	2.003	Circular Pipe
"MH-A6"	Join	1506.48	755.38	769.22	762.426	7.046	65.00	1	4.09	0.26	762.69	0.000	2.347	0.000	0.00000	0.000	Circular Pipe
"Link99"	Transition	1512.48	755.68	769.20	761.615	5.935	65.00	1	9.20	1.31	762.93	0.000	2.585	0.000	0.05000	0.000	Circular Pipe
"L-A7"	Reach	1809.08	758.43	771.11	764.432	6.002	65.00	1	9.20	1.31	765.74	0.000	2.585	0.000	0.00927	2.493	Circular Pipe
"MH-A7"	Junction	1814.08	758.43	771.11	765.385	6.955	52.48	1	7.42	0.86	766.24	0.000	2.355	0.000	0.00000	0.000	Circular Pipe
"L-A8"	Reach	2183.64	760.30	774.84	767.673	7.373	52.48	1	7.42	0.86	768.53	0.000	2.355	0.000	0.00506	3.000	Circular Pipe
"MH-A8"	Join	2188.64	760.30	774.84	769.395	9.095	3.00	1	0.42	0.00	769.40	0.000	0.539	0.000	0.00000	0.000	Circular Pipe
"Tra3"	Transition	2194.64	760.43	774.54	769.386	8.960	3.00	1	0.95	0.01	769.40	0.000	0.604	0.000	0.02100	0.000	Circular Pipe
"L-A9"	Reach	2442.27	766.77	778.27	769.430	2.660	3.00	1	0.95	0.01	769.44	0.000	0.604	0.000	0.02562	0.389	Circular Pipe
"MH-9"	Junction	2447.27	766.77	778.27	769.452	2.682	1.50	1	0.48	0.00	769.46	0.000	0.423	0.000	0.00000	0.000	Circular Pipe

HYDRAULIC JUMP at 2544.83 of length 0.01

	"i.p."	2479.81	767.45	778.52	769.453	2.000	1.50	1	0.48	0.00	769.46	0.000	0.423	0.008	0.02099	0.291	Circular Pipe
	"i.p."	2488.63	767.64	778.59	769.453	1.815	1.50	1	0.50	0.00	769.46	0.000	0.423	0.055	0.02099	0.291	Circular Pipe
	"i.p."	2493.75	767.75	778.63	769.453	1.707	1.50	1	0.53	0.00	769.46	0.000	0.423	0.065	0.02099	0.291	Circular Pipe
	"i.p."	2497.98	767.83	778.66	769.453	1.618	1.50	1	0.55	0.00	769.46	0.000	0.423	0.074	0.02099	0.291	Circular Pipe
	"i.p."	2501.67	767.91	778.69	769.452	1.540	1.50	1	0.58	0.01	769.46	0.000	0.423	0.082	0.02099	0.291	Circular Pipe
	"i.p."	2504.99	767.98	778.72	769.452	1.470	1.50	1	0.61	0.01	769.46	0.000	0.423	0.090	0.02099	0.291	Circular Pipe
	"i.p."	2508.02	768.05	778.74	769.452	1.406	1.50	1	0.64	0.01	769.46	0.000	0.423	0.099	0.02099	0.291	Circular Pipe
	"i.p."	2510.83	768.10	778.76	769.451	1.347	1.50	1	0.67	0.01	769.46	0.000	0.423	0.107	0.02099	0.291	Circular Pipe
	"i.p."	2513.44	768.16	778.79	769.451	1.292	1.50	1	0.70	0.01	769.46	0.000	0.423	0.116	0.02099	0.291	Circular Pipe
	"i.p."	2515.88	768.21	778.80	769.450	1.240	1.50	1	0.73	0.01	769.46	0.000	0.423	0.126	0.02099	0.291	Circular Pipe
	"i.p."	2518.17	768.26	778.82	769.449	1.191	1.50	1	0.77	0.01	769.46	0.000	0.423	0.136	0.02099	0.291	Circular Pipe
	"i.p."	2520.33	768.30	778.84	769.449	1.145	1.50	1	0.81	0.01	769.46	0.000	0.423	0.147	0.02099	0.291	Circular Pipe
	"i.p."	2522.37	768.35	778.85	769.448	1.101	1.50	1	0.85	0.01	769.46	0.000	0.423	0.158	0.02099	0.291	Circular Pipe
	"i.p."	2524.30	768.39	778.87	769.447	1.060	1.50	1	0.89	0.01	769.46	0.000	0.423	0.170	0.02099	0.291	Circular Pipe
	"i.p."	2526.14	768.43	778.88	769.446	1.021	1.50	1	0.93	0.01	769.46	0.000	0.423	0.183	0.02099	0.291	Circular Pipe
	"i.p."	2527.87	768.46	778.90	769.445	0.983	1.50	1	0.98	0.01	769.46	0.000	0.423	0.196	0.02099	0.291	Circular Pipe
	"i.p."	2529.52	768.50	778.91	769.444	0.947	1.50	1	1.02	0.02	769.46	0.000	0.423	0.211	0.02099	0.291	Circular Pipe
	"i.p."	2531.09	768.53	778.92	769.443	0.913	1.50	1	1.07	0.02	769.46	0.000	0.423	0.226	0.02099	0.291	Circular Pipe
	"i.p."	2532.58	768.56	778.93	769.441	0.880	1.50	1	1.13	0.02	769.46	0.000	0.423	0.242	0.02099	0.291	Circular Pipe
	"i.p."	2533.99	768.59	778.95	769.440	0.849	1.50	1	1.18	0.02	769.46	0.000	0.423	0.260	0.02099	0.291	Circular Pipe
	"i.p."	2535.34	768.62	778.96	769.438	0.819	1.50	1	1.24	0.02	769.46	0.000	0.423	0.278	0.02099	0.291	Circular Pipe
	"i.p."	2536.62	768.65	778.97	769.436	0.791	1.50	1	1.30	0.03	769.46	0.000	0.423	0.298	0.02099	0.291	Circular Pipe
	"i.p."	2537.83	768.67	778.98	769.434	0.763	1.50	1	1.36	0.03	769.46	0.000	0.423	0.319	0.02099	0.291	Circular Pipe
	"i.p."	2538.98	768.70	778.98	769.432	0.736	1.50	1	1.43	0.03	769.46	0.000	0.423	0.341	0.02099	0.291	Circular Pipe
	"i.p."	2540.07	768.72	778.99	769.429	0.711	1.50	1	1.50	0.03	769.46	0.000	0.423	0.365	0.02099	0.291	Circular Pipe
	"i.p."	2541.10	768.74	779.00	769.426	0.687	1.50	1	1.57	0.04	769.46	0.000	0.423	0.391	0.02099	0.291	Circular Pipe
	"i.p."	2542.07	768.76	779.01	769.423	0.663	1.50	1	1.65	0.04	769.47	0.000	0.423	0.418	0.02099	0.291	Circular Pipe
	"i.p."	2542.98	768.78	779.02	769.420	0.641	1.50	1	1.73	0.05	769.47	0.000	0.423	0.447	0.02099	0.291	Circular Pipe
	"i.p."	2543.84	768.80	779.02	769.416	0.619	1.50	1	1.81	0.05	769.47	0.000	0.423	0.478	0.02099	0.291	Circular Pipe
	"i.p."	2544.63	768.81	779.03	769.412	0.598	1.50	1	1.90	0.06	769.47	0.000	0.423	0.511	0.02099	0.291	Circular Pipe
	"i.p."	2544.83	768.82	779.03	769.411	0.593	1.50	1	1.92	0.06	769.47	0.000	0.423	0.519	0.02099	0.291	Circular Pipe
	"i.p."	2544.83	768.82	779.03	769.109	0.291	1.50	1	5.30	0.44	769.54	0.000	0.423	2.083	0.02099	0.291	Circular Pipe
	"i.p."	2689.04	771.85	780.15	772.137	0.291	1.50	1	5.30	0.44	772.57	0.000	0.423	2.083	0.02099	0.291	Circular Pipe
	"i.p."	2711.53	772.32	780.33	772.611	0.293	1.50	1	5.24	0.43	773.04	0.000	0.423	2.054	0.02099	0.291	Circular Pipe
	"i.p."	2726.70	772.64	780.45	772.939	0.303	1.50	1	5.00	0.39	773.33	0.000	0.423	1.925	0.02099	0.291	Circular Pipe
	"i.p."	2732.47	772.76	780.49	773.071	0.313	1.50	1	4.76	0.35	773.42	0.000	0.423	1.804	0.02099	0.291	Circular Pipe
	"i.p."	2735.81	772.83	780.52	773.151	0.324	1.50	1	4.54	0.32	773.47	0.000	0.423	1.691	0.02099	0.291	Circular Pipe
	"i.p."	2738.01	772.87	780.53	773.208	0.335	1.50	1	4.33	0.29	773.50	0.000	0.423	1.585	0.02099	0.291	Circular Pipe
	"i.p."	2739.56	772.91	780.55	773.252	0.346	1.50	1	4.13	0.26	773.52	0.000	0.423	1.485	0.02099	0.291	Circular Pipe
	"i.p."	2740.66	772.93	780.55	773.287	0.358	1.50	1	3.94	0.24	773.53	0.000	0.423	1.392	0.02099	0.291	Circular Pipe
	"i.p."	2741.44	772.95	780.56	773.315	0.370	1.50	1	3.75	0.22	773.53	0.000	0.423	1.304	0.02099	0.291	Circular Pipe
	"i.p."	2741.99	772.96	780.57	773.339	0.382	1.50	1	3.58	0.20	773.54	0.000	0.423	1.222	0.02099	0.291	Circular Pipe
	"i.p."	2742.34	772.96	780.57	773.360	0.395	1.50	1	3.41	0.18	773.54	0.000	0.423	1.145	0.02099	0.291	Circular Pipe
	"i.p."	2742.54	772.97	780.57	773.377	0.409	1.50	1	3.25	0.16	773.54	0.000	0.423	1.073	0.02099	0.291	Circular Pipe
"L-A10"	Reach	2742.61	772.97	780.57	773.392	0.422	1.50	1	3.10	0.15	773.54	0.000	0.423	1.005	0.02099	0.291	Circular Pipe
"MH-10"	Headwrk	2742.61	772.97	780.57	773.393	0.423	1.50	1	3.09	0.15	773.54	0.000	0.423	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

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MH-A8_Lateral1
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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																	
"Outlet/M"	Outlet	2188.64	760.30	774.84	768.534	8.234	46.48	1	14.80	3.40	771.93	0.000	1.973	0.000	0.00000	0.000	Circular Pipe
"Tra7"	Transition	2194.64	760.48	774.50	771.676	11.196	46.48	1	6.58	0.67	772.35	0.000	2.221	0.000	0.03000	0.000	Circular Pipe
"L-E2"	Reach	2285.14	763.24	774.82	772.115	8.875	46.48	1	6.58	0.67	772.79	0.000	2.221	0.000	0.03050	1.318	Circular Pipe
"MH-E2"	Junction	2290.14	763.24	774.82	773.117	9.877	23.94	1	3.39	0.18	773.30	0.000	1.577	0.000	0.00000	0.000	Circular Pipe
"L-E1"	Reach	2609.44	764.84	776.48	773.528	8.688	23.94	1	3.39	0.18	773.71	0.000	1.577	0.000	0.00501	1.512	Circular Pipe
"MH-E1"	Junction	2614.44	764.84	776.48	773.538	8.698	23.84	1	3.37	0.18	773.71	0.000	1.573	0.000	0.00000	0.000	Circular Pipe
"L-F1"	Reach	2882.74	766.20	777.56	773.880	7.680	23.84	1	3.37	0.18	774.06	0.000	1.573	0.000	0.00507	1.504	Circular Pipe
"MH-F1"	Junction	2887.74	766.20	777.56	774.051	7.851	17.38	1	2.46	0.09	774.14	0.000	1.333	0.000	0.00000	0.000	Circular Pipe
"L-F2"	Reach	3208.74	768.11	775.69	774.269	6.159	17.38	1	2.46	0.09	774.36	0.000	1.333	0.000	0.00595	1.202	Circular Pipe
"MH-F2"	Junction	3213.74	768.11	775.69	774.450	6.340	3.60	1	0.51	0.00	774.45	0.000	0.592	0.000	0.00000	0.000	Circular Pipe
"Link107"	Transition	3219.74	768.11	775.69	774.438	6.328	3.60	1	1.15	0.02	774.46	0.000	0.664	0.000	0.00000	0.000	Circular Pipe
"L-F3"	Reach	3414.14	770.11	776.70	774.487	4.377	3.60	1	1.15	0.02	774.51	0.000	0.664	0.000	0.01029	0.536	Circular Pipe
"MH-F3"	Junction	3419.14	770.11	776.70	774.491	4.381	3.50	1	1.11	0.02	774.51	0.000	0.654	0.000	0.00000	0.000	Circular Pipe
"L-CBF3"	Reach	3615.64	771.08	777.29	774.538	3.458	3.50	1	1.11	0.02	774.56	0.000	0.654	0.000	0.00494	0.638	Circular Pipe
"MH-CBF3"	Headwrk	3615.64	771.08	777.29	774.538	3.458	3.50	1	1.11	0.02	774.56	0.000	0.654	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

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MH-A8_Branch2
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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																	
"Outlet/M"	Outlet	2188.64	760.30	774.84	768.534	8.234	3.00	1	0.95	0.01	768.55	0.000	0.604	0.000	0.00000	0.000	Circular Pipe
"Tra-DD1"	Transition	2194.64	760.60	774.84	768.535	7.935	3.00	1	0.95	0.01	768.55	0.000	0.604	0.000	0.05000	0.000	Circular Pipe
"L-DD1"	Reach	2249.84	764.51	774.83	768.545	4.035	3.00	1	0.95	0.01	768.56	0.000	0.604	0.000	0.07083	0.304	Circular Pipe
"MH-DD1"	Headwrk	2249.84	764.51	774.83	768.545	4.035	3.00	1	0.95	0.01	768.56	0.000	0.604	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

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MH-A4_Lateral1

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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																	
"Outlet/M"	Outlet	1155.61	752.19	765.92	758.953	6.763	59.65	1	4.75	0.35	759.30	0.000	2.326	0.000	0.00000	0.000	Circular Pipe
"TR6"	Transition	1161.61	752.28	765.92	758.964	6.686	59.65	1	4.75	0.35	759.31	0.000	2.326	0.000	0.01467	0.000	Circular Pipe
	"i.p."	1592.52	755.71	765.26	759.707	4.000	59.65	1	4.75	0.35	760.06	0.000	2.326	0.047	0.00796	1.918	Circular Pipe
	"i.p."	1645.42	756.13	765.18	759.757	3.629	59.65	1	4.98	0.38	760.14	0.000	2.326	0.386	0.00796	1.918	Circular Pipe
	"i.p."	1673.08	756.35	765.14	759.762	3.414	59.65	1	5.22	0.42	760.18	0.000	2.326	0.458	0.00796	1.918	Circular Pipe
	"i.p."	1694.68	756.52	765.10	759.756	3.236	59.65	1	5.48	0.47	760.22	0.000	2.326	0.519	0.00796	1.918	Circular Pipe
	"i.p."	1712.55	756.66	765.08	759.742	3.081	59.65	1	5.74	0.51	760.25	0.000	2.326	0.576	0.00796	1.918	Circular Pipe
	"i.p."	1727.63	756.78	765.05	759.722	2.941	59.65	1	6.02	0.56	760.29	0.000	2.326	0.634	0.00796	1.918	Circular Pipe
	"i.p."	1740.34	756.88	765.03	759.695	2.812	59.65	1	6.32	0.62	760.32	0.000	2.326	0.693	0.00796	1.918	Circular Pipe
	"i.p."	1750.87	756.97	765.02	759.660	2.694	59.65	1	6.63	0.68	760.34	0.000	2.326	0.754	0.00796	1.918	Circular Pipe
	"i.p."	1759.24	757.03	765.01	759.617	2.583	59.65	1	6.95	0.75	760.37	0.000	2.326	0.818	0.00796	1.918	Circular Pipe
"Link62"	Reach	1762.61	757.06	765.00	759.590	2.530	59.65	1	7.12	0.79	760.38	0.000	2.326	0.851	0.00796	1.918	Circular Pipe
"MH-D1"	Junction	1767.61	757.06	765.00	760.410	3.350	43.58	1	3.88	0.23	760.64	0.000	1.974	0.000	0.00000	0.000	Circular Pipe
HYDRAULIC JUMP at 1890.95 of length 0.03																	
	"i.p."	1790.57	757.23	765.18	760.408	3.181	43.58	1	4.07	0.26	760.66	0.000	1.974	0.393	0.00727	1.648	Circular Pipe
	"i.p."	1810.43	757.37	765.33	760.403	3.031	43.58	1	4.27	0.28	760.69	0.000	1.974	0.435	0.00727	1.648	Circular Pipe
	"i.p."	1827.96	757.50	765.47	760.394	2.896	43.58	1	4.47	0.31	760.71	0.000	1.974	0.478	0.00727	1.648	Circular Pipe
	"i.p."	1843.58	757.61	765.59	760.383	2.771	43.58	1	4.69	0.34	760.73	0.000	1.974	0.521	0.00727	1.648	Circular Pipe
	"i.p."	1857.54	757.71	765.70	760.369	2.655	43.58	1	4.92	0.38	760.75	0.000	1.974	0.567	0.00727	1.648	Circular Pipe
	"i.p."	1869.98	757.80	765.80	760.352	2.547	43.58	1	5.16	0.41	760.77	0.000	1.974	0.614	0.00727	1.648	Circular Pipe
	"i.p."	1880.99	757.88	765.88	760.330	2.446	43.58	1	5.41	0.45	760.79	0.000	1.974	0.664	0.00727	1.648	Circular Pipe
	"i.p."	1890.58	757.95	765.96	760.304	2.350	43.58	1	5.68	0.50	760.80	0.000	1.974	0.717	0.00727	1.648	Circular Pipe
	"i.p."	1890.95	757.96	765.96	760.303	2.346	43.58	1	5.69	0.50	760.81	0.000	1.974	0.719	0.00727	1.648	Circular Pipe
	"i.p."	1890.95	757.96	765.96	759.605	1.648	43.58	1	8.92	1.24	760.84	0.000	1.974	1.412	0.00727	1.648	Circular Pipe
	"i.p."	1979.16	758.60	766.65	760.247	1.648	43.58	1	8.92	1.24	761.48	0.000	1.974	1.412	0.00727	1.648	Circular Pipe
	"i.p."	2097.19	759.46	767.57	761.161	1.704	43.58	1	8.54	1.13	762.29	0.000	1.974	1.325	0.00727	1.648	Circular Pipe
	"i.p."	2130.21	759.70	767.83	761.464	1.767	43.58	1	8.14	1.03	762.49	0.000	1.974	1.236	0.00727	1.648	Circular Pipe
	"i.p."	2144.55	759.80	767.94	761.634	1.832	43.58	1	7.76	0.94	762.57	0.000	1.974	1.153	0.00727	1.648	Circular Pipe
	"i.p."	2150.89	759.85	767.99	761.749	1.901	43.58	1	7.40	0.85	762.60	0.000	1.974	1.074	0.00727	1.648	Circular Pipe
"L-D2"	Reach	2152.61	759.86	768.00	761.833	1.973	43.58	1	7.06	0.77	762.61	0.000	1.974	1.001	0.00727	1.648	Circular Pipe
"MH-D2"	Headwrk	2152.61	759.86	768.00	761.834	1.974	43.58	1	7.05	0.77	762.61	0.000	1.974	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

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MH-A6_Branch1

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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																	
"Outlet/M"	Outlet	1506.48	755.38	769.22	761.920	6.540	24.64	1	7.84	0.96	762.87	0.000	1.752	0.000	0.00000	0.000	Circular Pipe
"Link101"	Transition	1512.48	755.49	769.22	761.991	6.503	24.64	1	7.84	0.96	762.95	0.000	1.752	0.000	0.01800	0.000	Circular Pipe
"Link71"	Reach	1561.88	758.57	769.64	762.577	4.007	24.64	1	7.84	0.96	763.53	0.000	1.752	0.000	0.06239	0.924	Circular Pipe
"MH-B1"	Junction	1566.88	758.57	769.64	763.779	5.209	15.43	1	4.91	0.37	764.15	0.000	1.416	0.000	0.00000	0.000	Circular Pipe
"L-B2"	Reach	1818.58	759.67	771.19	764.950	5.280	15.43	1	4.91	0.37	765.32	0.000	1.416	0.000	0.00437	1.703	Circular Pipe
"MH-B2"	Junction	1823.58	759.67	771.19	765.675	6.005	3.41	1	1.09	0.02	765.69	0.000	0.646	0.000	0.00000	0.000	Circular Pipe
"L-B3"	Reach	2103.78	761.38	772.93	765.739	4.359	3.41	1	1.09	0.02	765.76	0.000	0.646	0.000	0.00610	0.595	Circular Pipe
"MH-B3"	Junction	2108.78	761.38	772.93	765.764	4.384	2.00	1	0.64	0.01	765.77	0.000	0.491	0.000	0.00000	0.000	Circular Pipe
	"i.p."	2589.09	763.80	777.65	765.801	2.000	2.00	1	0.64	0.01	765.81	0.000	0.491	0.011	0.00504	0.477	Circular Pipe
	"i.p."	2626.25	763.99	778.01	765.803	1.815	2.00	1	0.67	0.01	765.81	0.000	0.491	0.073	0.00504	0.477	Circular Pipe
	"i.p."	2647.77	764.10	778.22	765.804	1.707	2.00	1	0.70	0.01	765.81	0.000	0.491	0.087	0.00504	0.477	Circular Pipe
"L-B4"	Reach	2648.38	764.10	778.23	765.804	1.704	2.00	1	0.70	0.01	765.81	0.000	0.491	0.087	0.00504	0.477	Circular Pipe
"MH-B4"	Headwrk	2648.38	764.10	778.23	765.804	1.704	2.00	1	0.70	0.01	765.81	0.000	0.491	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

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MH-A6_Branch2
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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																	
"Outlet/M"	Outlet	1506.48	755.38	769.22	761.920	6.540	21.65	1	6.89	0.74	762.66	0.000	1.664	0.000	0.00000	0.000	Circular Pipe
"Link102"	Transition	1512.48	755.99	769.22	761.975	5.983	21.65	1	6.89	0.74	762.71	0.000	1.664	0.000	0.10200	0.000	Circular Pipe
"L-C4"	Reach	1560.91	758.07	769.27	762.418	4.348	21.65	1	6.89	0.74	763.16	0.000	1.664	0.000	0.04291	0.955	Circular Pipe
"MH-C4"	Junction	1565.91	758.07	769.27	762.477	4.407	21.55	1	6.86	0.73	763.21	0.000	1.660	0.000	0.00000	0.000	Circular Pipe
"L-C3"	Reach	1900.91	759.67	770.99	765.517	5.847	21.55	1	6.86	0.73	766.25	0.000	1.660	0.000	0.00478	2.000	Circular Pipe
"MH-C3"	Junction	1905.91	759.67	770.99	765.576	5.906	21.45	1	6.83	0.72	766.30	0.000	1.657	0.000	0.00000	0.000	Circular Pipe
"L-C2"	Reach	2317.81	761.69	773.07	769.279	7.589	21.45	1	6.83	0.72	770.00	0.000	1.657	0.000	0.00490	2.000	Circular Pipe
"MH-C2"	Junction	2322.81	761.69	773.07	770.671	8.981	5.03	1	1.60	0.04	770.71	0.000	0.790	0.000	0.00000	0.000	Circular Pipe
"L-CB1"	Reach	2975.71	765.03	776.06	770.994	5.964	5.03	1	1.60	0.04	771.03	0.000	0.790	0.000	0.00512	0.766	Circular Pipe
"CB-C1"	Headwrk	2975.71	765.03	776.06	770.994	5.964	5.03	1	0.71	0.01	771.00	0.000	0.790	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

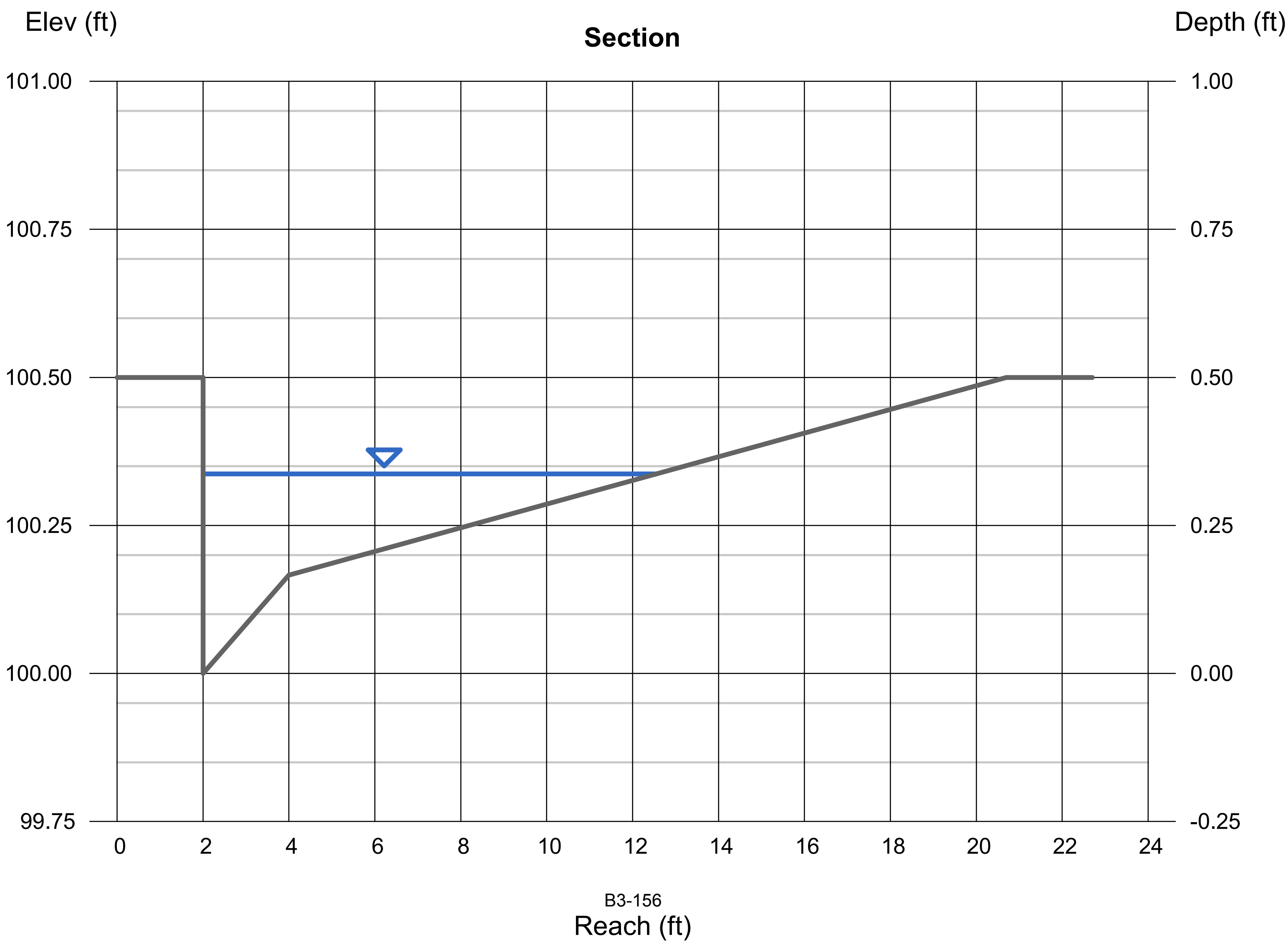
ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	DEPTH	Q	BARREL	AREA	VELOC.	NORMAL DEPTH	CRITICAL DEPTH	SLOPE
"MH-A0"	Outlet U/S		no computation									
"Link46"	Reach D/S		no computation									
"Link46"	Reach U/S		no computation									
"MH-A1"	JunctioD/S	196.0	743.40	757.26	4.026	198.53	1	15.012	13.23	0.000	4.026	0.00000
"MH-A1"	JunctioU/S	201.0	743.40	757.26	4.286	198.43	1	15.628	12.70	0.000	4.025	0.00000
"Link45"	Reach D/S	201.0	743.40	757.26	4.286	198.43	1	15.628	12.70	3.940	4.025	0.00922
	"i.p."	359.4	744.86	758.78	4.025	198.43	1	15.009	13.22	3.940	4.025	0.00922
"Link45"	Reach U/S	801.0	748.93	763.00	4.025	198.43	1	15.009	13.22	3.940	4.025	0.00922
"MH-A11"	JunctioD/S	801.0	748.93	763.00	4.025	198.43	1	15.009	13.22	0.000	4.025	0.00000
"MH-A11"	JunctioU/S	806.0	748.93	763.00	4.595	193.86	1	15.904	12.19	0.000	3.993	0.00000
"Link44"	Reach D/S	806.0	748.93	763.00	4.595	193.86	1	15.904	12.19	3.868	3.993	0.00901
"Link44"	Reach U/S	1369.0	754.00	765.00	4.997	193.86	1	15.904	12.19	3.868	3.993	0.00901
"MH-A12"	Join D/S	1369.0	754.00	765.00	4.997	193.86	1	15.904	12.19	0.000	3.993	0.00000
"MH-A12"	Join U/S	1374.0	754.00	765.00	7.435	134.21	1	15.904	8.44	0.000	3.408	0.00000
"Link43"	Reach D/S	1374.0	754.00	765.00	7.435	134.21	1	15.904	8.44	2.764	3.408	0.00961
"Link43"	Reach U/S	1514.5	755.35	769.22	6.740	134.21	1	15.904	8.44	2.764	3.408	0.00961
"MH-A2"	Join D/S	1514.5	755.35	769.22	6.740	134.21	1	15.904	8.44	0.000	3.408	0.00000
"MH-A2"	Join U/S	1519.5	755.35	769.22	8.495	61.90	1	15.904	3.89	0.000	2.287	0.00000
"Tra5"	TransitD/S	1519.5	755.35	769.22	8.495	61.90	1	15.904	3.89	0.000	2.287	0.05000
"Tra5"	TransitU/S	1525.5	755.65	774.54	7.459	61.90	1	7.069	8.76	0.000	2.535	0.05000
"Node78"	JunctioD/S	1525.5	755.65	774.54	7.459	61.90	1	7.069	8.76	0.000	2.535	0.93000
"Node78"	JunctioU/S	1530.5	760.30	774.54	3.710	49.38	1	7.069	6.99	0.000	2.287	0.93000
"Link60"	Reach D/S	1530.5	760.30	774.54	3.710	49.38	1	7.069	6.99	3.000	2.287	0.00000
"Link60"	Reach U/S	2164.2	760.30	774.54	7.184	49.38	1	7.069	6.99	3.000	2.287	0.00000
"MH-A3"	Join D/S	2164.2	760.30	774.54	7.184	49.38	1	7.069	6.99	0.000	2.287	0.00000
"MH-A3"	Join U/S	2169.2	760.30	774.50	8.708	3.00	1	7.069	0.42	0.000	0.539	0.00000
"Tra3"	TransitD/S	2169.2	760.30	774.50	8.708	3.00	1	7.069	0.42	0.000	0.539	0.02100
"Tra3"	TransitU/S	2175.2	760.43	774.54	8.573	3.00	1	3.142	0.95	0.000	0.604	0.02100
"L-CBA9"	Reach D/S	2175.2	760.43	774.54	8.573	3.00	1	3.142	0.95	0.393	0.604	0.02473
	"i.p."	2442.9	767.05	776.83	2.000	3.00	1	3.142	0.95	0.393	0.604	0.02473
	"i.p."	2450.4	767.23	776.90	1.815	3.00	1	2.995	1.00	0.393	0.604	0.02473
	"i.p."	2454.7	767.34	776.93	1.707	3.00	1	2.856	1.05	0.393	0.604	0.02473
	"i.p."	2458.3	767.43	776.97	1.618	3.00	1	2.723	1.10	0.393	0.604	0.02473
	"i.p."	2461.4	767.50	776.99	1.540	3.00	1	2.596	1.16	0.393	0.604	0.02473
	"i.p."	2464.1	767.57	777.02	1.470	3.00	1	2.476	1.21	0.393	0.604	0.02473
	"i.p."	2466.7	767.63	777.04	1.406	3.00	1	2.360	1.27	0.393	0.604	0.02473
	"i.p."	2469.0	767.69	777.06	1.347	3.00	1	2.250	1.33	0.393	0.604	0.02473
	"i.p."	2471.1	767.74	777.08	1.292	3.00	1	2.146	1.40	0.393	0.604	0.02473
	"i.p."	2473.1	767.79	777.09	1.240	3.00	1	2.046	1.47	0.393	0.604	0.02473
	"i.p."	2475.0	767.84	777.11	1.191	3.00	1	1.951	1.54	0.393	0.604	0.02473
	"i.p."	2476.7	767.88	777.12	1.145	3.00	1	1.860	1.61	0.393	0.604	0.02473
	"i.p."	2478.4	767.92	777.14	1.101	3.00	1	1.773	1.69	0.393	0.604	0.02473
	"i.p."	2479.9	767.96	777.15	1.060	3.00	1	1.691	1.77	0.393	0.604	0.02473
	"i.p."	2481.3	768.00	777.16	1.021	3.00	1	1.612	1.86	0.393	0.604	0.02473
	"i.p."	2482.7	768.03	777.17	0.983	3.00	1	1.537	1.95	0.393	0.604	0.02473
	"i.p."	2483.9	768.06	777.18	0.947	3.00	1	1.466	2.05	0.393	0.604	0.02473
	"i.p."	2485.1	768.09	777.19	0.913	3.00	1	1.397	2.15	0.393	0.604	0.02473
	"i.p."	2486.2	768.12	777.20	0.880	3.00	1	1.332	2.25	0.393	0.604	0.02473
	"i.p."	2487.1	768.14	777.21	0.849	3.00	1	1.270	2.36	0.393	0.604	0.02473
	"i.p."	2488.1	768.16	777.22	0.819	3.00	1	1.211	2.48	0.393	0.604	0.02473
	"i.p."	2488.9	768.18	777.23	0.791	3.00	1	1.155	2.60	0.393	0.604	0.02473
	"i.p."	2489.6	768.20	777.23	0.763	3.00	1	1.101	2.72	0.393	0.604	0.02473
	"i.p."	2490.3	768.22	777.24	0.736	3.00	1	1.050	2.86	0.393	0.604	0.02473
	"i.p."	2490.8	768.23	777.24	0.711	3.00	1	1.001	3.00	0.393	0.604	0.02473
	"i.p."	2491.3	768.24	777.25	0.687	3.00	1	0.954	3.14	0.393	0.604	0.02473
	"i.p."	2491.7	768.25	777.25	0.663	3.00	1	0.910	3.30	0.393	0.604	0.02473
	"i.p."	2492.0	768.26	777.25	0.641	3.00	1	0.868	3.46	0.393	0.604	0.02473
	"i.p."	2492.1	768.26	777.26	0.619	3.00	1	0.827	3.63	0.393	0.604	0.02473

B.2 – STREET CAPACITY CALCULATIONS

Channel Report

R1 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.34
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.360
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.24
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.10
Slope (%)	= 0.10	Wetted Perim (ft)	= 10.90
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.29
		Spread Width (ft)	= 10.55
Calculations		EGL (ft)	= 0.36
Compute by:	Known Q		
Known Q (cfs)	= 1.36		

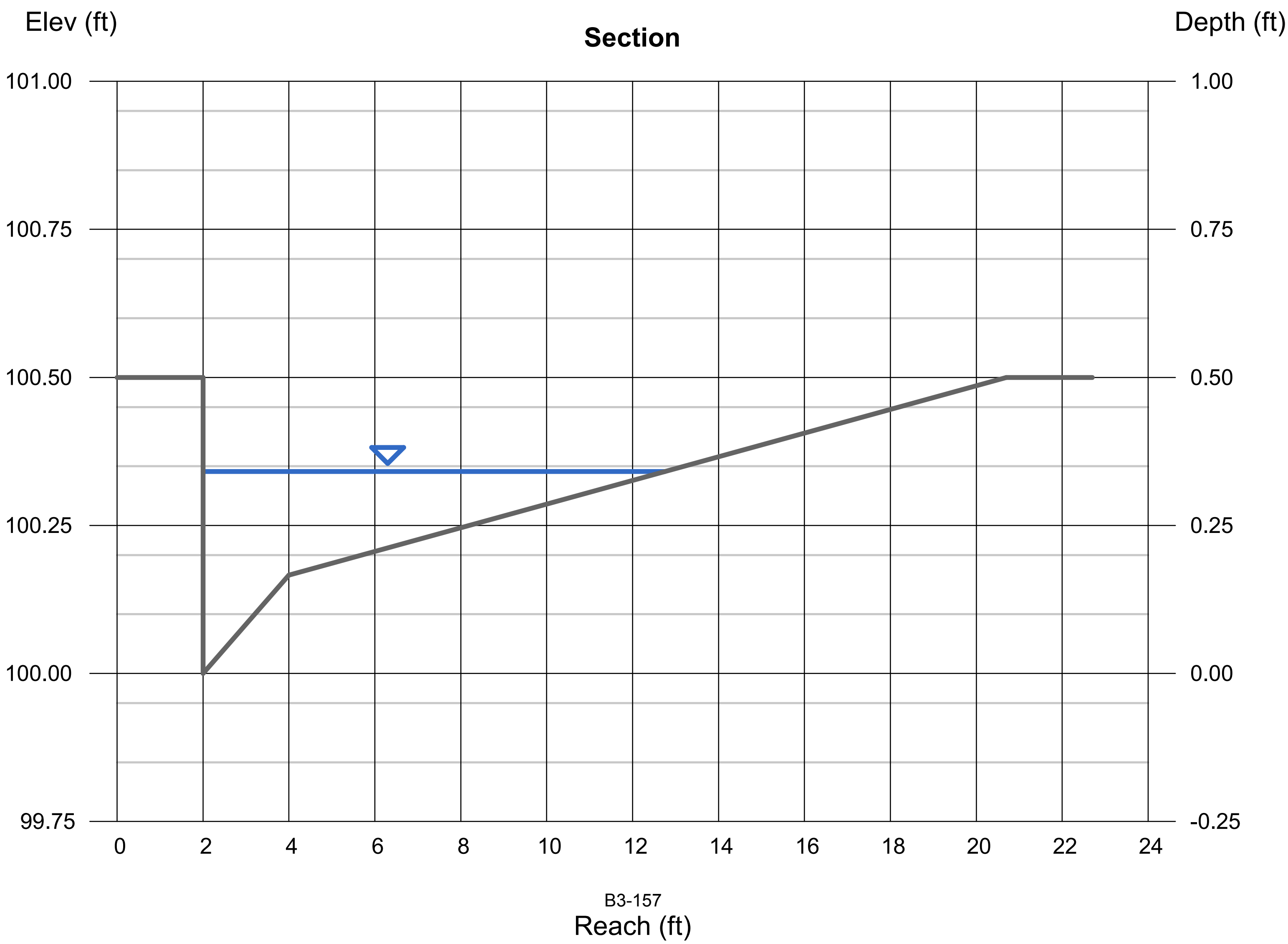


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V1 DA Street Capacity 10-YEAR

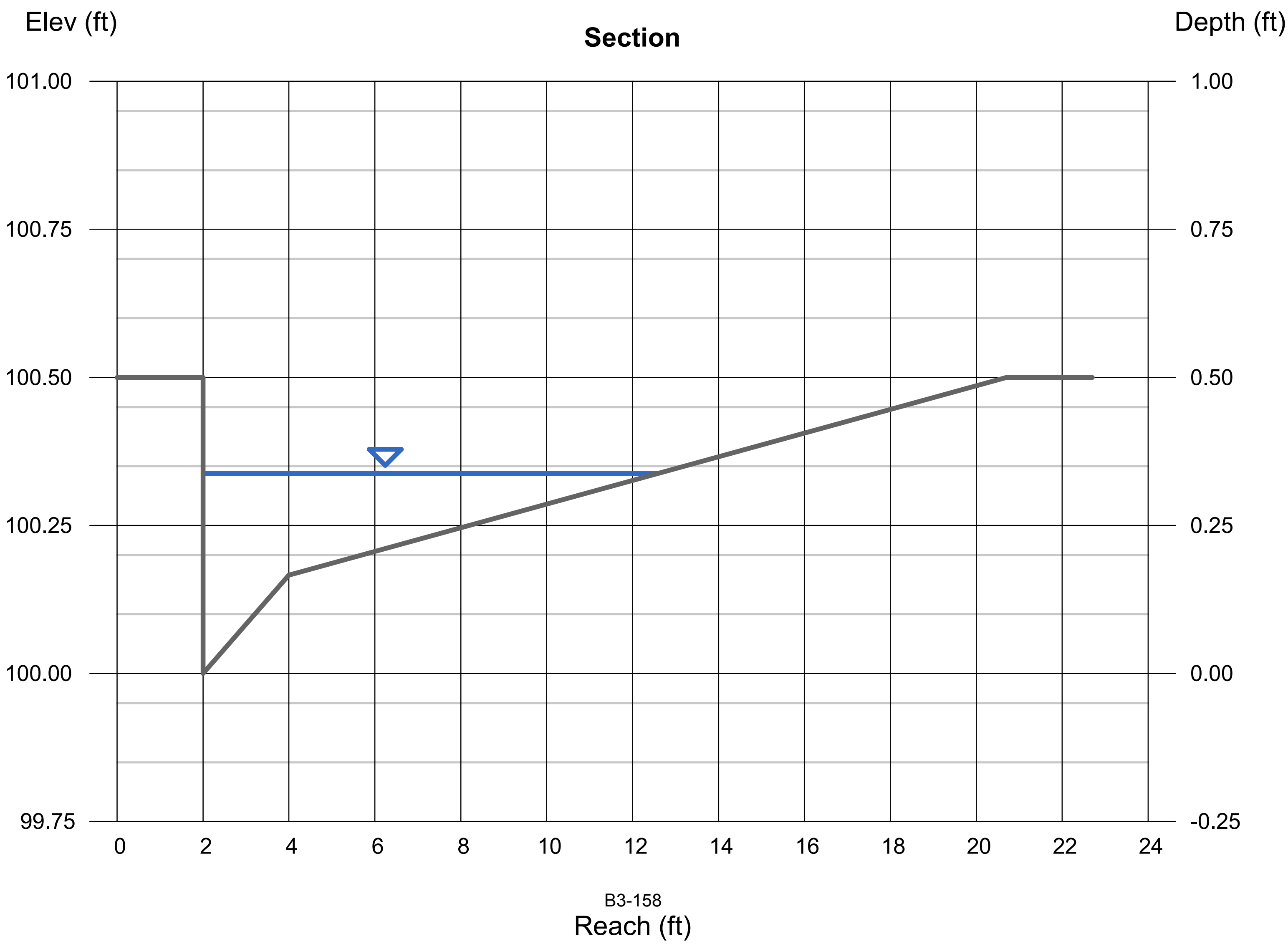
Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.34
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.420
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.11
Slope (%)	= 0.10	Wetted Perim (ft)	= 11.10
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.30
		Spread Width (ft)	= 10.75
Calculations		EGL (ft)	= 0.36
Compute by:	Known Q		
Known Q (cfs)	= 1.42		



Channel Report

V2 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.34
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.370
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.25
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.10
Slope (%)	= 0.10	Wetted Perim (ft)	= 10.95
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.29
		Spread Width (ft)	= 10.60
Calculations		EGL (ft)	= 0.36
Compute by:	Known Q		
Known Q (cfs)	= 1.37		



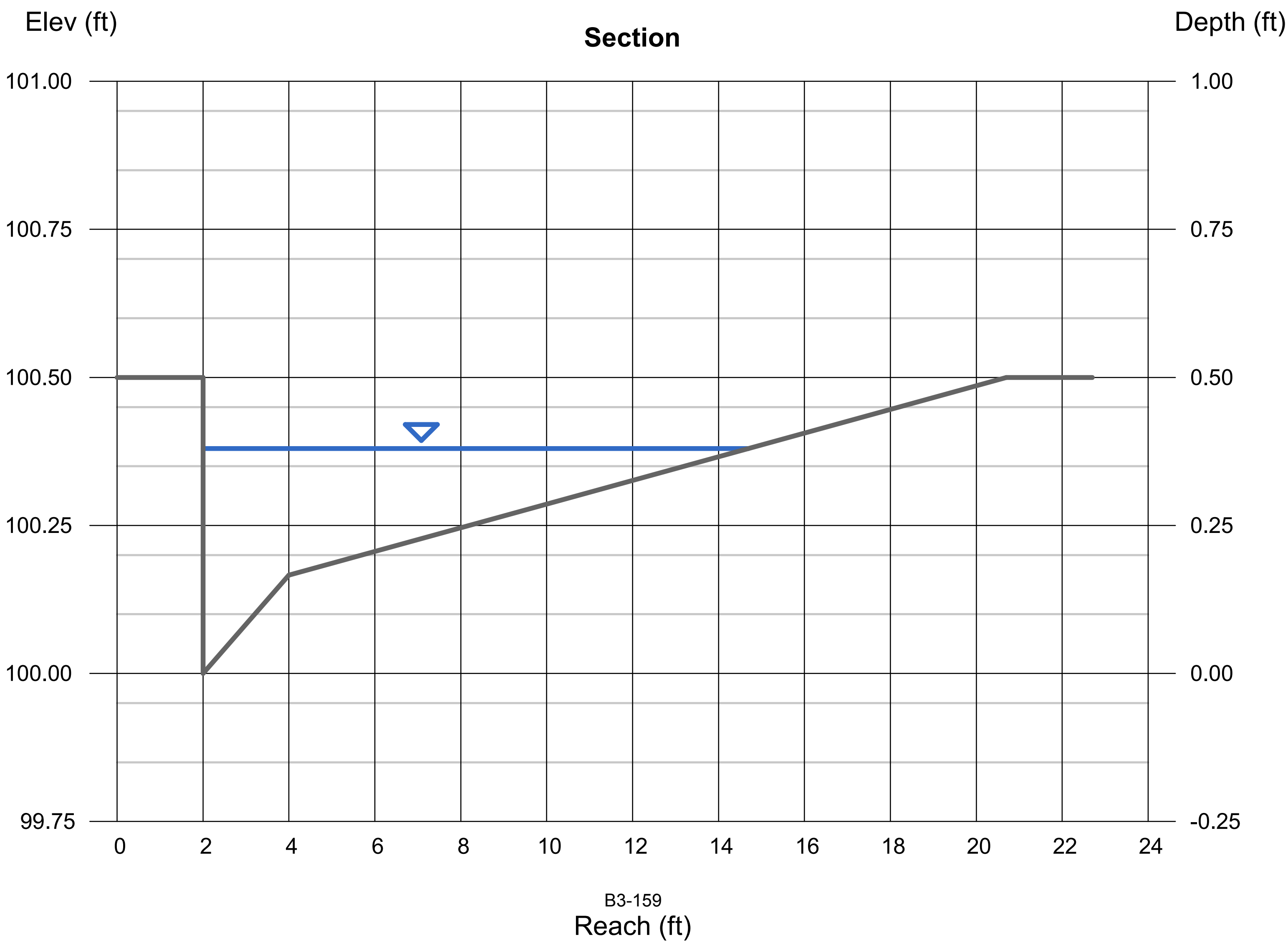
Channel Report

V3 DA Street Capacity 10-YEAR

Gutter
Cross Sl, Sx (ft/ft) = 0.020
Cross Sl, Sw (ft/ft) = 0.083
Gutter Width (ft) = 2.00
Invert Elev (ft) = 100.00
Slope (%) = 0.10
N-Value = 0.013

Calculations
Compute by: Known Q
Known Q (cfs) = 2.08

Highlighted
Depth (ft) = 0.38
Q (cfs) = 2.080
Area (sqft) = 1.74
Velocity (ft/s) = 1.20
Wetted Perim (ft) = 13.09
Crit Depth, Yc (ft) = 0.33
Spread Width (ft) = 12.70
EGL (ft) = 0.40



Channel Report

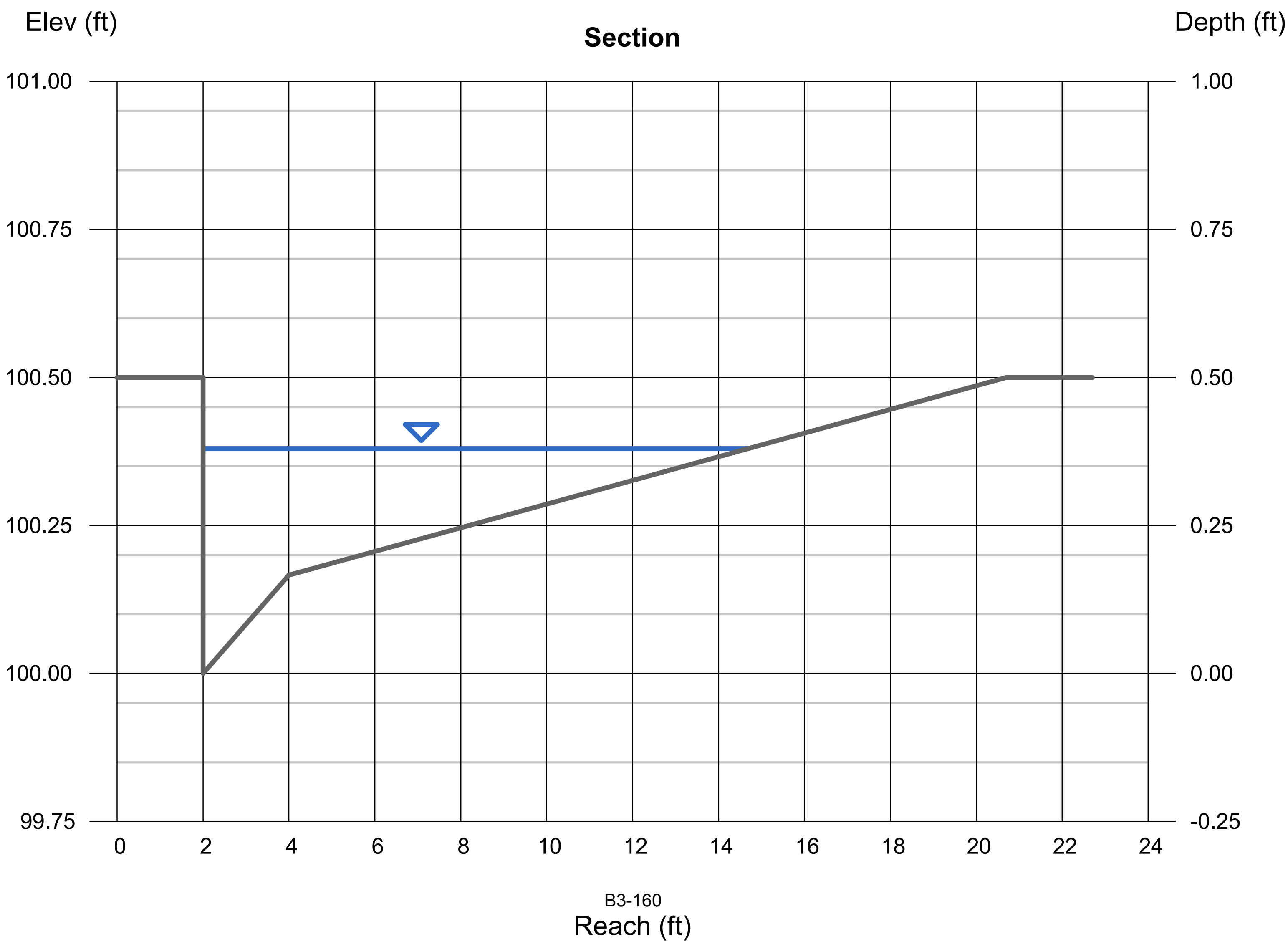
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

V4 DA Street Capacity 10-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.38
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.080
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.74
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.20
Slope (%)	= 0.10	Wetted Perim (ft)	= 13.09
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.33
		Spread Width (ft)	= 12.70
		EGL (ft)	= 0.40

Calculations

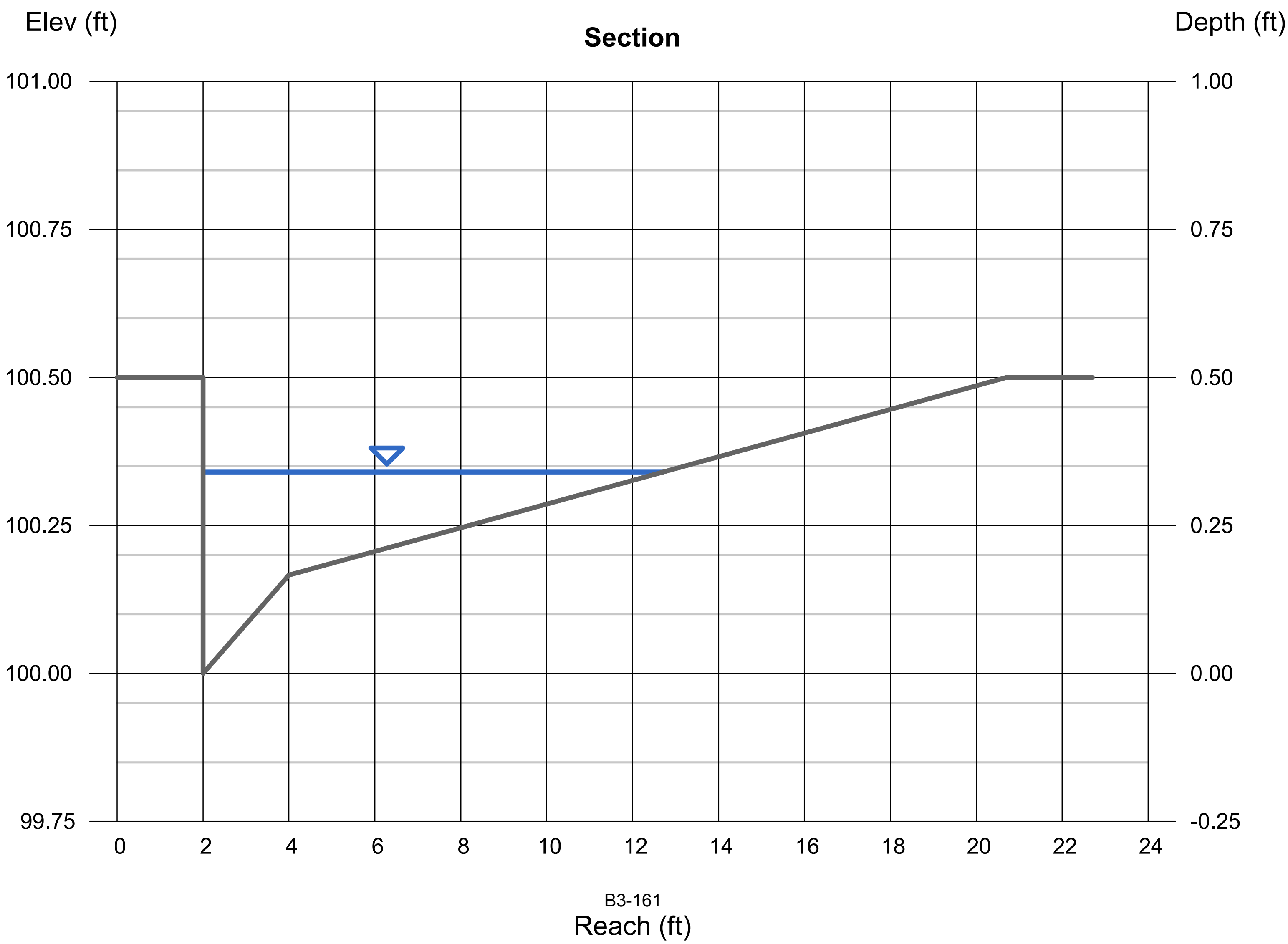
Compute by:	Known Q
Known Q (cfs)	= 2.08



Channel Report

V5 DA Street Capacity 10-YEAR

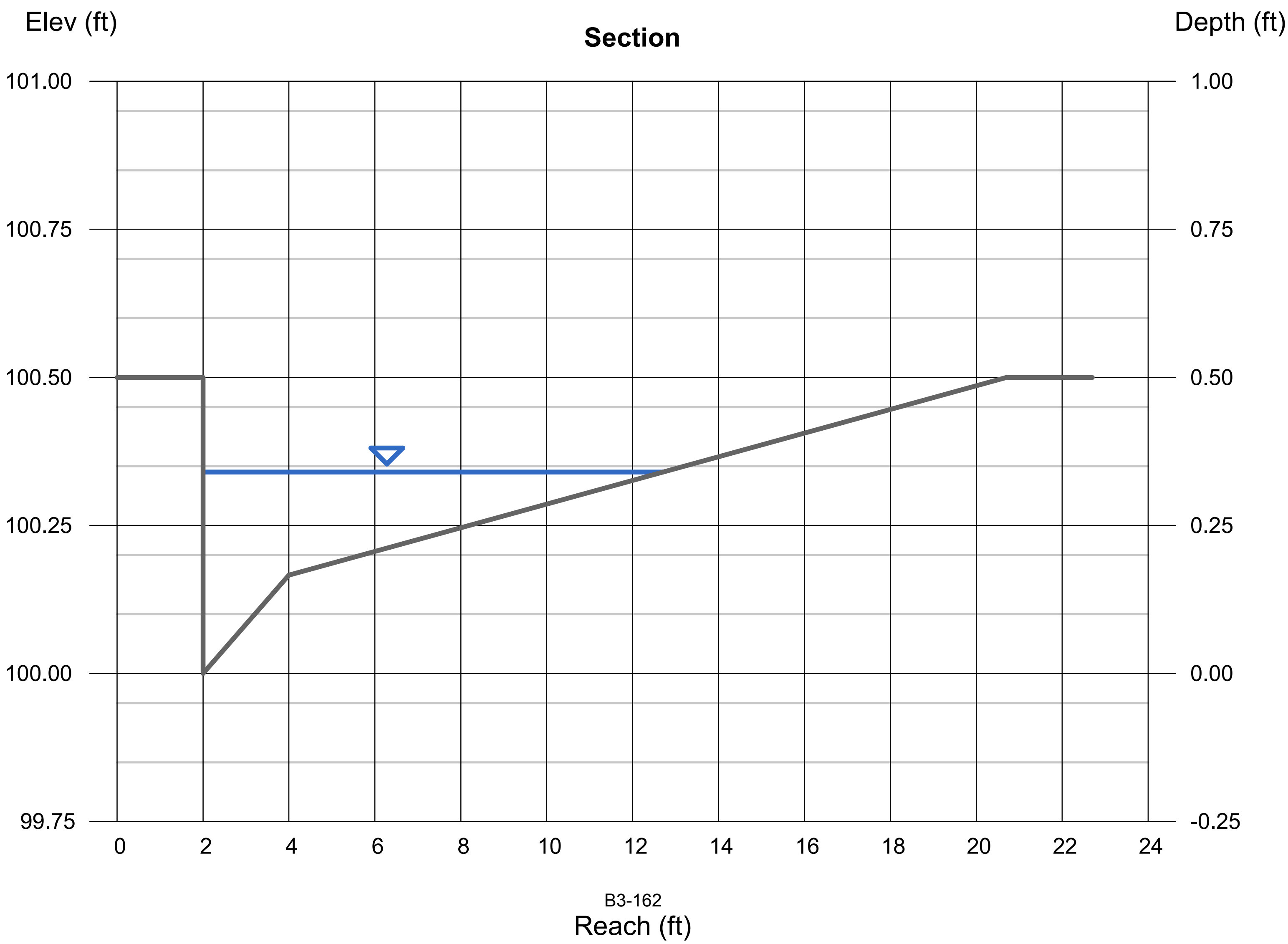
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.34
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.400
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.27
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.10
Slope (%)	= 0.10	Wetted Perim (ft)	= 11.05
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.29
		Spread Width (ft)	= 10.70
Calculations		EGL (ft)	= 0.36
Compute by:	Known Q		
Known Q (cfs)	= 1.40		



Channel Report

V6 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.34
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.400
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.27
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.10
Slope (%)	= 0.10	Wetted Perim (ft)	= 11.05
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.29
		Spread Width (ft)	= 10.70
Calculations		EGL (ft)	= 0.36
Compute by:	Known Q		
Known Q (cfs)	= 1.40		



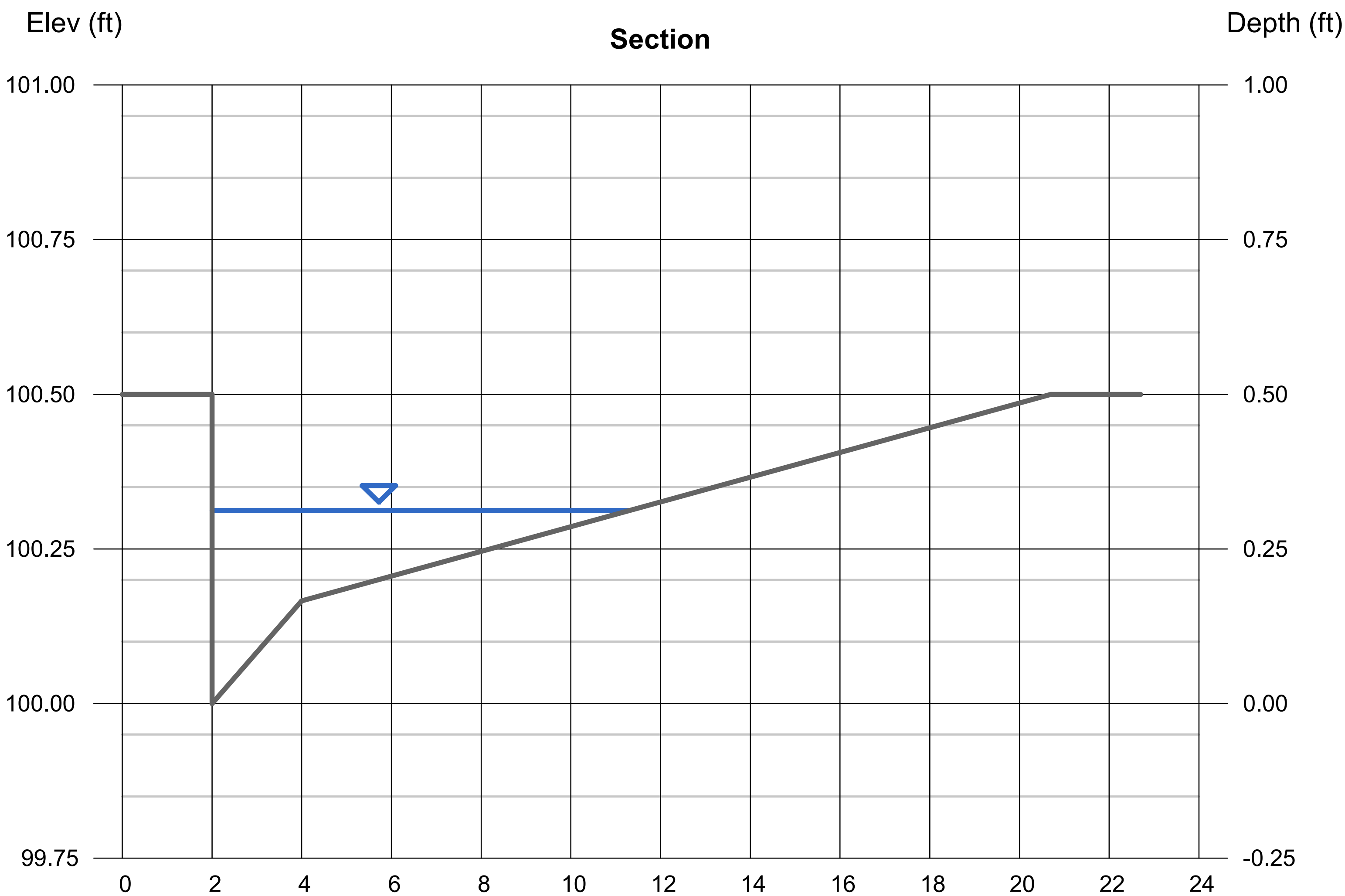
Channel Report

V7 DA Street Capacity 10-YEAR

Gutter	
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.10
N-Value	= 0.013

Calculations	
Compute by:	Known Q
Known Q (cfs)	= 1.03

Highlighted	
Depth (ft)	= 0.31
Q (cfs)	= 1.030
Area (sqft)	= 0.99
Velocity (ft/s)	= 1.04
Wetted Perim (ft)	= 9.62
Crit Depth, Yc (ft)	= 0.27
Spread Width (ft)	= 9.30
EGL (ft)	= 0.33



Reach (ft)

Channel Report

V8 DA Street Capacity 10-YEAR

Gutter

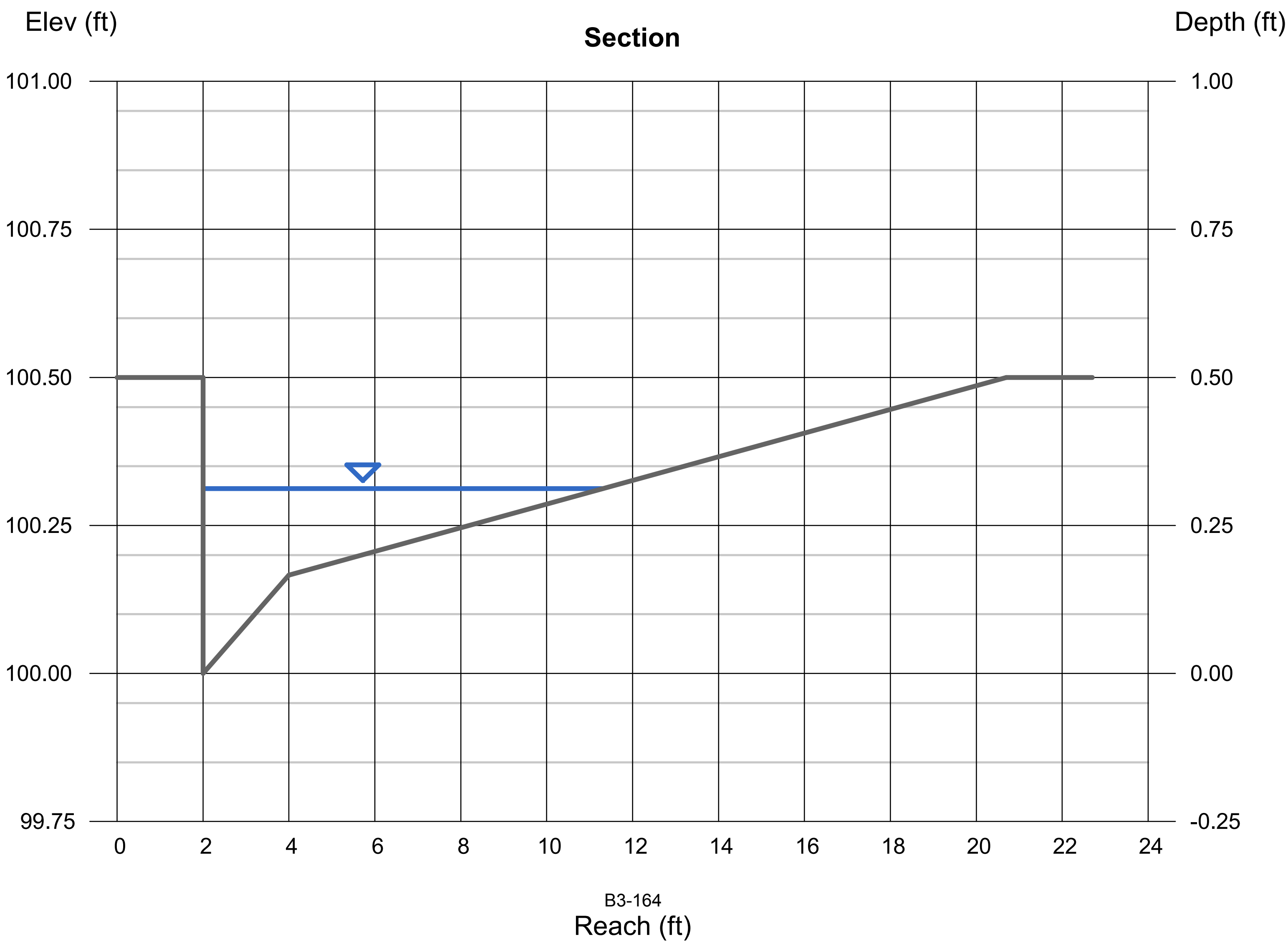
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.10
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.03

Highlighted

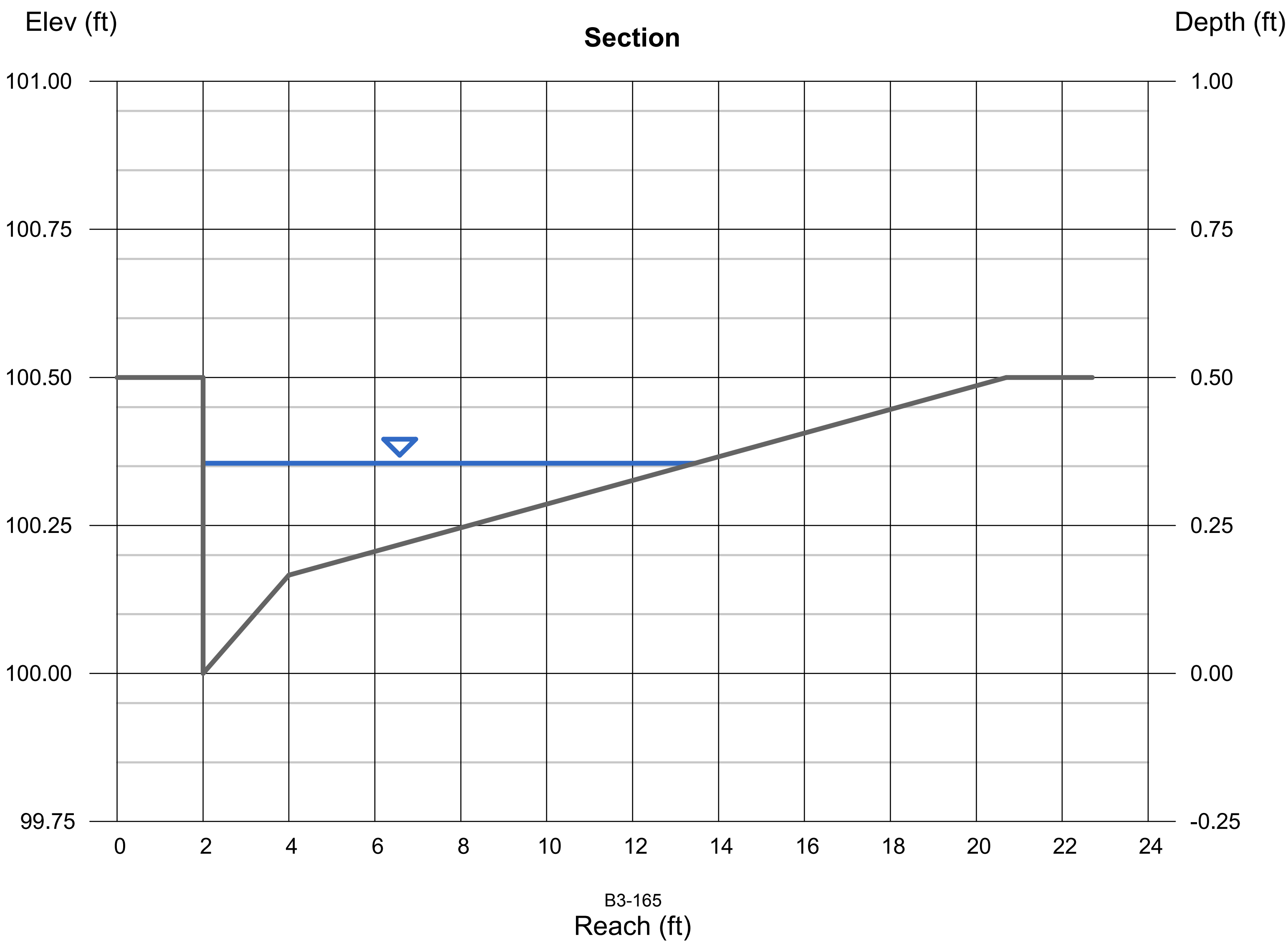
Depth (ft)	= 0.31
Q (cfs)	= 1.030
Area (sqft)	= 0.99
Velocity (ft/s)	= 1.04
Wetted Perim (ft)	= 9.62
Crit Depth, Yc (ft)	= 0.27
Spread Width (ft)	= 9.30
EGL (ft)	= 0.33



Channel Report

R2 DA Street Capacity 10-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.35
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 3.270
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.44
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.28
Slope (%)	= 0.40	Wetted Perim (ft)	= 11.81
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.37
		Spread Width (ft)	= 11.45
Calculations		EGL (ft)	= 0.44
Compute by:	Known Q		
Known Q (cfs)	= 3.27		



Channel Report

F3 DA Street Capacity 10-YEAR

Gutter

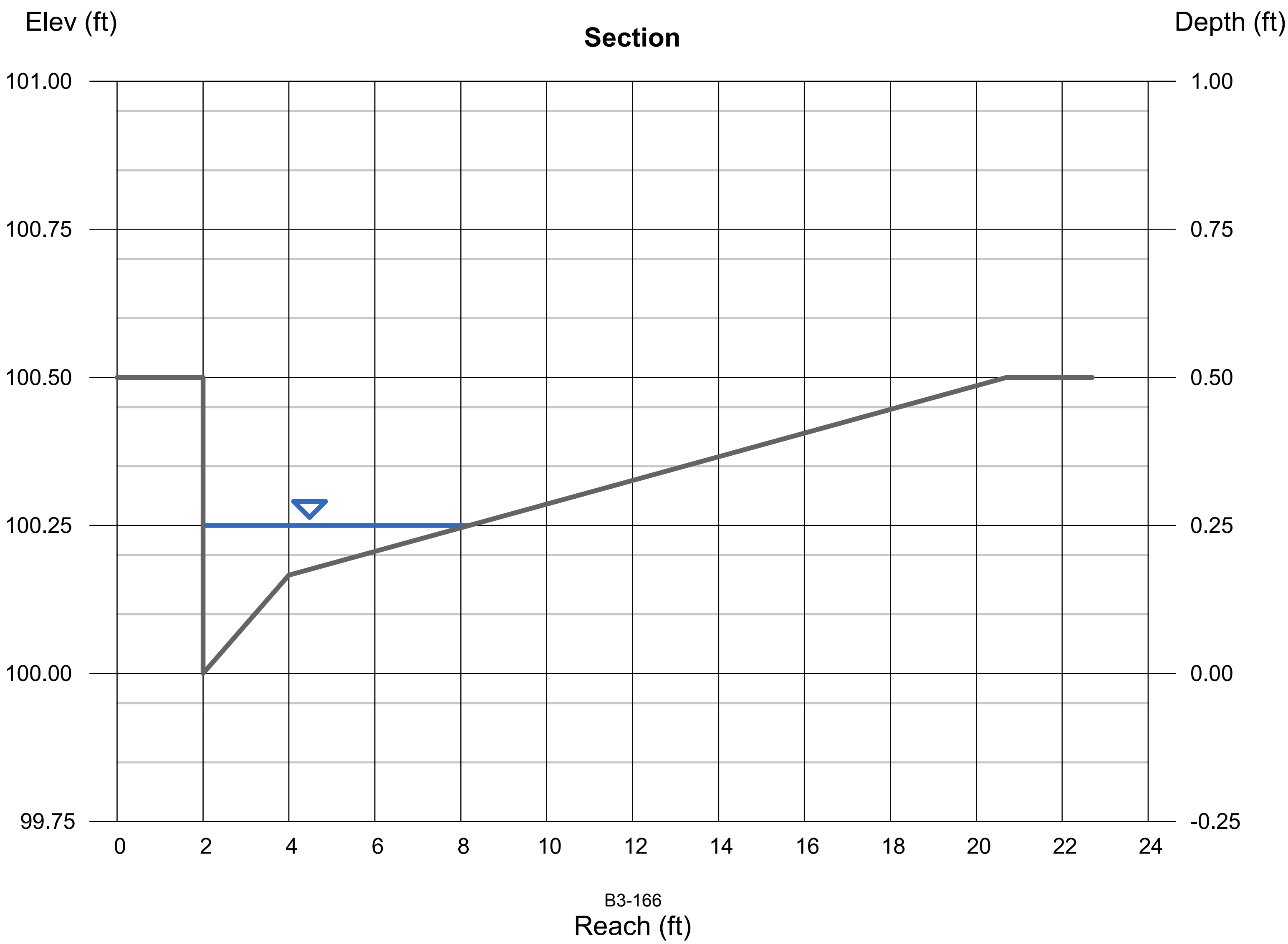
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.50

Highlighted

Depth (ft)	= 0.25
Q (cfs)	= 1.500
Area (sqft)	= 0.51
Velocity (ft/s)	= 2.94
Wetted Perim (ft)	= 6.46
Crit Depth, Yc (ft)	= 0.30
Spread Width (ft)	= 6.20
EGL (ft)	= 0.38



Channel Report

C6 DA Street Capacity 10-YEAR

Gutter

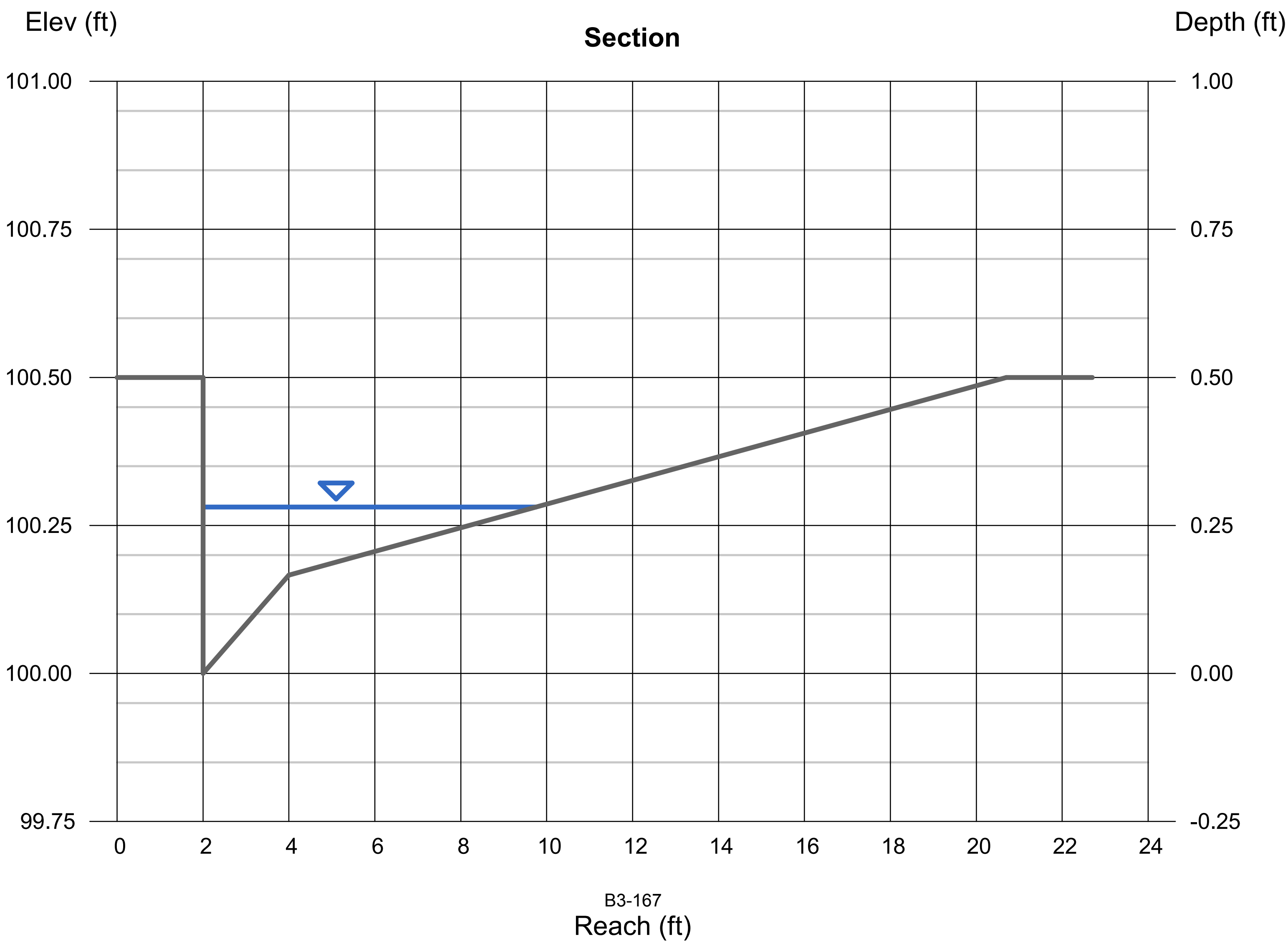
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.30
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.23

Highlighted

Depth (ft)	= 0.28
Q (cfs)	= 1.230
Area (sqft)	= 0.73
Velocity (ft/s)	= 1.69
Wetted Perim (ft)	= 8.04
Crit Depth, Yc (ft)	= 0.28
Spread Width (ft)	= 7.75
EGL (ft)	= 0.33



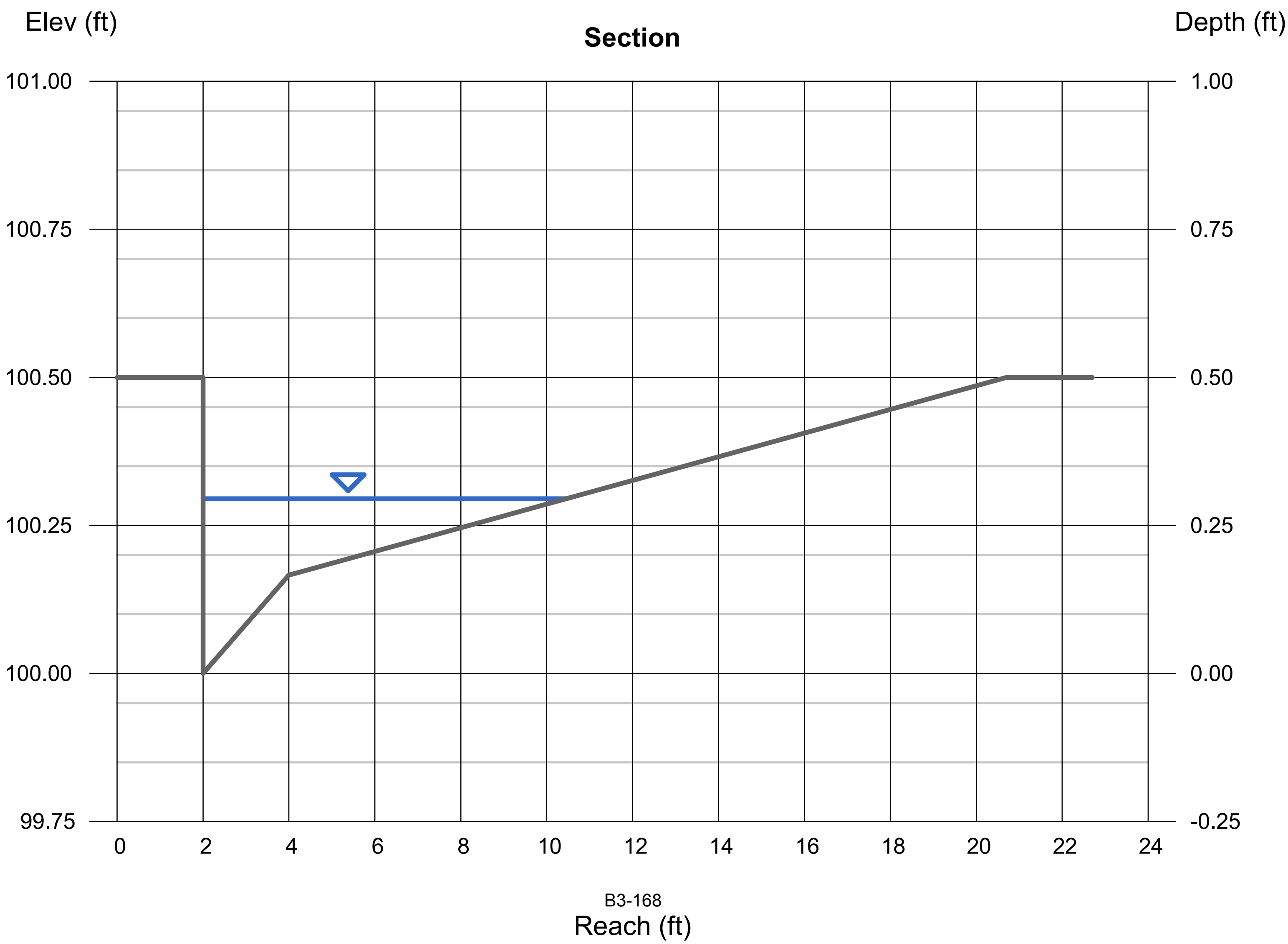
Channel Report

C5 DA Street Capacity 10-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.29
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.190
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.84
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.42
Slope (%)	= 0.20	Wetted Perim (ft)	= 8.75
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.28
		Spread Width (ft)	= 8.45
		EGL (ft)	= 0.33

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.19



Channel Report

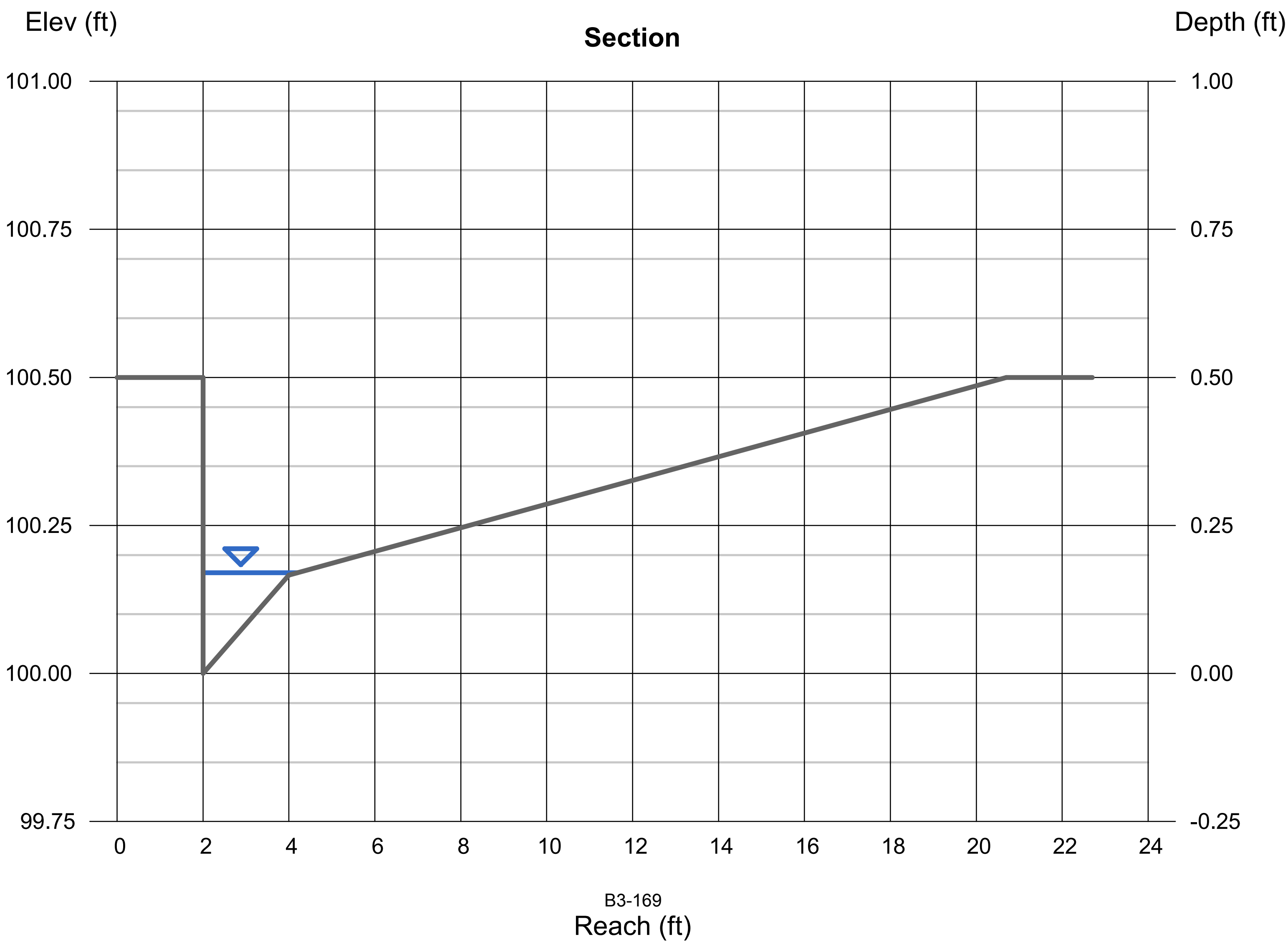
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

F1 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.17
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.320
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.17
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.83
Slope (%)	= 0.50	Wetted Perim (ft)	= 2.38
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.19
		Spread Width (ft)	= 2.20
		EGL (ft)	= 0.22

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.32



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. — Friday, May 17 2024

F2 DA Street Capacity 10-YEAR

Gutter

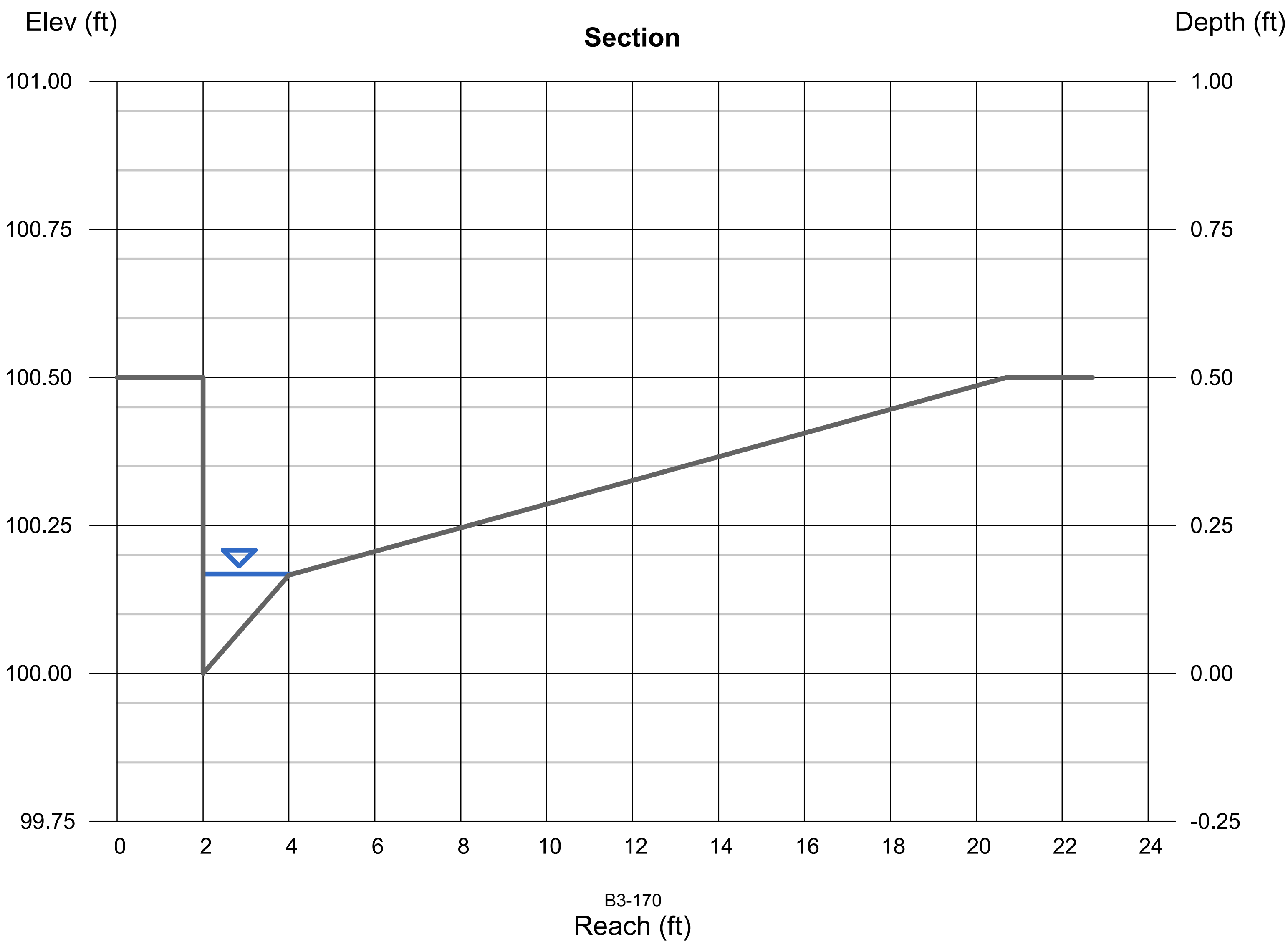
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.31

Highlighted

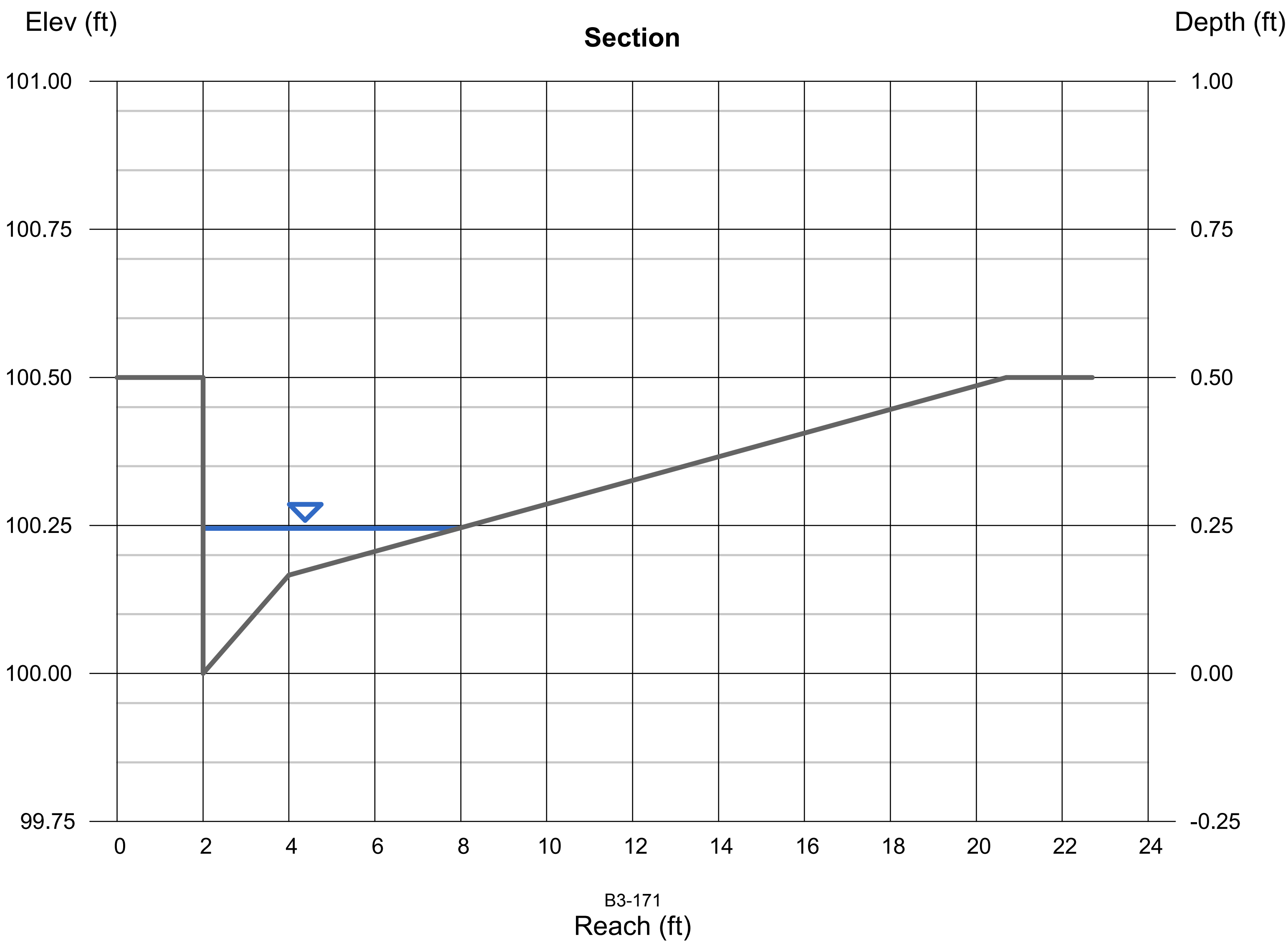
Depth (ft)	= 0.17
Q (cfs)	= 0.310
Area (sqft)	= 0.17
Velocity (ft/s)	= 1.82
Wetted Perim (ft)	= 2.27
Crit Depth, Yc (ft)	= 0.19
Spread Width (ft)	= 2.10
EGL (ft)	= 0.22



Channel Report

E2 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.25
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.620
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.48
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.29
Slope (%)	= 0.20	Wetted Perim (ft)	= 6.20
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.23
		Spread Width (ft)	= 5.95
Calculations		EGL (ft)	= 0.27
Compute by:	Known Q		
Known Q (cfs)	= 0.62		

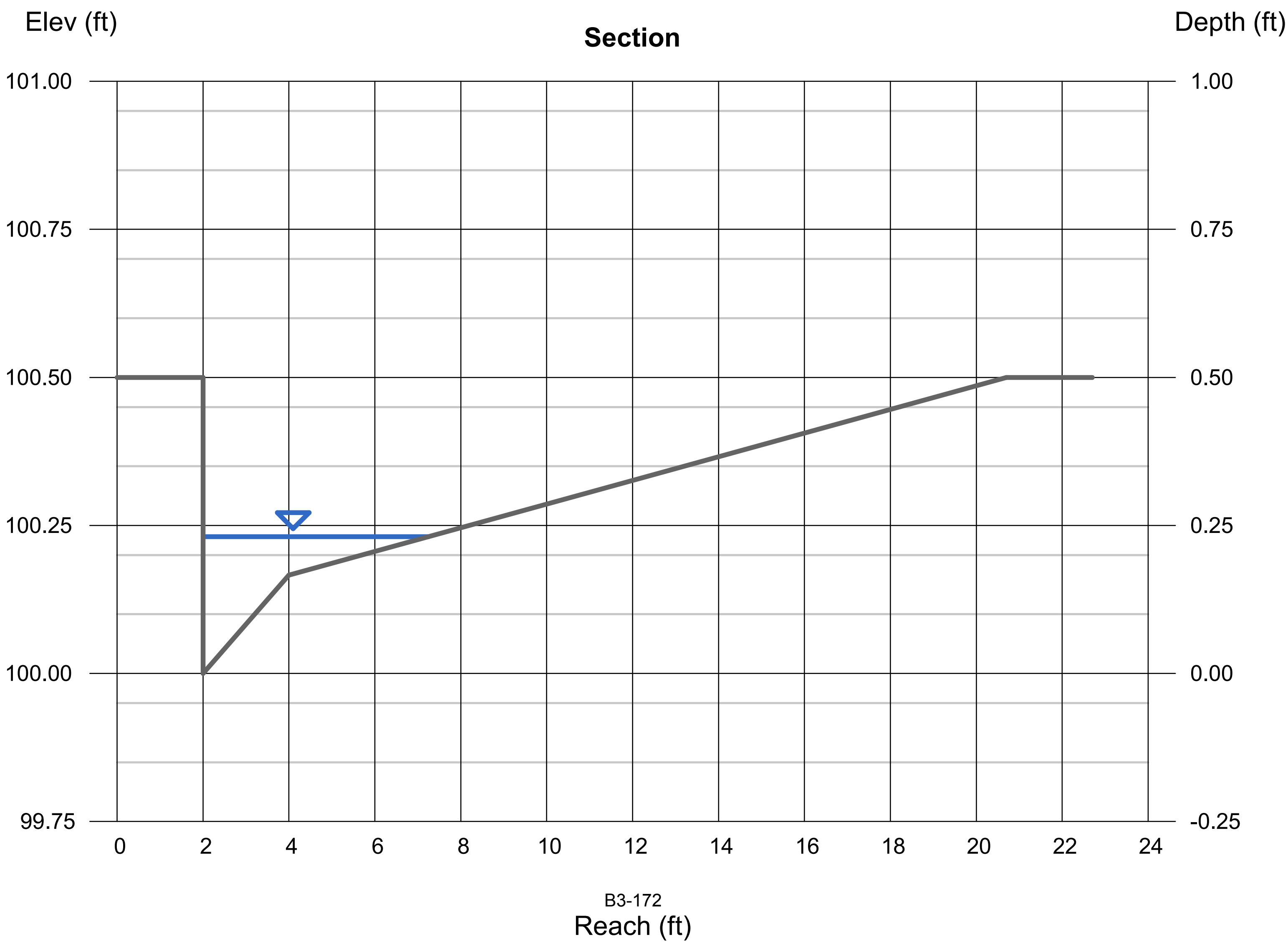


Channel Report

E1 DA Street Capacity 10-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.23
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.620
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.40
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.54
Slope (%)	= 0.30	Wetted Perim (ft)	= 5.49
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.23
		Spread Width (ft)	= 5.25
		EGL (ft)	= 0.27

Calculations
Compute by: Known Q
Known Q (cfs) = 0.62



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. — Friday, May 17 2024

E4 DA Street Capacity 10-YEAR

Gutter

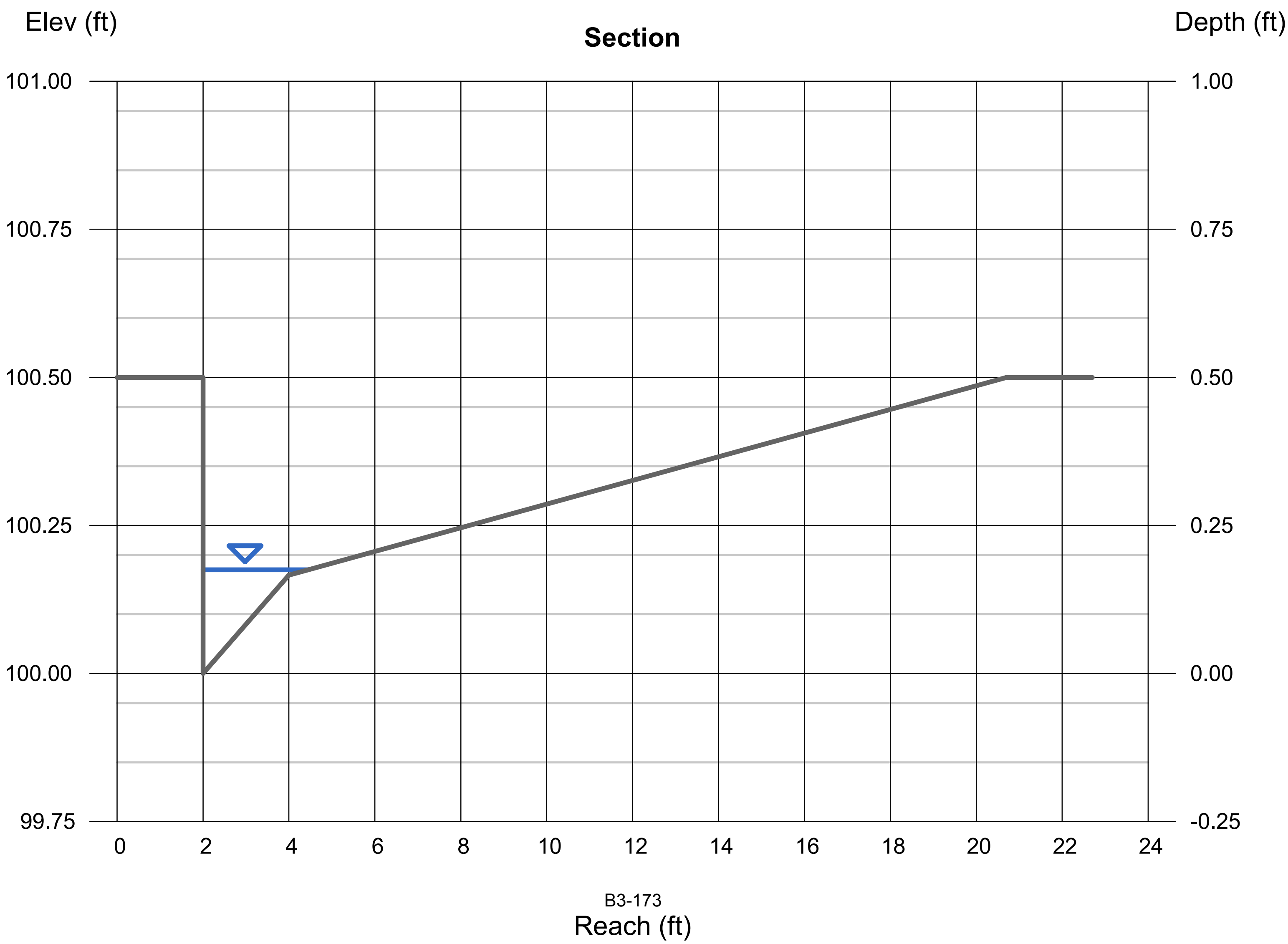
Cross Sl, Sx (ft/ft)	=	0.020
Cross Sl, Sw (ft/ft)	=	0.083
Gutter Width (ft)	=	2.00
Invert Elev (ft)	=	100.00
Slope (%)	=	0.40
N-Value	=	0.013

Calculations

Compute by:		Known Q
Known Q (cfs)	=	0.31

Highlighted

Depth (ft)	=	0.18
Q (cfs)	=	0.310
Area (sqft)	=	0.19
Velocity (ft/s)	=	1.67
Wetted Perim (ft)	=	2.63
Crit Depth, Yc (ft)	=	0.19
Spread Width (ft)	=	2.45
EGL (ft)	=	0.22



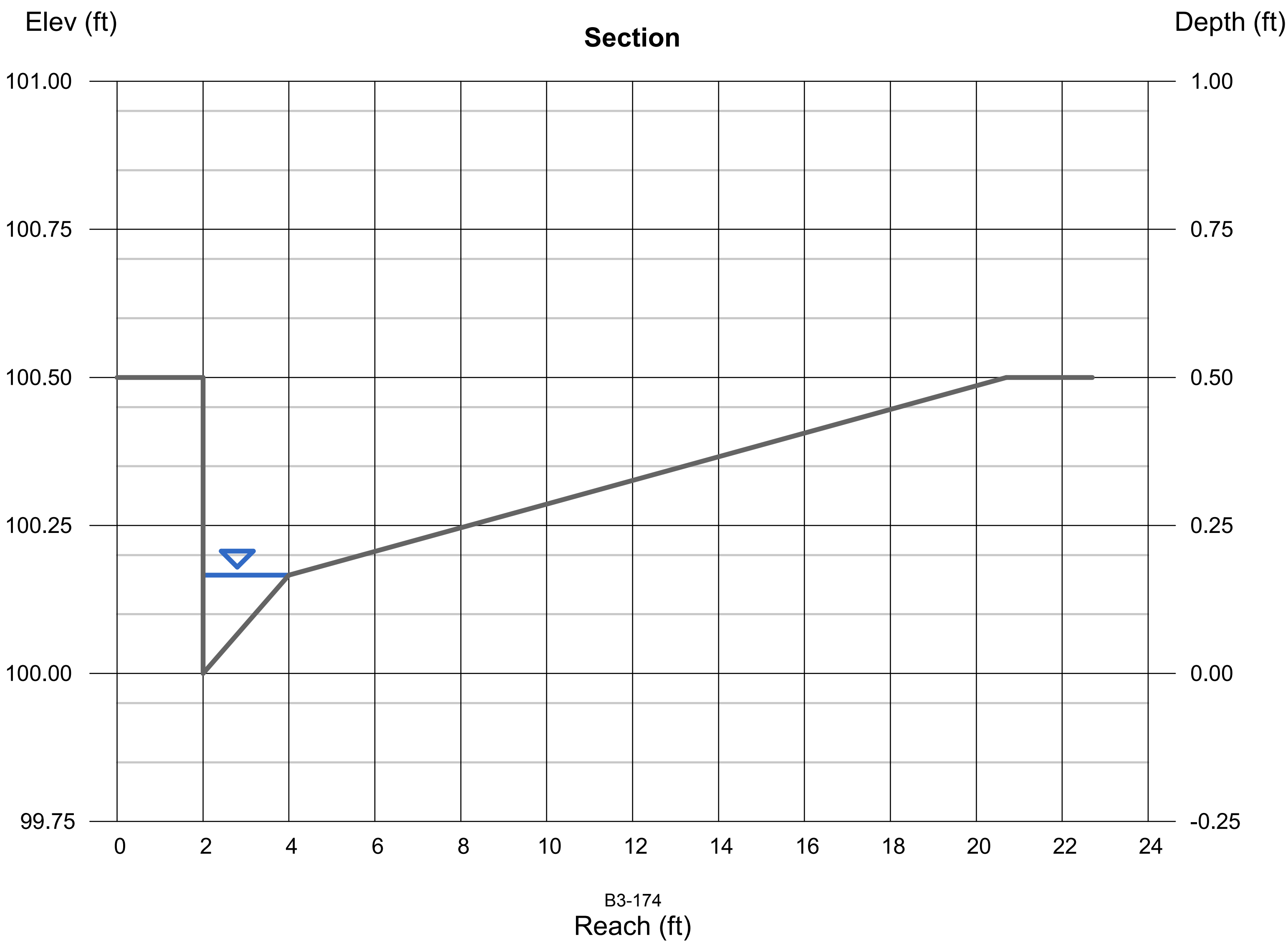
Channel Report

E3 DA Street Capacity 10-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.17
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.300
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.17
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.81
Slope (%)	= 0.50	Wetted Perim (ft)	= 2.17
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.18
		Spread Width (ft)	= 2.00
		EGL (ft)	= 0.22

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.30



Channel Report

C2 DA Street Capacity 10-YEAR

Gutter

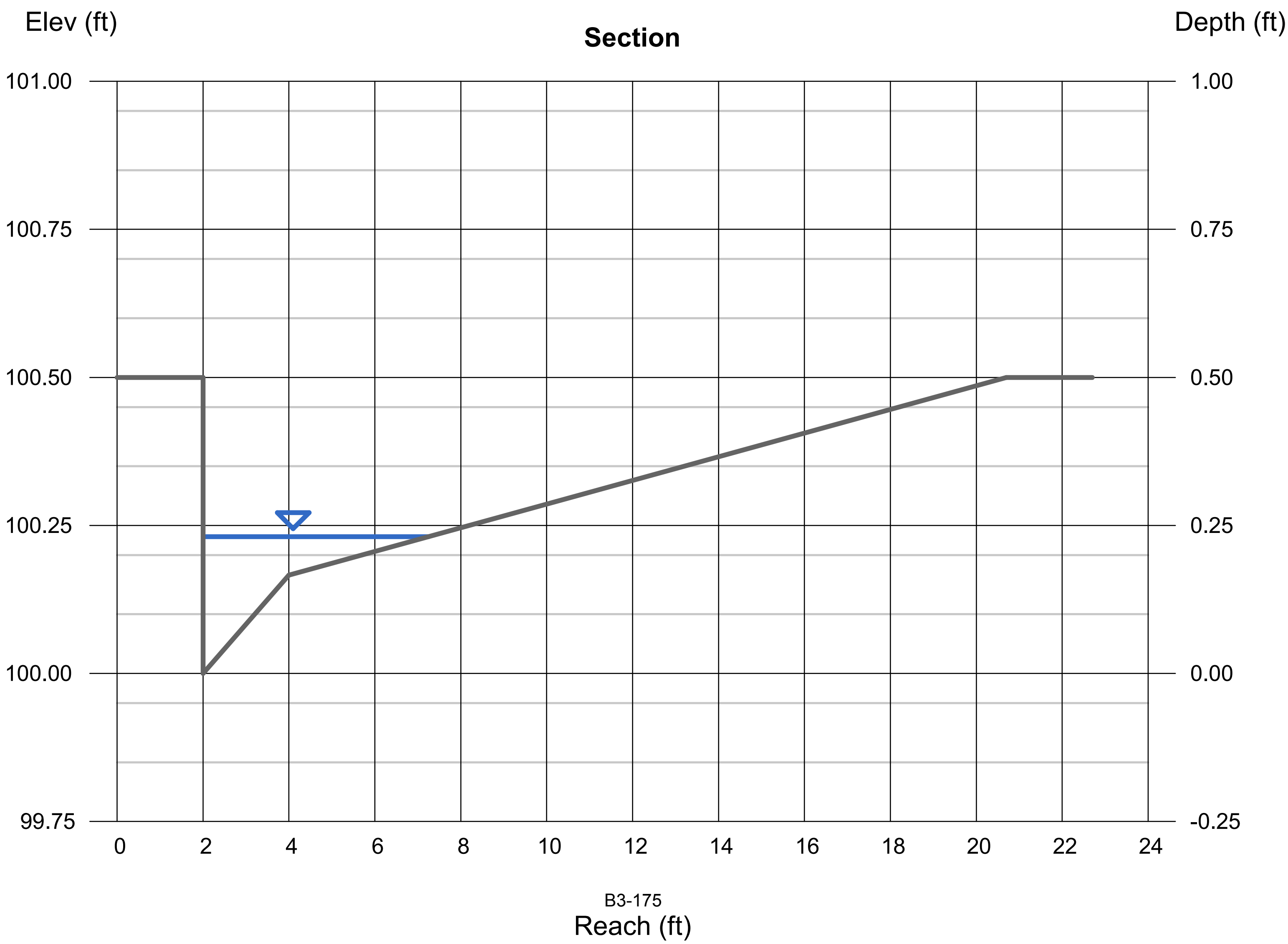
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.81

Highlighted

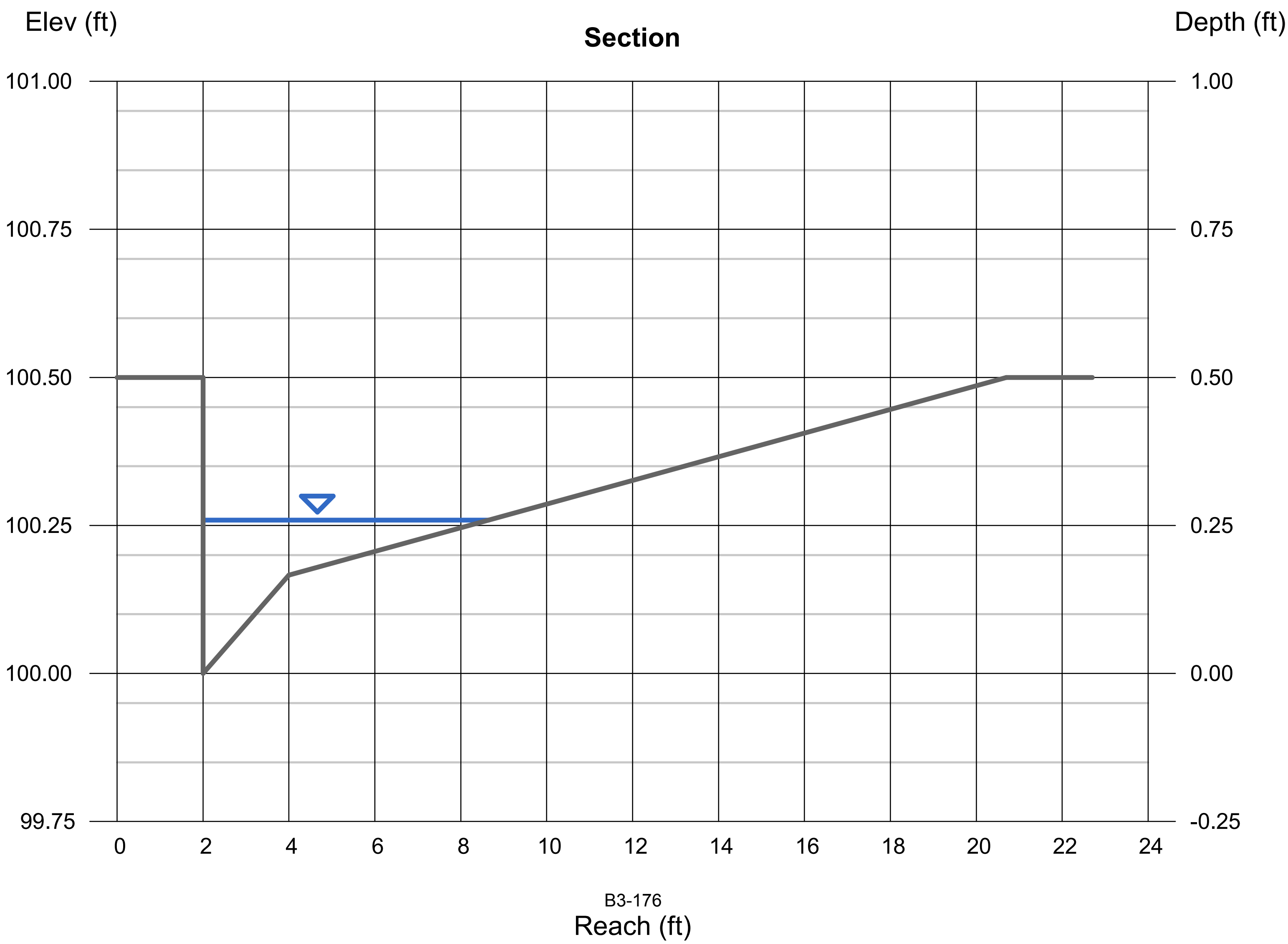
Depth (ft)	= 0.23
Q (cfs)	= 0.810
Area (sqft)	= 0.40
Velocity (ft/s)	= 2.02
Wetted Perim (ft)	= 5.49
Crit Depth, Yc (ft)	= 0.25
Spread Width (ft)	= 5.25
EGL (ft)	= 0.29



Channel Report

C1 DA Street Capacity 10-YEAR

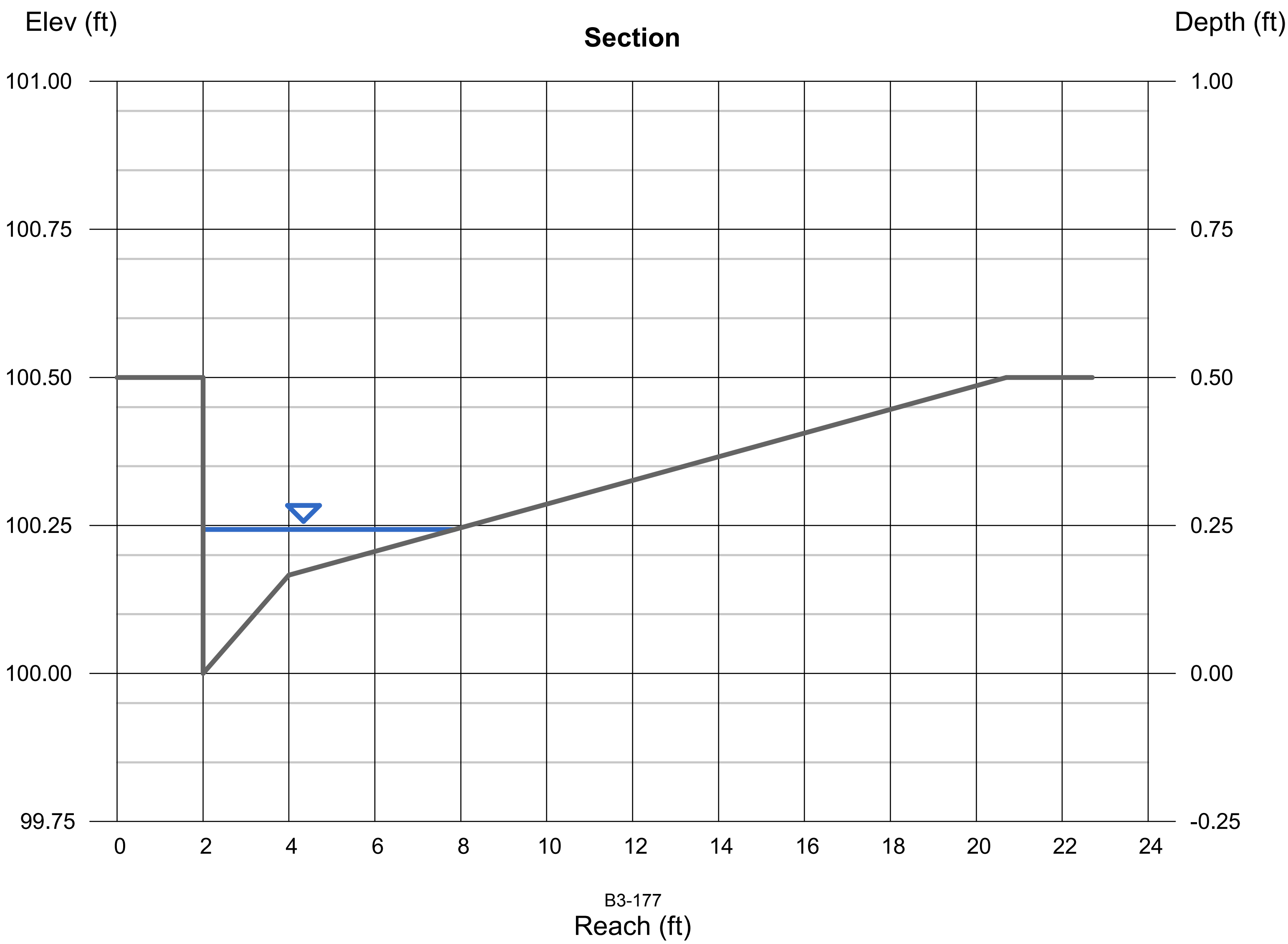
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.26
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.750
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.57
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.32
Slope (%)	= 0.20	Wetted Perim (ft)	= 6.92
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.25
		Spread Width (ft)	= 6.65
Calculations		EGL (ft)	= 0.29
Compute by:	Known Q		
Known Q (cfs)	= 0.75		



Channel Report

C4 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.24
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.850
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.47
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.82
Slope (%)	= 0.40	Wetted Perim (ft)	= 6.10
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.26
		Spread Width (ft)	= 5.85
Calculations		EGL (ft)	= 0.29
Compute by:	Known Q		
Known Q (cfs)	= 0.85		



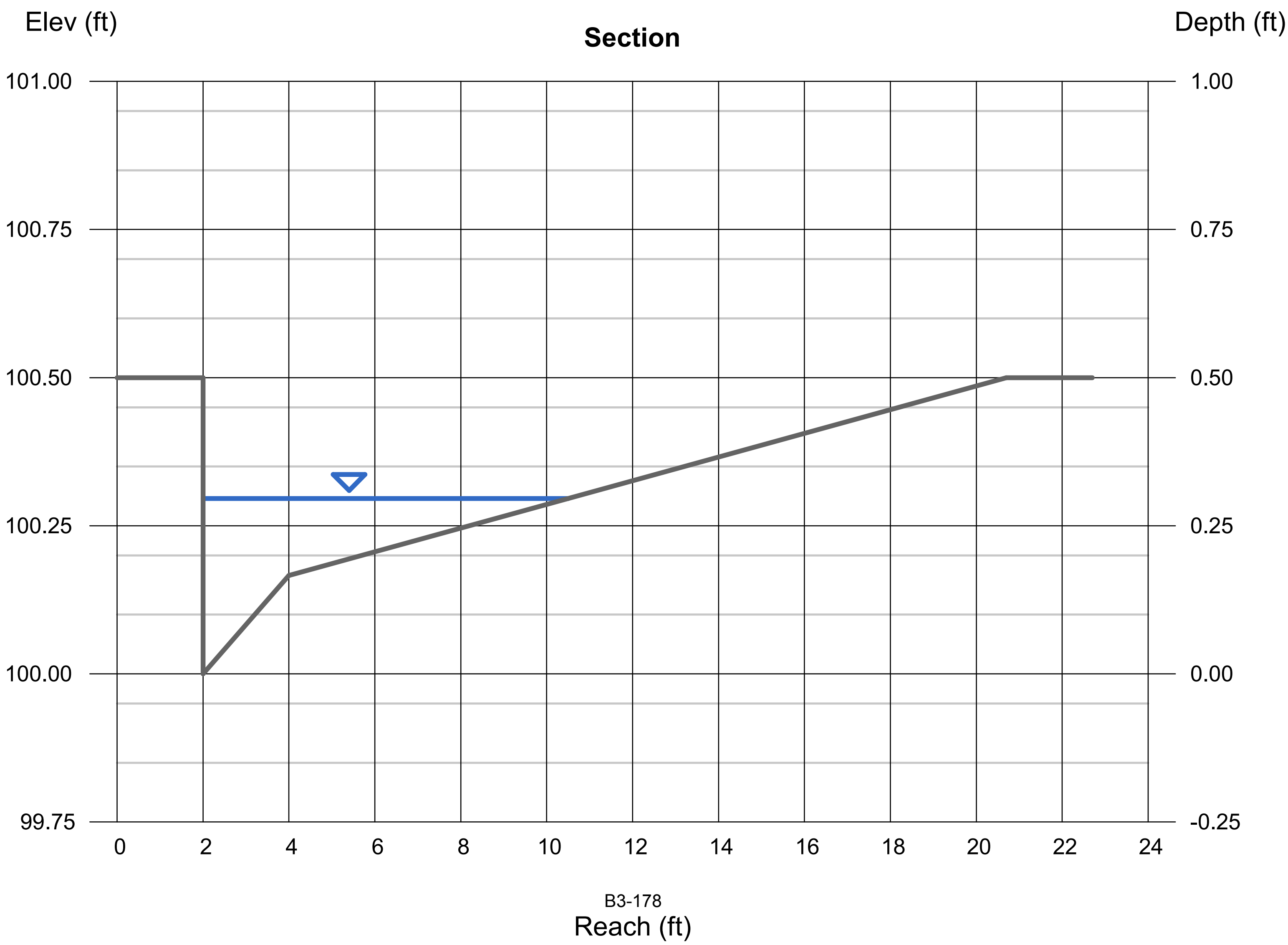
Channel Report

C3 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.30
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.850
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.85
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.00
Slope (%)	= 0.10	Wetted Perim (ft)	= 8.80
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.26
		Spread Width (ft)	= 8.50
		EGL (ft)	= 0.31

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.85



Channel Report

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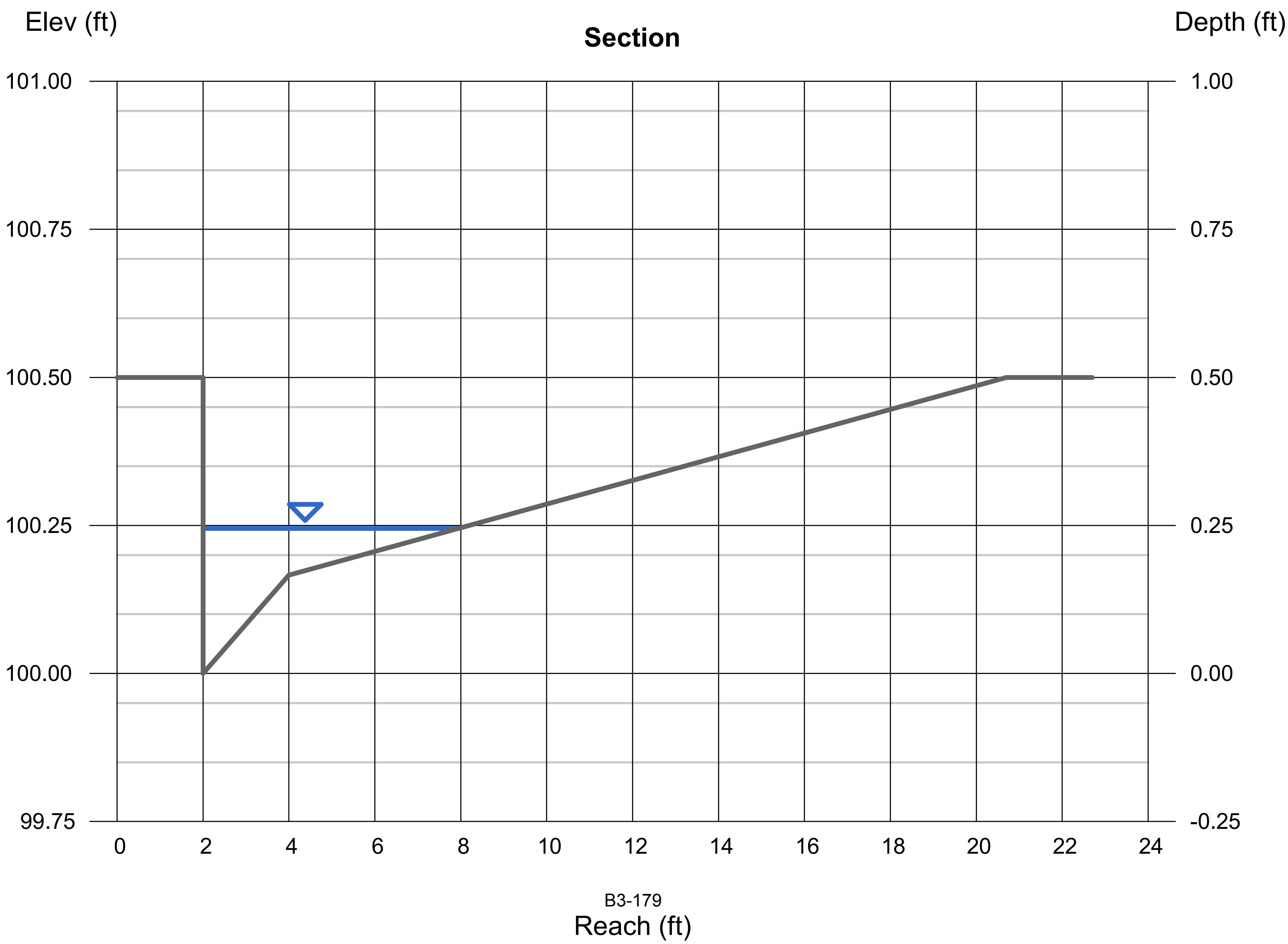
A9 DA Street Capacity 10-YEAR

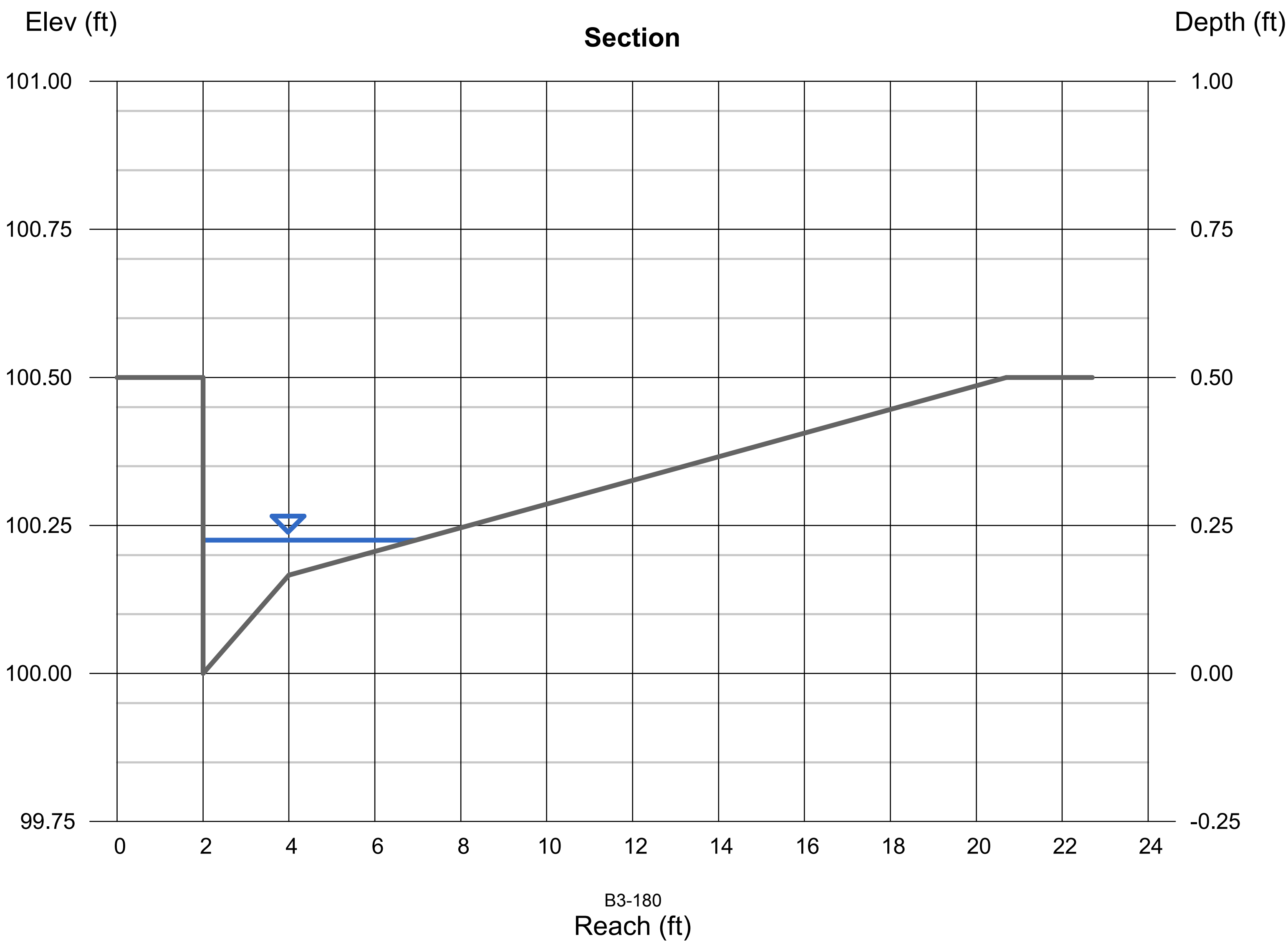
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.25
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.440
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.48
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 0.92
Slope (%)	= 0.10	Wetted Perim (ft)	= 6.20
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.21
		Spread Width (ft)	= 5.95
Calculations		EGL (ft)	= 0.26
Compute by:	Known Q		
Known Q (cfs)	= 0.44		



Channel Report

A10 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.23
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.330
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.37
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 0.89
Slope (%)	= 0.10	Wetted Perim (ft)	= 5.18
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.19
		Spread Width (ft)	= 4.95
Calculations		EGL (ft)	= 0.24
Compute by:	Known Q		
Known Q (cfs)	= 0.33		



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

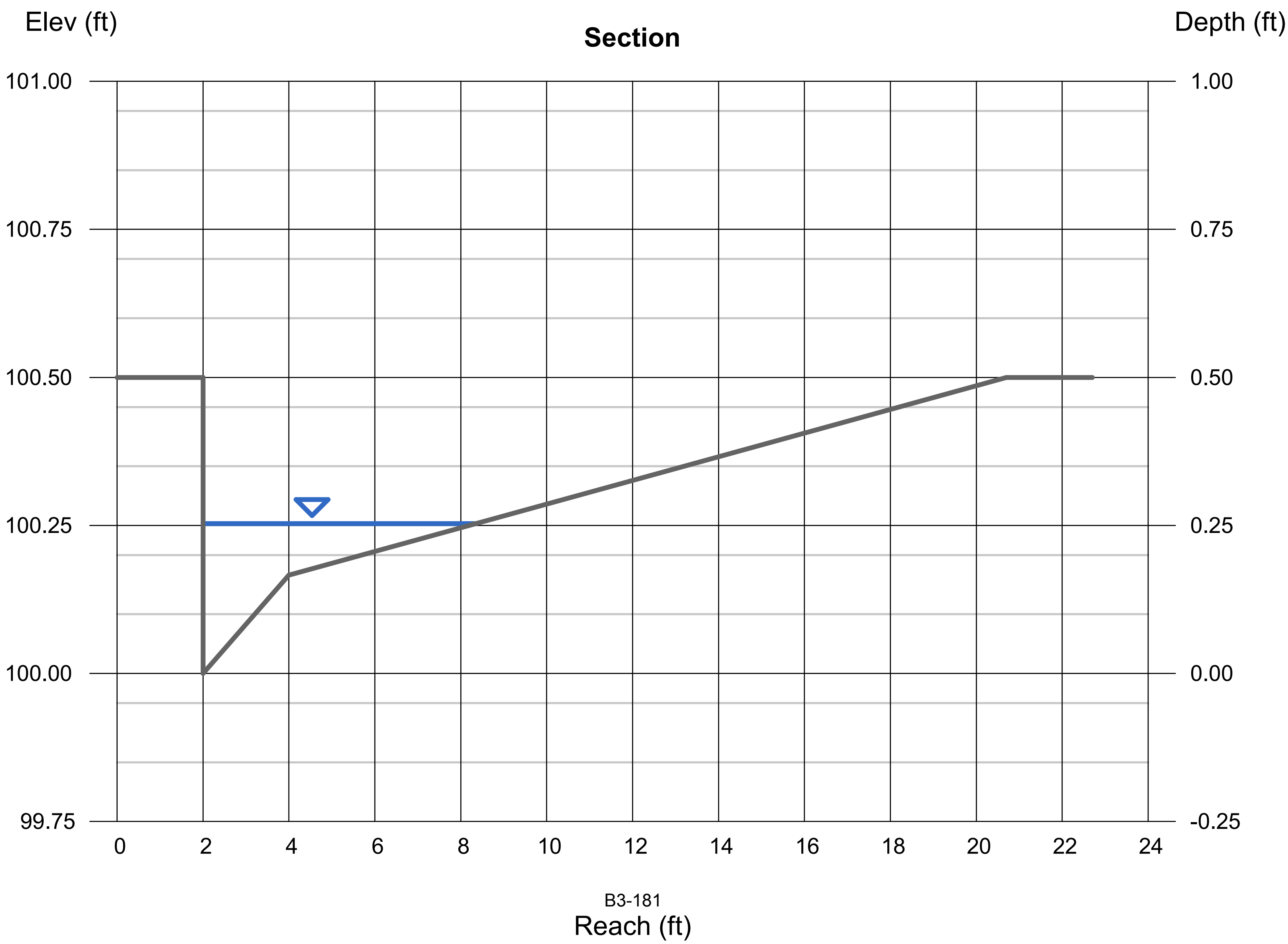
A7 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.25
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.850
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.53
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.61
Slope (%)	= 0.30	Wetted Perim (ft)	= 6.61
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.26
		Spread Width (ft)	= 6.35
		EGL (ft)	= 0.29

Calculations

Compute by: Known Q

Known Q (cfs) = 0.85

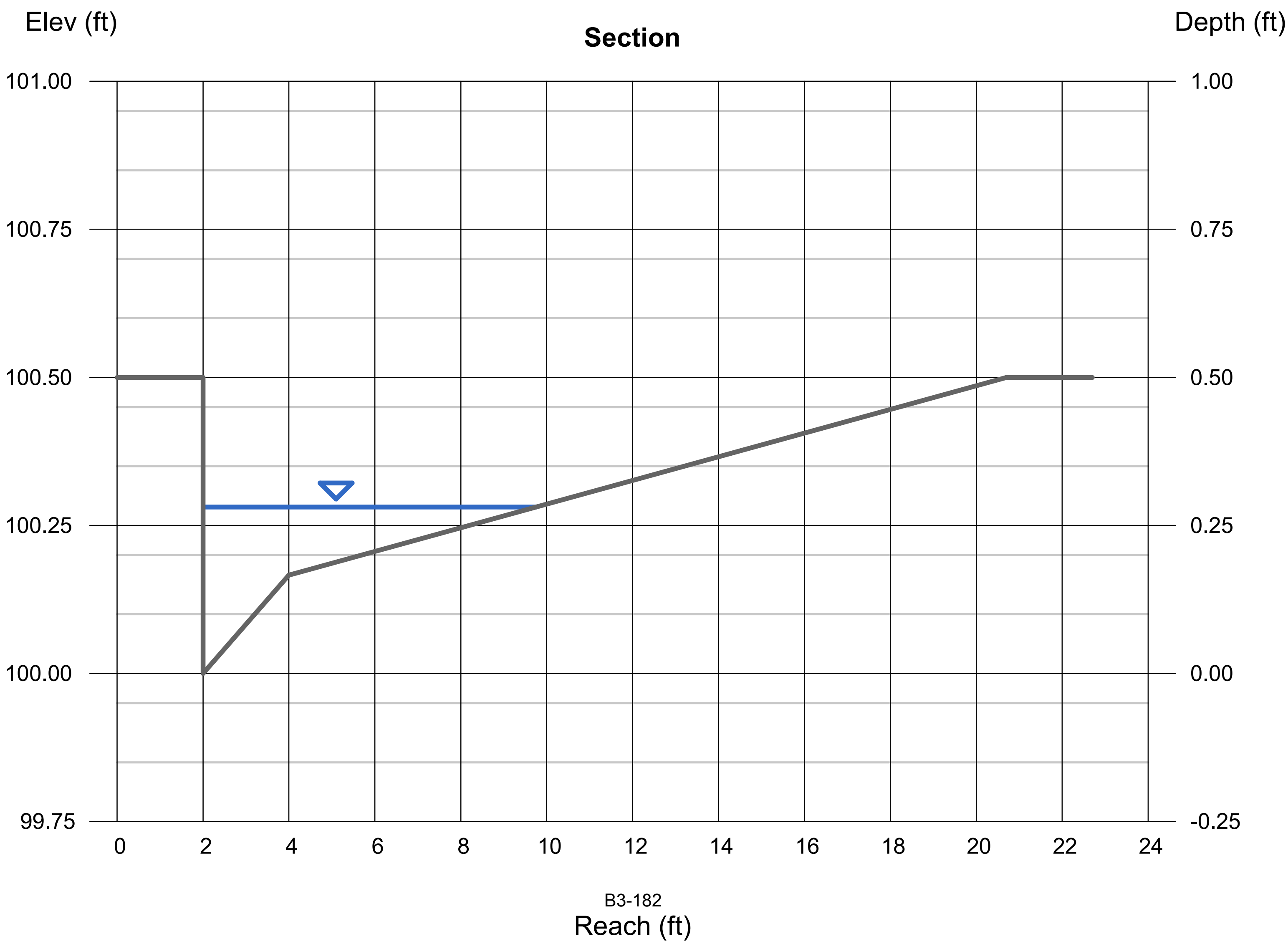


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. | Friday, May 17 2024

A8 DA Street Capacity 10-YEAR

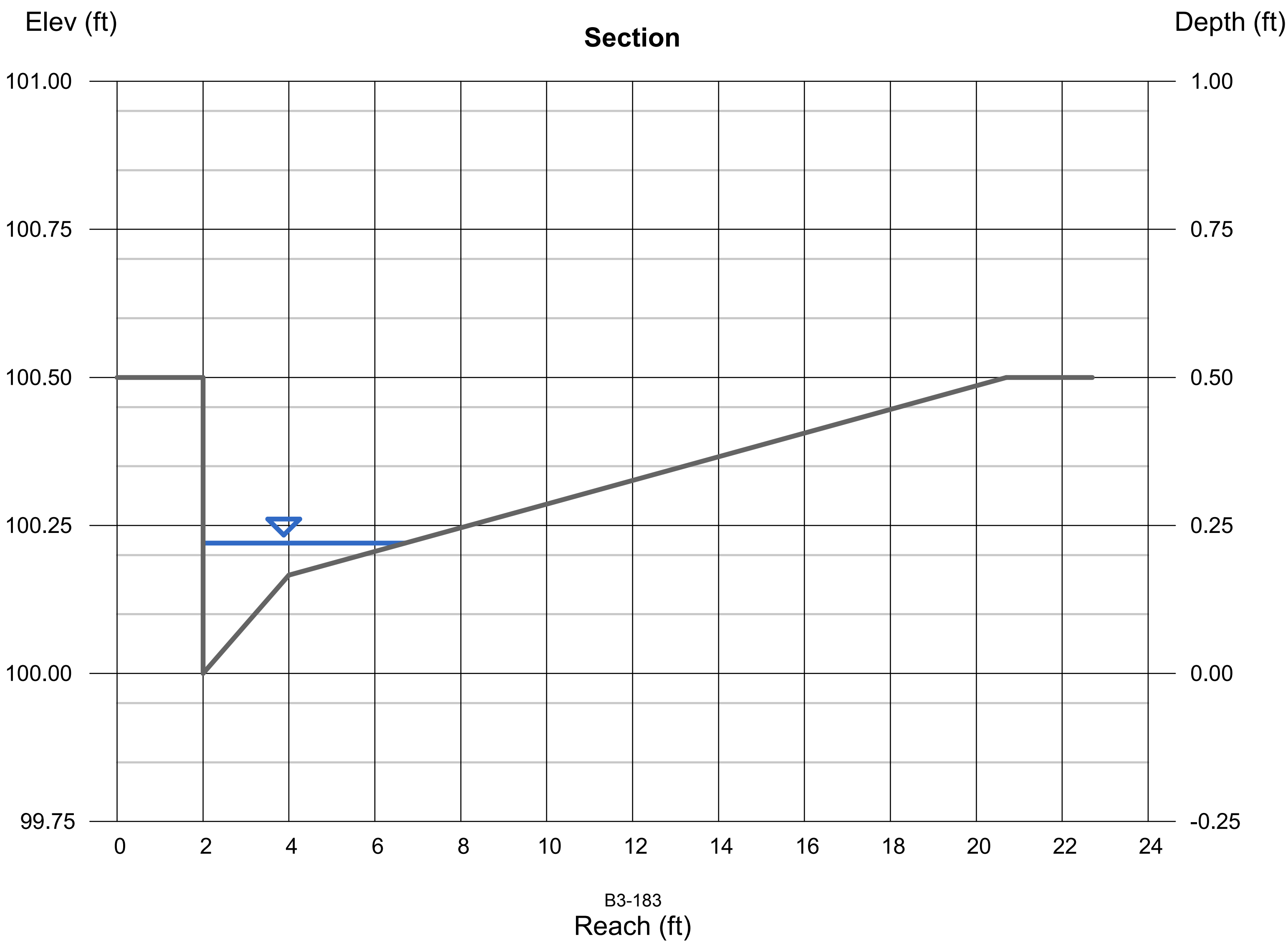
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.28
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.420
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.73
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.95
Slope (%)	= 0.40	Wetted Perim (ft)	= 8.04
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.30
		Spread Width (ft)	= 7.75
Calculations		EGL (ft)	= 0.34
Compute by:	Known Q		
Known Q (cfs)	= 1.42		



Channel Report

A11 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.22
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.920
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.35
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.65
Slope (%)	= 0.90	Wetted Perim (ft)	= 4.93
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.26
		Spread Width (ft)	= 4.70
Calculations		EGL (ft)	= 0.33
Compute by:	Known Q		
Known Q (cfs)	= 0.92		



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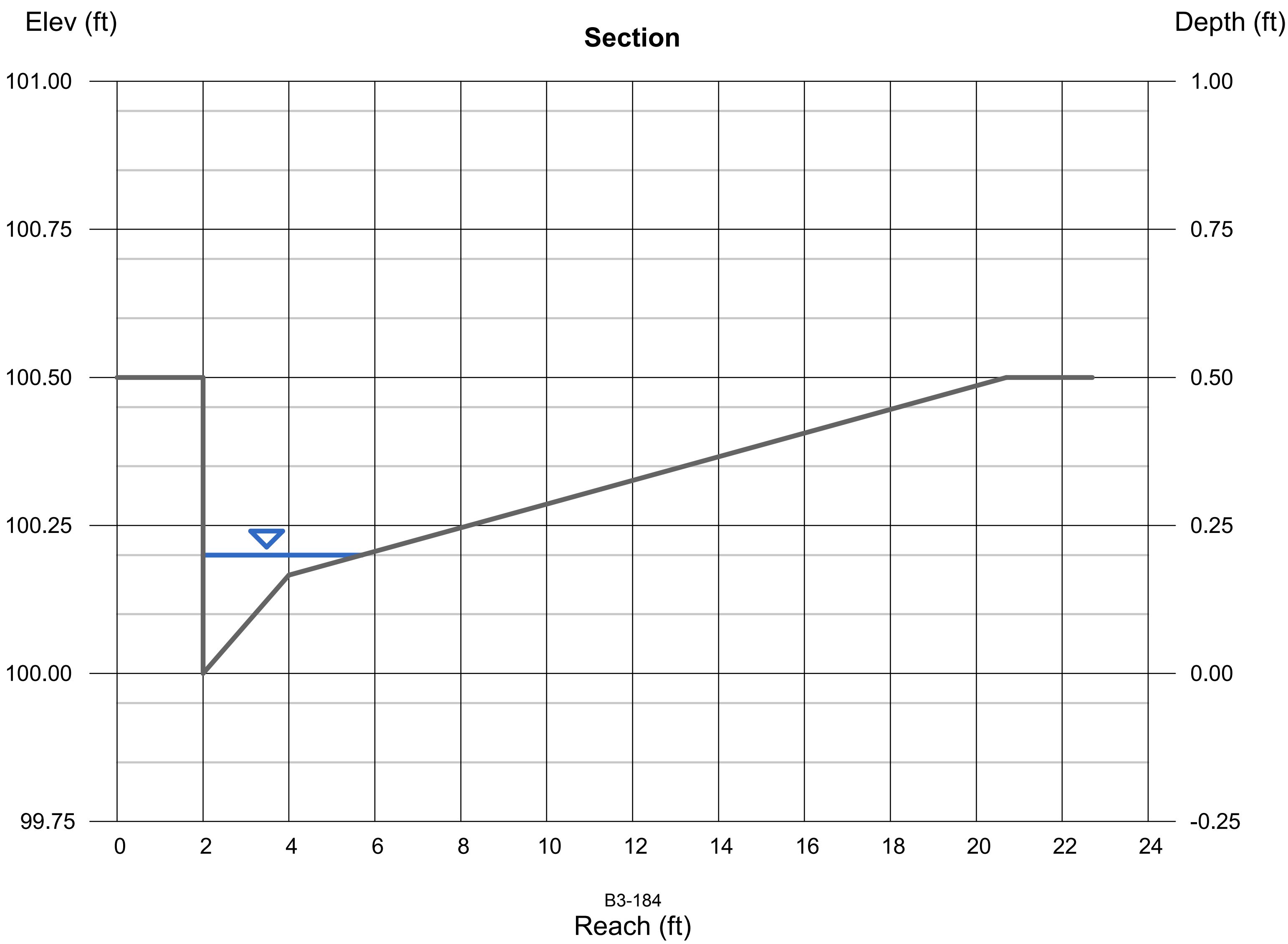
B5 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.20
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.720
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.26
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.74
Slope (%)	= 1.00	Wetted Perim (ft)	= 3.91
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.25
		Spread Width (ft)	= 3.70
		EGL (ft)	= 0.32

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.72



Channel Report

B6 DA Street Capacity 10-YEAR

Gutter

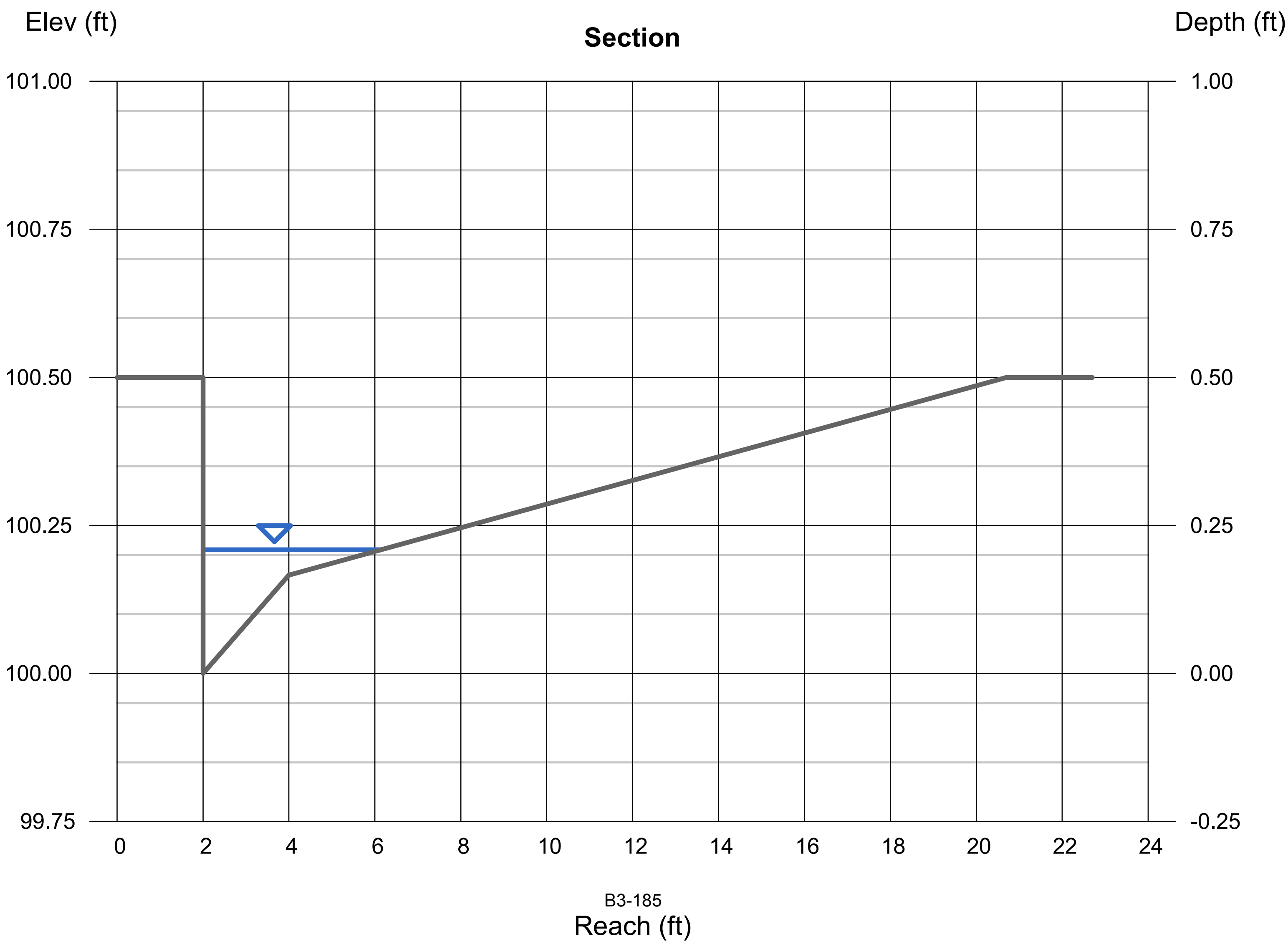
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.83

Highlighted

Depth (ft)	= 0.21
Q (cfs)	= 0.830
Area (sqft)	= 0.30
Velocity (ft/s)	= 2.78
Wetted Perim (ft)	= 4.37
Crit Depth, Yc (ft)	= 0.25
Spread Width (ft)	= 4.15
EGL (ft)	= 0.33



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Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

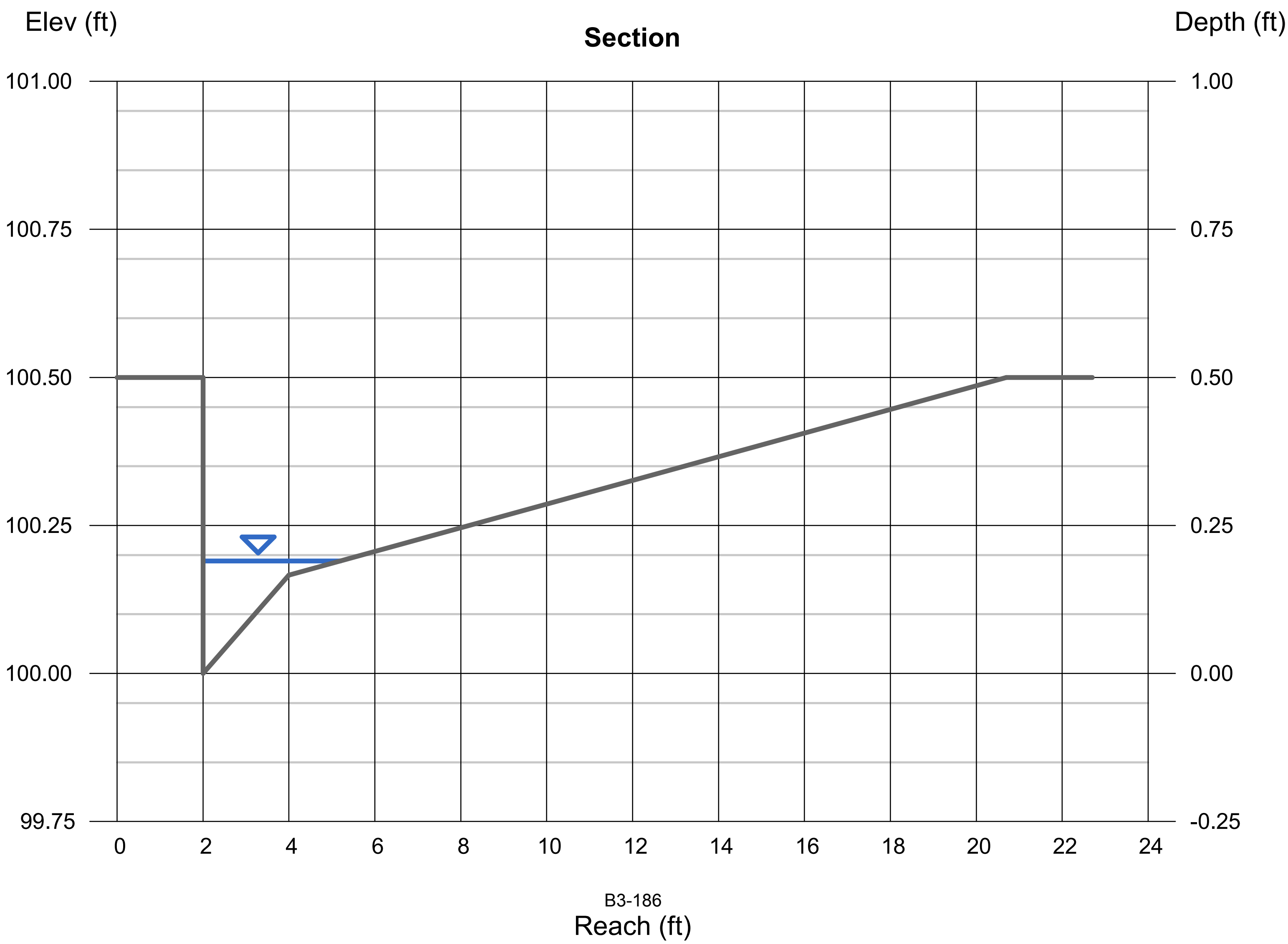
D2 DA Street Capacity 10-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.19
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.440
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.23
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.93
Slope (%)	= 0.50	Wetted Perim (ft)	= 3.40
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.21
		Spread Width (ft)	= 3.20
		EGL (ft)	= 0.25

Calculations

Compute by: Known Q

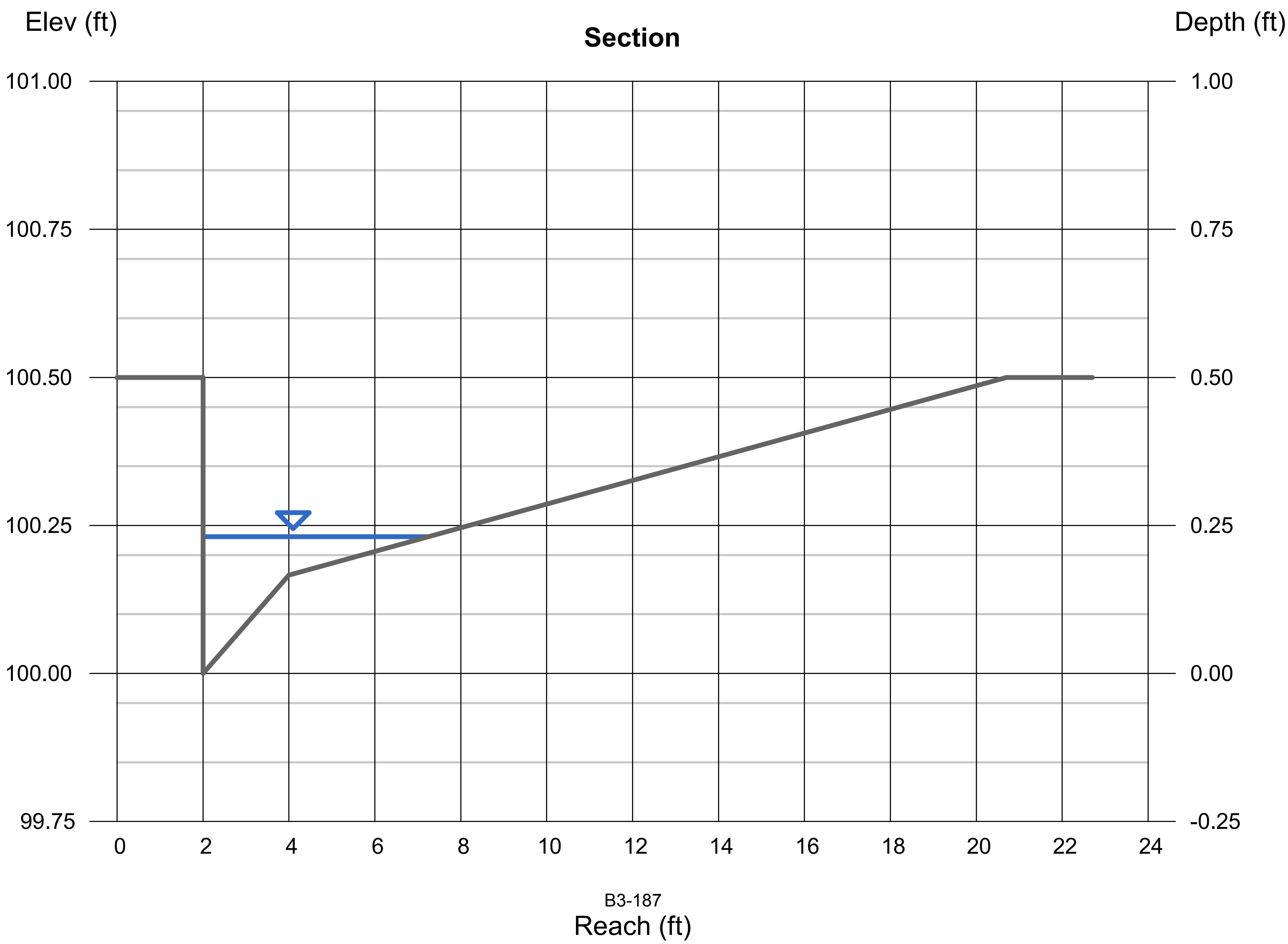
Known Q (cfs) = 0.44



Channel Report

D1 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.23
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.360
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.40
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 0.90
Slope (%)	= 0.10	Wetted Perim (ft)	= 5.49
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.20
		Spread Width (ft)	= 5.25
Calculations		EGL (ft)	= 0.24
Compute by:	Known Q		
Known Q (cfs)	= 0.36		



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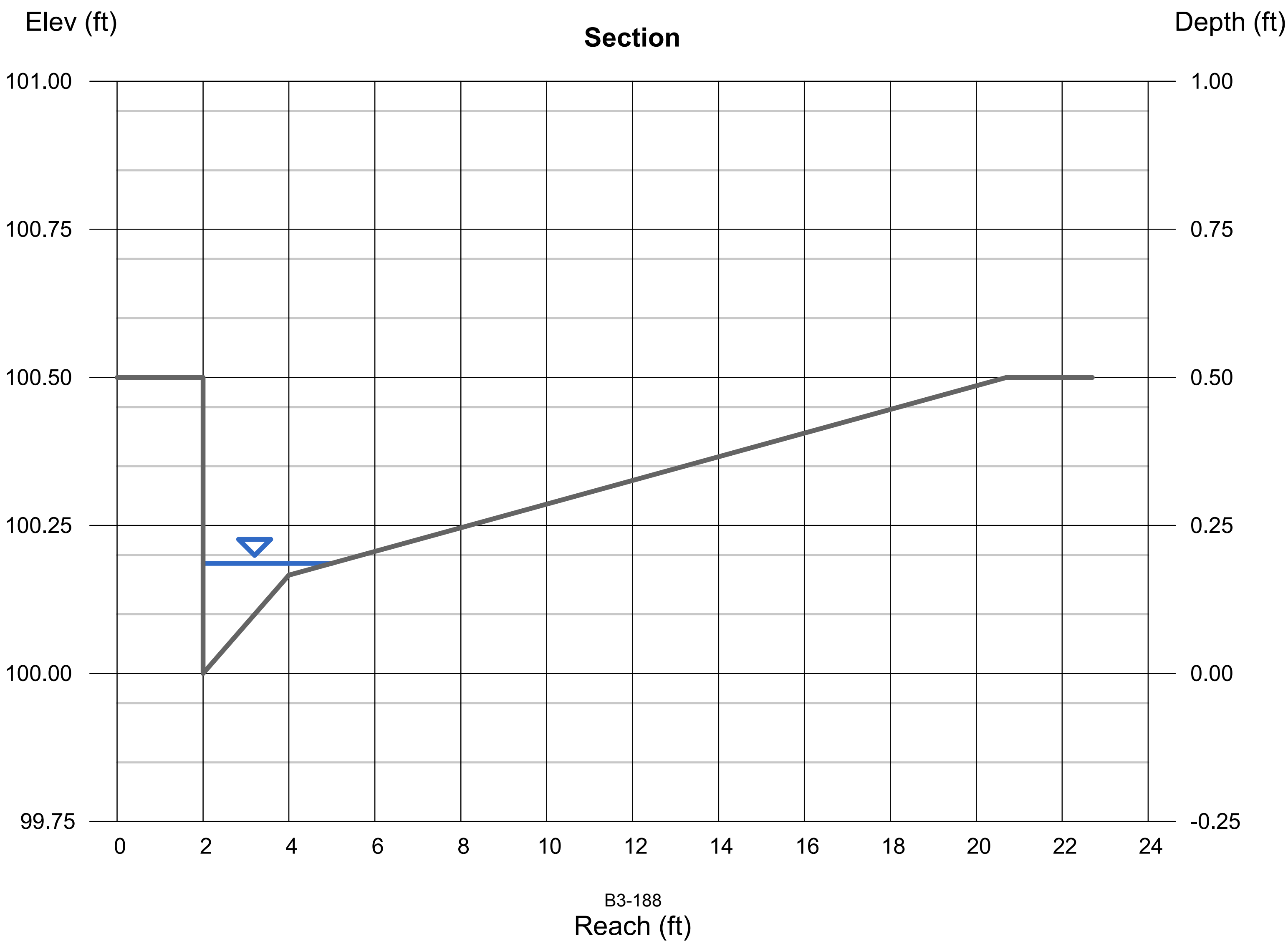
B3 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.19
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.580
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.22
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.69
Slope (%)	= 1.00	Wetted Perim (ft)	= 3.19
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.23
		Spread Width (ft)	= 3.00
Calculations		EGL (ft)	= 0.30
Compute by:	Known Q		
Known Q (cfs)	= 0.58		



Channel Report

B4 DA Street Capacity 10-YEAR

Gutter

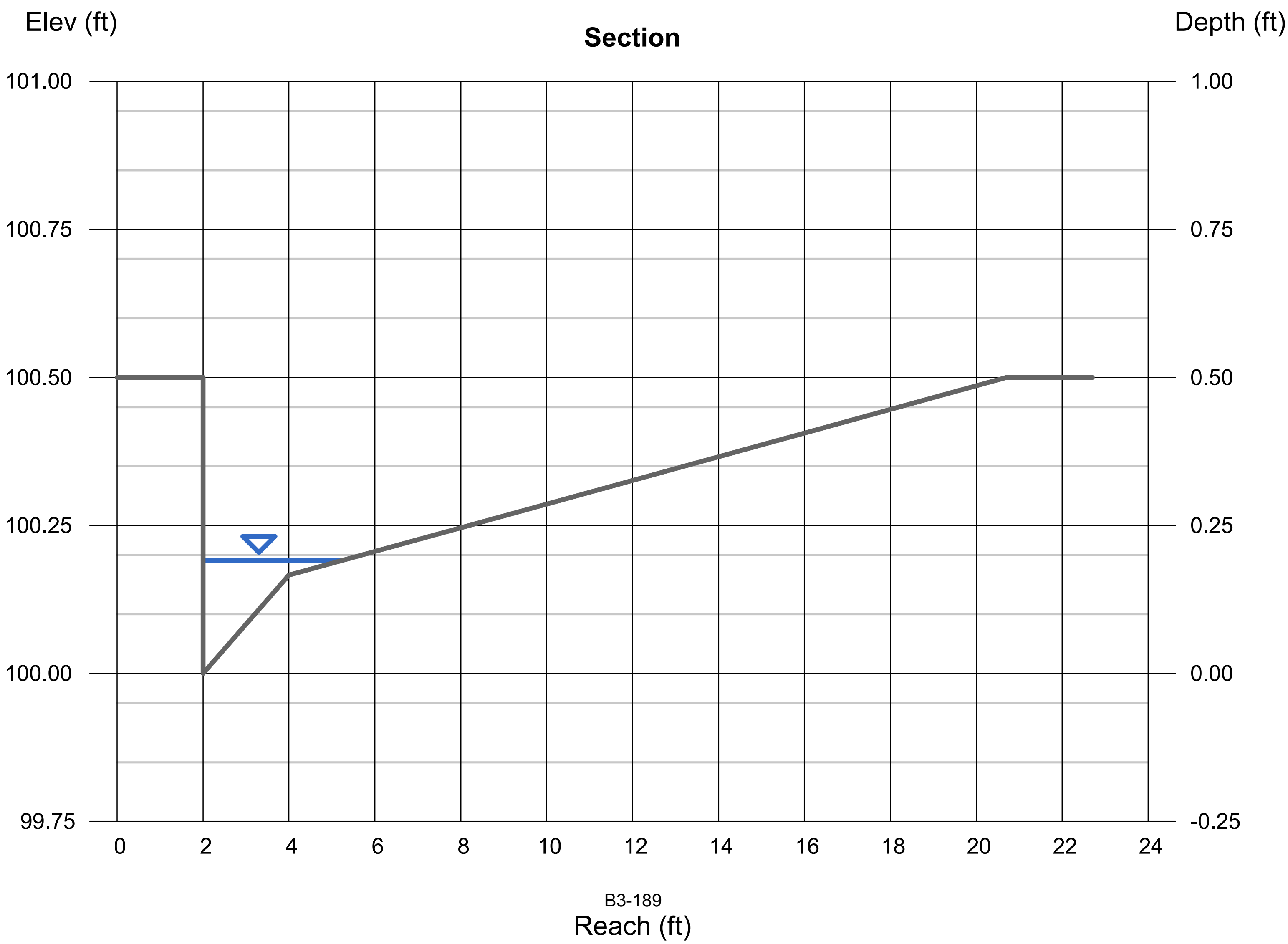
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.63

Highlighted

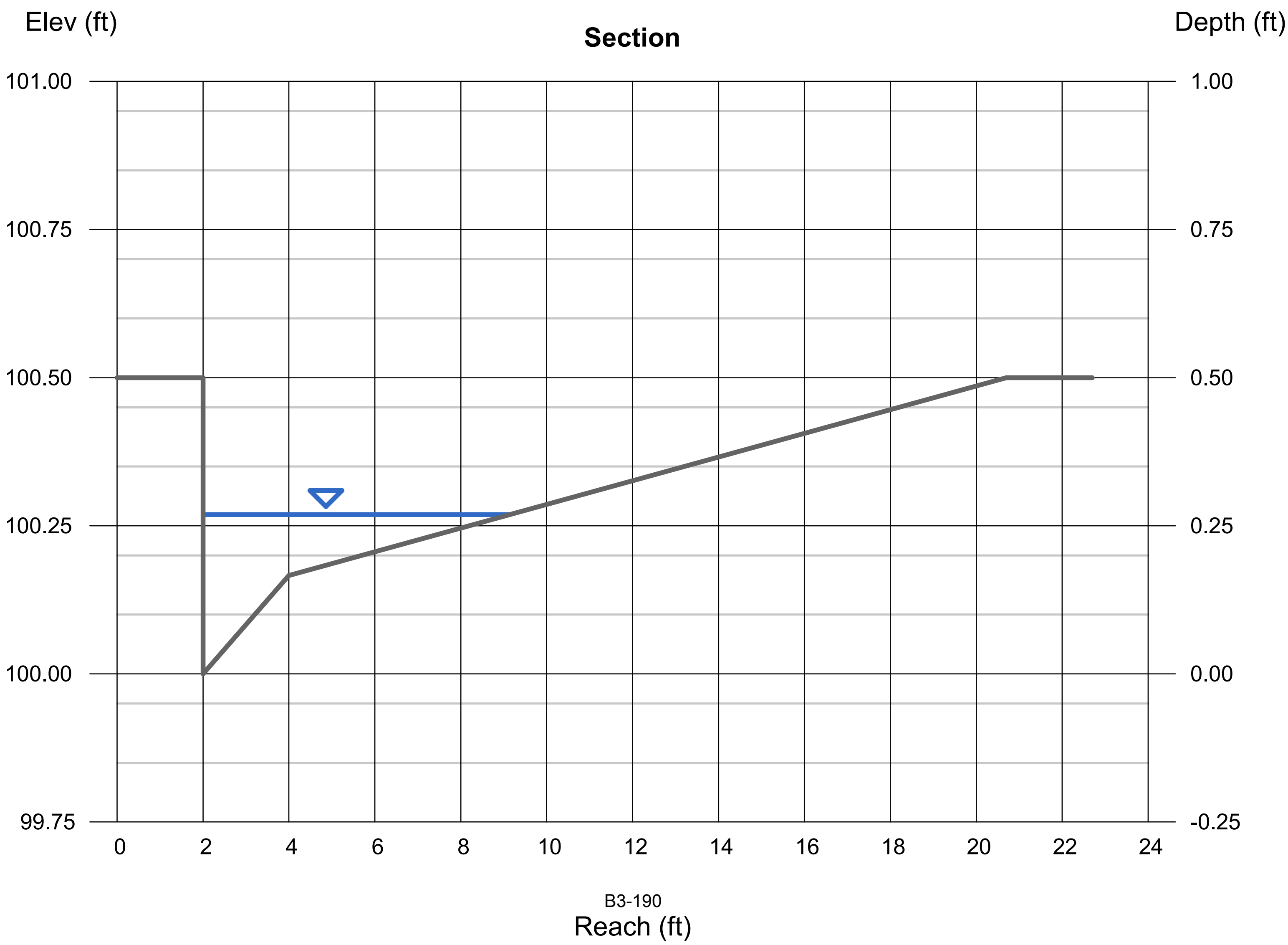
Depth (ft)	= 0.19
Q (cfs)	= 0.630
Area (sqft)	= 0.23
Velocity (ft/s)	= 2.72
Wetted Perim (ft)	= 3.45
Crit Depth, Yc (ft)	= 0.24
Spread Width (ft)	= 3.25
EGL (ft)	= 0.31



Channel Report

B2 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.27
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.610
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.64
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 0.96
Slope (%)	= 0.10	Wetted Perim (ft)	= 7.43
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.23
		Spread Width (ft)	= 7.15
Calculations		EGL (ft)	= 0.28
Compute by:	Known Q		
Known Q (cfs)	= 0.61		



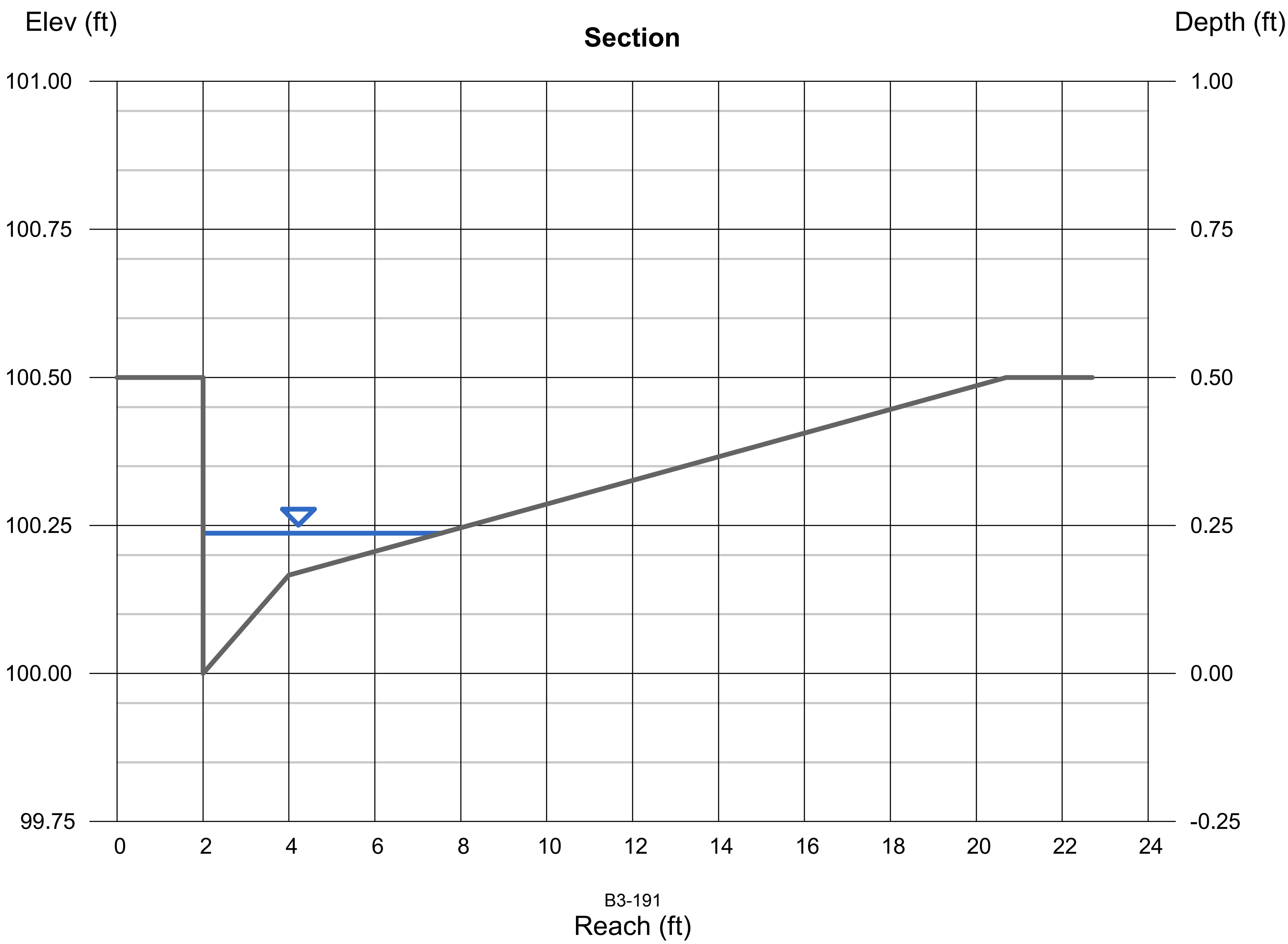
Channel Report

B1 DA Street Capacity 10-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.24
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.680
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.43
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.57
Slope (%)	= 0.30	Wetted Perim (ft)	= 5.79
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.24
		Spread Width (ft)	= 5.55
		EGL (ft)	= 0.28

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.68

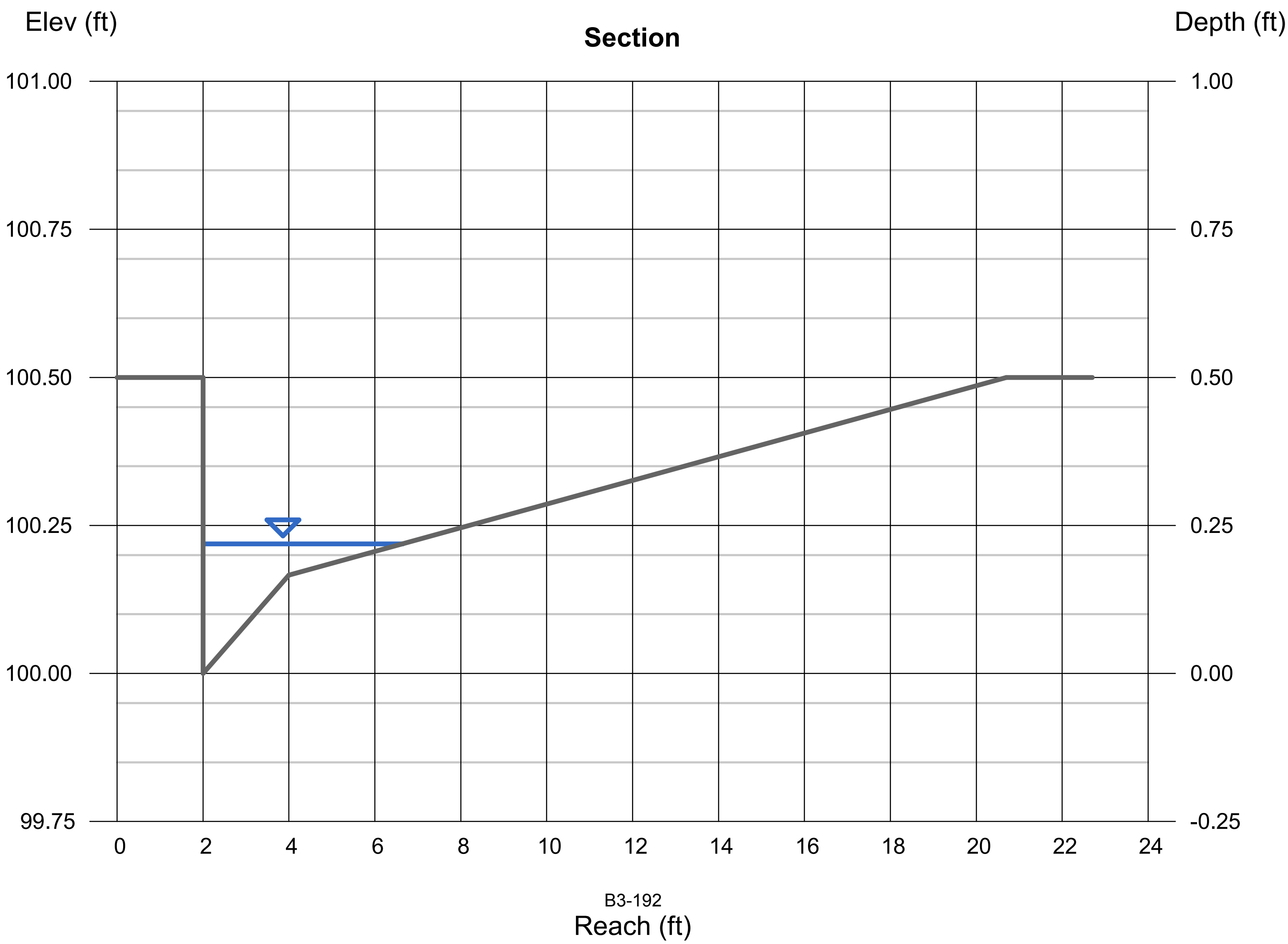


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. | Friday, May 17 2024

A6 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.22
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.860
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.34
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.51
Slope (%)	= 0.80	Wetted Perim (ft)	= 4.88
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.26
		Spread Width (ft)	= 4.65
Calculations		EGL (ft)	= 0.32
Compute by:	Known Q		
Known Q (cfs)	= 0.86		



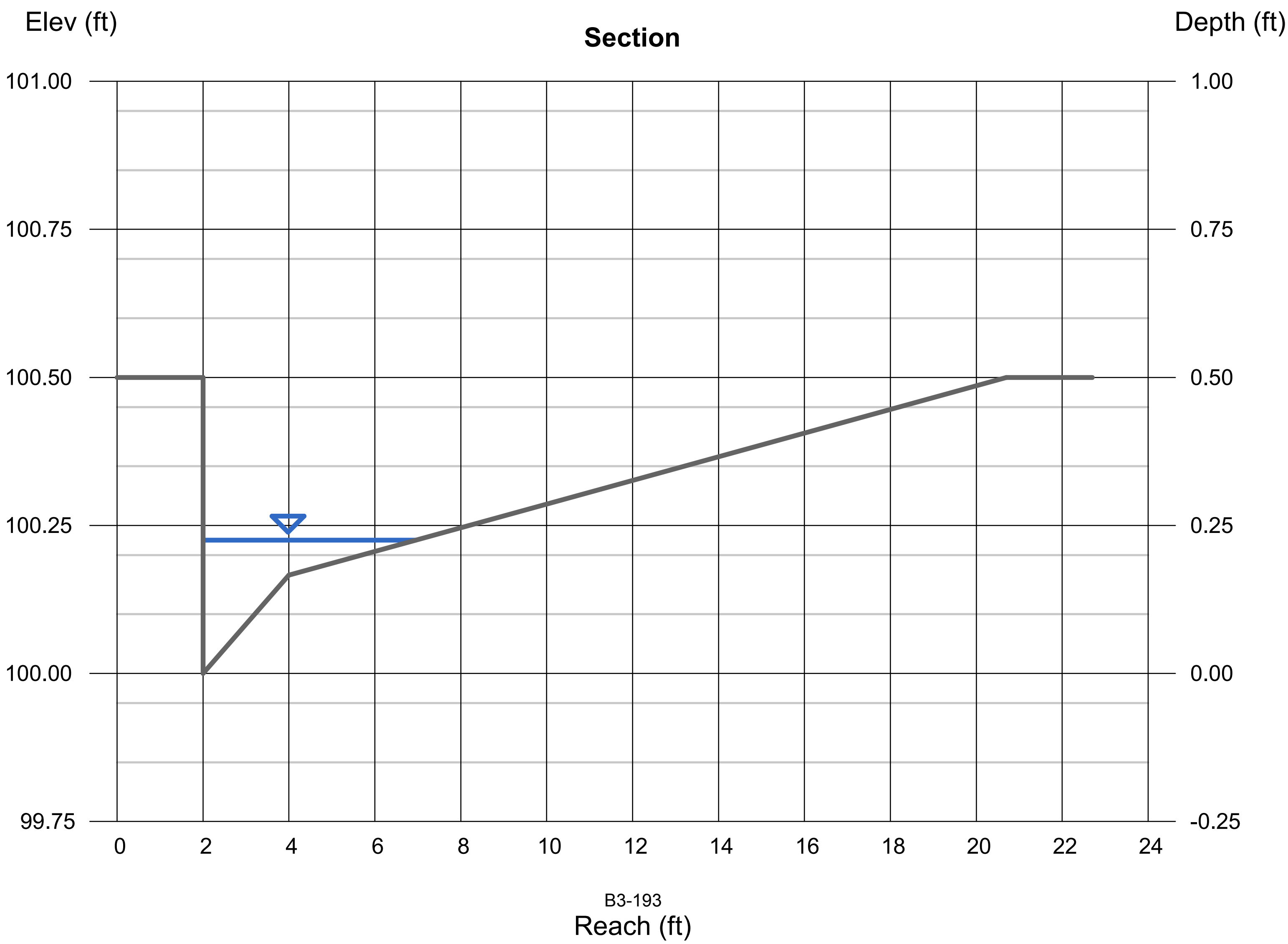
Channel Report

A5 DA Street Capacity 10-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.23
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.930
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.37
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.51
Slope (%)	= 0.80	Wetted Perim (ft)	= 5.18
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.26
		Spread Width (ft)	= 4.95
		EGL (ft)	= 0.32

Calculations

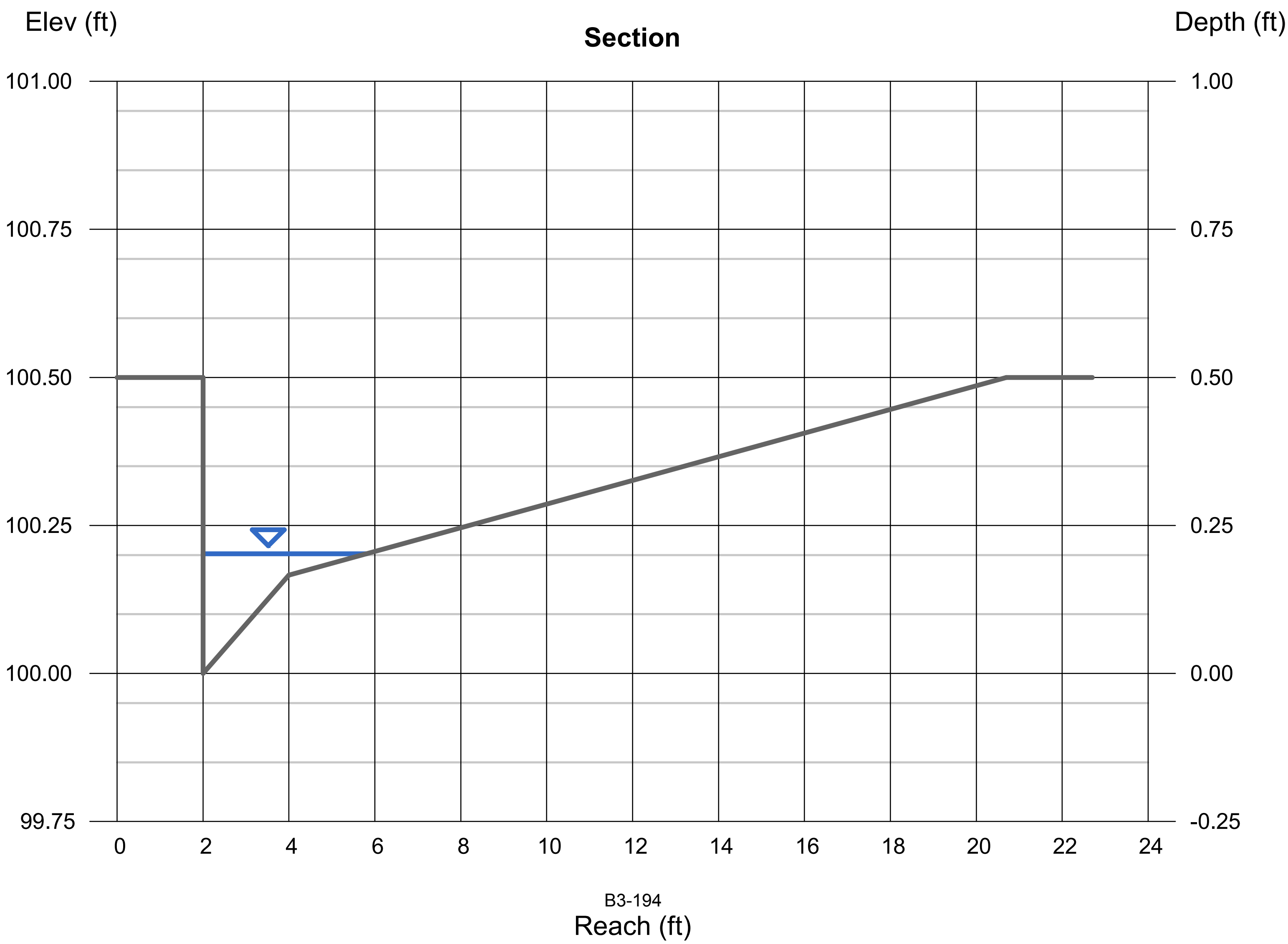
Compute by:	Known Q
Known Q (cfs)	= 0.93



Channel Report

A3 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.20
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.780
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.27
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.88
Slope (%)	= 1.10	Wetted Perim (ft)	= 4.01
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.25
		Spread Width (ft)	= 3.80
Calculations		EGL (ft)	= 0.33
Compute by:	Known Q		
Known Q (cfs)	= 0.78		



Channel Report

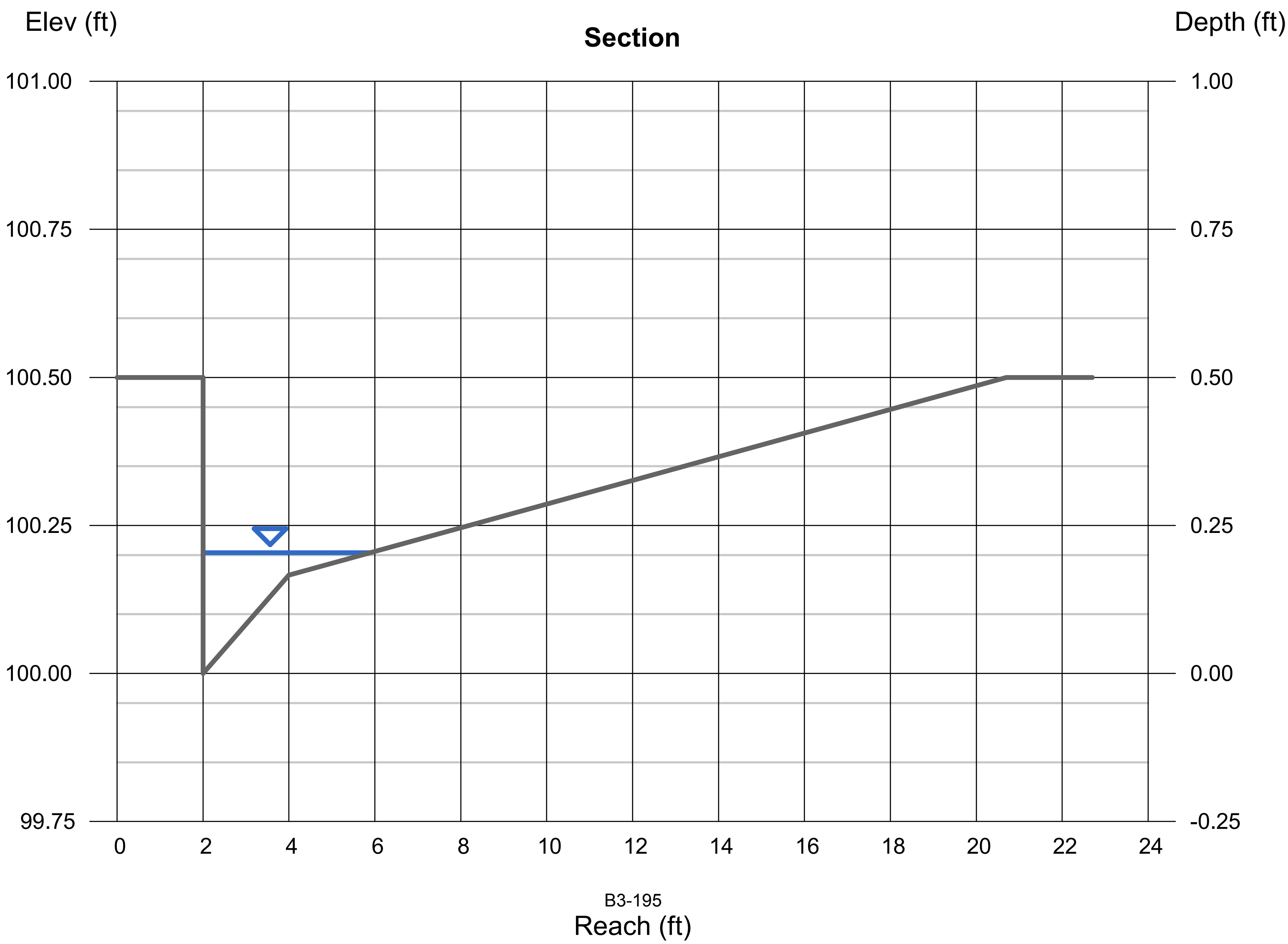
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

A4 DA Street Capacity 10-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.20
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.770
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.77
Slope (%)	= 1.00	Wetted Perim (ft)	= 4.11
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.25
		Spread Width (ft)	= 3.90
		EGL (ft)	= 0.32

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.77



Channel Report

A2 DA Street Capacity 10-YEAR

Gutter

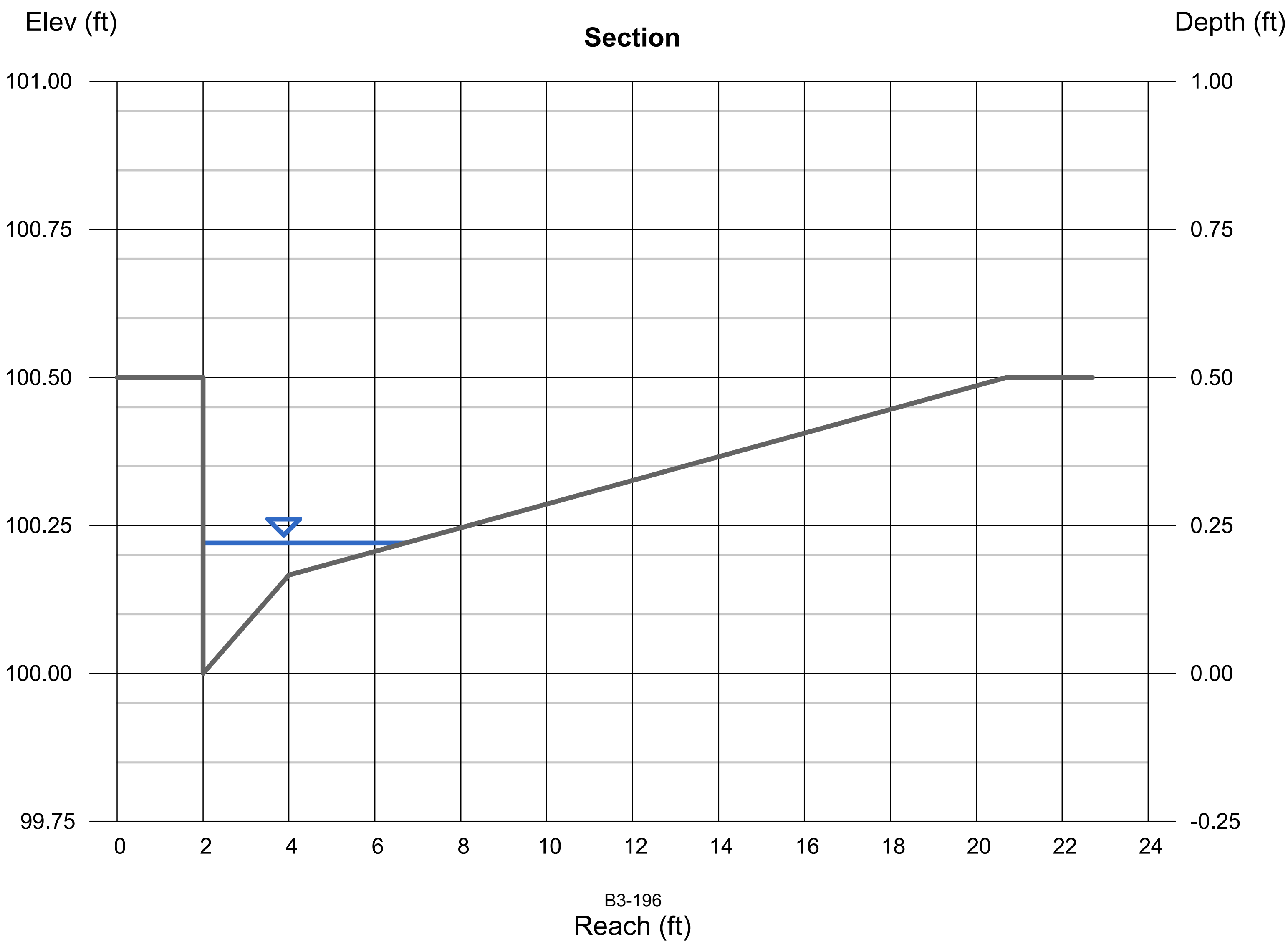
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.60
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.75

Highlighted

Depth (ft)	= 0.22
Q (cfs)	= 0.750
Area (sqft)	= 0.35
Velocity (ft/s)	= 2.16
Wetted Perim (ft)	= 4.93
Crit Depth, Yc (ft)	= 0.25
Spread Width (ft)	= 4.70
EGL (ft)	= 0.29



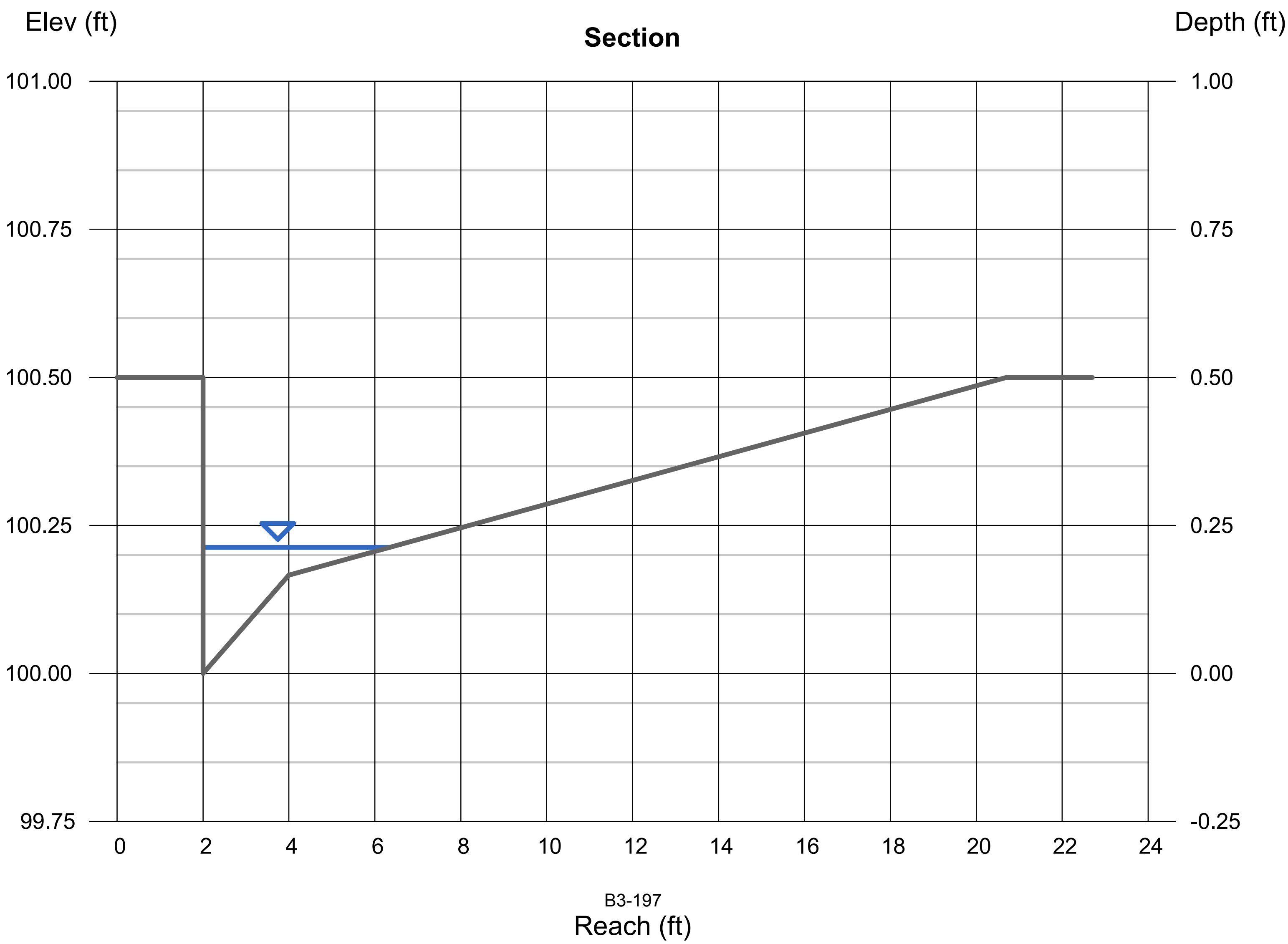
Channel Report

A1 DA Street Capacity 10-YEAR

Gutter
Cross Sl, Sx (ft/ft) = 0.020
Cross Sl, Sw (ft/ft) = 0.083
Gutter Width (ft) = 2.00
Invert Elev (ft) = 100.00
Slope (%) = 0.30
N-Value = 0.013

Calculations
Compute by: Known Q
Known Q (cfs) = 0.48

Highlighted
Depth (ft) = 0.21
Q (cfs) = 0.480
Area (sqft) = 0.32
Velocity (ft/s) = 1.52
Wetted Perim (ft) = 4.57
Crit Depth, Yc (ft) = 0.22
Spread Width (ft) = 4.35
EGL (ft) = 0.25

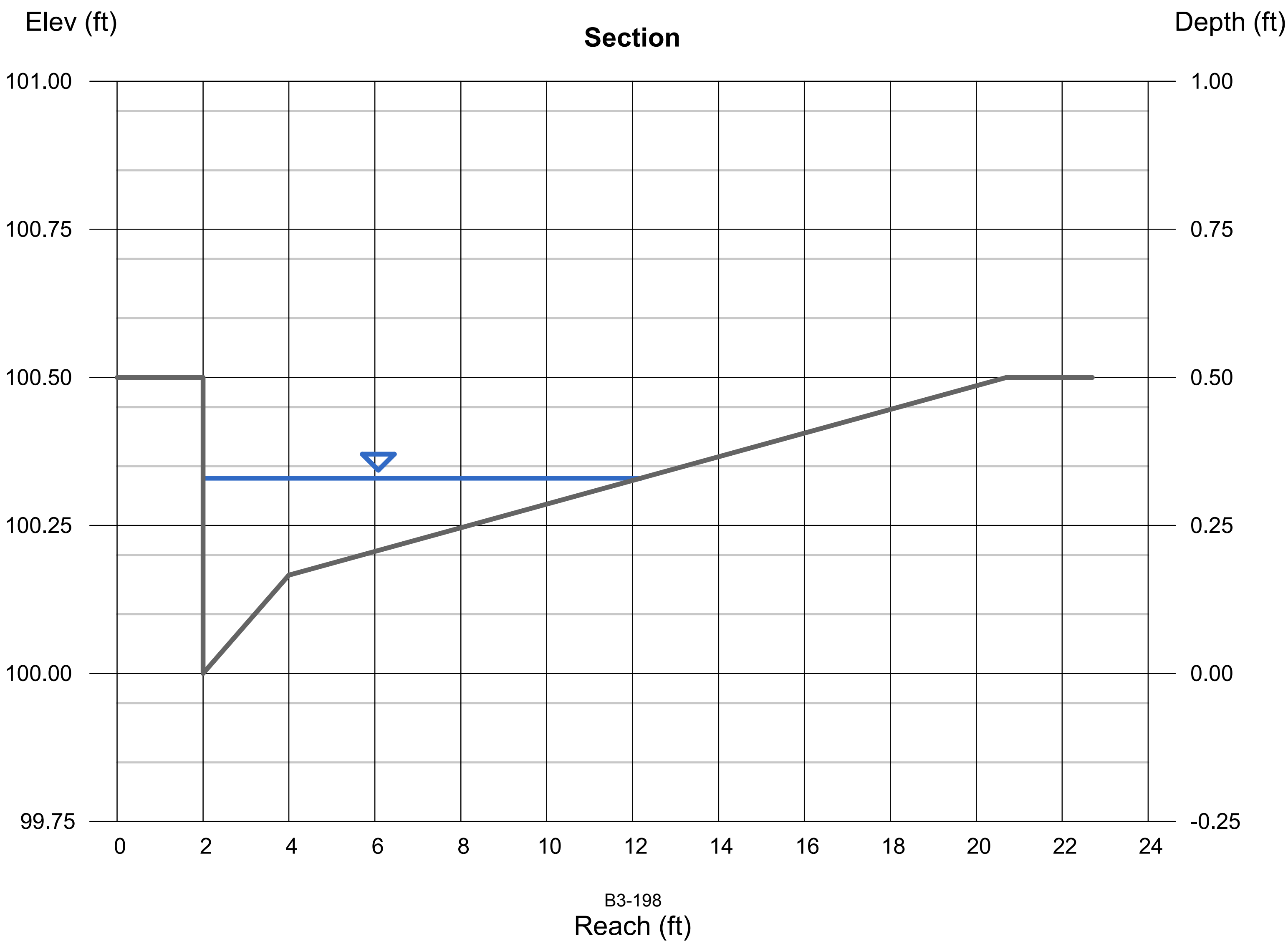


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

H3 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.33
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.780
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.17
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.53
Slope (%)	= 0.20	Wetted Perim (ft)	= 10.54
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.31
		Spread Width (ft)	= 10.20
Calculations		EGL (ft)	= 0.37
Compute by:	Known Q		
Known Q (cfs)	= 1.78		



Channel Report

H4 DA Street Capacity 10-YEAR

Gutter

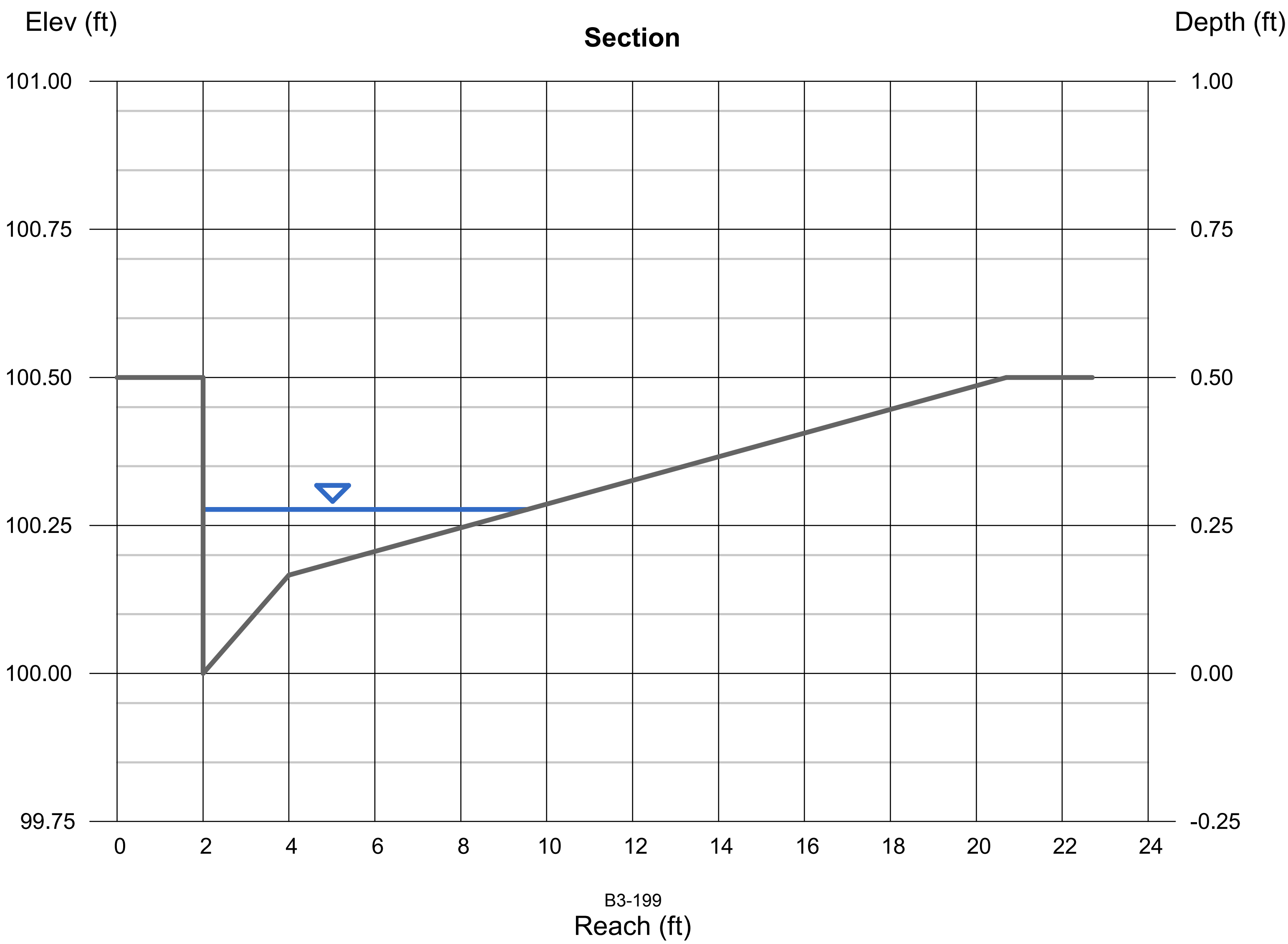
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.60
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.66

Highlighted

Depth (ft)	= 0.28
Q (cfs)	= 1.660
Area (sqft)	= 0.70
Velocity (ft/s)	= 2.38
Wetted Perim (ft)	= 7.83
Crit Depth, Yc (ft)	= 0.31
Spread Width (ft)	= 7.55
EGL (ft)	= 0.37

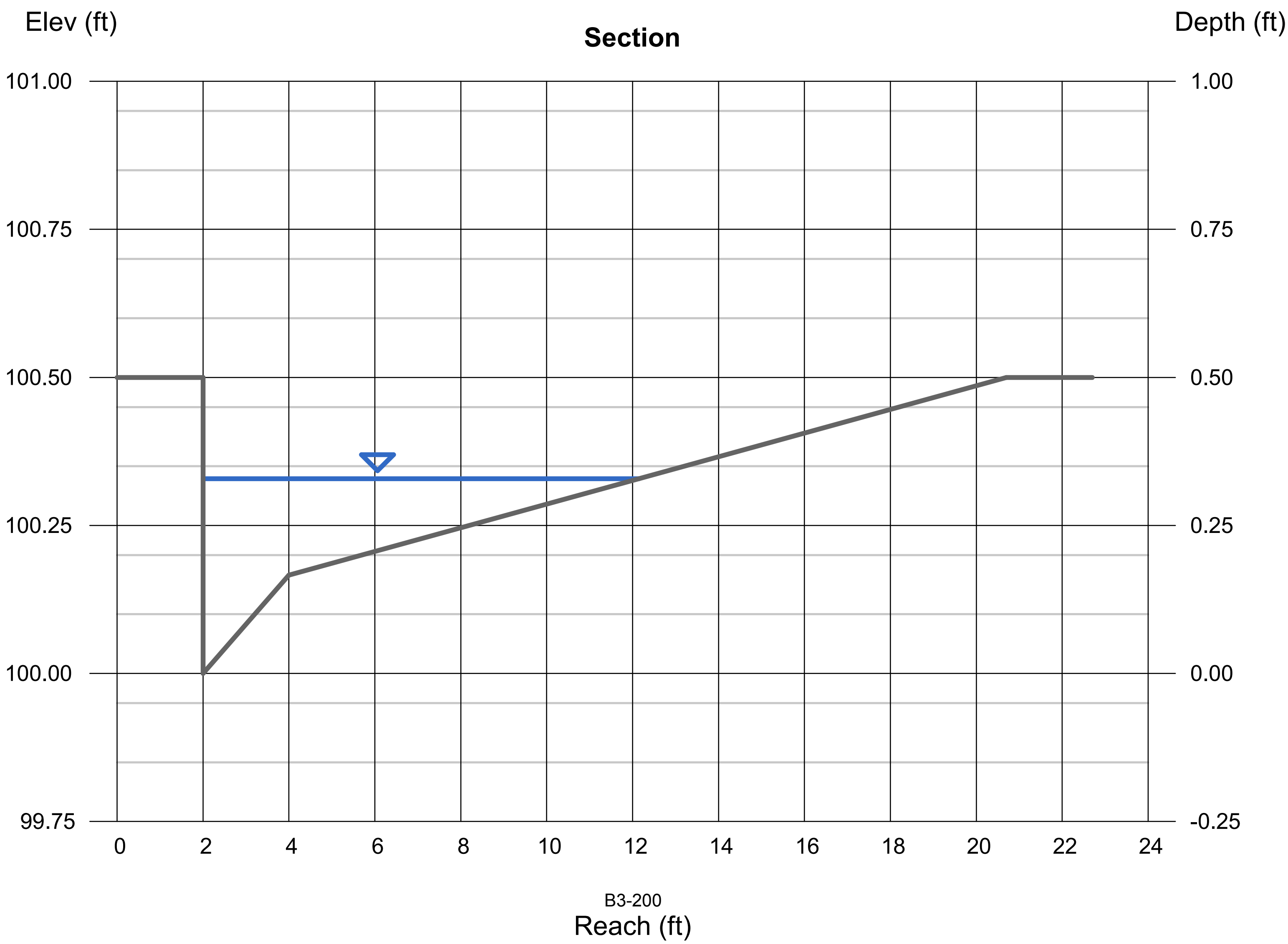


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

H1 DA Street Capacity 10-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.33
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.760
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.16
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.52
Slope (%)	= 0.20	Wetted Perim (ft)	= 10.49
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.31
		Spread Width (ft)	= 10.15
Calculations		EGL (ft)	= 0.37
Compute by:	Known Q		
Known Q (cfs)	= 1.76		



Channel Report

H2 DA Street Capacity 10-YEAR

Gutter

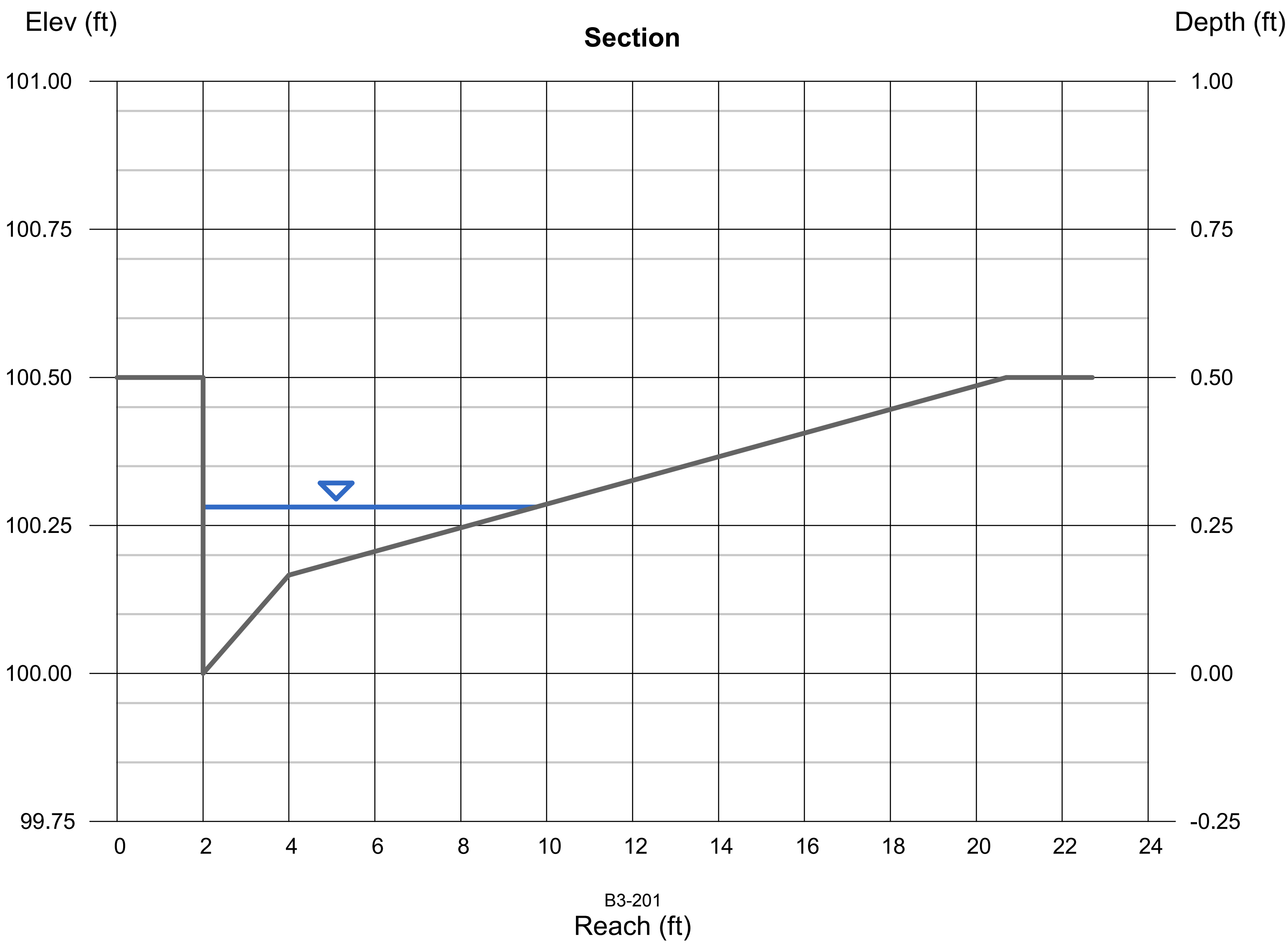
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.60
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.74

Highlighted

Depth (ft)	= 0.28
Q (cfs)	= 1.740
Area (sqft)	= 0.73
Velocity (ft/s)	= 2.39
Wetted Perim (ft)	= 8.04
Crit Depth, Yc (ft)	= 0.31
Spread Width (ft)	= 7.75
EGL (ft)	= 0.37

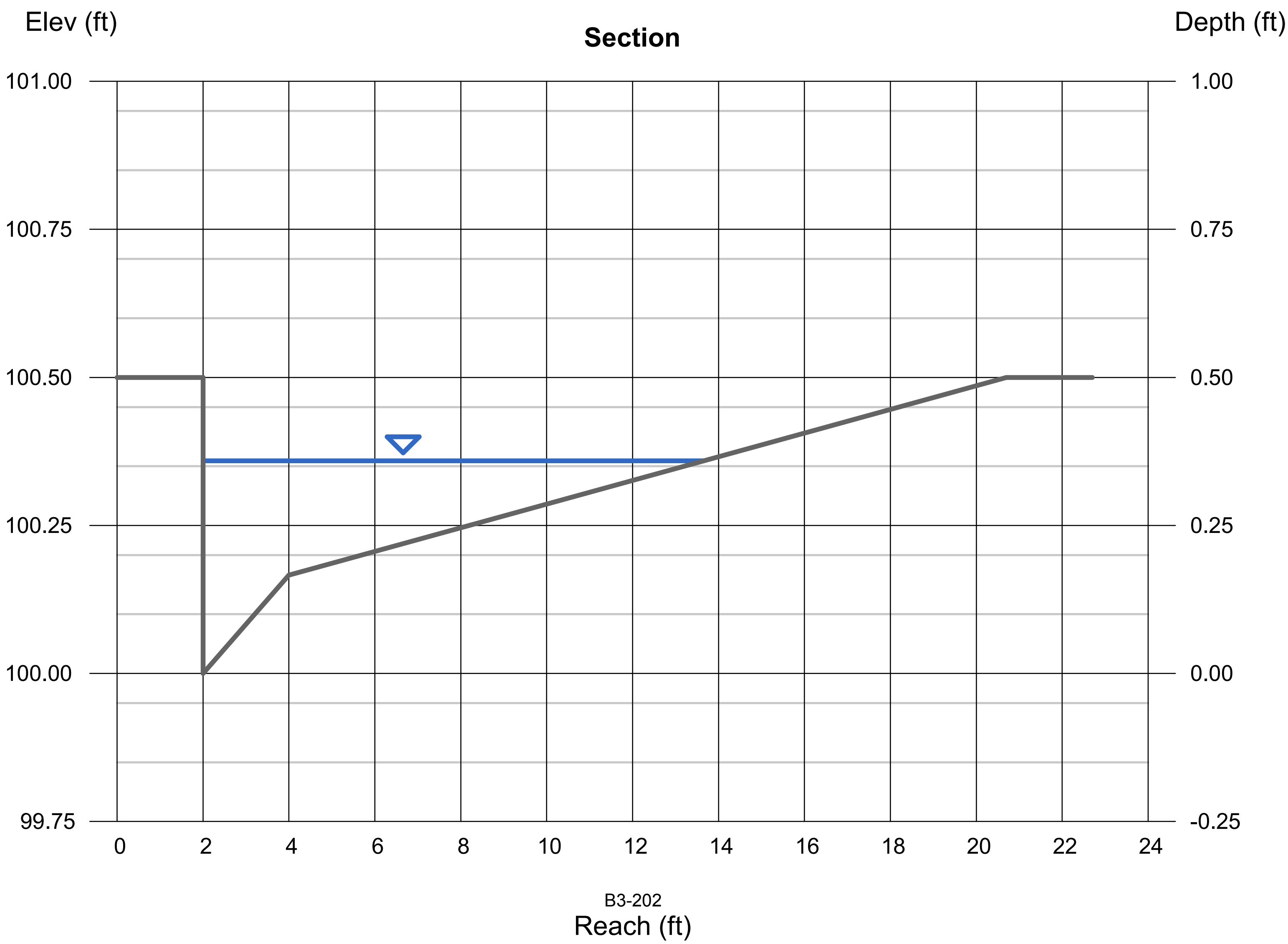


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

R1 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.36
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.700
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.48
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.15
Slope (%)	= 0.10	Wetted Perim (ft)	= 12.02
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.31
		Spread Width (ft)	= 11.65
Calculations		EGL (ft)	= 0.38
Compute by:	Known Q		
Known Q (cfs)	= 1.70		



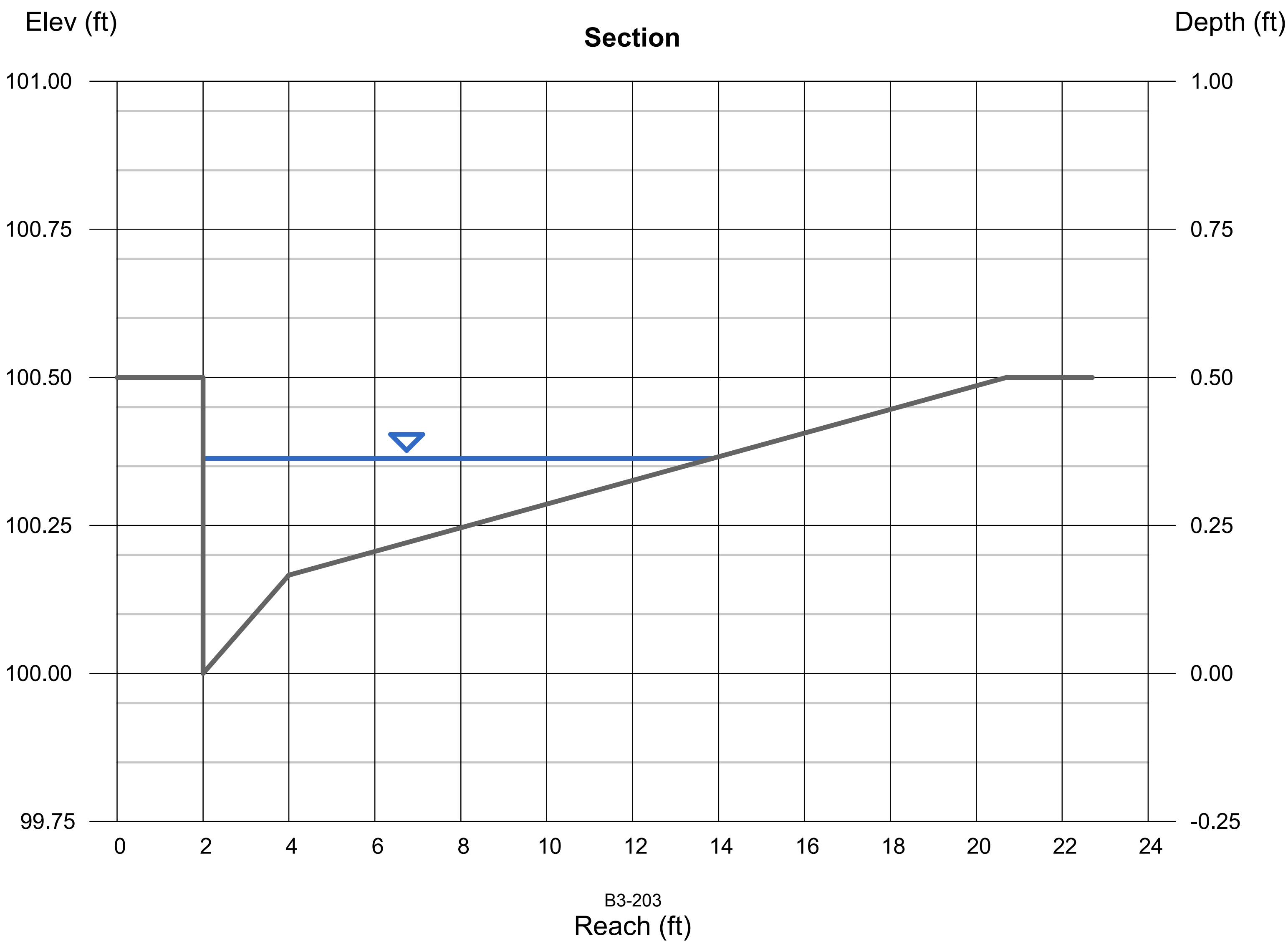
Channel Report

V1 DA Street Capacity 25-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.36
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.760
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.53
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.15
Slope (%)	= 0.10	Wetted Perim (ft)	= 12.22
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.31
		Spread Width (ft)	= 11.85
		EGL (ft)	= 0.38

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.76



Channel Report

V2 DA Street Capacity 25-YEAR

Gutter

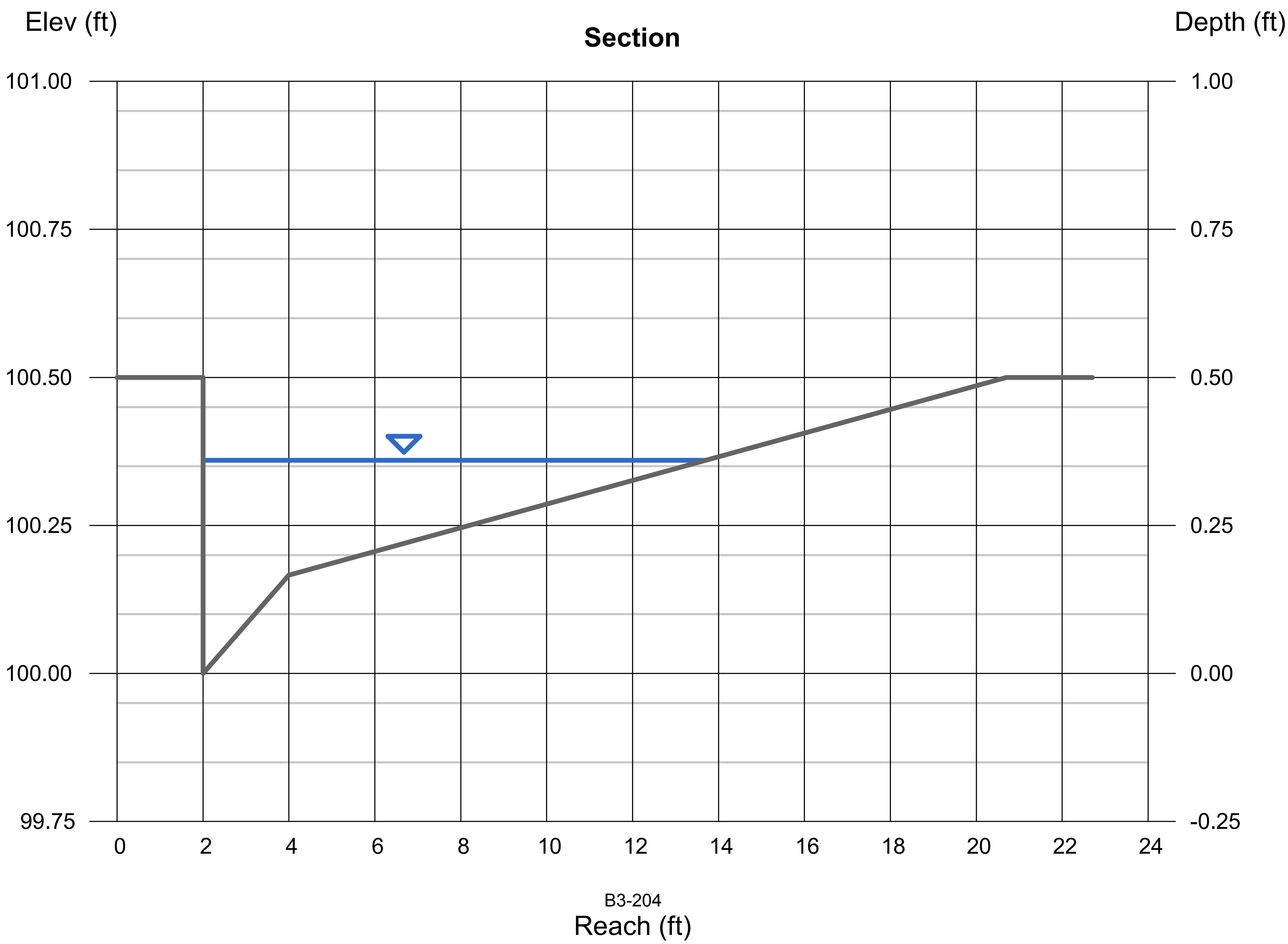
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.10
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.71

Highlighted

Depth (ft)	= 0.36
Q (cfs)	= 1.710
Area (sqft)	= 1.49
Velocity (ft/s)	= 1.14
Wetted Perim (ft)	= 12.07
Crit Depth, Yc (ft)	= 0.31
Spread Width (ft)	= 11.70
EGL (ft)	= 0.38

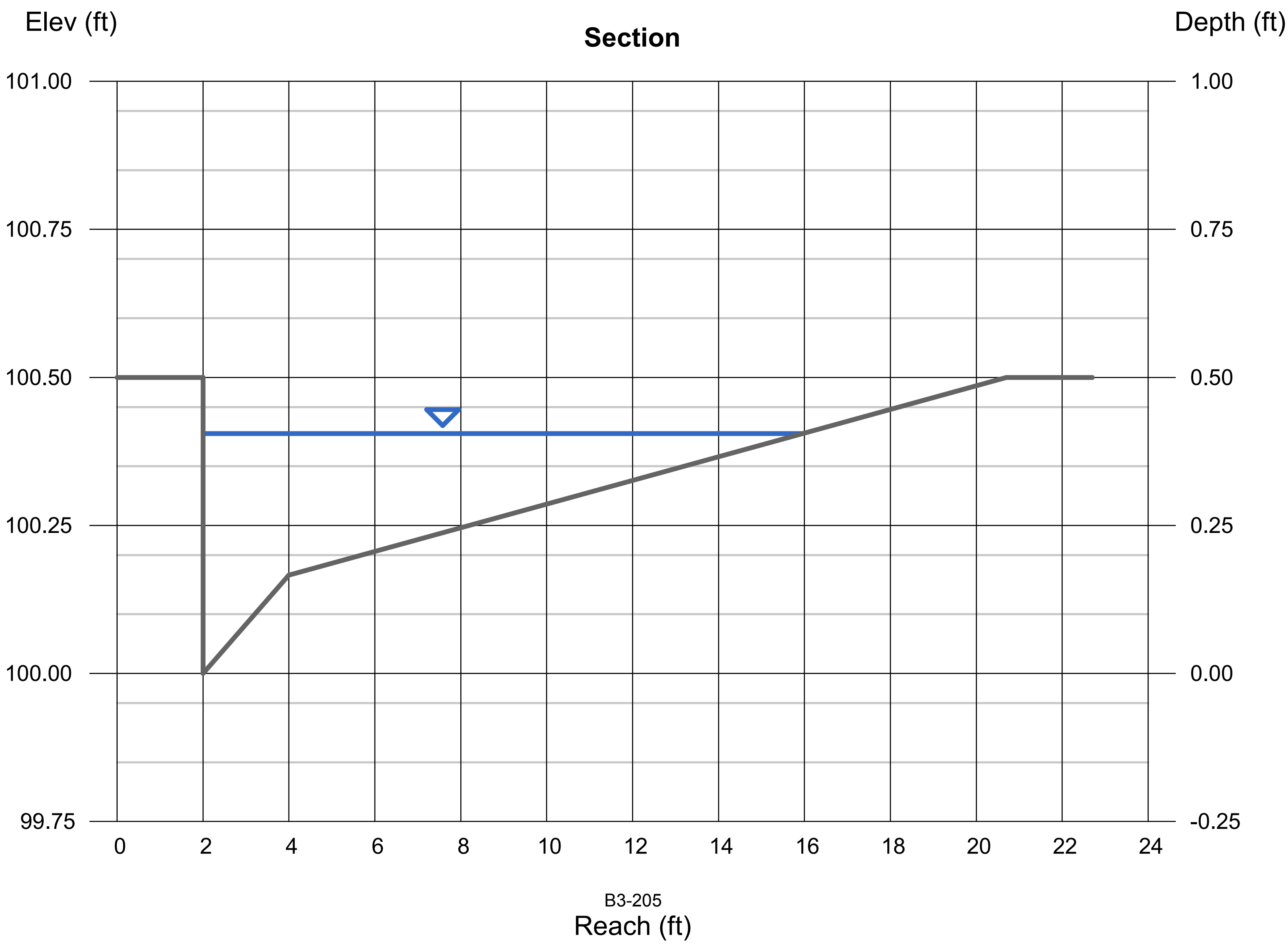


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

V3 DA Street Capacity 25-YEAR

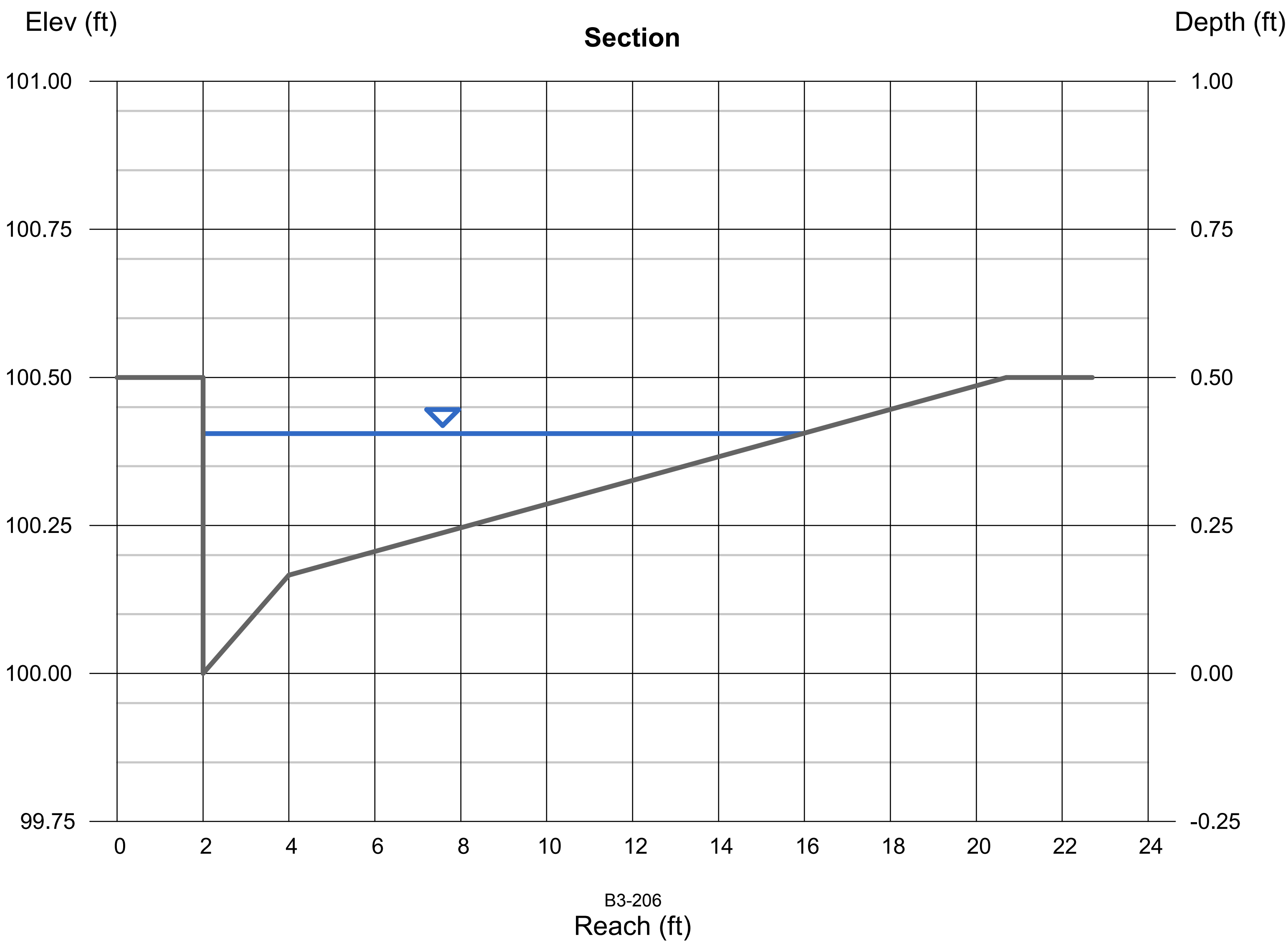
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.40
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.600
Gutter Width (ft)	= 2.00	Area (sqft)	= 2.07
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.25
Slope (%)	= 0.10	Wetted Perim (ft)	= 14.36
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.35
		Spread Width (ft)	= 13.95
Calculations		EGL (ft)	= 0.43
Compute by:	Known Q		
Known Q (cfs)	= 2.60		



Channel Report

V4 DA Street Capacity 25-YEAR

Gutter			**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020		Depth (ft)	= 0.40
Cross Sl, Sw (ft/ft)	= 0.083		Q (cfs)	= 2.600
Gutter Width (ft)	= 2.00		Area (sqft)	= 2.07
Invert Elev (ft)	= 100.00		Velocity (ft/s)	= 1.25
Slope (%)	= 0.10		Wetted Perim (ft)	= 14.36
N-Value	= 0.013		Crit Depth, Yc (ft)	= 0.35
			Spread Width (ft)	= 13.95
Calculations			EGL (ft)	= 0.43
Compute by:	Known Q			
Known Q (cfs)	= 2.60			



Channel Report

V5 DA Street Capacity 25-YEAR

Gutter

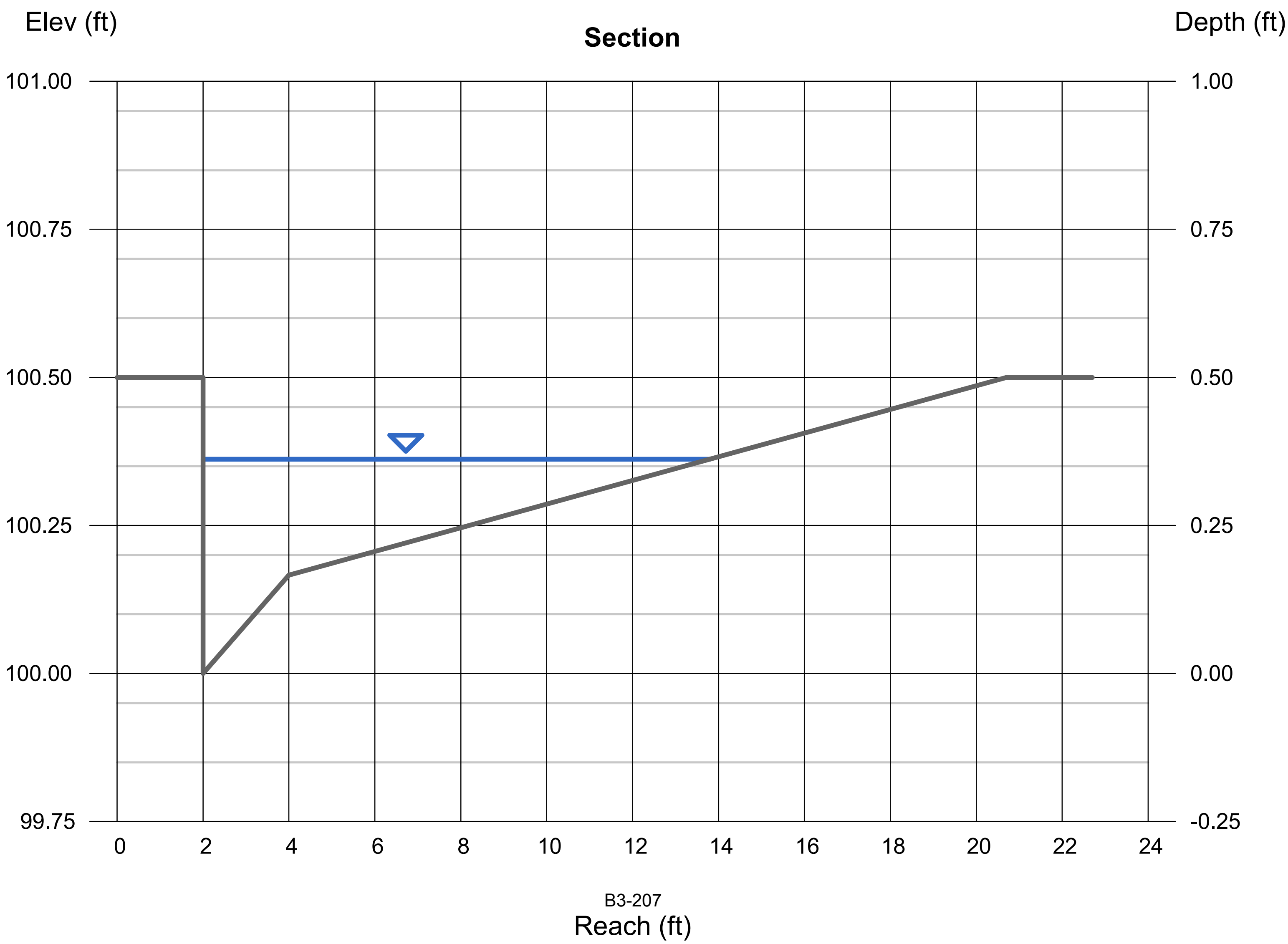
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.10
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.74

Highlighted

Depth (ft)	= 0.36
Q (cfs)	= 1.740
Area (sqft)	= 1.52
Velocity (ft/s)	= 1.15
Wetted Perim (ft)	= 12.17
Crit Depth, Yc (ft)	= 0.31
Spread Width (ft)	= 11.80
EGL (ft)	= 0.38

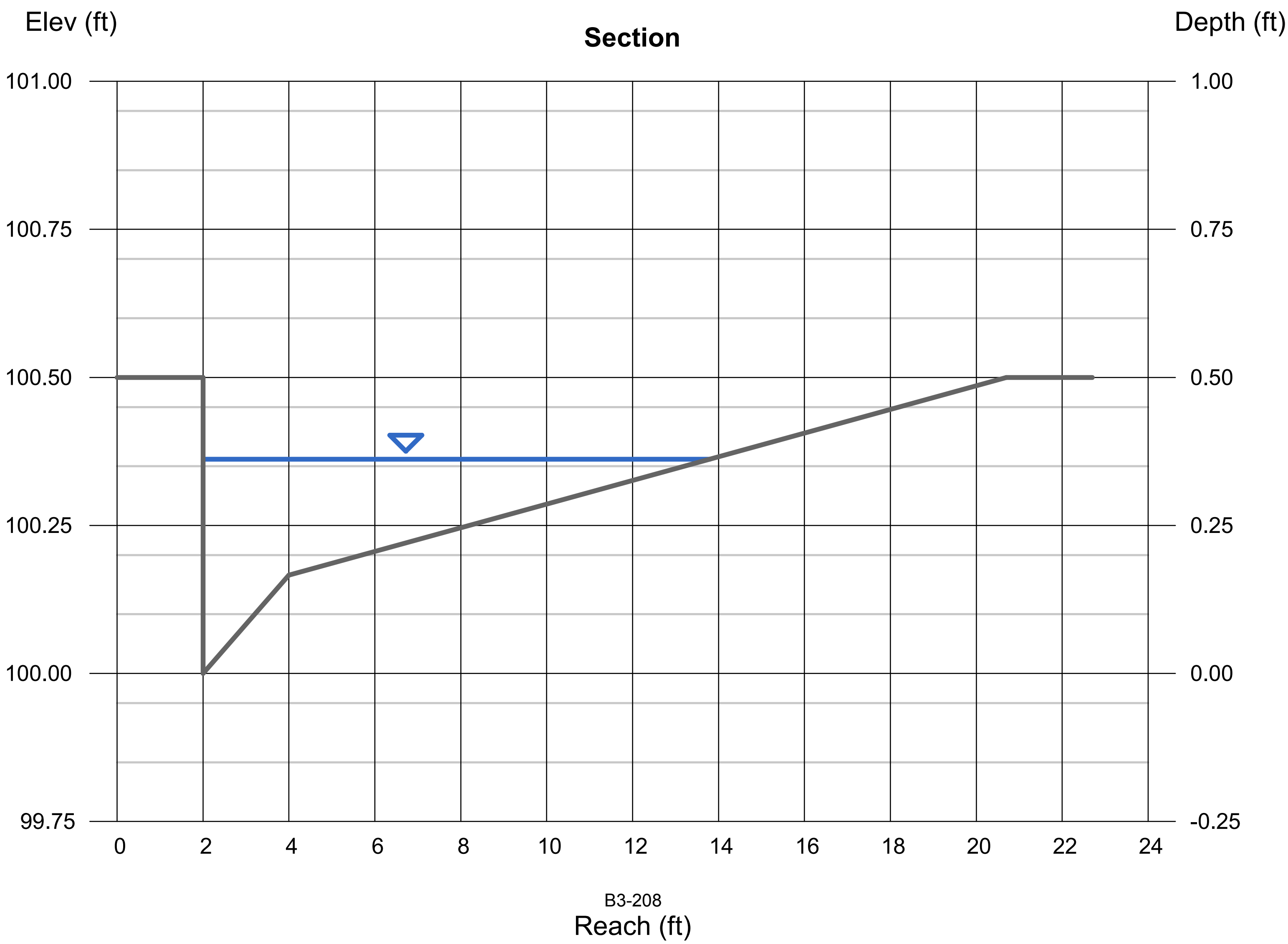


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

V6 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.36
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.740
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.52
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.15
Slope (%)	= 0.10	Wetted Perim (ft)	= 12.17
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.31
		Spread Width (ft)	= 11.80
Calculations		EGL (ft)	= 0.38
Compute by:	Known Q		
Known Q (cfs)	= 1.74		



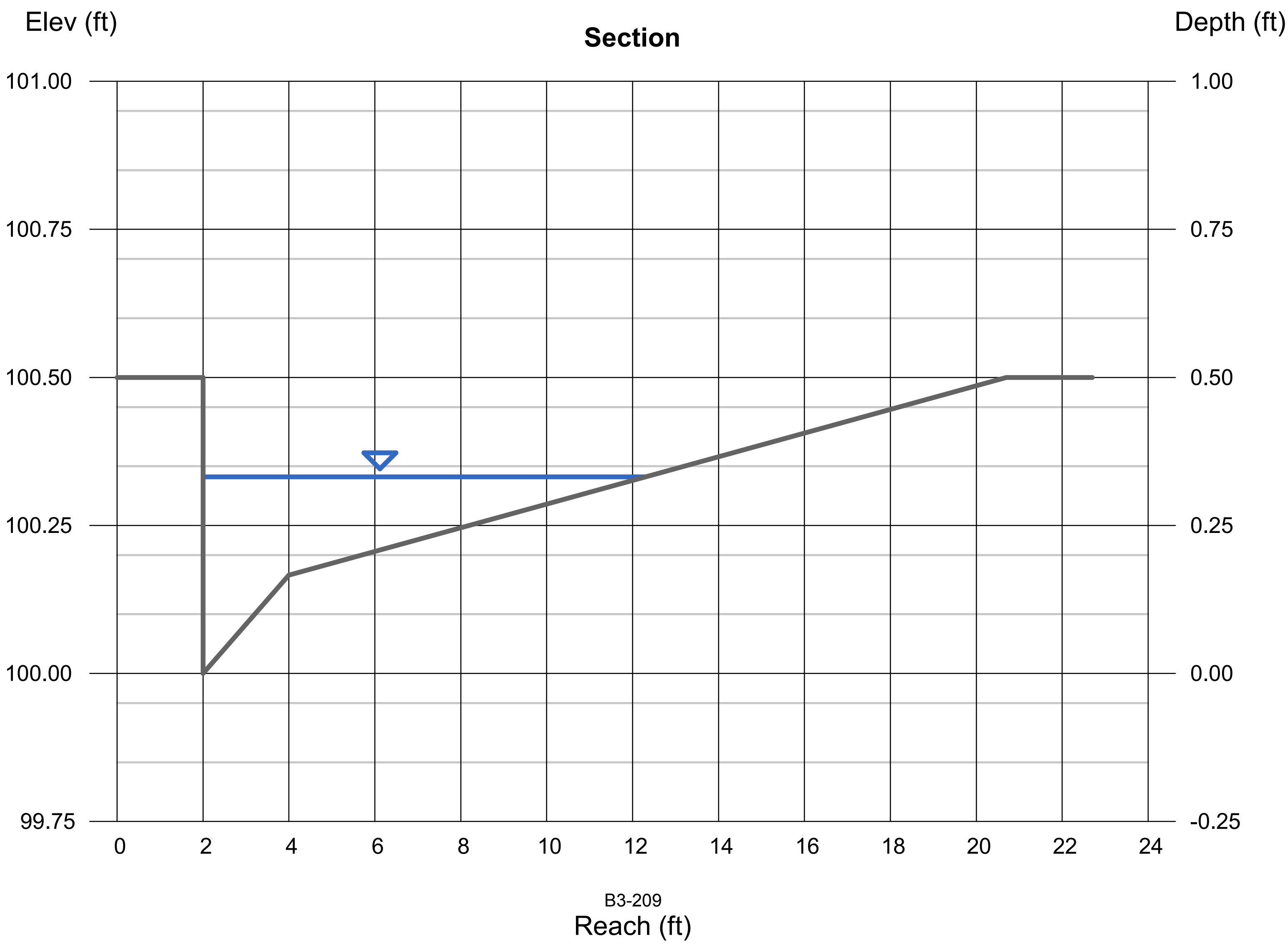
Channel Report

V7 DA Street Capacity 25-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.33
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.280
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.19
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.08
Slope (%)	= 0.10	Wetted Perim (ft)	= 10.64
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.29
		Spread Width (ft)	= 10.30
		EGL (ft)	= 0.35

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.28



Channel Report

V8 DA Street Capacity 25-YEAR

Gutter

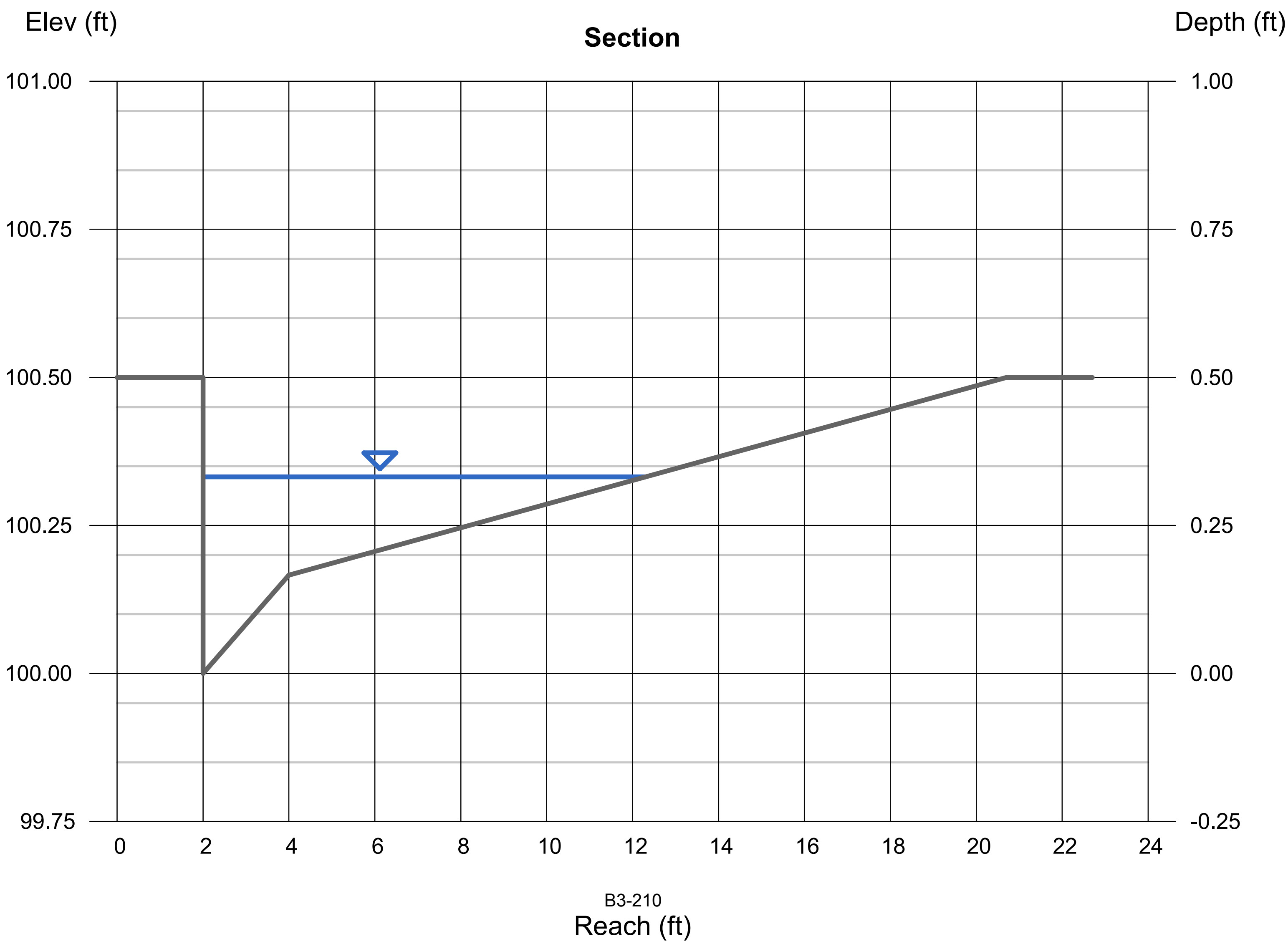
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.10
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.28

Highlighted

Depth (ft)	= 0.33
Q (cfs)	= 1.280
Area (sqft)	= 1.19
Velocity (ft/s)	= 1.08
Wetted Perim (ft)	= 10.64
Crit Depth, Yc (ft)	= 0.29
Spread Width (ft)	= 10.30
EGL (ft)	= 0.35

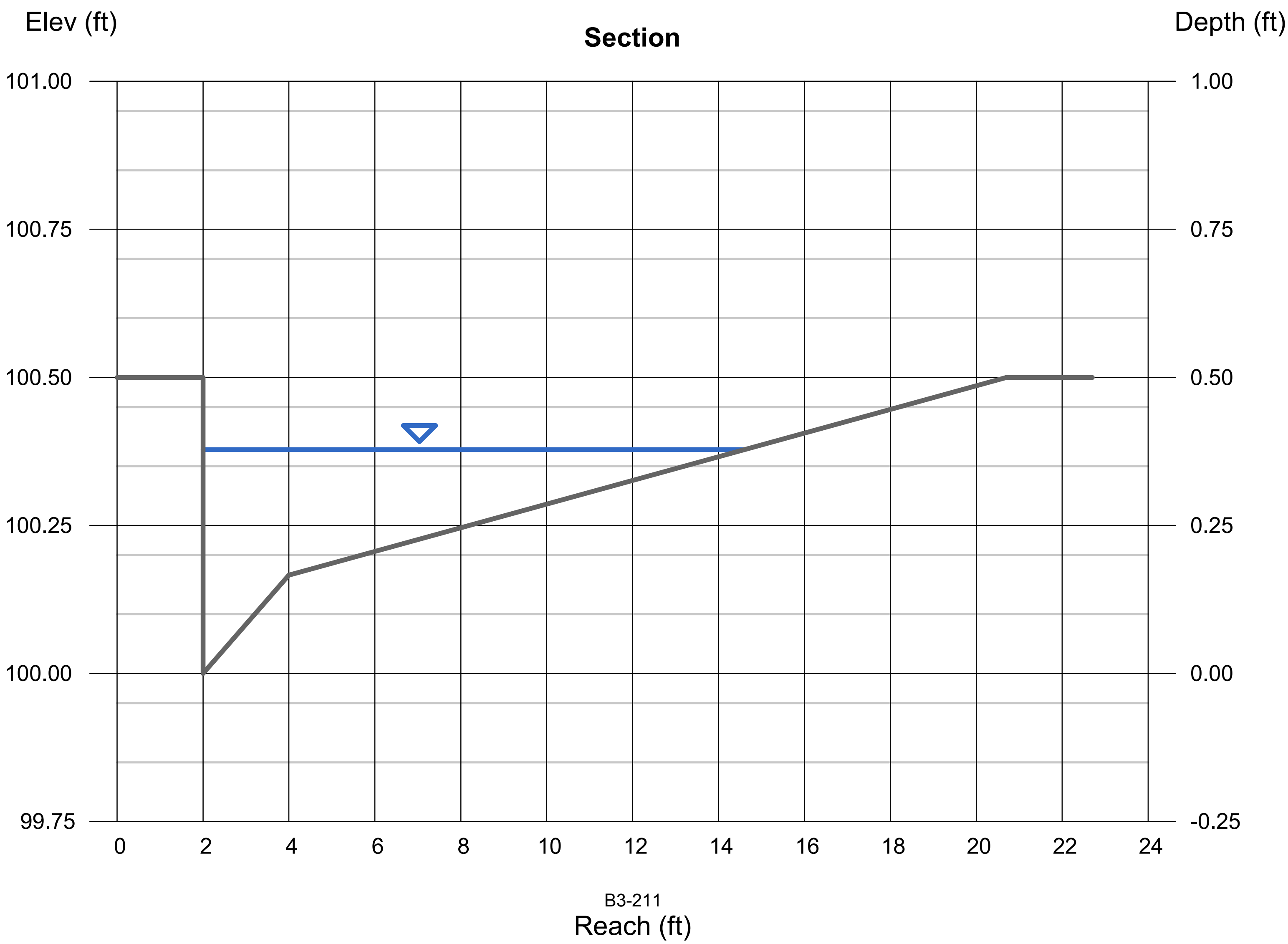


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

R2 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.38
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 4.070
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.71
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.38
Slope (%)	= 0.40	Wetted Perim (ft)	= 12.99
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.40
		Spread Width (ft)	= 12.60
Calculations		EGL (ft)	= 0.47
Compute by:	Known Q		
Known Q (cfs)	= 4.07		



Channel Report

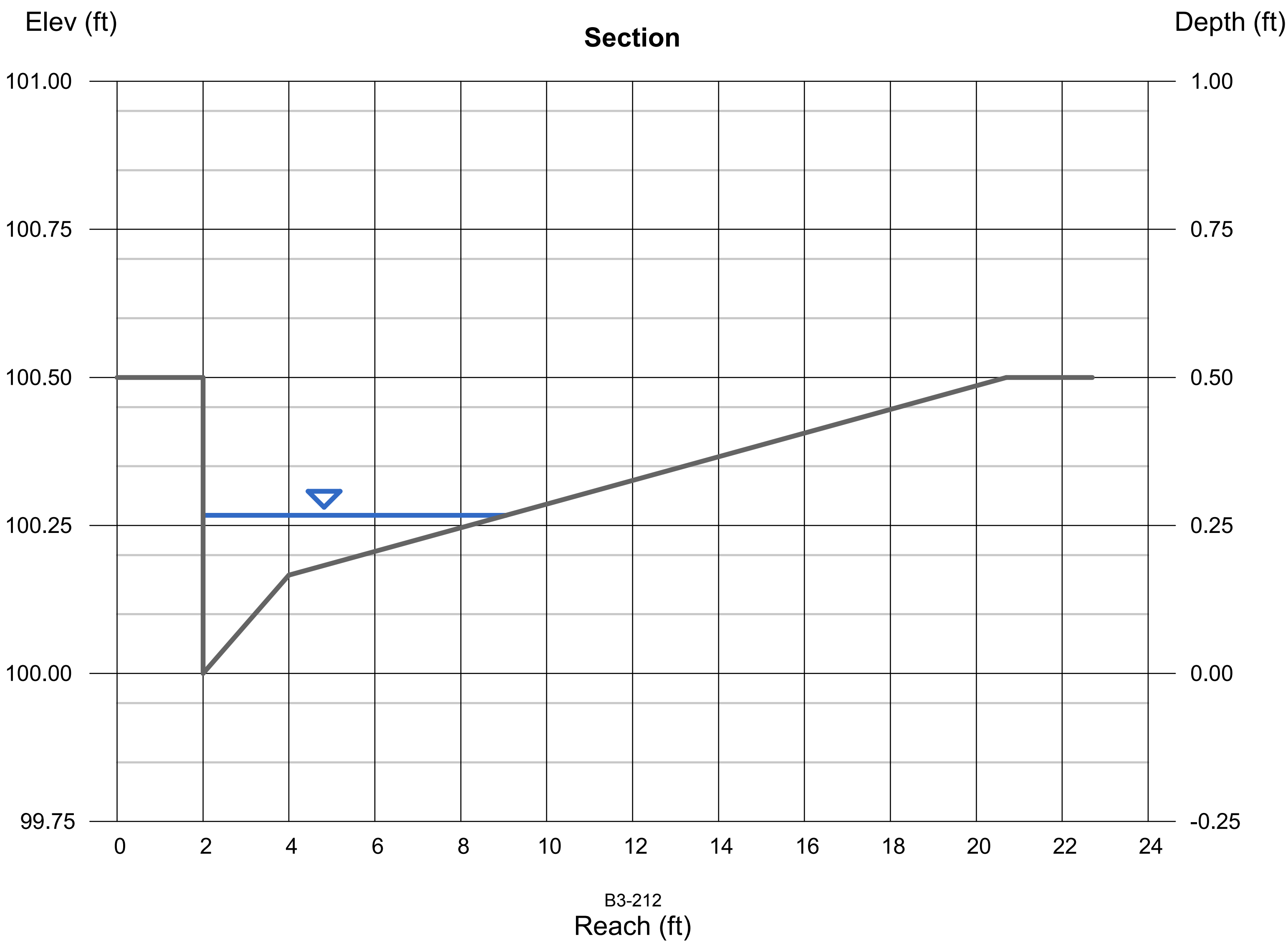
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

F3 DA Street Capacity 25-YEAR

Gutter	
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations	
Compute by:	Known Q
Known Q (cfs)	= 1.87

Highlighted	
Depth (ft)	= 0.27
Q (cfs)	= 1.870
Area (sqft)	= 0.62
Velocity (ft/s)	= 3.00
Wetted Perim (ft)	= 7.32
Crit Depth, Yc (ft)	= 0.32
Spread Width (ft)	= 7.05
EGL (ft)	= 0.41



Channel Report

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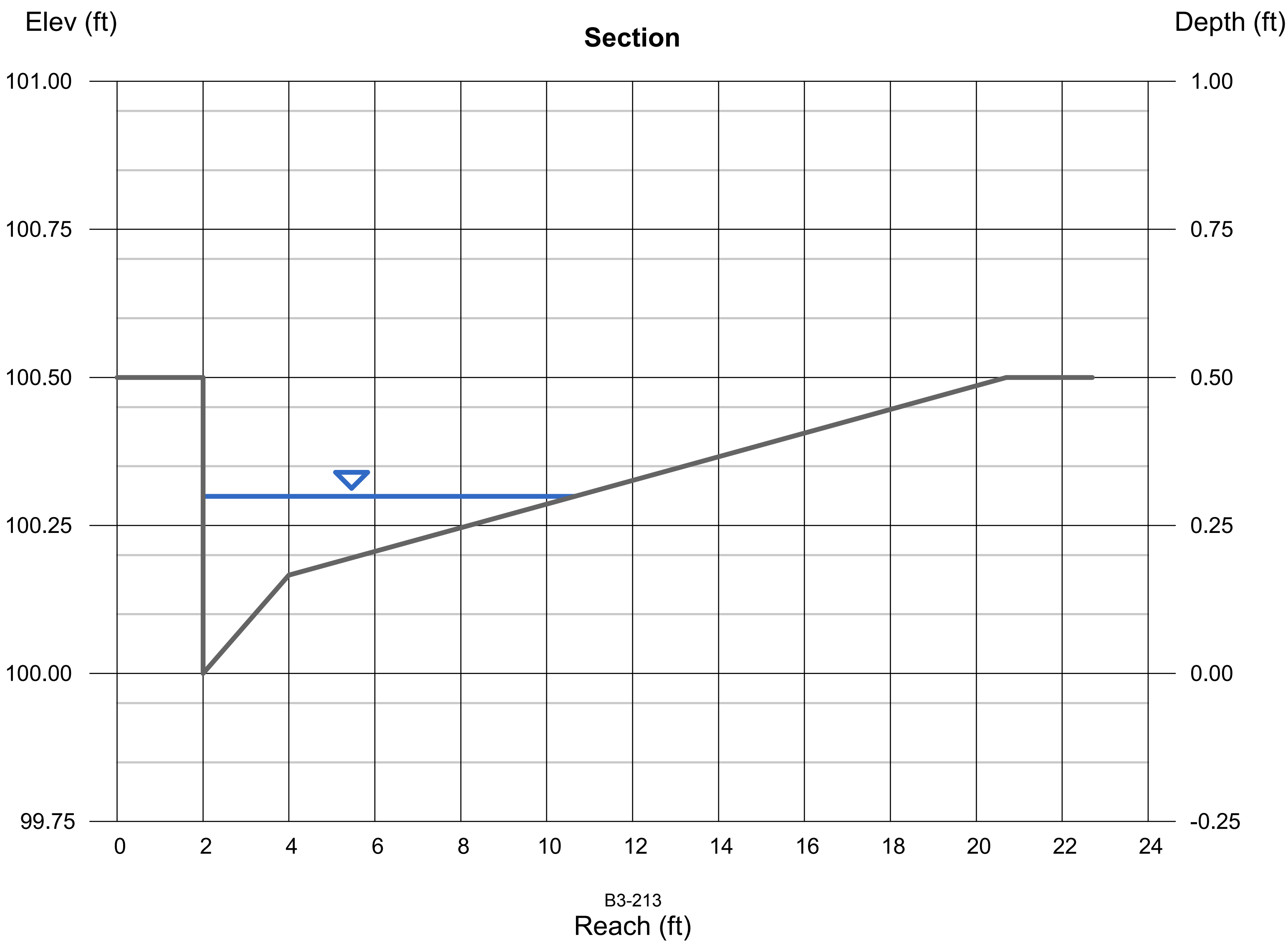
C6 DA Street Capacity 25-YEAR

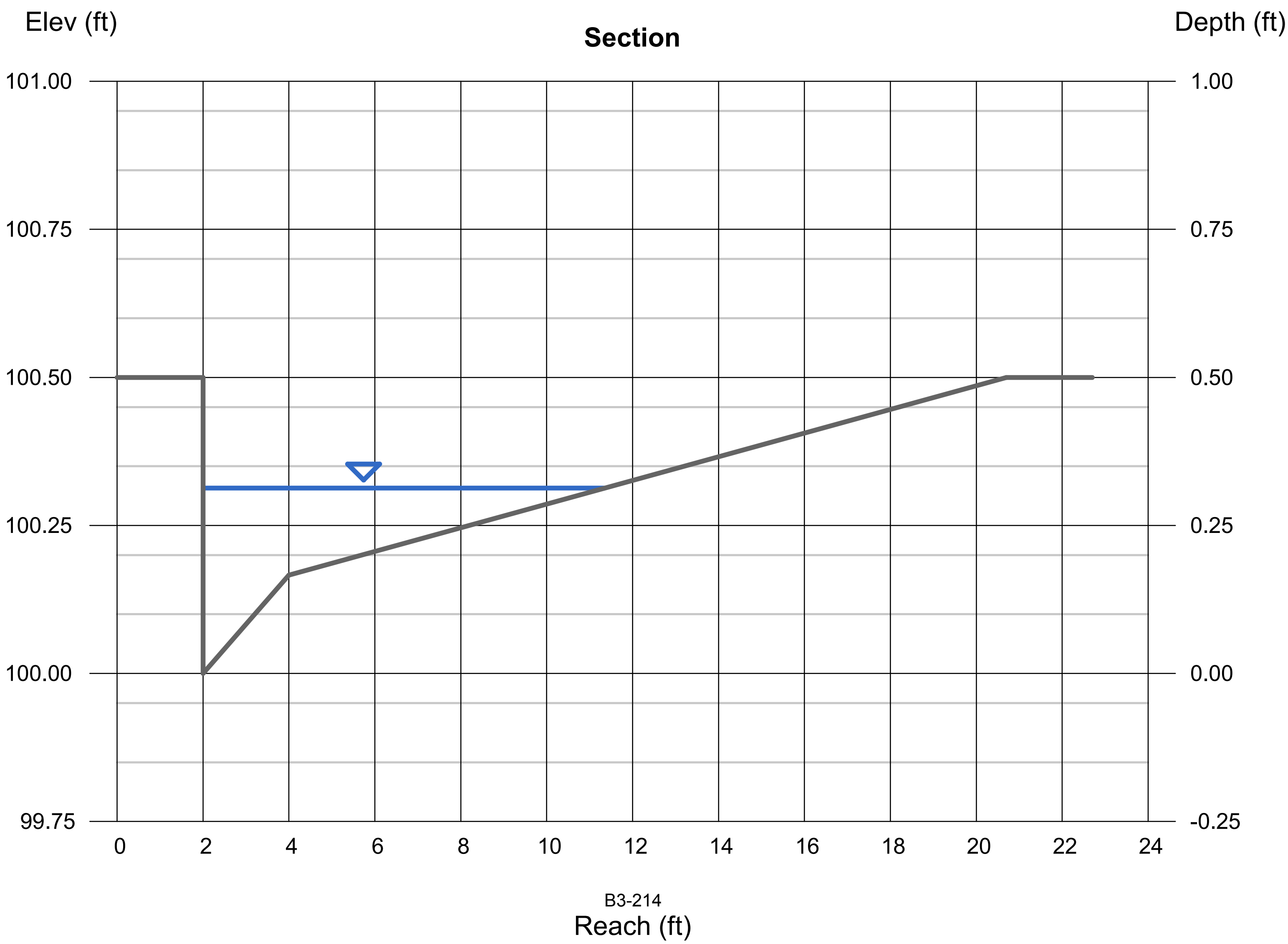
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.30
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.530
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.87
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.75
Slope (%)	= 0.30	Wetted Perim (ft)	= 8.96
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.30
		Spread Width (ft)	= 8.65
Calculations		EGL (ft)	= 0.35
Compute by:	Known Q		
Known Q (cfs)	= 1.53		



Channel Report

C5 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.31
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.480
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.00
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.48
Slope (%)	= 0.20	Wetted Perim (ft)	= 9.67
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.30
		Spread Width (ft)	= 9.35
Calculations		EGL (ft)	= 0.35
Compute by:	Known Q		
Known Q (cfs)	= 1.48		



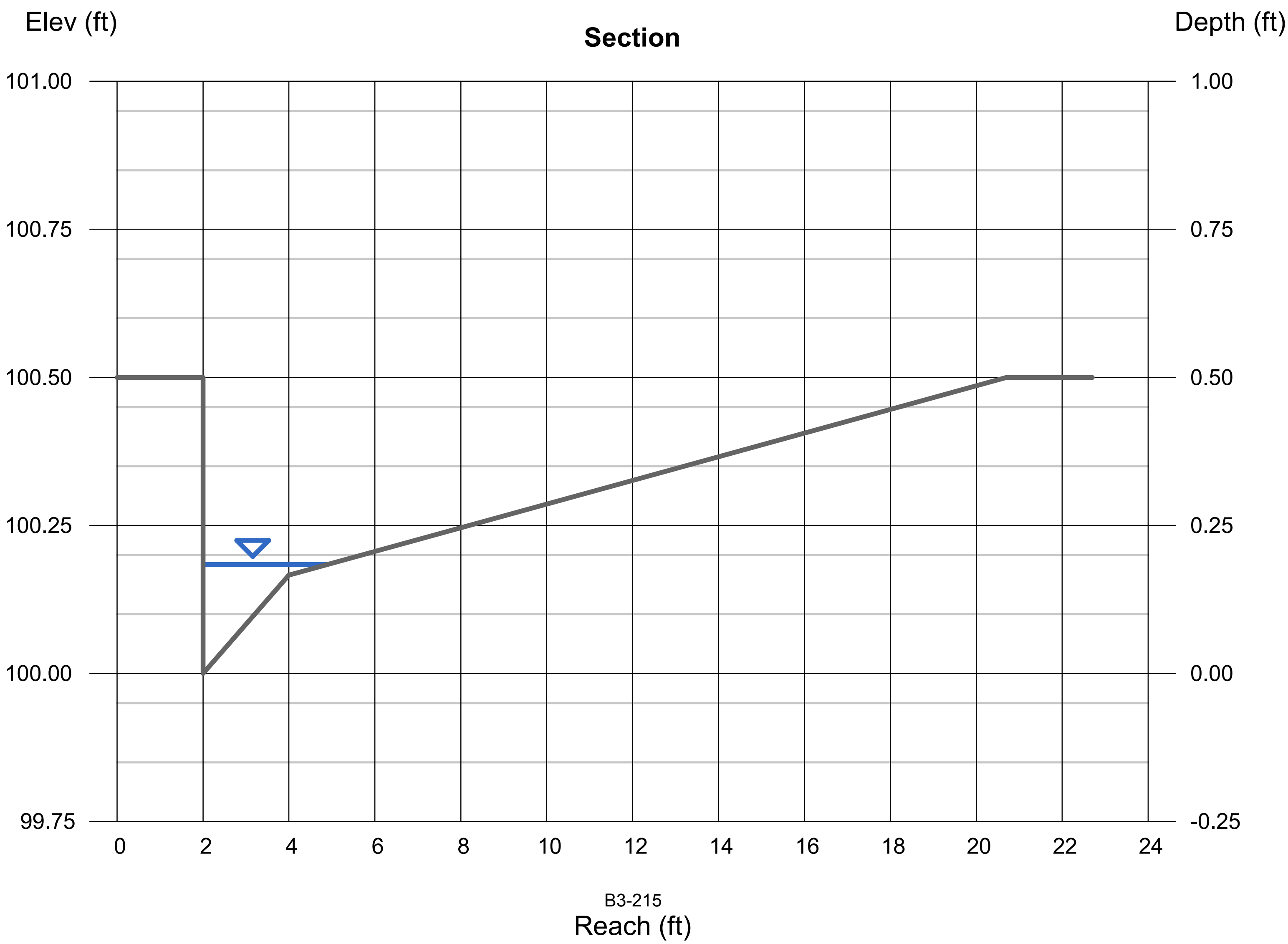
Channel Report

F1 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.18
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.400
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.21
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.90
Slope (%)	= 0.50	Wetted Perim (ft)	= 3.09
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.21
		Spread Width (ft)	= 2.90
		EGL (ft)	= 0.24

Calculations

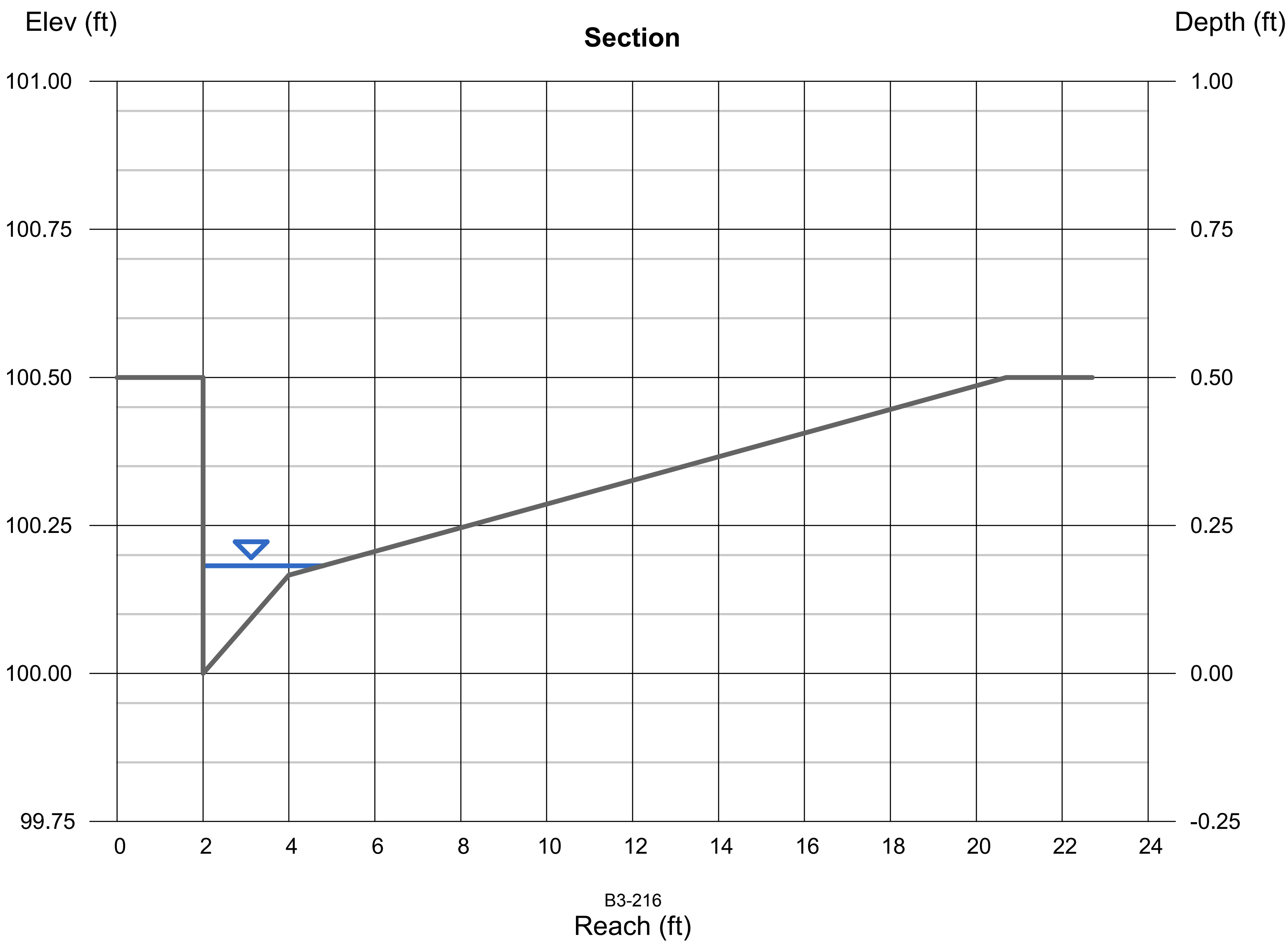
Compute by:	Known Q
Known Q (cfs)	= 0.40



Channel Report

F2 DA Street Capacity 25-YEAR

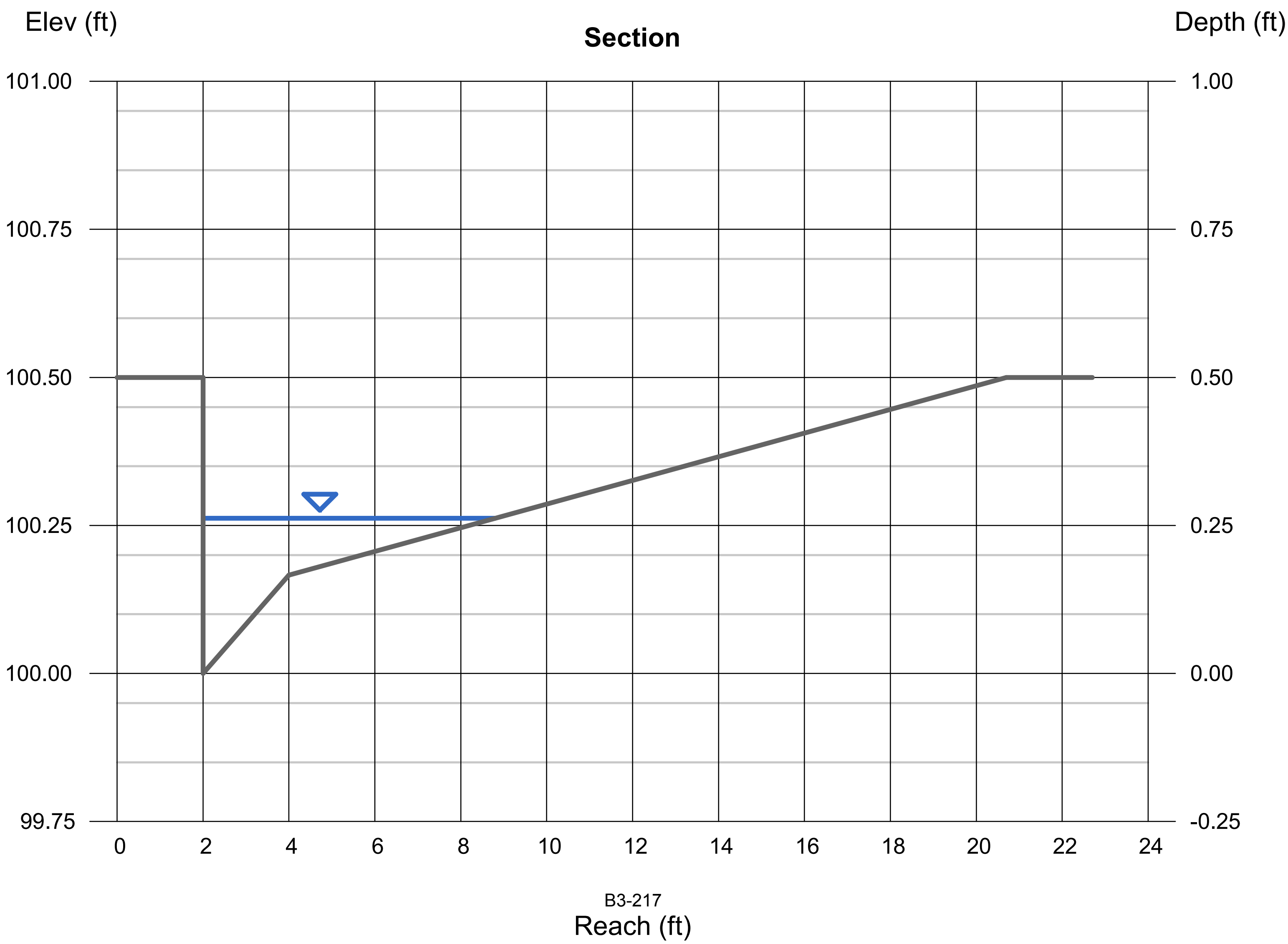
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.18
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.390
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.20
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.91
Slope (%)	= 0.50	Wetted Perim (ft)	= 2.99
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.20
		Spread Width (ft)	= 2.80
Calculations		EGL (ft)	= 0.24
Compute by:	Known Q		
Known Q (cfs)	= 0.39		



Channel Report

E2 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.26
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.780
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.59
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.33
Slope (%)	= 0.20	Wetted Perim (ft)	= 7.07
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.25
		Spread Width (ft)	= 6.80
Calculations		EGL (ft)	= 0.29
Compute by:	Known Q		
Known Q (cfs)	= 0.78		



Channel Report

E1 DA Street Capacity 25-YEAR

Gutter

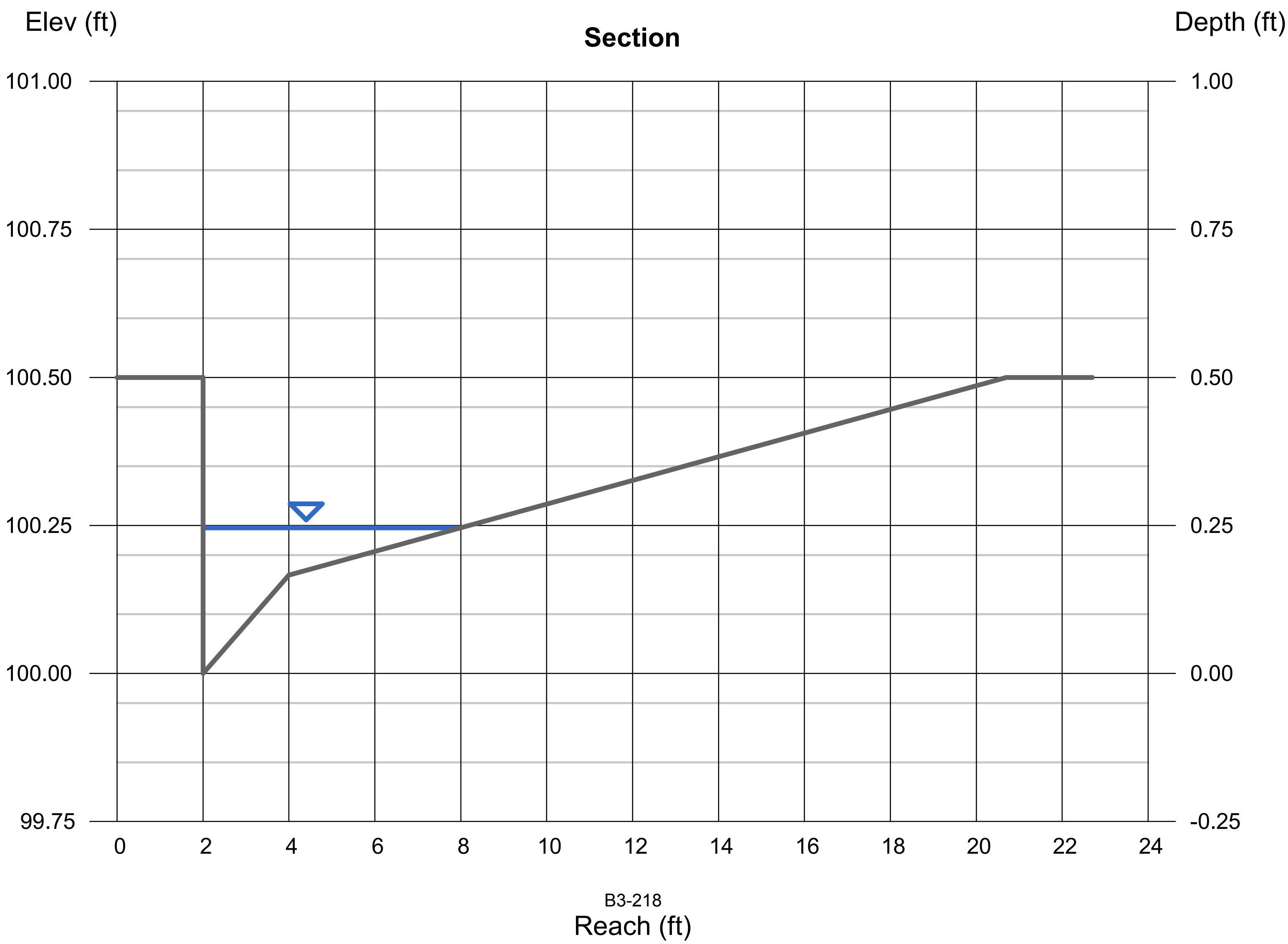
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.30
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.77

Highlighted

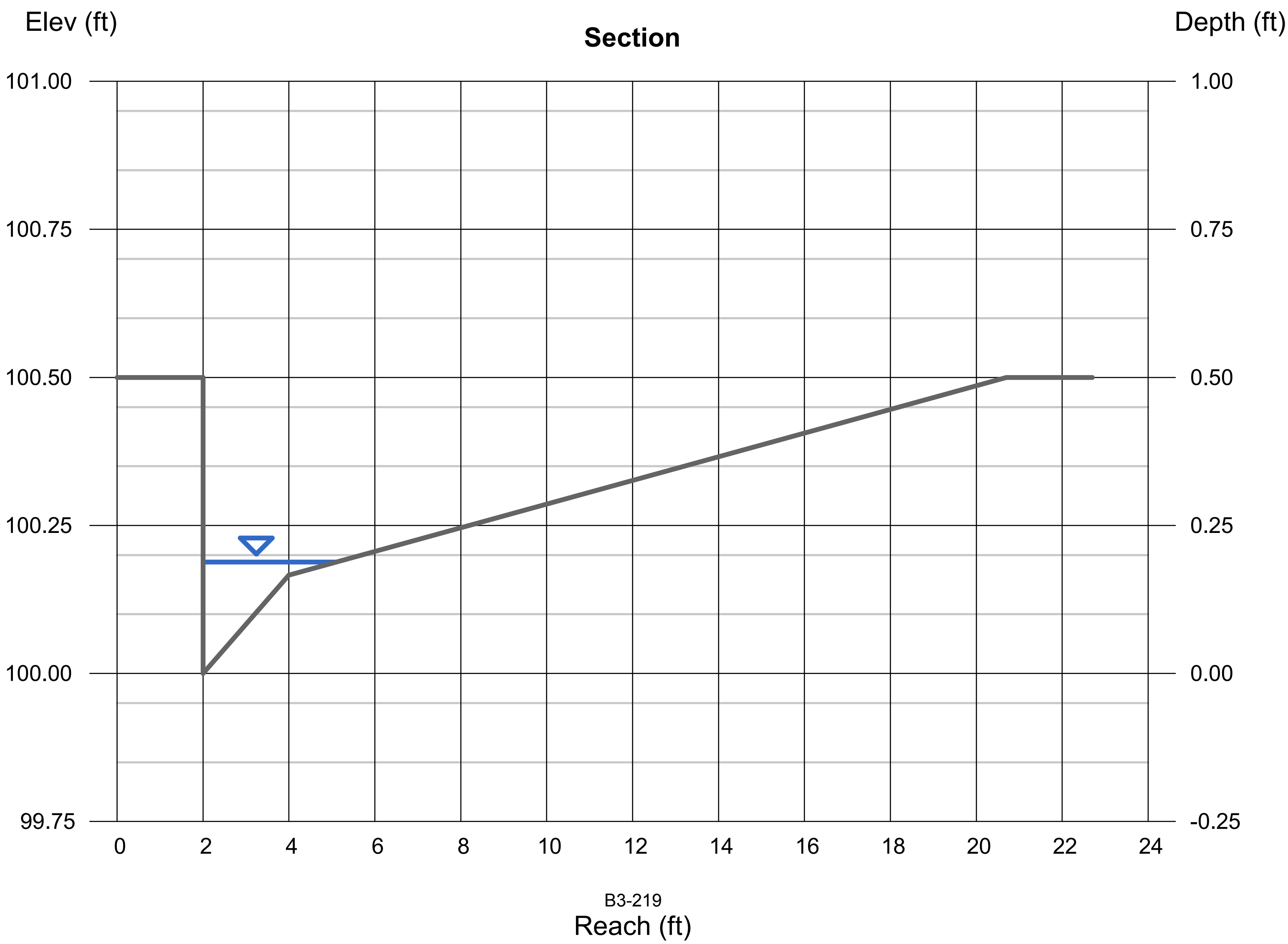
Depth (ft)	= 0.25
Q (cfs)	= 0.770
Area (sqft)	= 0.49
Velocity (ft/s)	= 1.58
Wetted Perim (ft)	= 6.25
Crit Depth, Yc (ft)	= 0.25
Spread Width (ft)	= 6.00
EGL (ft)	= 0.29



Channel Report

E4 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.19
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.380
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.22
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.71
Slope (%)	= 0.40	Wetted Perim (ft)	= 3.30
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.20
		Spread Width (ft)	= 3.10
Calculations		EGL (ft)	= 0.23
Compute by:	Known Q		
Known Q (cfs)	= 0.38		



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

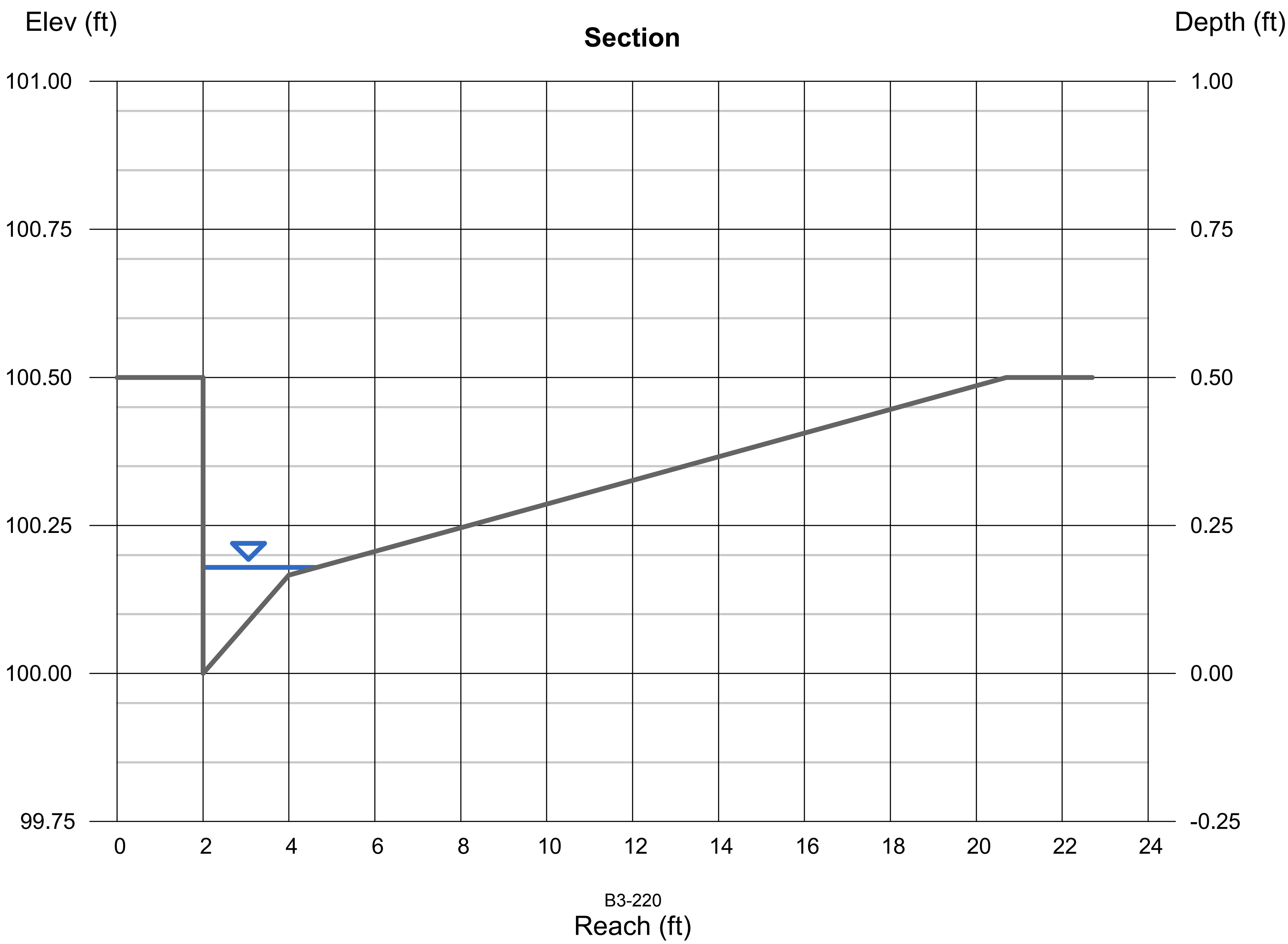
E3 DA Street Capacity 25-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.18
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.370
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.20
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.89
Slope (%)	= 0.50	Wetted Perim (ft)	= 2.84
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.20
		Spread Width (ft)	= 2.65
		EGL (ft)	= 0.23

Calculations

Compute by: Known Q

Known Q (cfs) = 0.37

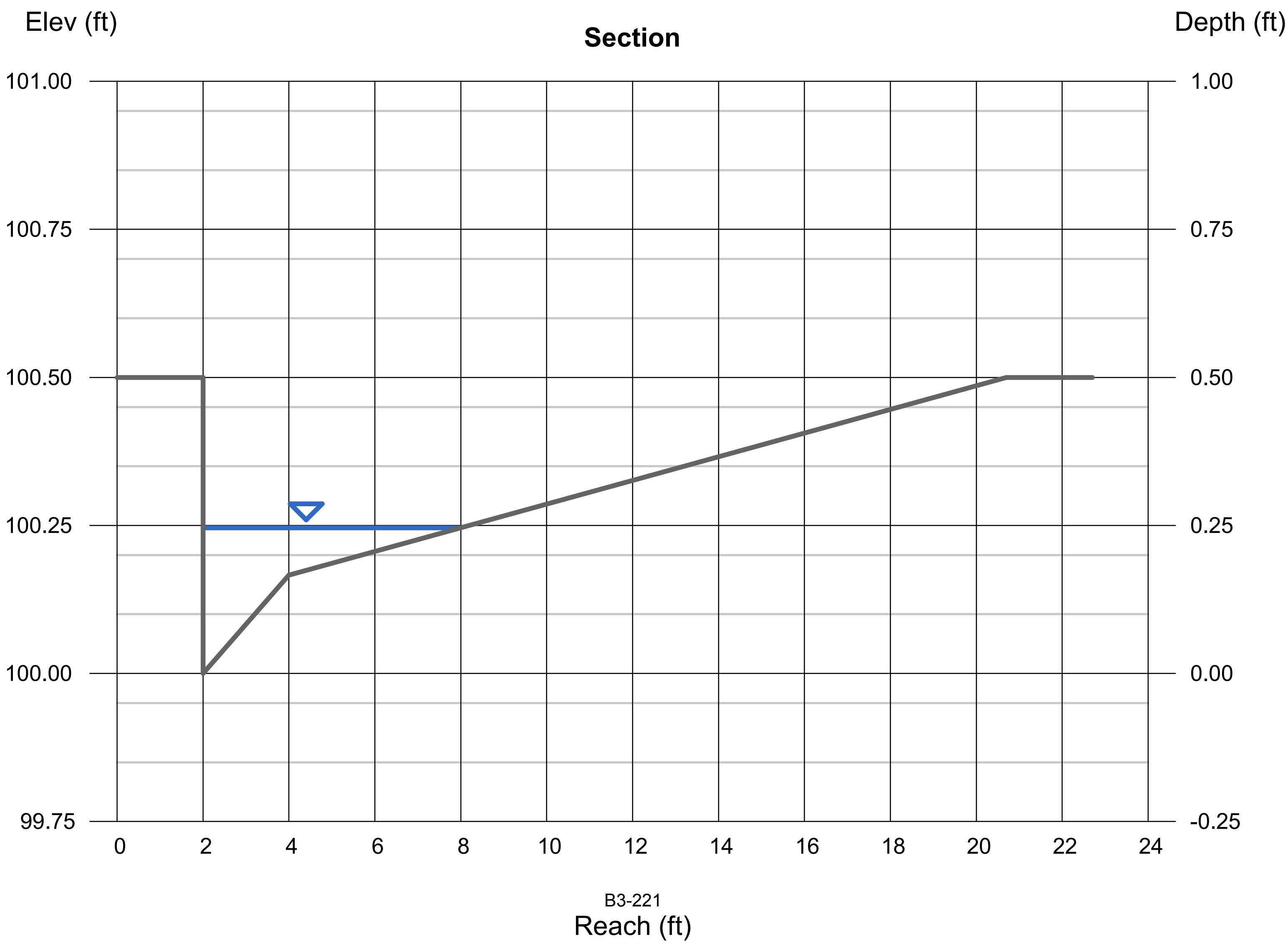


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. — Friday, May 17 2024

C2 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.25
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.000
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.49
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.06
Slope (%)	= 0.50	Wetted Perim (ft)	= 6.25
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.27
		Spread Width (ft)	= 6.00
Calculations		EGL (ft)	= 0.31
Compute by:	Known Q		
Known Q (cfs)	= 1.00		

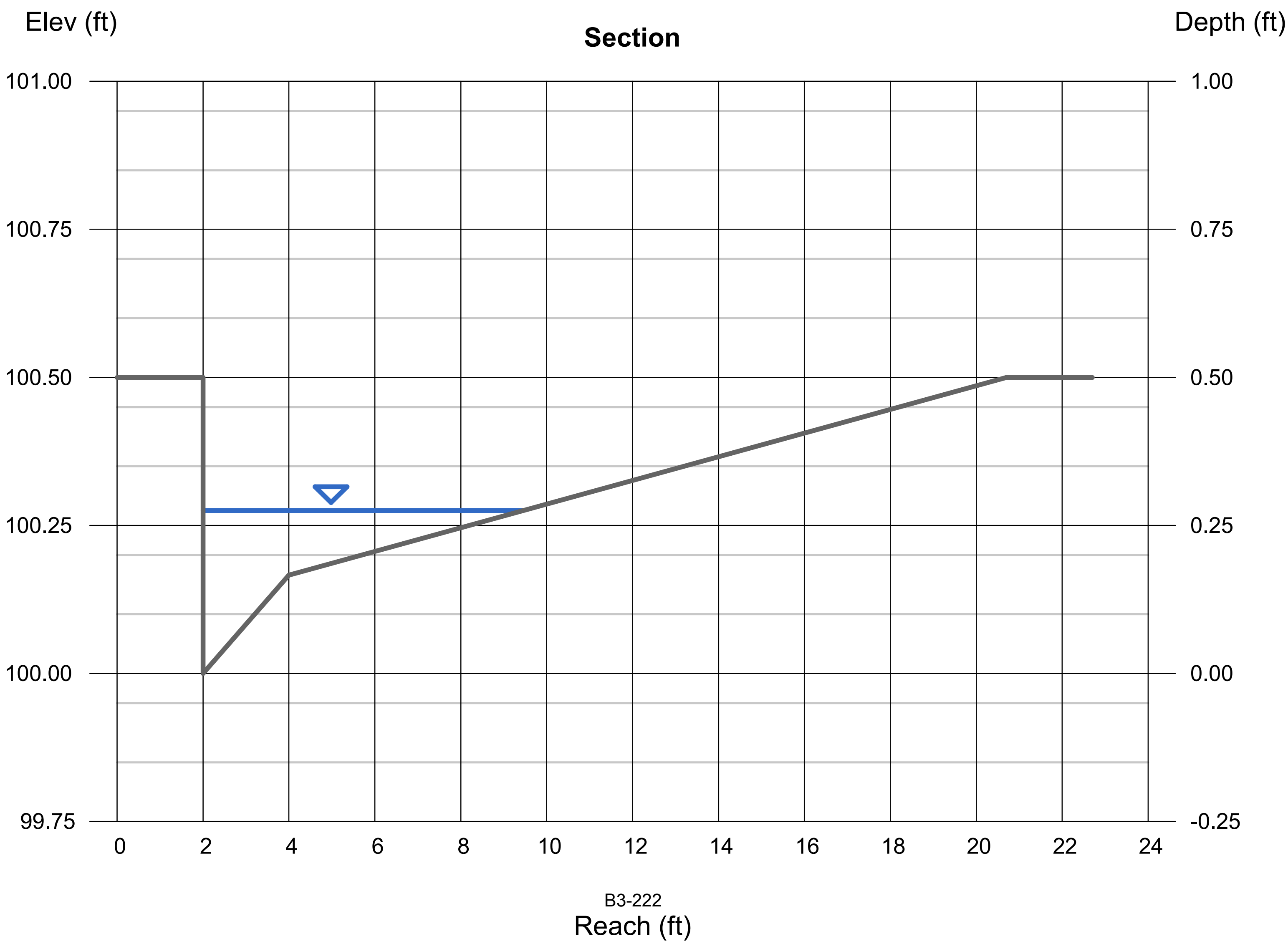


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

C1 DA Street Capacity 25-YEAR

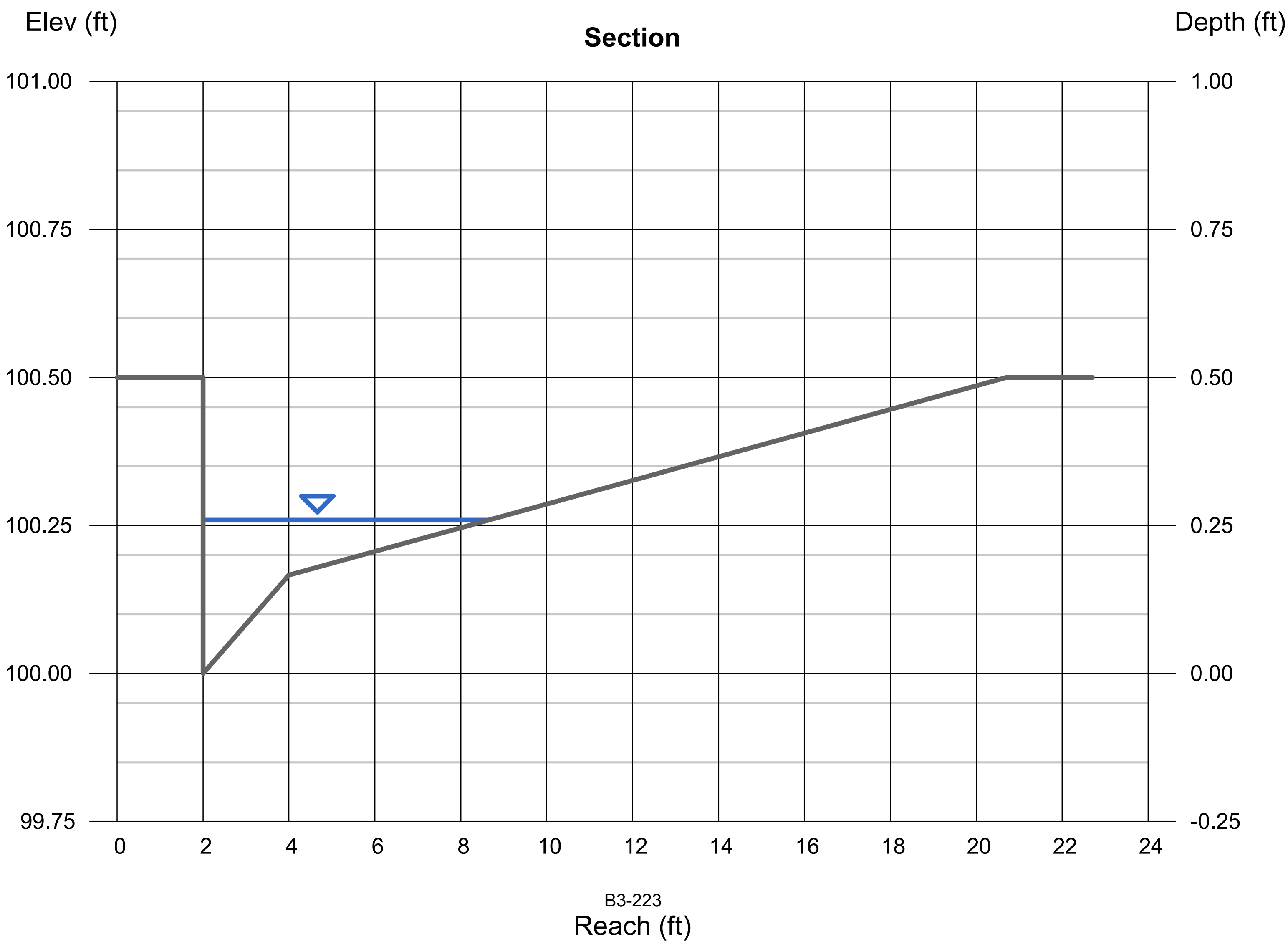
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.28
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.930
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.68
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.37
Slope (%)	= 0.20	Wetted Perim (ft)	= 7.73
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.26
		Spread Width (ft)	= 7.45
Calculations		EGL (ft)	= 0.30
Compute by:	Known Q		
Known Q (cfs)	= 0.93		



Channel Report

C4 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.26
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.060
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.57
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.87
Slope (%)	= 0.40	Wetted Perim (ft)	= 6.92
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.27
		Spread Width (ft)	= 6.65
Calculations		EGL (ft)	= 0.31
Compute by:	Known Q		
Known Q (cfs)	= 1.06		

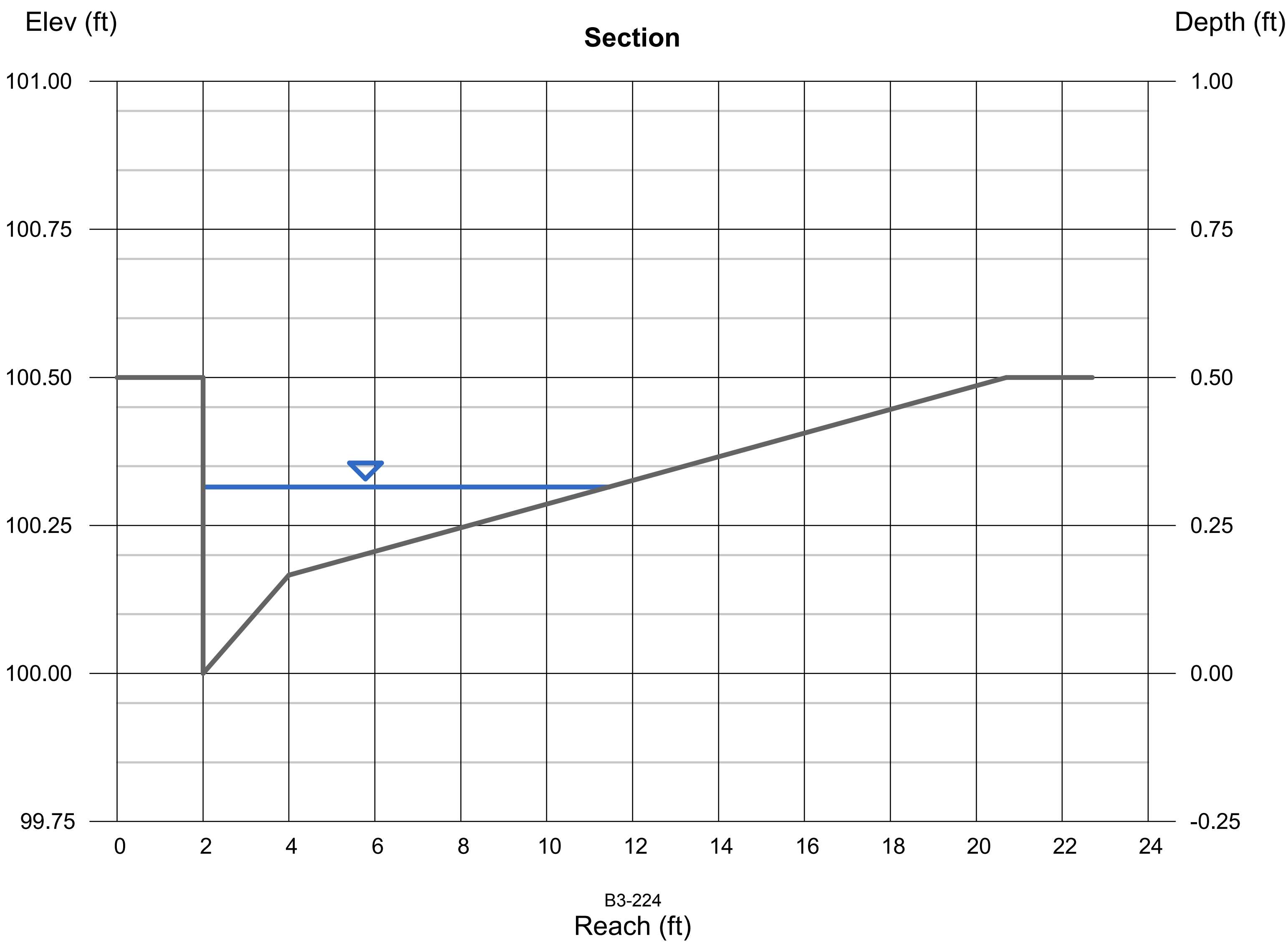


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

C3 DA Street Capacity 25-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.31
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.060
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.02
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.04
Slope (%)	= 0.10	Wetted Perim (ft)	= 9.77
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.27
		Spread Width (ft)	= 9.45
Calculations		EGL (ft)	= 0.33
Compute by:	Known Q		
Known Q (cfs)	= 1.06		



Channel Report

A9 DA Street Capacity 25-YEAR

Gutter

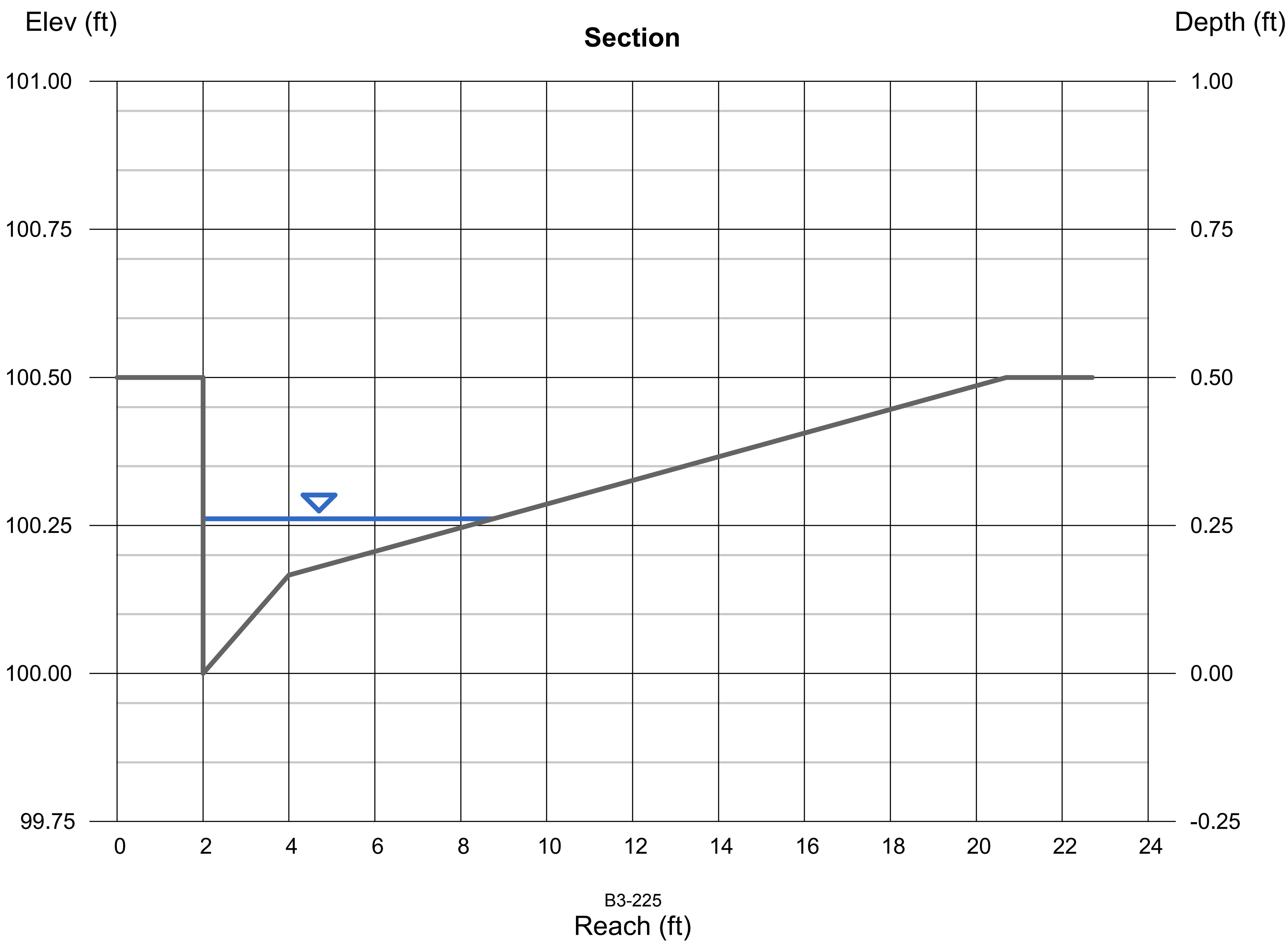
Cross Sl, Sx (ft/ft)	=	0.020
Cross Sl, Sw (ft/ft)	=	0.083
Gutter Width (ft)	=	2.00
Invert Elev (ft)	=	100.00
Slope (%)	=	0.10
N-Value	=	0.013

Calculations

Compute by:		Known Q
Known Q (cfs)	=	0.55

Highlighted

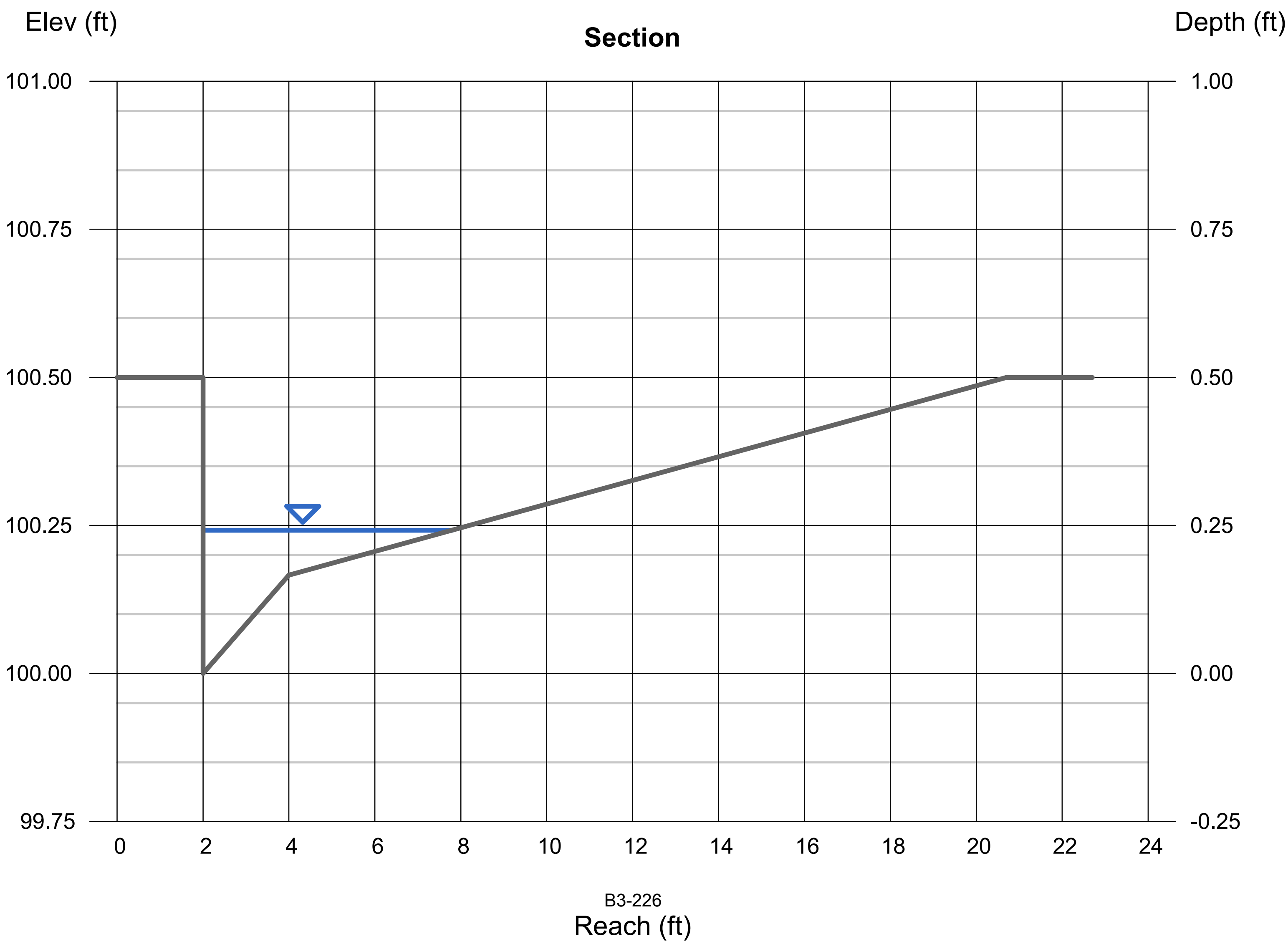
Depth (ft)	=	0.26
Q (cfs)	=	0.550
Area (sqft)	=	0.58
Velocity (ft/s)	=	0.95
Wetted Perim (ft)	=	7.02
Crit Depth, Yc (ft)	=	0.23
Spread Width (ft)	=	6.75
EGL (ft)	=	0.27



Channel Report

A10 DA Street Capacity 25-YEAR

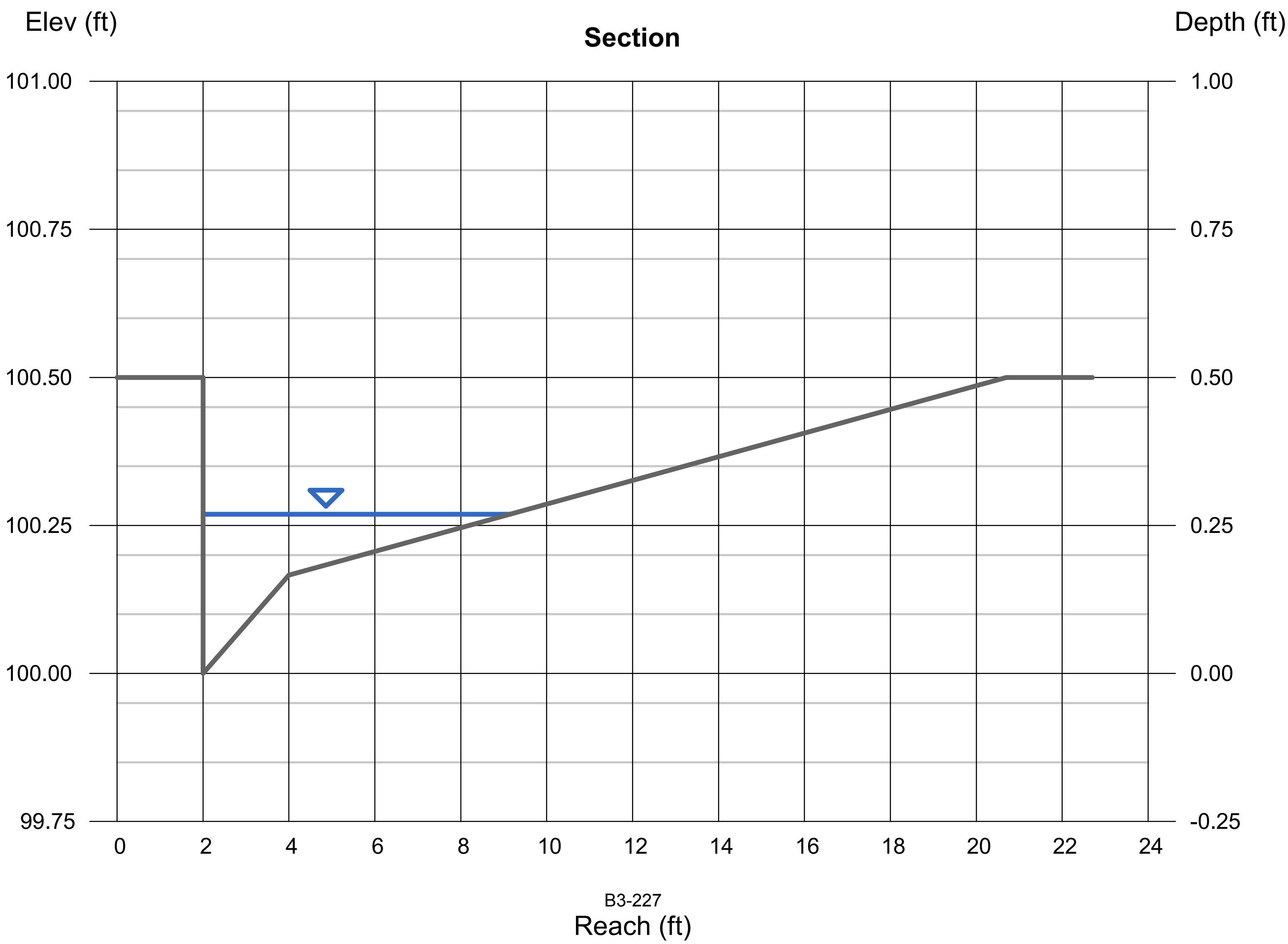
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.24
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.420
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.46
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 0.91
Slope (%)	= 0.10	Wetted Perim (ft)	= 6.05
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.21
		Spread Width (ft)	= 5.80
Calculations		EGL (ft)	= 0.25
Compute by:	Known Q		
Known Q (cfs)	= 0.42		



Channel Report

A7 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.27
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.060
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.64
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.66
Slope (%)	= 0.30	Wetted Perim (ft)	= 7.43
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.27
		Spread Width (ft)	= 7.15
Calculations		EGL (ft)	= 0.31
Compute by:	Known Q		
Known Q (cfs)	= 1.06		



Channel Report

A8 DA Street Capacity 25-YEAR

Gutter

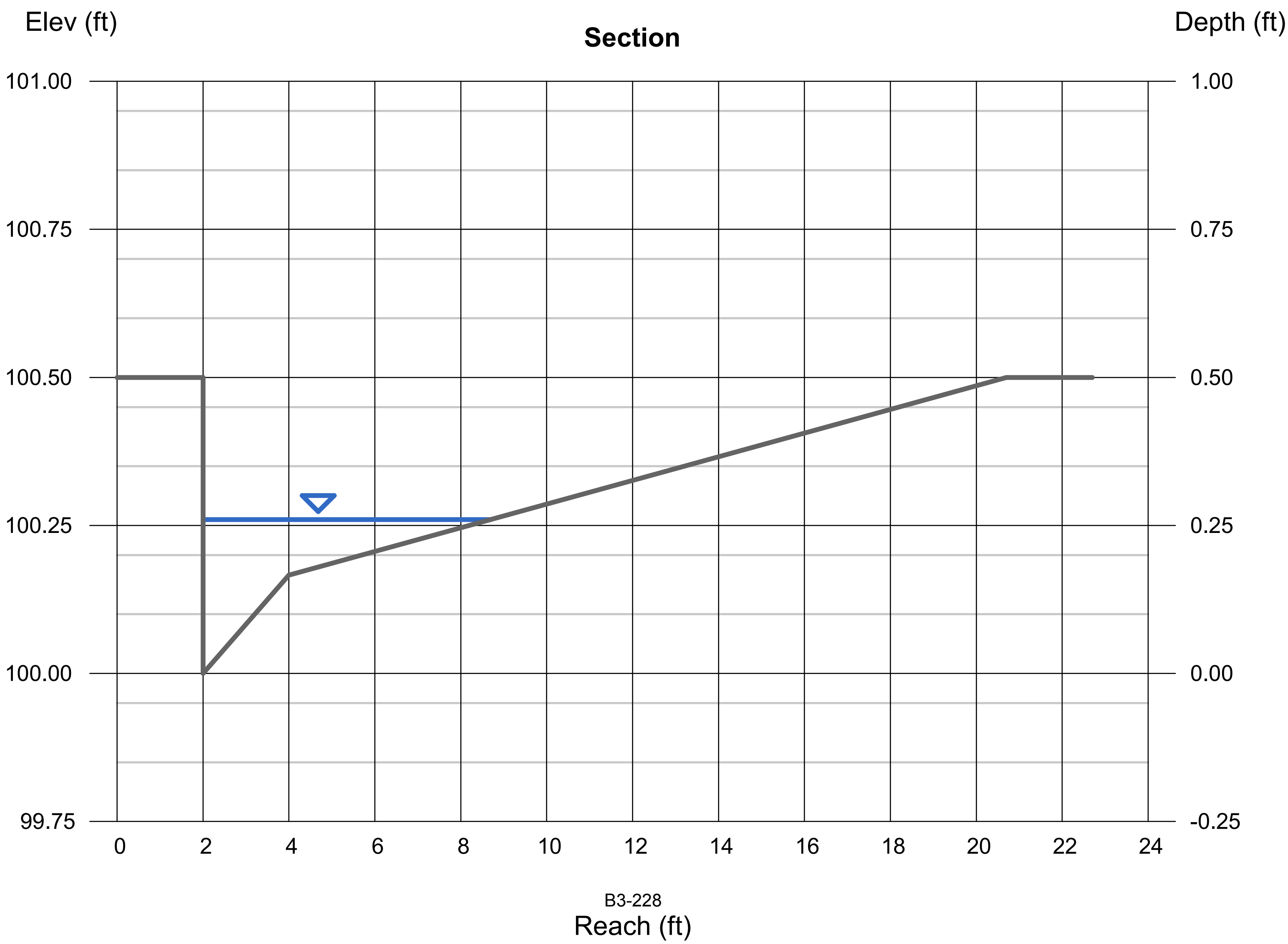
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.40
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.08

Highlighted

Depth (ft)	= 0.26
Q (cfs)	= 1.080
Area (sqft)	= 0.57
Velocity (ft/s)	= 1.88
Wetted Perim (ft)	= 6.97
Crit Depth, Yc (ft)	= 0.27
Spread Width (ft)	= 6.70
EGL (ft)	= 0.31



Channel Report

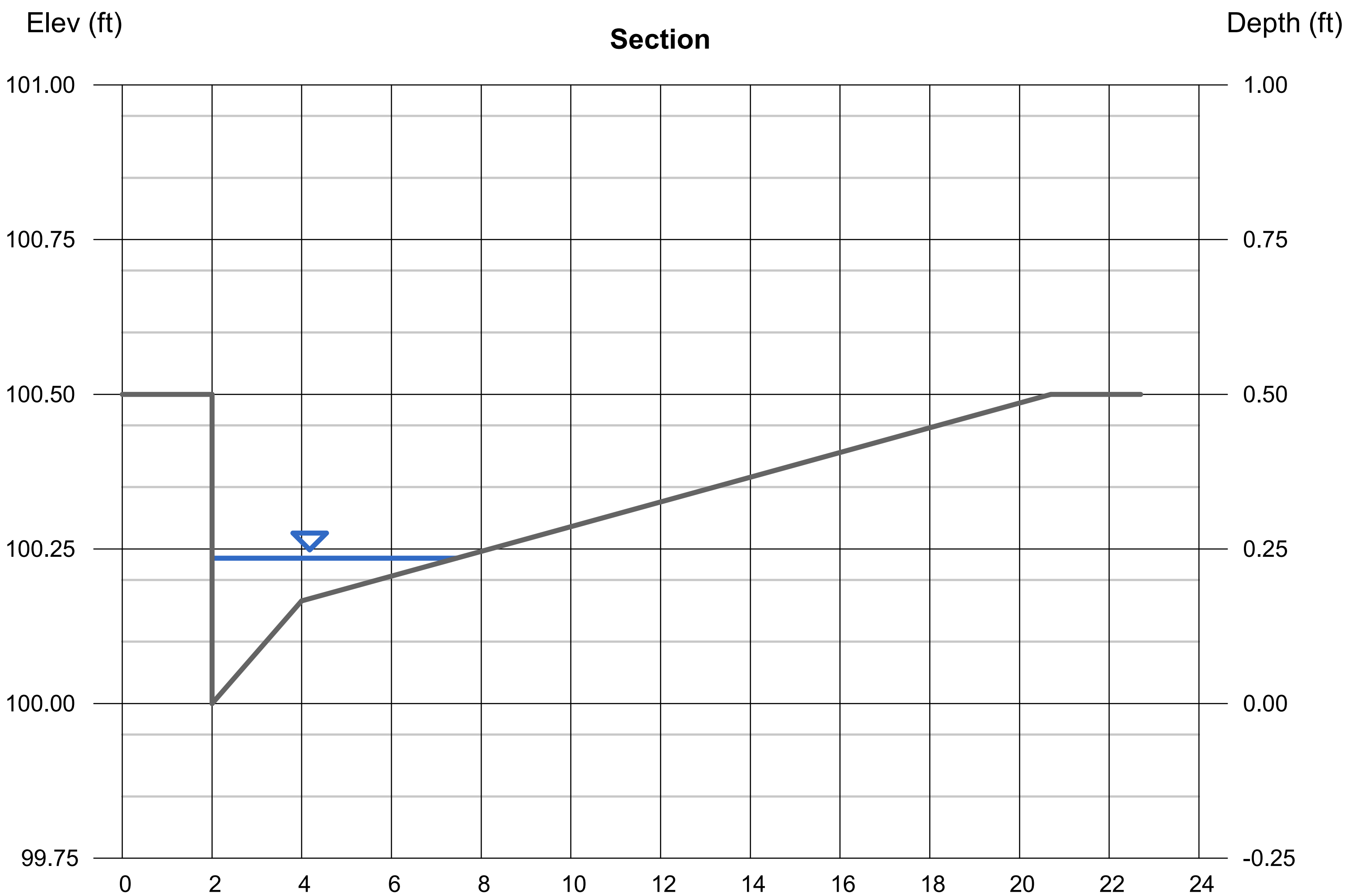
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

A11 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.24
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.140
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.42
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.69
Slope (%)	= 0.90	Wetted Perim (ft)	= 5.69
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.28
		Spread Width (ft)	= 5.45
		EGL (ft)	= 0.35

Calculations

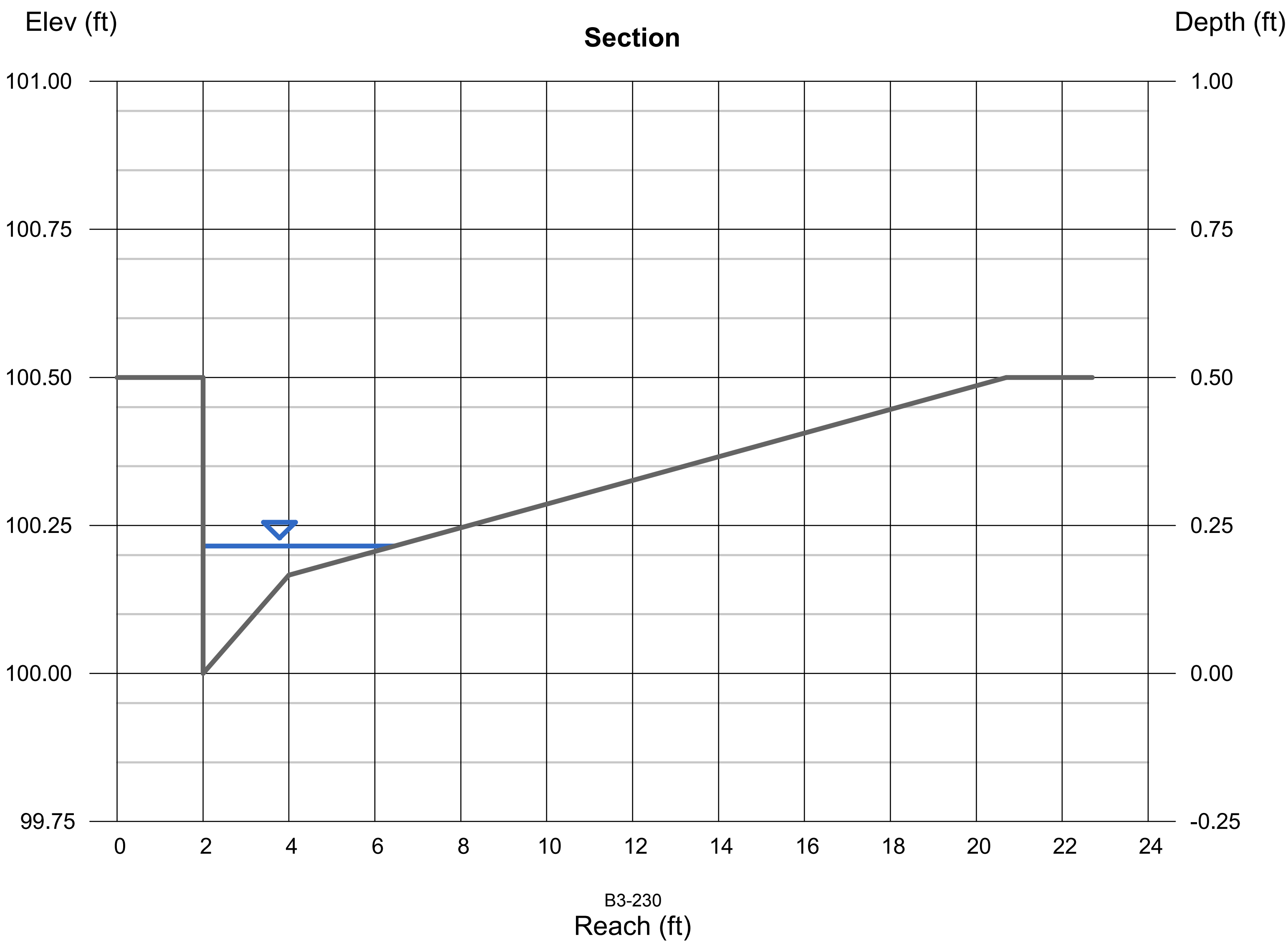
Compute by:	Known Q
Known Q (cfs)	= 1.14



Channel Report

B5 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.22
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.900
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.32
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.78
Slope (%)	= 1.00	Wetted Perim (ft)	= 4.67
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.26
		Spread Width (ft)	= 4.45
Calculations		EGL (ft)	= 0.33
Compute by:	Known Q		
Known Q (cfs)	= 0.90		



Channel Report

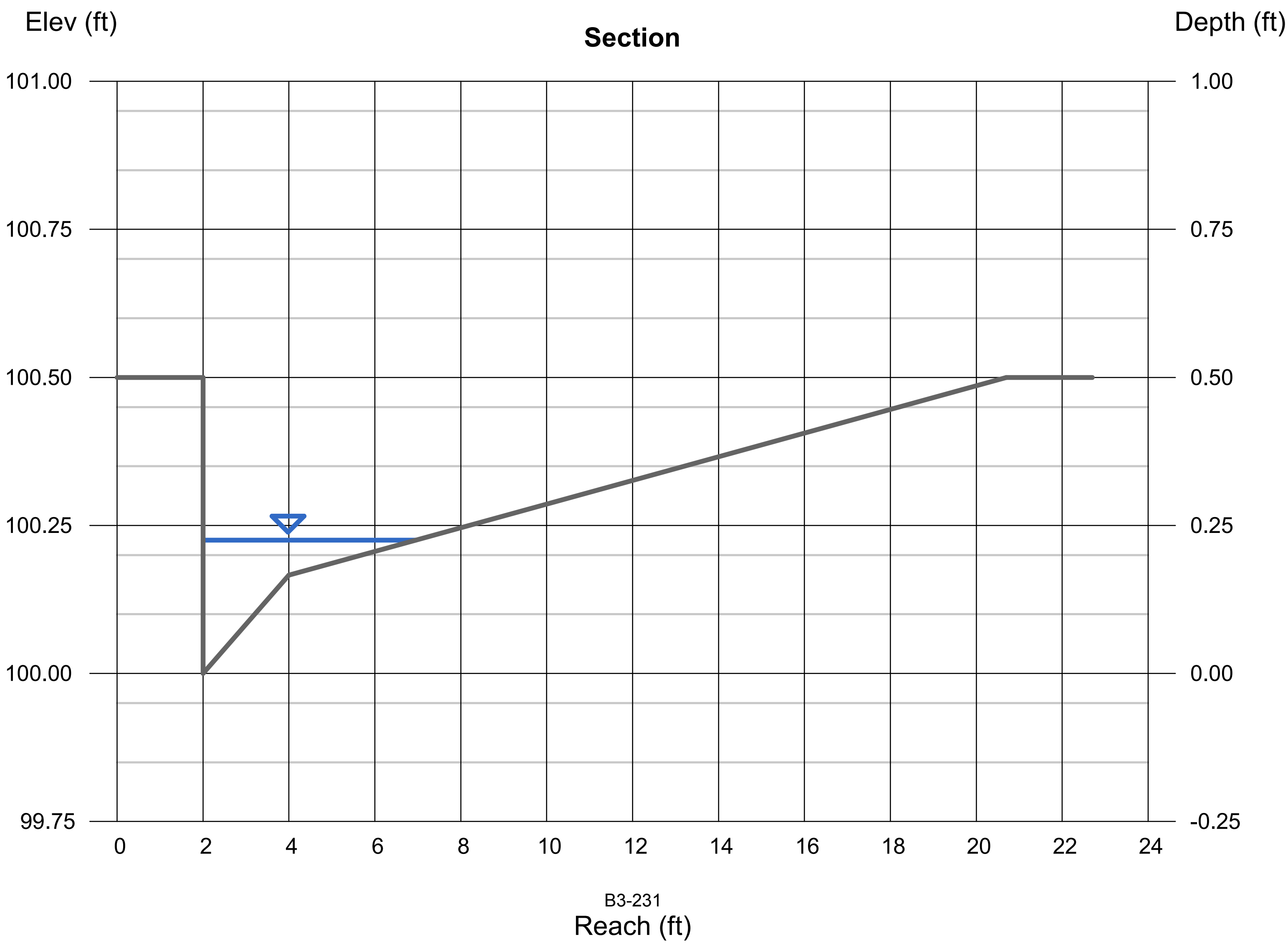
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

B6 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.23
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.040
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.37
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.80
Slope (%)	= 1.00	Wetted Perim (ft)	= 5.18
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.27
		Spread Width (ft)	= 4.95
		EGL (ft)	= 0.35

Calculations

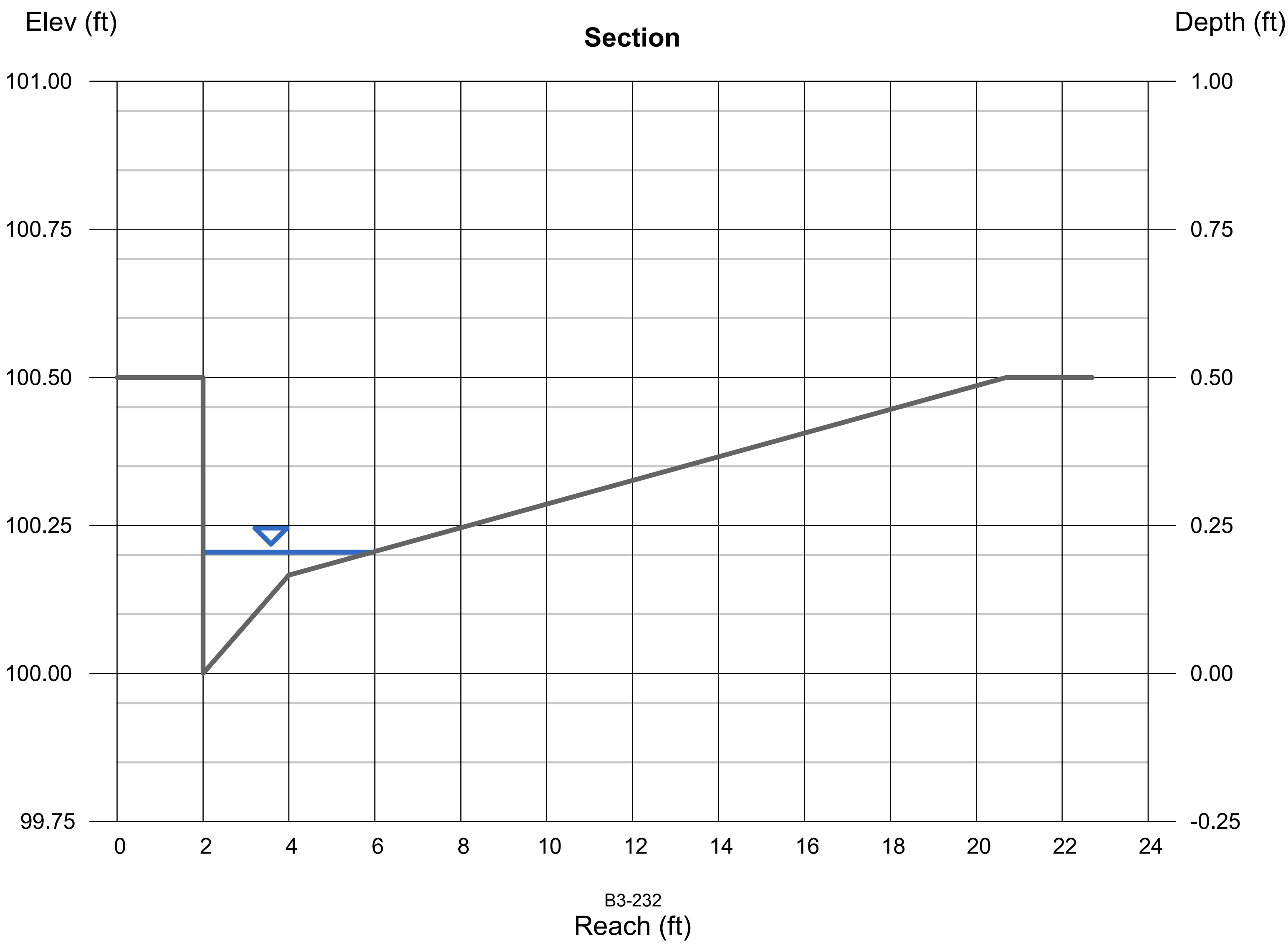
Compute by:	Known Q
Known Q (cfs)	= 1.04



Channel Report

D2 DA Street Capacity 25-YEAR

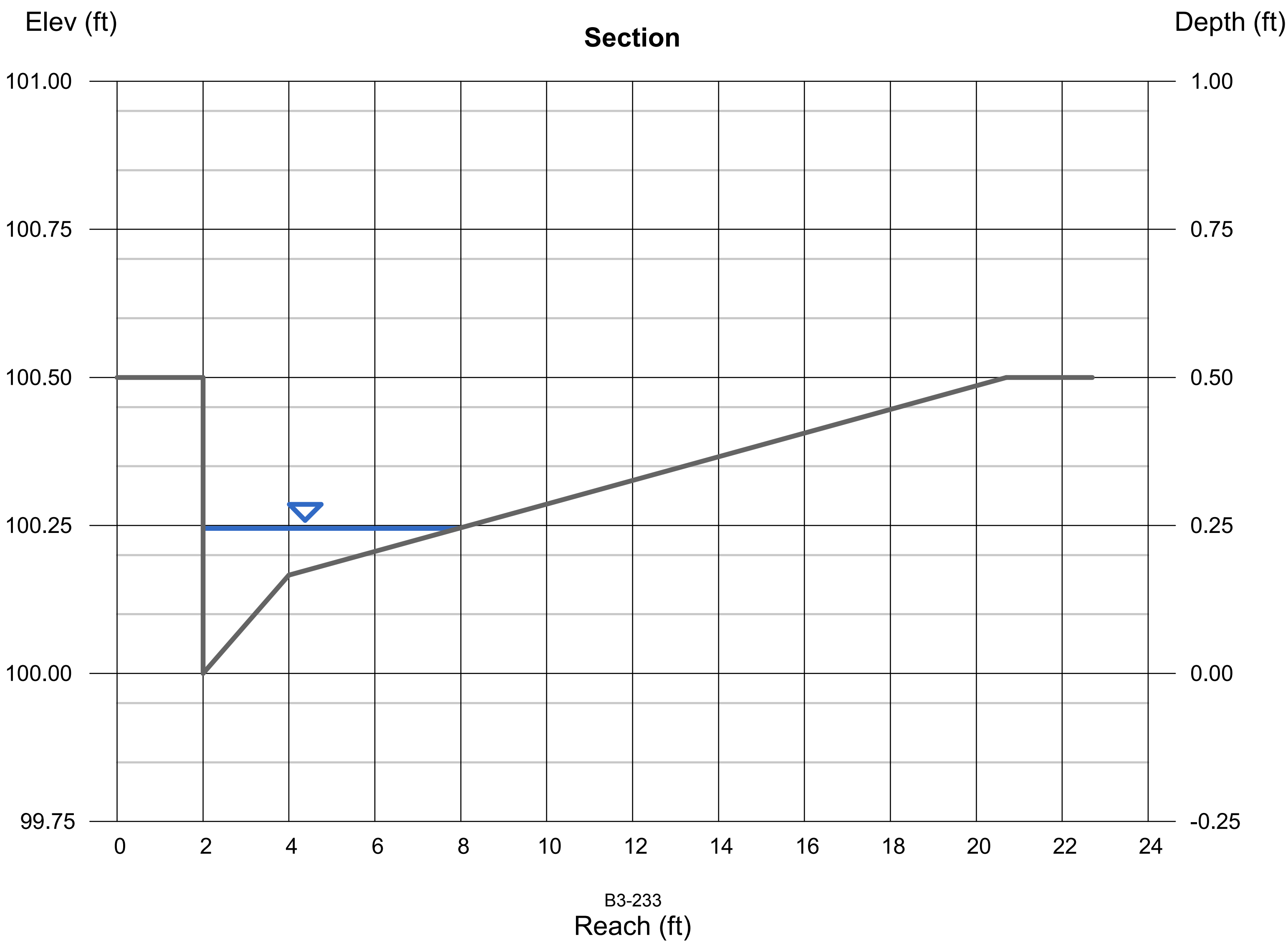
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.21
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.550
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.95
Slope (%)	= 0.50	Wetted Perim (ft)	= 4.16
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.23
		Spread Width (ft)	= 3.95
Calculations		EGL (ft)	= 0.26
Compute by:	Known Q		
Known Q (cfs)	= 0.55		



Channel Report

D1 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.25
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.440
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.48
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 0.92
Slope (%)	= 0.10	Wetted Perim (ft)	= 6.20
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.21
		Spread Width (ft)	= 5.95
Calculations		EGL (ft)	= 0.26
Compute by:	Known Q		
Known Q (cfs)	= 0.44		



Channel Report

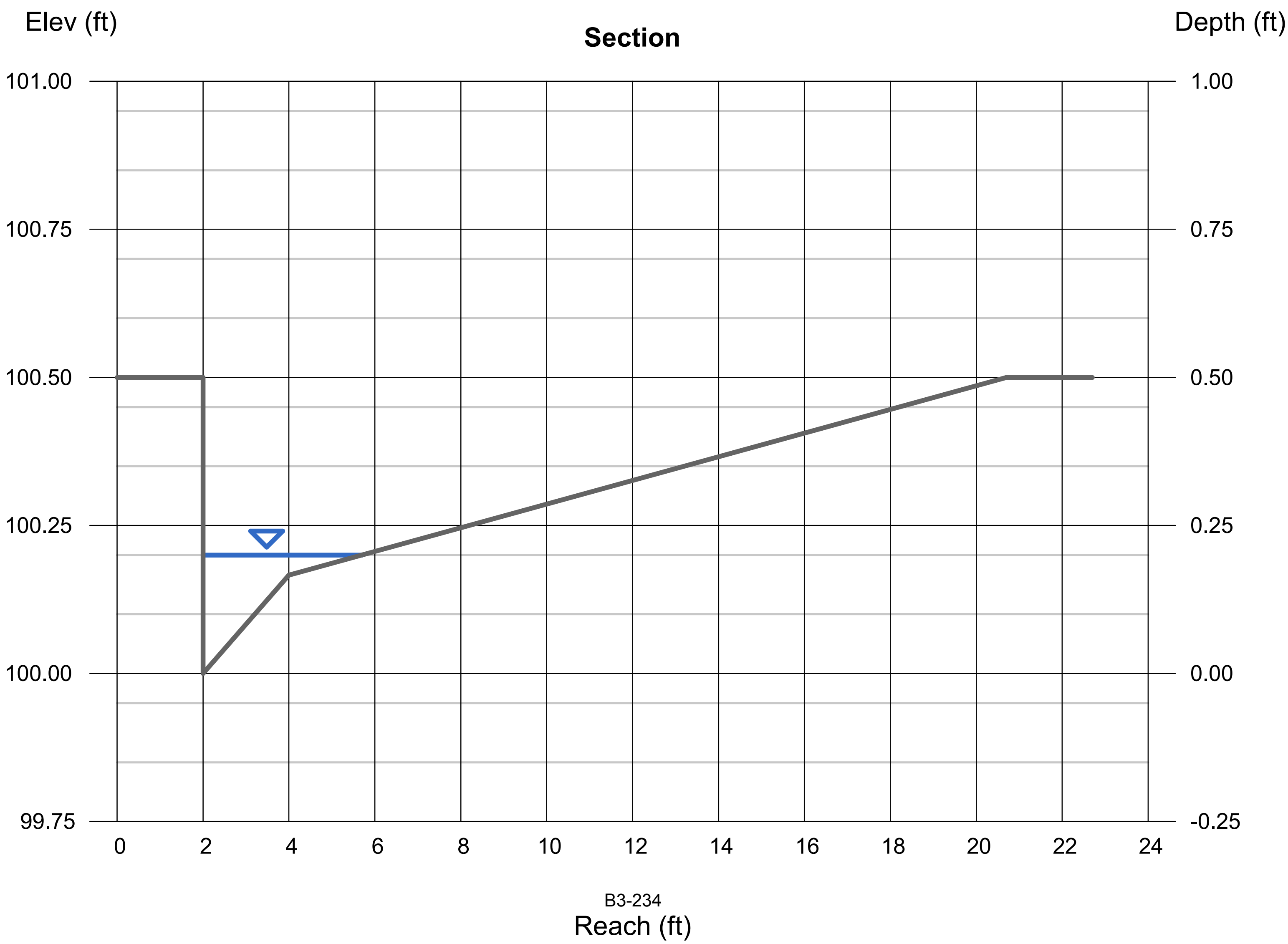
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

B3 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.20
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.720
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.26
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.74
Slope (%)	= 1.00	Wetted Perim (ft)	= 3.91
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.25
		Spread Width (ft)	= 3.70
		EGL (ft)	= 0.32

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.72



Channel Report

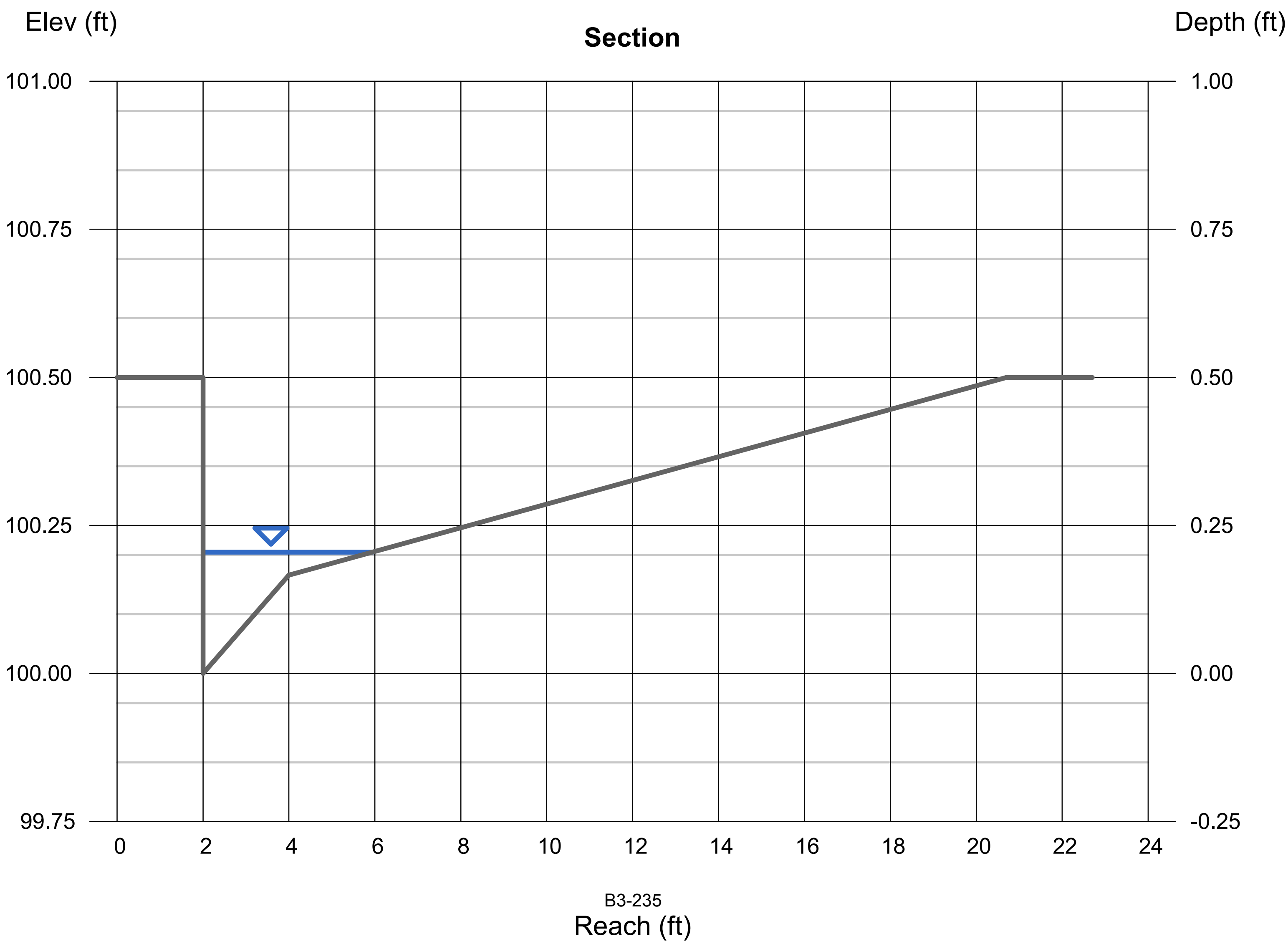
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

B4 DA Street Capacity 25-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.21
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.780
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.77
Slope (%)	= 1.00	Wetted Perim (ft)	= 4.16
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.25
		Spread Width (ft)	= 3.95
		EGL (ft)	= 0.32

Calculations

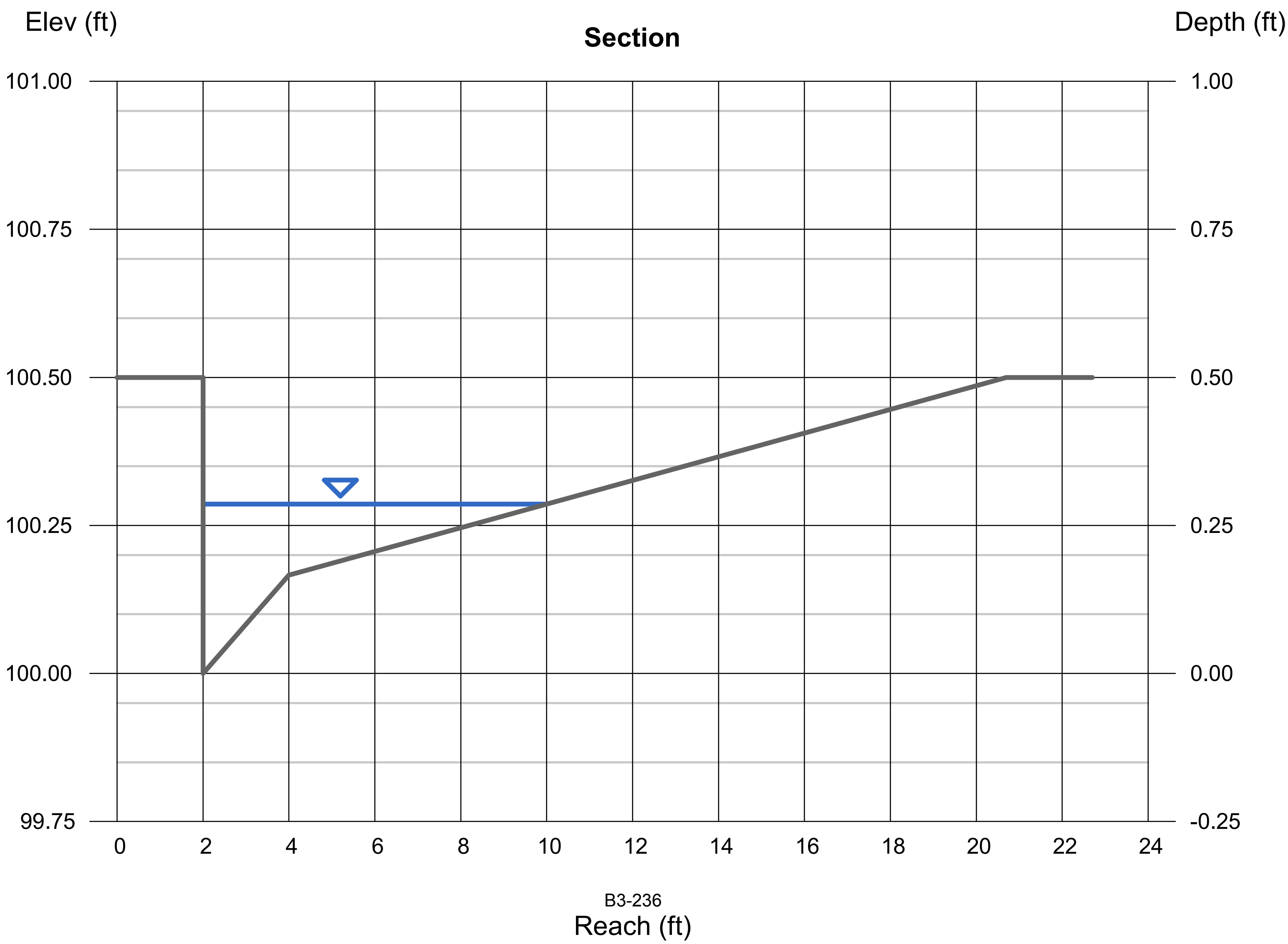
Compute by:	Known Q
Known Q (cfs)	= 0.78



Channel Report

B2 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.29
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.760
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.77
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 0.99
Slope (%)	= 0.10	Wetted Perim (ft)	= 8.29
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.25
		Spread Width (ft)	= 8.00
Calculations		EGL (ft)	= 0.30
Compute by:	Known Q		
Known Q (cfs)	= 0.76		



Channel Report

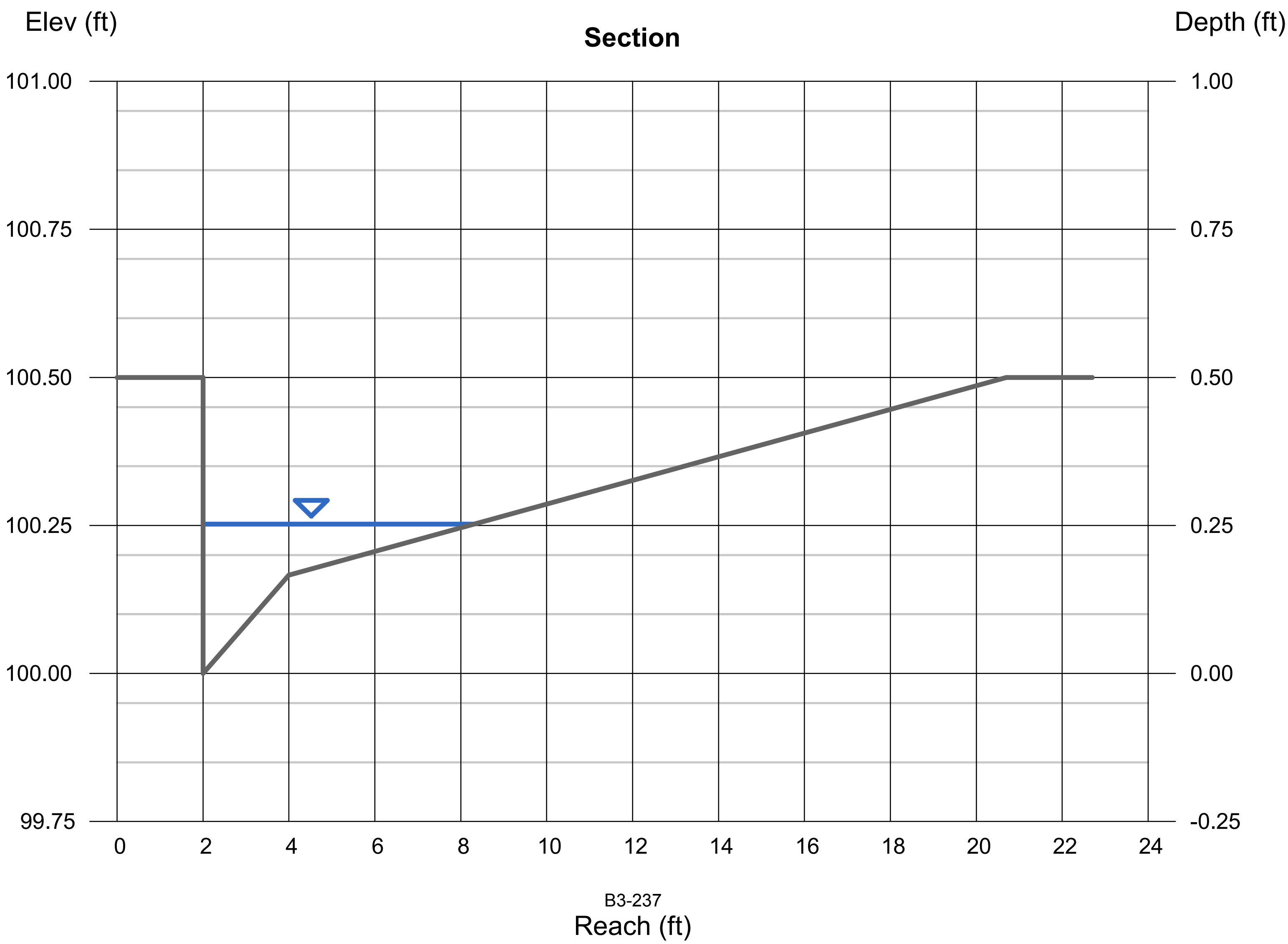
B1 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.25
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.840
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.52
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.61
Slope (%)	= 0.30	Wetted Perim (ft)	= 6.56
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.26
		Spread Width (ft)	= 6.30
		EGL (ft)	= 0.29

Calculations

Compute by: Known Q

Known Q (cfs) = 0.84

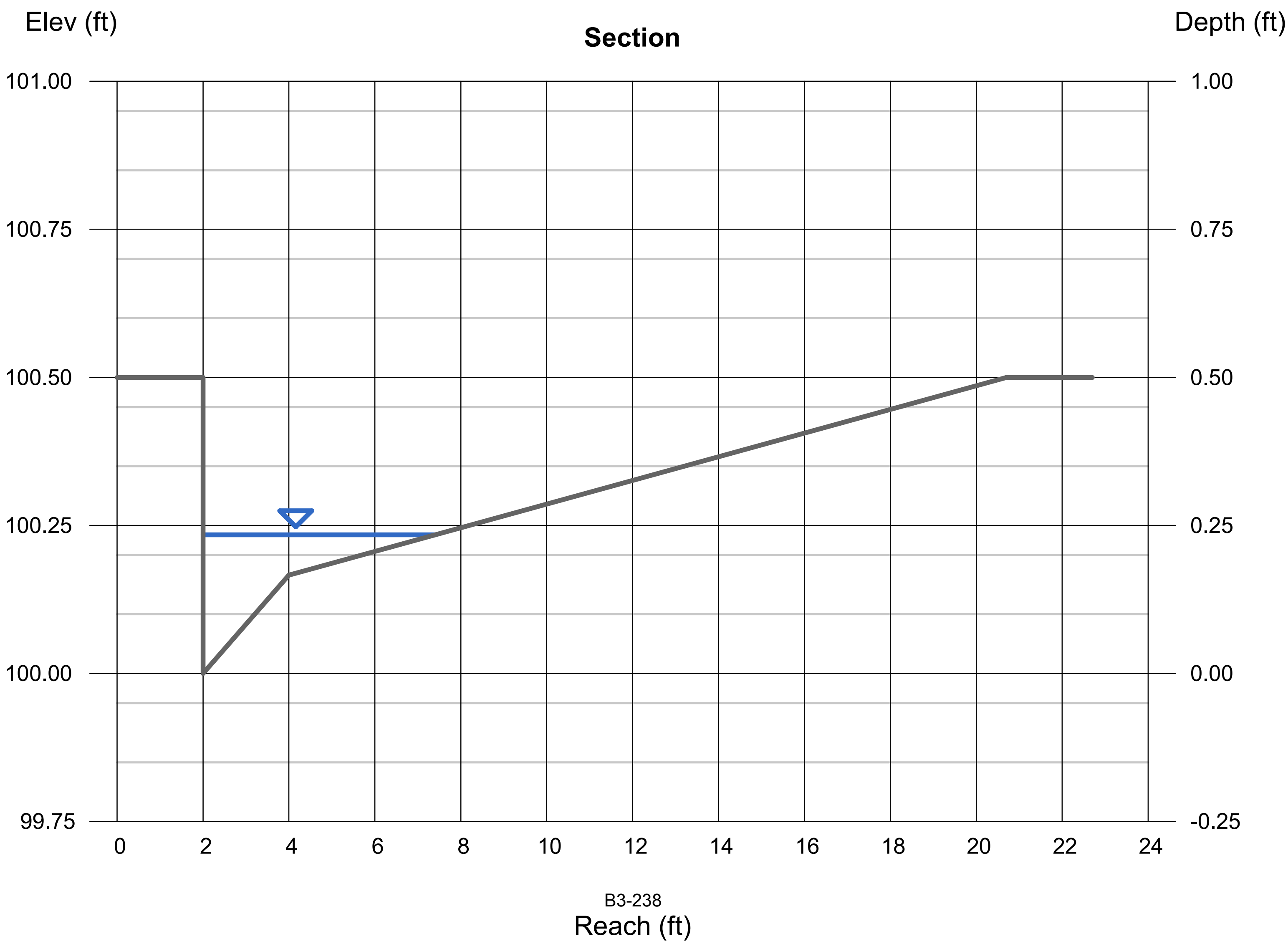


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

A6 DA Street Capacity 25-YEAR

Gutter			**Highlighted**		
Cross Sl, Sx (ft/ft)	=	0.020	Depth (ft)	=	0.23
Cross Sl, Sw (ft/ft)	=	0.083	Q (cfs)	=	1.070
Gutter Width (ft)	=	2.00	Area (sqft)	=	0.42
Invert Elev (ft)	=	100.00	Velocity (ft/s)	=	2.56
Slope (%)	=	0.80	Wetted Perim (ft)	=	5.64
N-Value	=	0.013	Crit Depth, Yc (ft)	=	0.27
			Spread Width (ft)	=	5.40
Calculations			EGL (ft)	=	0.34
Compute by:		Known Q			
Known Q (cfs)	=	1.07			



Channel Report

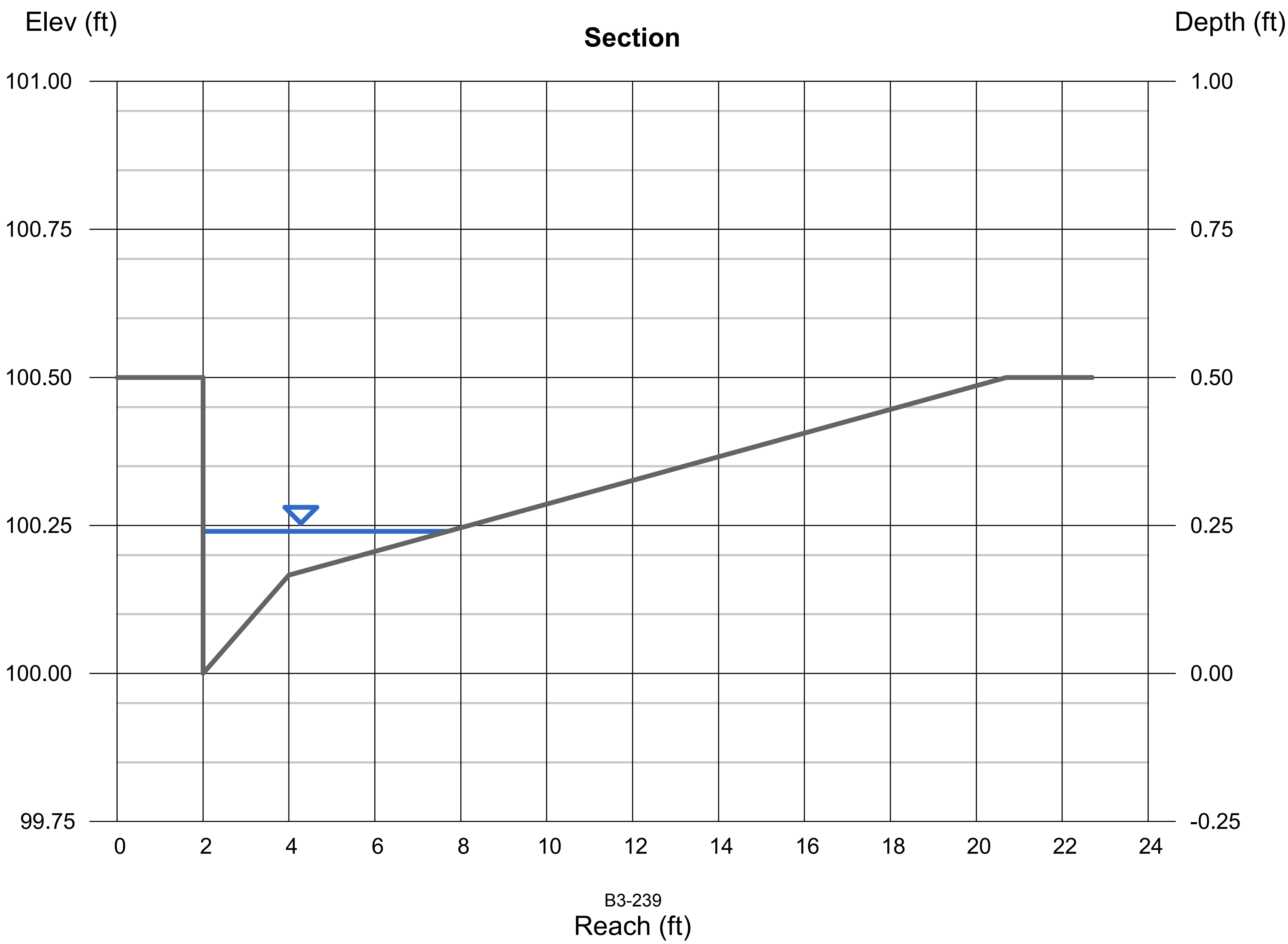
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

A5 DA Street Capacity 25-YEAR

Gutter
Cross Sl, Sx (ft/ft) = 0.020
Cross Sl, Sw (ft/ft) = 0.083
Gutter Width (ft) = 2.00
Invert Elev (ft) = 100.00
Slope (%) = 0.80
N-Value = 0.013

Calculations
Compute by: Known Q
Known Q (cfs) = 1.16

Highlighted
Depth (ft) = 0.24
Q (cfs) = 1.160
Area (sqft) = 0.45
Velocity (ft/s) = 2.57
Wetted Perim (ft) = 5.95
Crit Depth, Yc (ft) = 0.28
Spread Width (ft) = 5.70
EGL (ft) = 0.34



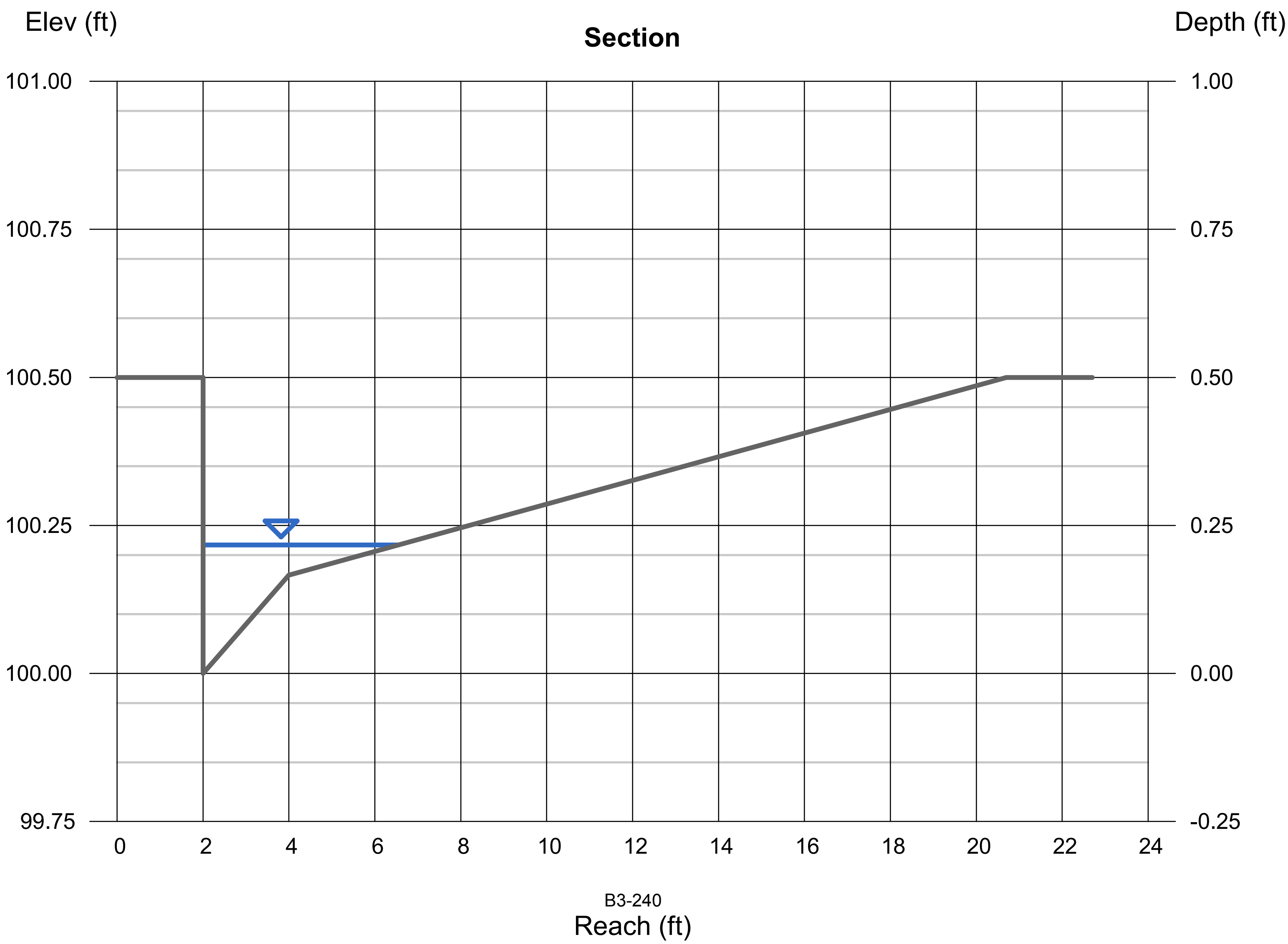
Channel Report

A3 DA Street Capacity 25-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.22
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.980
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.33
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.94
Slope (%)	= 1.10	Wetted Perim (ft)	= 4.77
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.27
		Spread Width (ft)	= 4.55
		EGL (ft)	= 0.35

Calculations

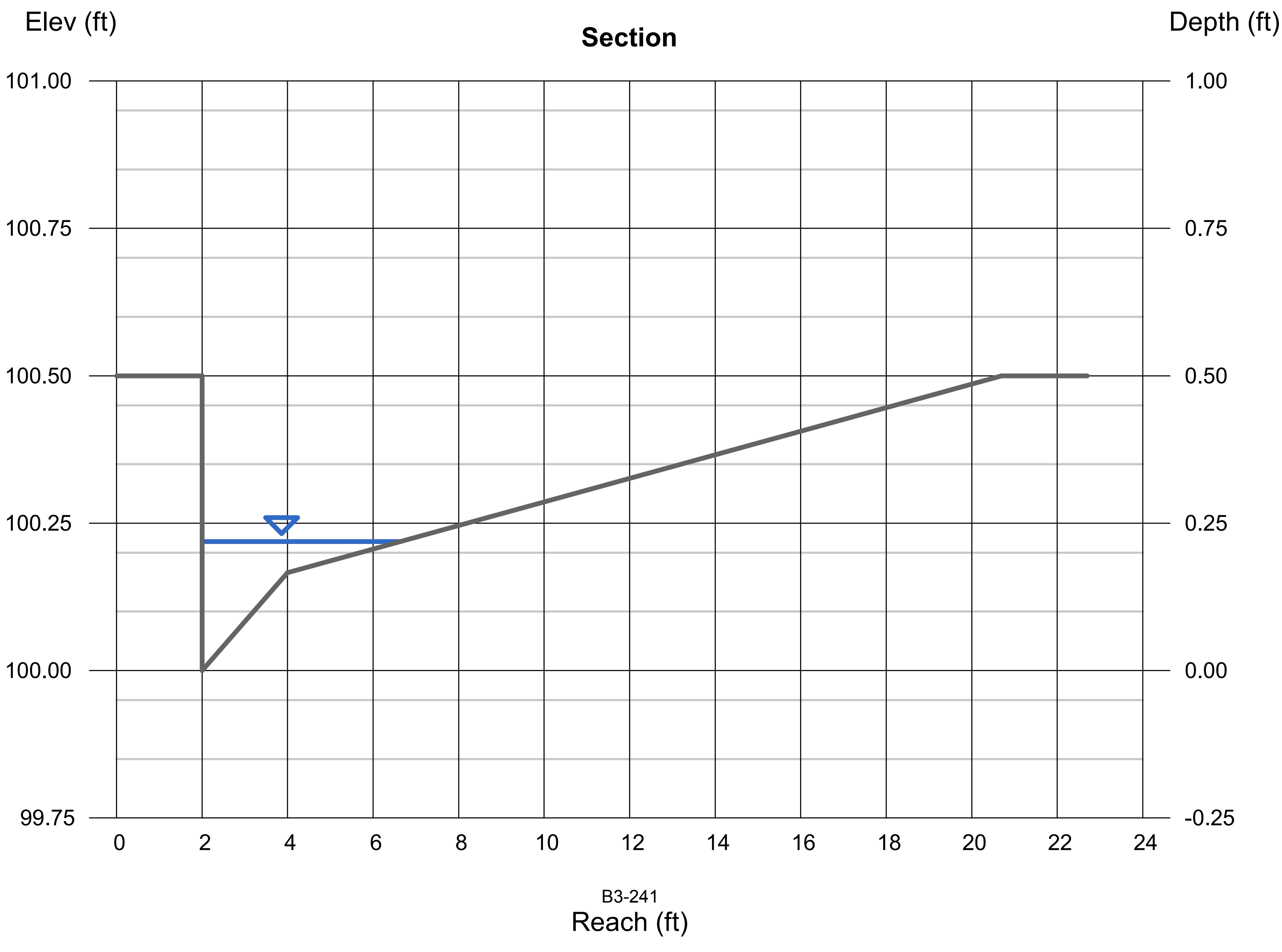
Compute by:	Known Q
Known Q (cfs)	= 0.98



Channel Report

A4 DA Street Capacity 25-YEAR

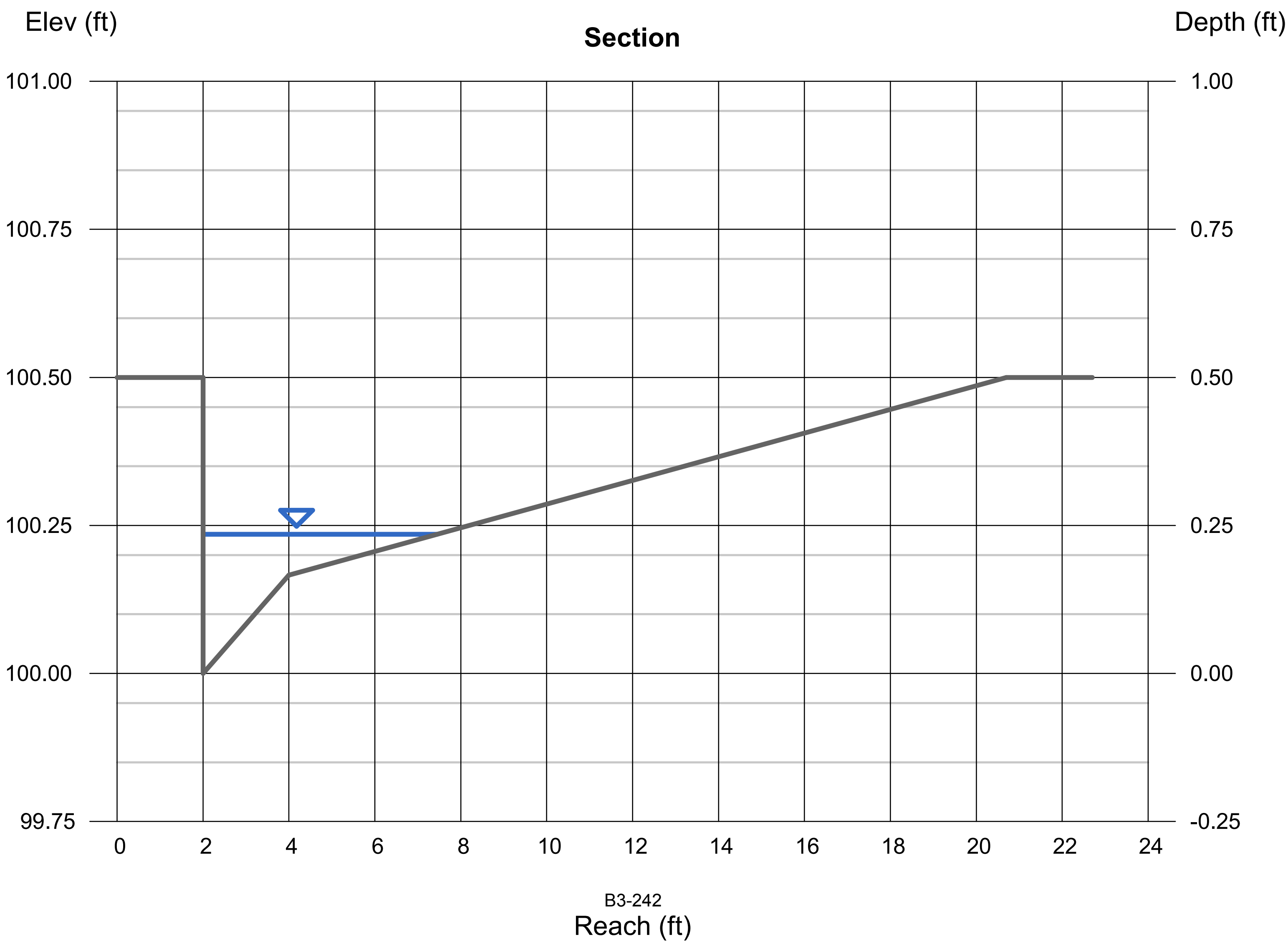
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.22
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.950
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.34
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.78
Slope (%)	= 1.00	Wetted Perim (ft)	= 4.88
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.26
		Spread Width (ft)	= 4.65
Calculations		EGL (ft)	= 0.34
Compute by:	Known Q		
Known Q (cfs)	= 0.95		



Channel Report

A2 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.24
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.930
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.42
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.20
Slope (%)	= 0.60	Wetted Perim (ft)	= 5.69
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.26
		Spread Width (ft)	= 5.45
Calculations		EGL (ft)	= 0.31
Compute by:	Known Q		
Known Q (cfs)	= 0.93		

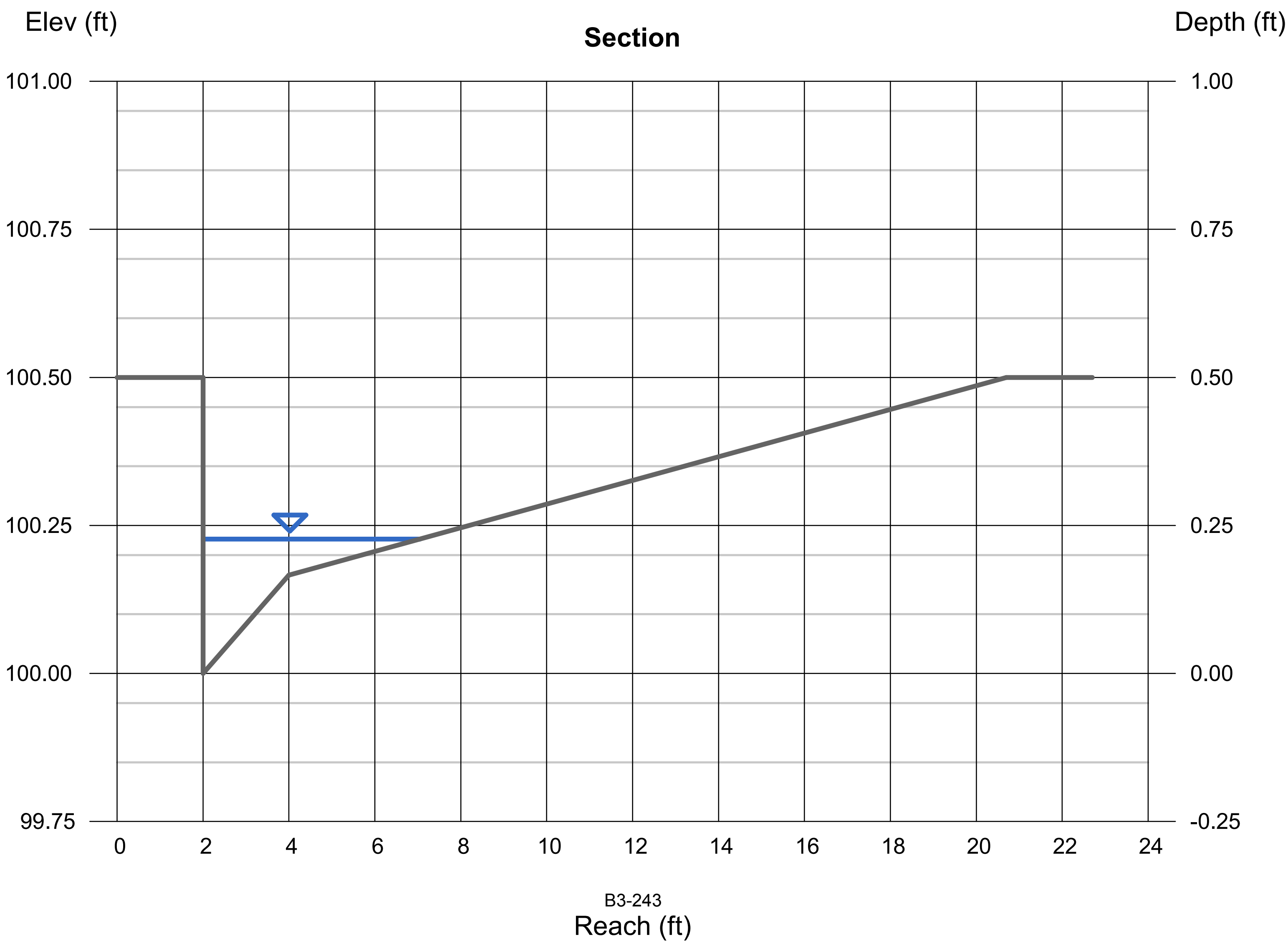


Channel Report

A1 DA Street Capacity 25-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.23
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.590
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.38
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.55
Slope (%)	= 0.30	Wetted Perim (ft)	= 5.28
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.23
		Spread Width (ft)	= 5.05
		EGL (ft)	= 0.26

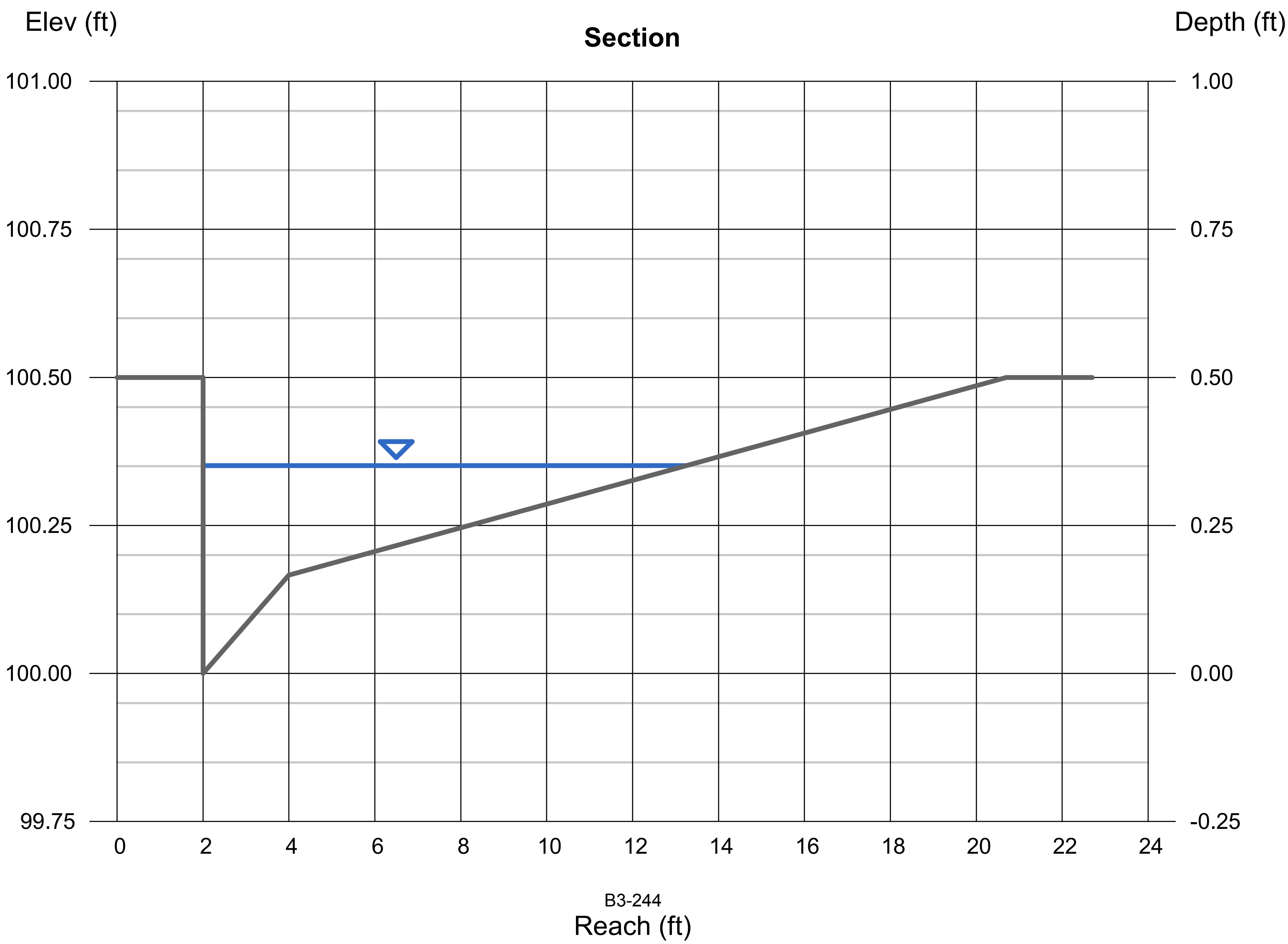
Calculations
Compute by: Known Q
Known Q (cfs) = 0.59



Channel Report

H3 DA Street Capacity 25-YEAR

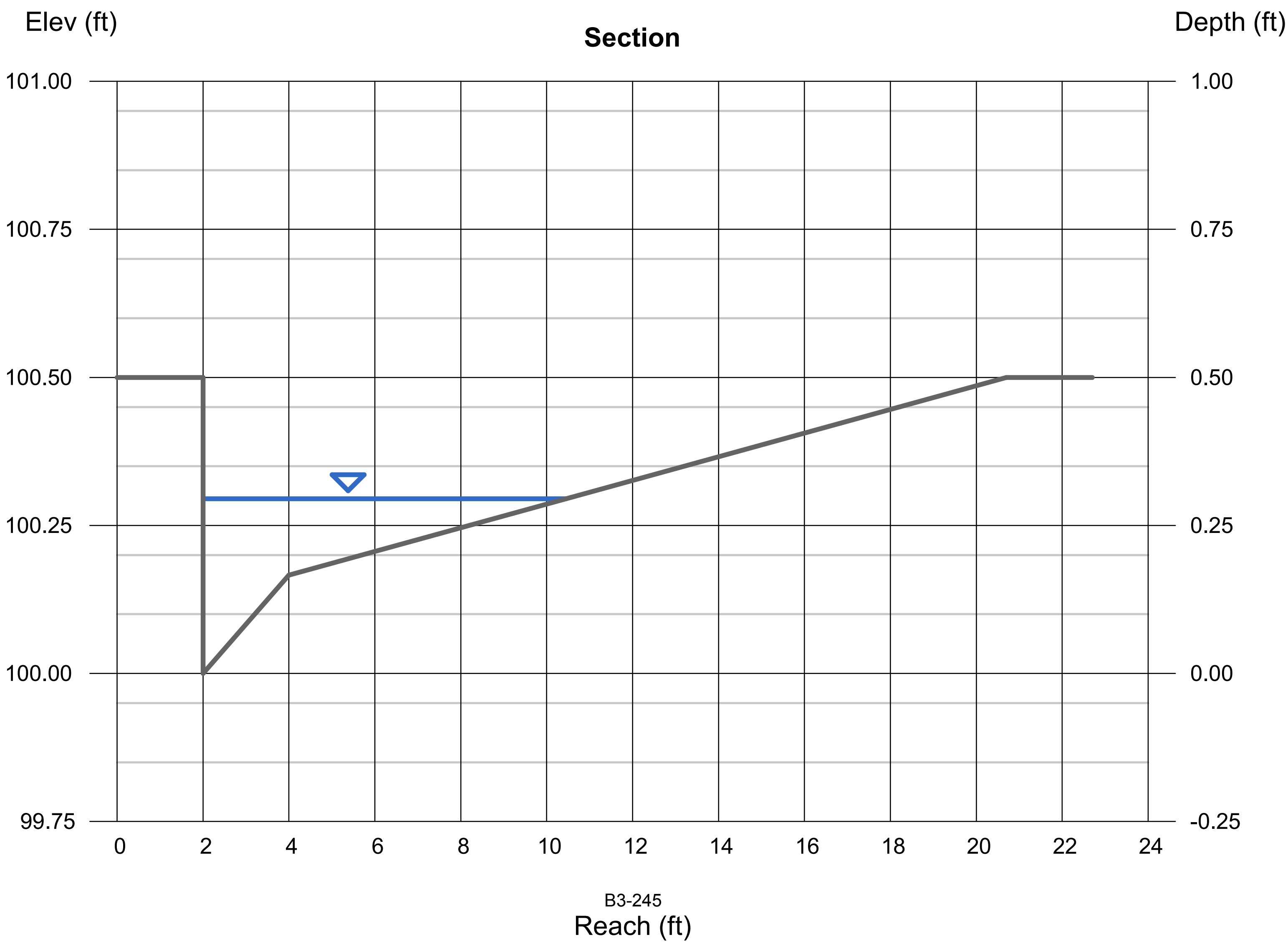
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.35
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.220
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.39
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.60
Slope (%)	= 0.20	Wetted Perim (ft)	= 11.61
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.33
		Spread Width (ft)	= 11.25
Calculations		EGL (ft)	= 0.39
Compute by:	Known Q		
Known Q (cfs)	= 2.22		



Channel Report

H4 DA Street Capacity 25-YEAR

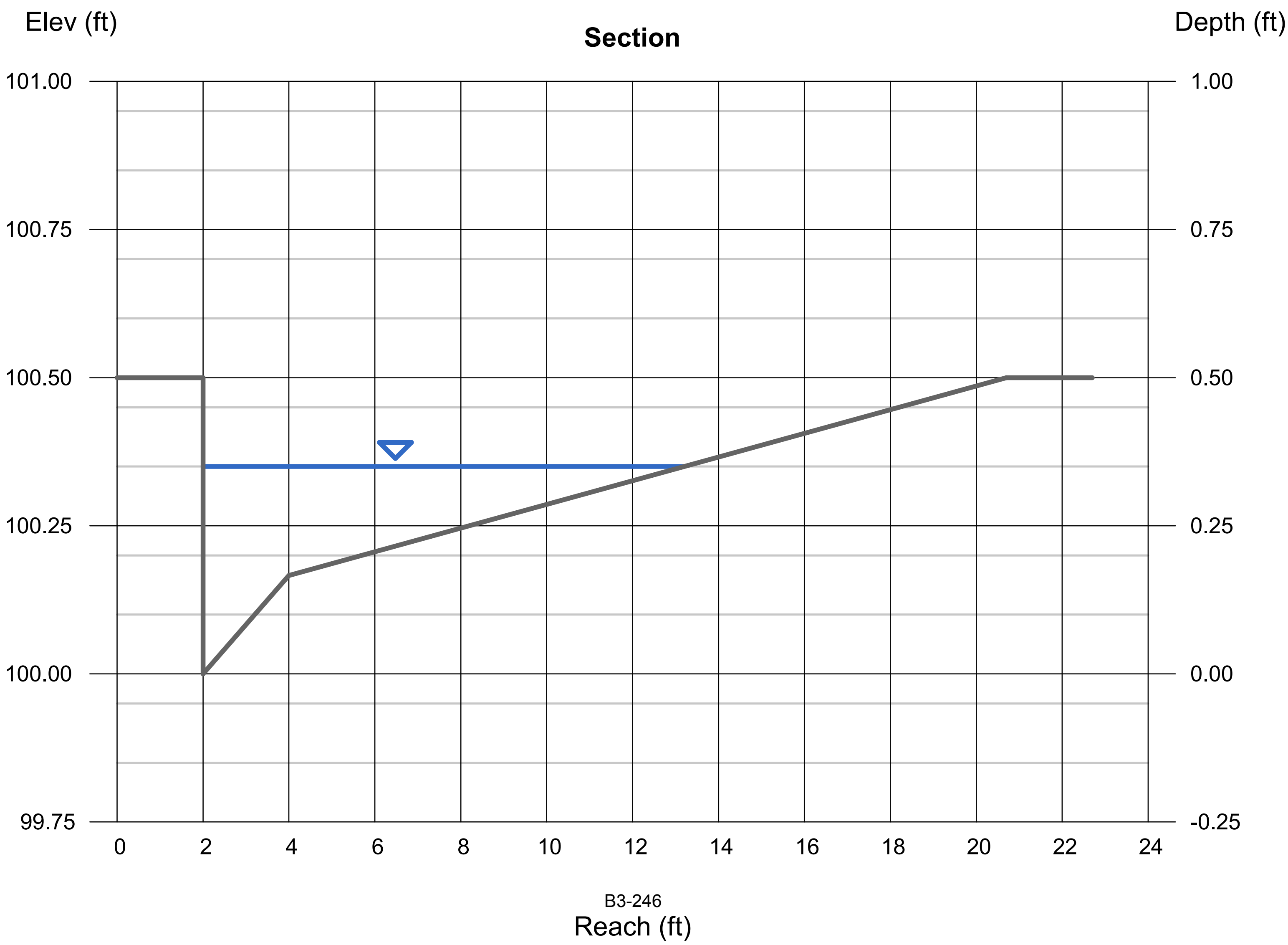
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.29
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.070
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.84
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.46
Slope (%)	= 0.60	Wetted Perim (ft)	= 8.75
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.33
		Spread Width (ft)	= 8.45
Calculations		EGL (ft)	= 0.39
Compute by:	Known Q		
Known Q (cfs)	= 2.07		



Channel Report

H1 DA Street Capacity 25-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.35
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.190
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.38
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.59
Slope (%)	= 0.20	Wetted Perim (ft)	= 11.56
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.33
		Spread Width (ft)	= 11.20
Calculations		EGL (ft)	= 0.39
Compute by:	Known Q		
Known Q (cfs)	= 2.19		

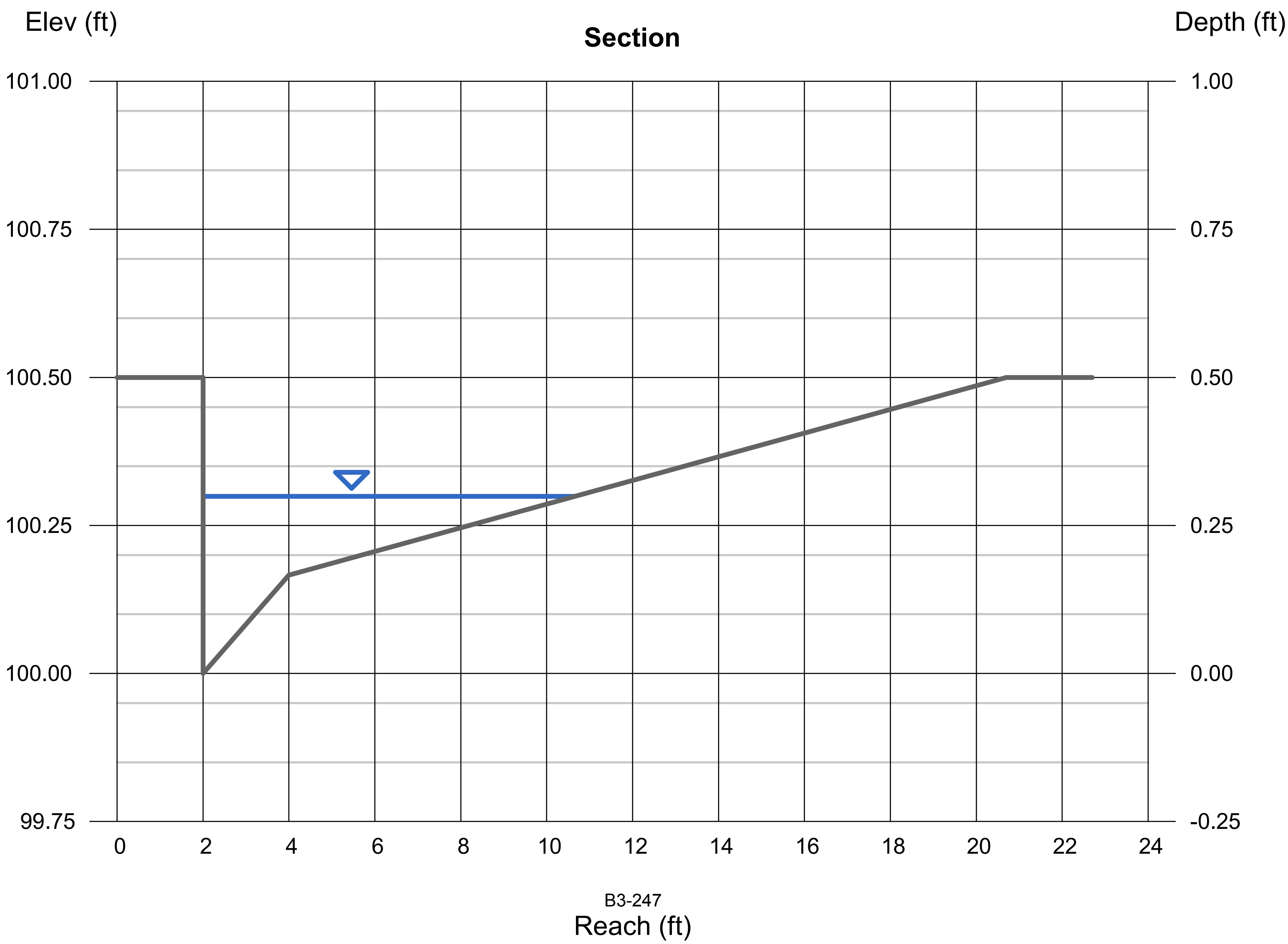


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

H2 DA Street Capacity 25-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.30
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.170
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.87
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.48
Slope (%)	= 0.60	Wetted Perim (ft)	= 8.96
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.33
		Spread Width (ft)	= 8.65
Calculations		EGL (ft)	= 0.39
Compute by:	Known Q		
Known Q (cfs)	= 2.17		



Channel Report

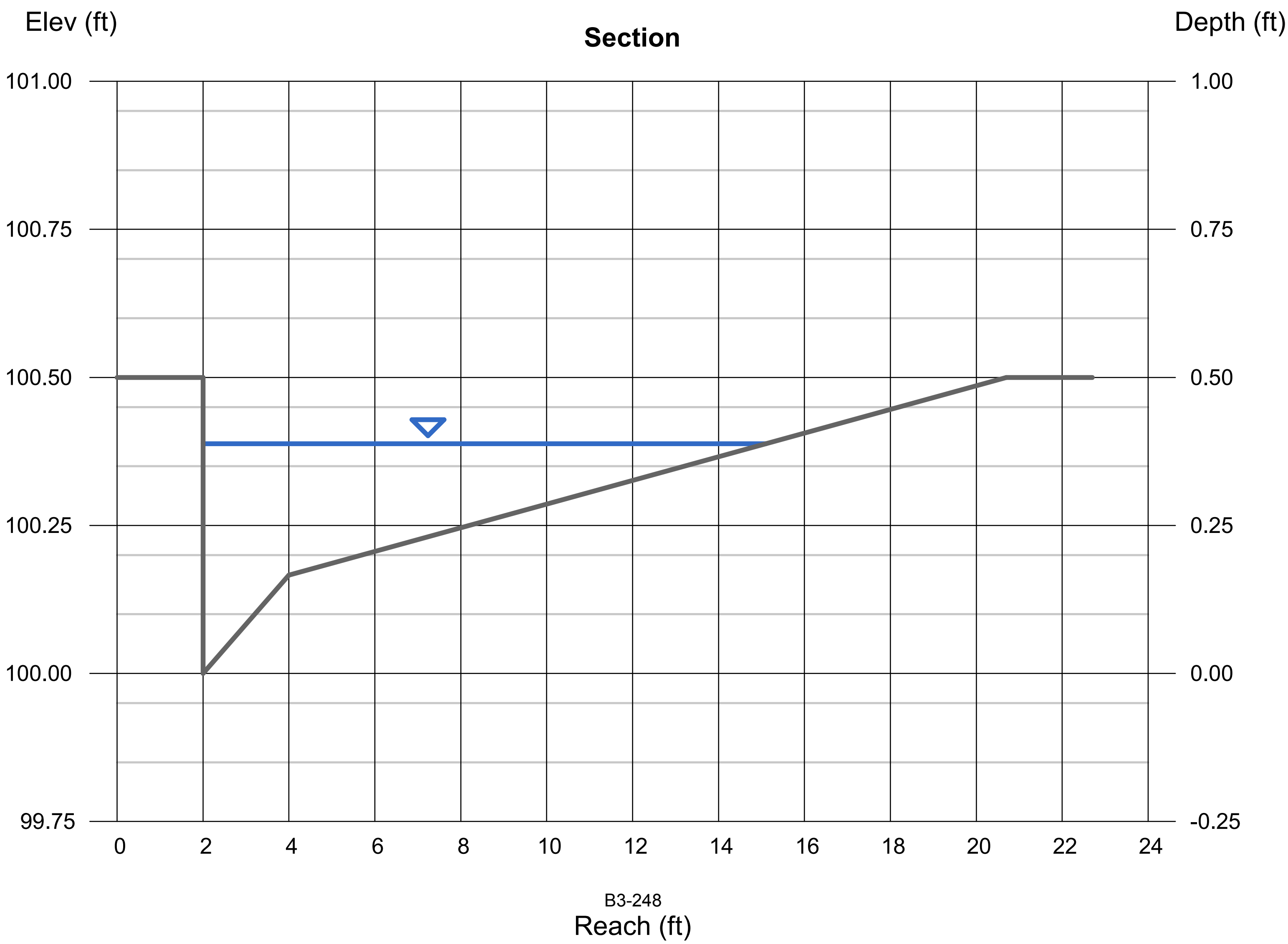
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

R1 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.39
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.230
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.84
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.21
Slope (%)	= 0.10	Wetted Perim (ft)	= 13.50
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.33
		Spread Width (ft)	= 13.10
		EGL (ft)	= 0.41

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.23

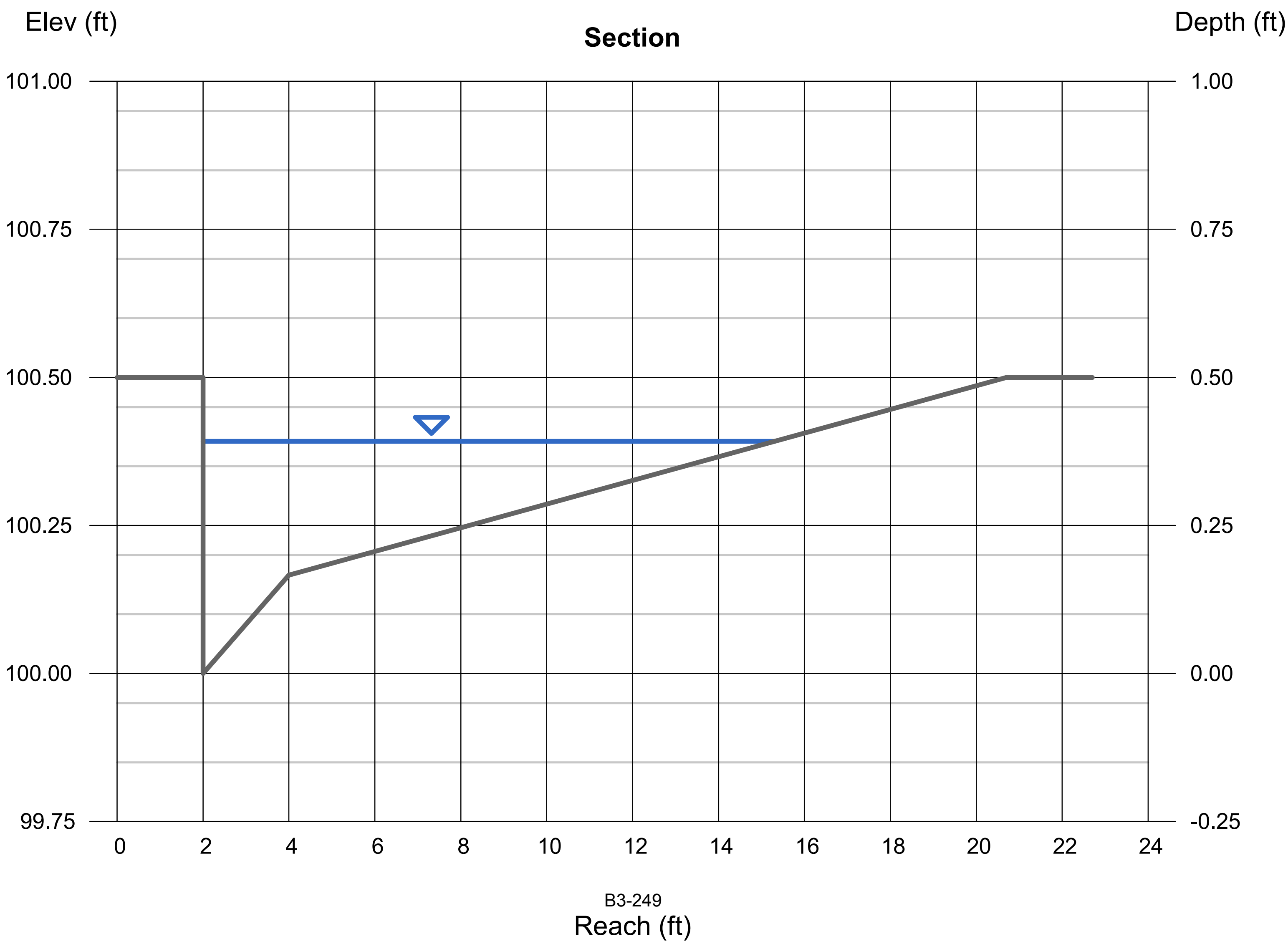


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V1 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.39
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.320
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.89
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.22
Slope (%)	= 0.10	Wetted Perim (ft)	= 13.70
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.34
		Spread Width (ft)	= 13.30
Calculations		EGL (ft)	= 0.42
Compute by:	Known Q		
Known Q (cfs)	= 2.32		



Channel Report

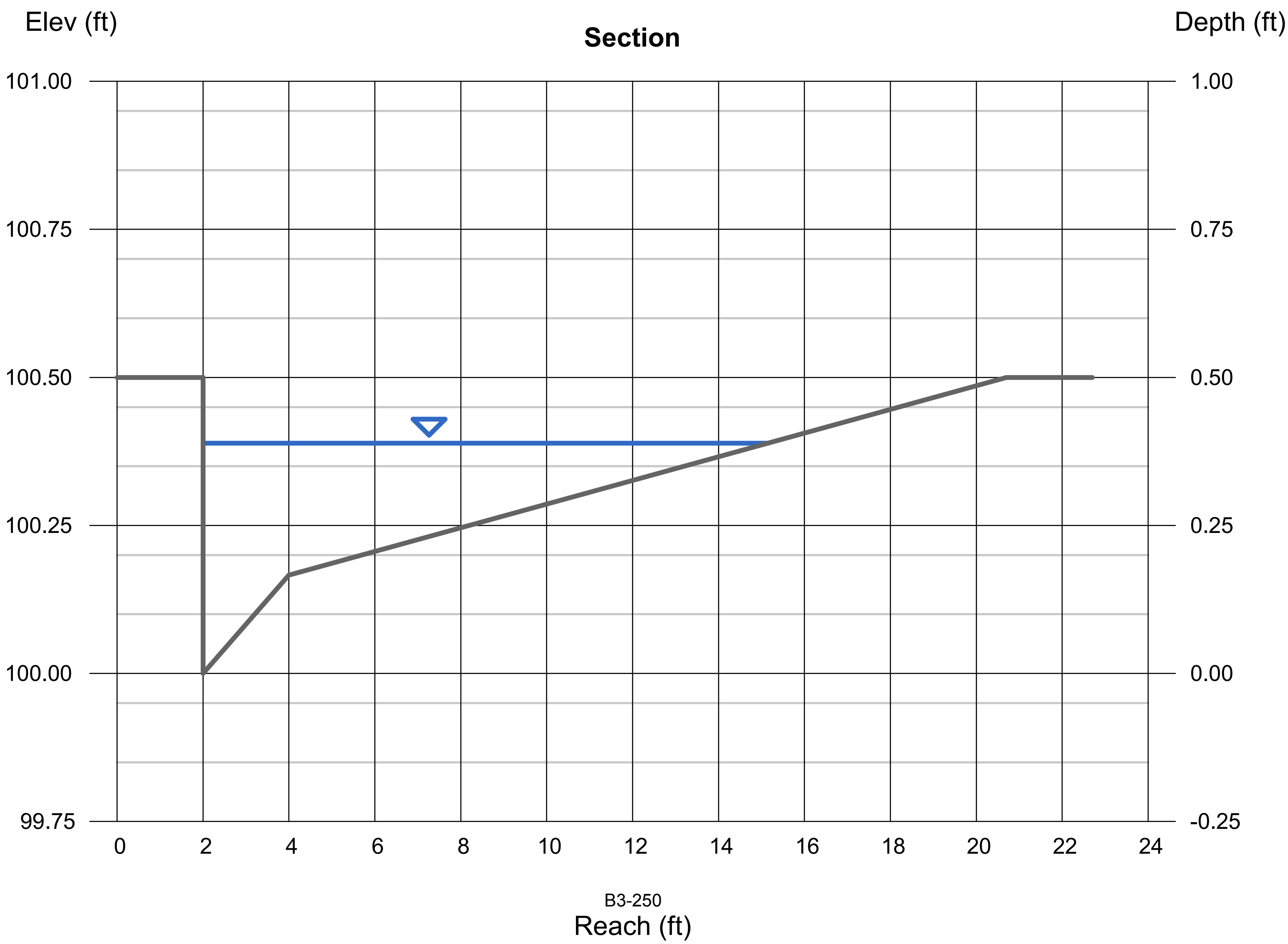
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

V2 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.39
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.250
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.86
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.21
Slope (%)	= 0.10	Wetted Perim (ft)	= 13.55
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.34
		Spread Width (ft)	= 13.15
		EGL (ft)	= 0.41

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.25



Channel Report

V3 DA Street Capacity 100-YEAR

Gutter

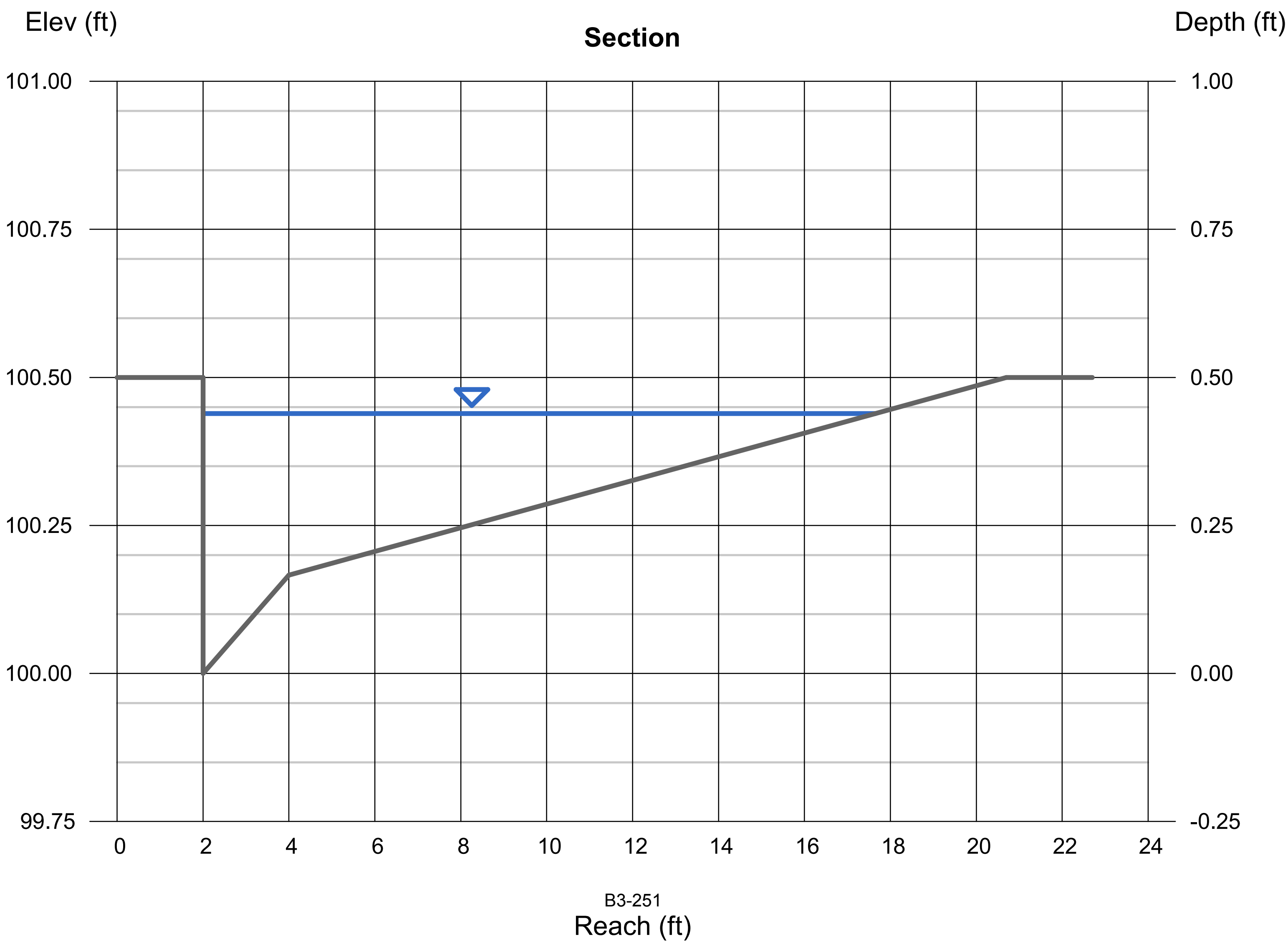
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.10
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.42

Highlighted

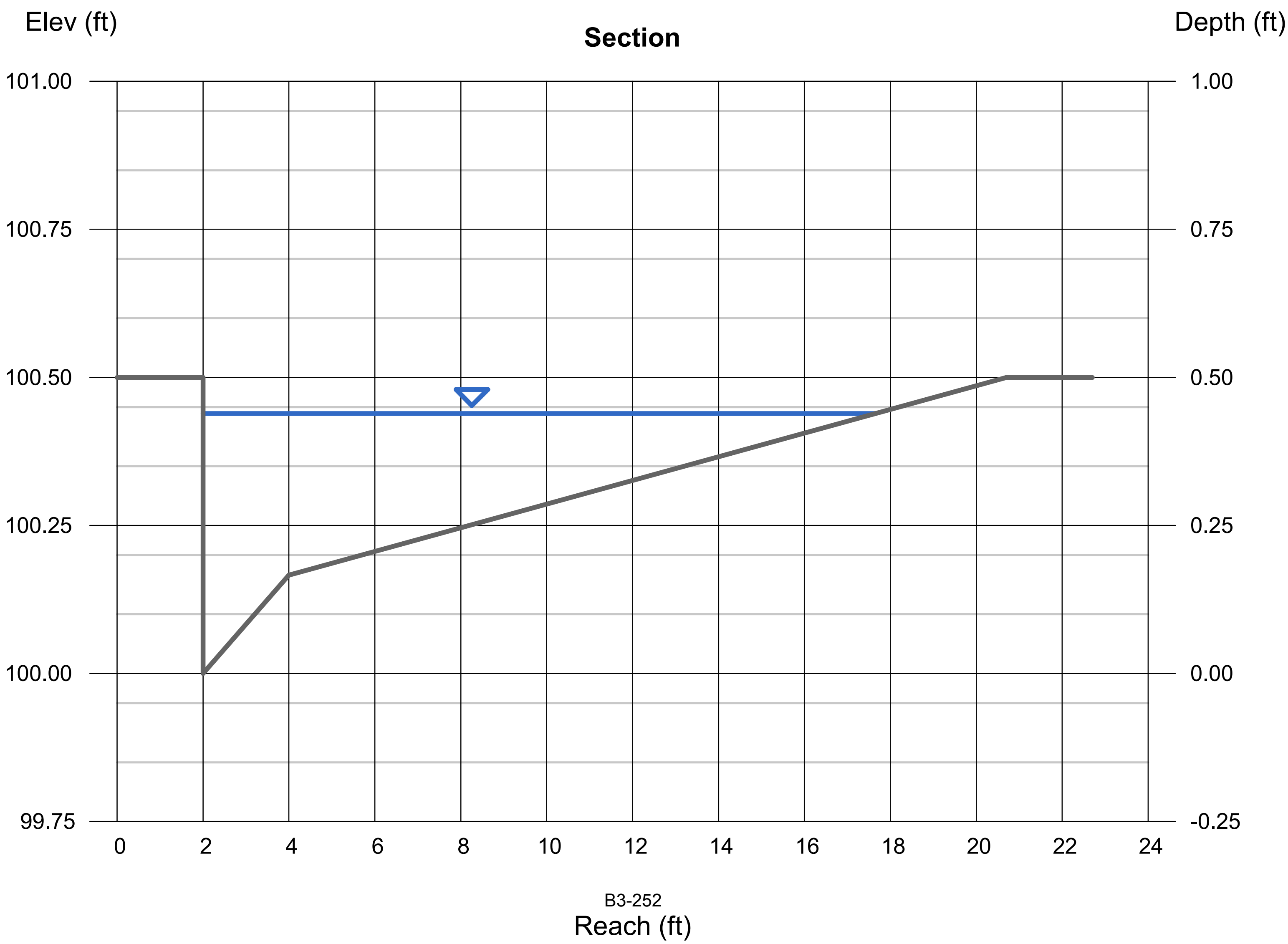
Depth (ft)	= 0.44
Q (cfs)	= 3.420
Area (sqft)	= 2.58
Velocity (ft/s)	= 1.33
Wetted Perim (ft)	= 16.10
Crit Depth, Yc (ft)	= 0.38
Spread Width (ft)	= 15.65
EGL (ft)	= 0.47



Channel Report

V4 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.44
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 3.410
Gutter Width (ft)	= 2.00	Area (sqft)	= 2.58
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.32
Slope (%)	= 0.10	Wetted Perim (ft)	= 16.10
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.38
		Spread Width (ft)	= 15.65
Calculations		EGL (ft)	= 0.47
Compute by:	Known Q		
Known Q (cfs)	= 3.41		



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

V5 DA Street Capacity 100-YEAR

Gutter

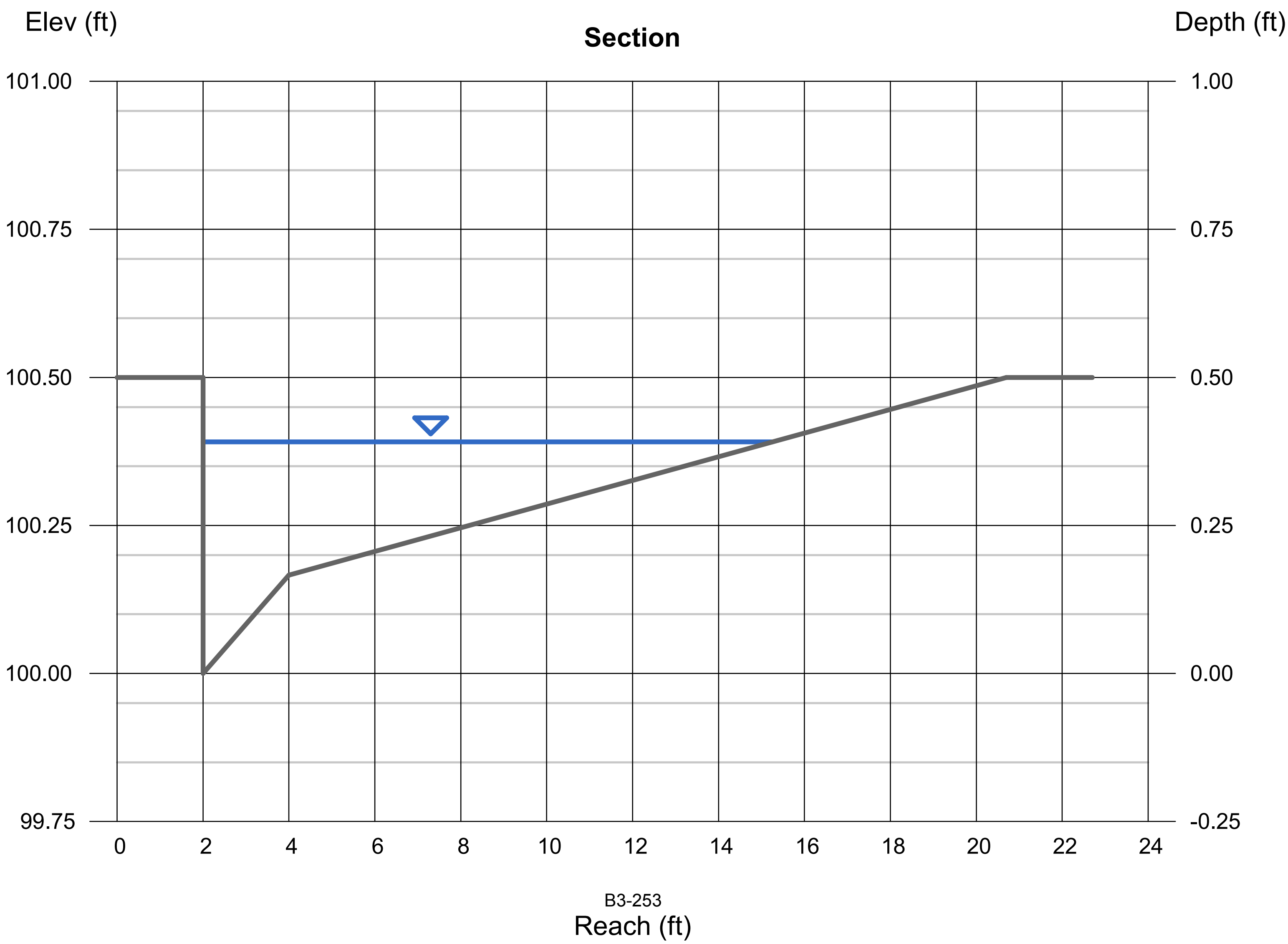
Cross Sl, Sx (ft/ft)	=	0.020
Cross Sl, Sw (ft/ft)	=	0.083
Gutter Width (ft)	=	2.00
Invert Elev (ft)	=	100.00
Slope (%)	=	0.10
N-Value	=	0.013

Calculations

Compute by:		Known Q
Known Q (cfs)	=	2.29

Highlighted

Depth (ft)	=	0.39
Q (cfs)	=	2.290
Area (sqft)	=	1.88
Velocity (ft/s)	=	1.22
Wetted Perim (ft)	=	13.65
Crit Depth, Yc (ft)	=	0.34
Spread Width (ft)	=	13.25
EGL (ft)	=	0.41

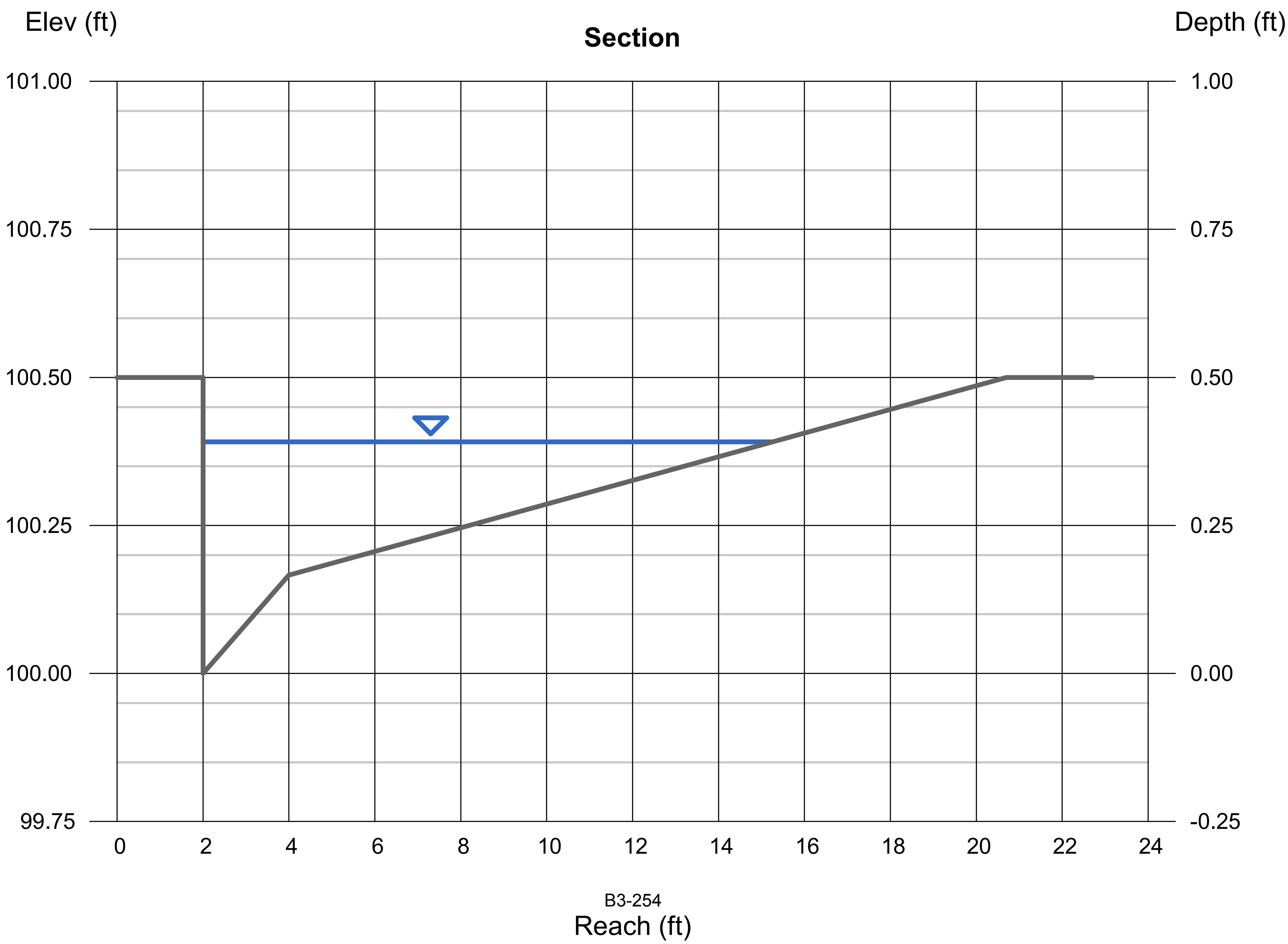


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

V6 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.39
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.290
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.88
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.22
Slope (%)	= 0.10	Wetted Perim (ft)	= 13.65
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.34
		Spread Width (ft)	= 13.25
Calculations		EGL (ft)	= 0.41
Compute by:	Known Q		
Known Q (cfs)	= 2.29		

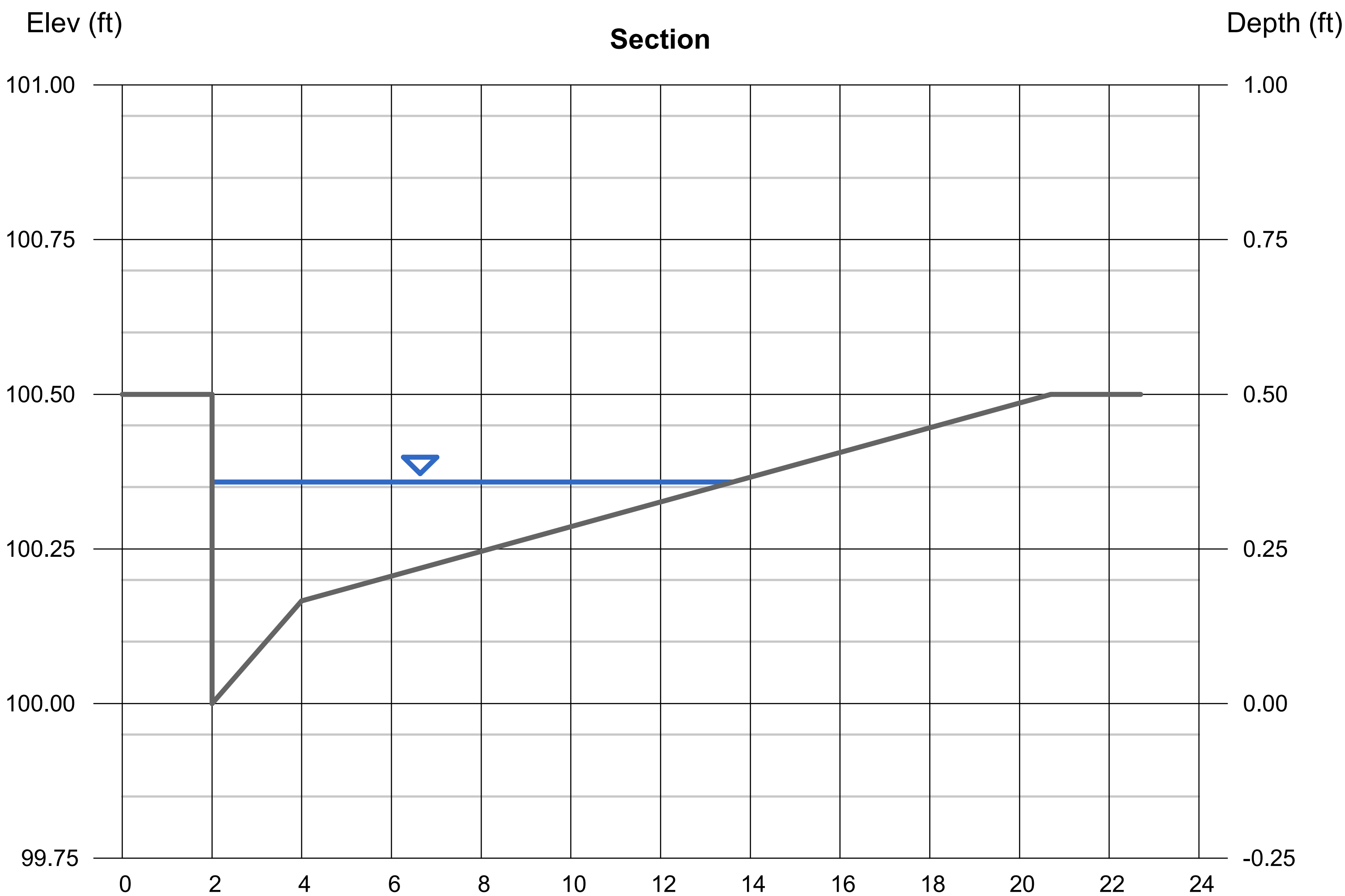


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

V7 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.36
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.680
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.47
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.14
Slope (%)	= 0.10	Wetted Perim (ft)	= 11.97
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.31
		Spread Width (ft)	= 11.60
Calculations		EGL (ft)	= 0.38
Compute by:	Known Q		
Known Q (cfs)	= 1.68		



Reach (ft)

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. — Friday, May 17 2024

V8 DA Street Capacity 100-YEAR

Gutter

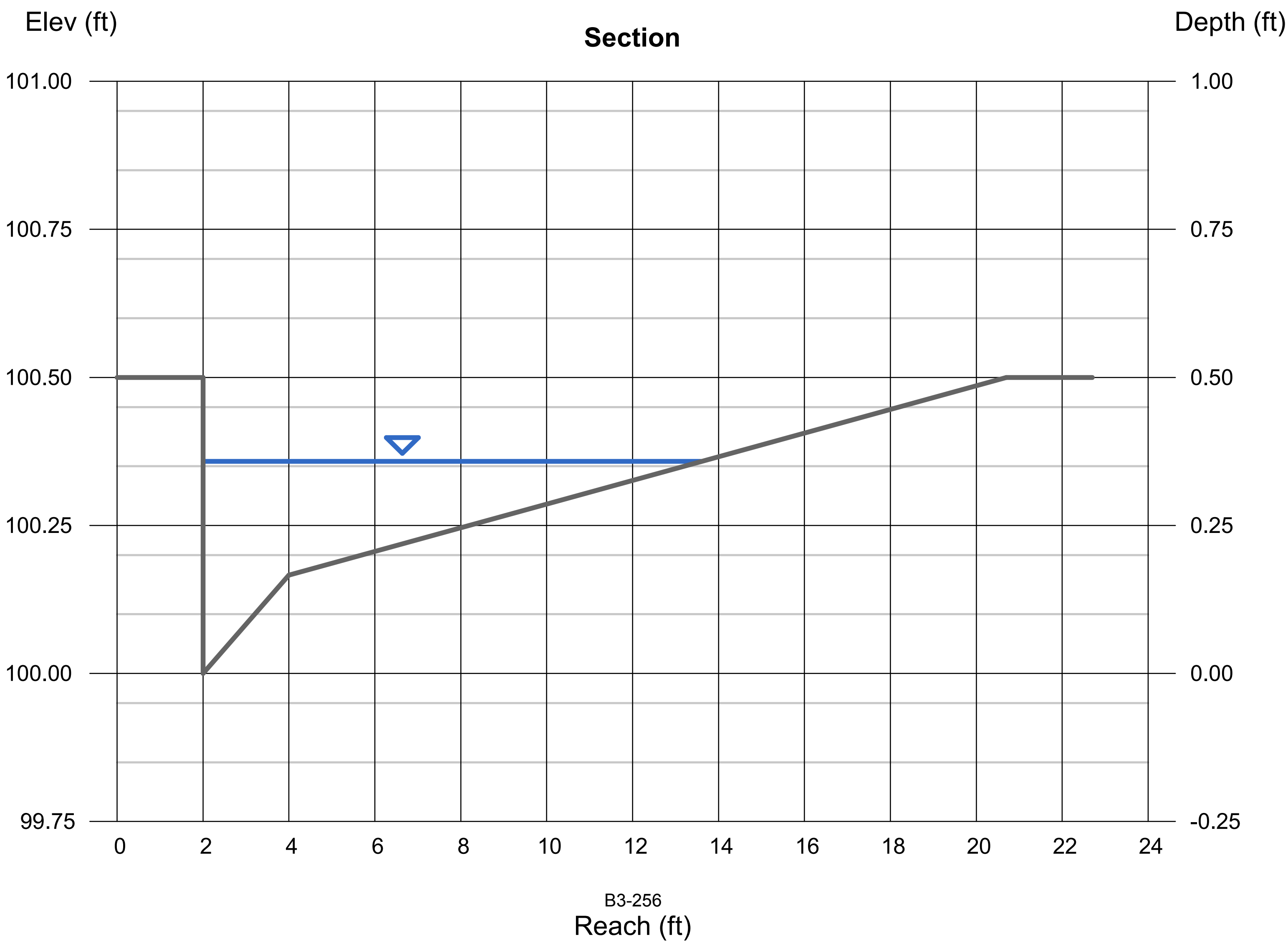
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.10
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.68

Highlighted

Depth (ft)	= 0.36
Q (cfs)	= 1.680
Area (sqft)	= 1.47
Velocity (ft/s)	= 1.14
Wetted Perim (ft)	= 11.97
Crit Depth, Yc (ft)	= 0.31
Spread Width (ft)	= 11.60
EGL (ft)	= 0.38

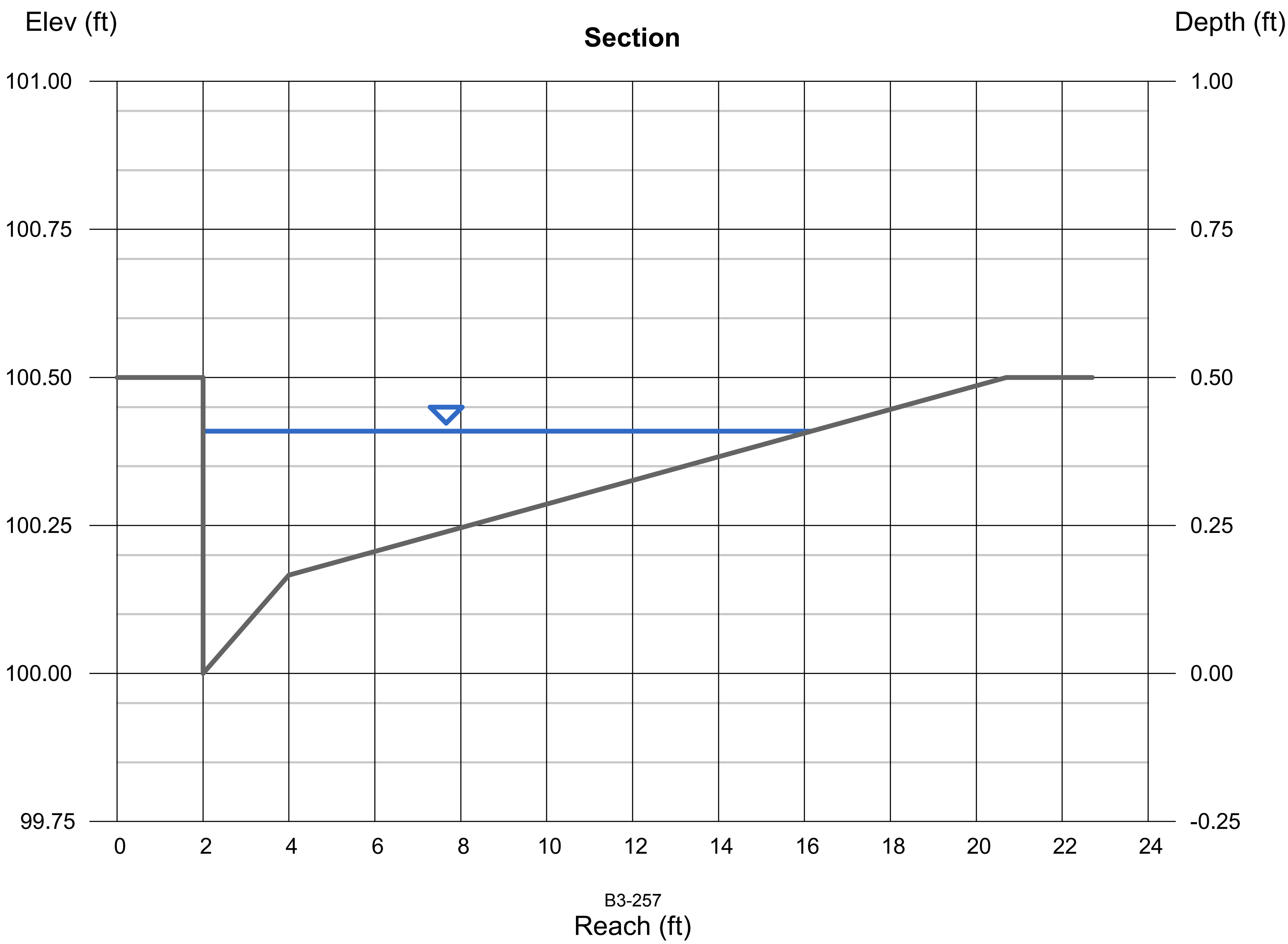


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. — Friday, May 17 2024

R2 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.41
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 5.360
Gutter Width (ft)	= 2.00	Area (sqft)	= 2.13
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.52
Slope (%)	= 0.40	Wetted Perim (ft)	= 14.57
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.43
		Spread Width (ft)	= 14.15
Calculations		EGL (ft)	= 0.51
Compute by:	Known Q		
Known Q (cfs)	= 5.36		



Channel Report

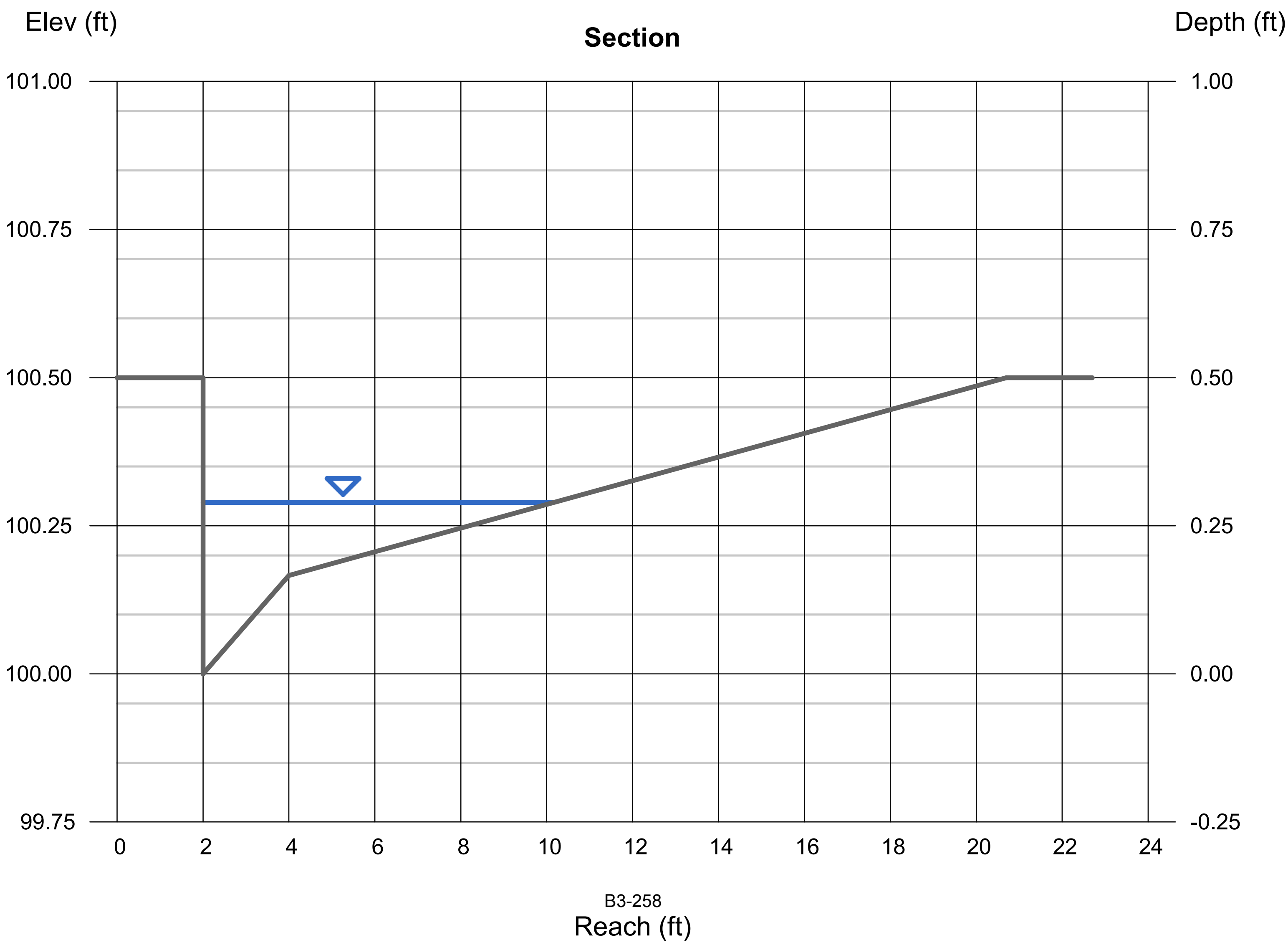
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

F3 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.29
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.470
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.79
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 3.13
Slope (%)	= 1.00	Wetted Perim (ft)	= 8.45
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.34
		Spread Width (ft)	= 8.15
		EGL (ft)	= 0.44

Calculations

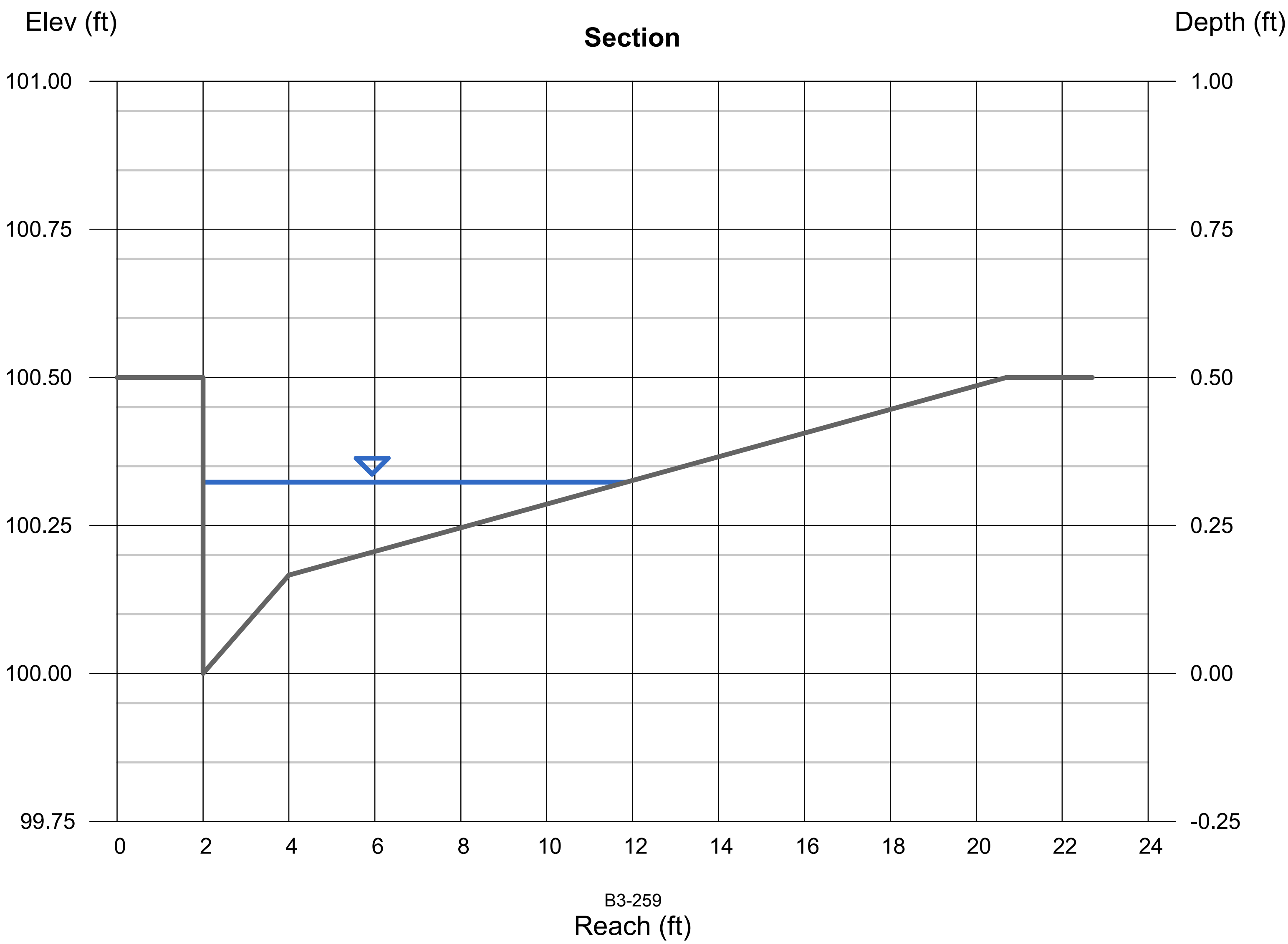
Compute by:	Known Q
Known Q (cfs)	= 2.47



Channel Report

C6 DA Street Capacity 100-YEAR

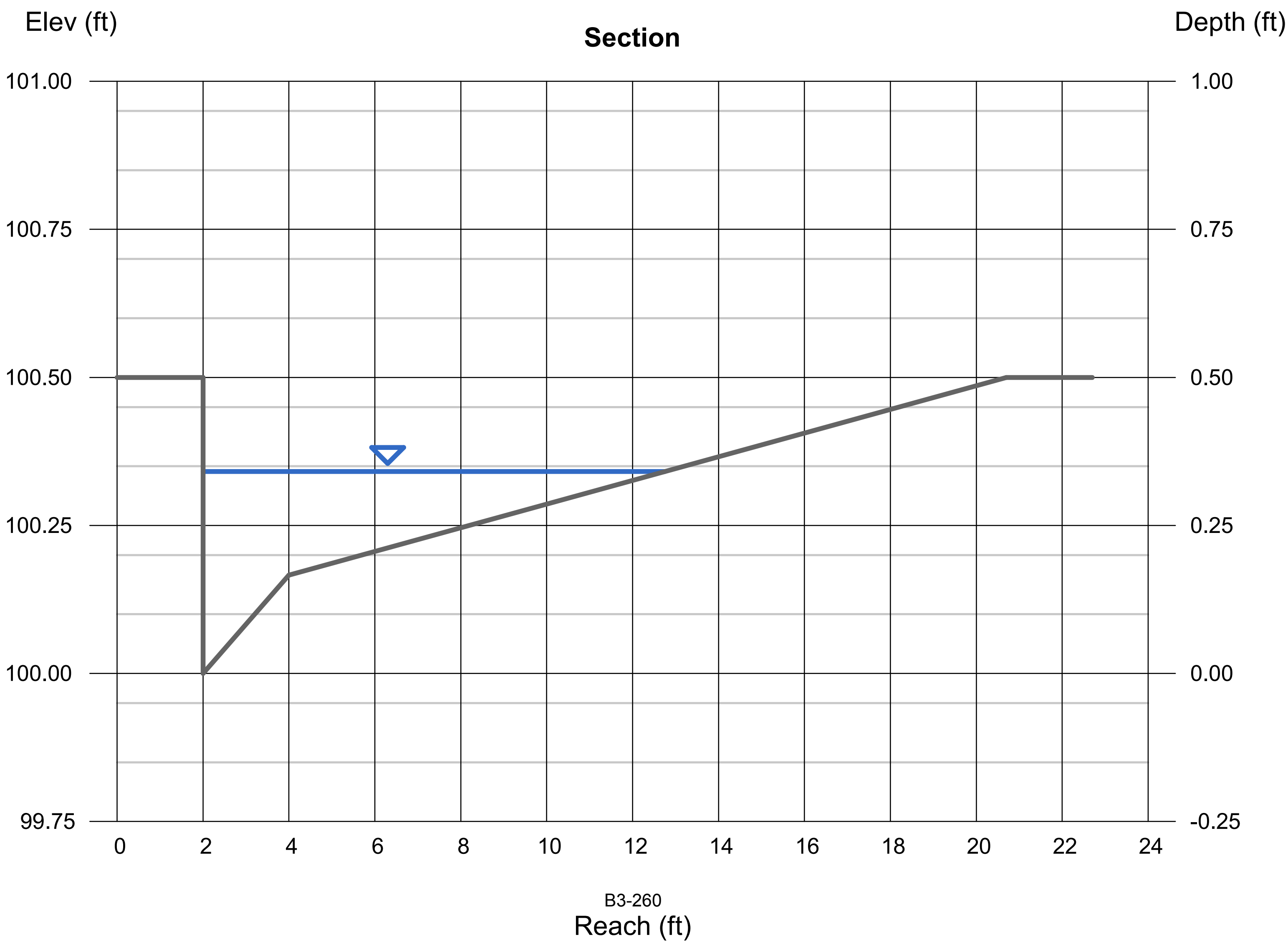
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.32
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.010
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.10
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.83
Slope (%)	= 0.30	Wetted Perim (ft)	= 10.18
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.33
		Spread Width (ft)	= 9.85
Calculations		EGL (ft)	= 0.38
Compute by:	Known Q		
Known Q (cfs)	= 2.01		



Channel Report

C5 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.34
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.990
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.55
Slope (%)	= 0.20	Wetted Perim (ft)	= 11.10
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.32
		Spread Width (ft)	= 10.75
Calculations		EGL (ft)	= 0.38
Compute by:	Known Q		
Known Q (cfs)	= 1.99		

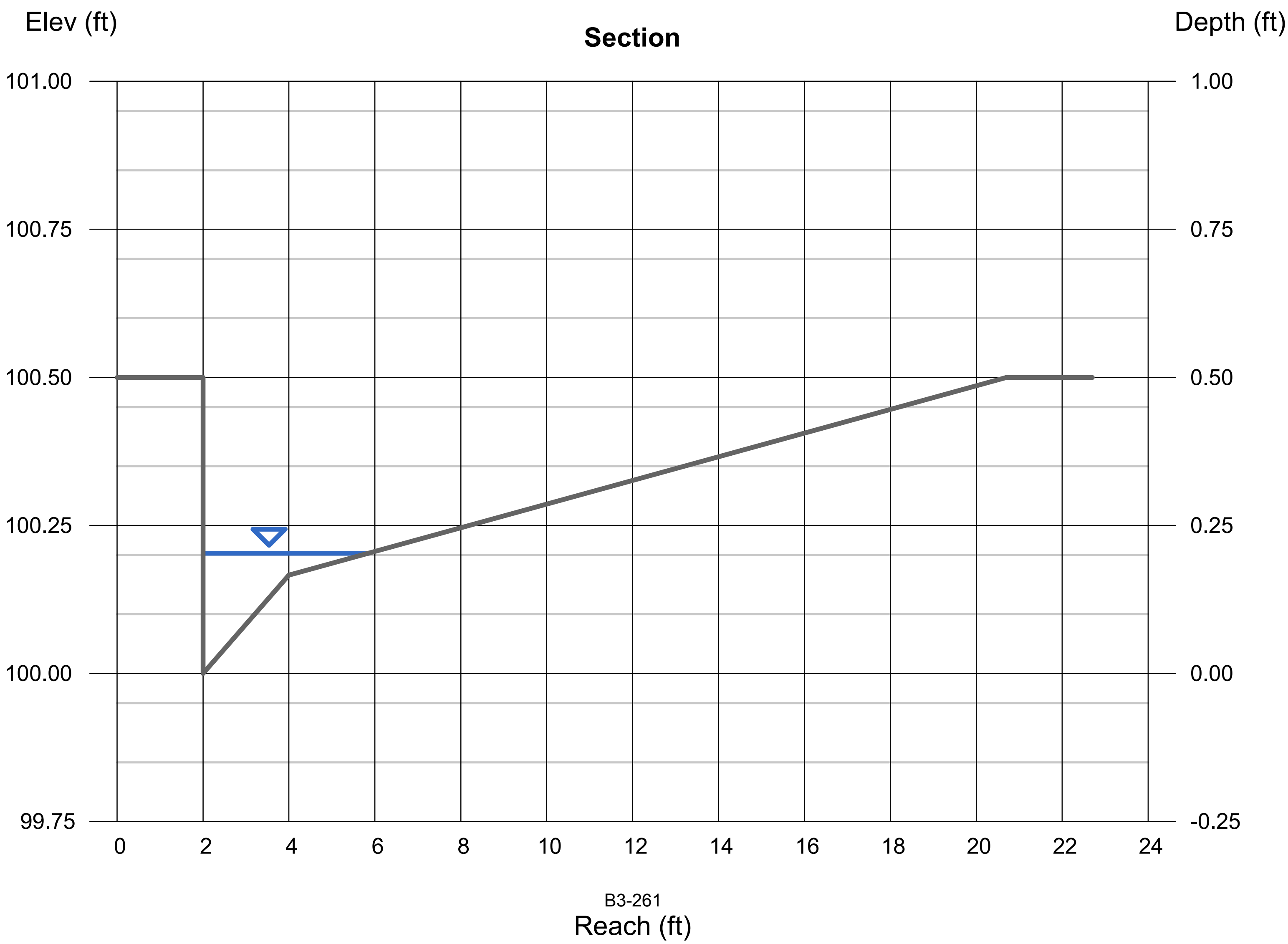


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

F1 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.20
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.530
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.27
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.93
Slope (%)	= 0.50	Wetted Perim (ft)	= 4.06
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.22
		Spread Width (ft)	= 3.85
Calculations		EGL (ft)	= 0.26
Compute by:	Known Q		
Known Q (cfs)	= 0.53		

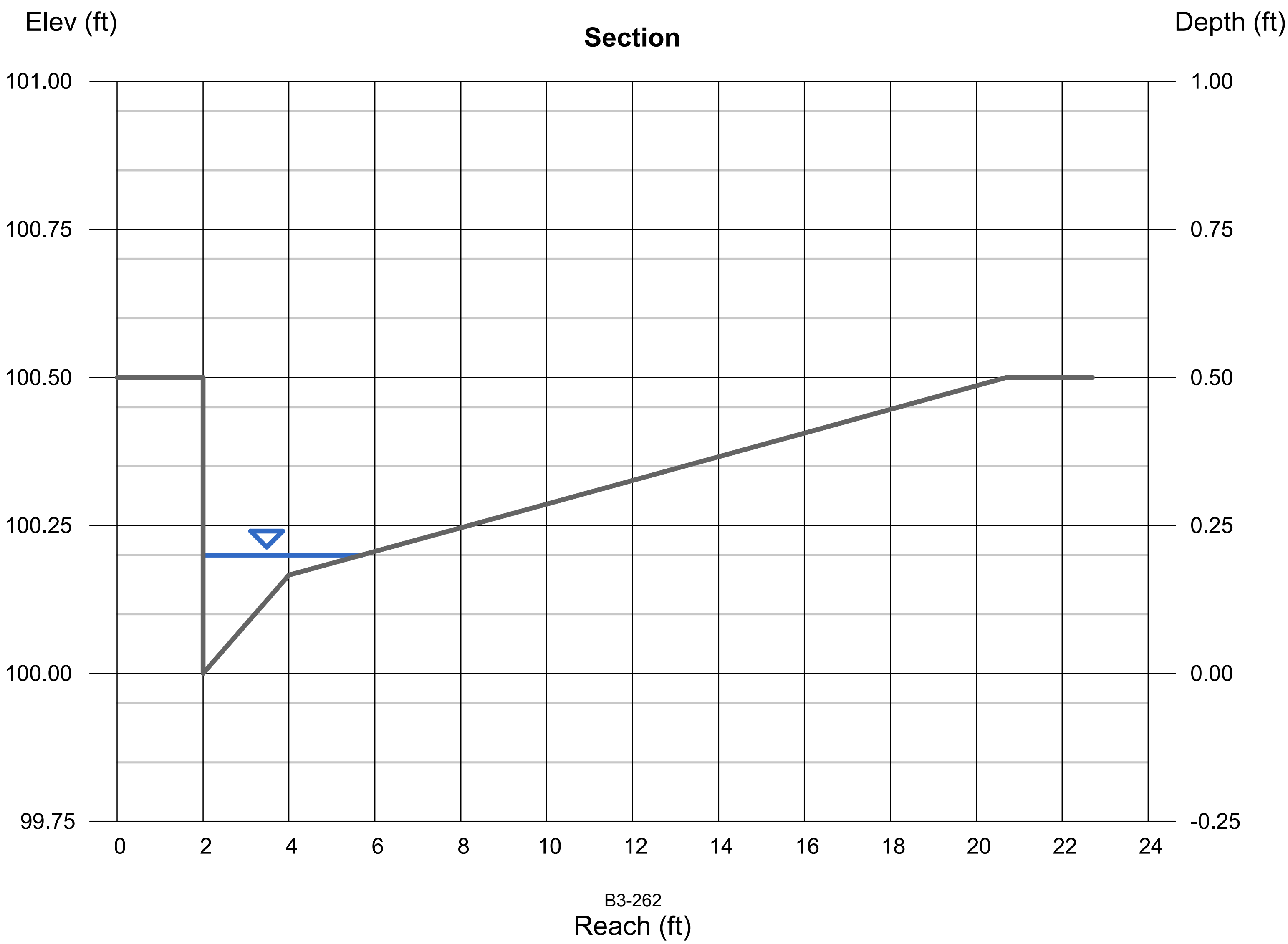


Channel Report

F2 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.20
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.510
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.26
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.94
Slope (%)	= 0.50	Wetted Perim (ft)	= 3.91
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.22
		Spread Width (ft)	= 3.70
		EGL (ft)	= 0.26

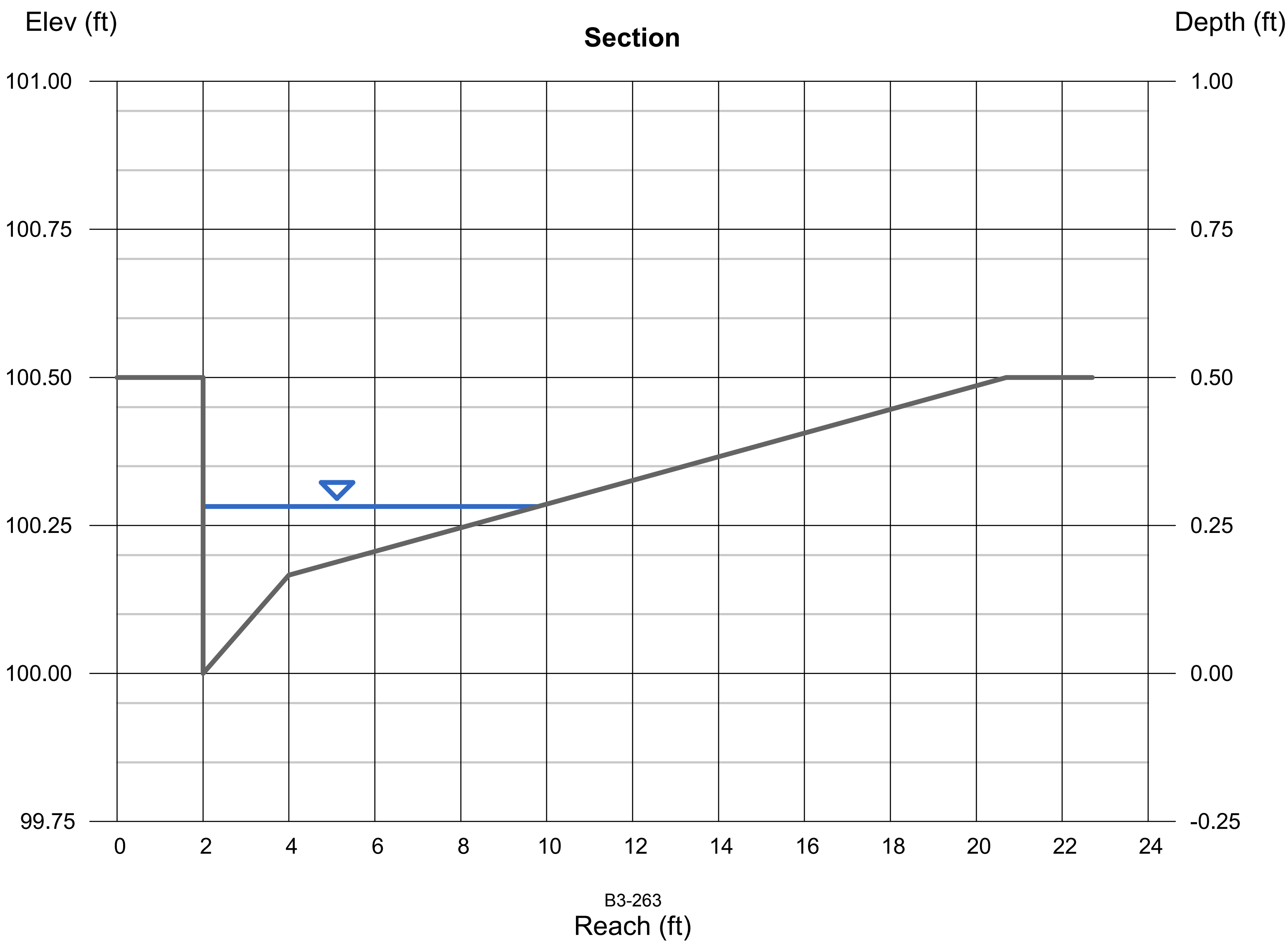
Calculations
Compute by: Known Q
Known Q (cfs) = 0.51



Channel Report

E2 DA Street Capacity 100-YEAR

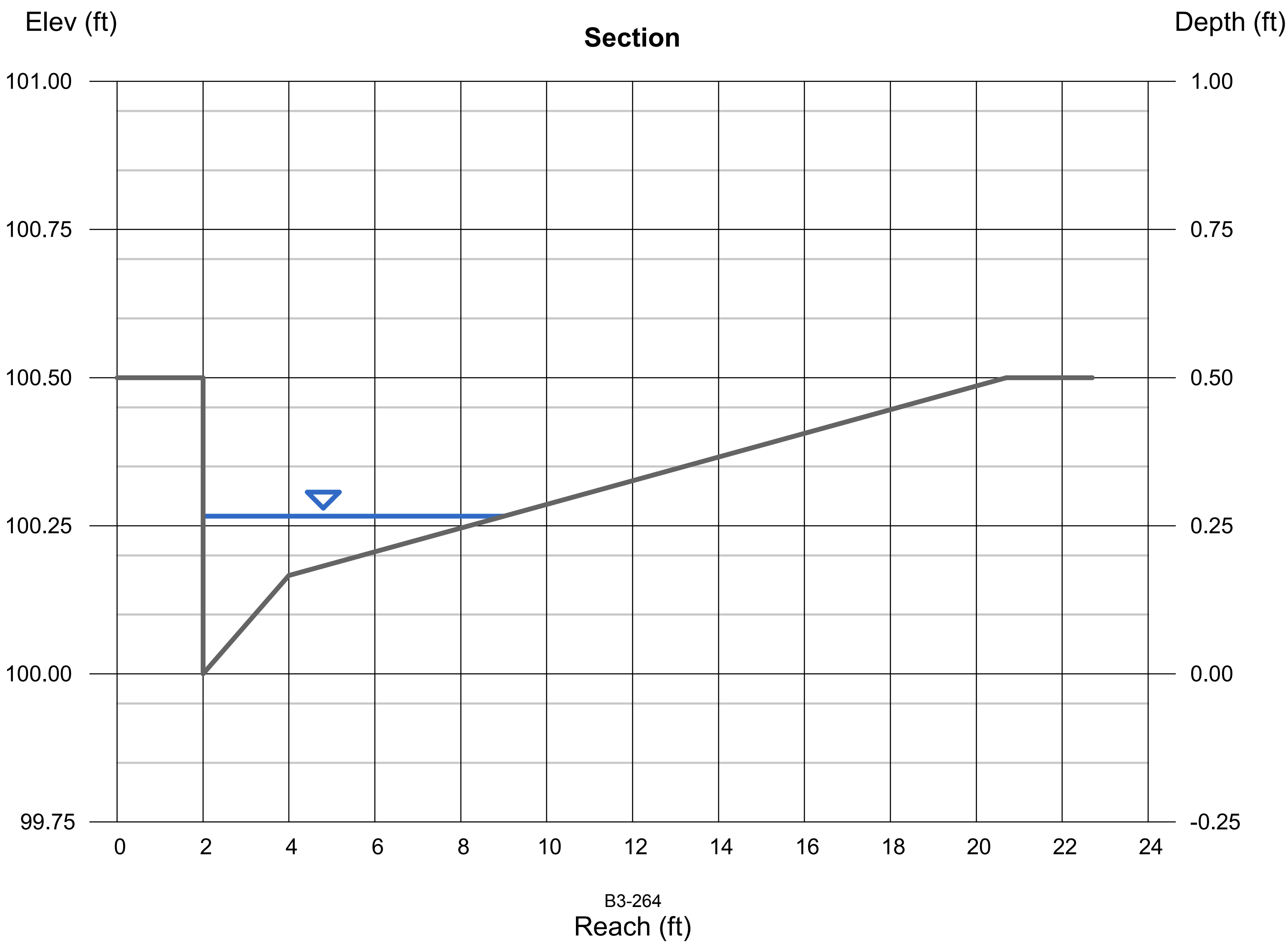
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.28
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.020
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.73
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.39
Slope (%)	= 0.20	Wetted Perim (ft)	= 8.09
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.27
		Spread Width (ft)	= 7.80
Calculations		EGL (ft)	= 0.31
Compute by:	Known Q		
Known Q (cfs)	= 1.02		



Channel Report

E1 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.27
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.010
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.62
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.64
Slope (%)	= 0.30	Wetted Perim (ft)	= 7.27
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.27
		Spread Width (ft)	= 7.00
Calculations		EGL (ft)	= 0.31
Compute by:	Known Q		
Known Q (cfs)	= 1.01		



Channel Report

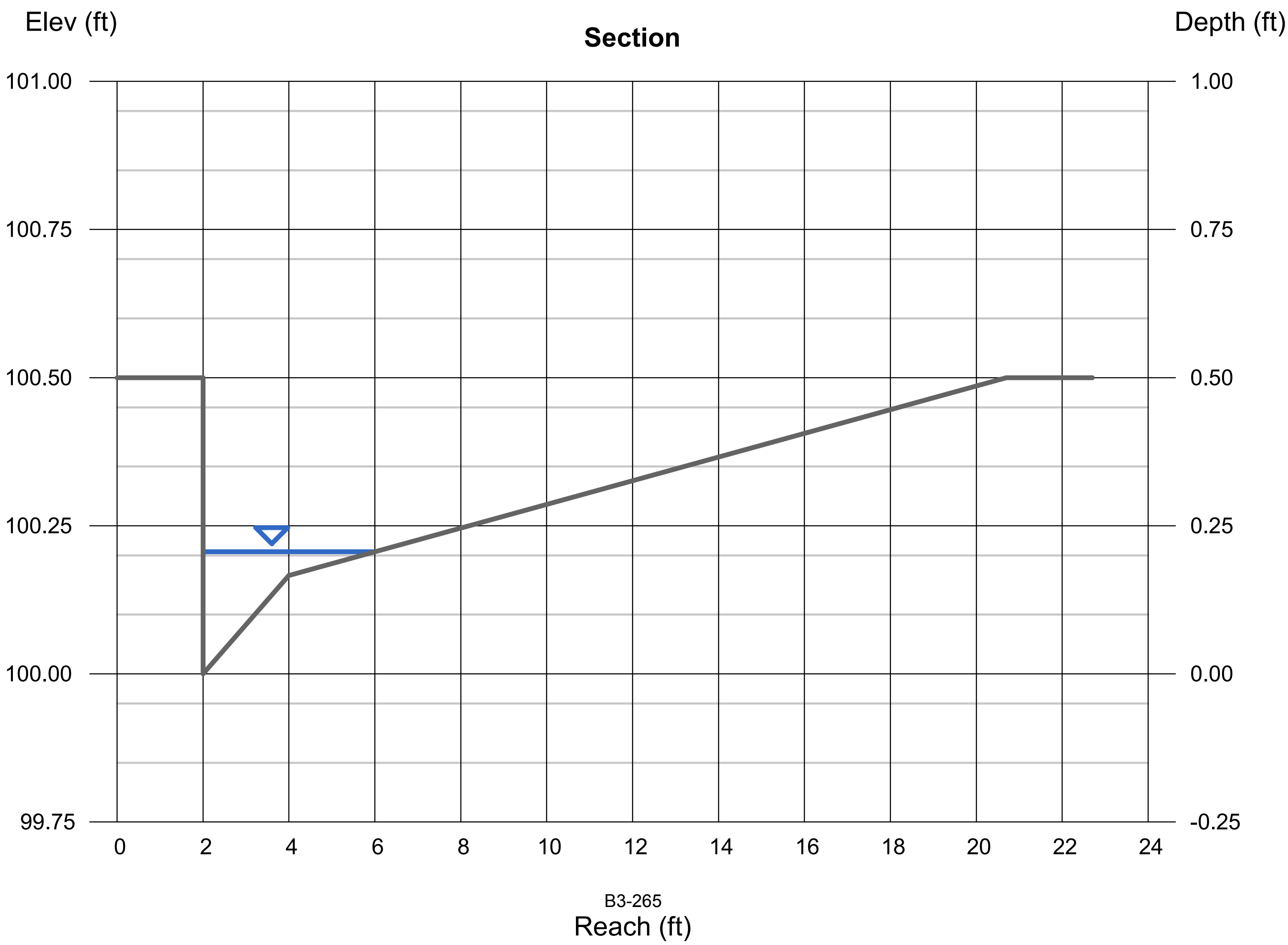
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. — Friday, May 17 2024

E4 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.21
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.500
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.29
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.75
Slope (%)	= 0.40	Wetted Perim (ft)	= 4.21
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.22
		Spread Width (ft)	= 4.00
		EGL (ft)	= 0.25

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.50

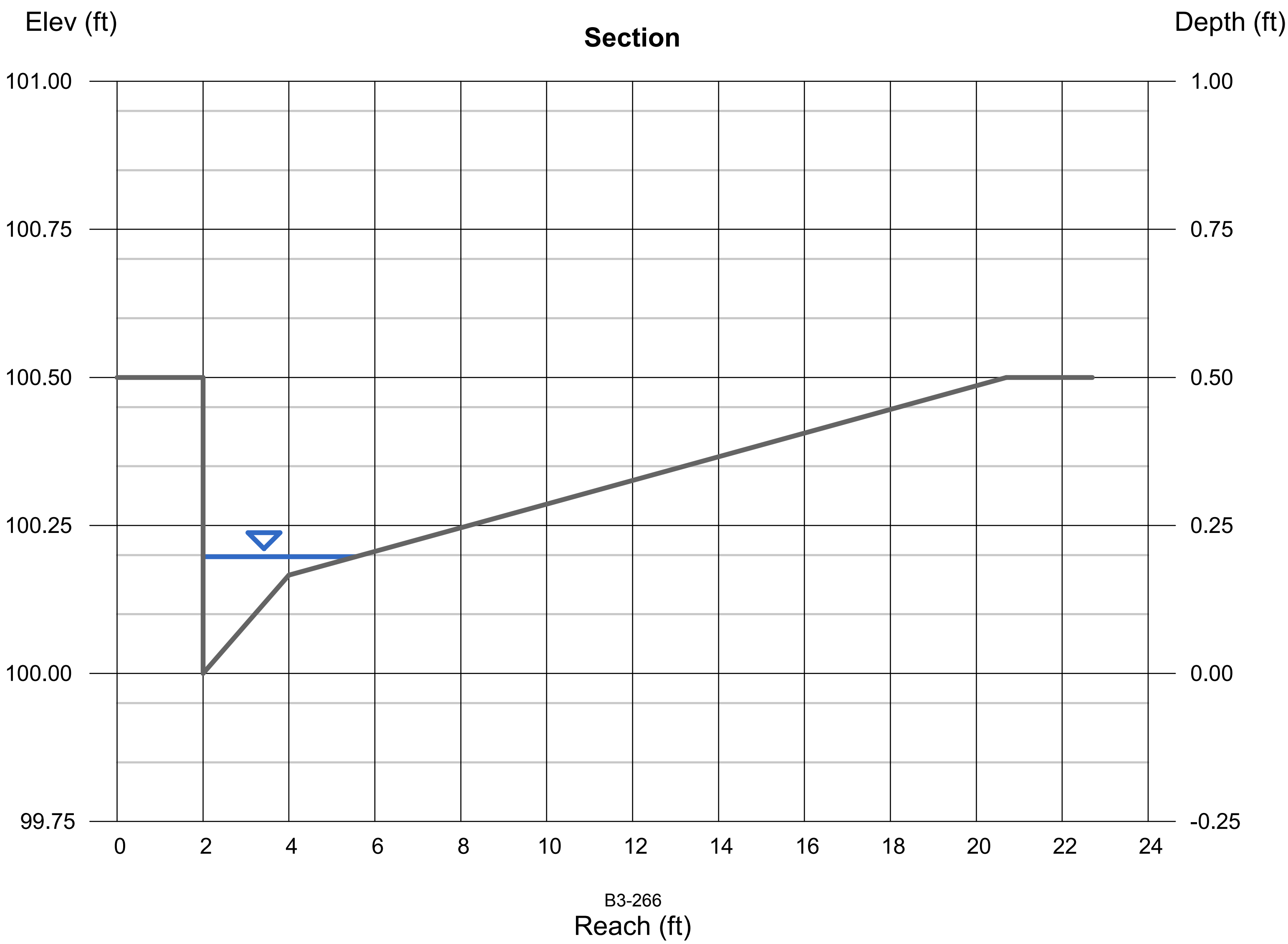


Channel Report

E3 DA Street Capacity 100-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.20
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.490
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.25
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.94
Slope (%)	= 0.50	Wetted Perim (ft)	= 3.75
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.22
		Spread Width (ft)	= 3.55
		EGL (ft)	= 0.26

Calculations
Compute by: Known Q
Known Q (cfs) = 0.49



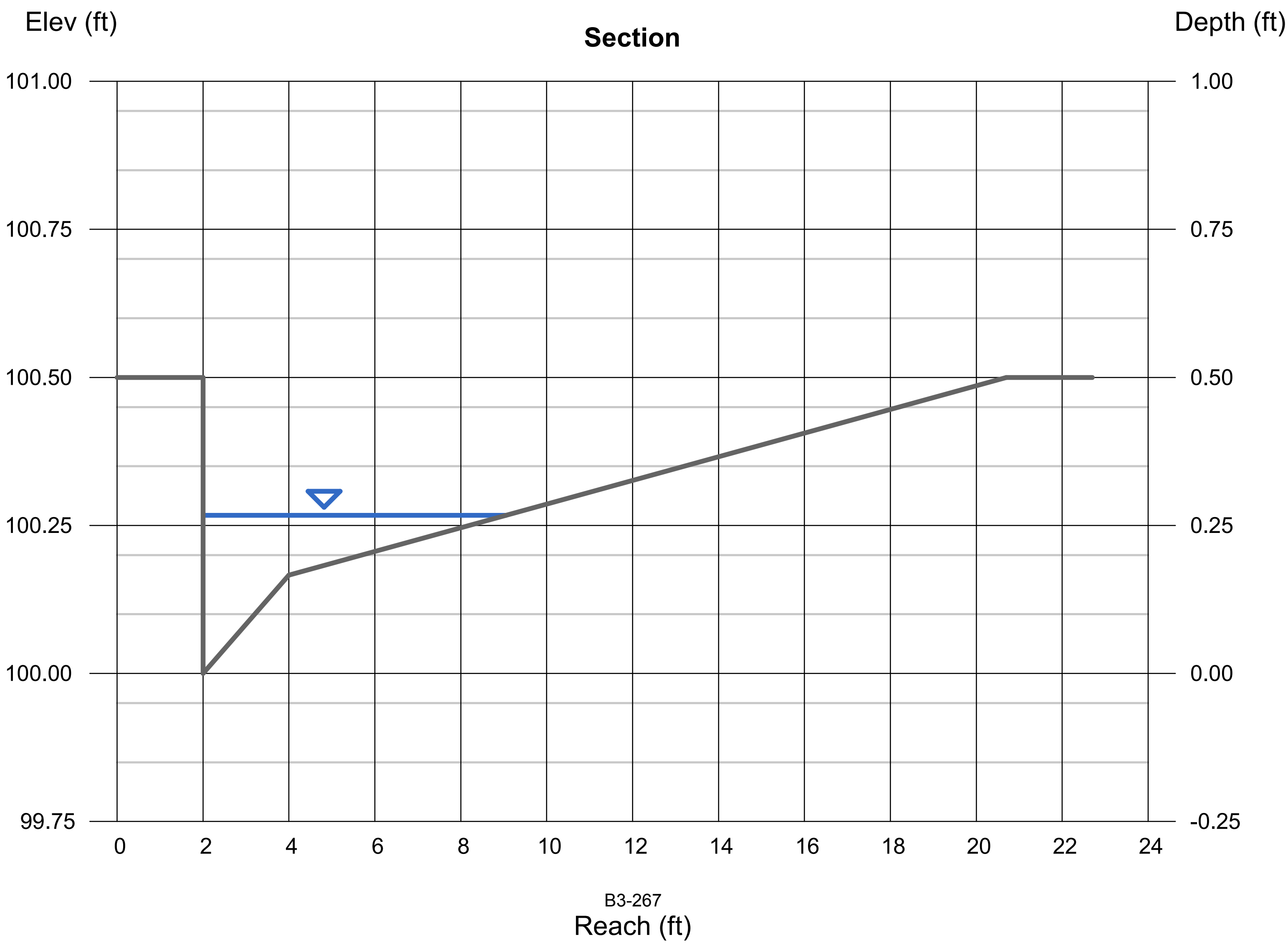
Channel Report

C2 DA Street Capacity 100-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.27
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.320
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.62
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.12
Slope (%)	= 0.50	Wetted Perim (ft)	= 7.32
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.29
		Spread Width (ft)	= 7.05
		EGL (ft)	= 0.34

Calculations

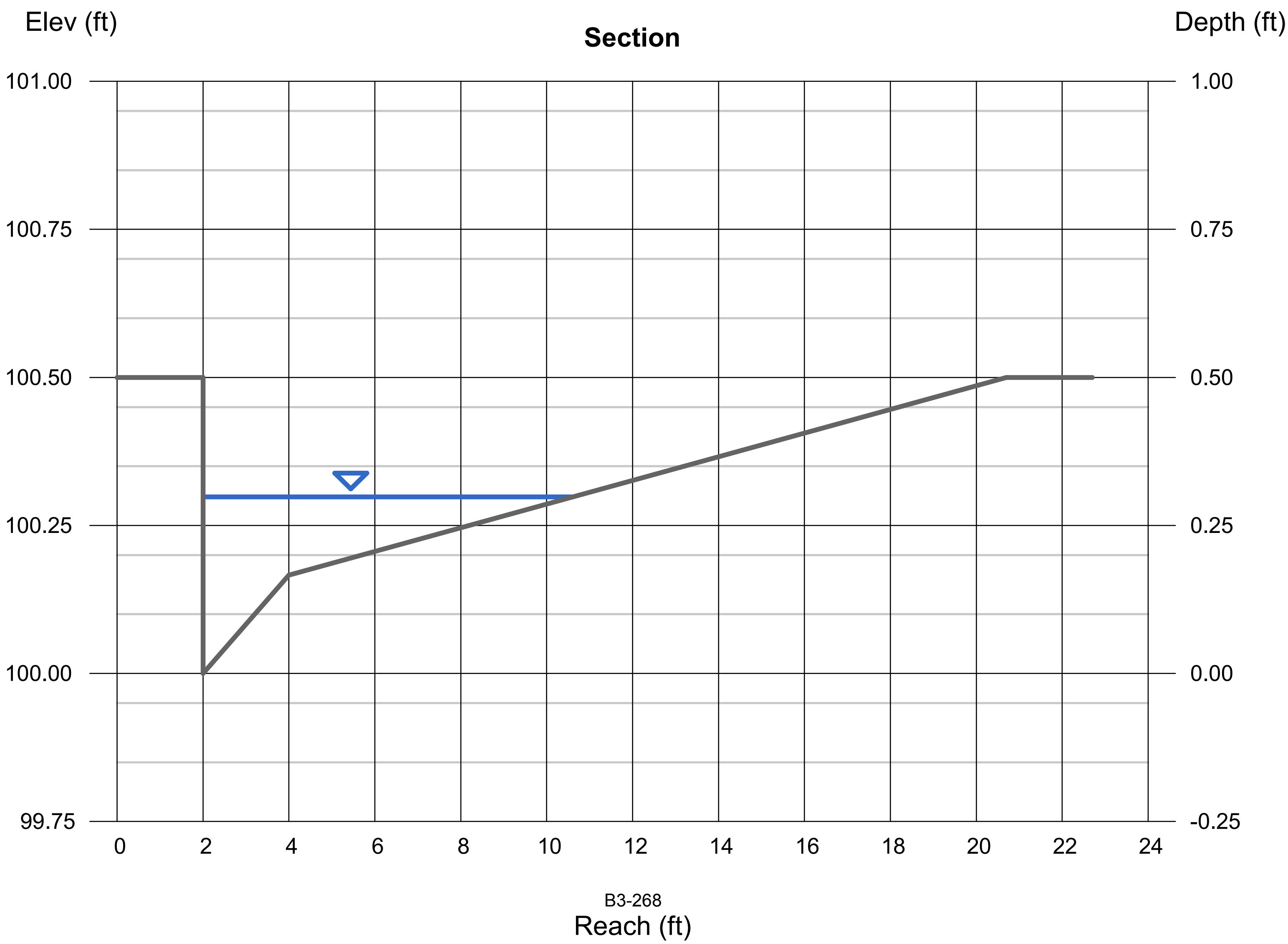
Compute by:	Known Q
Known Q (cfs)	= 1.32



Channel Report

C1 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.30
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.230
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.87
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.42
Slope (%)	= 0.20	Wetted Perim (ft)	= 8.91
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.28
		Spread Width (ft)	= 8.60
Calculations		EGL (ft)	= 0.33
Compute by:	Known Q		
Known Q (cfs)	= 1.23		

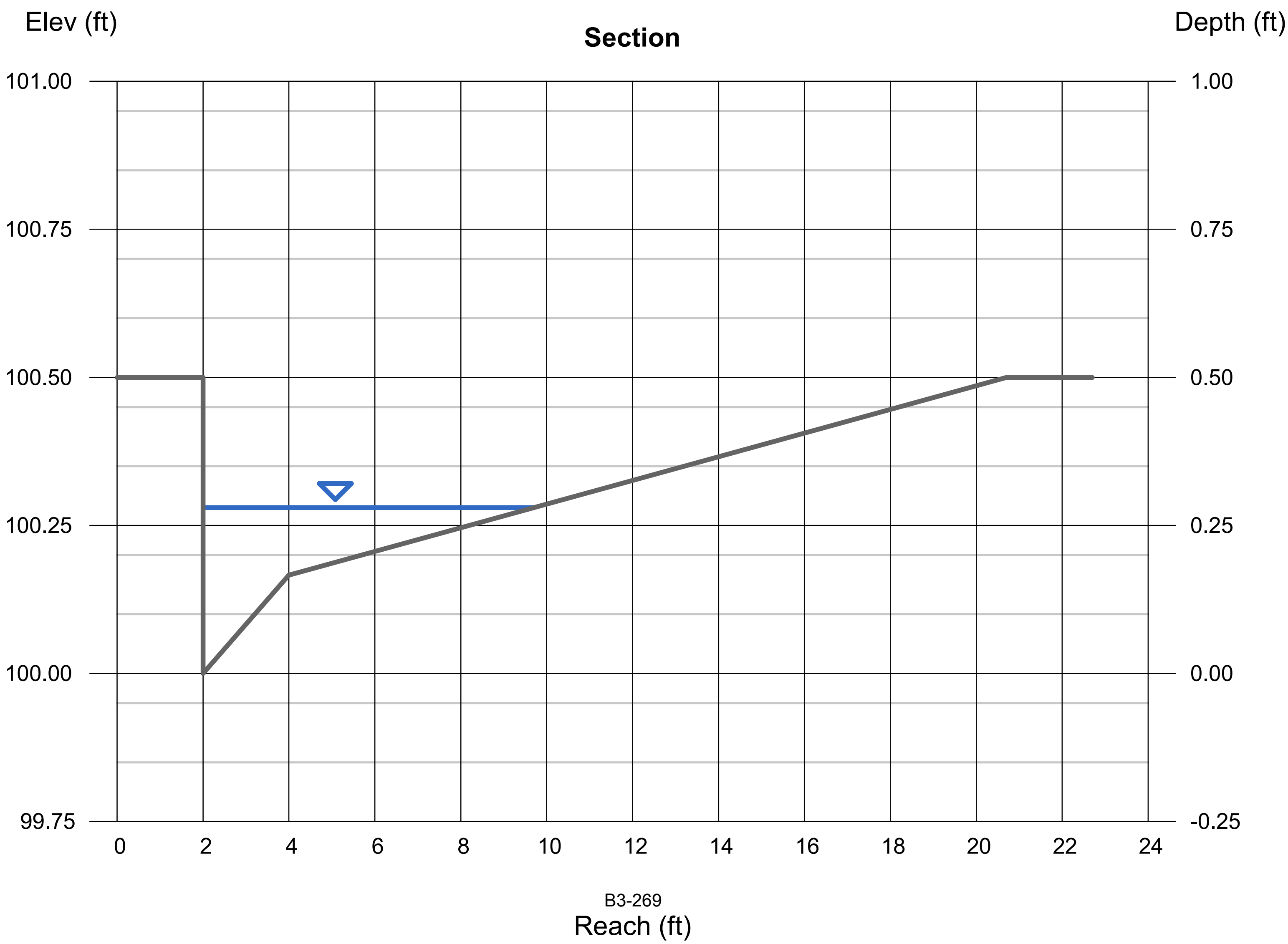


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. — Friday, May 17 2024

C4 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.28
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.400
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.72
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.95
Slope (%)	= 0.40	Wetted Perim (ft)	= 7.99
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.29
		Spread Width (ft)	= 7.70
Calculations		EGL (ft)	= 0.34
Compute by:	Known Q		
Known Q (cfs)	= 1.40		



Channel Report

C3 DA Street Capacity 100-YEAR

Gutter

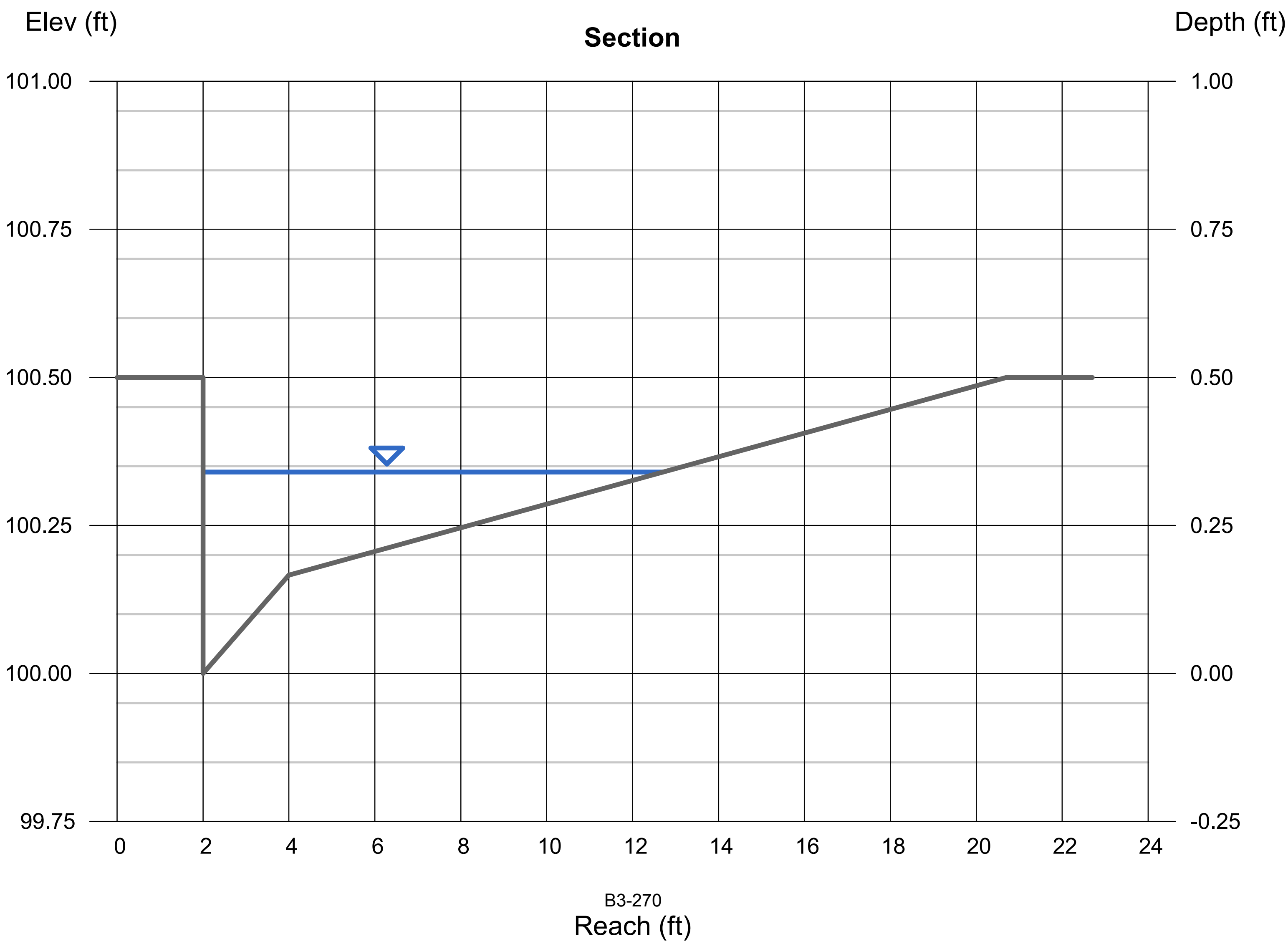
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.10
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.40

Highlighted

Depth (ft)	= 0.34
Q (cfs)	= 1.400
Area (sqft)	= 1.27
Velocity (ft/s)	= 1.10
Wetted Perim (ft)	= 11.05
Crit Depth, Yc (ft)	= 0.29
Spread Width (ft)	= 10.70
EGL (ft)	= 0.36



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

A9 DA Street Capacity 100-YEAR

Gutter

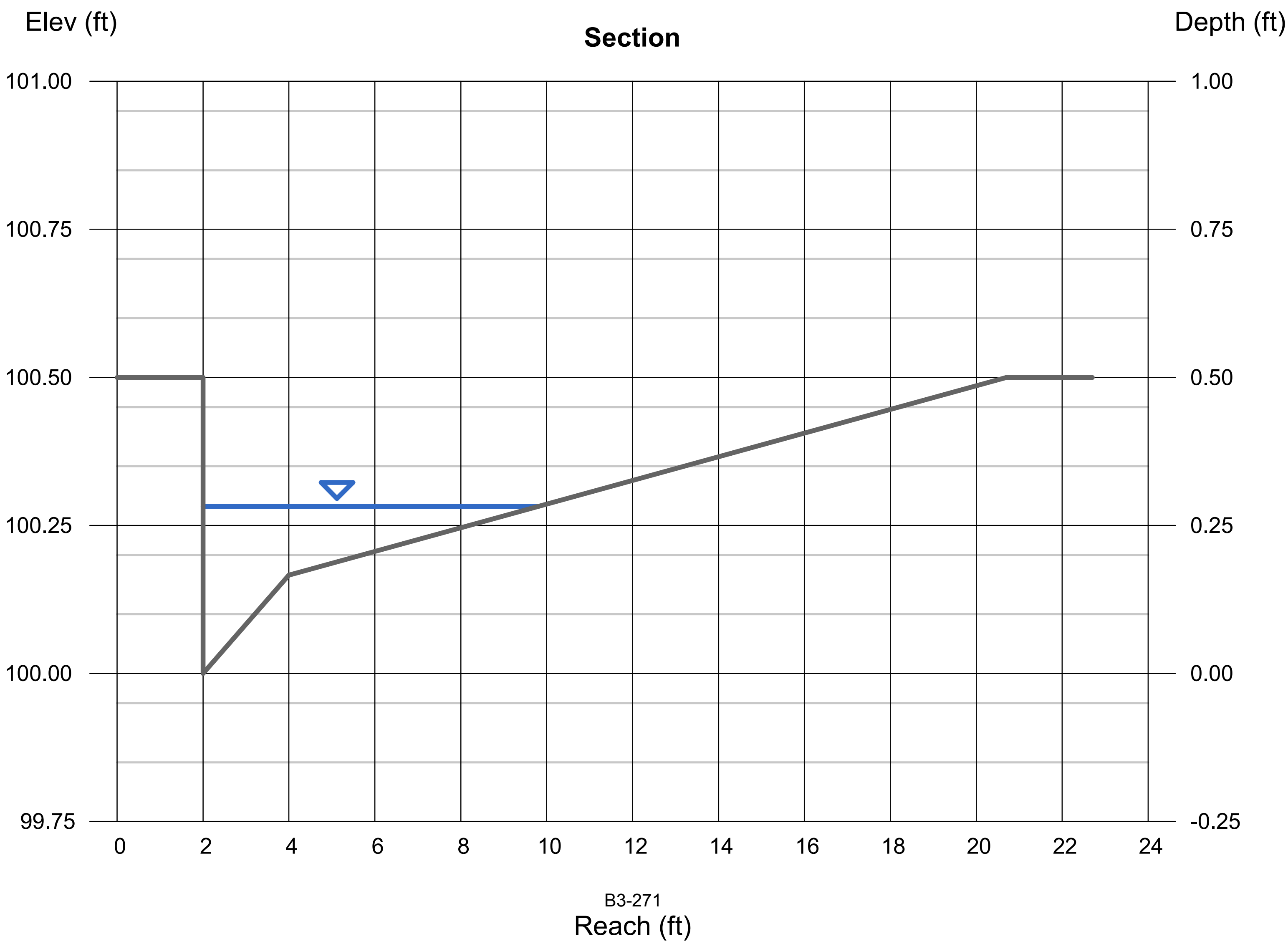
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.10
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.72

Highlighted

Depth (ft)	= 0.28
Q (cfs)	= 0.720
Area (sqft)	= 0.73
Velocity (ft/s)	= 0.98
Wetted Perim (ft)	= 8.09
Crit Depth, Yc (ft)	= 0.25
Spread Width (ft)	= 7.80
EGL (ft)	= 0.30



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. — Friday, May 17 2024

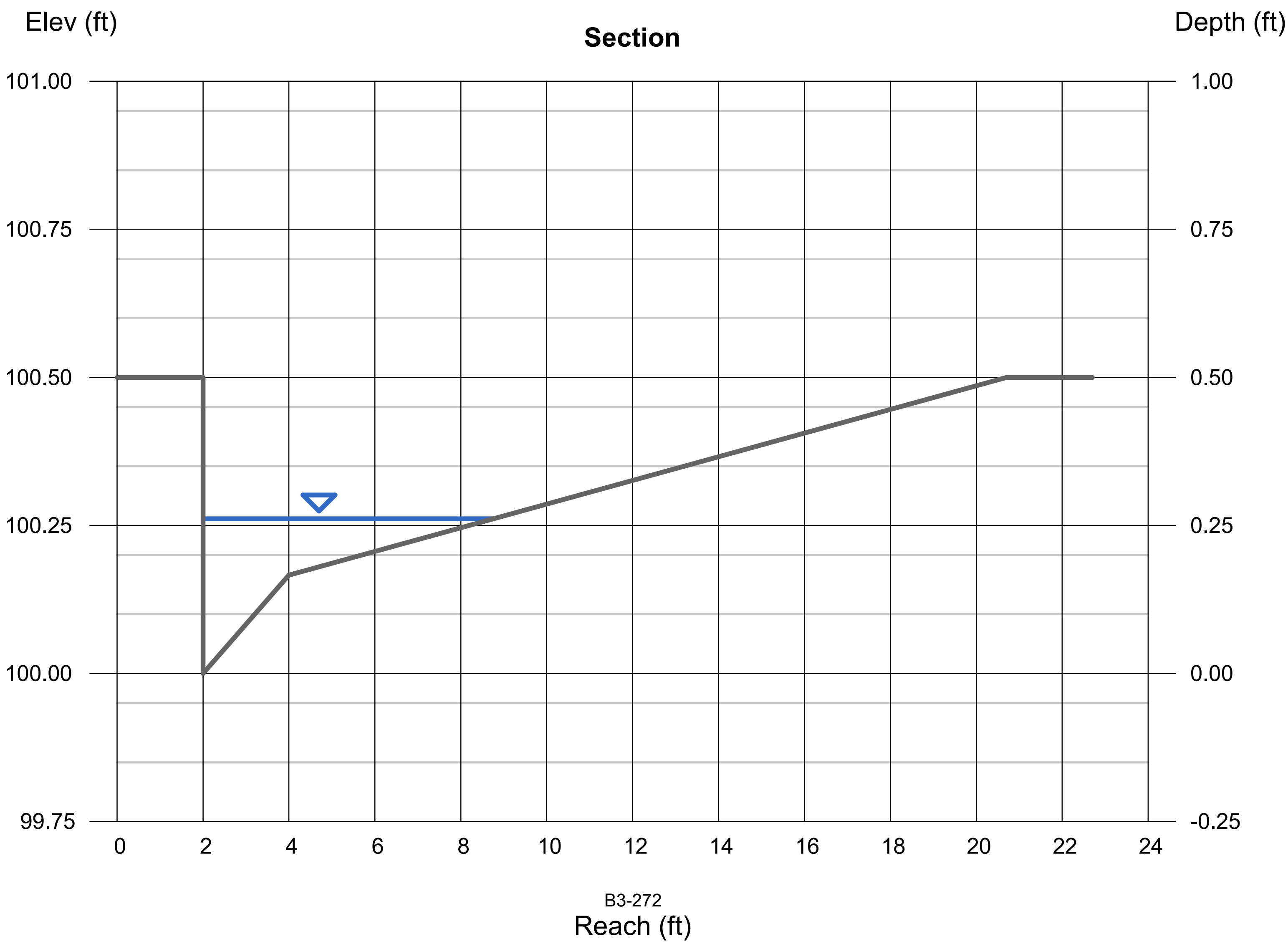
A10 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.26
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.550
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.58
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 0.95
Slope (%)	= 0.10	Wetted Perim (ft)	= 7.02
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.23
		Spread Width (ft)	= 6.75
		EGL (ft)	= 0.27

Calculations

Compute by: Known Q

Known Q (cfs) = 0.55

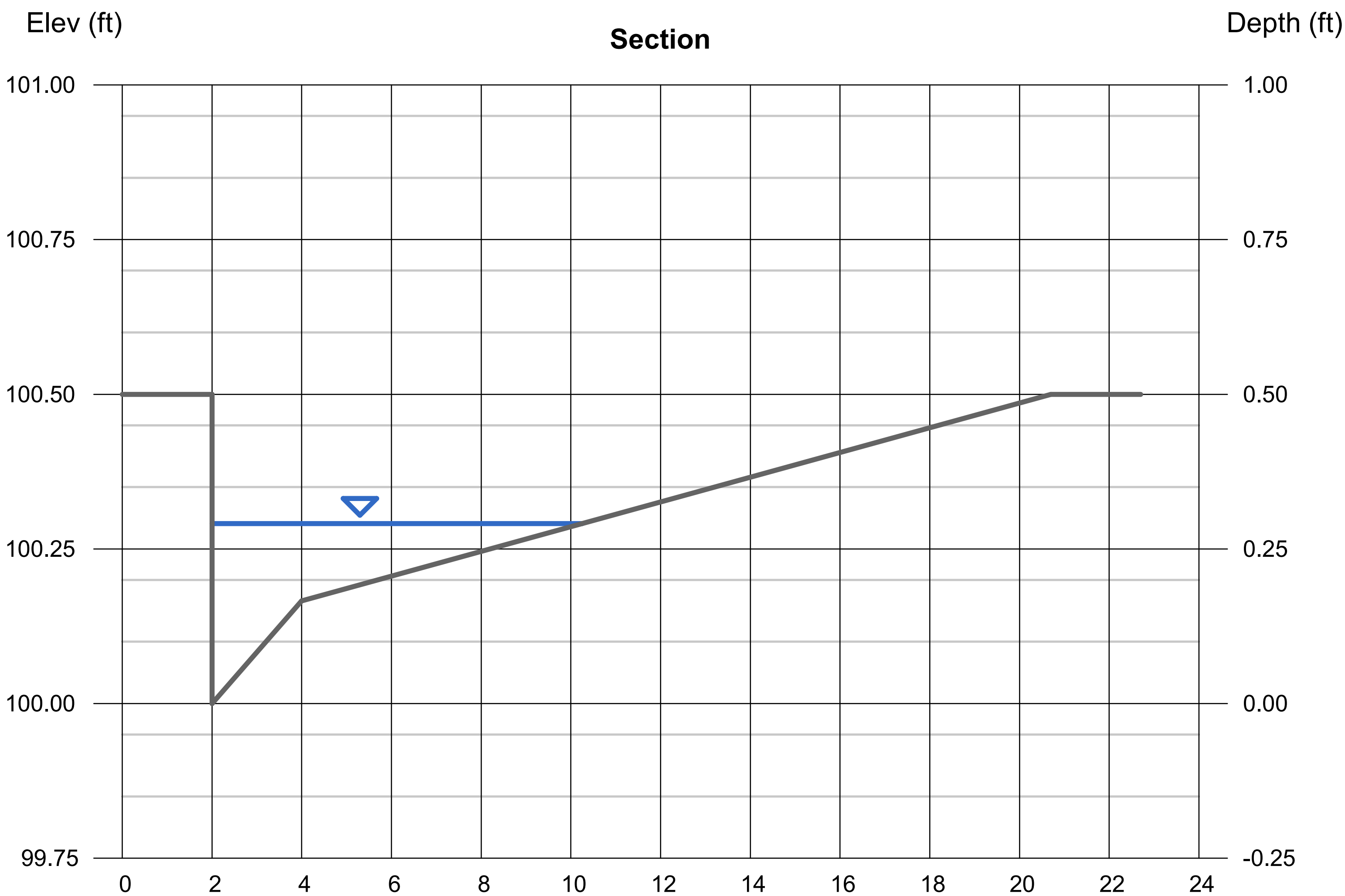


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

A7 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.29
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.390
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.81
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.72
Slope (%)	= 0.30	Wetted Perim (ft)	= 8.55
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.29
		Spread Width (ft)	= 8.25
Calculations		EGL (ft)	= 0.34
Compute by:	Known Q		
Known Q (cfs)	= 1.39		



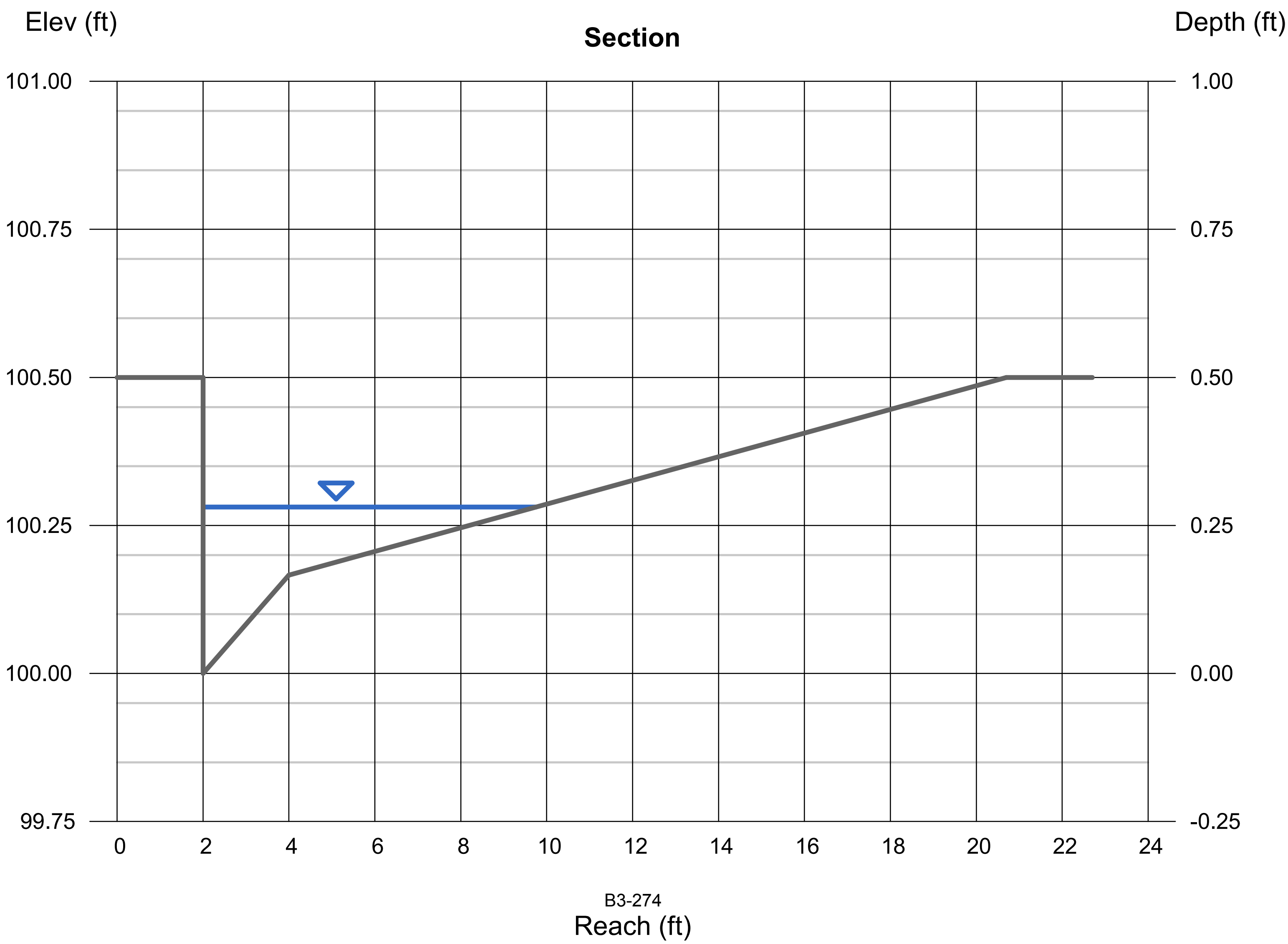
Reach (ft)

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

A8 DA Street Capacity 100-YEAR

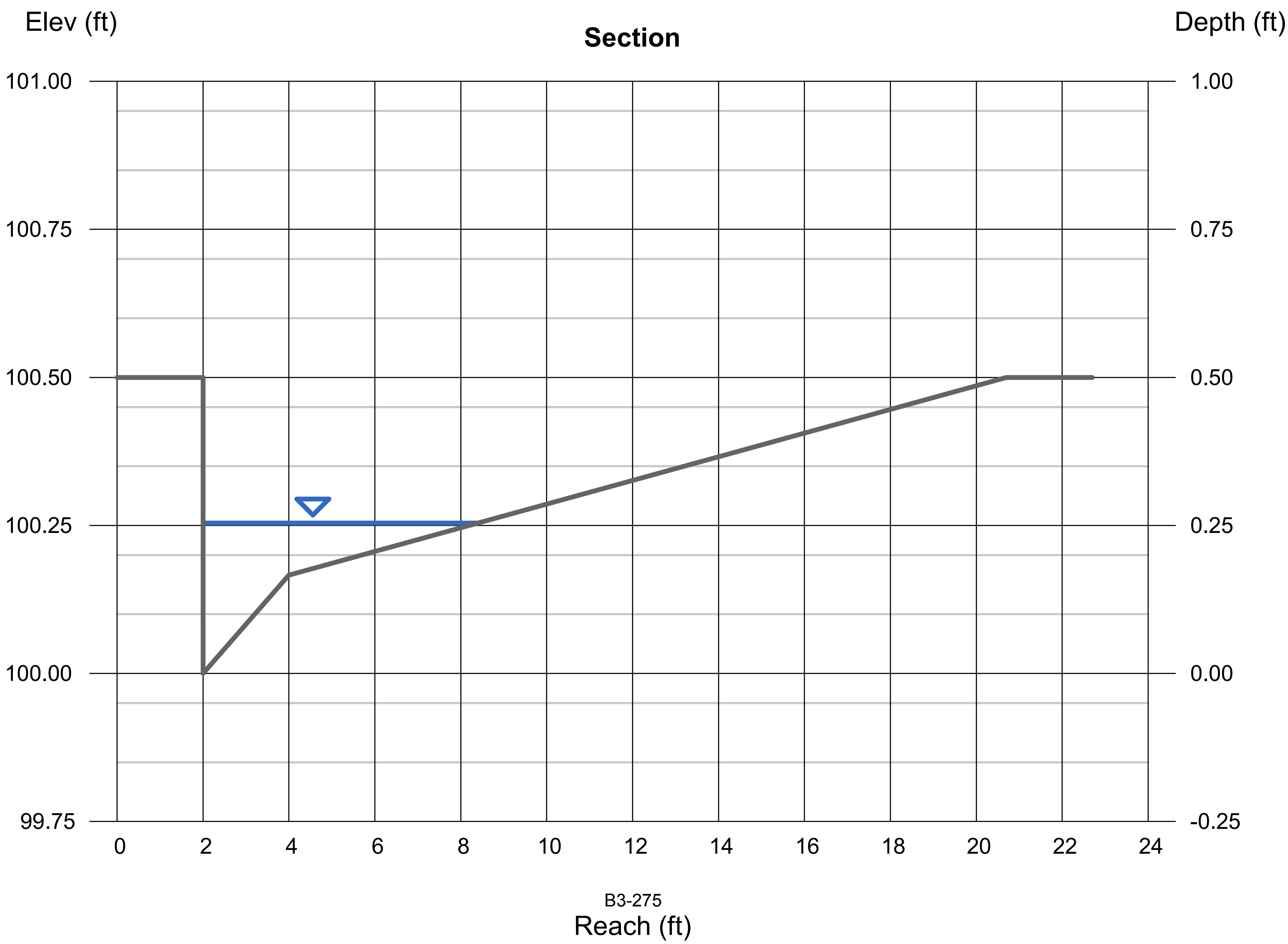
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.28
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.420
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.73
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.95
Slope (%)	= 0.40	Wetted Perim (ft)	= 8.04
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.30
		Spread Width (ft)	= 7.75
Calculations		EGL (ft)	= 0.34
Compute by:	Known Q		
Known Q (cfs)	= 1.42		



Channel Report

A11 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.25
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.500
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.54
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.80
Slope (%)	= 0.90	Wetted Perim (ft)	= 6.66
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.30
		Spread Width (ft)	= 6.40
Calculations		EGL (ft)	= 0.38
Compute by:	Known Q		
Known Q (cfs)	= 1.50		



Channel Report

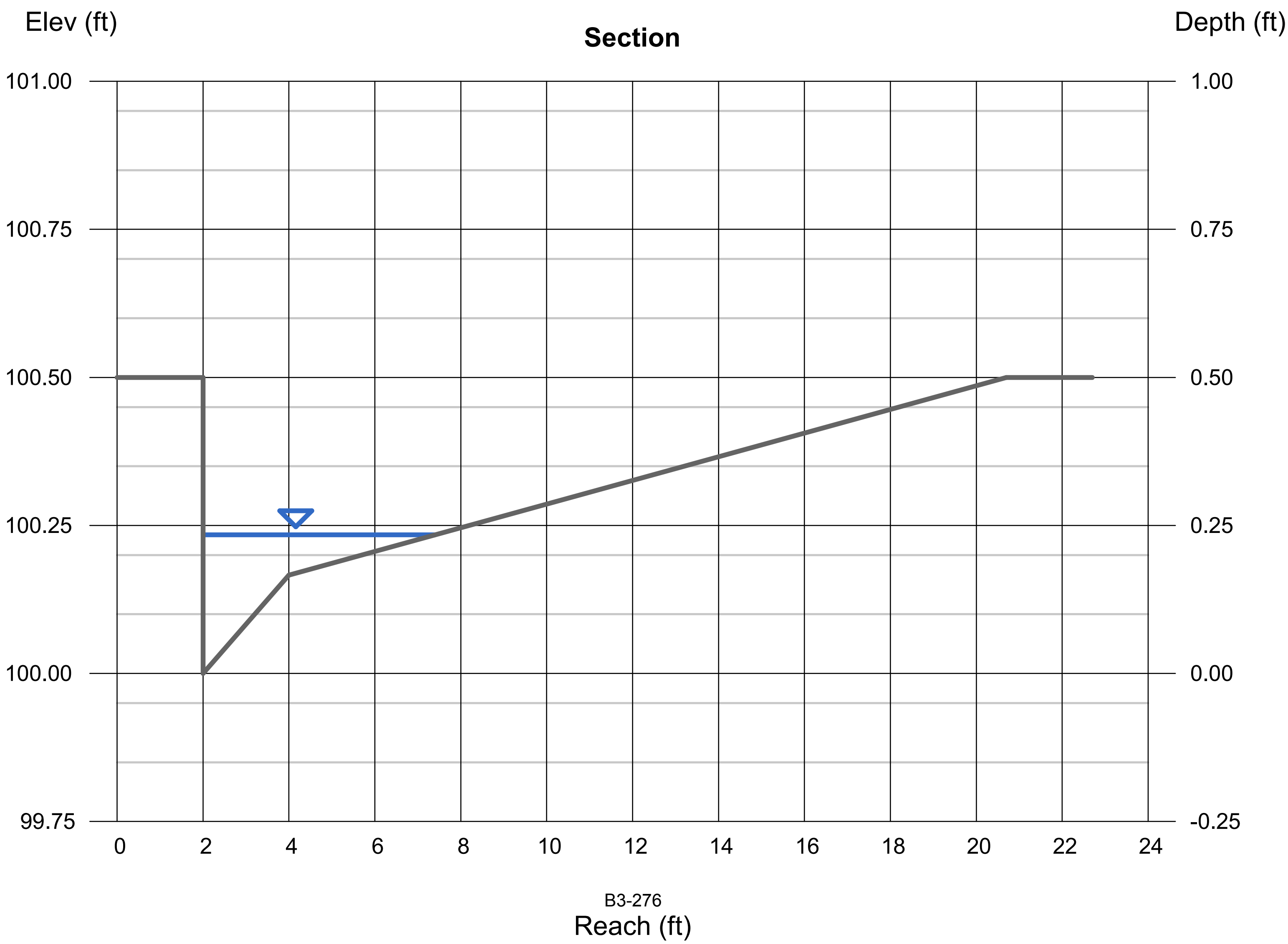
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

B5 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.23
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.190
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.42
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.85
Slope (%)	= 1.00	Wetted Perim (ft)	= 5.64
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.28
		Spread Width (ft)	= 5.40
		EGL (ft)	= 0.36

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.19



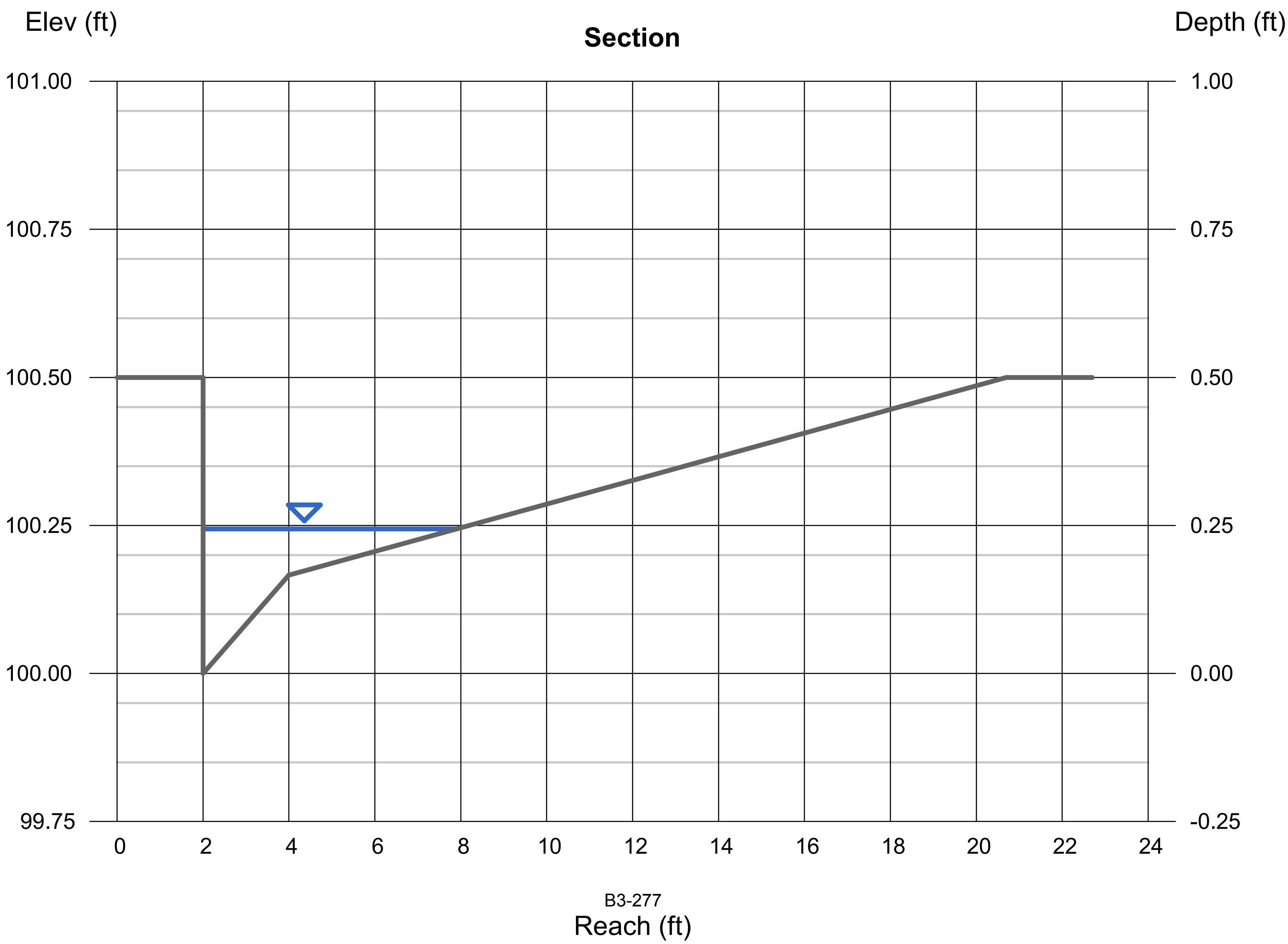
Channel Report

B6 DA Street Capacity 100-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.24
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.370
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.47
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.89
Slope (%)	= 1.00	Wetted Perim (ft)	= 6.15
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.29
		Spread Width (ft)	= 5.90
		EGL (ft)	= 0.37

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.37



Channel Report

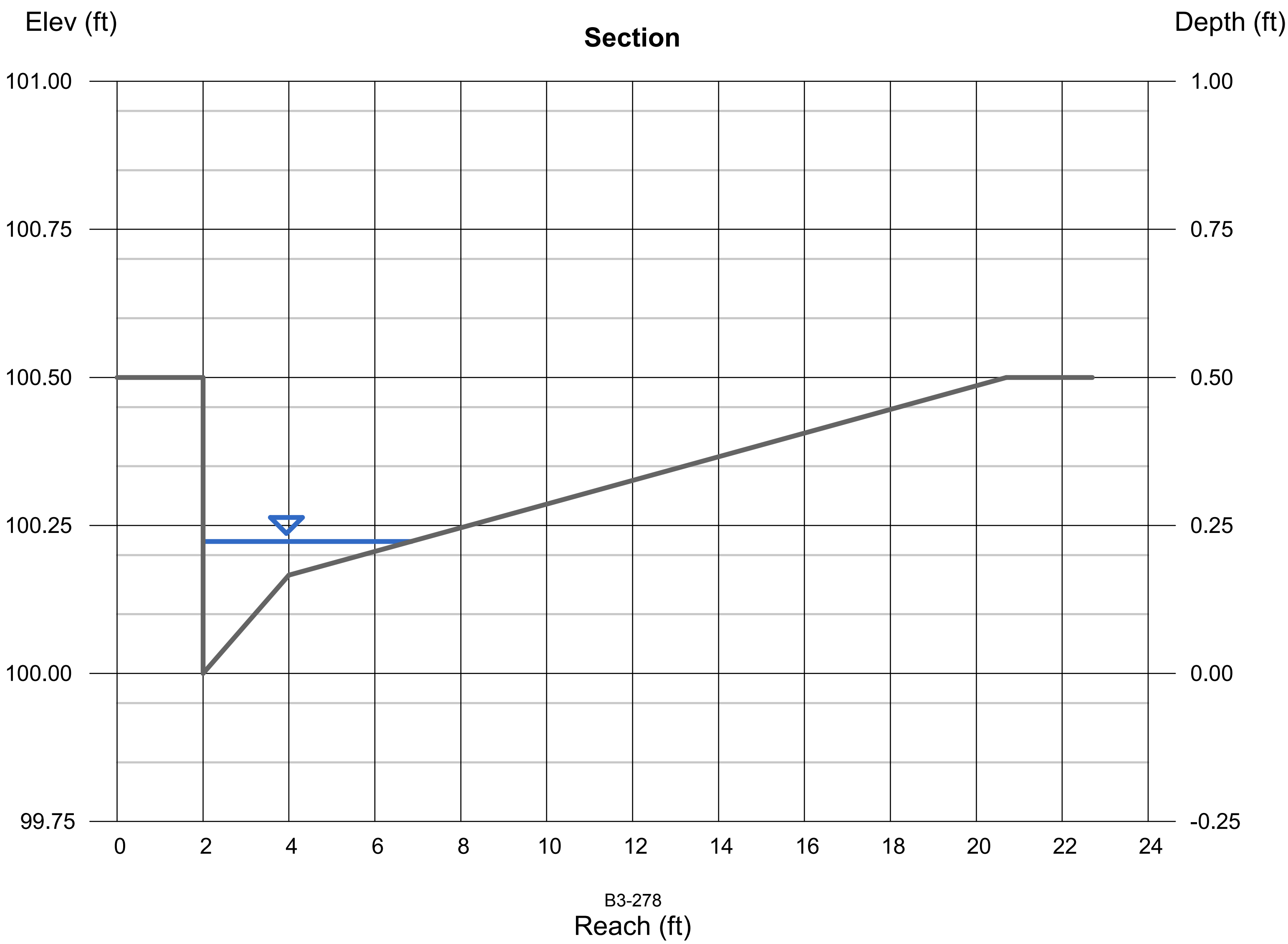
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

D2 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.22
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.720
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.36
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.99
Slope (%)	= 0.50	Wetted Perim (ft)	= 5.08
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.25
		Spread Width (ft)	= 4.85
		EGL (ft)	= 0.28

Calculations

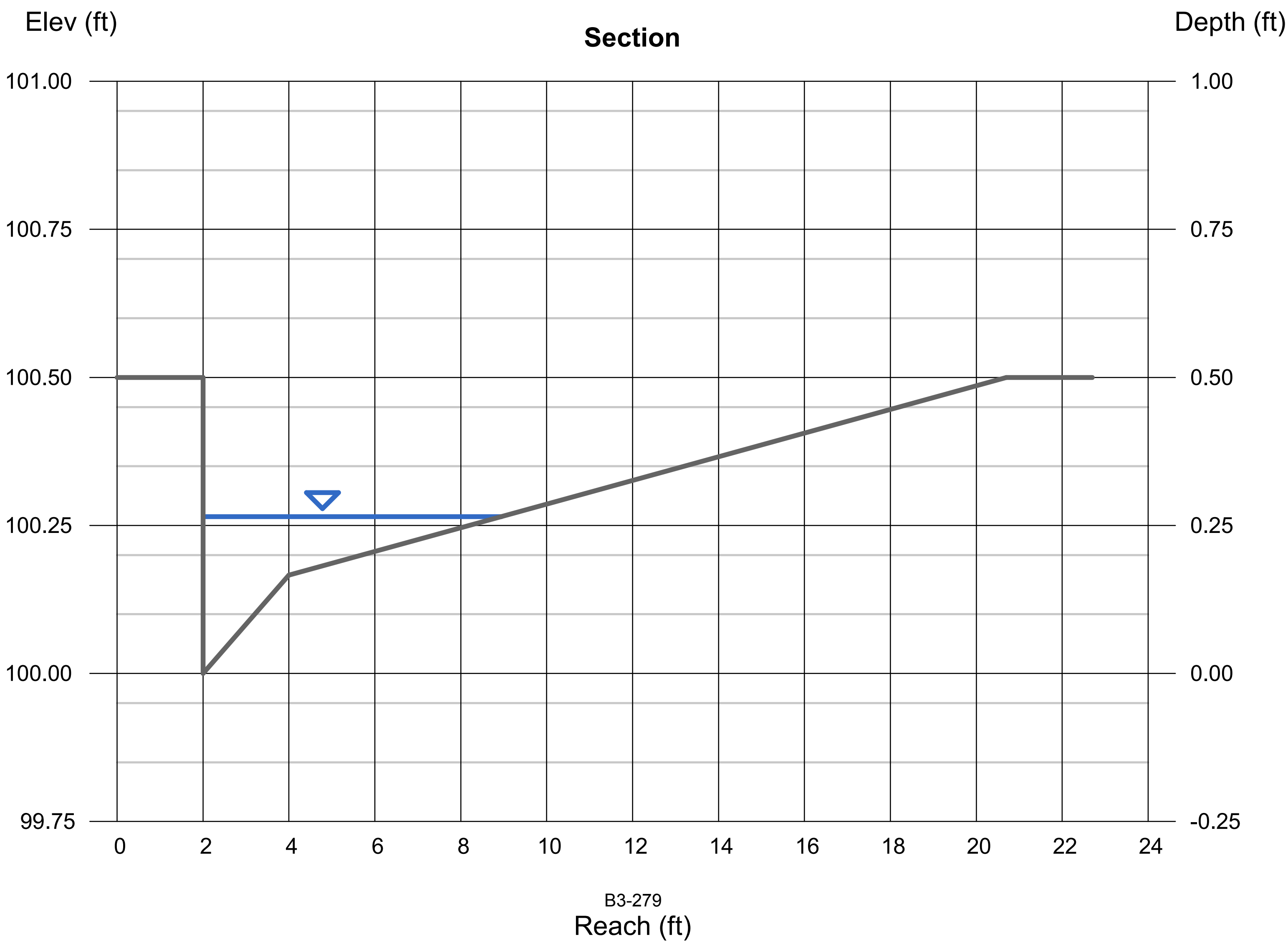
Compute by:	Known Q
Known Q (cfs)	= 0.72



Channel Report

D1 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.27
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.580
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.61
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 0.95
Slope (%)	= 0.10	Wetted Perim (ft)	= 7.22
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.23
		Spread Width (ft)	= 6.95
Calculations		EGL (ft)	= 0.28
Compute by:	Known Q		
Known Q (cfs)	= 0.58		

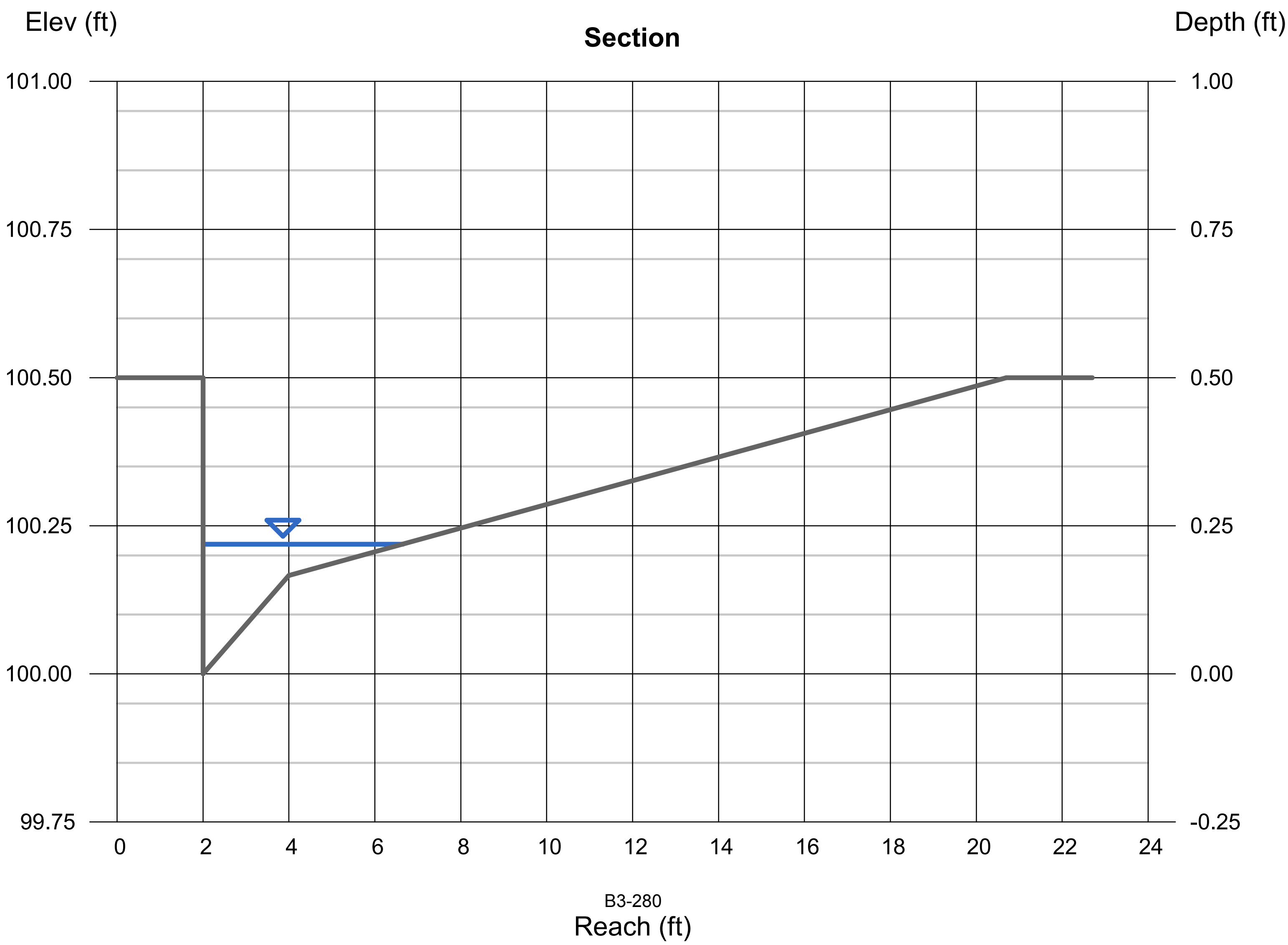


Channel Report

B3 DA Street Capacity 100-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.22
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.950
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.34
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.78
Slope (%)	= 1.00	Wetted Perim (ft)	= 4.88
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.26
		Spread Width (ft)	= 4.65
		EGL (ft)	= 0.34

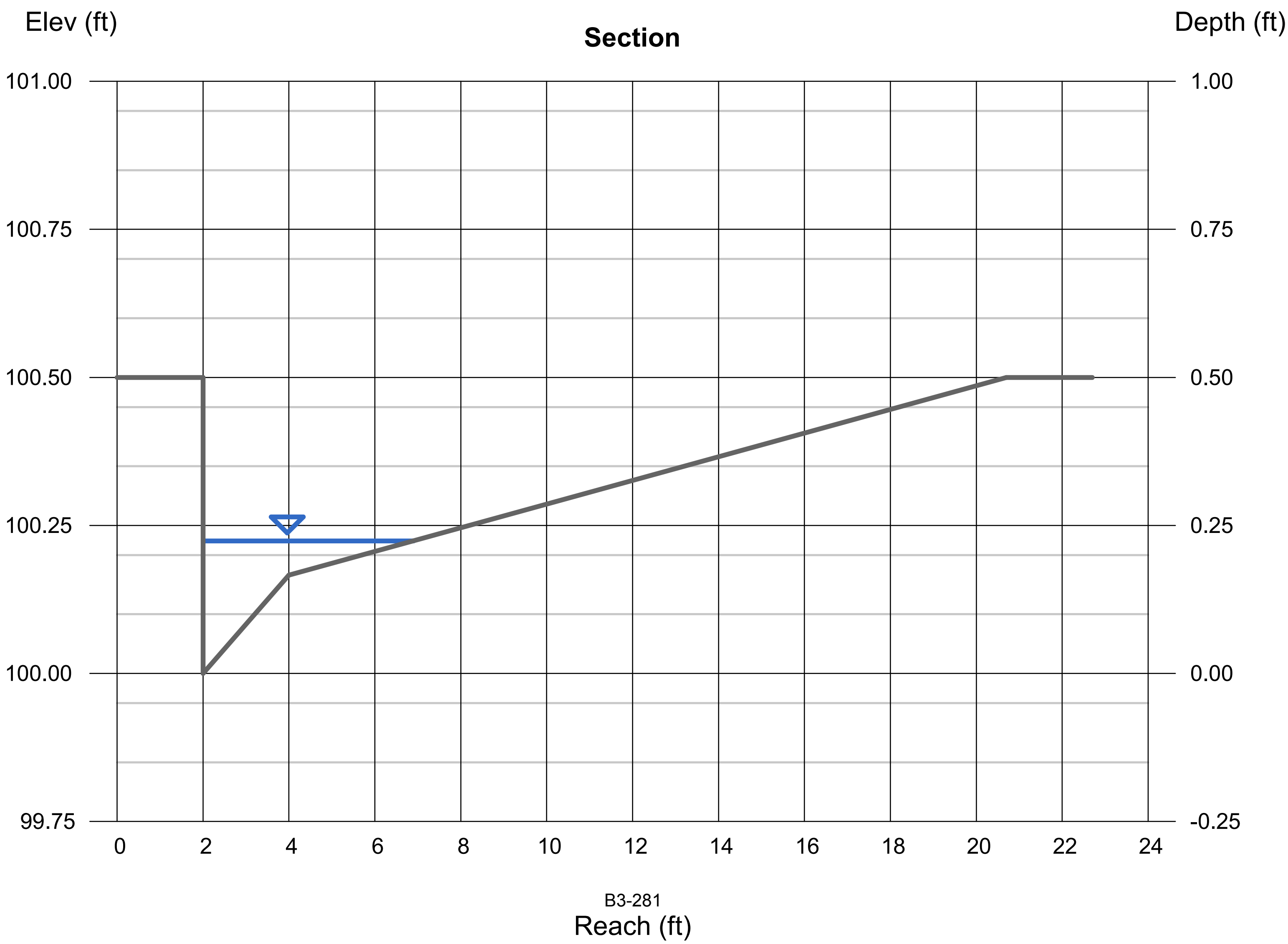
Calculations
Compute by: Known Q
Known Q (cfs) = 0.95



Channel Report

B4 DA Street Capacity 100-YEAR

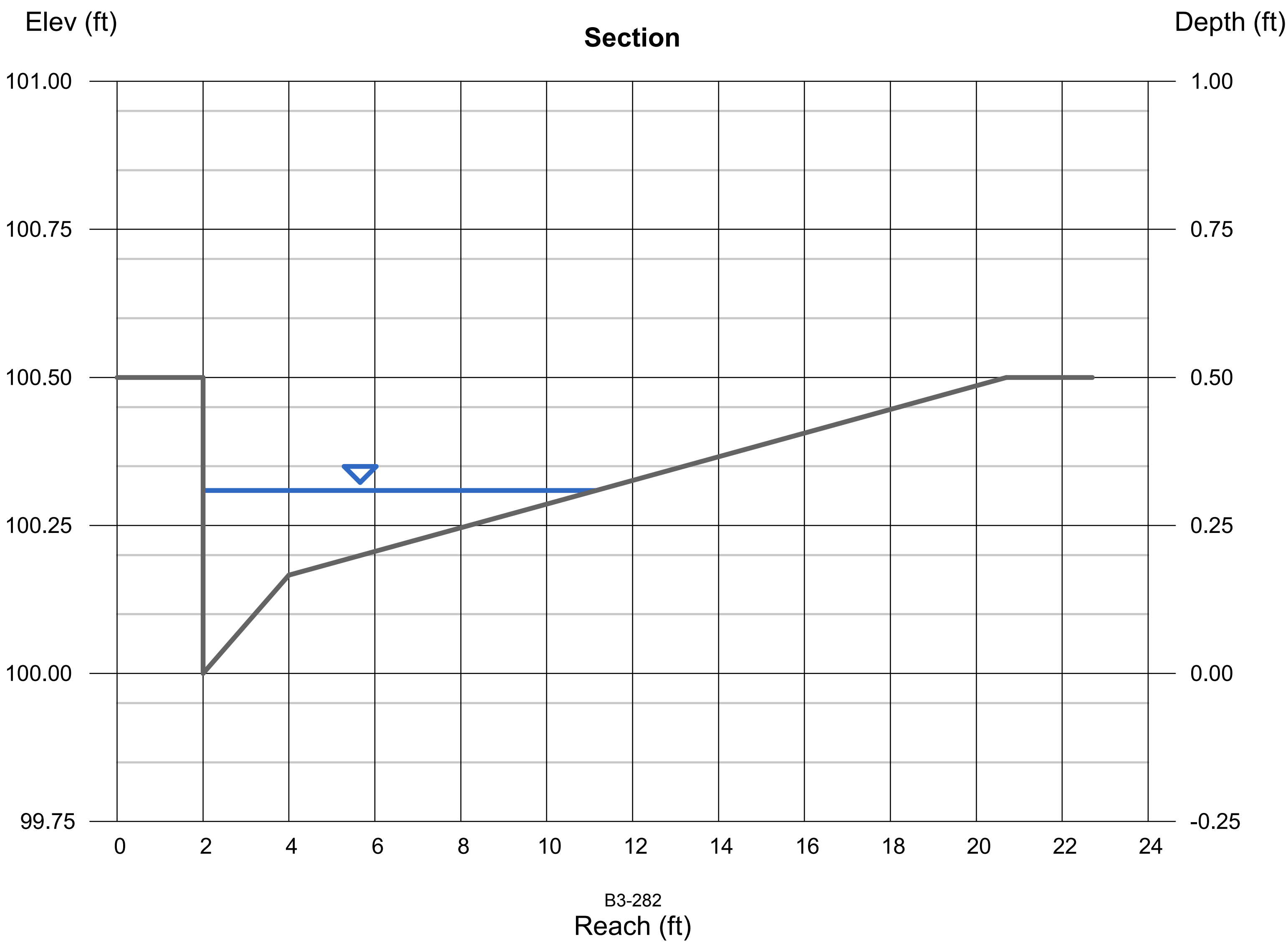
Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.22
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.030
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.37
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.81
Slope (%)	= 1.00	Wetted Perim (ft)	= 5.13
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.27
		Spread Width (ft)	= 4.90
Calculations		EGL (ft)	= 0.35
Compute by:	Known Q		
Known Q (cfs)	= 1.03		



Channel Report

B2 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.31
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.000
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.96
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.04
Slope (%)	= 0.10	Wetted Perim (ft)	= 9.47
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.27
		Spread Width (ft)	= 9.15
Calculations		EGL (ft)	= 0.33
Compute by:	Known Q		
Known Q (cfs)	= 1.00		



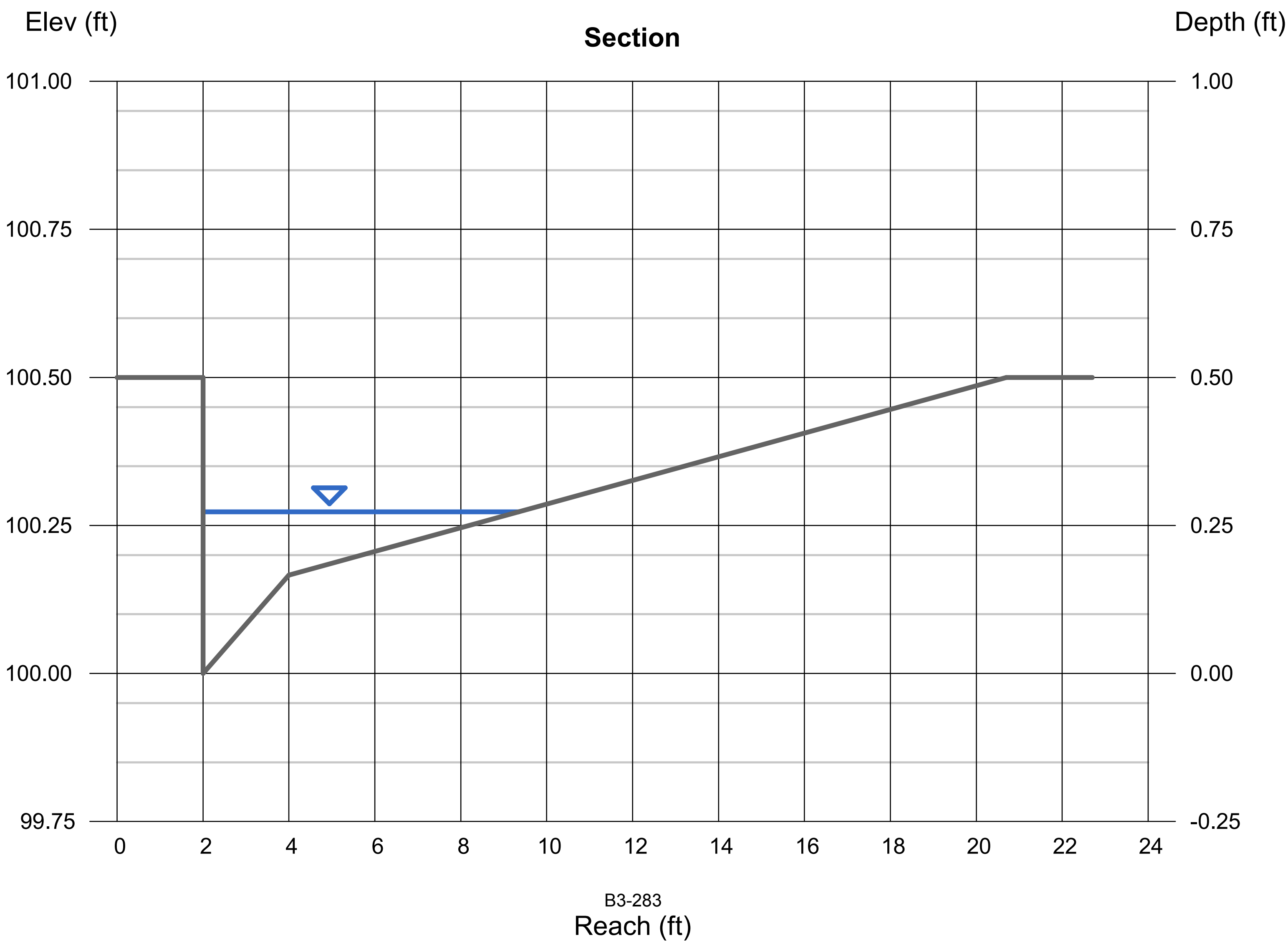
Channel Report

B1 DA Street Capacity 100-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.27
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.110
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.67
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.67
Slope (%)	= 0.30	Wetted Perim (ft)	= 7.63
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.28
		Spread Width (ft)	= 7.35
		EGL (ft)	= 0.32

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.11



Channel Report

A6 DA Street Capacity 100-YEAR

Gutter

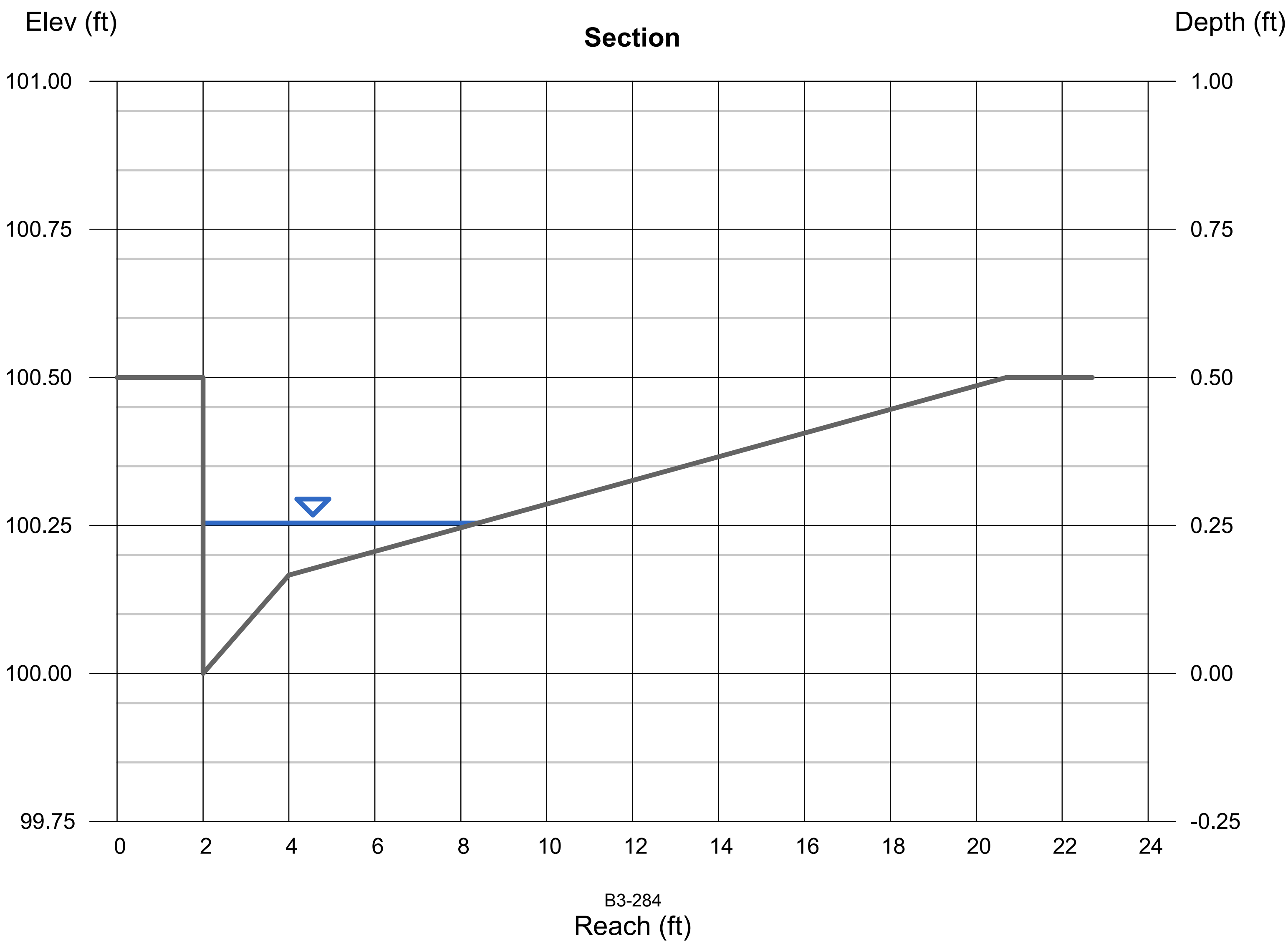
Cross Sl, Sx (ft/ft)	=	0.020
Cross Sl, Sw (ft/ft)	=	0.083
Gutter Width (ft)	=	2.00
Invert Elev (ft)	=	100.00
Slope (%)	=	0.80
N-Value	=	0.013

Calculations

Compute by:		Known Q
Known Q (cfs)	=	1.41

Highlighted

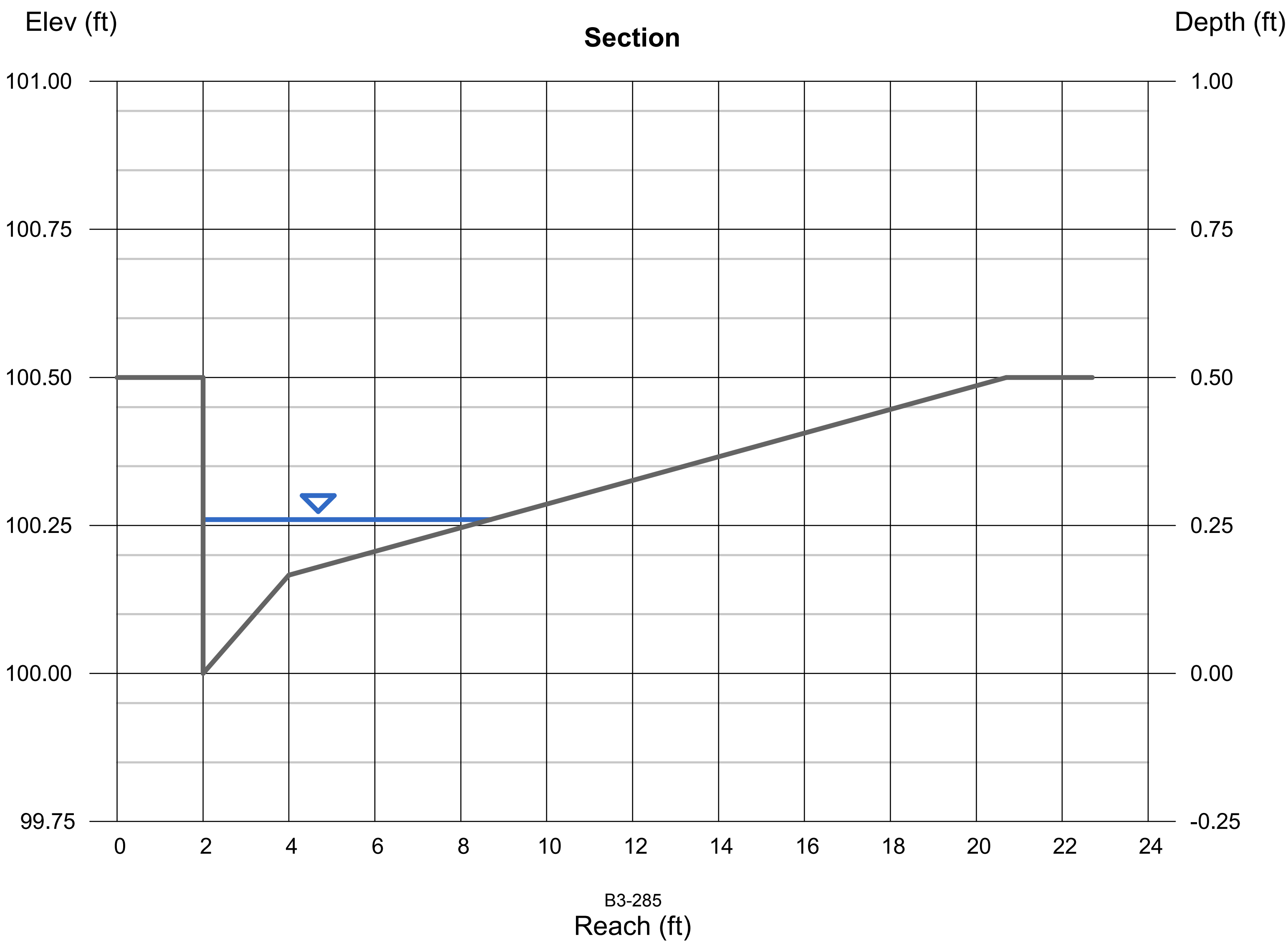
Depth (ft)	=	0.25
Q (cfs)	=	1.410
Area (sqft)	=	0.54
Velocity (ft/s)	=	2.63
Wetted Perim (ft)	=	6.66
Crit Depth, Yc (ft)	=	0.29
Spread Width (ft)	=	6.40
EGL (ft)	=	0.36



Channel Report

A5 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.26
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.530
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.57
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.66
Slope (%)	= 0.80	Wetted Perim (ft)	= 6.97
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.30
		Spread Width (ft)	= 6.70
Calculations		EGL (ft)	= 0.37
Compute by:	Known Q		
Known Q (cfs)	= 1.53		

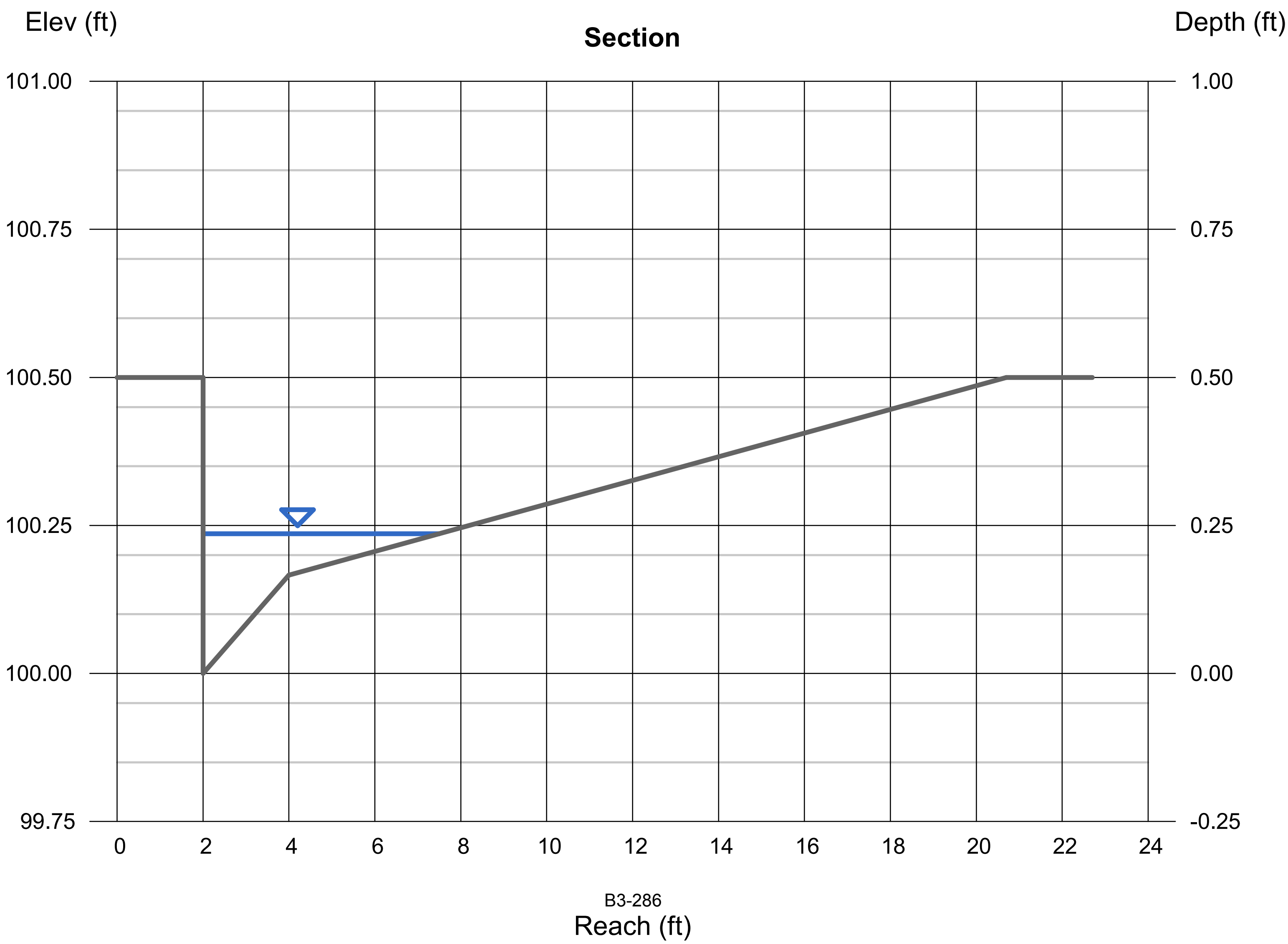


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

A3 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.24
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.280
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.43
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.99
Slope (%)	= 1.10	Wetted Perim (ft)	= 5.74
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.29
		Spread Width (ft)	= 5.50
Calculations		EGL (ft)	= 0.37
Compute by:	Known Q		
Known Q (cfs)	= 1.28		



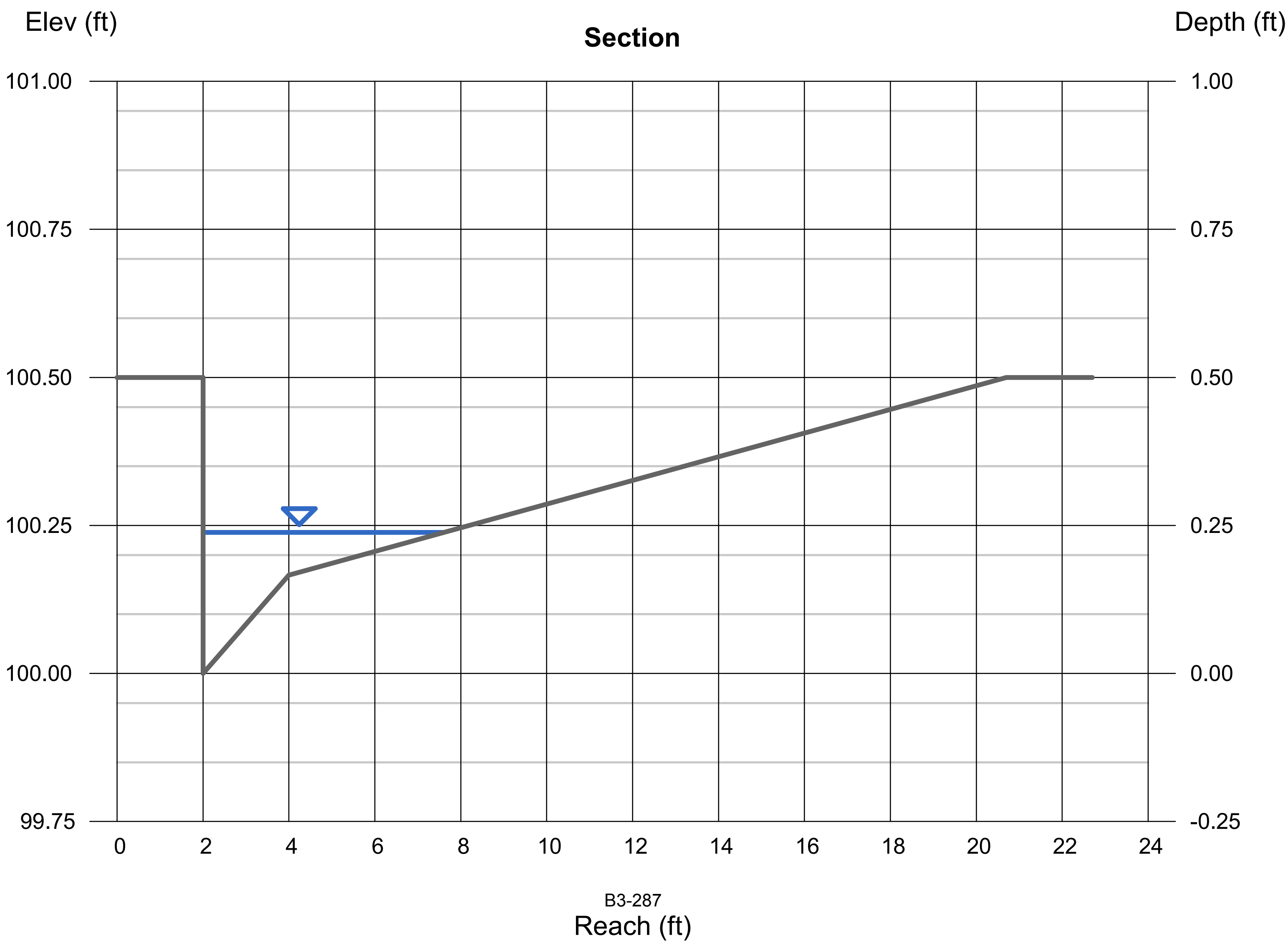
Channel Report

A4 DA Street Capacity 100-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.24
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.260
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.44
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.87
Slope (%)	= 1.00	Wetted Perim (ft)	= 5.85
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.29
		Spread Width (ft)	= 5.60
		EGL (ft)	= 0.37

Calculations

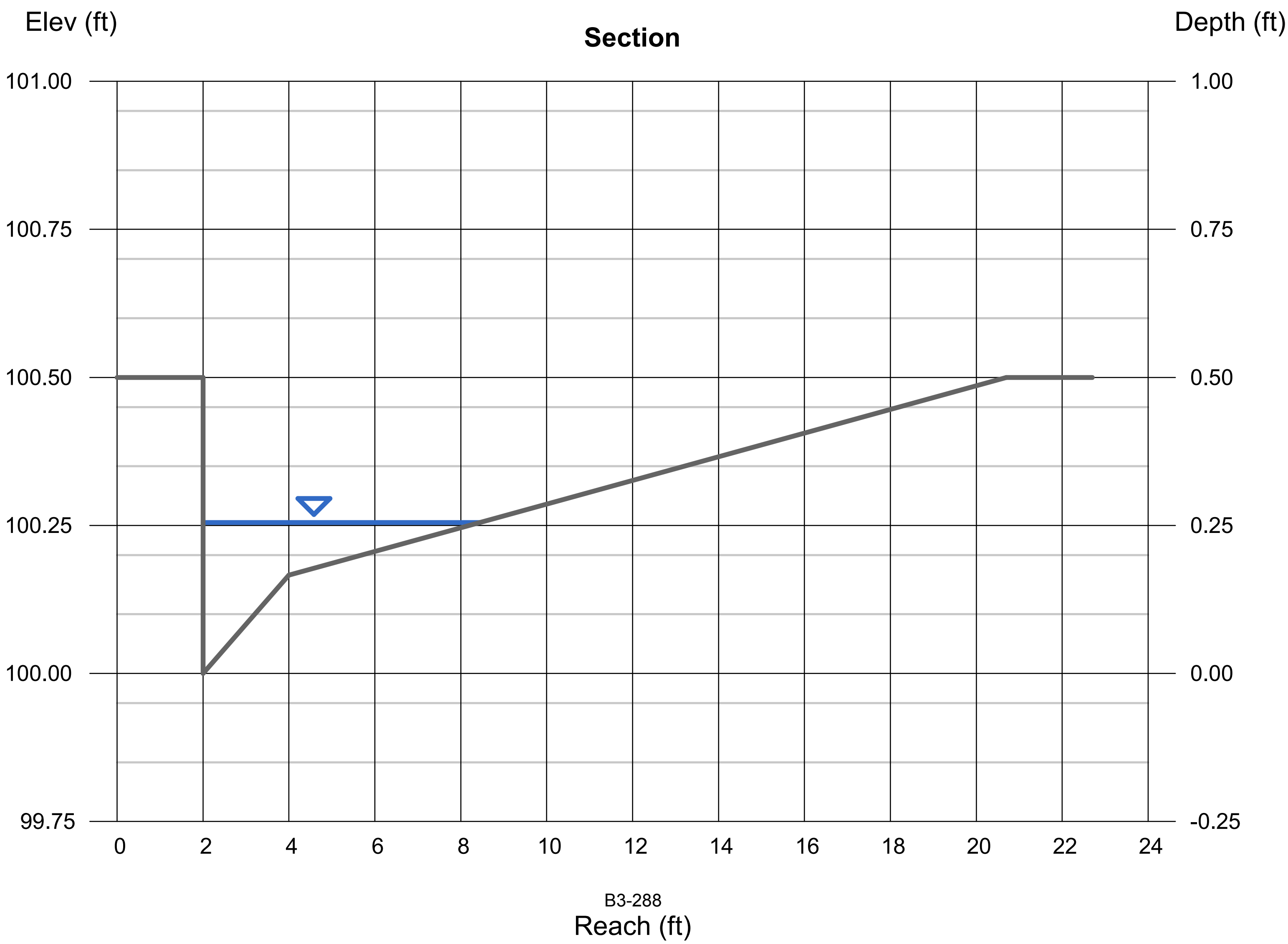
Compute by:	Known Q
Known Q (cfs)	= 1.26



Channel Report

A2 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.26
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 1.230
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.54
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.27
Slope (%)	= 0.60	Wetted Perim (ft)	= 6.71
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.28
		Spread Width (ft)	= 6.45
Calculations		EGL (ft)	= 0.34
Compute by:	Known Q		
Known Q (cfs)	= 1.23		

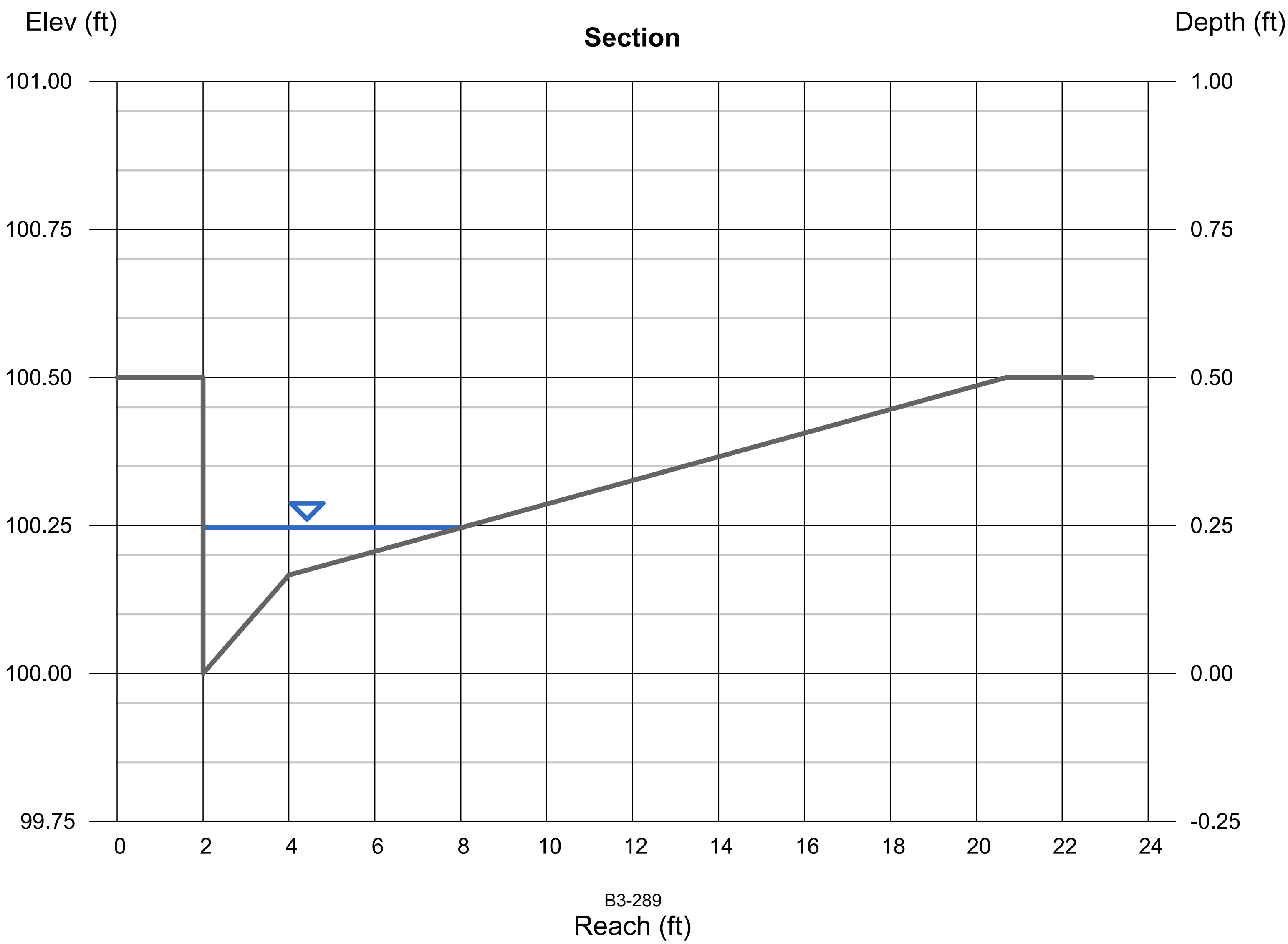


Channel Report

A1 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.25
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 0.780
Gutter Width (ft)	= 2.00	Area (sqft)	= 0.49
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.59
Slope (%)	= 0.30	Wetted Perim (ft)	= 6.30
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.25
		Spread Width (ft)	= 6.05
		EGL (ft)	= 0.29

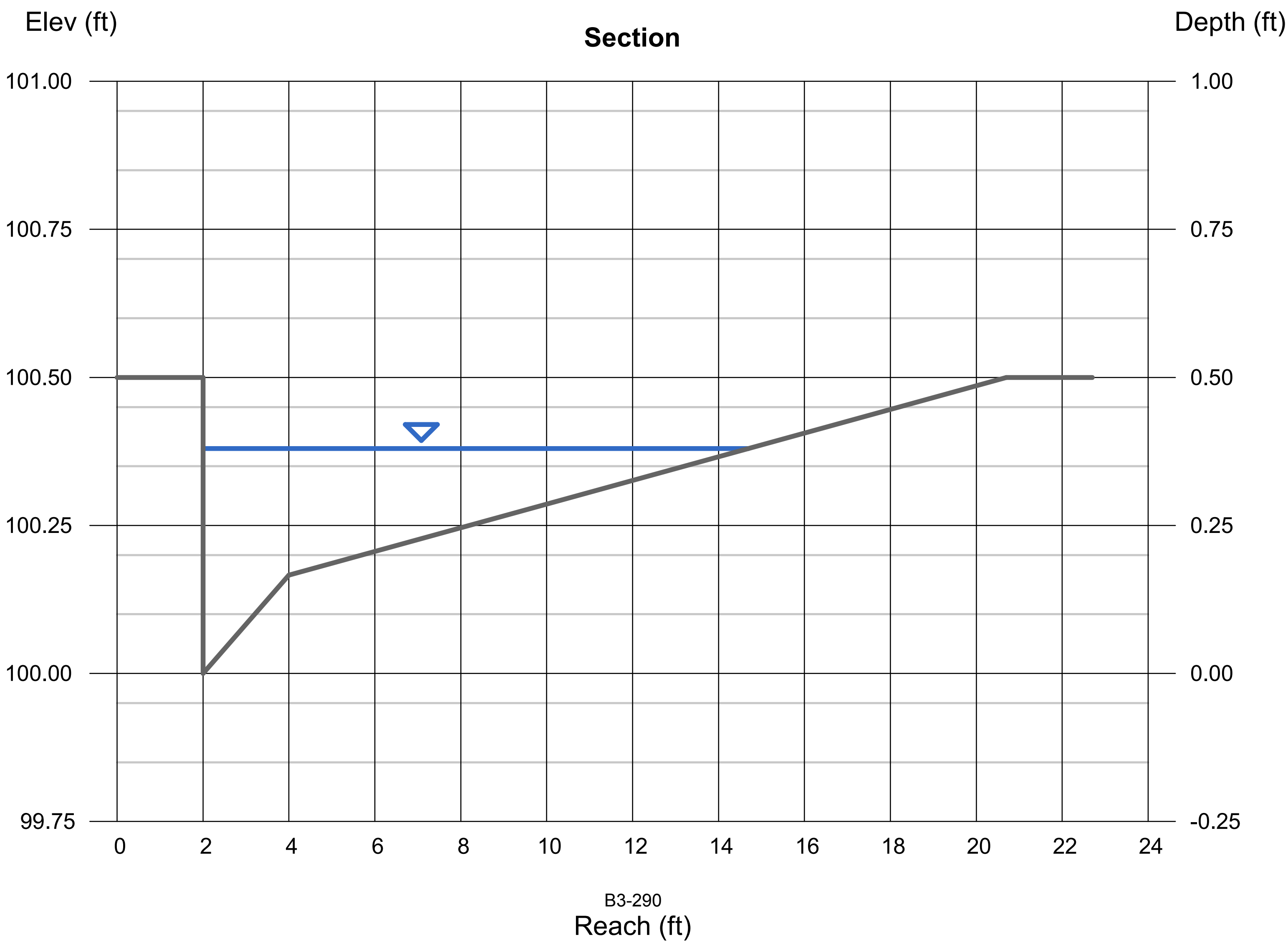
Calculations	
Compute by:	Known Q
Known Q (cfs)	= 0.78



Channel Report

H3 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.38
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.920
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.74
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 1.68
Slope (%)	= 0.20	Wetted Perim (ft)	= 13.09
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.36
		Spread Width (ft)	= 12.70
Calculations		EGL (ft)	= 0.42
Compute by:	Known Q		
Known Q (cfs)	= 2.92		



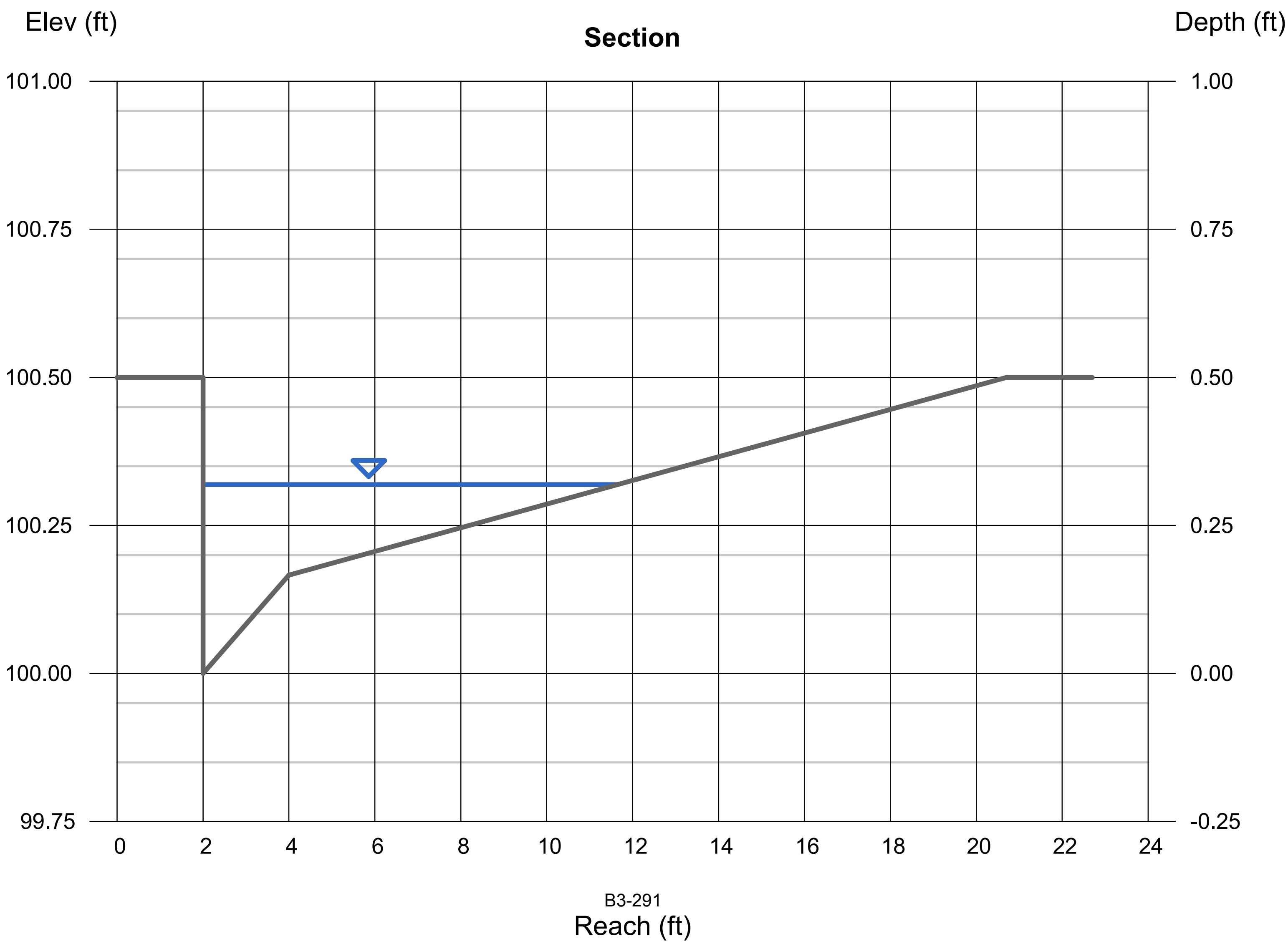
Channel Report

H4 DA Street Capacity 100-YEAR

Gutter		Highlighted	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.32
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.730
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.06
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.58
Slope (%)	= 0.60	Wetted Perim (ft)	= 9.98
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.35
		Spread Width (ft)	= 9.65
		EGL (ft)	= 0.42

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.73

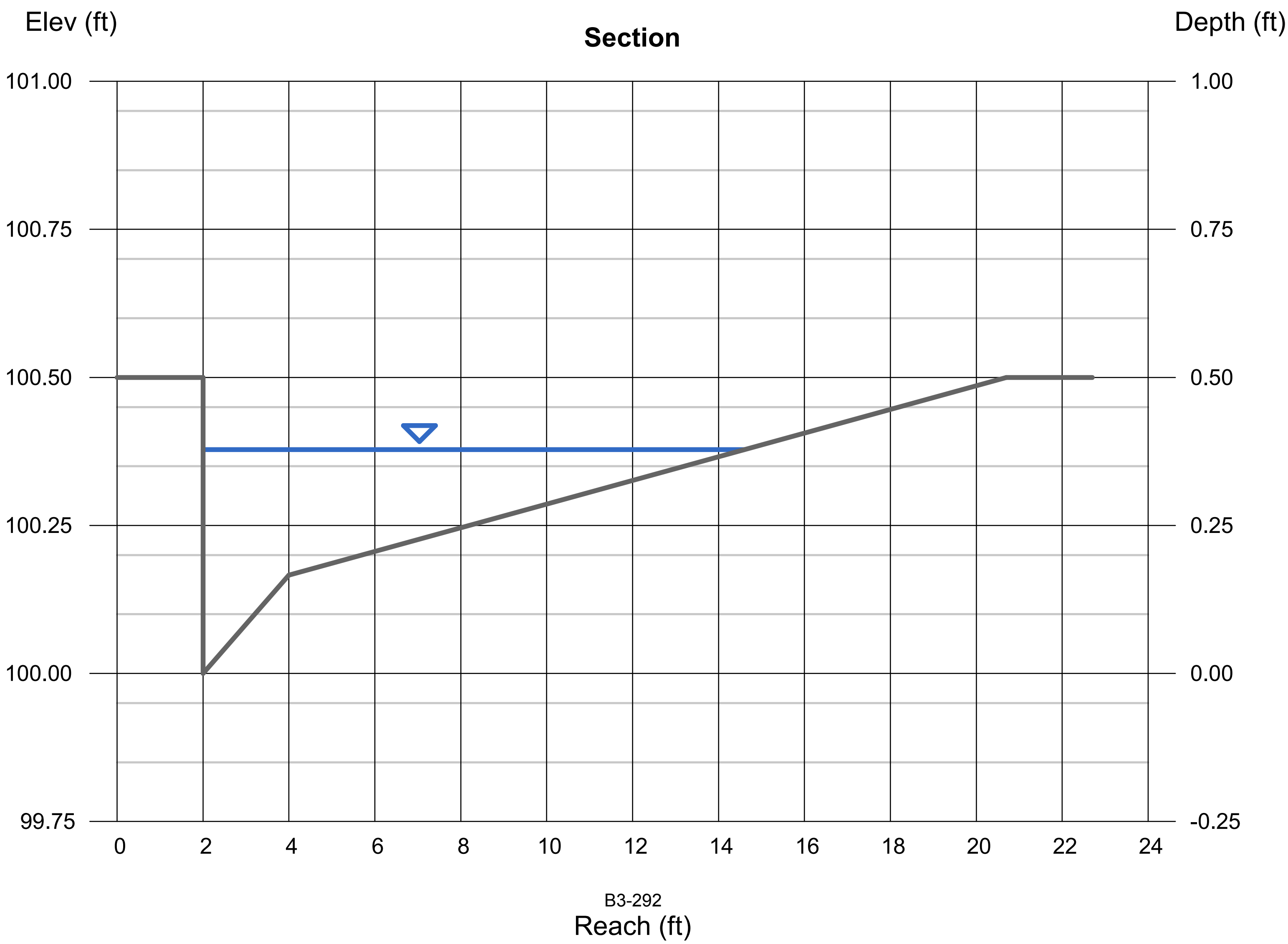


Channel Report

H1 DA Street Capacity 100-YEAR

Gutter	
Cross Sl, Sx (ft/ft)	= 0.020
Cross Sl, Sw (ft/ft)	= 0.083
Gutter Width (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.20
N-Value	= 0.013
Calculations	
Compute by:	Known Q
Known Q (cfs)	= 2.88

Highlighted	
Depth (ft)	= 0.38
Q (cfs)	= 2.880
Area (sqft)	= 1.71
Velocity (ft/s)	= 1.68
Wetted Perim (ft)	= 12.99
Crit Depth, Yc (ft)	= 0.36
Spread Width (ft)	= 12.60
EGL (ft)	= 0.42

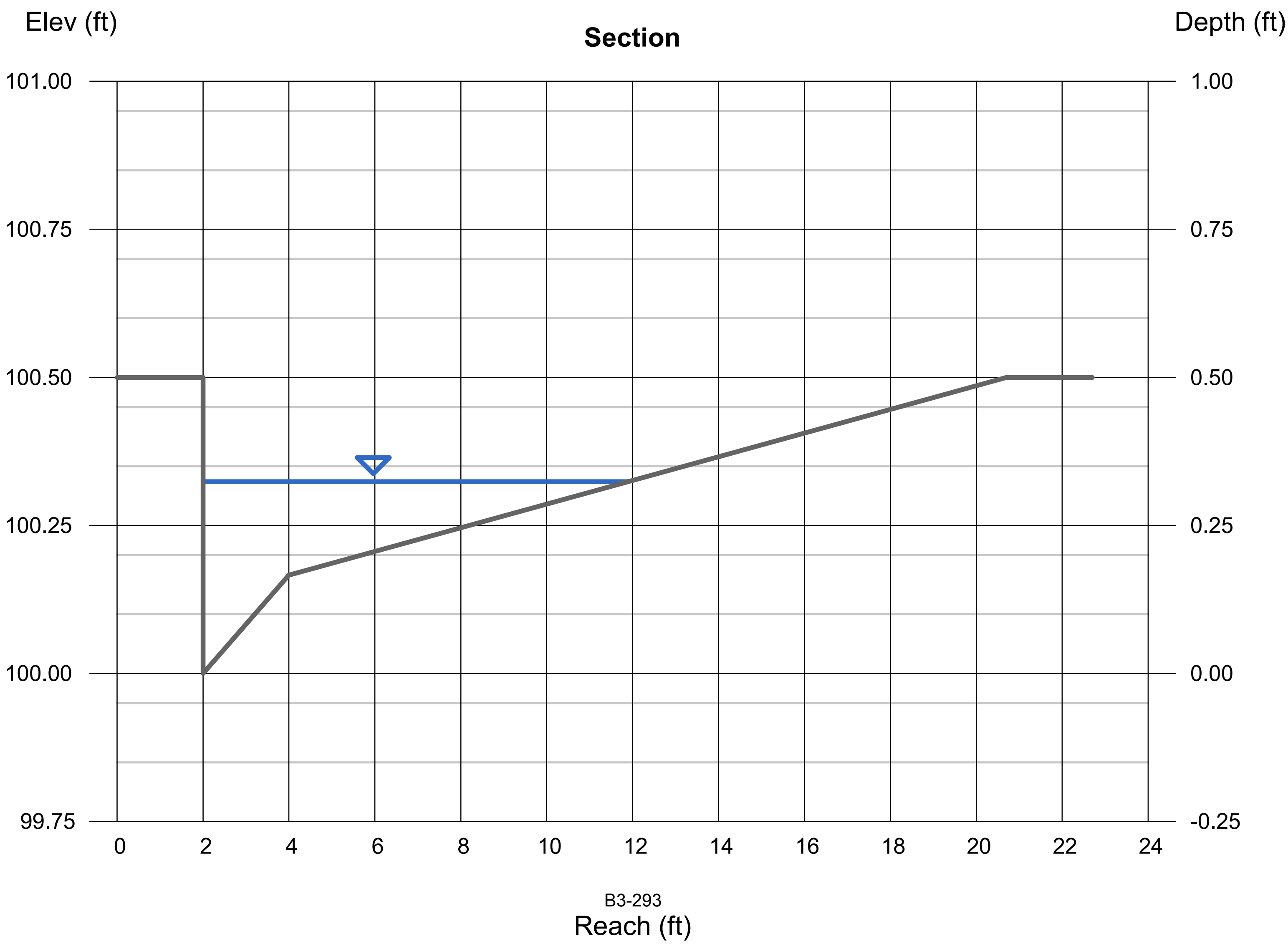


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

H2 DA Street Capacity 100-YEAR

Gutter		**Highlighted**	
Cross Sl, Sx (ft/ft)	= 0.020	Depth (ft)	= 0.32
Cross Sl, Sw (ft/ft)	= 0.083	Q (cfs)	= 2.880
Gutter Width (ft)	= 2.00	Area (sqft)	= 1.11
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.60
Slope (%)	= 0.60	Wetted Perim (ft)	= 10.23
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.36
		Spread Width (ft)	= 9.90
Calculations		EGL (ft)	= 0.43
Compute by:	Known Q		
Known Q (cfs)	= 2.88		



B.3 – CATCH BASIN CALCULATIONS

10-Year Flows (100% Efficiency, No bypass flows)					
CB#	10 YR Flows (cfs)	Bypass Flows	Opening Width (ft)	Spread (ft)	Downstream CB
R1	1.36	-	7	7.11	V1
V1	1.42	-	7	7.28	V3
V2	1.37	-	7	7.14	V4
V3	2.08	-	14	8.82	V5
V4	2.08	-	14	8.82	V6
V5	1.40	-	7	7.22	V7
V6	1.40	-	7	7.22	V8
V7	1.03	-	7	6.08	-
V8	1.03	-	7	6.08	-
R2	3.27	-	7	13.09	-
F3	1.50	-	7	8.32	C5
C6	1.23	-	7	7.52	C2
C5	1.19	-	7	7.4	C1
F1	0.32	-	7	2.78	-
F2	0.31	-	7	2.72	-
E2	0.62	-	7	5.02	E4
E1	0.62	-	7	5.02	E3
E4	0.31	-	7	2.71	A7
E3	0.30	-	7	2.61	A7
C2	0.81	-	7	5.96	C3
C1	0.75	-	7	5.69	C4
C4	0.85	-	7	6.13	A6
C3	0.85	-	7	6.13	A6
A9	0.44	-	7	3.86	A7
A10	0.33	-	7	4.08	A8
A7	0.85	-	7	6.13	A6
A8	0.87	-	7	6.22	A5
A11	0.92	-	7	5.83	A10
B5	0.72	-	7	5.54	D2
B6	0.83	-	7	6.05	B4
D2	0.44	-	7	3.86	A8
D1	0.36	-	7	3.2	A8
B3	0.58	-	7	4.79	B2
B4	0.63	-	7	5.08	B1
B2	0.61	-	7	4.97	A5
B1	0.68	-	7	5.34	A5
A6	0.86	-	7	6.18	A6
A5	0.93	-	7	6.46	A4
A3	0.78	-	7	5.83	H3
A4	0.77	-	7	5.78	A2
A2	0.75	-	7	5.69	-
A1	0.48	-	7	4.15	-
H3	1.78	-	14	9.04	H1
H4	1.66	-	7	8.75	H2
H1	1.76	-	14	8.99	-
H2	1.74	-	14	8.95	-

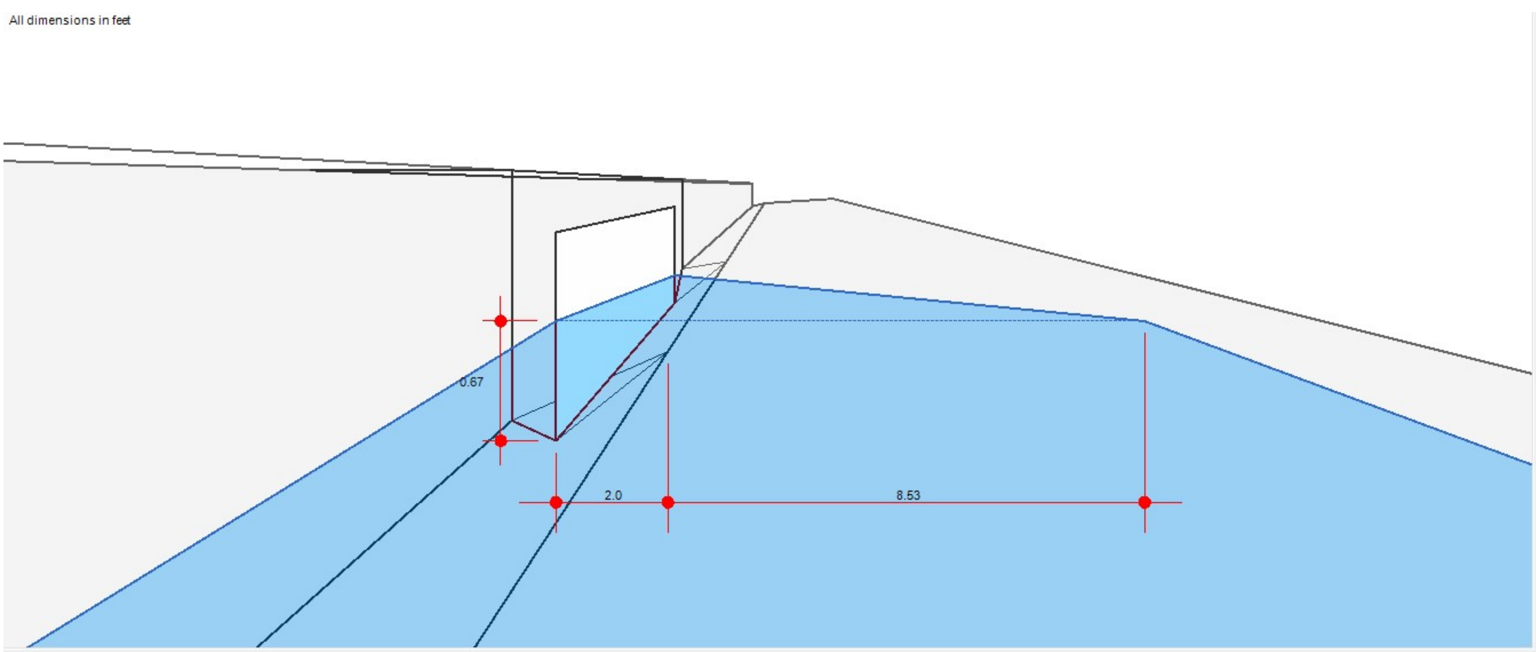
25-Year Flows (Spread Limited to Road Crown)					
CB#	25 YR Flows (cfs)	Bypass Flows	Opening Width (ft)	Spread (ft)	Downstream CB
R1	1.70	0.00	7	7.99	V1
V1	1.76	0.00	7	8.13	V3
V2	1.71	0.00	7	8.01	V4
V3	2.60	0.00	14	9.8	V5
V4	2.60	0.00	14	9.8	V6
V5	1.74	0.00	7	8.08	V7
V6	1.74	0.00	7	8.08	V8
V7	1.28	0.00	7	6.88	-
V8	1.28	0.00	7	6.88	-
R2	4.07	(sag)	7	15.15	-
F3	1.87	0.00	7	9.26	C5
C6	1.53	0.00	7	8.4	C2
C5	1.48	0.00	7	8.27	C1
F1	0.40	(sag)	7	3.22	-
F2	0.39	(sag)	7	3.17	-
E2	0.78	0.00	7	5.83	E4
E1	0.77	0.00	7	5.78	E3
E4	0.38	0.00	7	3.38	A7
E3	0.37	0.00	7	3.29	A7
C2	1.00	0.00	7	6.73	C3
C1	0.93	0.00	7	6.46	C4
C4	1.06	0.00	7	6.95	A6
C3	1.06	0.00	7	6.95	A6
A9	0.55	0.00	7	4.61	A7
A10	0.42	0.00	7	4.85	A8
A7	1.06	0.00	7	6.95	A6
A8	1.08	0.00	7	7.02	A5
A11	1.14	0.00	7	6.62	A10
B5	0.90	0.00	7	6.34	D2
B6	1.04	0.00	7	6.88	B4
D2	0.55	0.00	7	4.61	A8
D1	0.44	0.00	7	3.86	A8
B3	0.72	0.00	7	5.54	B2
B4	0.78	0.00	7	5.83	B1
B2	0.76	0.00	7	5.73	A5
B1	0.84	0.00	7	6.09	A5
A6	1.07	0.00	7	6.99	A6
A5	1.16	0.00	7	7.3	A4
A3	0.98	0.00	7	6.66	H3
A4	0.95	0.00	7	6.54	A2
A2	0.93	0.00	7	6.46	-
A1	0.59	0.00	7	4.85	-
H3	2.22	0.00	14	10.03	H1
H4	2.07	0.00	7	9.71	H2
H1	2.19	0.00	14	9.96	-
H2	2.17	0.00	14	9.92	-

100-Year Flows (Spread not to overtop curb)					
CB#	100 YR Flows (cfs)	Bypass Flows	Opening Width (ft)	Spread (ft)	Downstream CB
R1	2.23	0.00	7	9.12	V1
V1	2.32	0.00	7	9.29	V3
V2	2.25	0.00	7	9.16	V4
V3	3.42	0.00	14	11.09	V5
V4	3.41	0.00	14	11.08	V6
V5	2.29	0.00	7	9.24	V7
V6	2.29	0.00	7	9.24	V8
V7	1.68	0.00	7	7.94	-
V8	1.68	0.00	7	7.94	-
R2	5.36	(sag)	7	18.2	-
F3	2.47	0.04	7	10.52	C5
C6	2.01	0.00	7	9.58	C2
C5	1.99	0.00	7	9.44	C1
F1	0.53	(sag)	7	3.89	-
F2	0.51	(sag)	7	3.79	-
E2	1.02	0.00	7	6.81	E4
E1	1.01	0.00	7	6.77	E3
E4	0.50	0.00	7	4.29	A7
E3	0.49	0.00	7	4.22	A7
C2	1.32	0.00	7	7.8	C3
C1	1.23	0.00	7	7.52	C4
C4	1.40	0.00	7	8.04	A6
C3	1.40	0.00	7	8.04	A6
A9	0.72	0.00	7	5.54	A7
A10	0.55	0.00	7	5.78	A8
A7	1.39	0.00	7	8.01	A6
A8	1.42	0.00	7	8.1	A5
A11	1.50	0.00	7	7.68	A10
B5	1.19	0.00	7	7.4	D2
B6	1.37	0.00	7	7.95	B4
D2	0.72	0.00	7	6.46	A8
D1	0.58	0.00	7	4.79	A8
B3	0.95	0.00	7	6.54	B2
B4	1.03	0.00	7	6.84	B1
B2	1.00	0.00	7	6.73	A5
B1	1.11	0.00	7	7.13	A5
A6	1.41	0.00	7	8.07	A6
A5	1.53	0.00	7	8.4	A4
A3	1.28	0.00	7	7.68	H3
A4	1.26	0.00	7	7.62	A2
A2	1.23	0.00	7	7.52	-
A1	0.78	0.00	7	5.83	-
H3	2.92	0.00	14	11.34	H1
H4	2.73	0.02	7	11.01	H2
H1	2.88	0.00	14	11.27	-
H2	2.88	0.00	14	11.23	-

Inlet Report

R1 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.36
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.36
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.36
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.04
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 10.53
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.10
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.013		

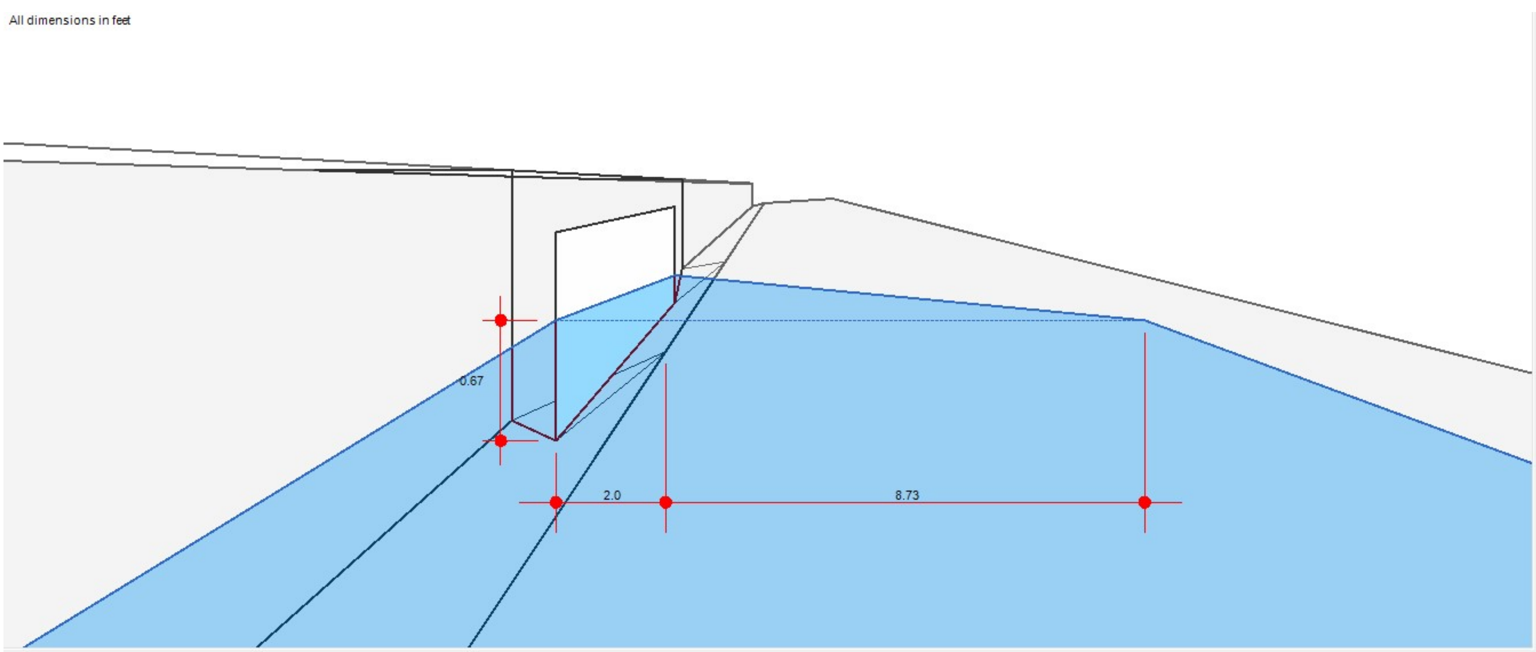


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. | Thursday, May 16 2024

V1 10YR

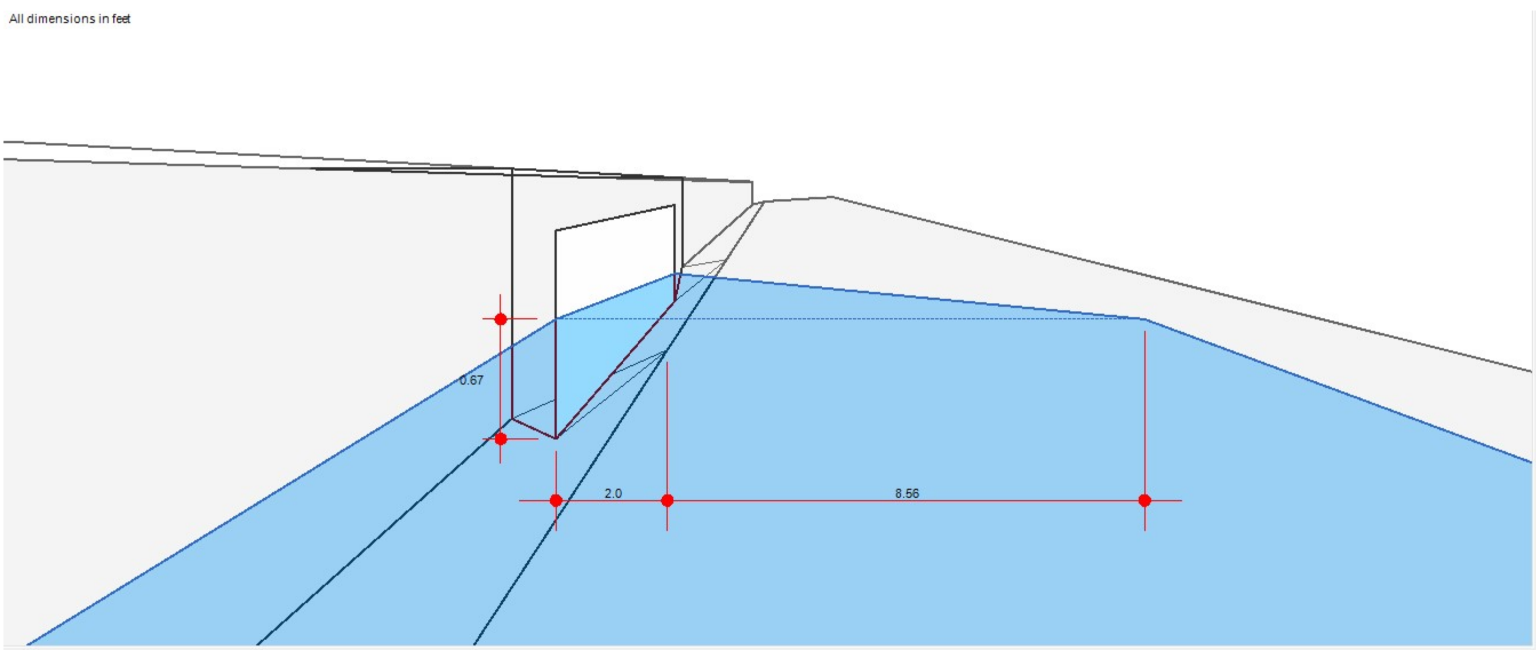
Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.42
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.42
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.42
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.09
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 10.73
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.11
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.013		



Inlet Report

V2 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.37
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.37
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.37
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.05
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 10.56
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.10
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.013		

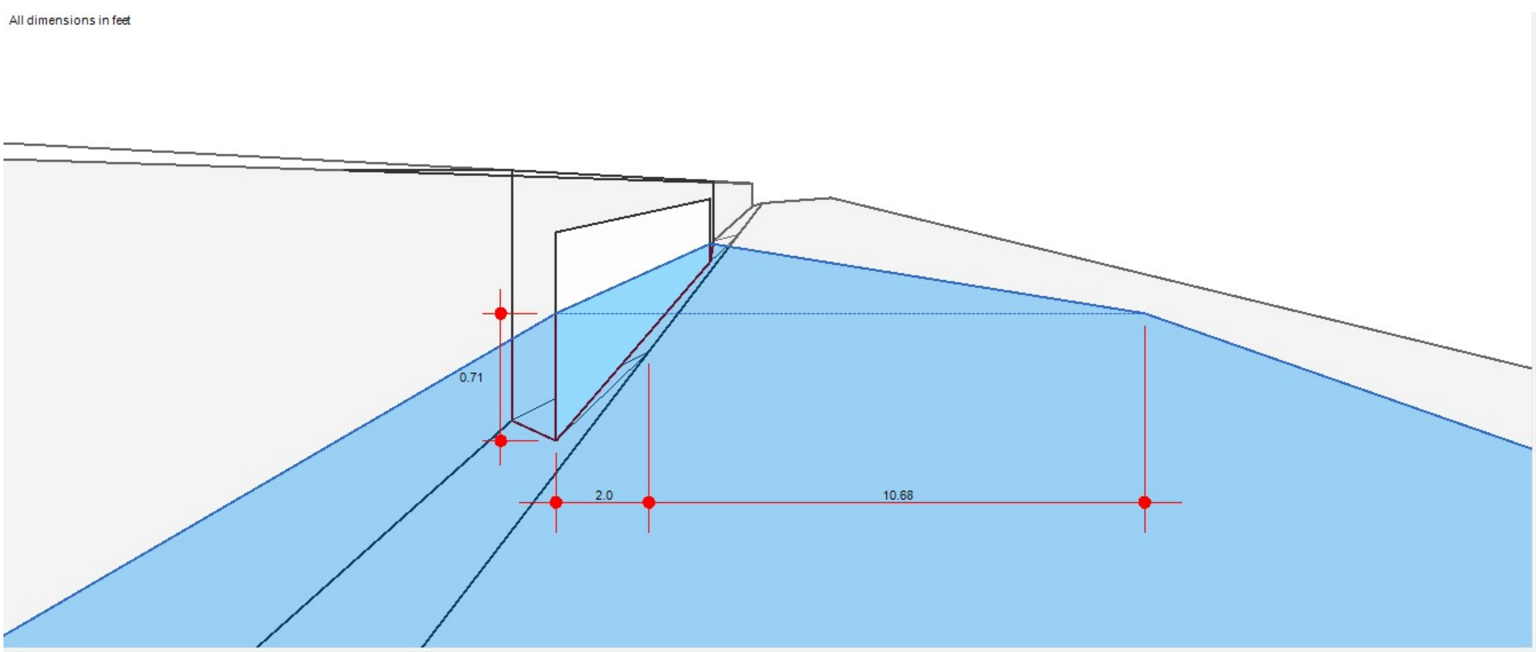


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V3 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 14.00	Q (cfs)	= 2.08
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 2.08
Grate Length (ft)	= -0-	Q Capt (cfs)	= 2.08
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.55
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 12.68
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.20
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.013		

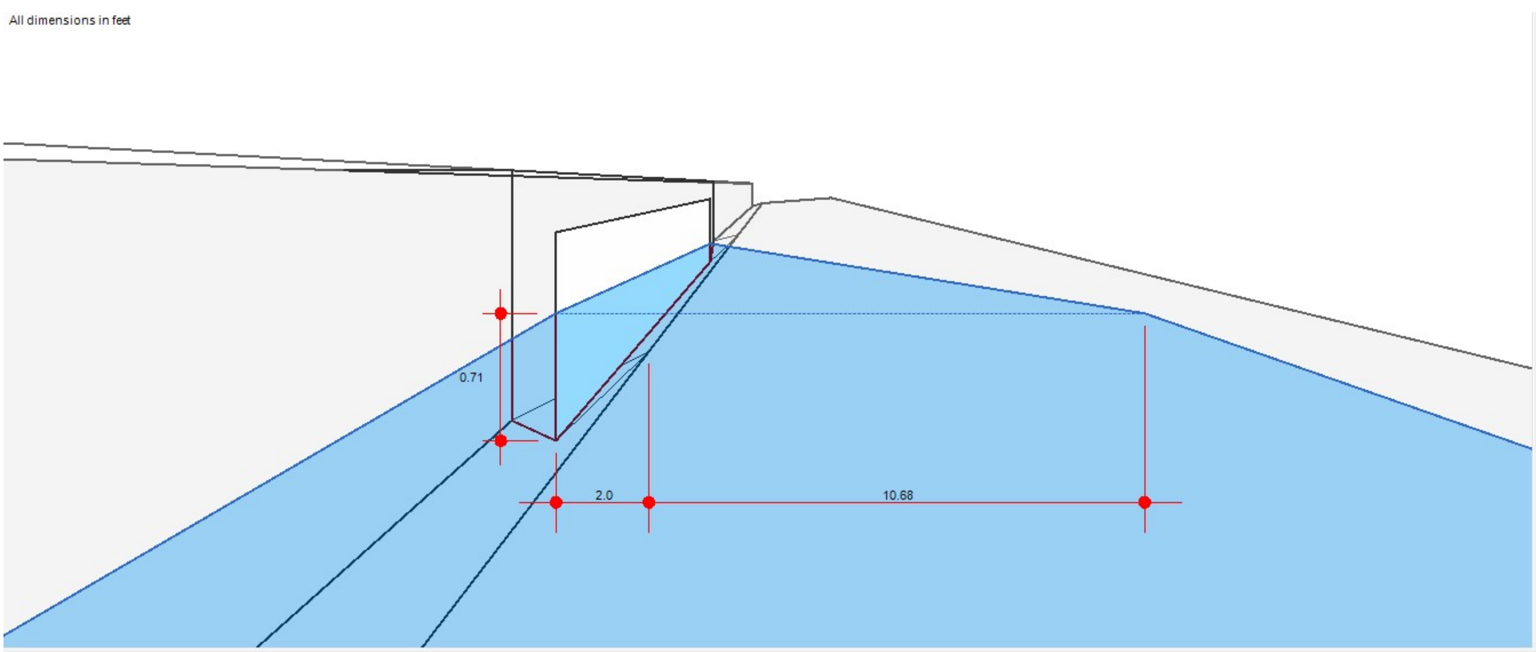


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V4 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 14.00	Q (cfs)	= 2.08
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 2.08
Grate Length (ft)	= -0-	Q Capt (cfs)	= 2.08
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.55
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 12.68
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.20
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.013		

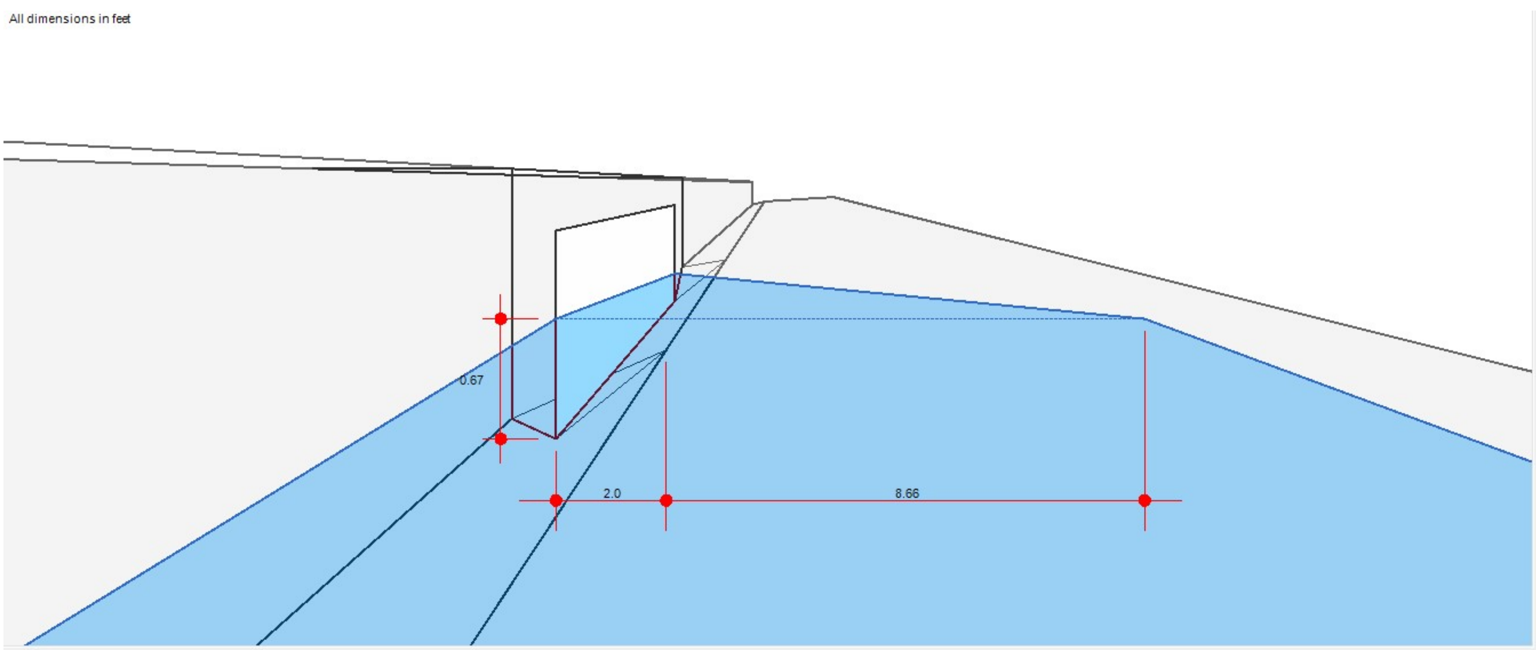


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V5 10YR

Curb Inlet			**Calculations**		
Location	=	On grade	Compute by:		Known Q
Curb Length (ft)	=	7.00	Q (cfs)	=	1.40
Throat Height (in)	=	6.00			
Grate Area (sqft)	=	-0-	**Highlighted**		
Grate Width (ft)	=	-0-	Q Total (cfs)	=	1.40
Grate Length (ft)	=	-0-	Q Capt (cfs)	=	1.40
			Q Bypass (cfs)	=	-0-
Gutter			Depth at Inlet (in)	=	8.07
Slope, Sw (ft/ft)	=	0.083	Efficiency (%)	=	100
Slope, Sx (ft/ft)	=	0.020	Gutter Spread (ft)	=	10.66
Local Depr (in)	=	4.00	Gutter Vel (ft/s)	=	1.11
Gutter Width (ft)	=	2.00	Bypass Spread (ft)	=	-0-
Gutter Slope (%)	=	0.10	Bypass Depth (in)	=	-0-
Gutter n-value	=	0.013			



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. | Thursday, May 16 2024

V6 10YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

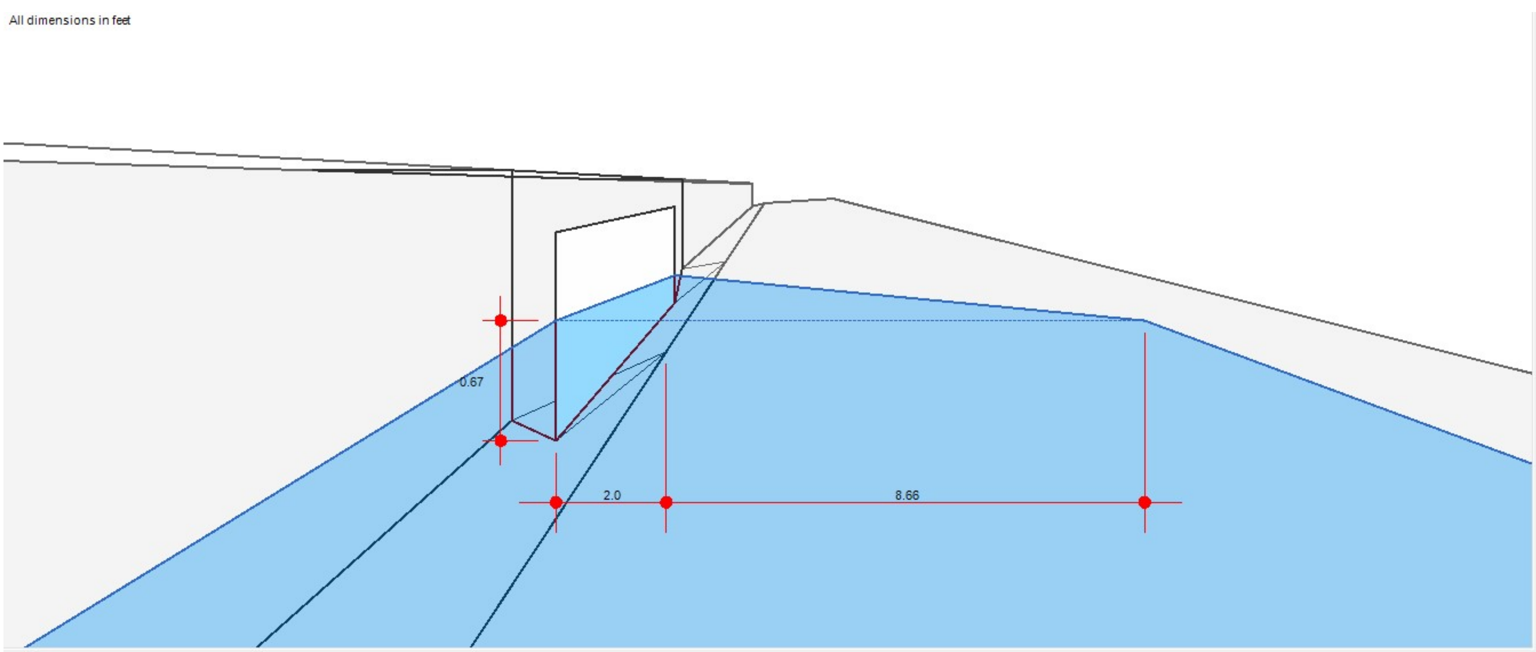
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations

Compute by:		Known Q
Q (cfs)	=	1.40

Highlighted

Q Total (cfs)	=	1.40
Q Capt (cfs)	=	1.40
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	8.07
Efficiency (%)	=	100
Gutter Spread (ft)	=	10.66
Gutter Vel (ft/s)	=	1.11
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. | Thursday, May 16 2024

V7 10YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

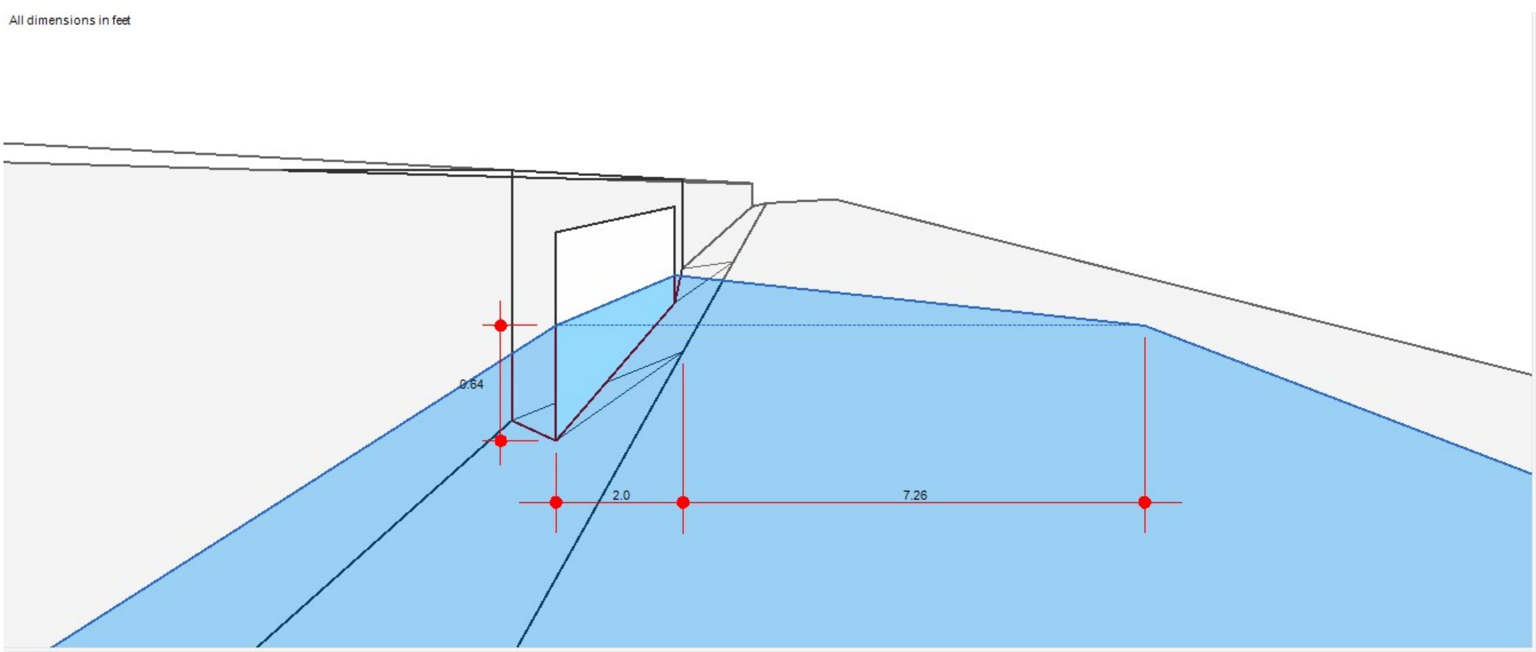
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations

Compute by:		Known Q
Q (cfs)	=	1.03

Highlighted

Q Total (cfs)	=	1.03
Q Capt (cfs)	=	1.03
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.73
Efficiency (%)	=	100
Gutter Spread (ft)	=	9.26
Gutter Vel (ft/s)	=	1.05
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V8 10YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

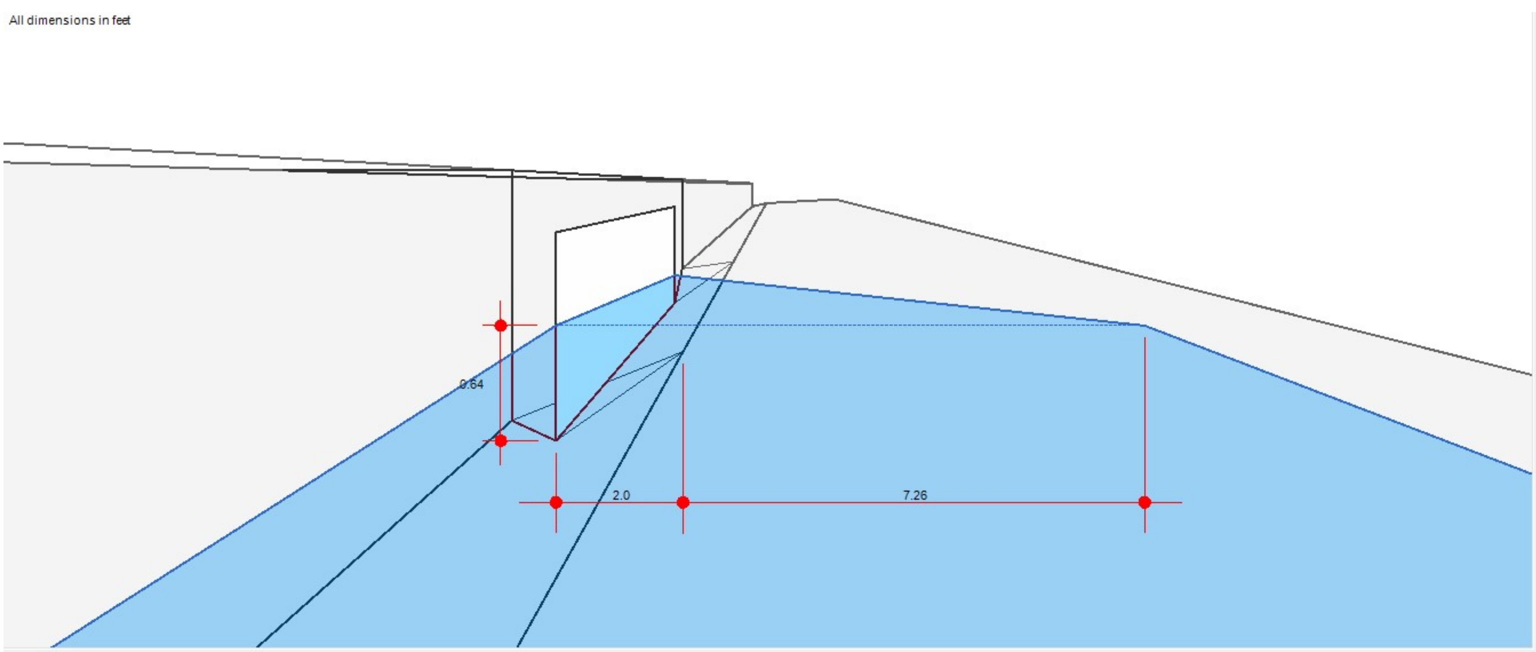
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations

Compute by:		Known Q
Q (cfs)	=	1.03

Highlighted

Q Total (cfs)	=	1.03
Q Capt (cfs)	=	1.03
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.73
Efficiency (%)	=	100
Gutter Spread (ft)	=	9.26
Gutter Vel (ft/s)	=	1.05
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

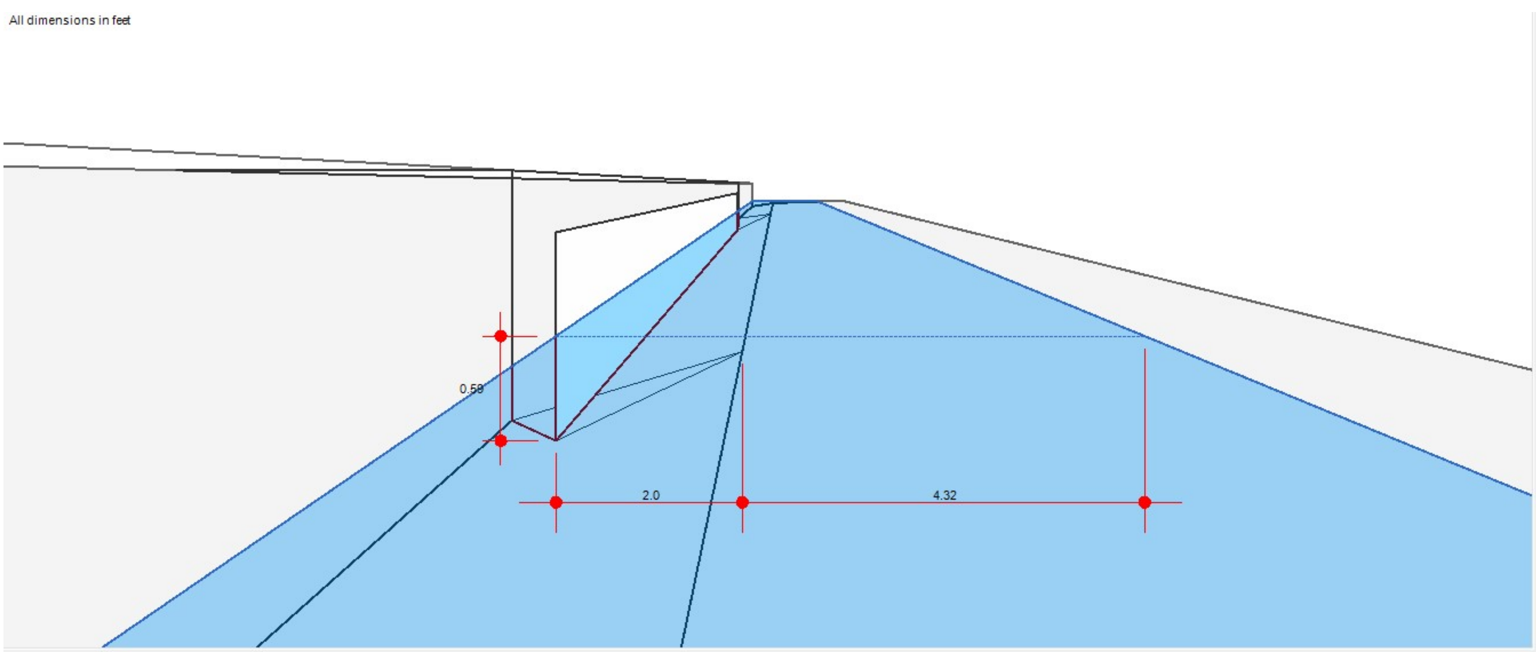


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 17 2024

R2 10YR

Curb Inlet		**Calculations**	
Location	= Sag	Compute by:	Known Q
Curb Length (ft)	= 28.00	Q (cfs)	= 3.27
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 3.27
Grate Length (ft)	= -0-	Q Capt (cfs)	= 3.27
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.03
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 6.32
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= -0-
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= -0-	Bypass Depth (in)	= -0-
Gutter n-value	= -0-		



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

F3 10YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

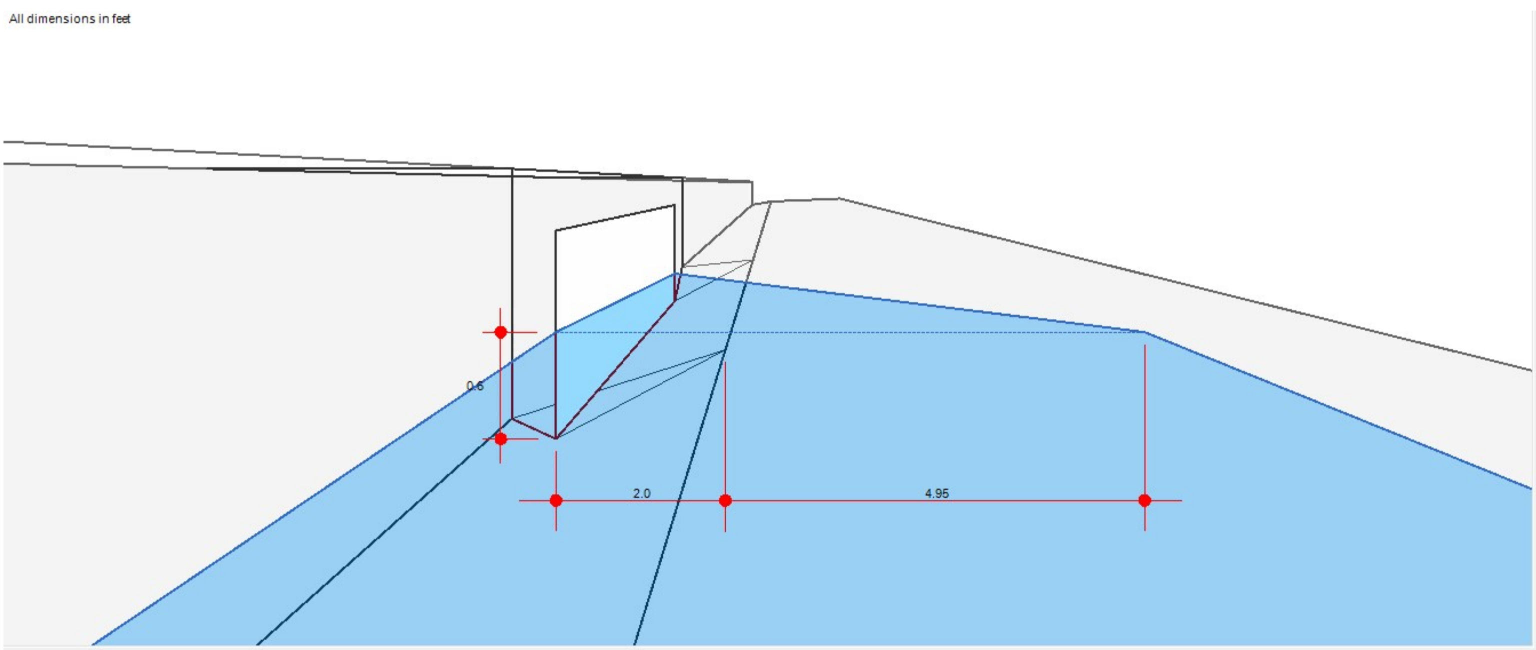
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	1.00
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	1.50

Highlighted

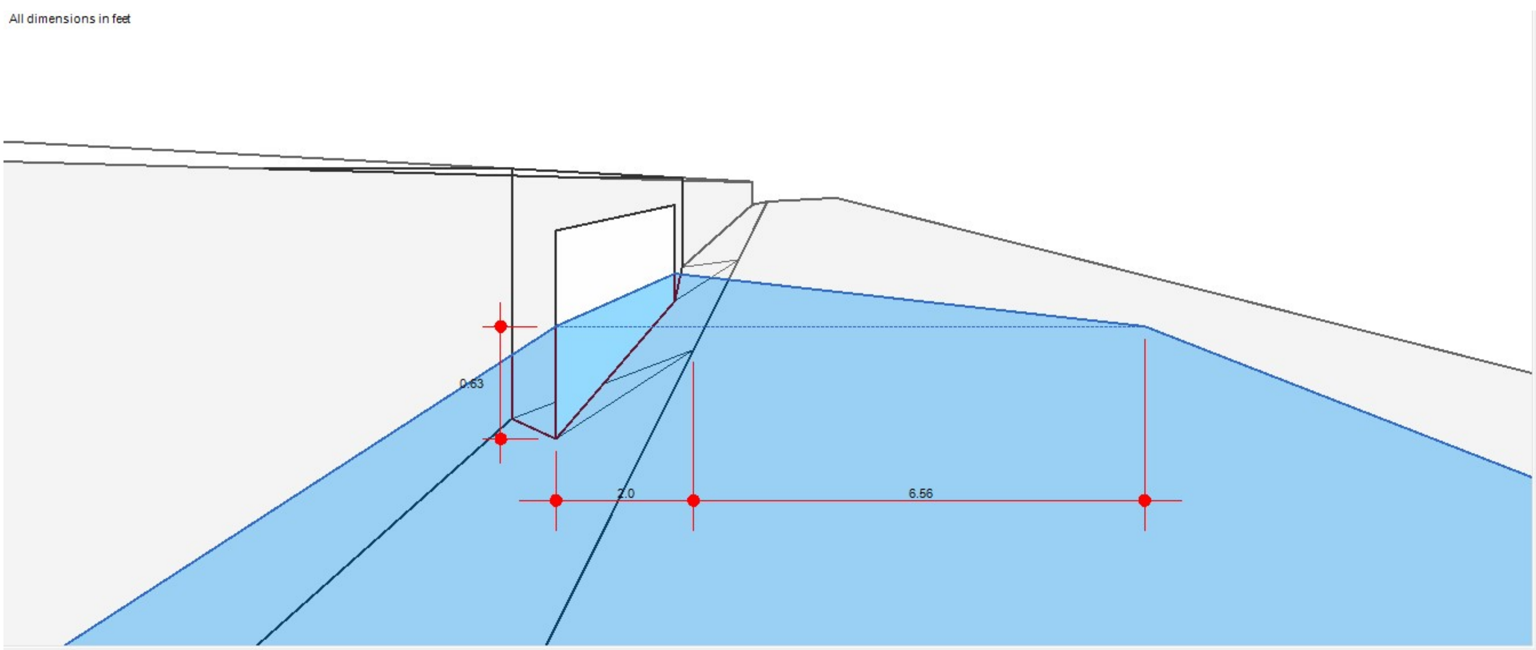
Q Total (cfs)	=	1.50
Q Capt (cfs)	=	1.50
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.18
Efficiency (%)	=	100
Gutter Spread (ft)	=	6.95
Gutter Vel (ft/s)	=	2.46
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

C6 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.23
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.23
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.23
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.57
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 8.56
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.43
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.30	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

C5 YR10

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

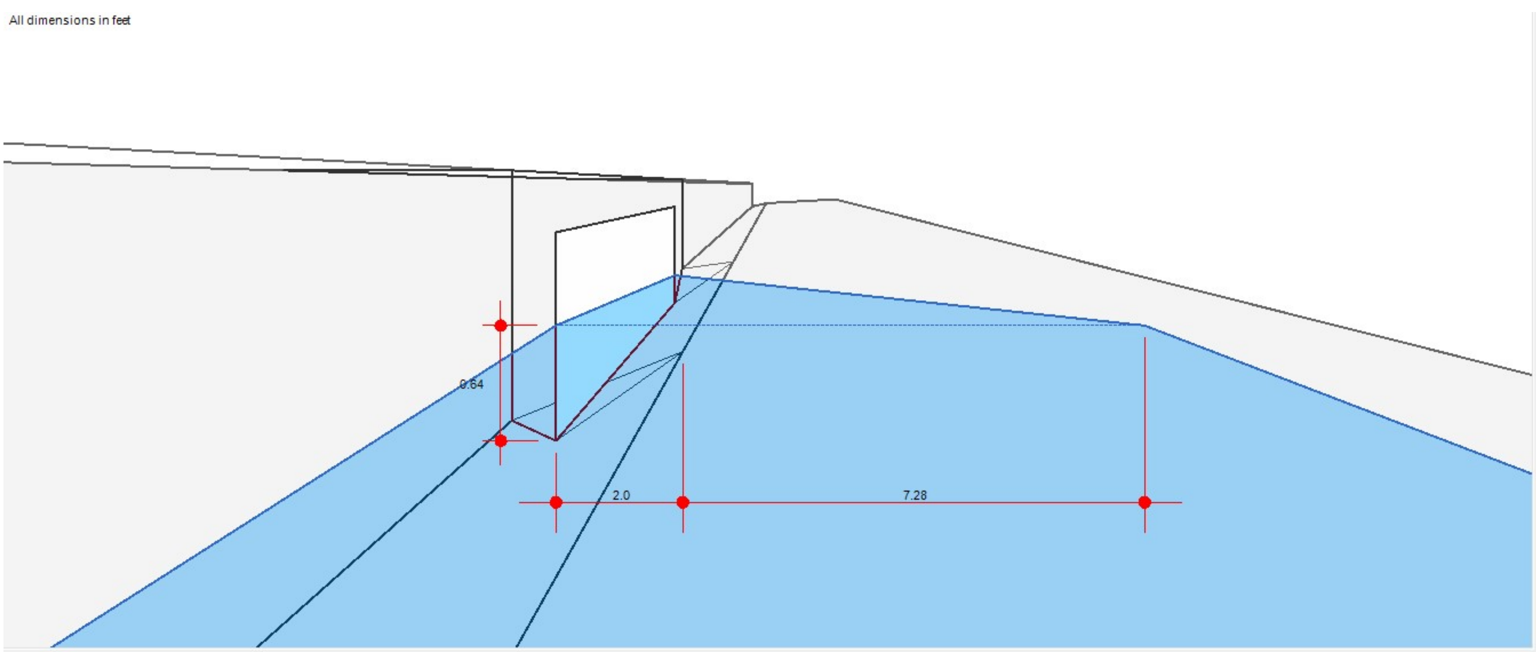
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.20
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	1.19

Highlighted

Q Total (cfs)	=	1.19
Q Capt (cfs)	=	1.19
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.74
Efficiency (%)	=	100
Gutter Spread (ft)	=	9.28
Gutter Vel (ft/s)	=	1.21
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

F1 10YR

Curb Inlet

Location	=	Sag
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

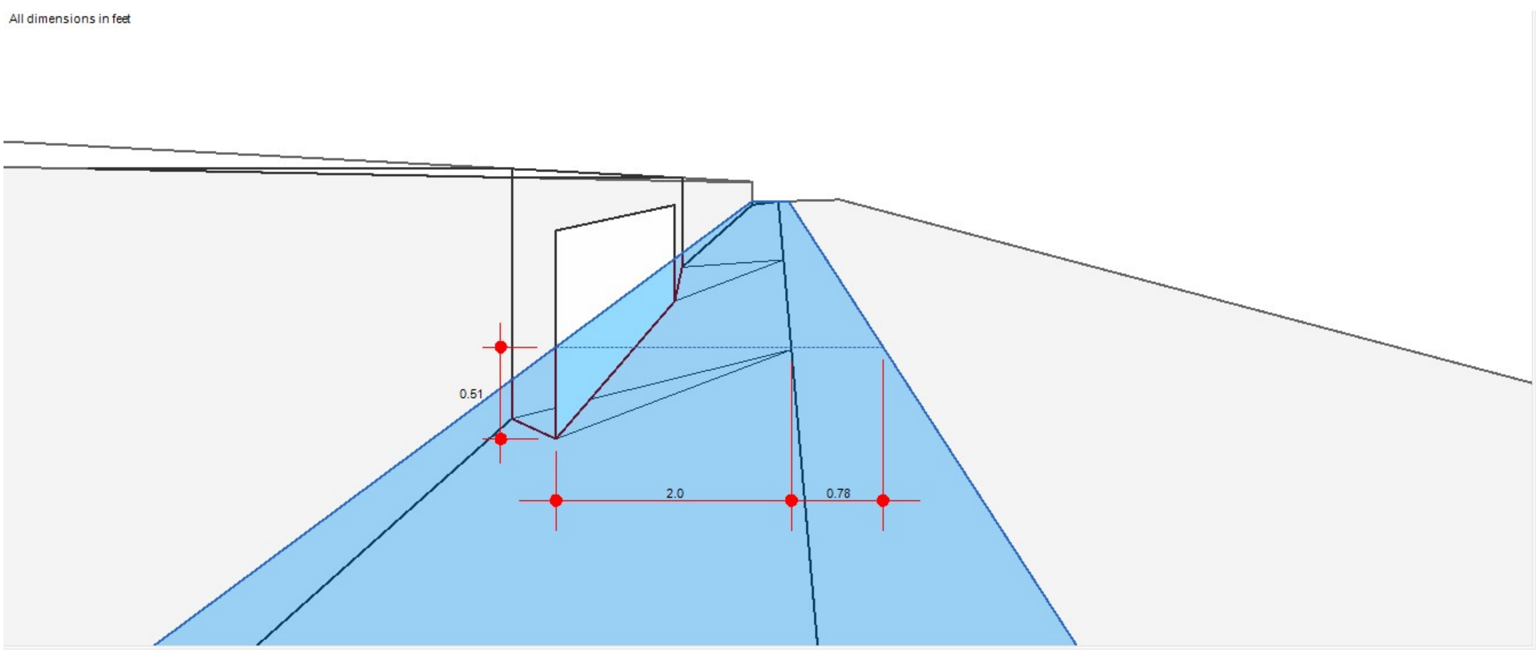
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	-0-
Gutter n-value	=	-0-

Calculations

Compute by:		Known Q
Q (cfs)	=	0.32

Highlighted

Q Total (cfs)	=	0.32
Q Capt (cfs)	=	0.32
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.18
Efficiency (%)	=	100
Gutter Spread (ft)	=	2.78
Gutter Vel (ft/s)	=	1.21
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

F2 10YR

Curb Inlet

Location	=	Sag
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

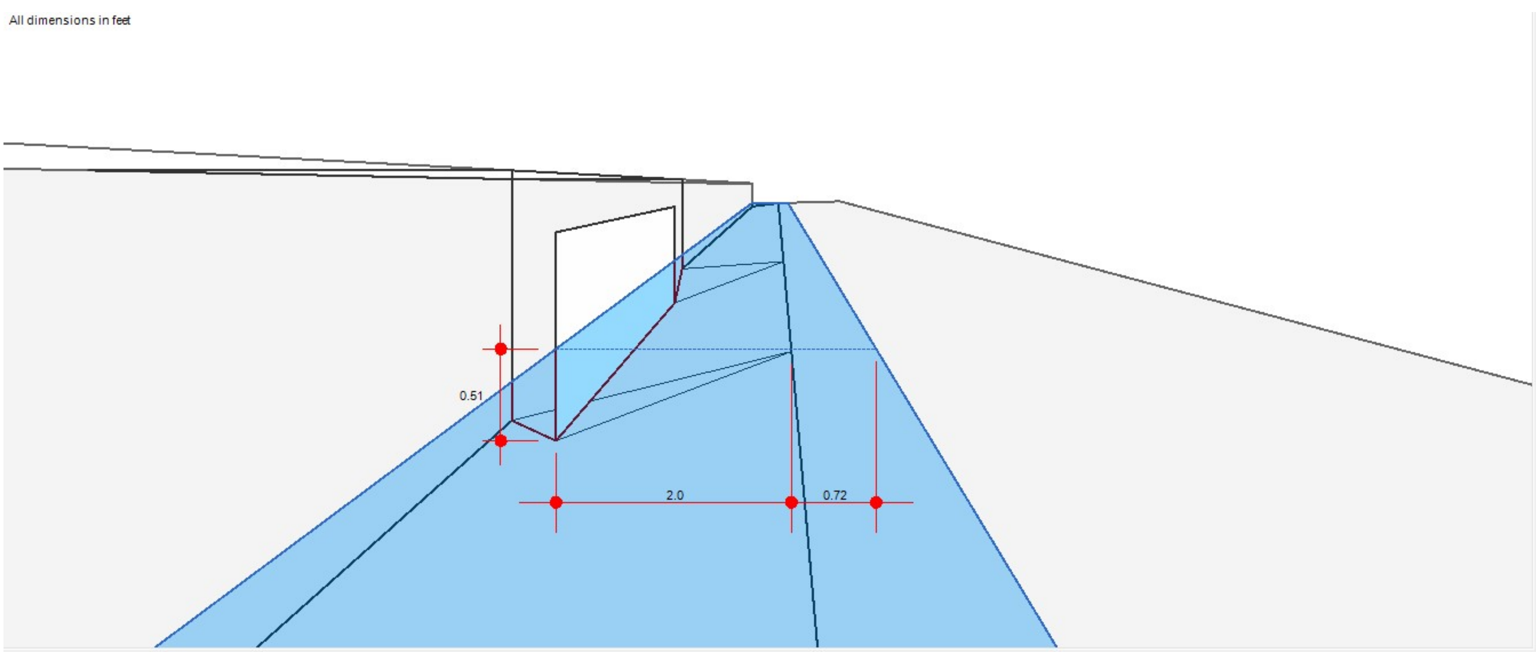
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	-0-
Gutter n-value	=	-0-

Calculations

Compute by:		Known Q
Q (cfs)	=	0.31

Highlighted

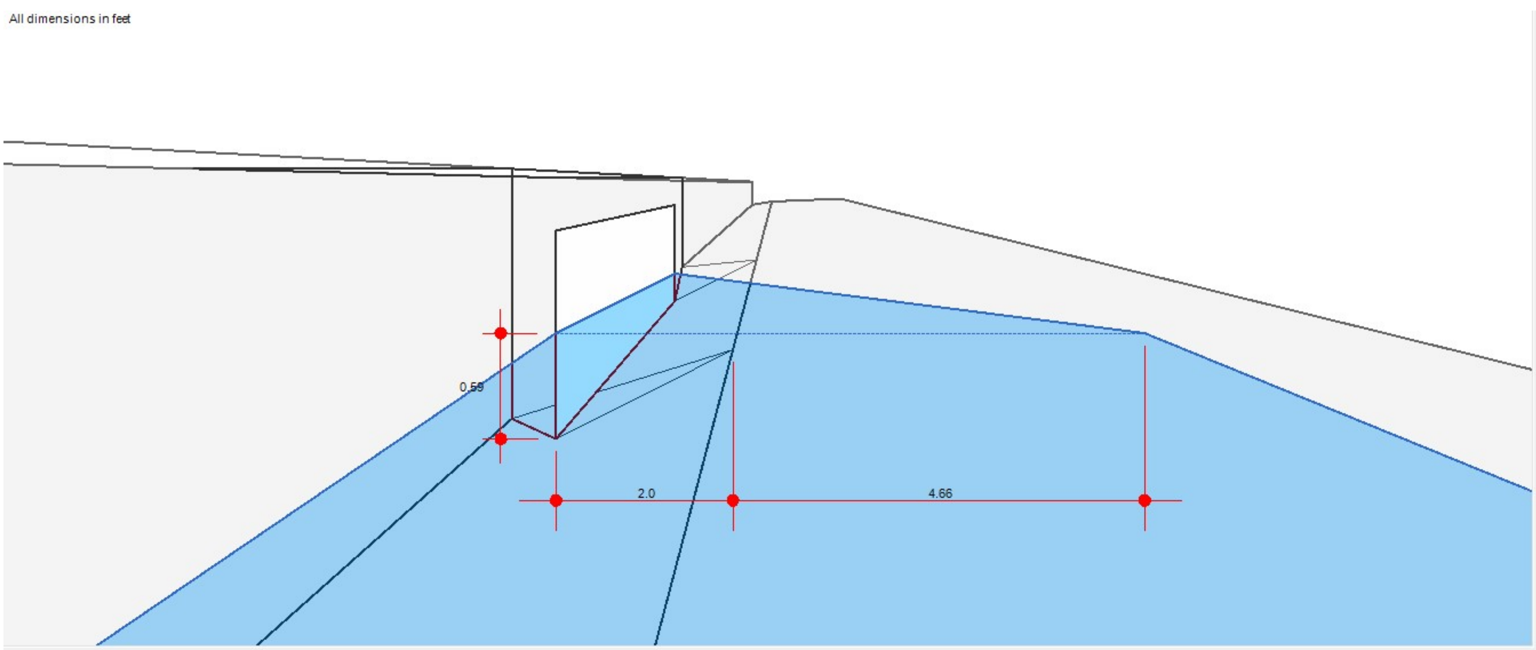
Q Total (cfs)	=	0.31
Q Capt (cfs)	=	0.31
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.16
Efficiency (%)	=	100
Gutter Spread (ft)	=	2.72
Gutter Vel (ft/s)	=	1.21
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

E2 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.62
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.62
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.62
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.11
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 6.66
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.09
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.20	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

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E1 10YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

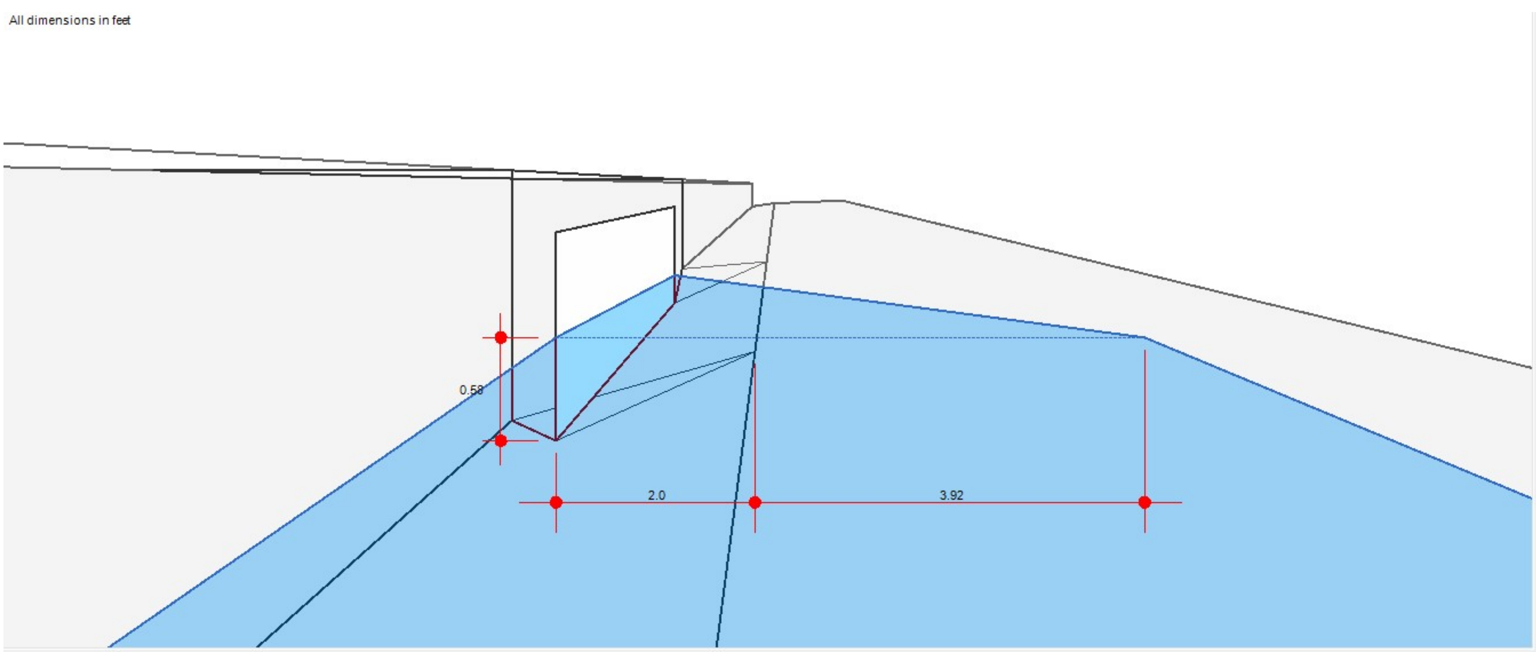
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.30
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.62

Highlighted

Q Total (cfs)	=	0.62
Q Capt (cfs)	=	0.62
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.93
Efficiency (%)	=	100
Gutter Spread (ft)	=	5.92
Gutter Vel (ft/s)	=	1.30
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

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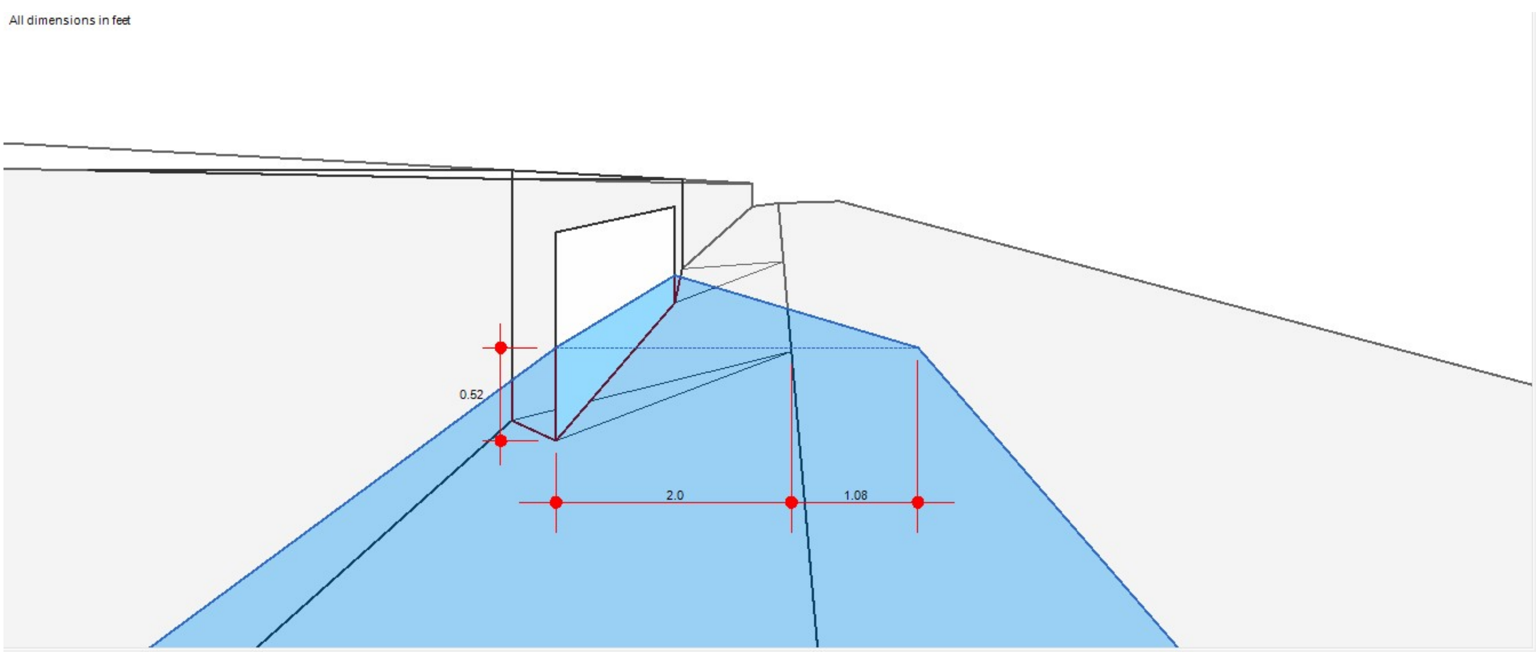
E4 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.31
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.31
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.31
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.25
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 3.08
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.41
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.40	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

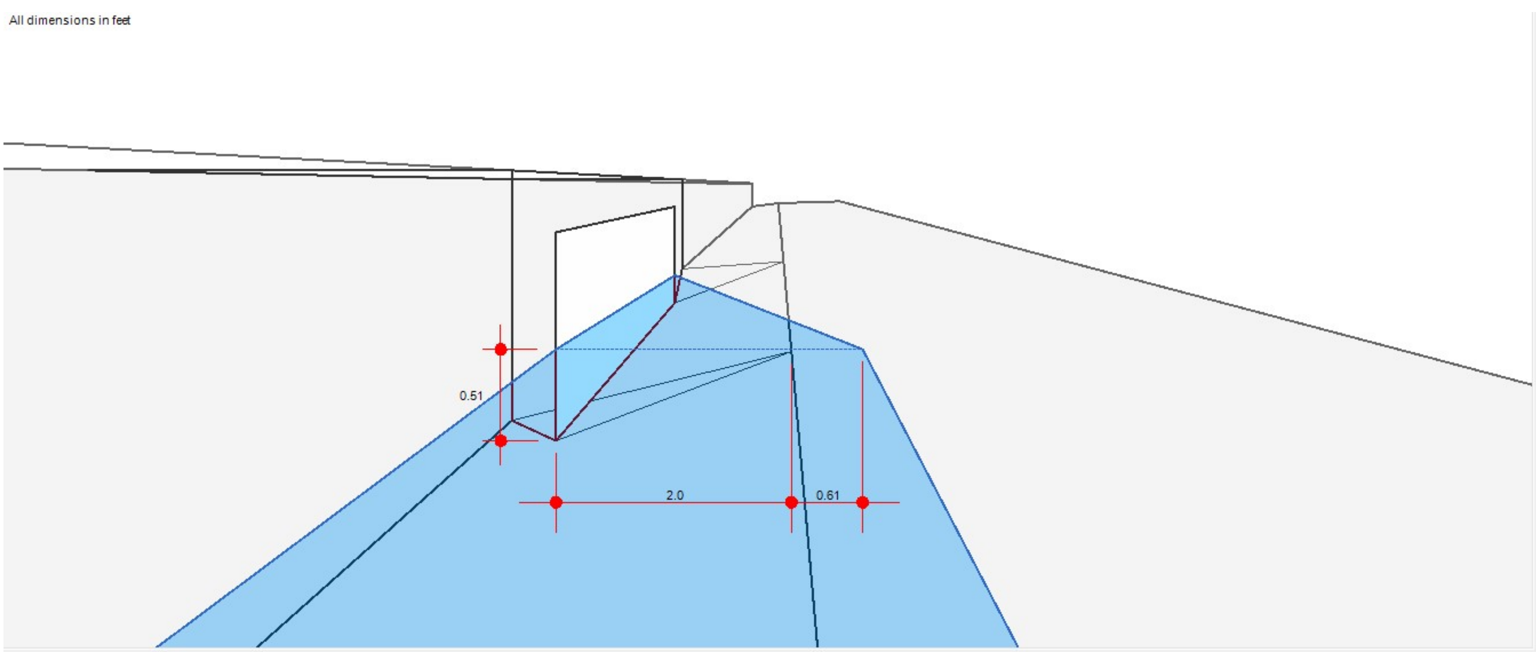


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

E3 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.30
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.30
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.30
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.14
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 2.61
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.55
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.50	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



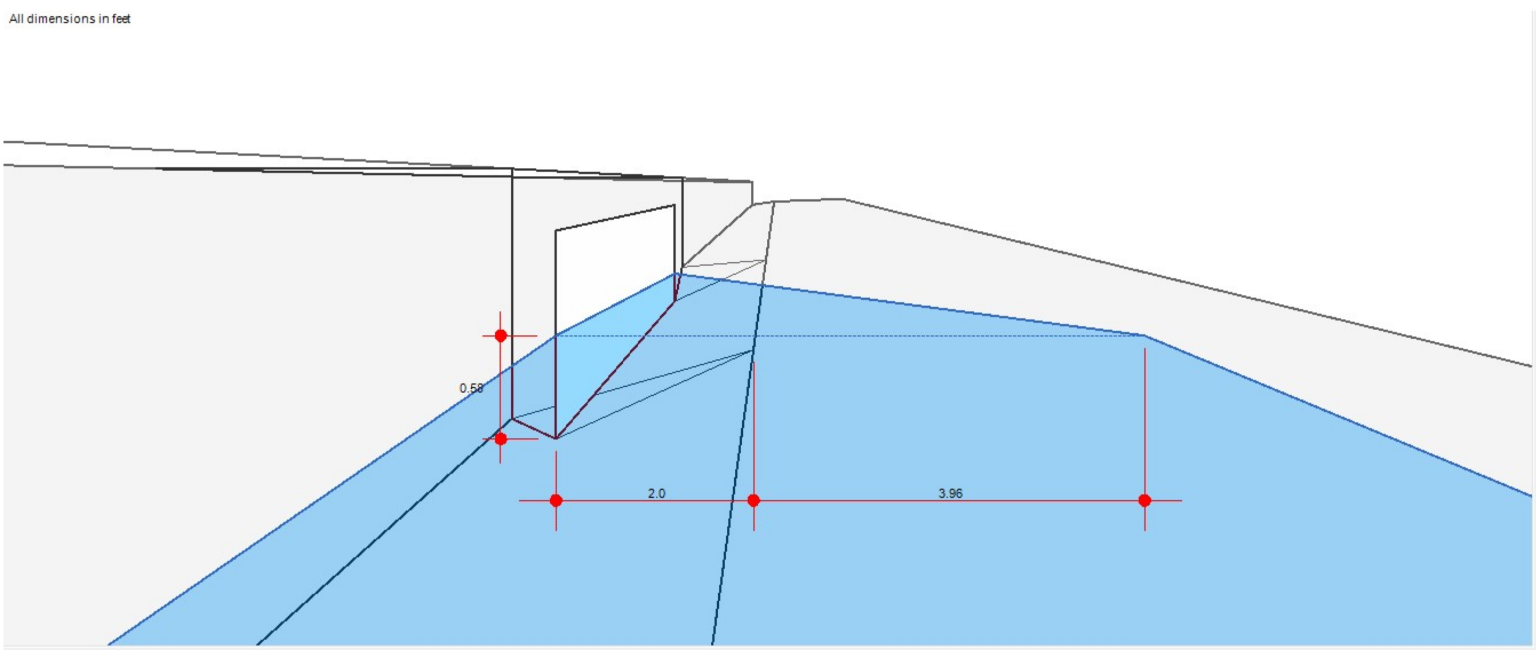
Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

C2 10YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-
Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.50
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	0.81
Highlighted		
Q Total (cfs)	=	0.81
Q Capt (cfs)	=	0.81
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.94
Efficiency (%)	=	100
Gutter Spread (ft)	=	5.96
Gutter Vel (ft/s)	=	1.68
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

C1 10YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

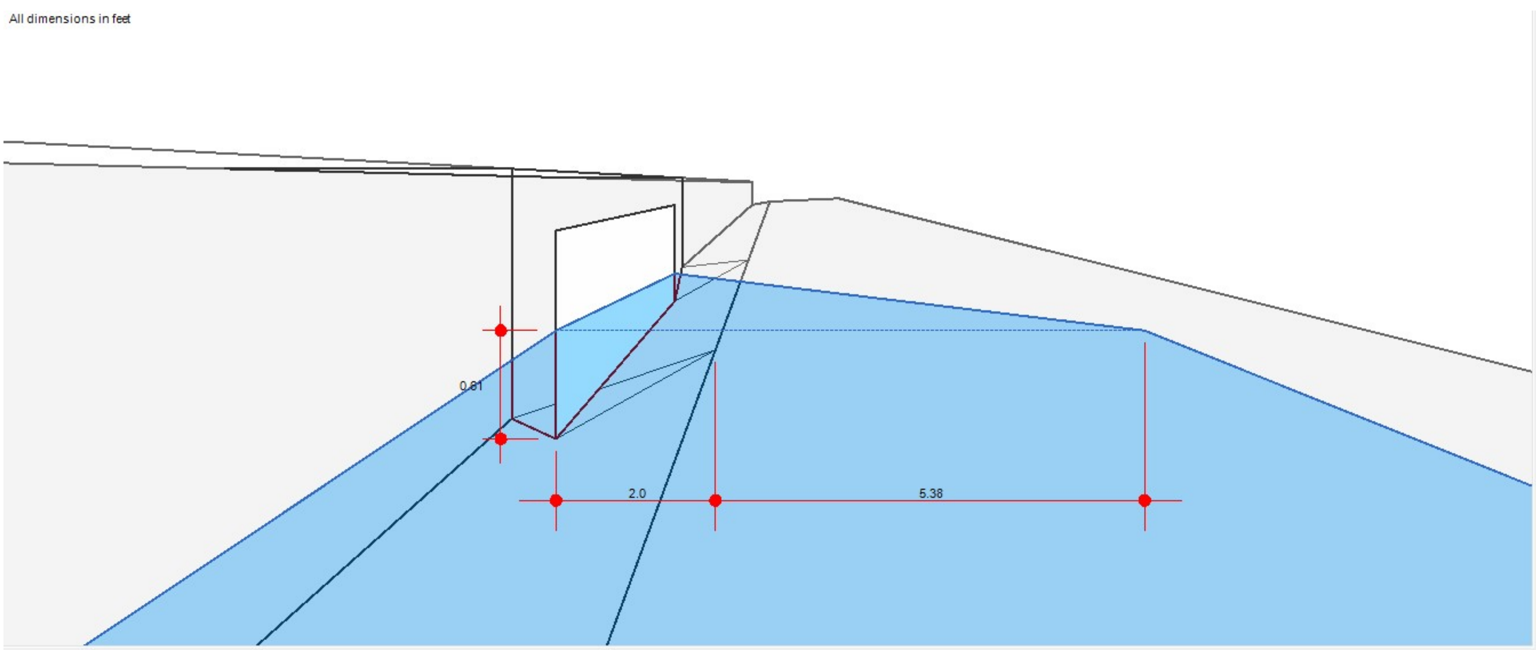
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.20
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.75

Highlighted

Q Total (cfs)	=	0.75
Q Capt (cfs)	=	0.75
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.28
Efficiency (%)	=	100
Gutter Spread (ft)	=	7.38
Gutter Vel (ft/s)	=	1.12
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

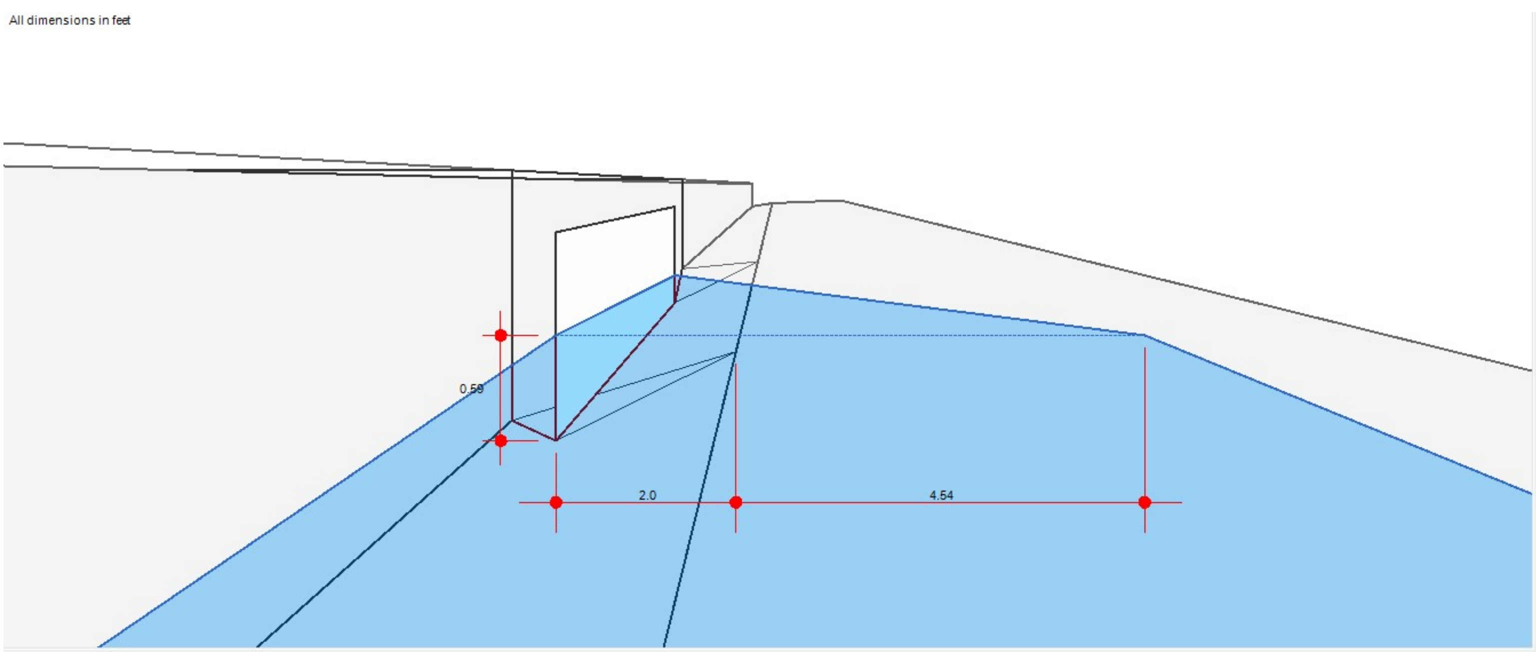


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

C4 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.85
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.85
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.85
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.08
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 6.54
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.54
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.40	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

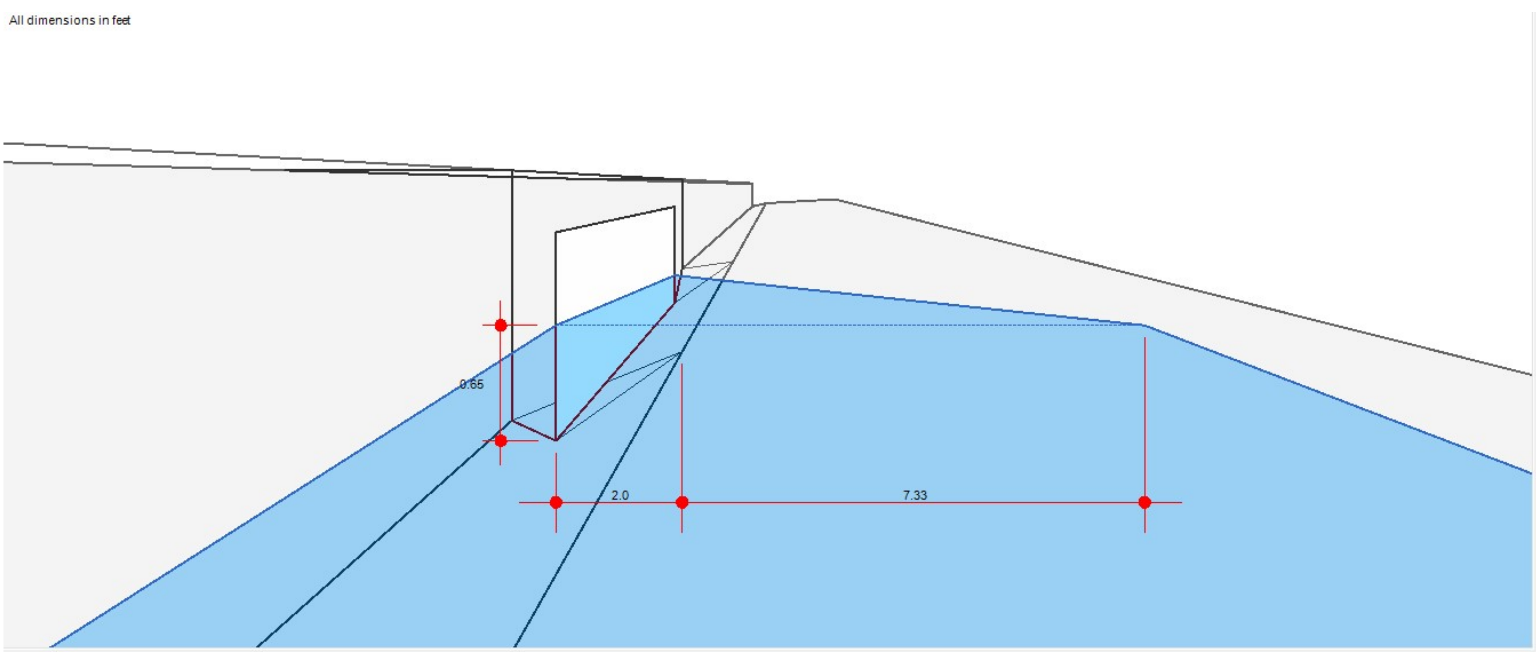


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

C3 10YR

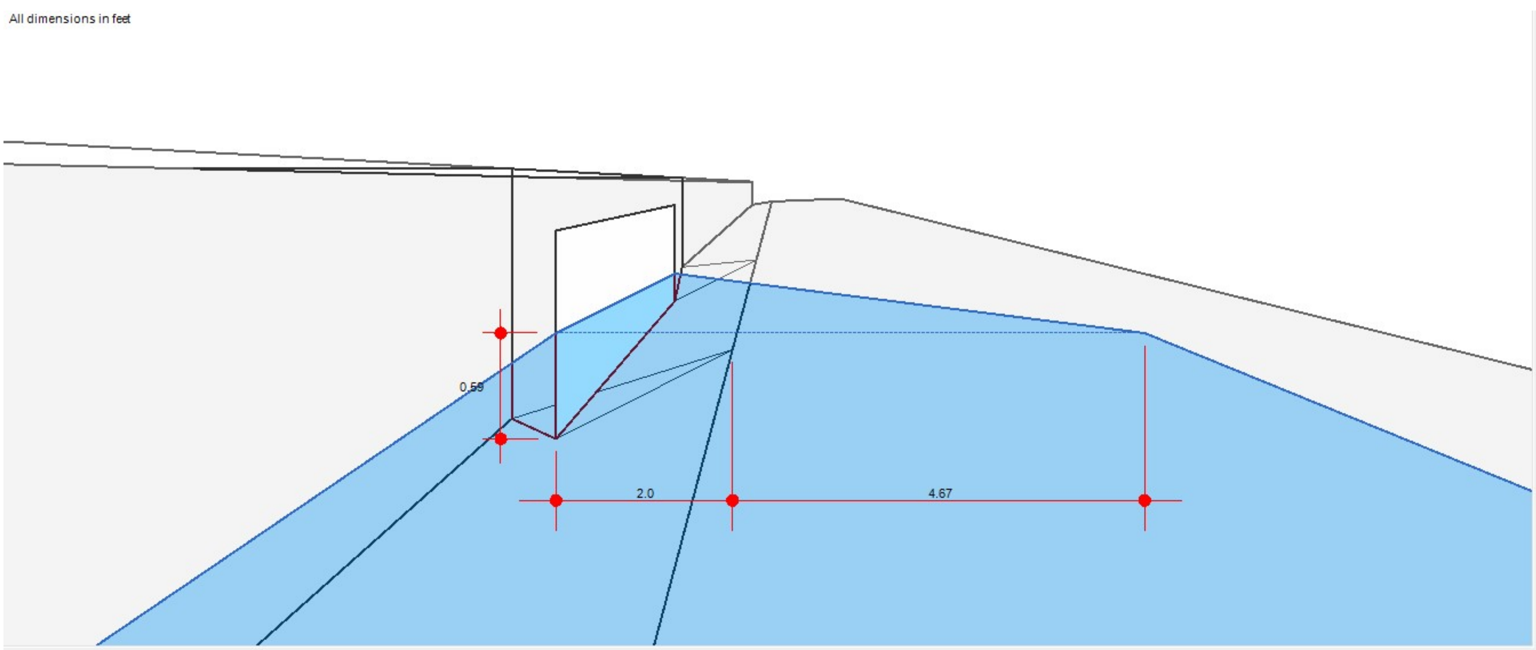
Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.85
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.85
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.85
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.75
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 9.33
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 0.85
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

A9 10YR

Curb Inlet			**Calculations**	
Location	= On grade		Compute by:	Known Q
Curb Length (ft)	= 7.00		Q (cfs)	= 0.44
Throat Height (in)	= 6.00			
Grate Area (sqft)	= -0-		**Highlighted**	
Grate Width (ft)	= -0-		Q Total (cfs)	= 0.44
Grate Length (ft)	= -0-		Q Capt (cfs)	= 0.44
			Q Bypass (cfs)	= -0-
Gutter			Depth at Inlet (in)	= 7.11
Slope, Sw (ft/ft)	= 0.083		Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020		Gutter Spread (ft)	= 6.67
Local Depr (in)	= 4.00		Gutter Vel (ft/s)	= 0.77
Gutter Width (ft)	= 2.00		Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10		Bypass Depth (in)	= -0-
Gutter n-value	= 0.016			



Inlet Report

A10 10YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

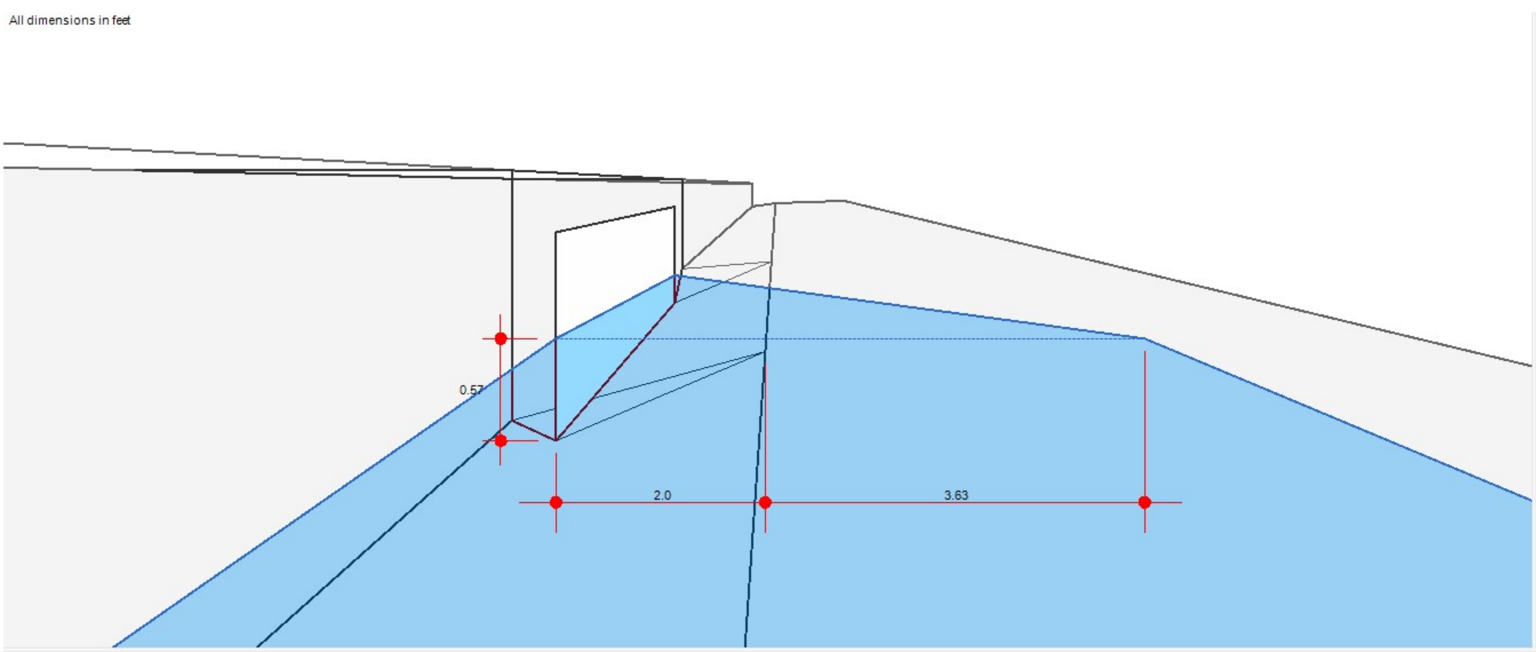
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.33

Highlighted

Q Total (cfs)	=	0.33
Q Capt (cfs)	=	0.33
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.86
Efficiency (%)	=	100
Gutter Spread (ft)	=	5.63
Gutter Vel (ft/s)	=	0.75
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

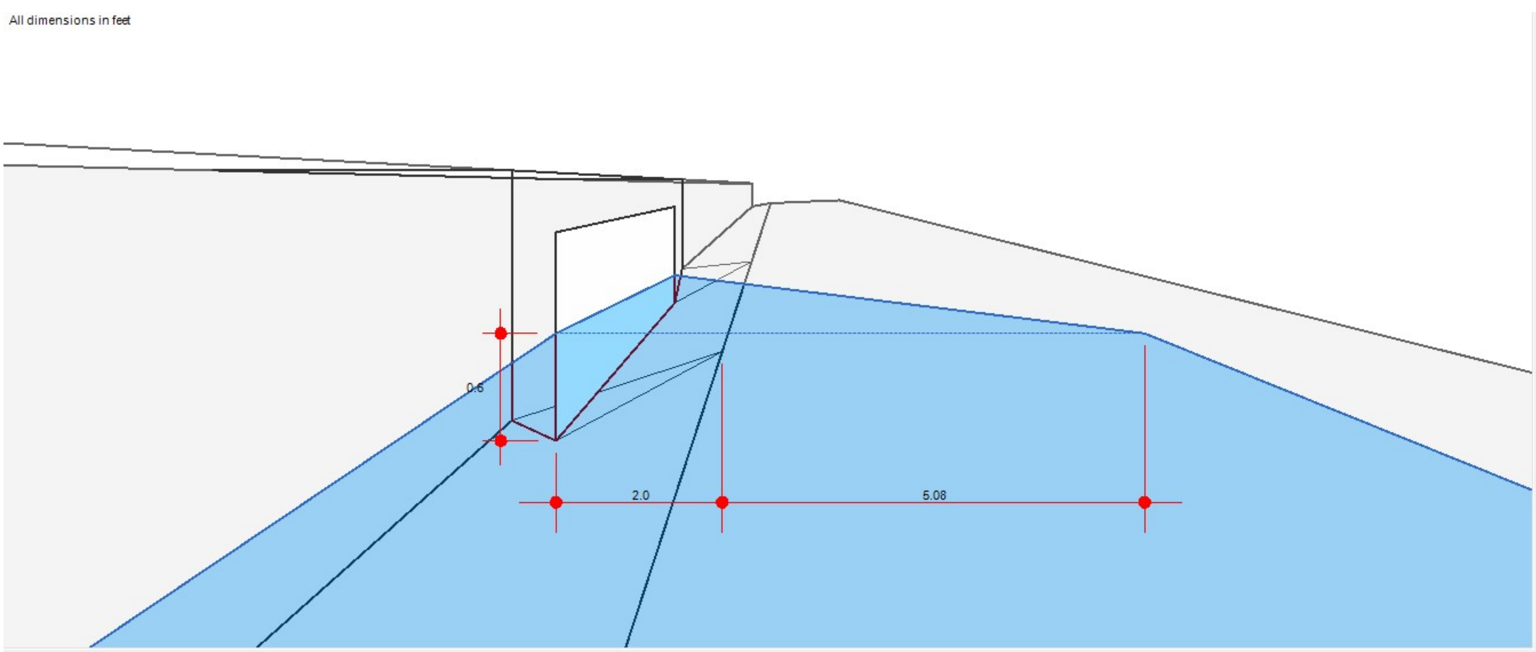


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

A7 10YR

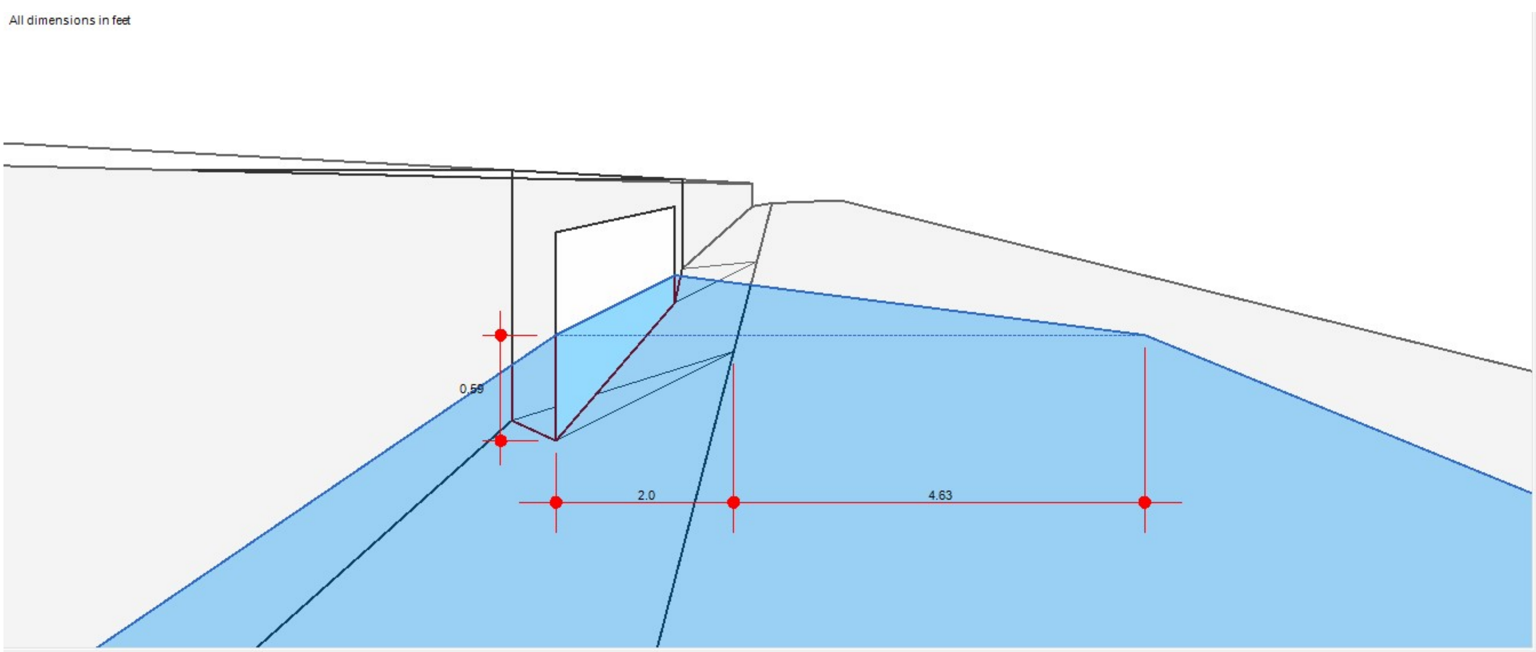
Curb Inlet			**Calculations**		
Location	=	On grade	Compute by:		Known Q
Curb Length (ft)	=	7.00	Q (cfs)	=	0.85
Throat Height (in)	=	6.00			
Grate Area (sqft)	=	-0-	**Highlighted**		
Grate Width (ft)	=	-0-	Q Total (cfs)	=	0.85
Grate Length (ft)	=	-0-	Q Capt (cfs)	=	0.85
			Q Bypass (cfs)	=	-0-
Gutter			Depth at Inlet (in)	=	7.21
Slope, Sw (ft/ft)	=	0.083	Efficiency (%)	=	100
Slope, Sx (ft/ft)	=	0.020	Gutter Spread (ft)	=	7.08
Local Depr (in)	=	4.00	Gutter Vel (ft/s)	=	1.36
Gutter Width (ft)	=	2.00	Bypass Spread (ft)	=	-0-
Gutter Slope (%)	=	0.30	Bypass Depth (in)	=	-0-
Gutter n-value	=	0.016			



Inlet Report

A8 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.87
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.87
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.87
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.10
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 6.63
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.54
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.40	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

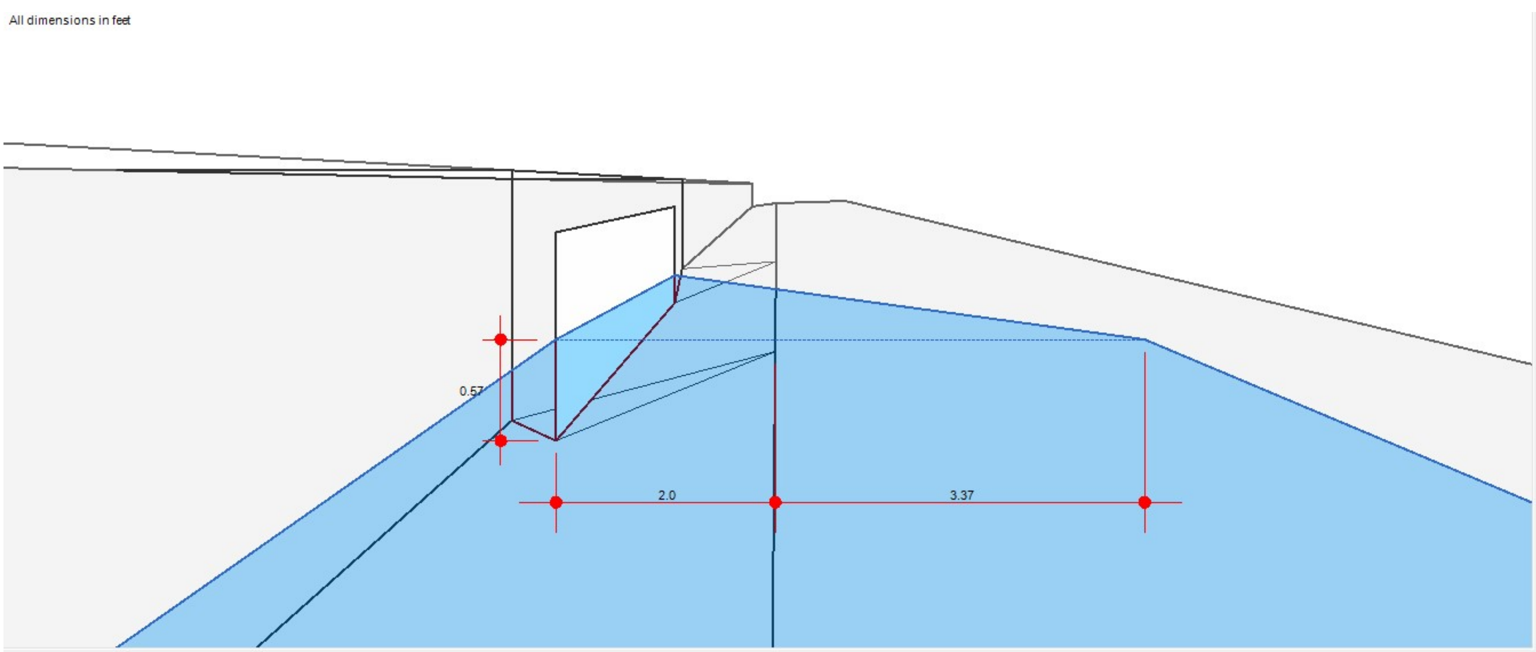


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

A11 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.92
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.92
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.92
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.80
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 5.37
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.22
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.90	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

B5 10YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

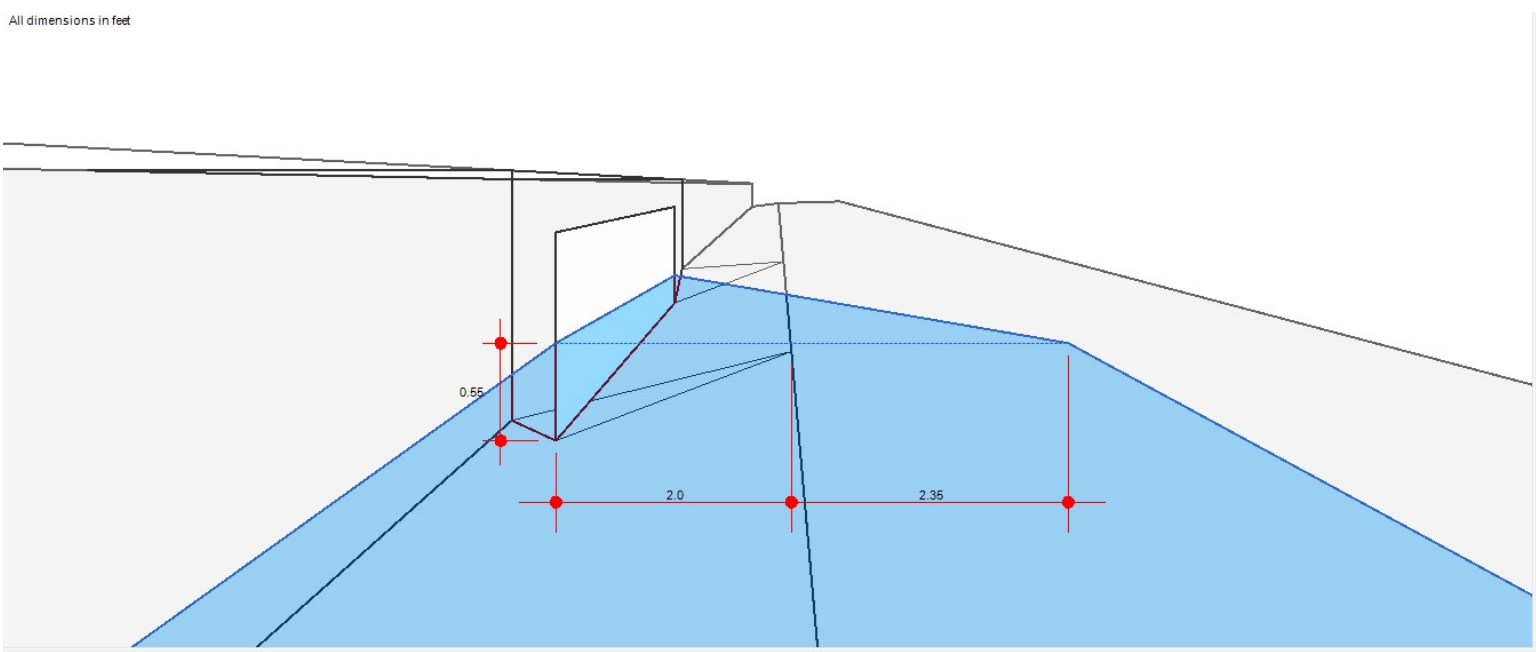
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	1.00
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.72

Highlighted

Q Total (cfs)	=	0.72
Q Capt (cfs)	=	0.72
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.56
Efficiency (%)	=	100
Gutter Spread (ft)	=	4.35
Gutter Vel (ft/s)	=	2.28
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

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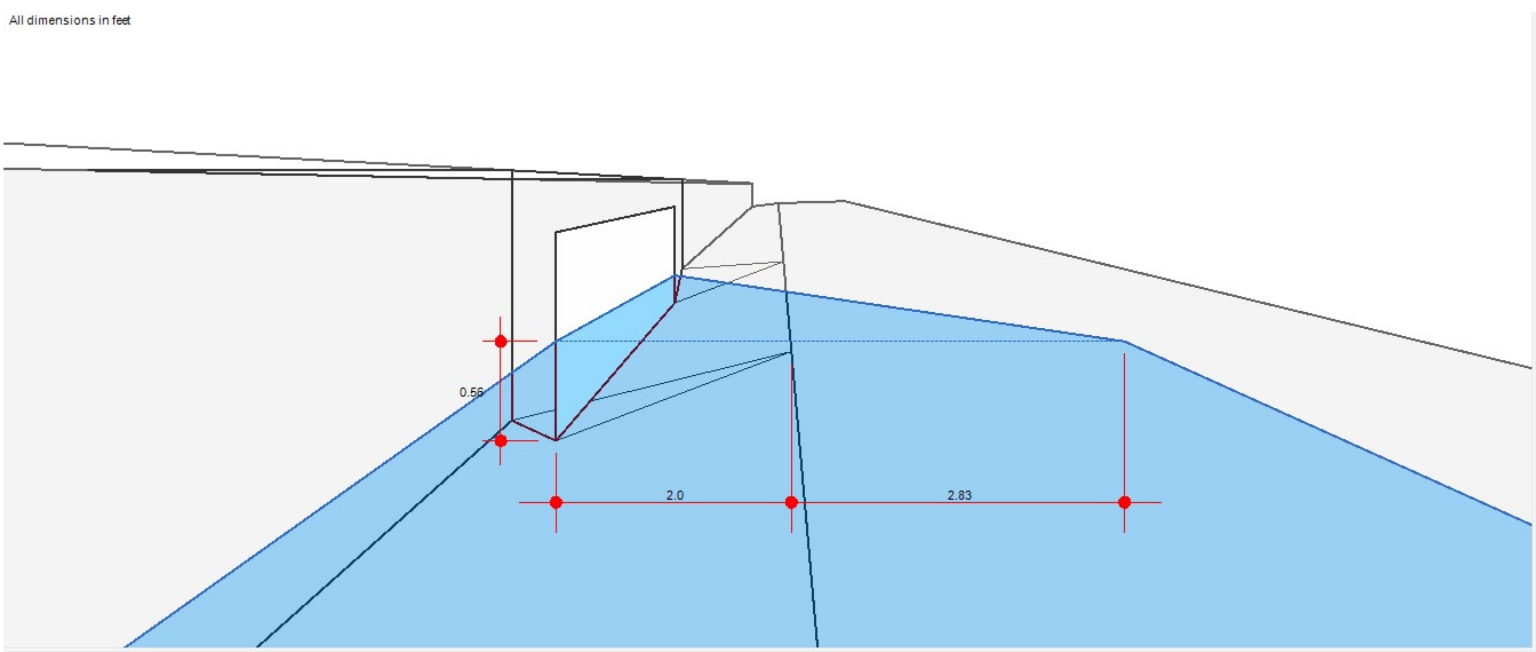
B6 10YR

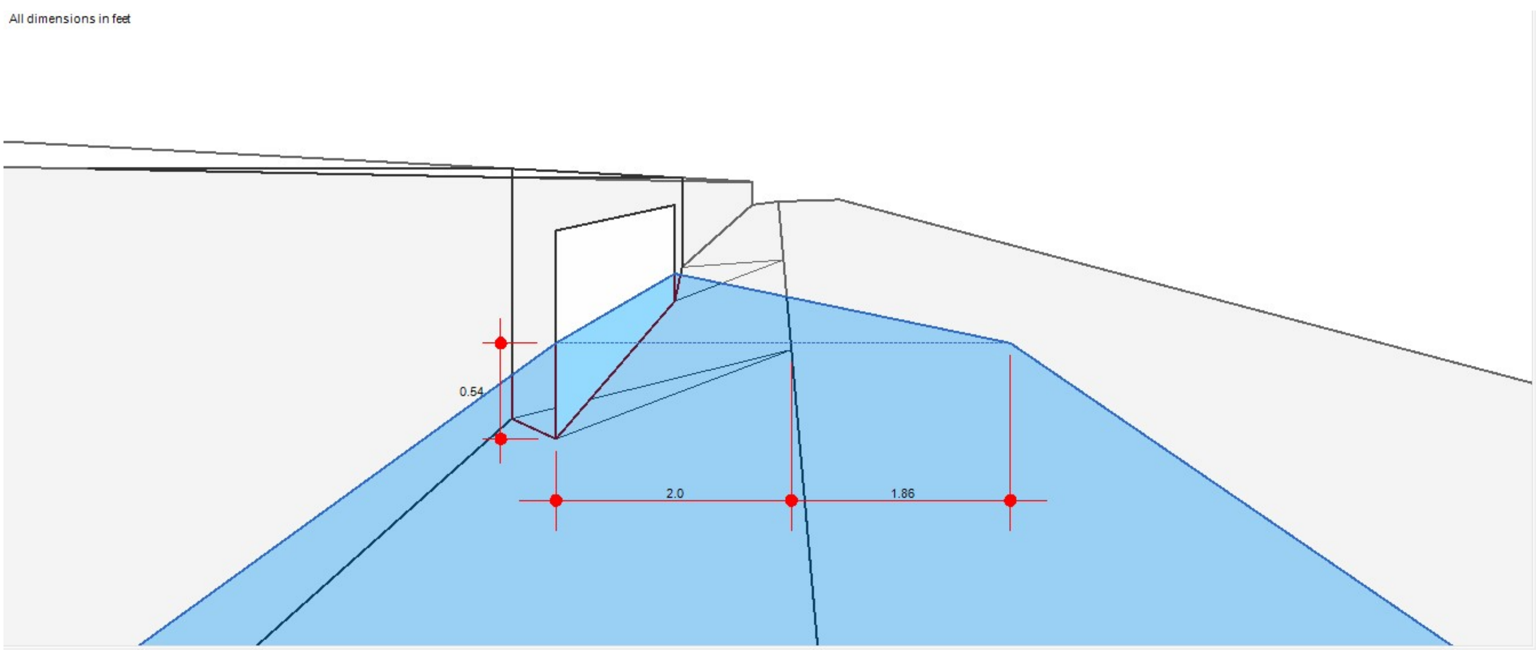
Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.83
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.83
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.83
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.67
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 4.83
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.31
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 1.00	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

D2 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.44
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.44
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.44
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.44
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 3.86
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.60
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.50	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

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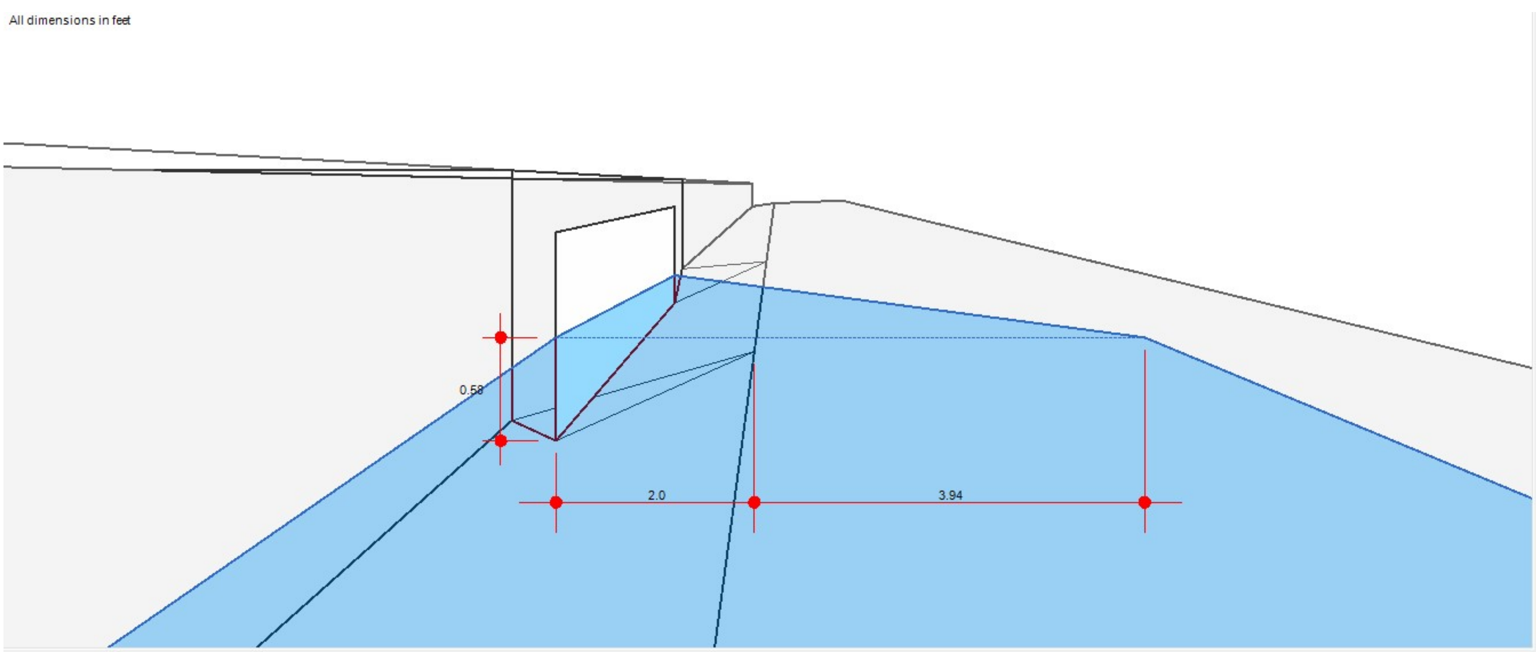
D1 10YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	0.36

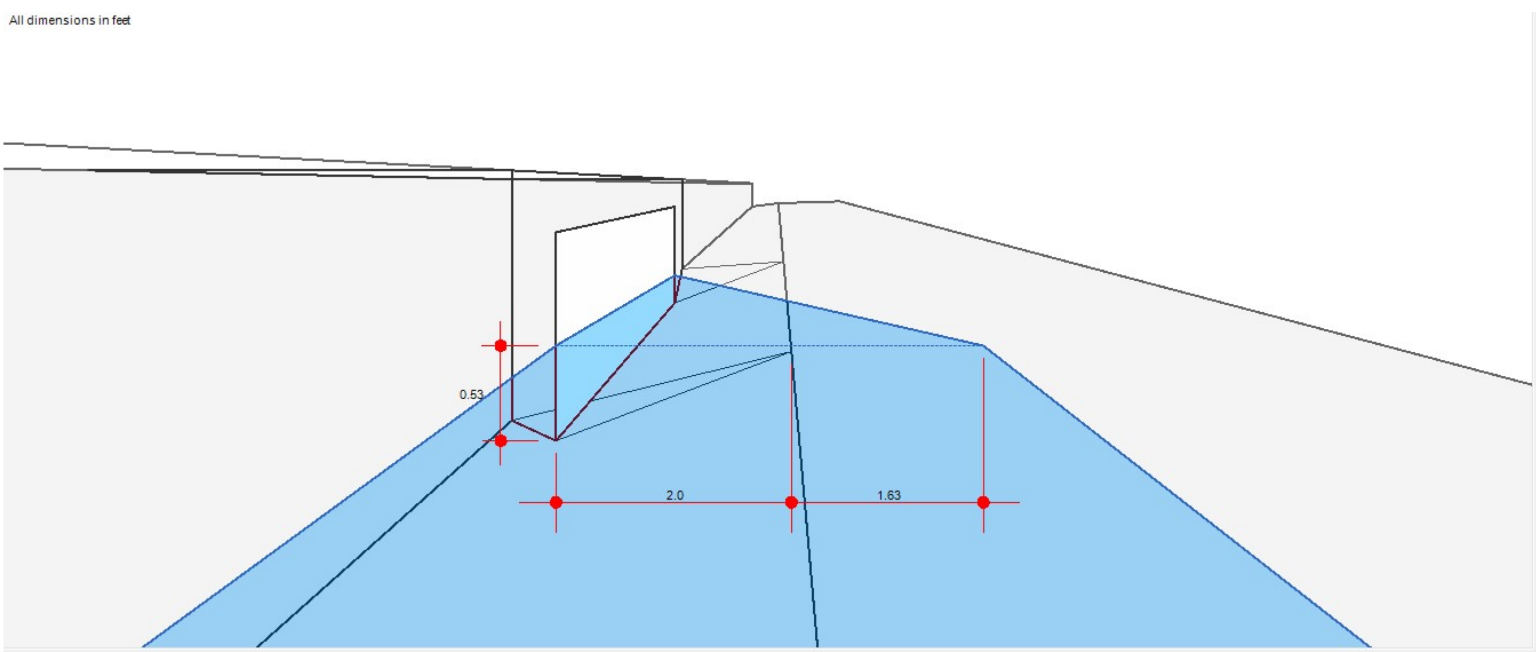
Highlighted		
Q Total (cfs)	=	0.36
Q Capt (cfs)	=	0.36
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.94
Efficiency (%)	=	100
Gutter Spread (ft)	=	5.94
Gutter Vel (ft/s)	=	0.75
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

B3 10YR

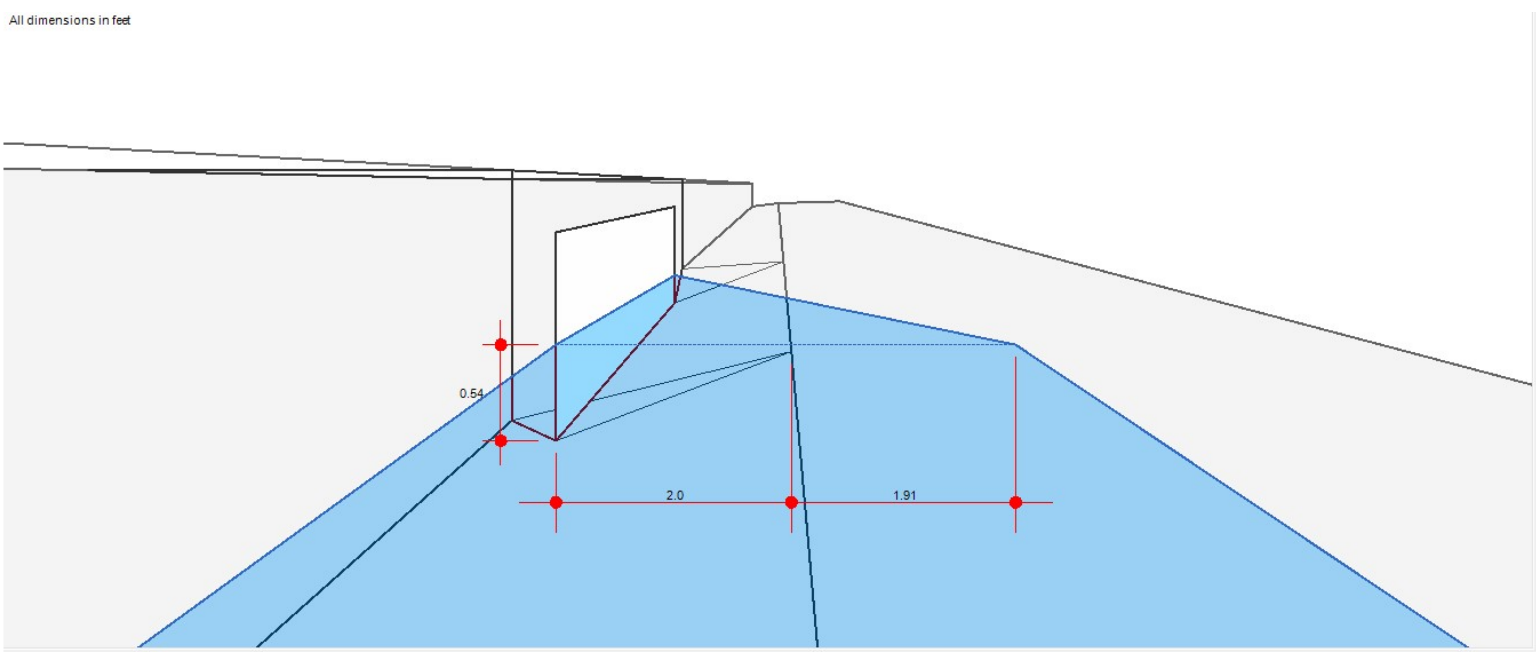
Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.58
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.58
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.58
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.38
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 3.63
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.25
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 1.00	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

B4 10YR

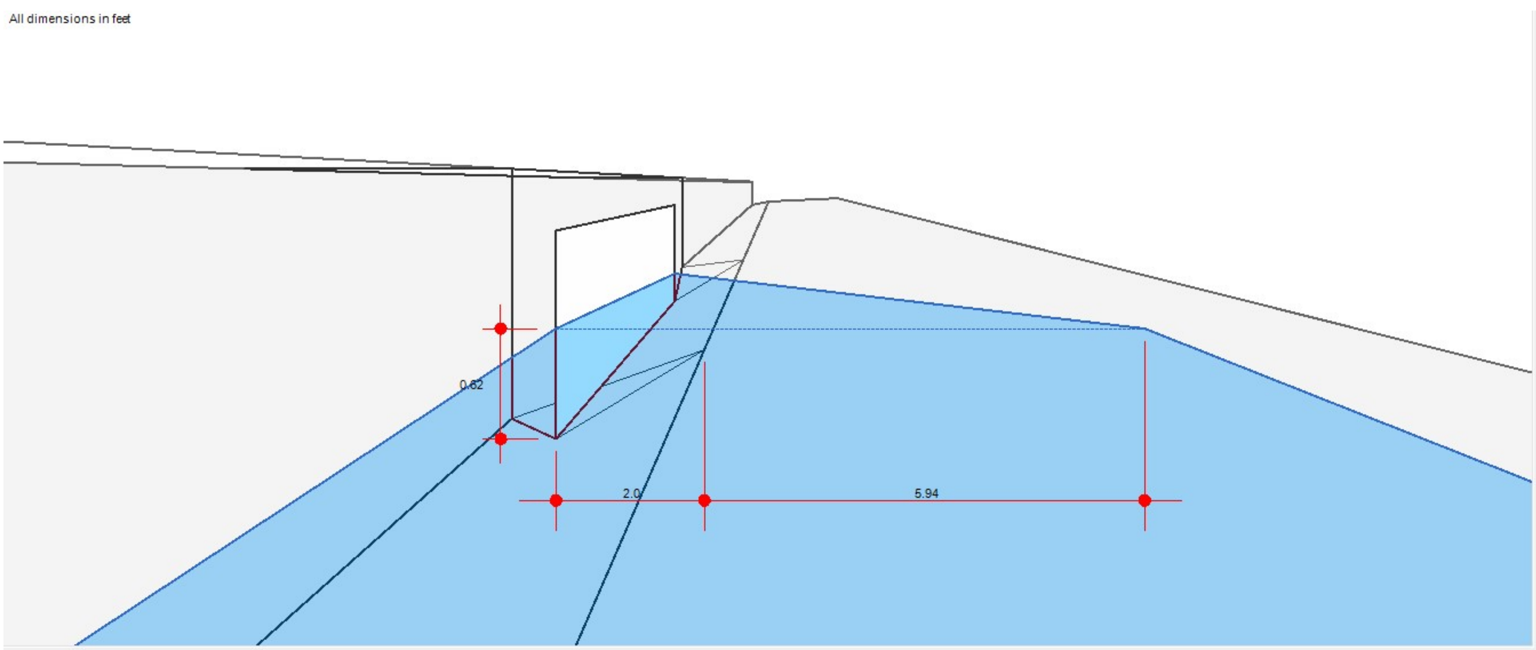
Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.63
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.63
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.63
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.45
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 3.91
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.26
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 1.00	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

B2 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.61
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.61
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.61
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.42
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 7.94
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 0.81
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

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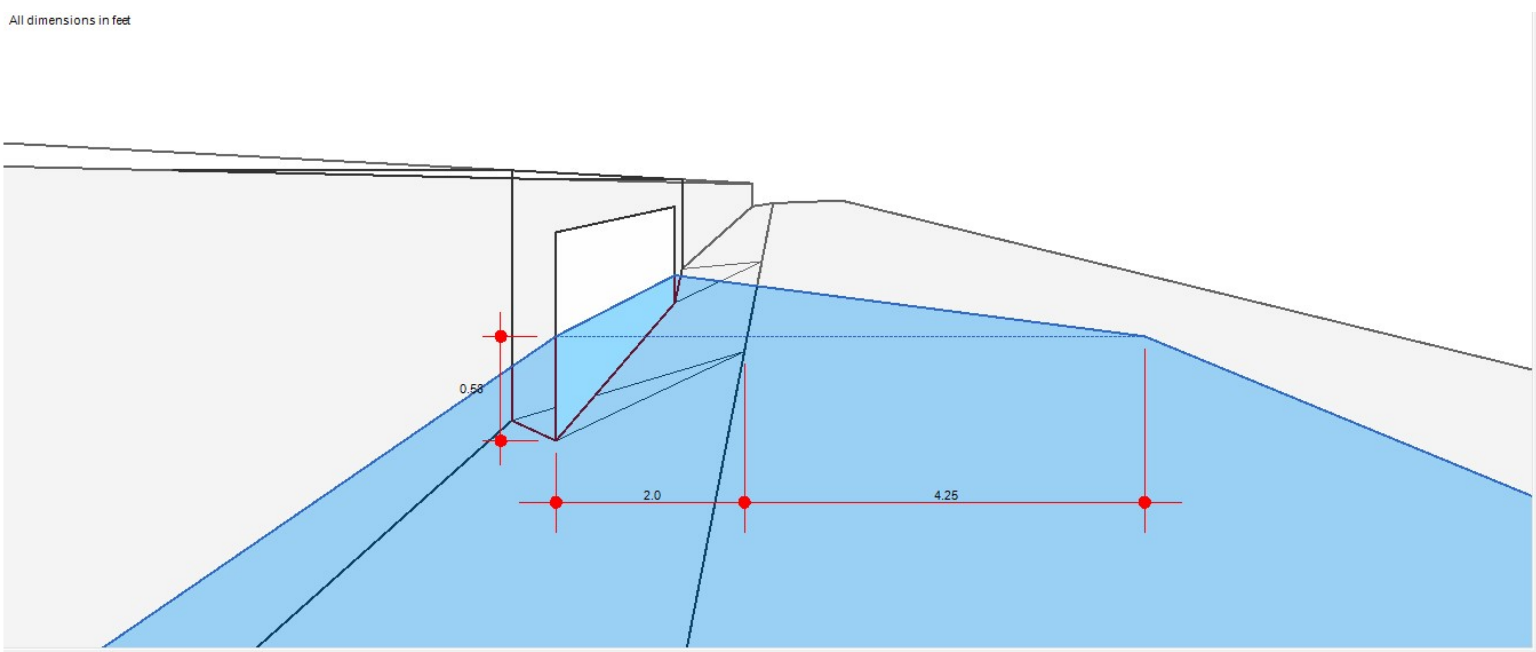
B1 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.68
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.68
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.68
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.01
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 6.25
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.32
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.30	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

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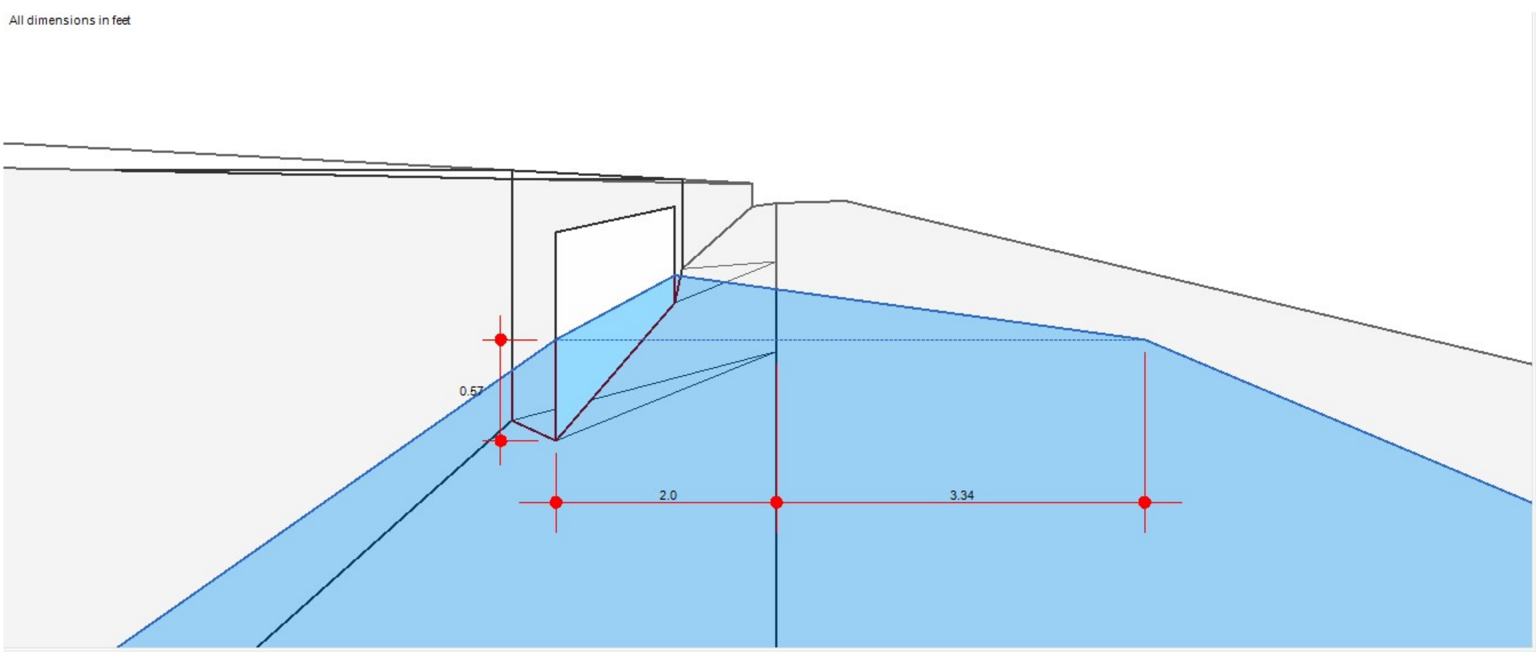
A6 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.86
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.86
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.86
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.79
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 5.34
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.09
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.80	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

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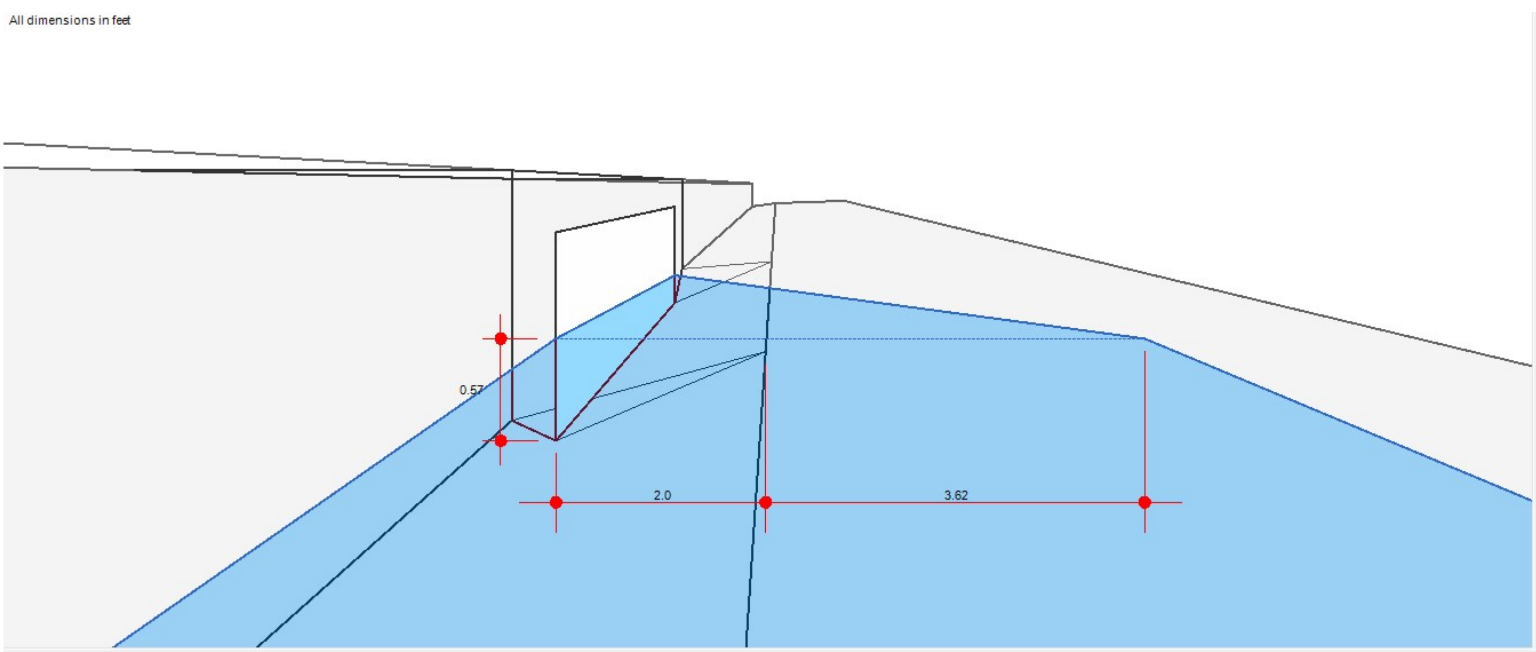
A5 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.93
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.93
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.93
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.86
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 5.62
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.11
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.80	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

A3 10YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

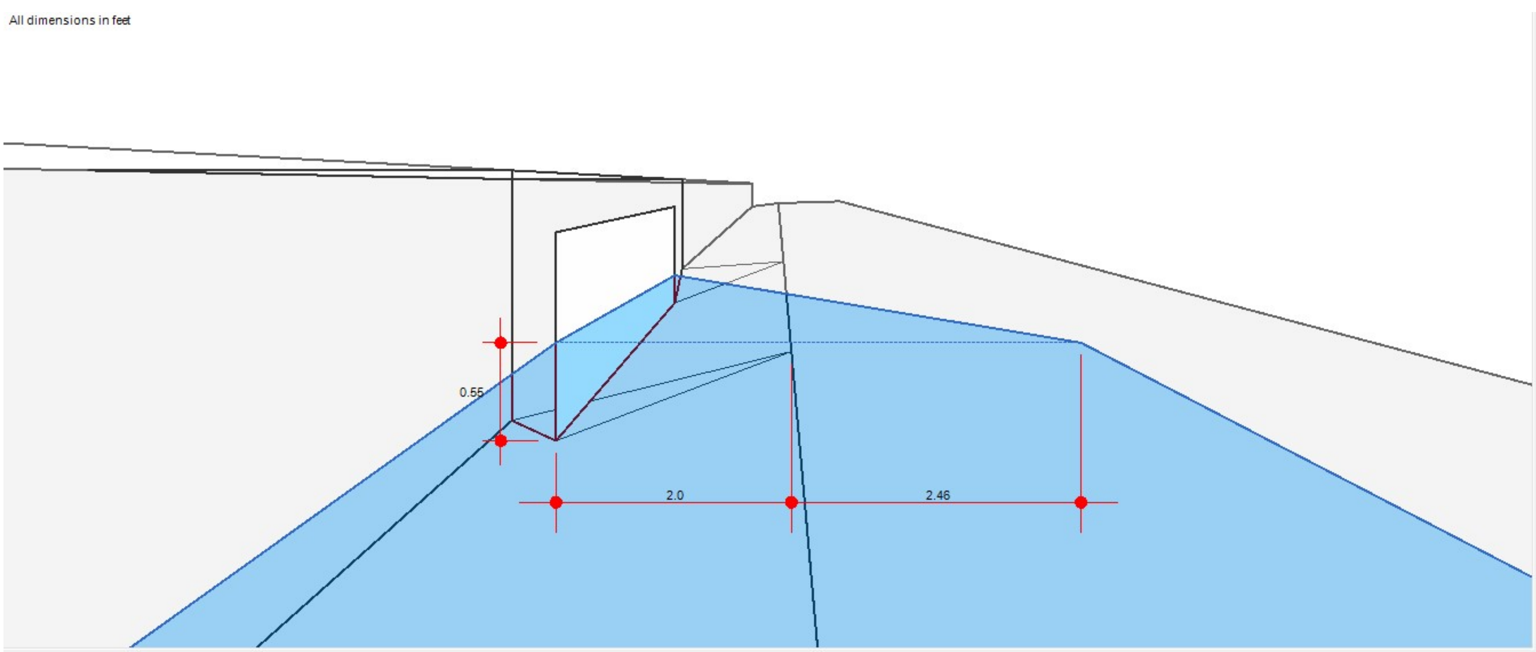
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	1.10
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.78

Highlighted

Q Total (cfs)	=	0.78
Q Capt (cfs)	=	0.78
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.58
Efficiency (%)	=	100
Gutter Spread (ft)	=	4.46
Gutter Vel (ft/s)	=	2.40
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

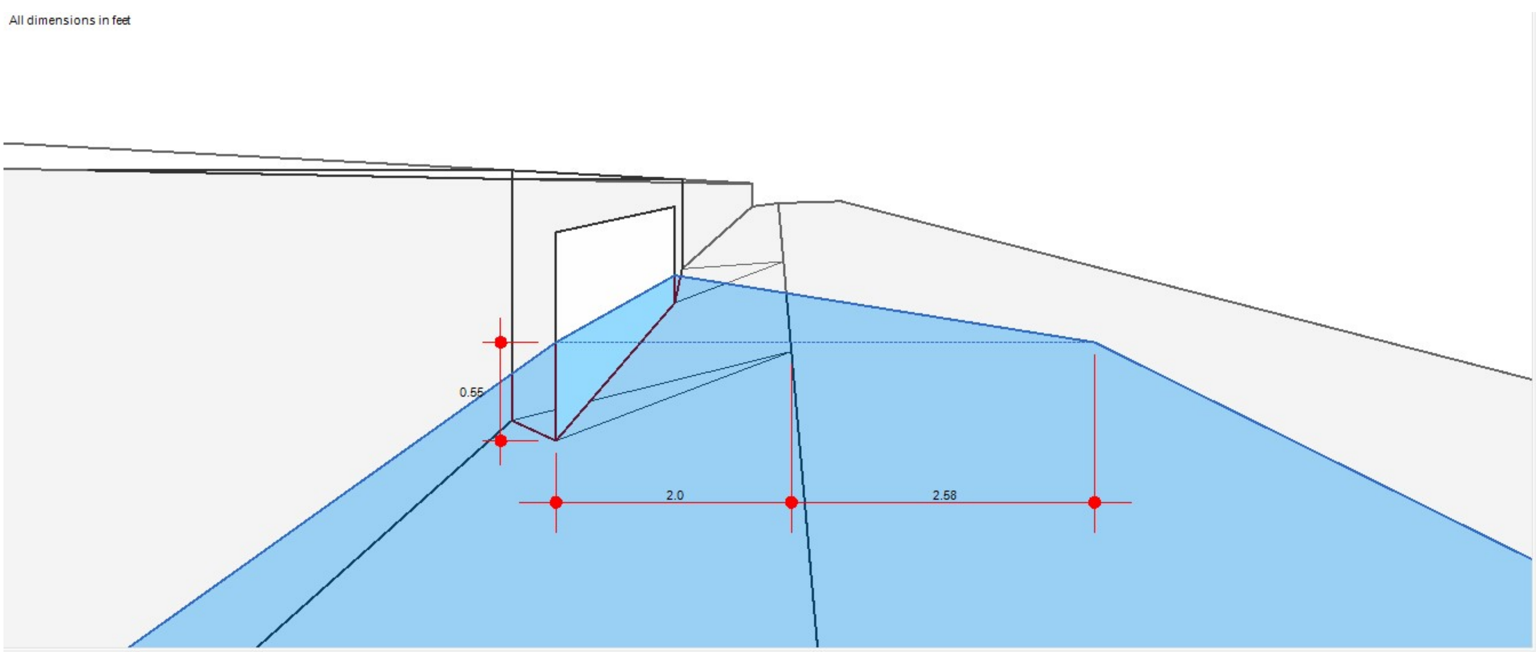


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

A4 10YR

Curb Inlet			**Calculations**		
Location	=	On grade	Compute by:		Known Q
Curb Length (ft)	=	7.00	Q (cfs)	=	0.77
Throat Height (in)	=	6.00			
Grate Area (sqft)	=	-0-	**Highlighted**		
Grate Width (ft)	=	-0-	Q Total (cfs)	=	0.77
Grate Length (ft)	=	-0-	Q Capt (cfs)	=	0.77
			Q Bypass (cfs)	=	-0-
Gutter			Depth at Inlet (in)	=	6.61
Slope, Sw (ft/ft)	=	0.083	Efficiency (%)	=	100
Slope, Sx (ft/ft)	=	0.020	Gutter Spread (ft)	=	4.58
Local Depr (in)	=	4.00	Gutter Vel (ft/s)	=	2.30
Gutter Width (ft)	=	2.00	Bypass Spread (ft)	=	-0-
Gutter Slope (%)	=	1.00	Bypass Depth (in)	=	-0-
Gutter n-value	=	0.016			

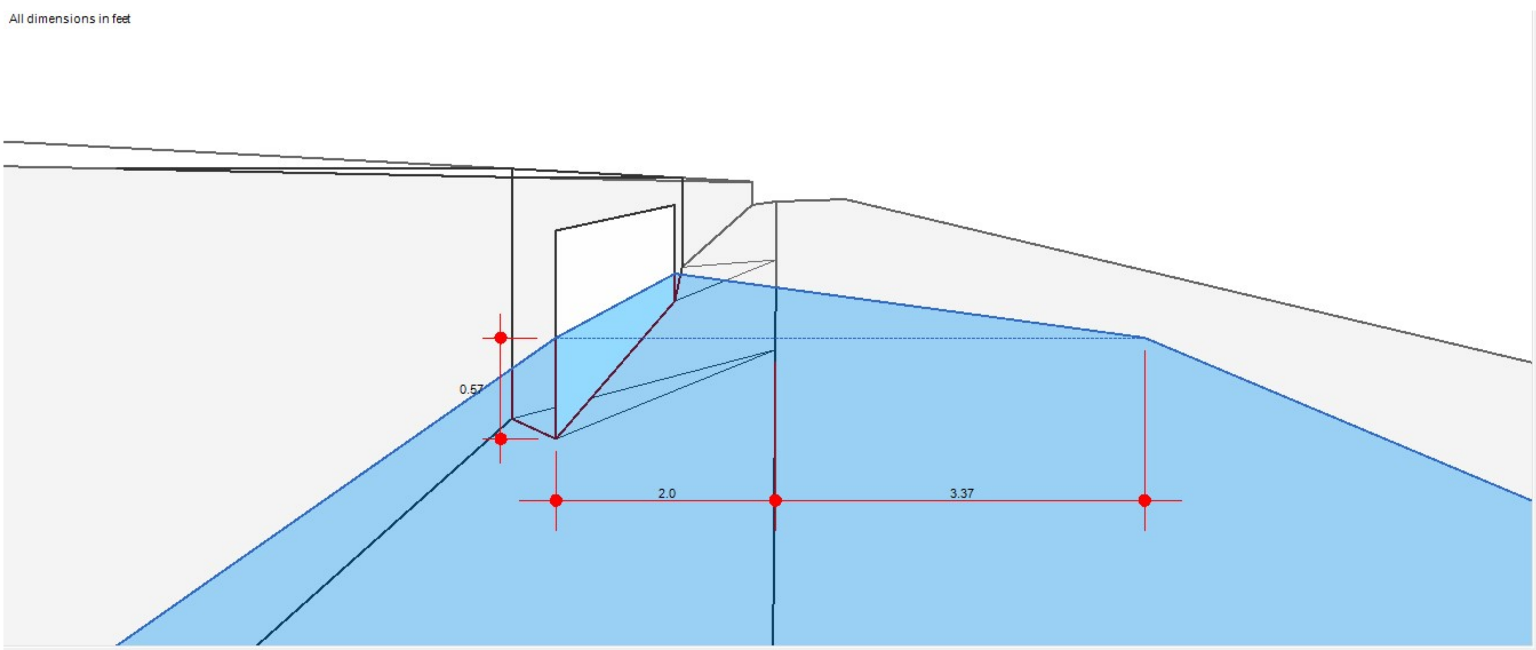


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

A2 10YR

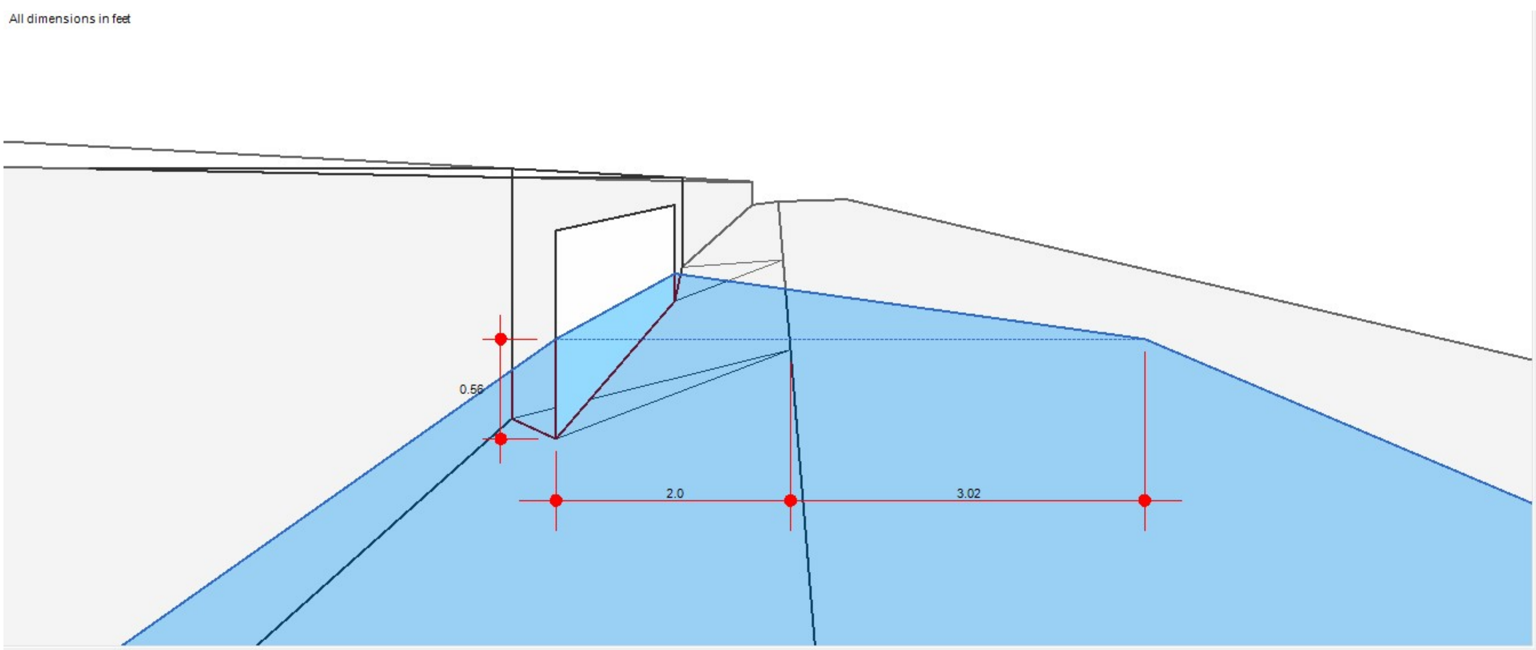
Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.75
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.75
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.75
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.80
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 5.37
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.81
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.60	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

A1 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.48
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.48
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.48
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.72
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 5.02
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.27
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.30	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

H3 10YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	14.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

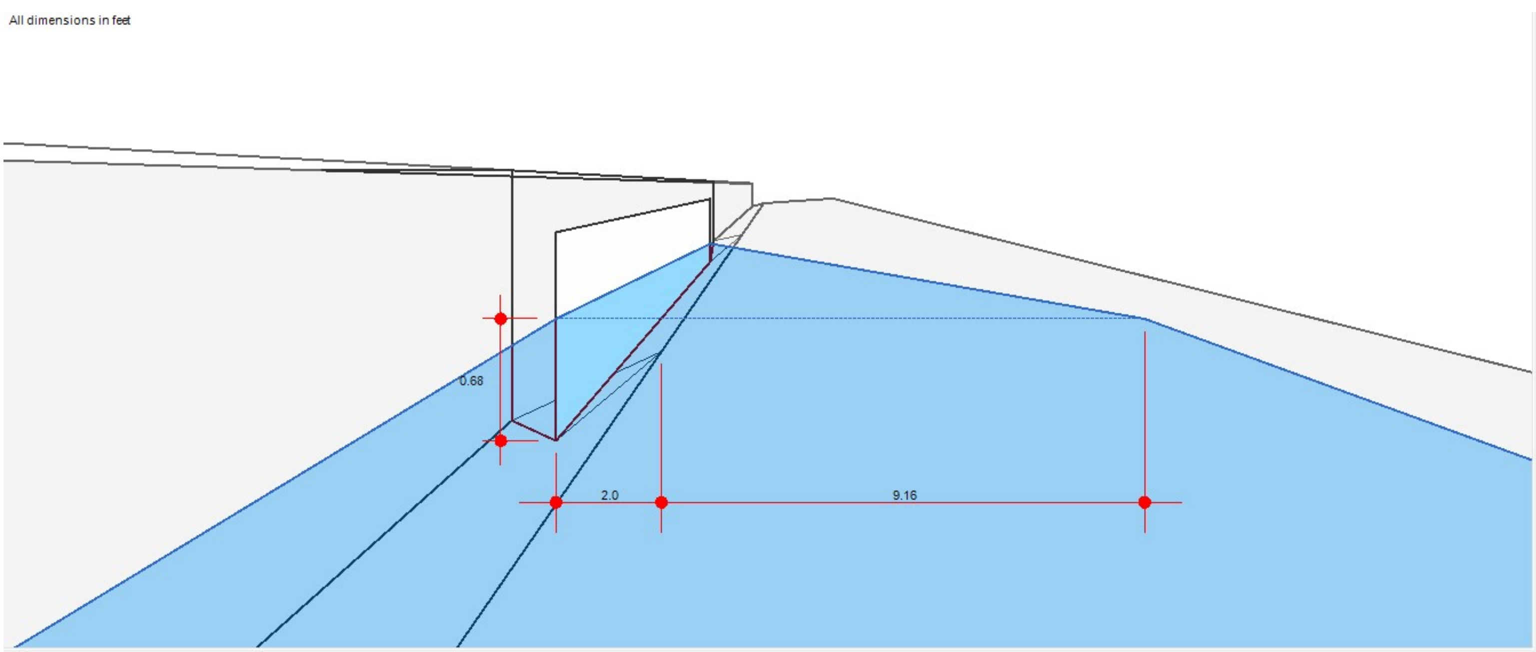
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.20
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	1.78

Highlighted

Q Total (cfs)	=	1.78
Q Capt (cfs)	=	1.78
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	8.19
Efficiency (%)	=	100
Gutter Spread (ft)	=	11.16
Gutter Vel (ft/s)	=	1.30
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

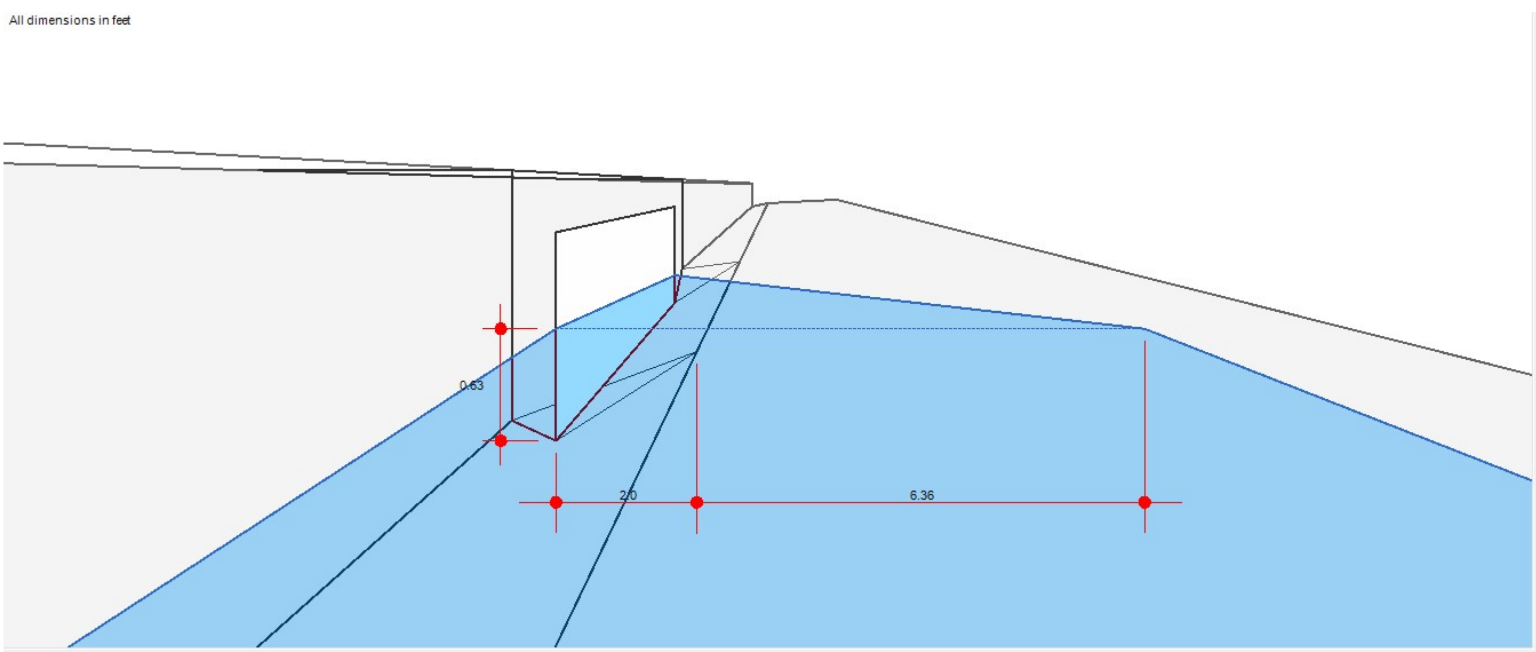


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

H4 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.66
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.66
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.66
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.52
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 8.36
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.01
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.60	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

H1 10YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	14.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

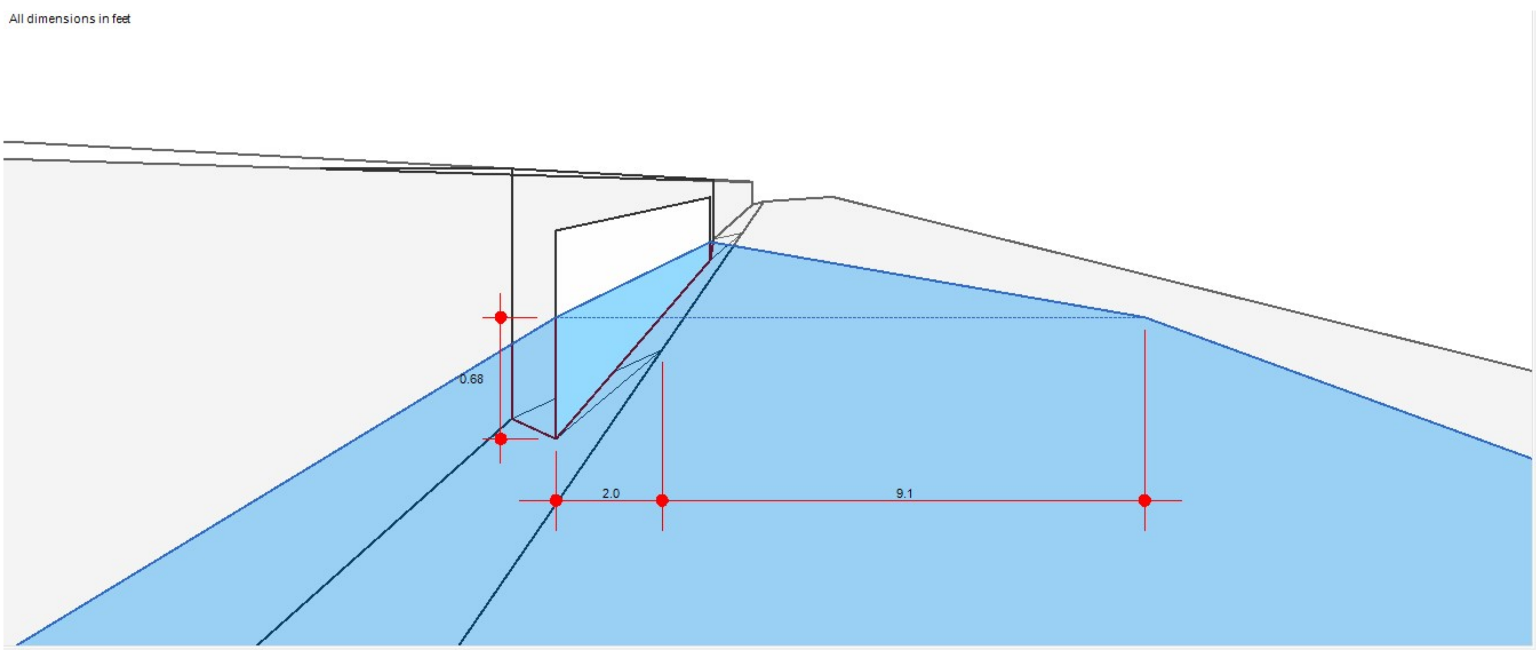
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.20
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	1.76

Highlighted

Q Total (cfs)	=	1.76
Q Capt (cfs)	=	1.76
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	8.17
Efficiency (%)	=	100
Gutter Spread (ft)	=	11.10
Gutter Vel (ft/s)	=	1.30
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

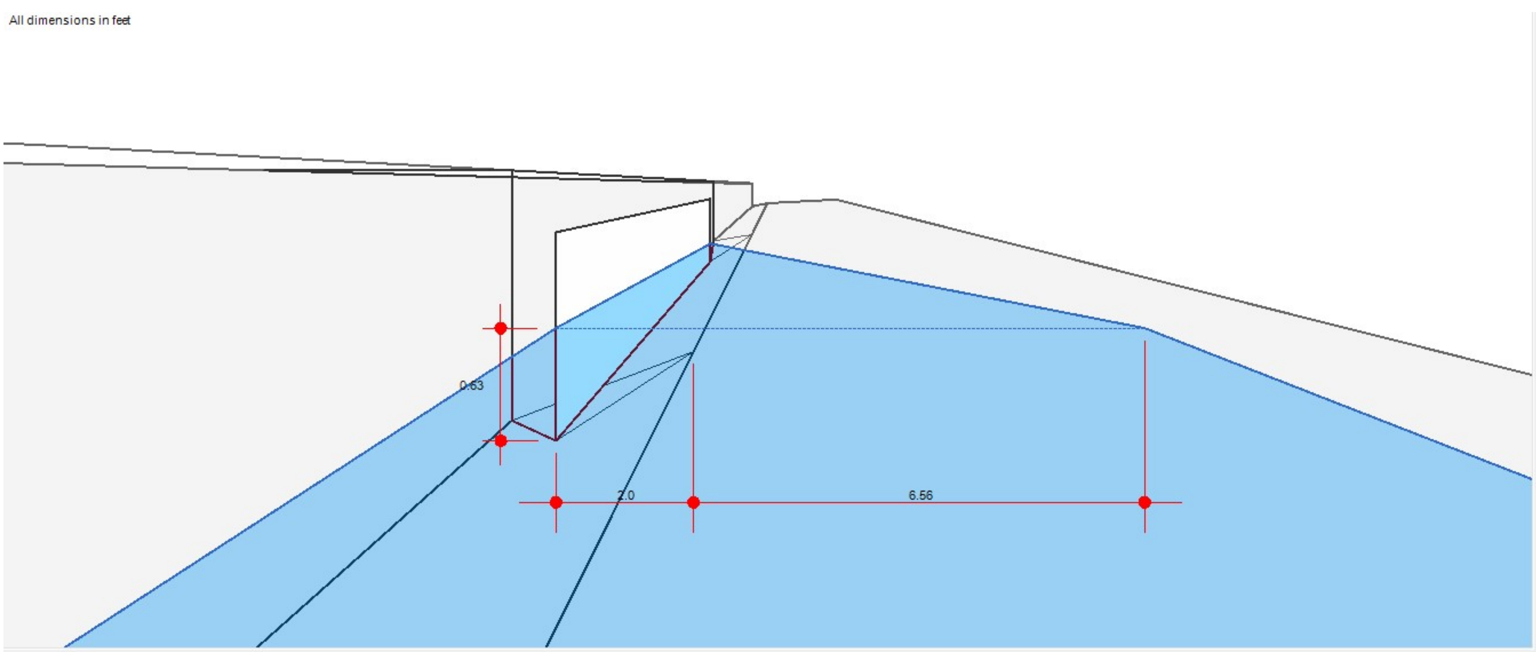


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

H2 10YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 14.00	Q (cfs)	= 1.74
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.74
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.74
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.57
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 8.56
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.03
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.60	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

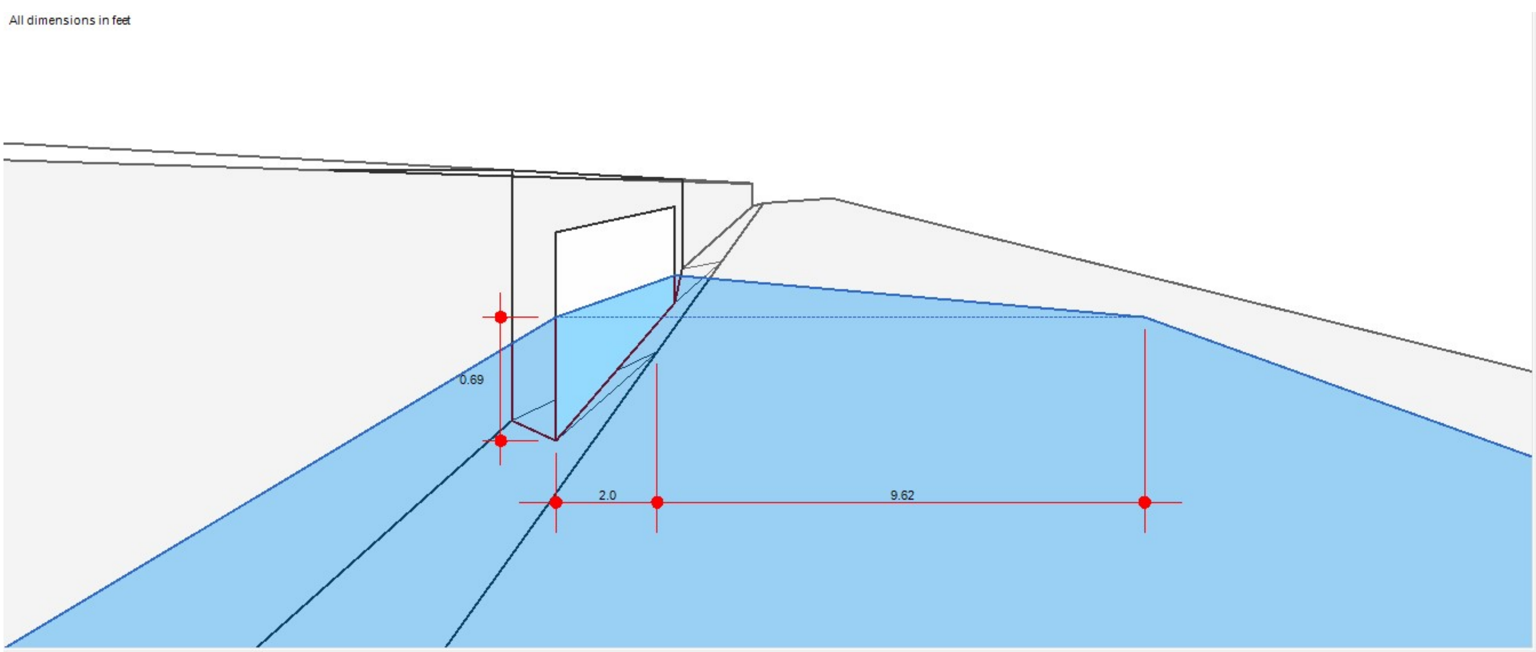


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

R1 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.70
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.70
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.70
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.30
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 11.62
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.15
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.013		



Inlet Report

V1 25YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

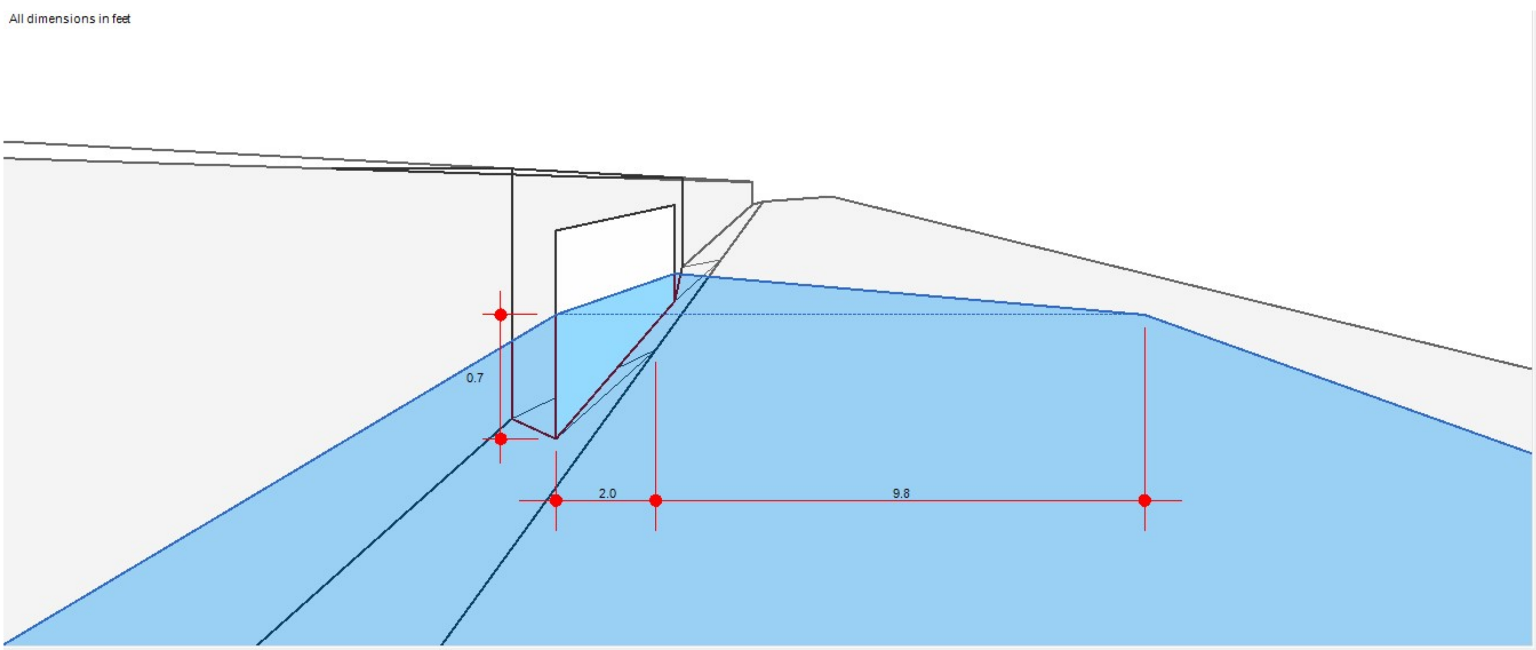
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations

Compute by:		Known Q
Q (cfs)	=	1.76

Highlighted

Q Total (cfs)	=	1.76
Q Capt (cfs)	=	1.76
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	8.34
Efficiency (%)	=	100
Gutter Spread (ft)	=	11.80
Gutter Vel (ft/s)	=	1.16
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. | Thursday, May 16 2024

V2 25YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

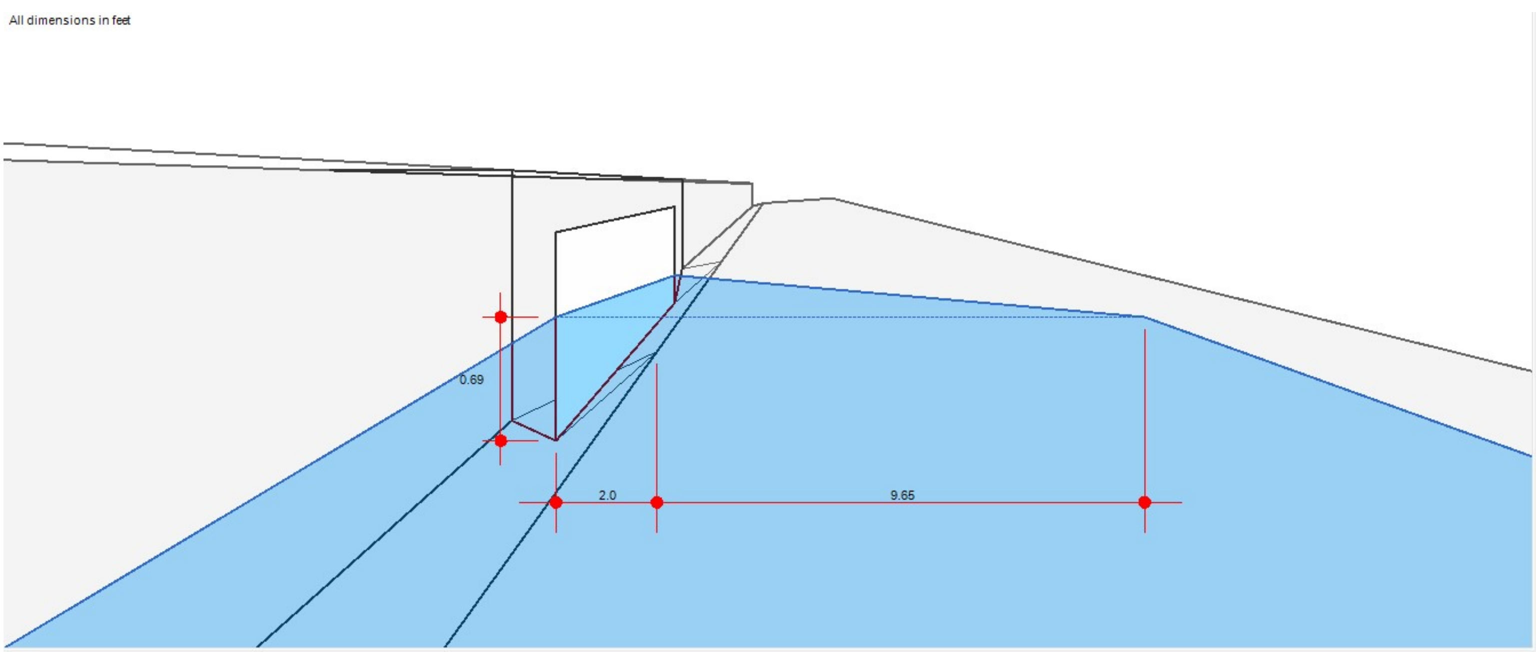
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations

Compute by:		Known Q
Q (cfs)	=	1.71

Highlighted

Q Total (cfs)	=	1.71
Q Capt (cfs)	=	1.71
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	8.31
Efficiency (%)	=	100
Gutter Spread (ft)	=	11.65
Gutter Vel (ft/s)	=	1.15
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

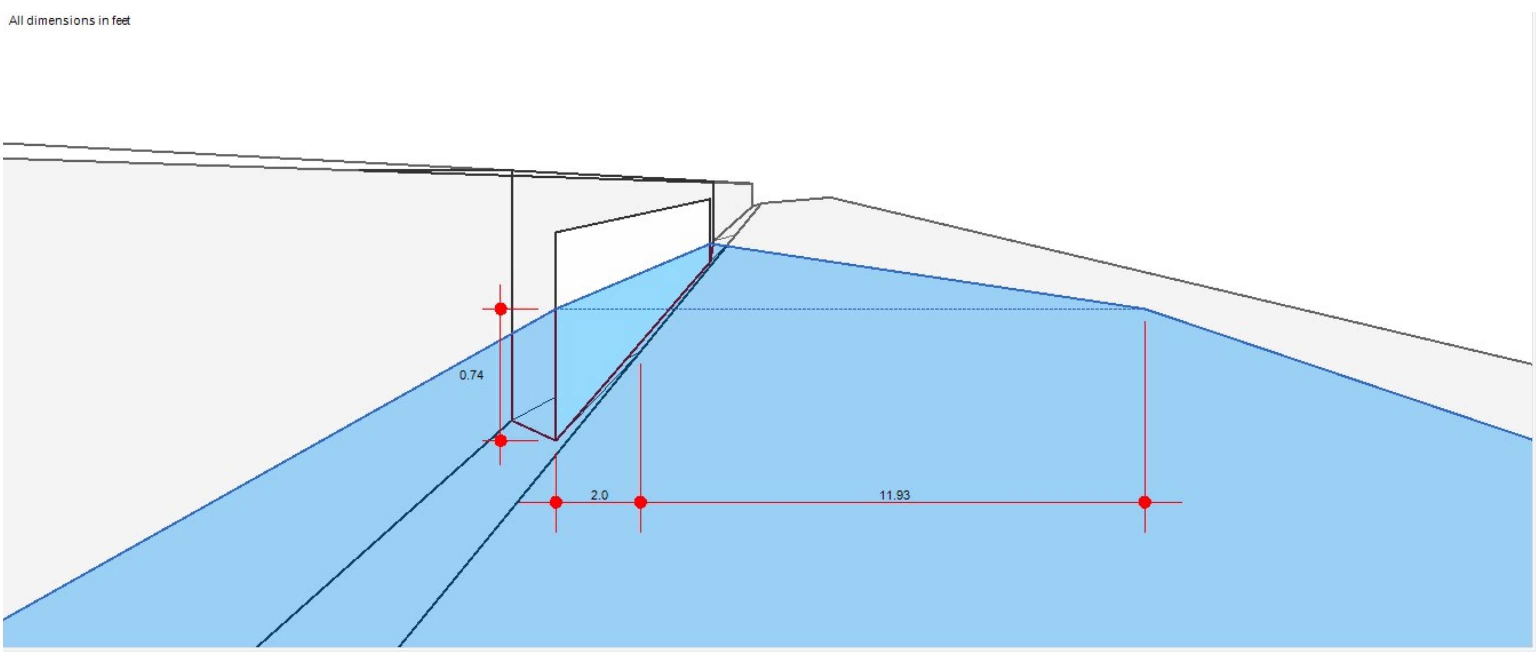


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V3 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 14.00	Q (cfs)	= 2.60
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 2.60
Grate Length (ft)	= -0-	Q Capt (cfs)	= 2.60
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.86
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 13.93
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.26
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.013		

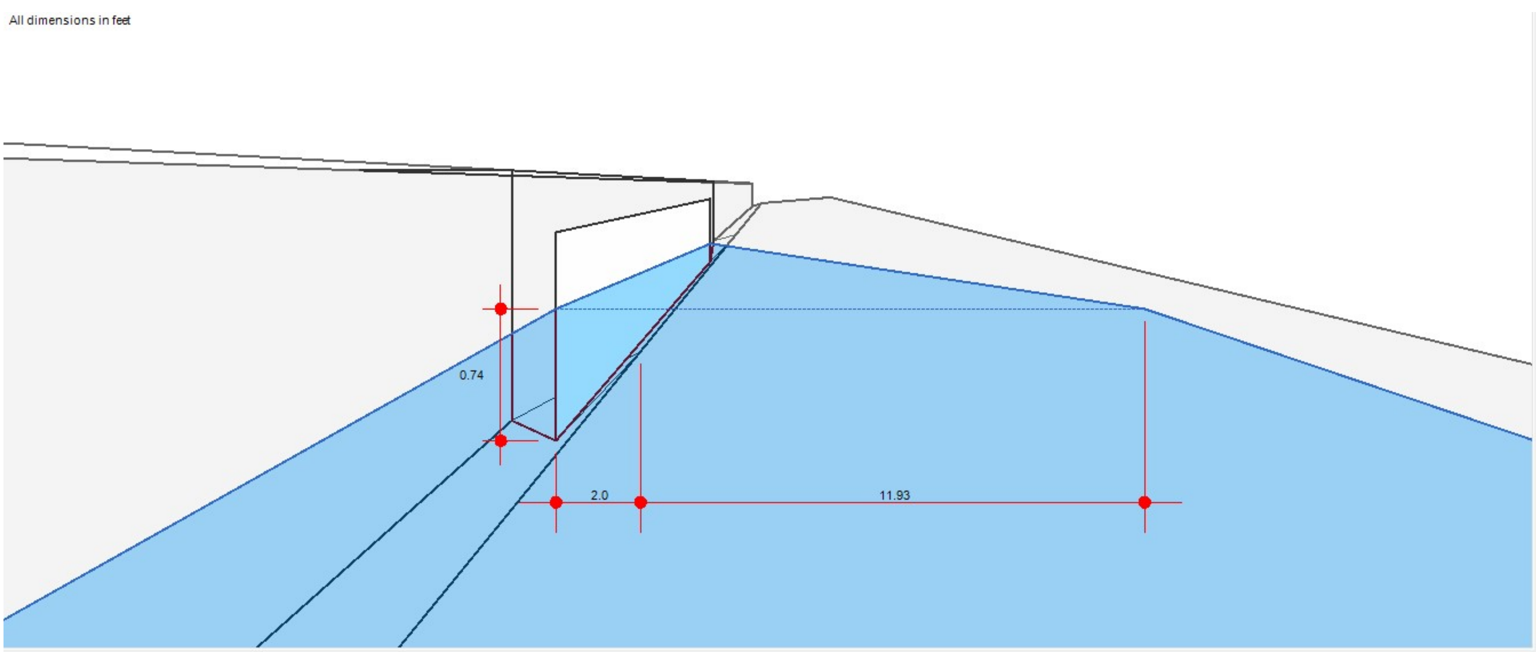


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V4 25YR

Curb Inlet			**Calculations**		
Location	=	On grade	Compute by:		Known Q
Curb Length (ft)	=	14.00	Q (cfs)	=	2.60
Throat Height (in)	=	6.00			
Grate Area (sqft)	=	-0-	**Highlighted**		
Grate Width (ft)	=	-0-	Q Total (cfs)	=	2.60
Grate Length (ft)	=	-0-	Q Capt (cfs)	=	2.60
			Q Bypass (cfs)	=	-0-
Gutter			Depth at Inlet (in)	=	8.86
Slope, Sw (ft/ft)	=	0.083	Efficiency (%)	=	100
Slope, Sx (ft/ft)	=	0.020	Gutter Spread (ft)	=	13.93
Local Depr (in)	=	4.00	Gutter Vel (ft/s)	=	1.26
Gutter Width (ft)	=	2.00	Bypass Spread (ft)	=	-0-
Gutter Slope (%)	=	0.10	Bypass Depth (in)	=	-0-
Gutter n-value	=	0.013			

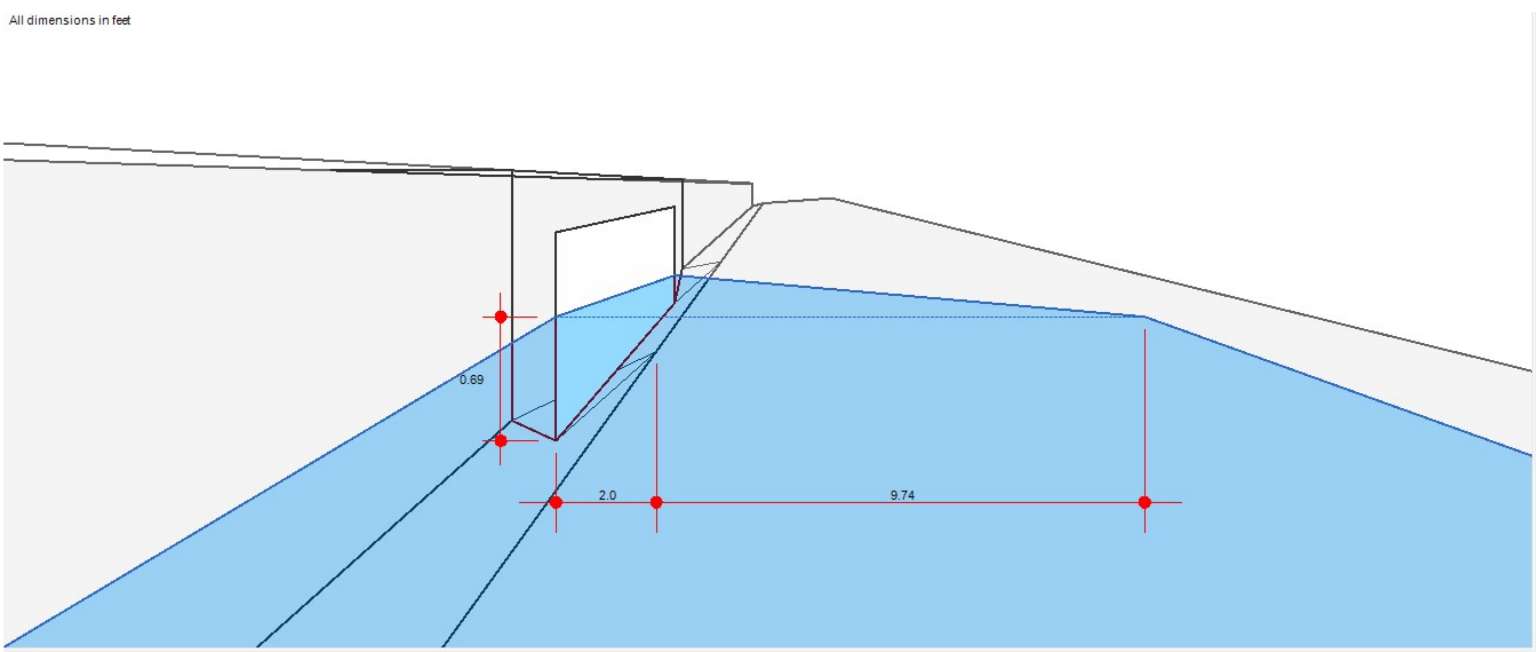


Inlet Report

V5 25YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-
Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations		
Compute by:		Known Q
Q (cfs)	=	1.74
Highlighted		
Q Total (cfs)	=	1.74
Q Capt (cfs)	=	1.74
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	8.33
Efficiency (%)	=	100
Gutter Spread (ft)	=	11.74
Gutter Vel (ft/s)	=	1.16
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

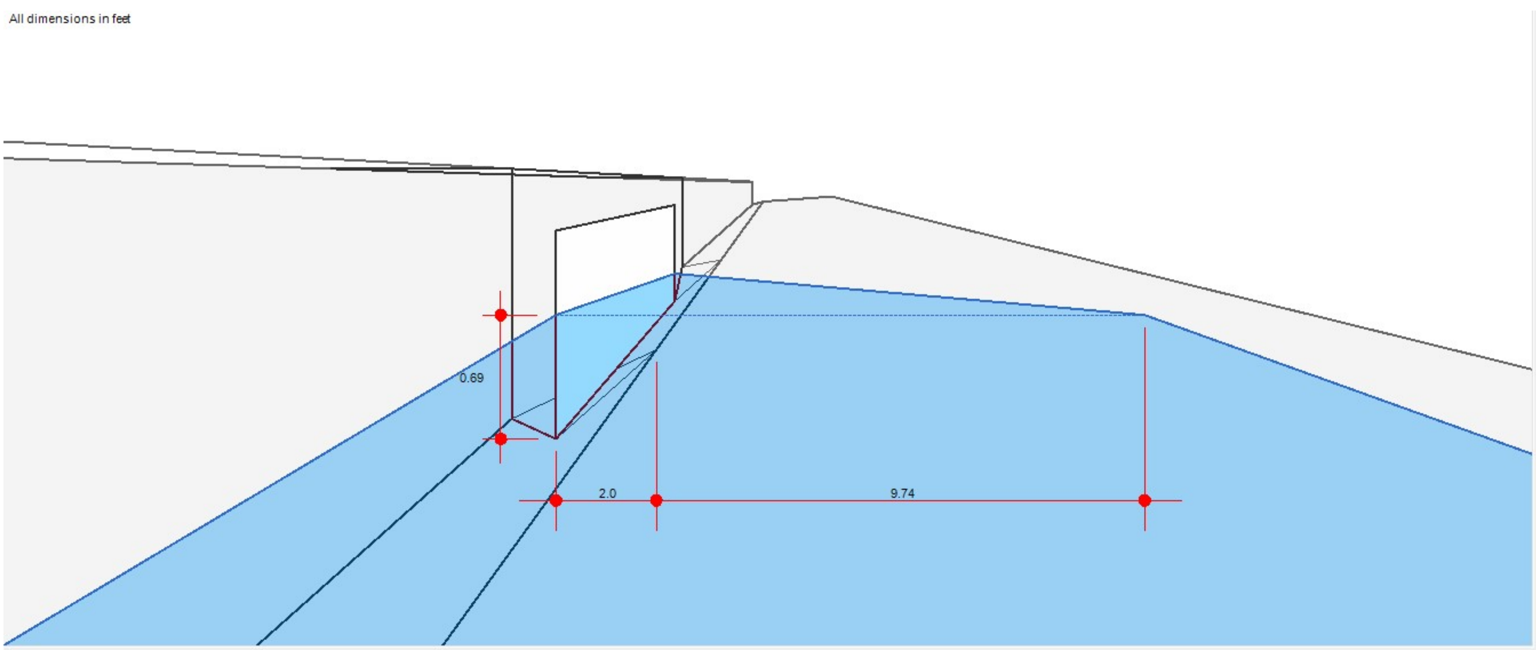


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. — Thursday, May 16 2024

V6 25YR

Curb Inlet		Calculations	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.74
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.74
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.74
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.33
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 11.74
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.16
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.013		

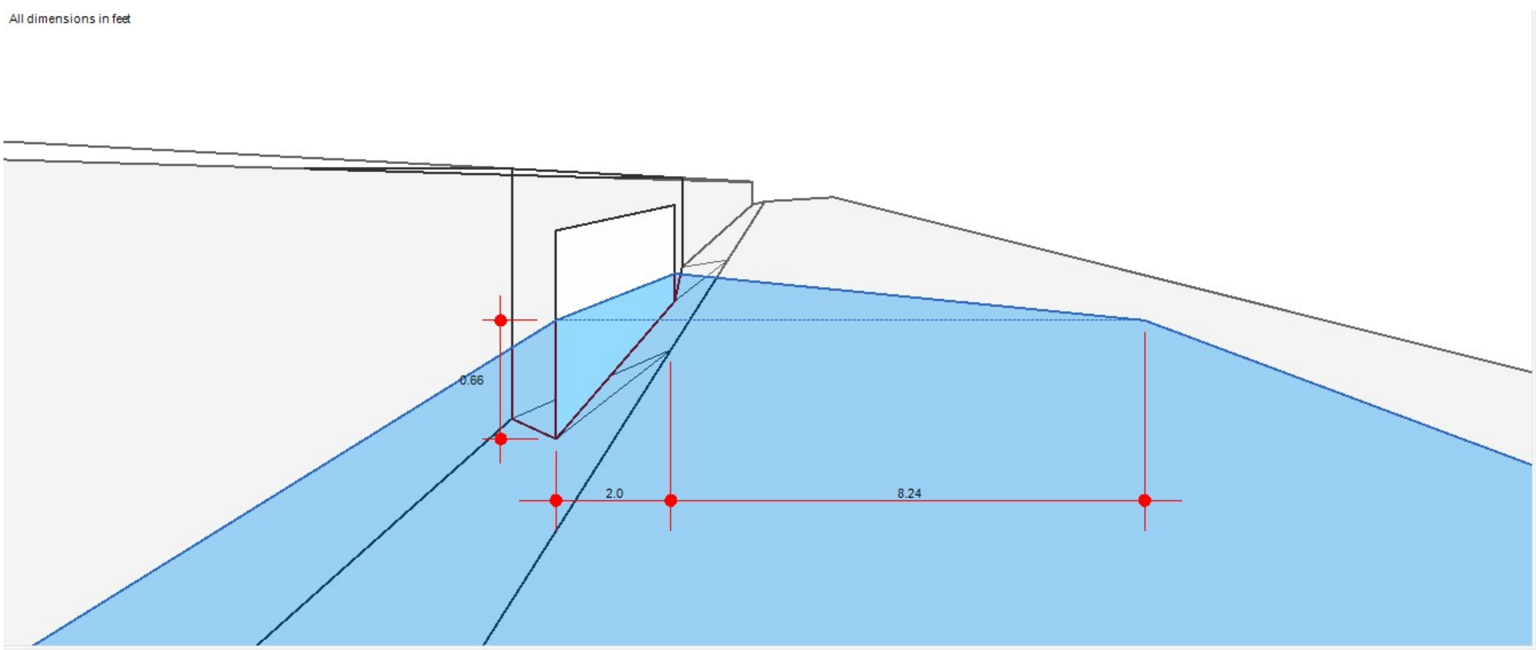


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V7 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.28
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.28
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.28
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.97
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 10.24
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.09
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.013		



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. | Thursday, May 16 2024

V8 25YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

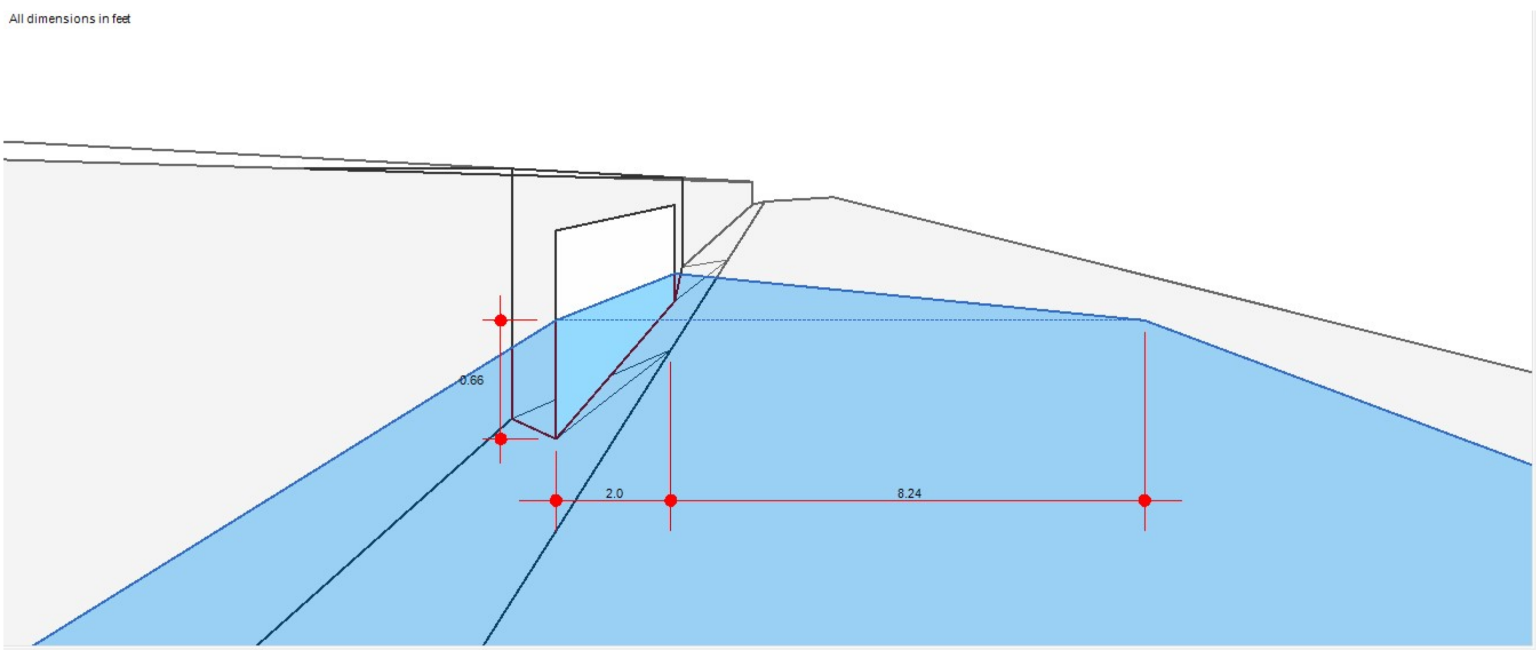
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations

Compute by:		Known Q
Q (cfs)	=	1.28

Highlighted

Q Total (cfs)	=	1.28
Q Capt (cfs)	=	1.28
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.97
Efficiency (%)	=	100
Gutter Spread (ft)	=	10.24
Gutter Vel (ft/s)	=	1.09
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

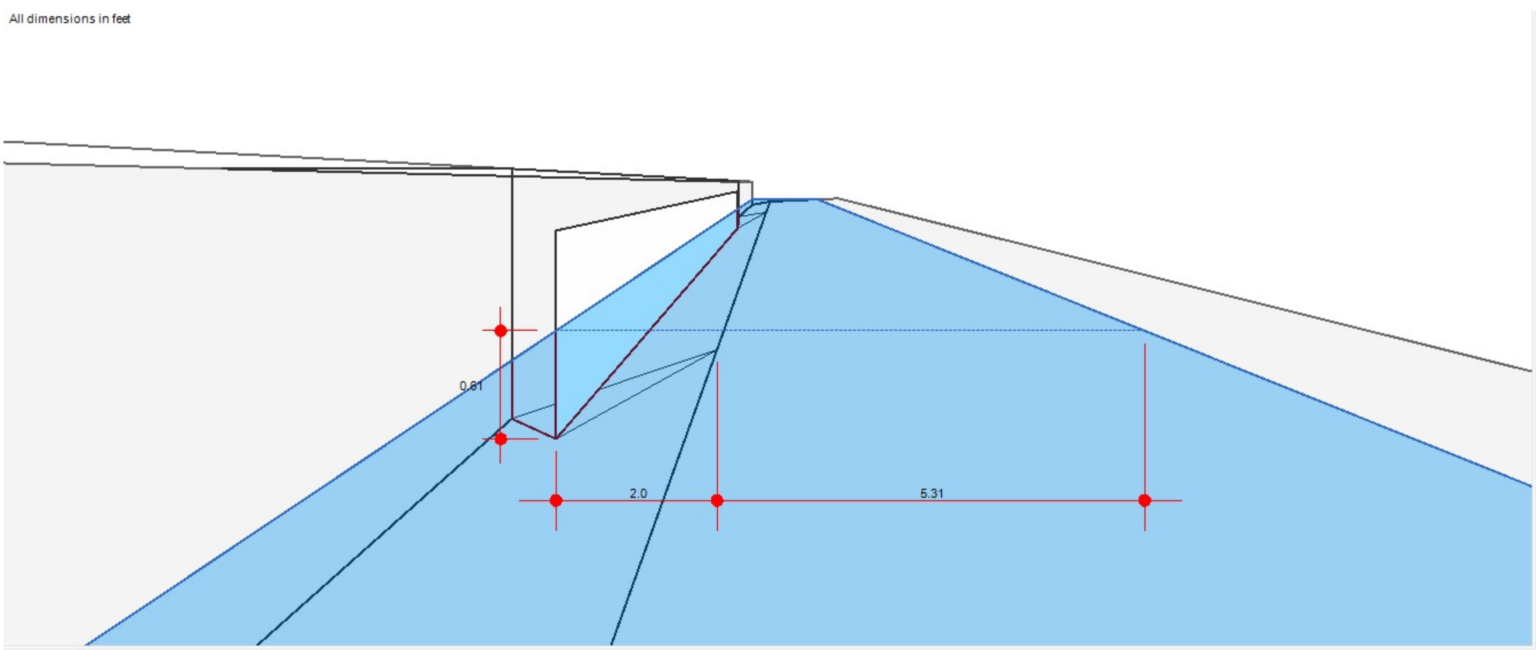
R2 25YR

Curb Inlet		
Location	=	Sag
Curb Length (ft)	=	28.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	-0-
Gutter n-value	=	-0-

Calculations		
Compute by:		Known Q
Q (cfs)	=	4.07

Highlighted		
Q Total (cfs)	=	4.07
Q Capt (cfs)	=	4.07
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.27
Efficiency (%)	=	100
Gutter Spread (ft)	=	7.31
Gutter Vel (ft/s)	=	-0-
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

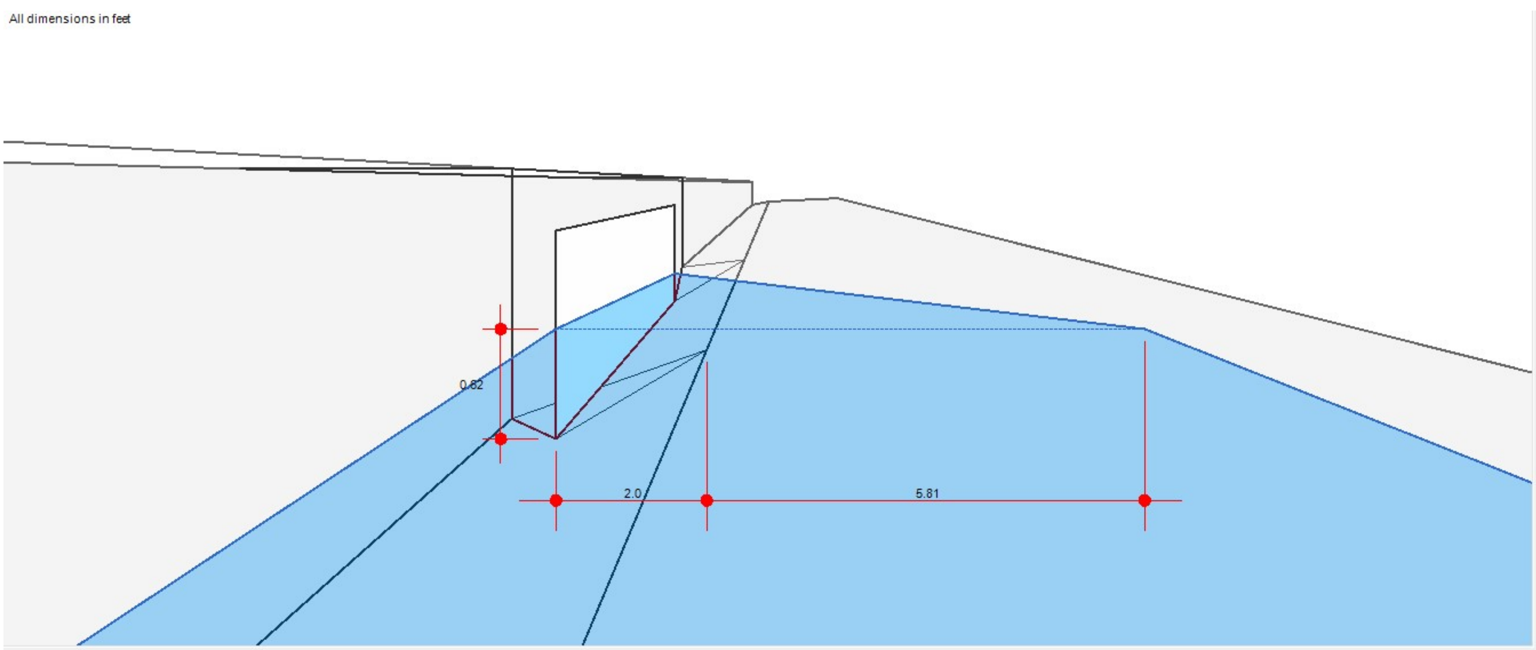


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

F3 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.87
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.87
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.87
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.39
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 7.81
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.54
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 1.00	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

C6 25YR

Curb Inlet

Location	= On grade
Curb Length (ft)	= 7.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

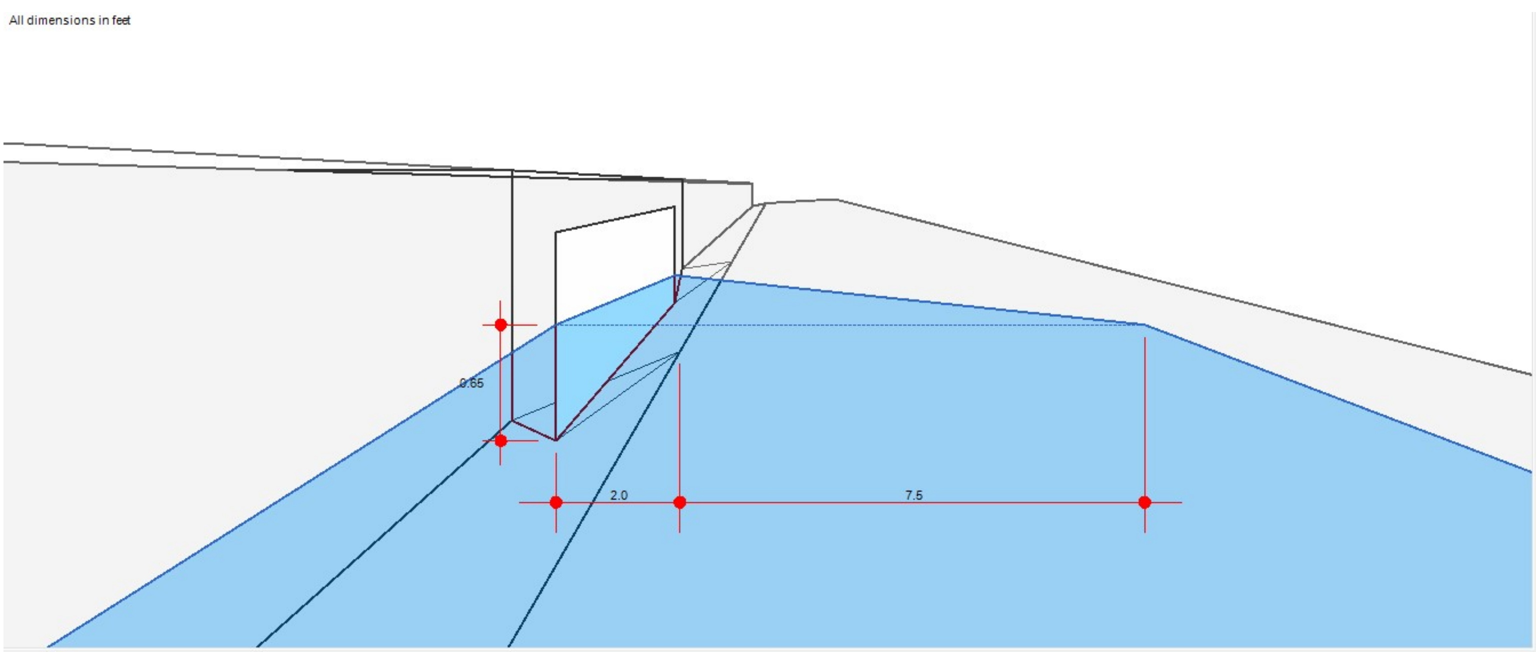
Slope, Sw (ft/ft)	= 0.083
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 4.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 0.30
Gutter n-value	= 0.016

Calculations

Compute by:	Known Q
Q (cfs)	= 1.53

Highlighted

Q Total (cfs)	= 1.53
Q Capt (cfs)	= 1.53
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 7.79
Efficiency (%)	= 100
Gutter Spread (ft)	= 9.50
Gutter Vel (ft/s)	= 1.49
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

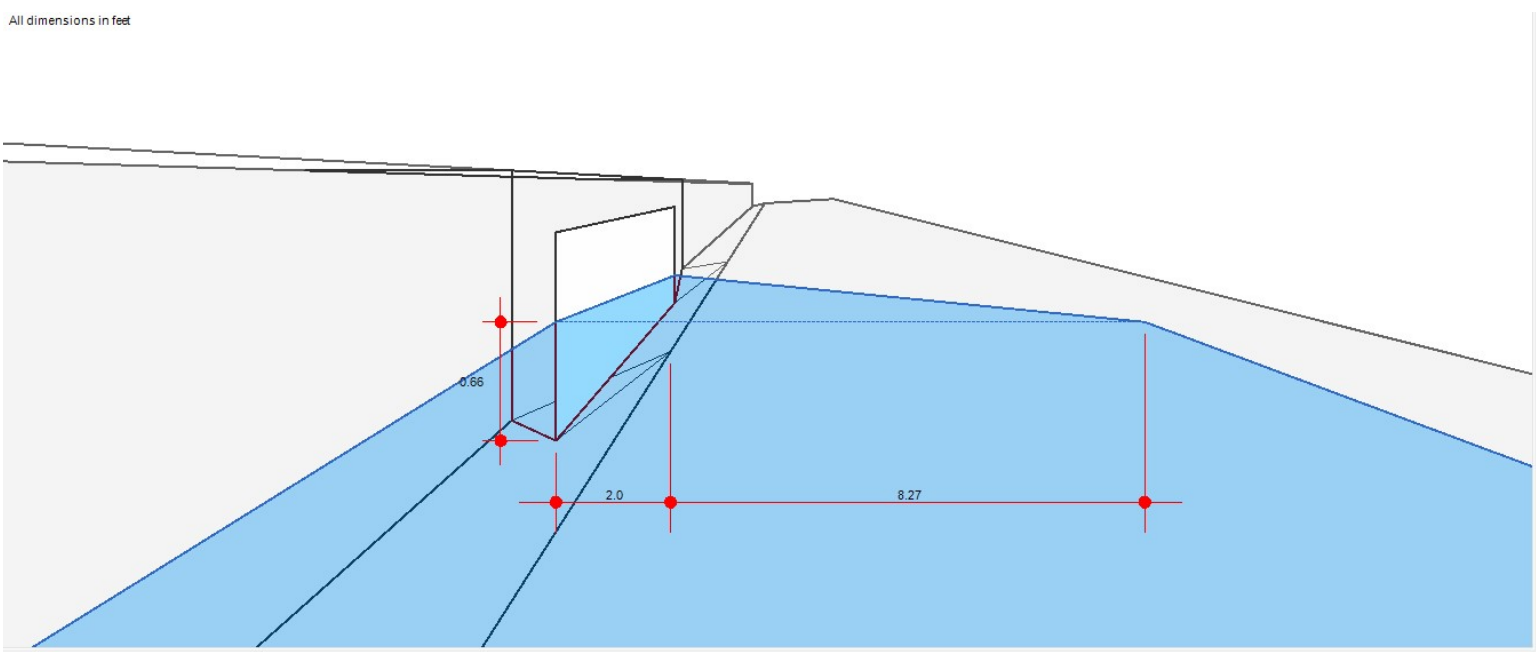


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

C5 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.48
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.48
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.48
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.98
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 10.27
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.25
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.20	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

F1 25YR

Curb Inlet

Location	= Sag
Curb Length (ft)	= 7.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

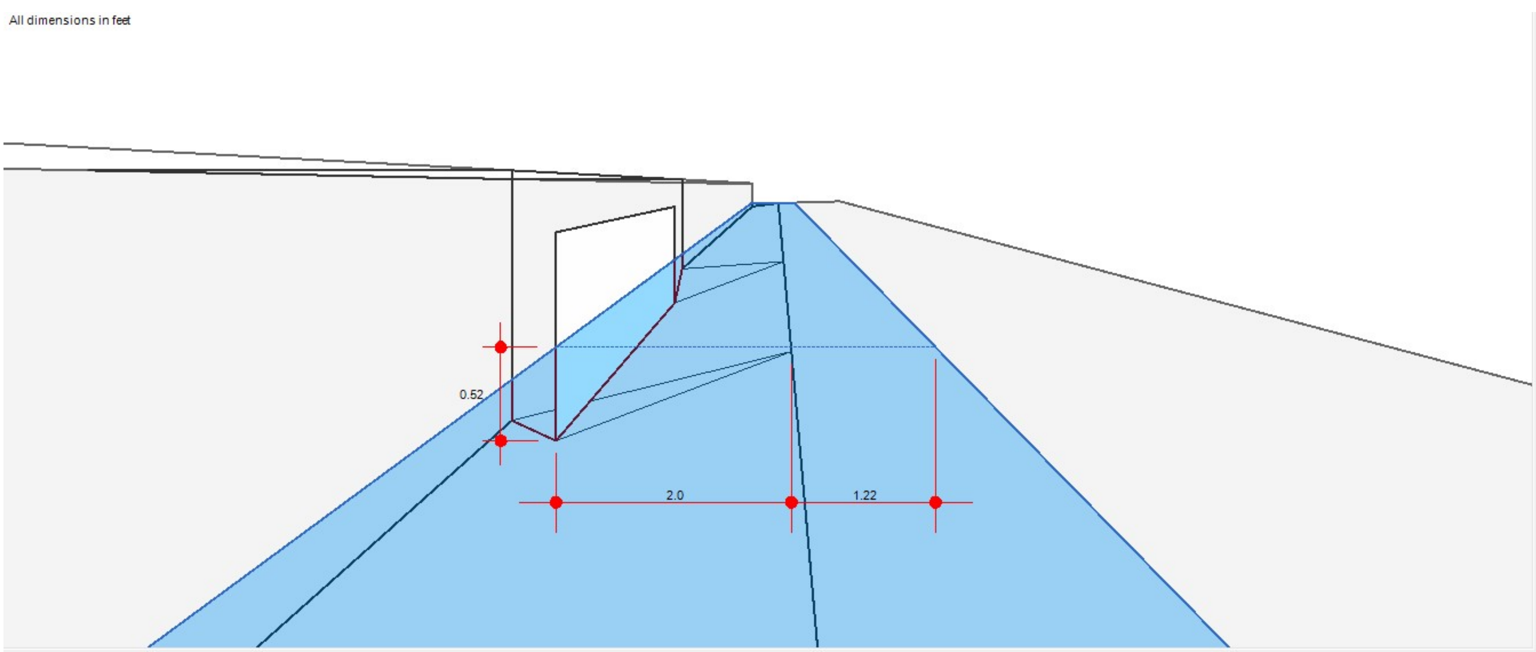
Slope, Sw (ft/ft)	= 0.083
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 4.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= -0-
Gutter n-value	= -0-

Calculations

Compute by:	Known Q
Q (cfs)	= 0.40

Highlighted

Q Total (cfs)	= 0.40
Q Capt (cfs)	= 0.40
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 6.29
Efficiency (%)	= 100
Gutter Spread (ft)	= 3.22
Gutter Vel (ft/s)	= 1.25
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Inlet Report

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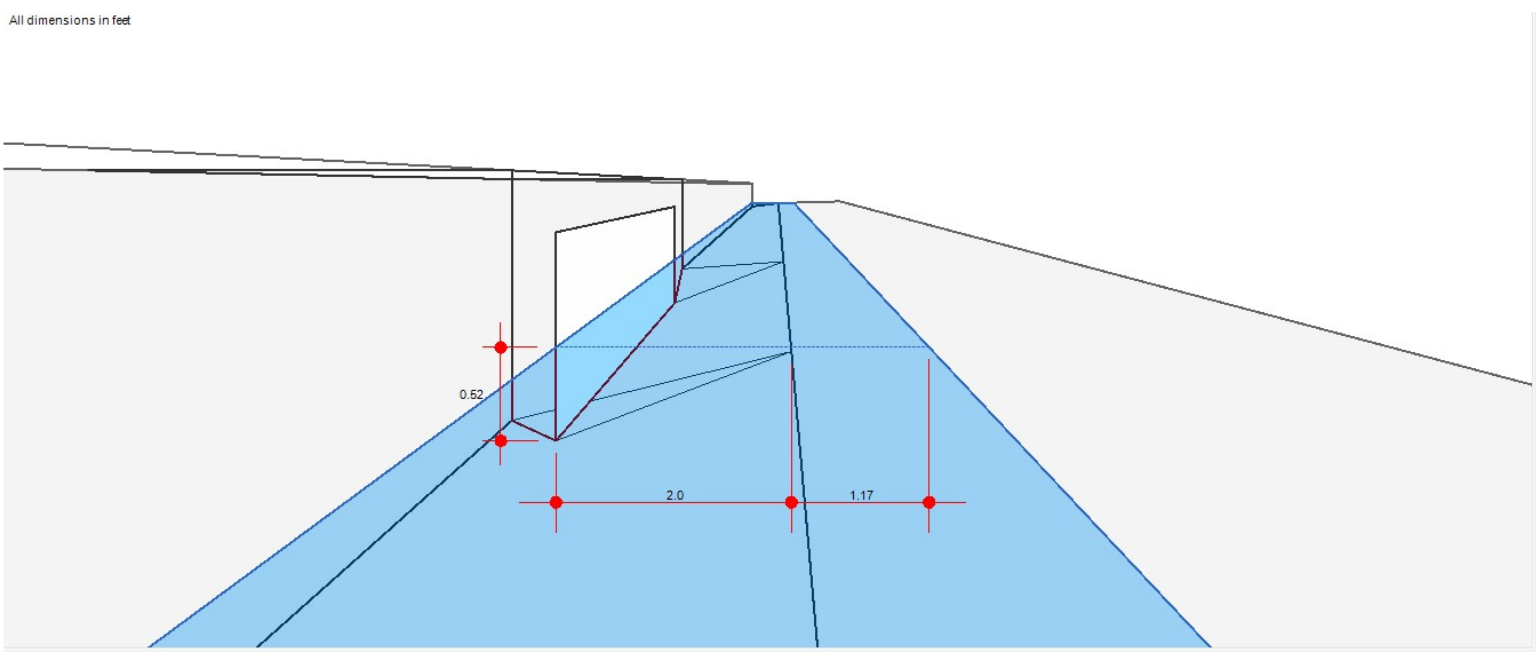
F2 25YR

Curb Inlet	
Location	= Sag
Curb Length (ft)	= 7.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter	
Slope, Sw (ft/ft)	= 0.083
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 4.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= -0-
Gutter n-value	= -0-

Calculations	
Compute by:	Known Q
Q (cfs)	= 0.39

Highlighted	
Q Total (cfs)	= 0.39
Q Capt (cfs)	= 0.39
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 6.27
Efficiency (%)	= 100
Gutter Spread (ft)	= 3.17
Gutter Vel (ft/s)	= 1.25
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

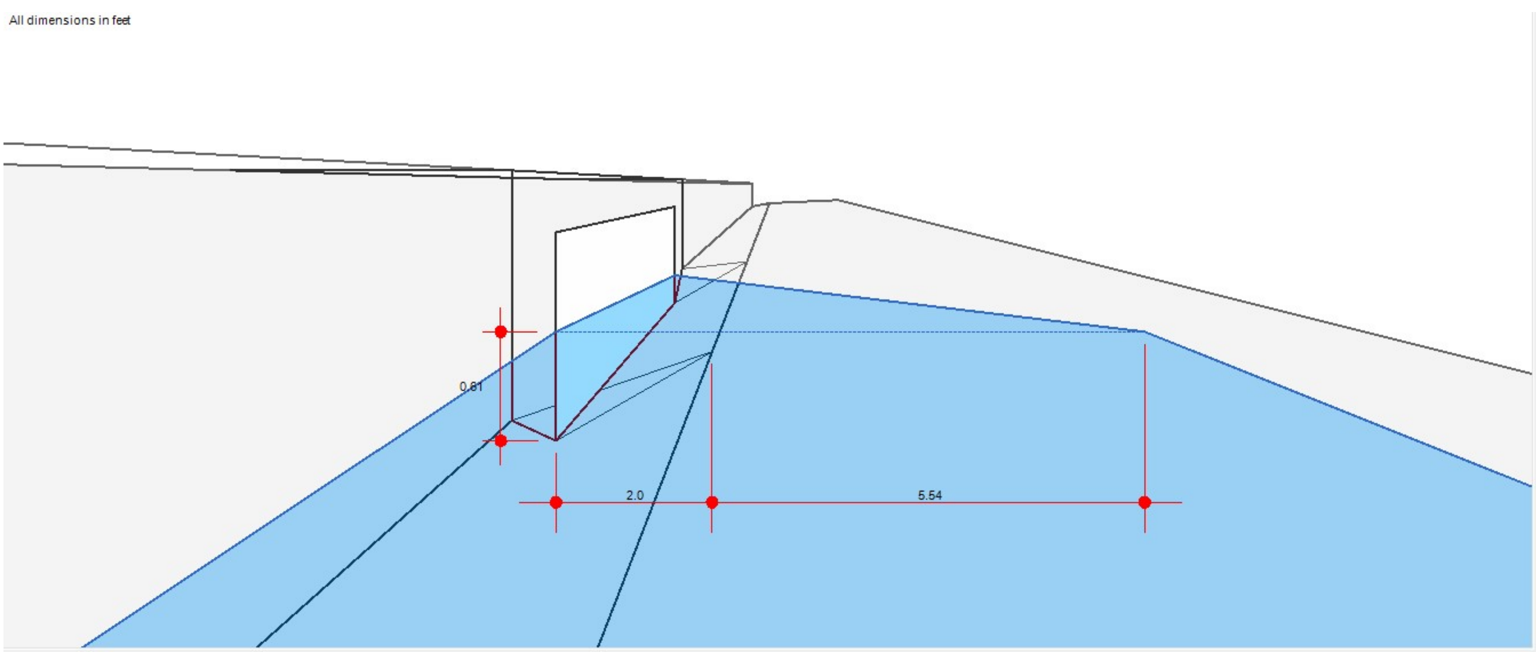


Inlet Report

E2 25YR

Curb Inlet	
Location	= On grade
Curb Length (ft)	= 7.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-
Gutter	
Slope, Sw (ft/ft)	= 0.083
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 4.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 0.20
Gutter n-value	= 0.016

Calculations	
Compute by:	Known Q
Q (cfs)	= 0.78
Highlighted	
Q Total (cfs)	= 0.78
Q Capt (cfs)	= 0.78
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 7.32
Efficiency (%)	= 100
Gutter Spread (ft)	= 7.54
Gutter Vel (ft/s)	= 1.12
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Inlet Report

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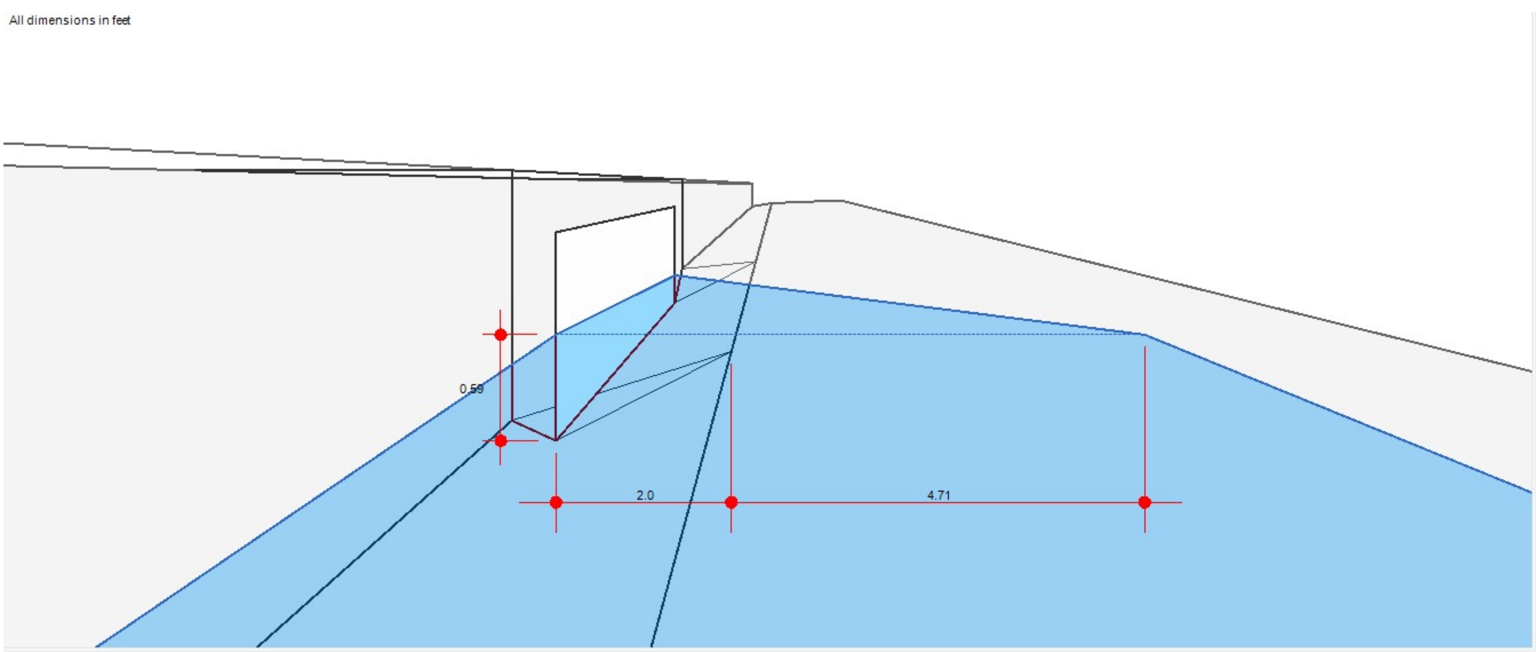
E1 25YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.30
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	0.77

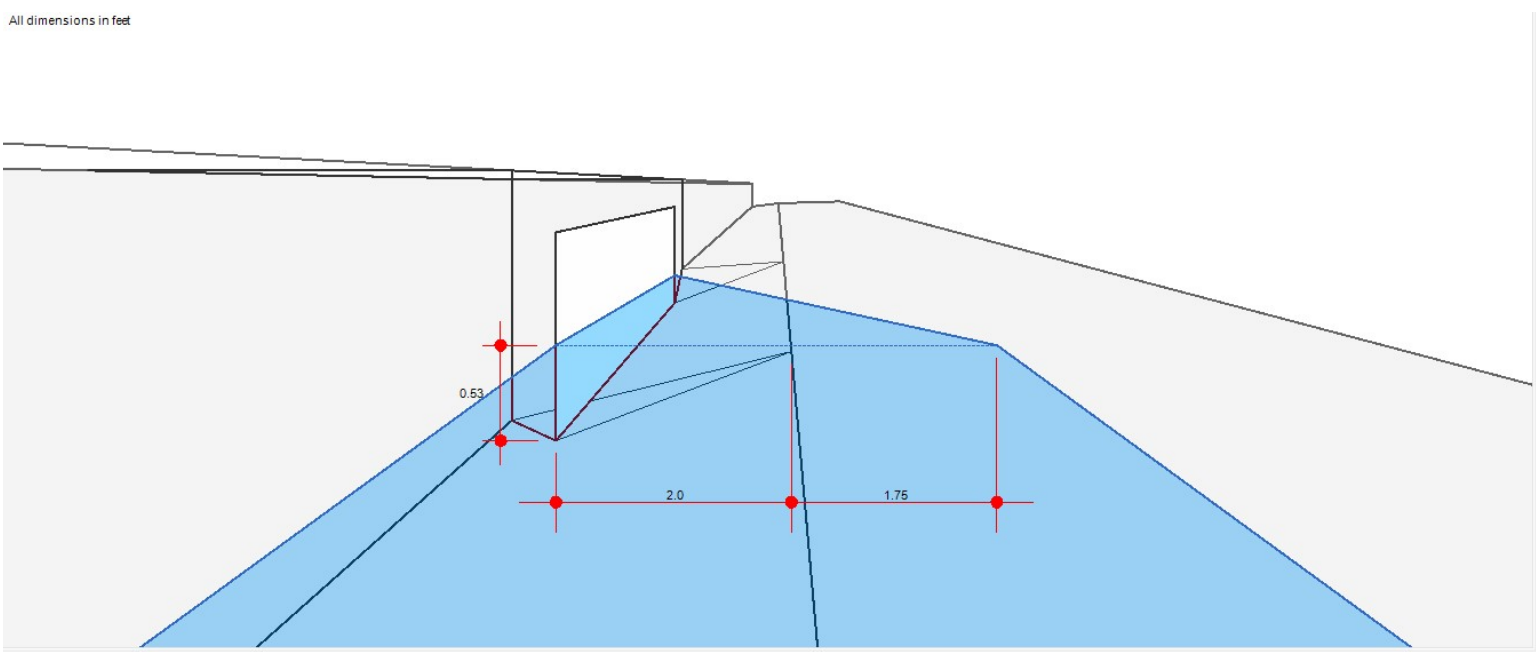
Highlighted		
Q Total (cfs)	=	0.77
Q Capt (cfs)	=	0.77
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.12
Efficiency (%)	=	100
Gutter Spread (ft)	=	6.71
Gutter Vel (ft/s)	=	1.34
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

E4 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.38
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.38
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.38
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.41
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 3.75
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.43
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.40	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

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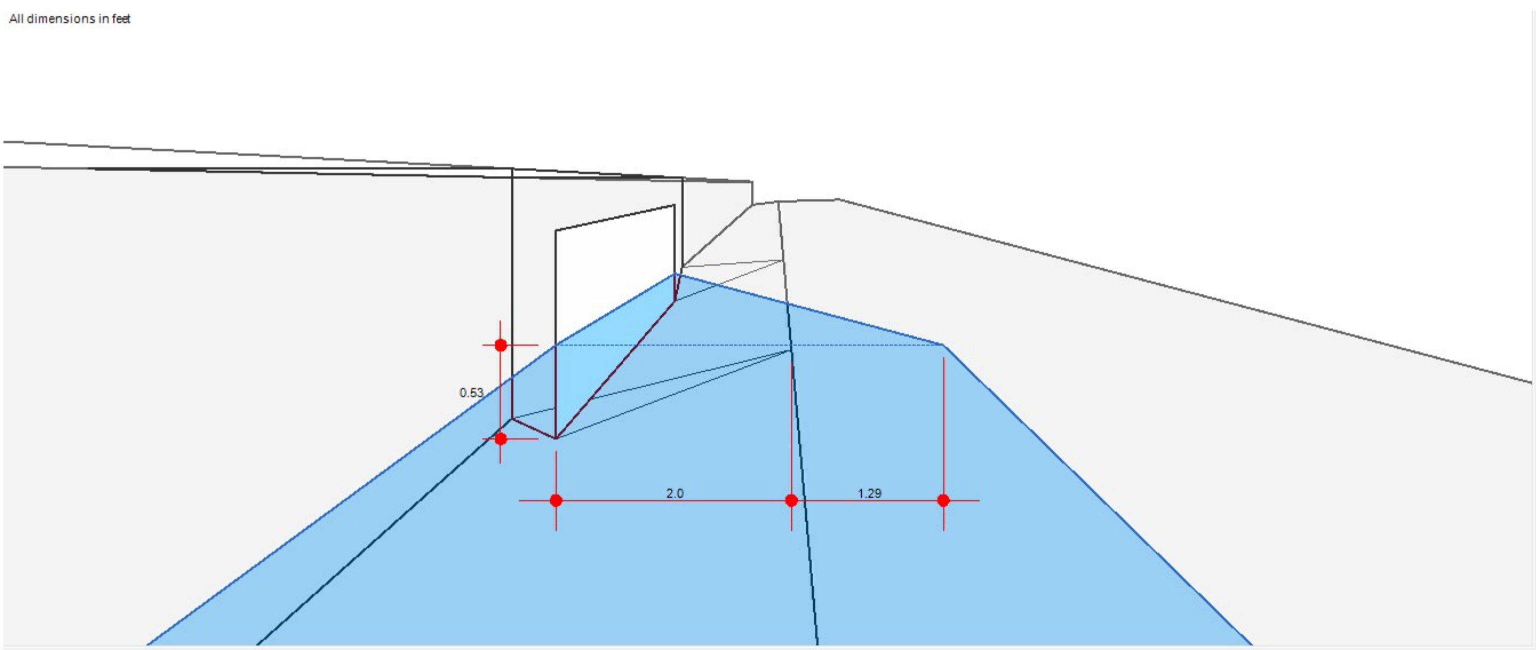
E3 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.37
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.37
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.37
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.30
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 3.29
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.58
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.50	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

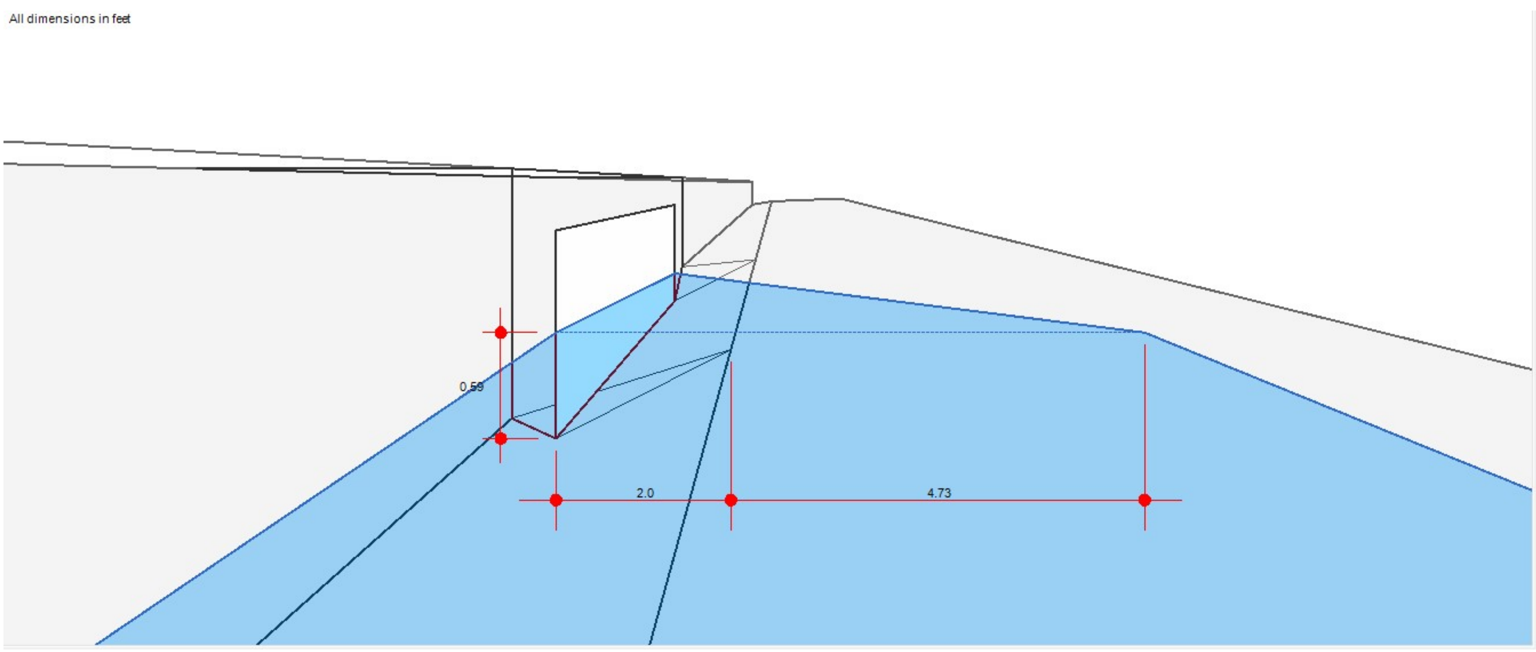


Inlet Report

C2 25YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-
Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.50
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	1.00
Highlighted		
Q Total (cfs)	=	1.00
Q Capt (cfs)	=	1.00
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.13
Efficiency (%)	=	100
Gutter Spread (ft)	=	6.73
Gutter Vel (ft/s)	=	1.73
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

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C1 25YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

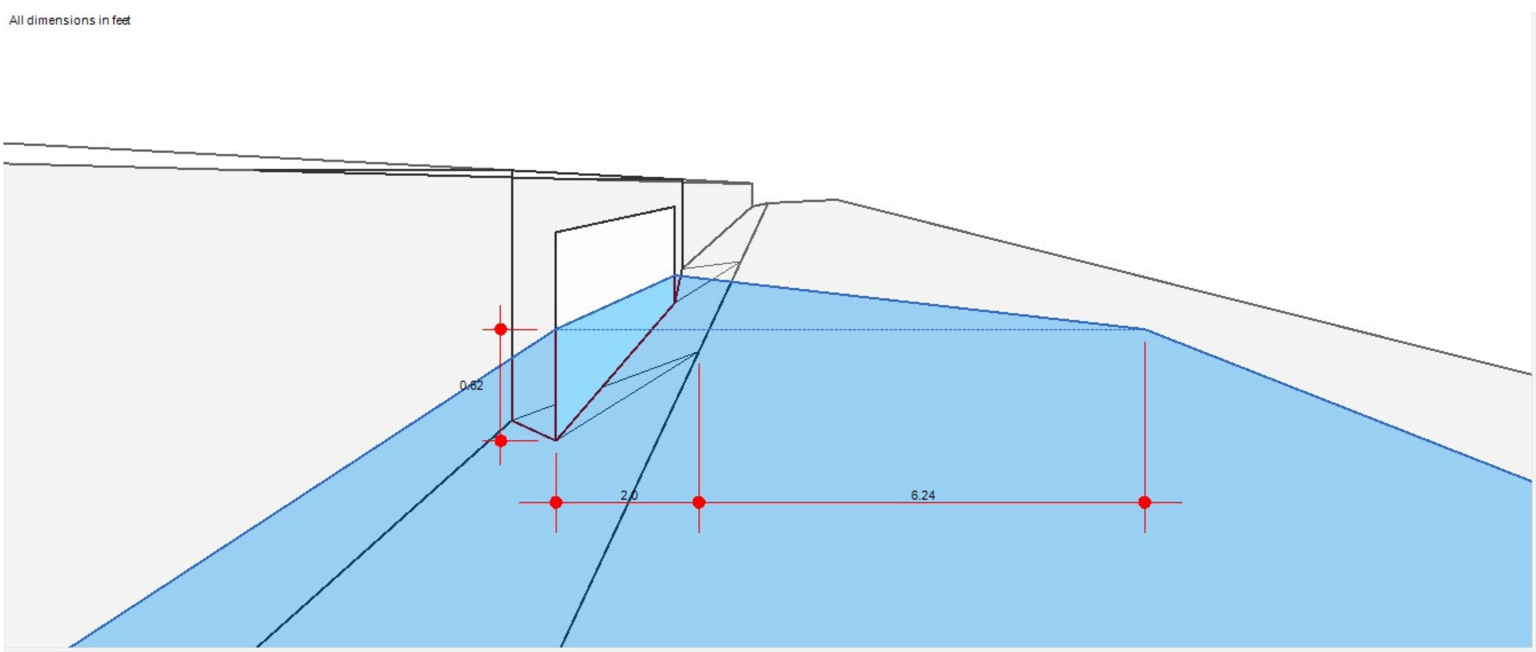
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.20
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.93

Highlighted

Q Total (cfs)	=	0.93
Q Capt (cfs)	=	0.93
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.49
Efficiency (%)	=	100
Gutter Spread (ft)	=	8.24
Gutter Vel (ft/s)	=	1.16
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

C4 25YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

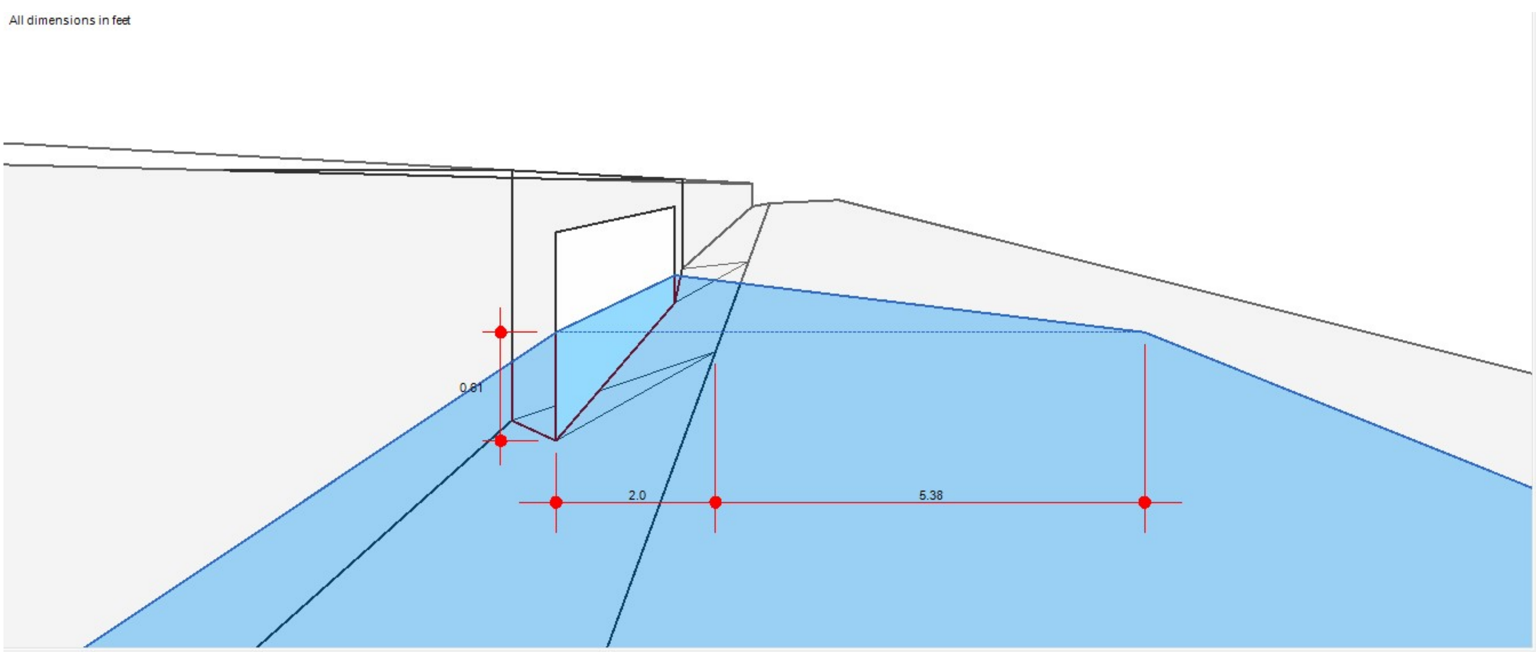
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.40
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	1.06

Highlighted

Q Total (cfs)	=	1.06
Q Capt (cfs)	=	1.06
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.28
Efficiency (%)	=	100
Gutter Spread (ft)	=	7.38
Gutter Vel (ft/s)	=	1.58
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

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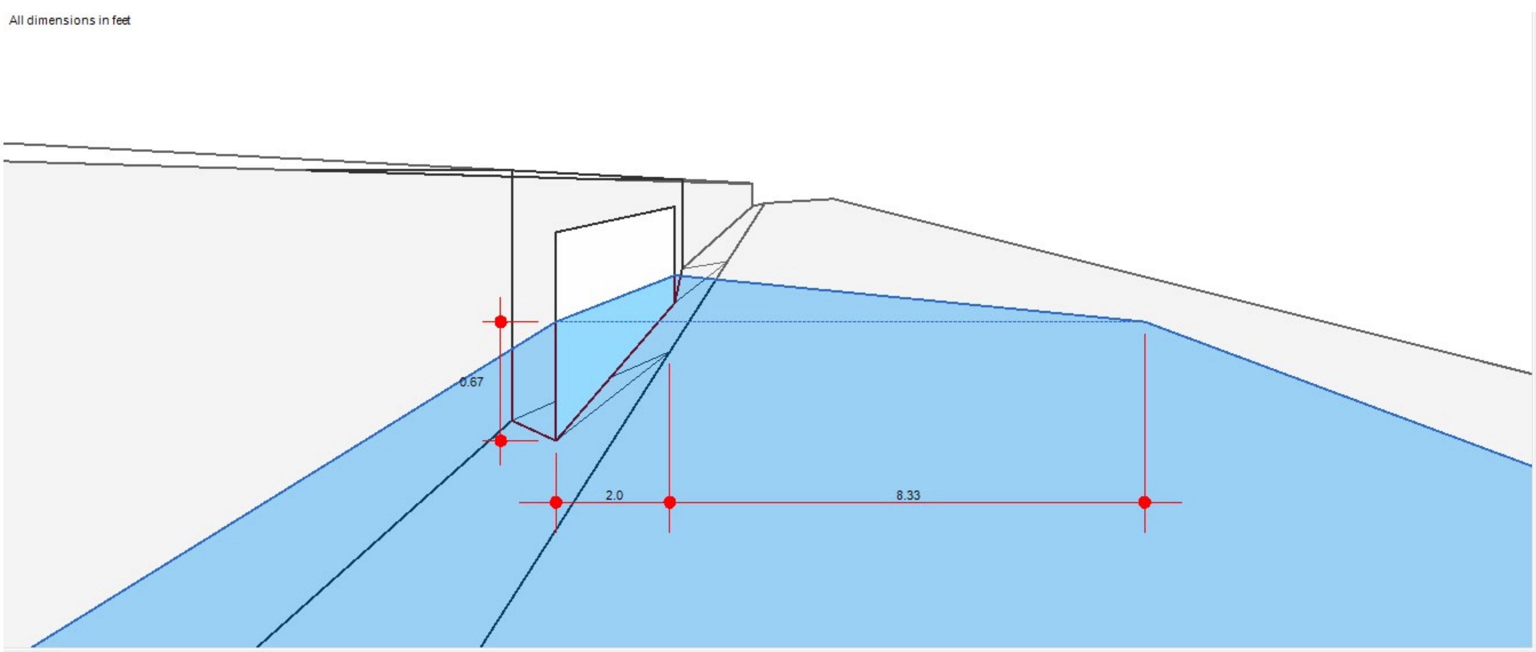
C3 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.06
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.06
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.06
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.99
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 10.33
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 0.89
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

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A9 25YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

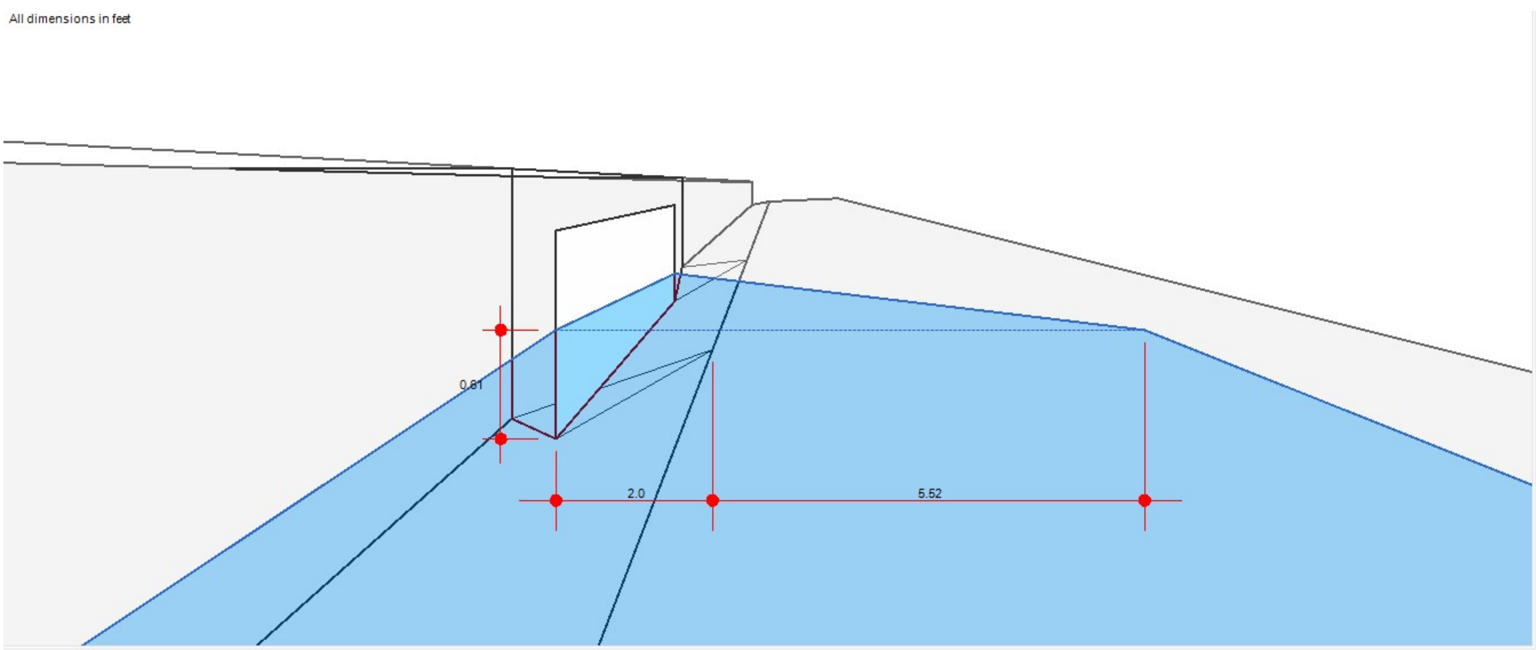
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.55

Highlighted

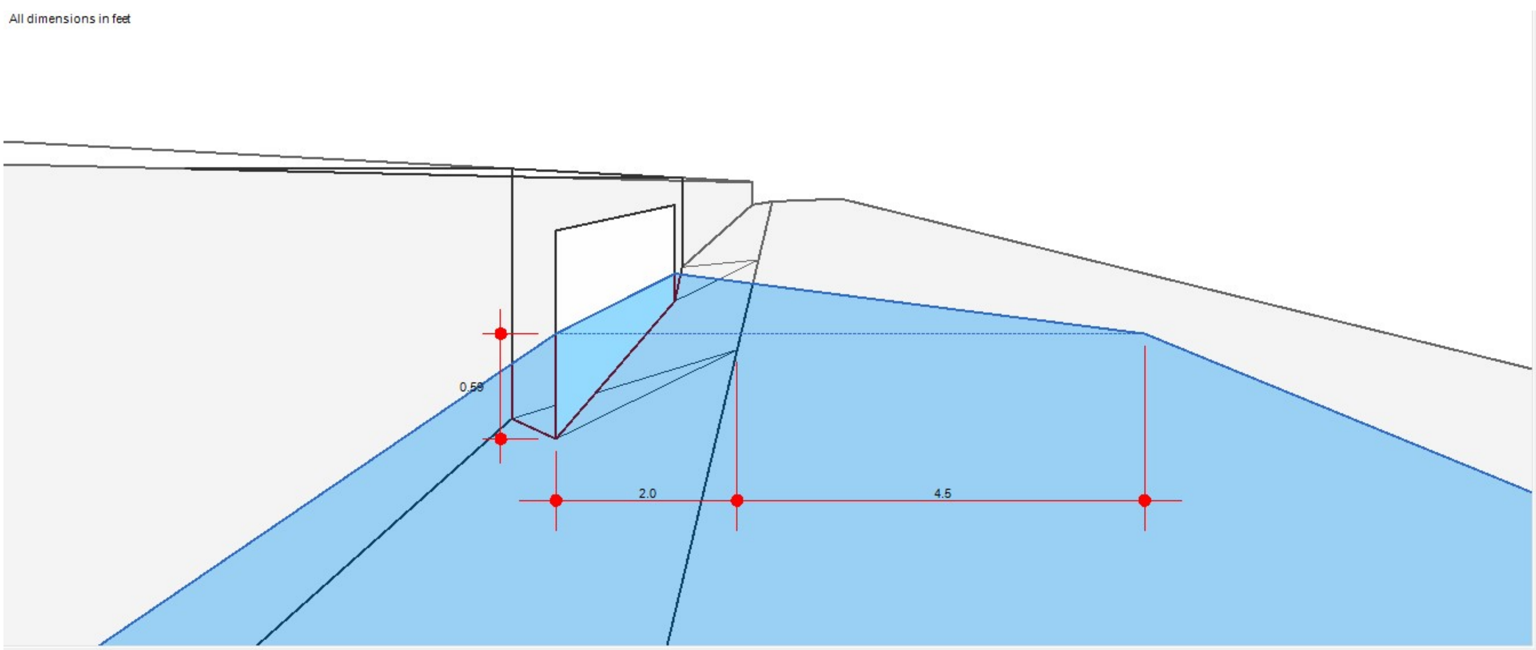
Q Total (cfs)	=	0.55
Q Capt (cfs)	=	0.55
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.32
Efficiency (%)	=	100
Gutter Spread (ft)	=	7.52
Gutter Vel (ft/s)	=	0.80
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

A10 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.42
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.42
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.42
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.07
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 6.50
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 0.77
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

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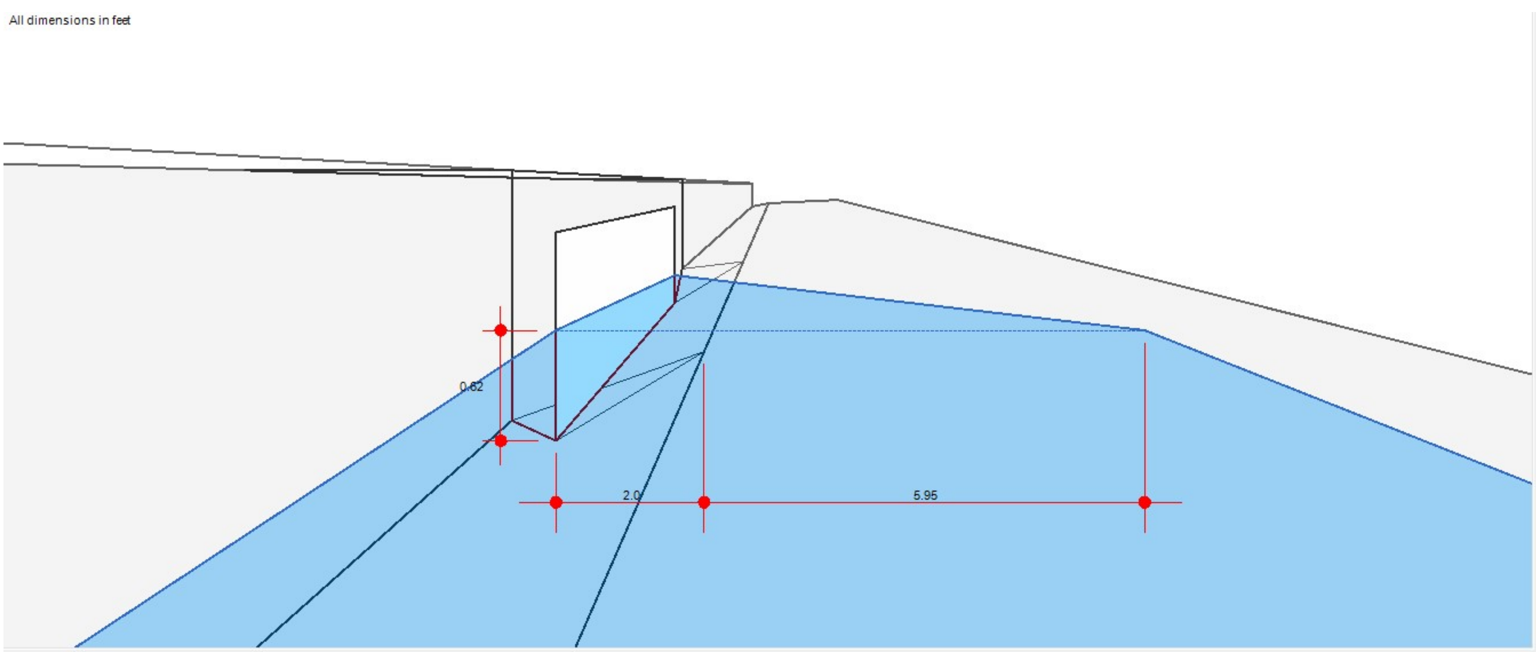
A7 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.06
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.06
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.06
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.42
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 7.95
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.40
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.30	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

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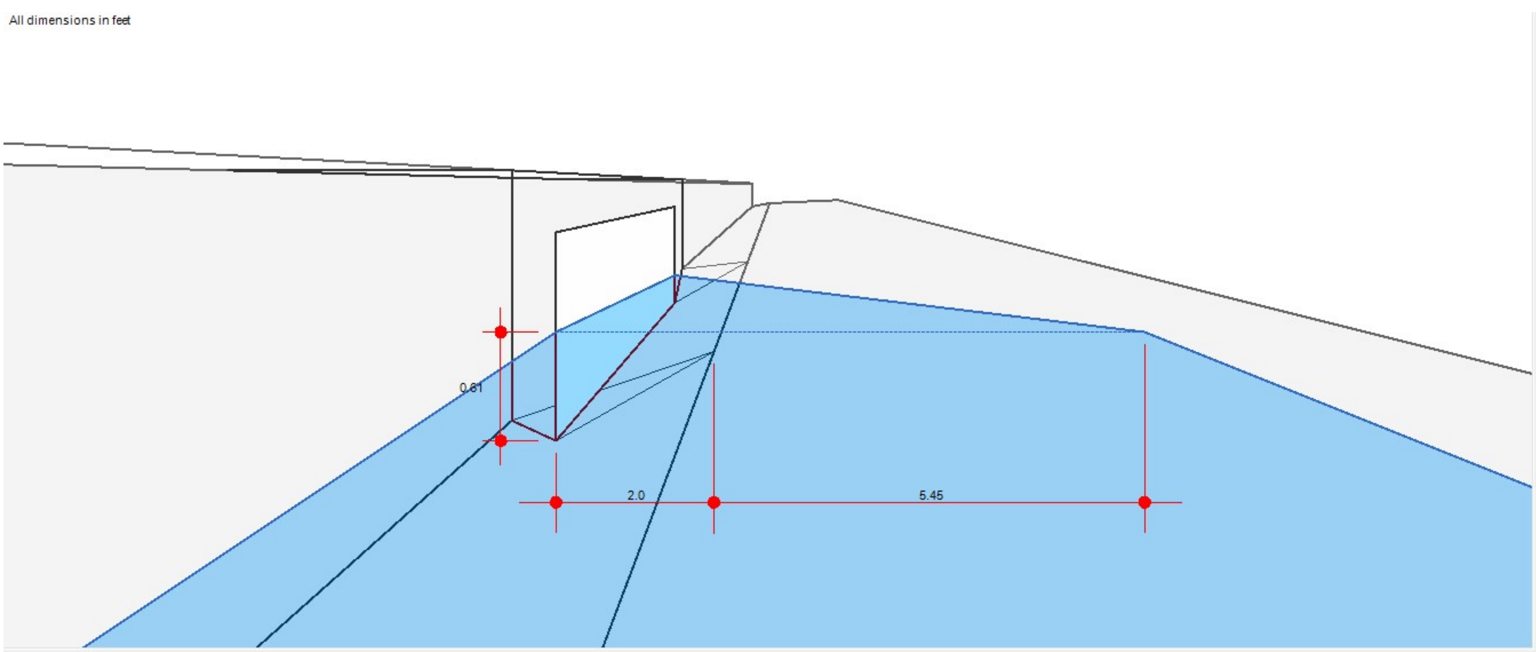
A8 25YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-
Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.40
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	1.08
Highlighted		
Q Total (cfs)	=	1.08
Q Capt (cfs)	=	1.08
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.30
Efficiency (%)	=	100
Gutter Spread (ft)	=	7.45
Gutter Vel (ft/s)	=	1.59
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

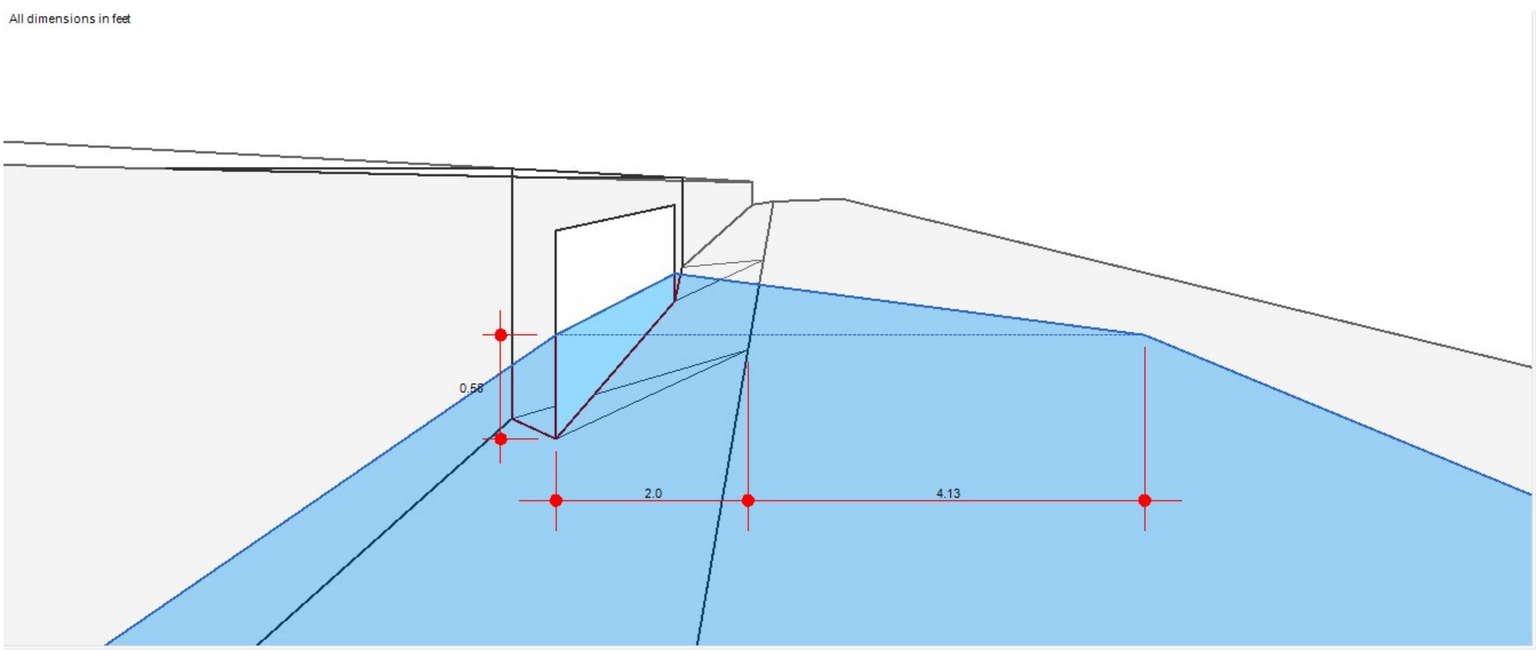
A11 25YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.90
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	1.14

Highlighted		
Q Total (cfs)	=	1.14
Q Capt (cfs)	=	1.14
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.98
Efficiency (%)	=	100
Gutter Spread (ft)	=	6.13
Gutter Vel (ft/s)	=	2.27
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

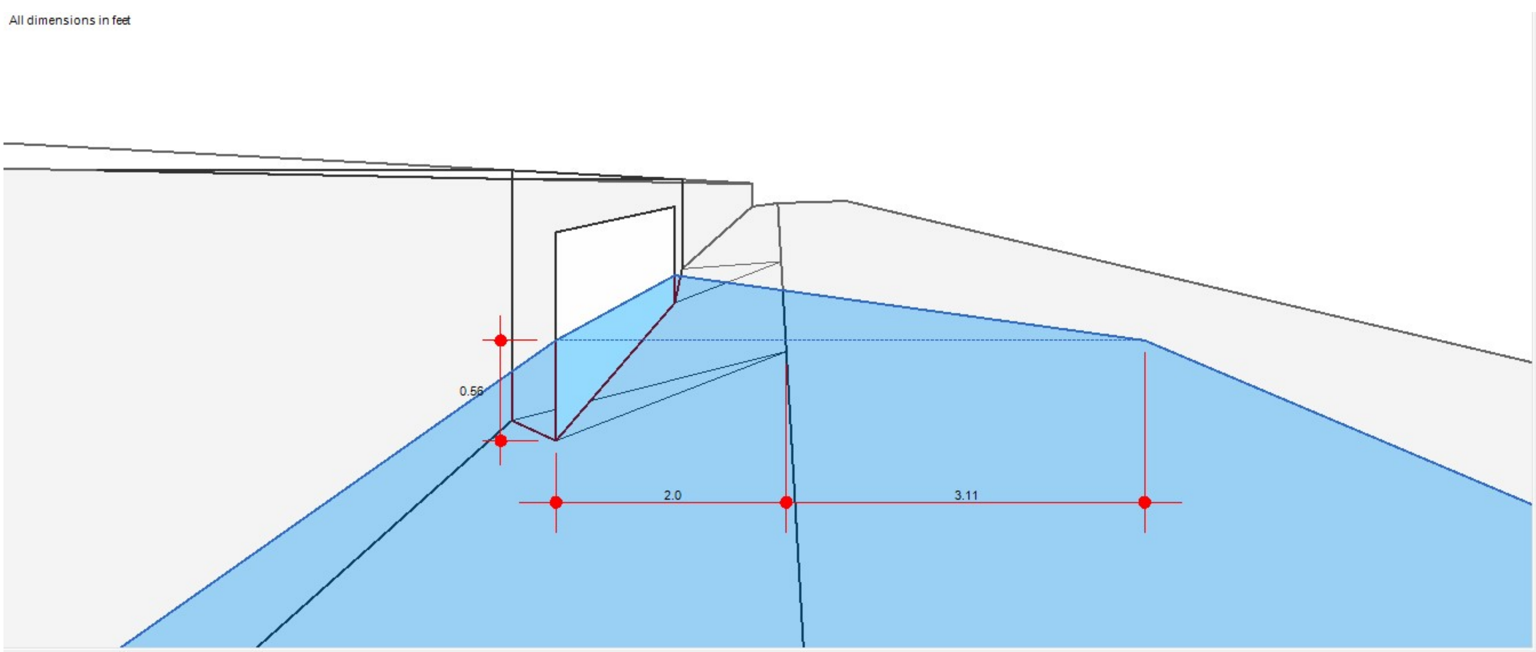


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

B5 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.90
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.90
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.90
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.74
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 5.11
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.32
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 1.00	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

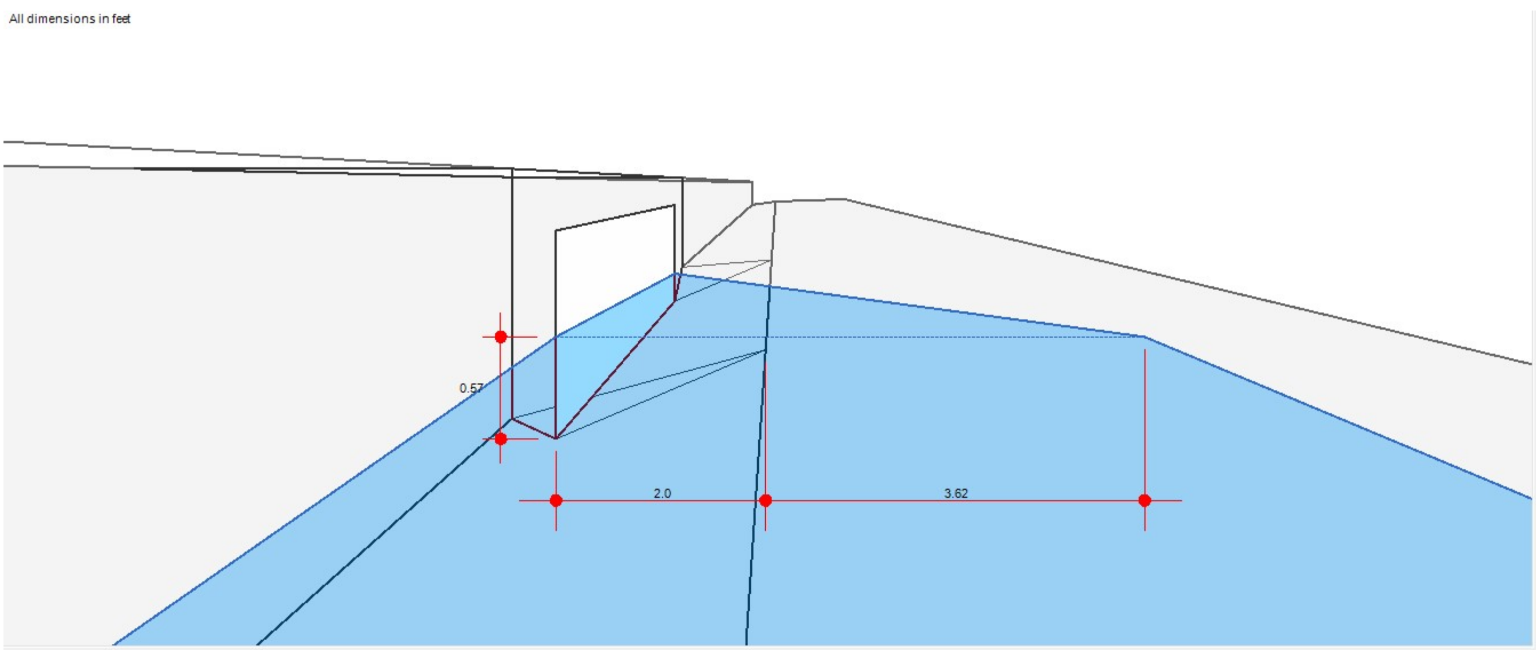


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

B6 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.04
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.04
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.04
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.86
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 5.62
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.36
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 1.00	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

D2 25YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

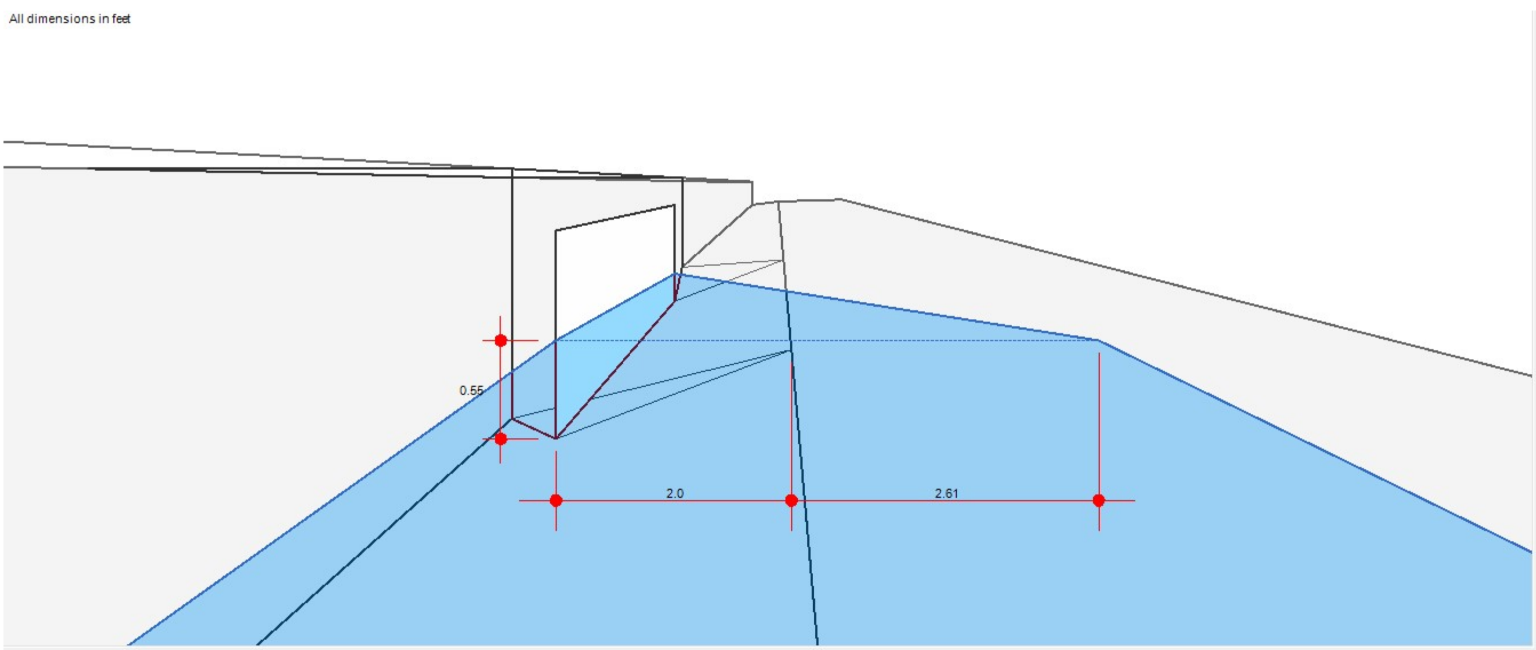
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.50
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.55

Highlighted

Q Total (cfs)	=	0.55
Q Capt (cfs)	=	0.55
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.62
Efficiency (%)	=	100
Gutter Spread (ft)	=	4.61
Gutter Vel (ft/s)	=	1.62
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

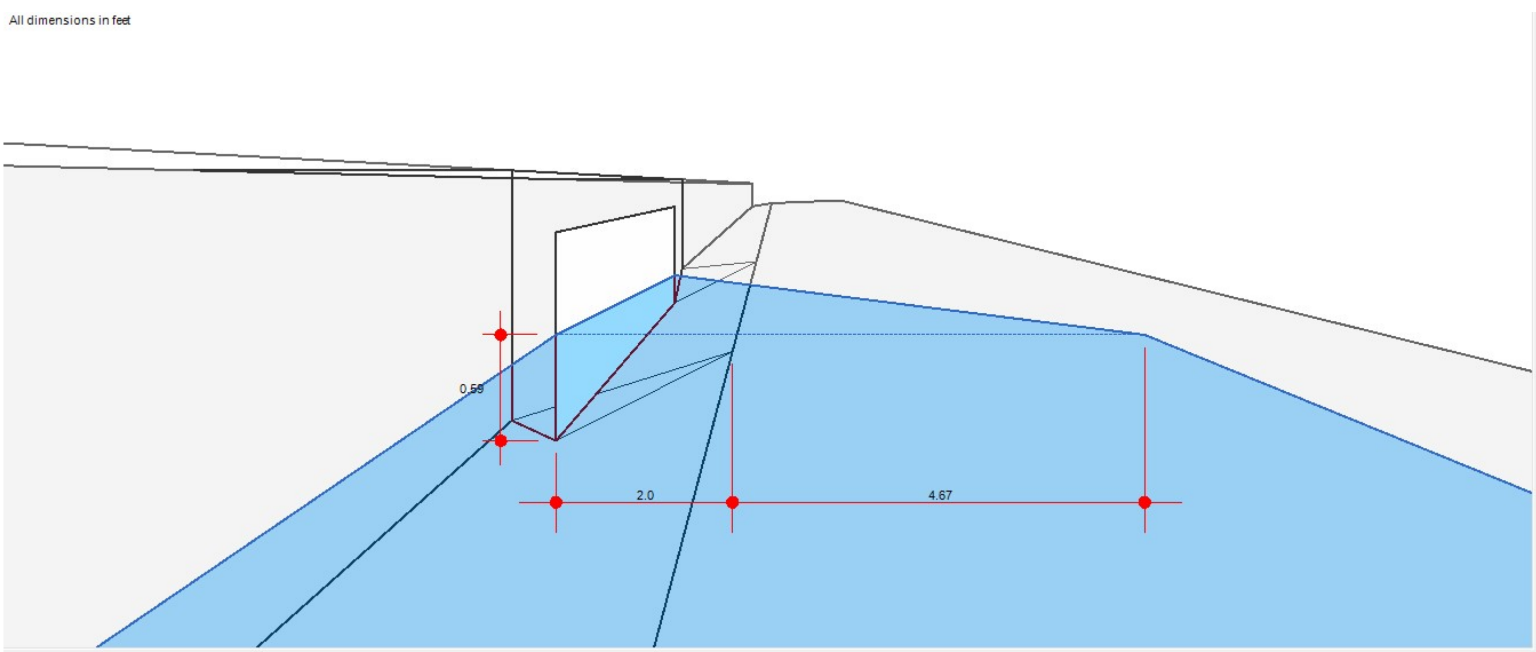
D1 25YR

Curb Inlet	
Location	= On grade
Curb Length (ft)	= 7.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter	
Slope, Sw (ft/ft)	= 0.083
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 4.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 0.10
Gutter n-value	= 0.016

Calculations	
Compute by:	Known Q
Q (cfs)	= 0.44

Highlighted	
Q Total (cfs)	= 0.44
Q Capt (cfs)	= 0.44
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 7.11
Efficiency (%)	= 100
Gutter Spread (ft)	= 6.67
Gutter Vel (ft/s)	= 0.77
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



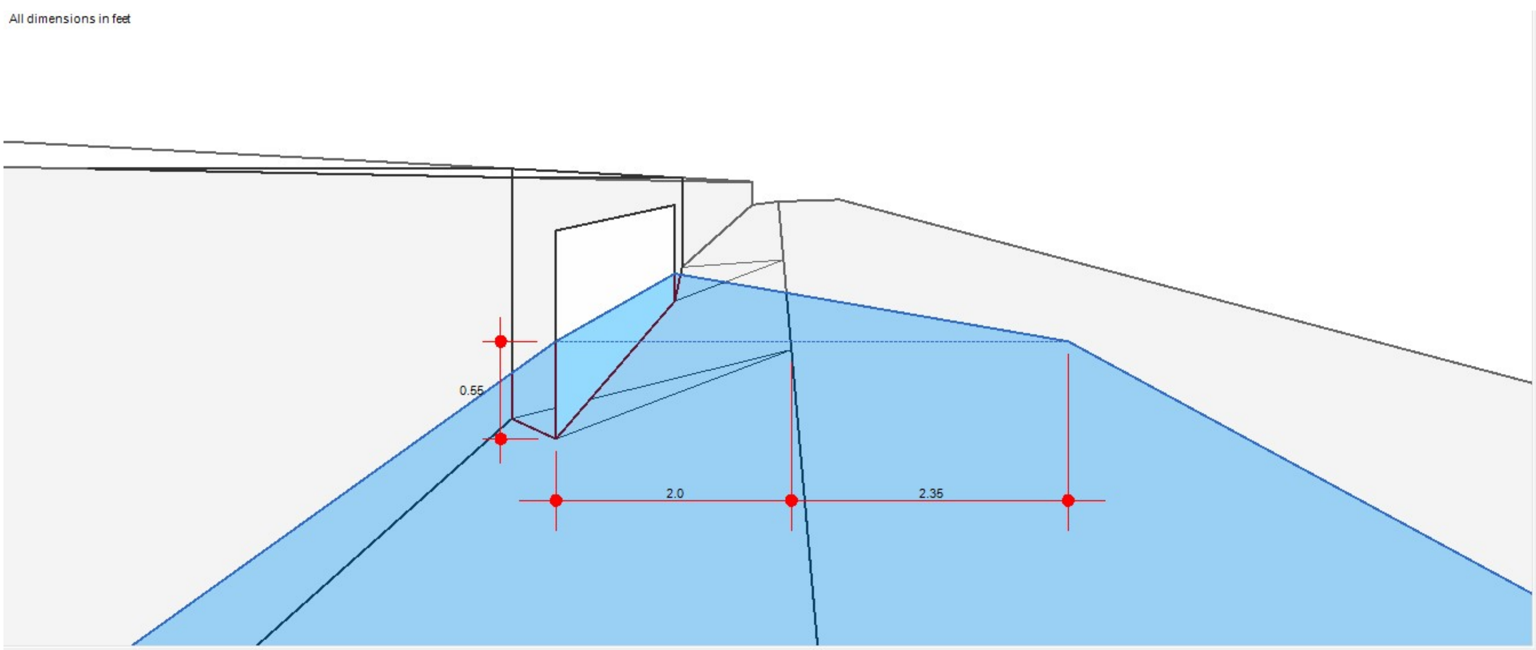
Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

B3 25YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-
Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	1.00
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	0.72
Highlighted		
Q Total (cfs)	=	0.72
Q Capt (cfs)	=	0.72
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.56
Efficiency (%)	=	100
Gutter Spread (ft)	=	4.35
Gutter Vel (ft/s)	=	2.28
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

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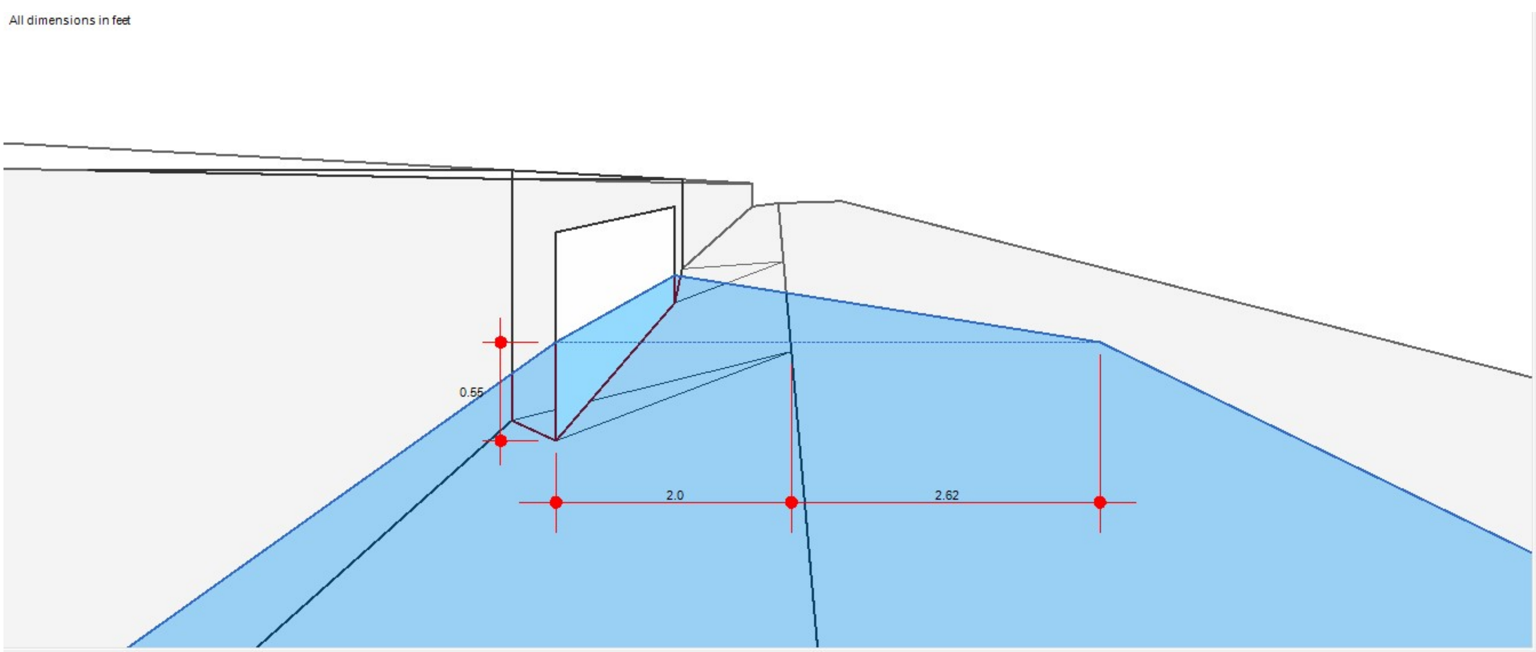
B4 25YR

Curb Inlet			**Calculations**	
Location	= On grade		Compute by:	Known Q
Curb Length (ft)	= 7.00		Q (cfs)	= 0.78
Throat Height (in)	= 6.00			
Grate Area (sqft)	= -0-		**Highlighted**	
Grate Width (ft)	= -0-		Q Total (cfs)	= 0.78
Grate Length (ft)	= -0-		Q Capt (cfs)	= 0.78
			Q Bypass (cfs)	= -0-
Gutter			Depth at Inlet (in)	= 6.62
Slope, Sw (ft/ft)	= 0.083		Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020		Gutter Spread (ft)	= 4.62
Local Depr (in)	= 4.00		Gutter Vel (ft/s)	= 2.30
Gutter Width (ft)	= 2.00		Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 1.00		Bypass Depth (in)	= -0-
Gutter n-value	= 0.016			



Inlet Report

B2 25YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

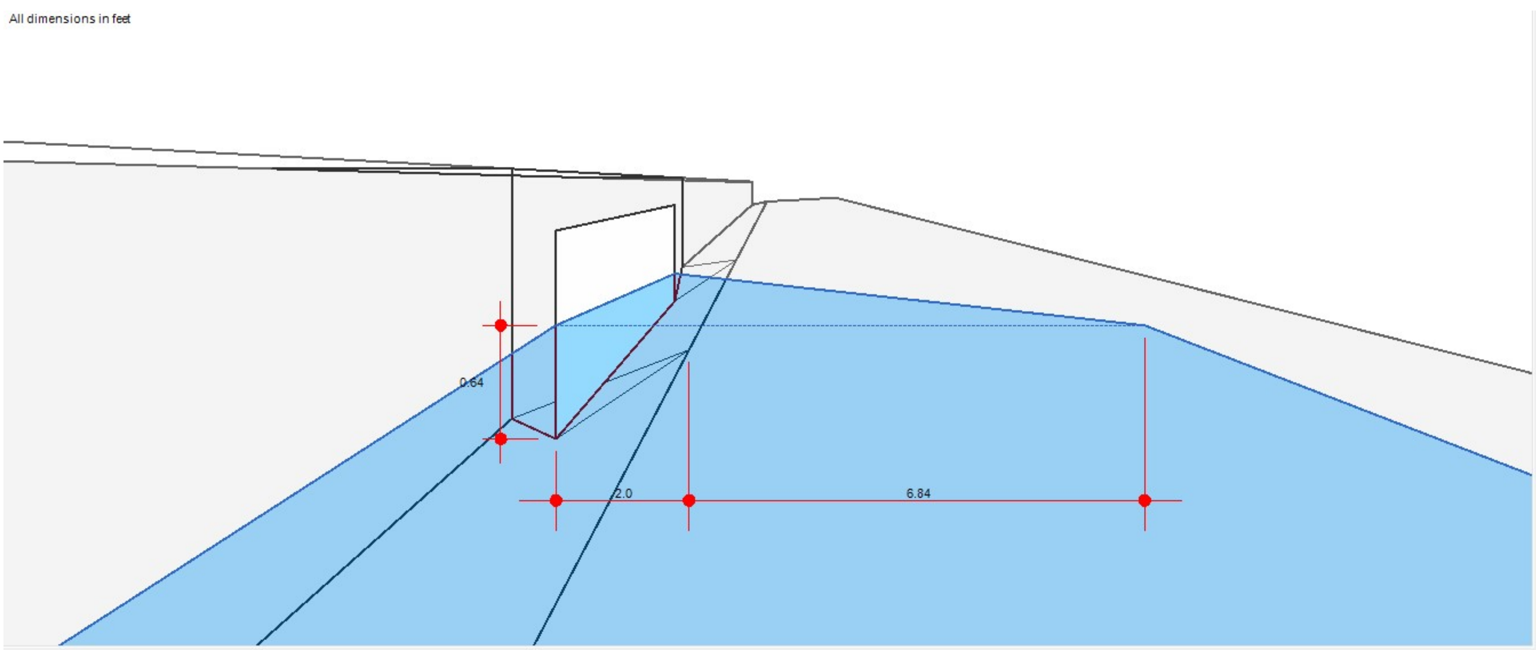
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.76

Highlighted

Q Total (cfs)	=	0.76
Q Capt (cfs)	=	0.76
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.63
Efficiency (%)	=	100
Gutter Spread (ft)	=	8.84
Gutter Vel (ft/s)	=	0.84
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

B1 25YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

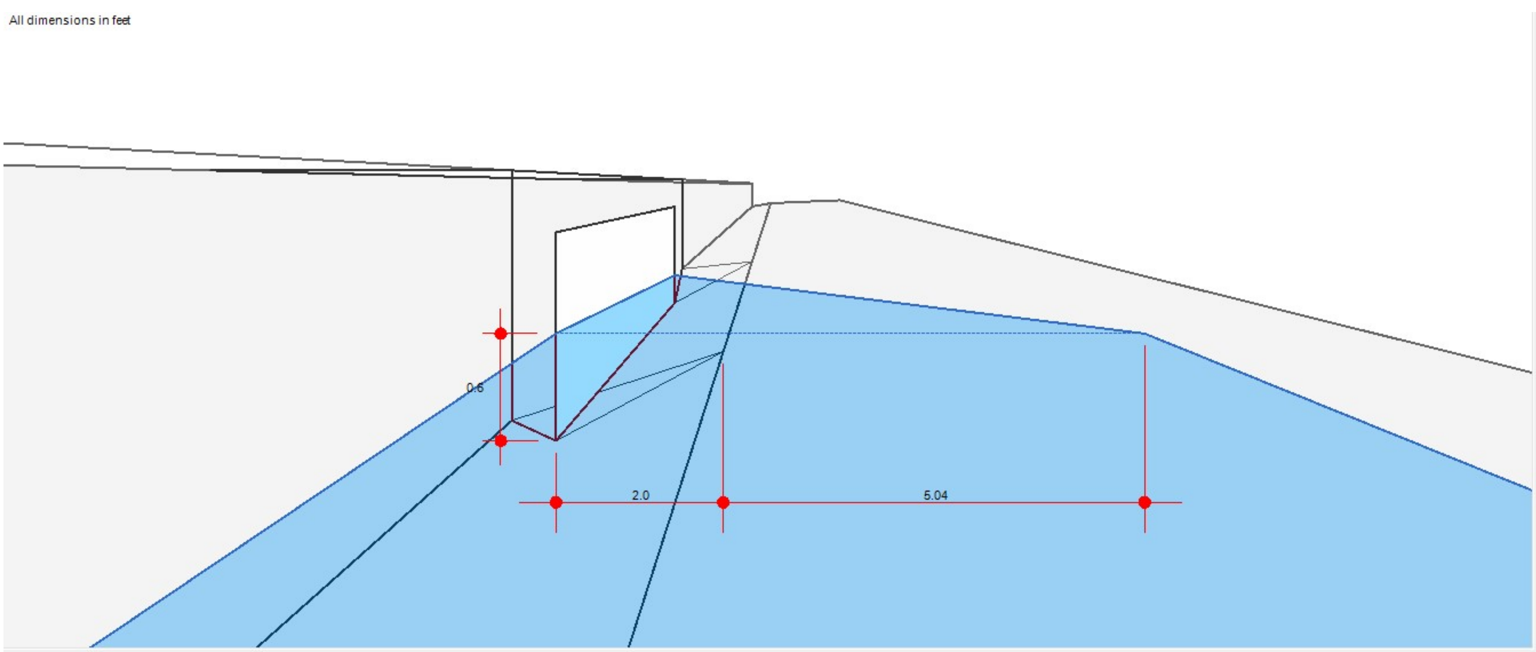
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.30
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.84

Highlighted

Q Total (cfs)	=	0.84
Q Capt (cfs)	=	0.84
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.20
Efficiency (%)	=	100
Gutter Spread (ft)	=	7.04
Gutter Vel (ft/s)	=	1.35
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

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A6 25YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

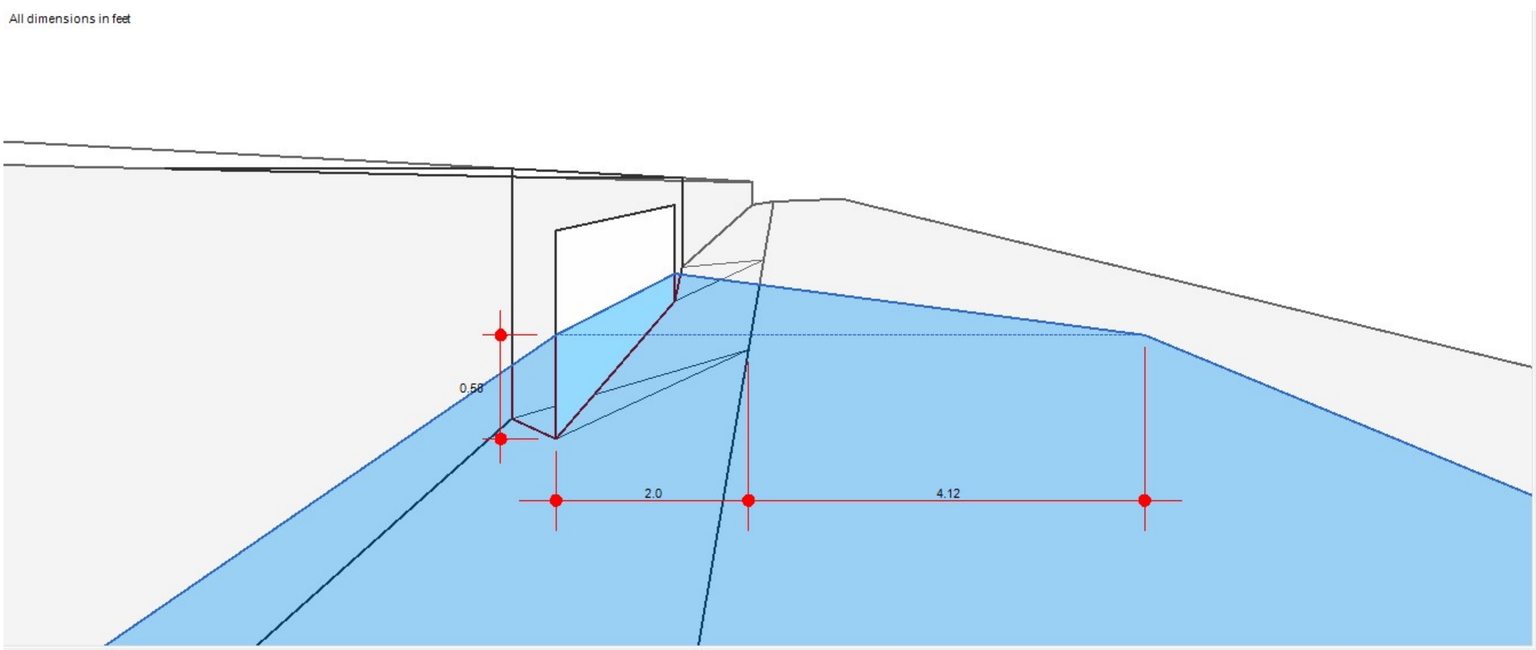
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.80
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	1.07

Highlighted

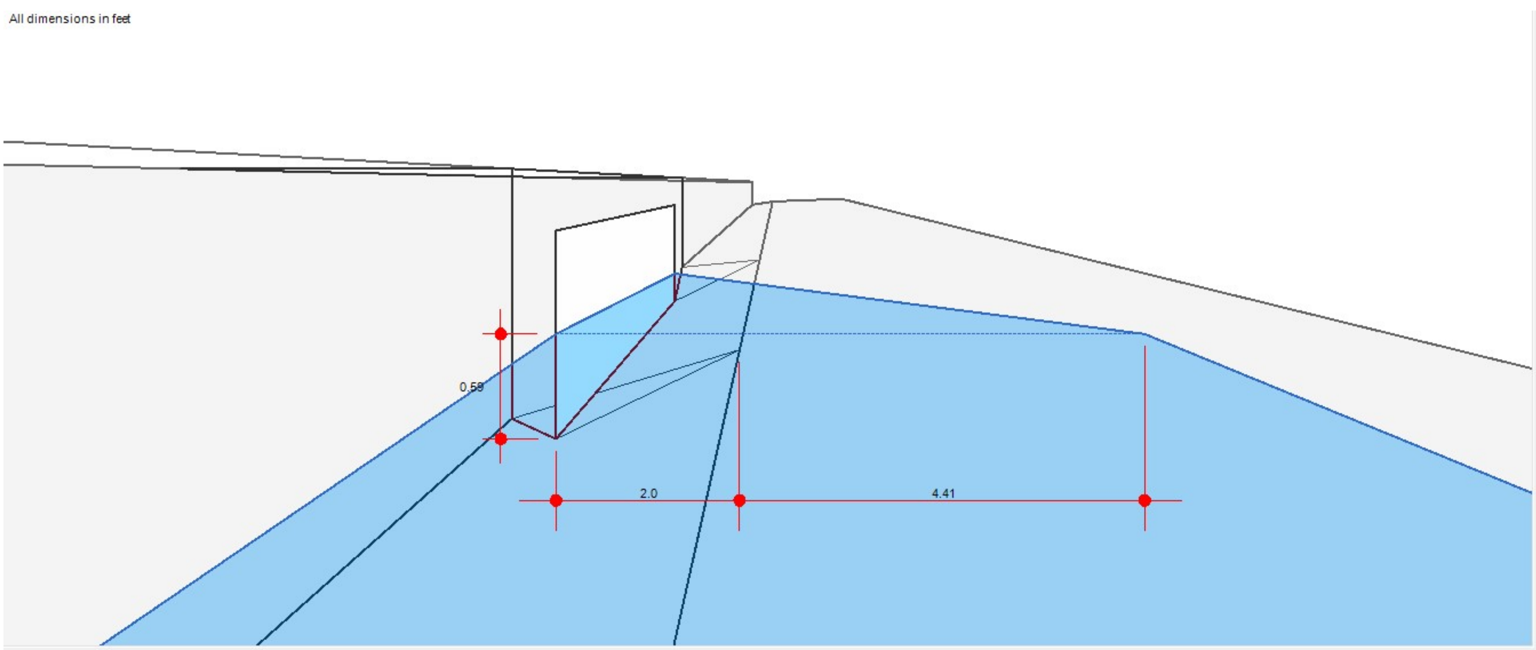
Q Total (cfs)	=	1.07
Q Capt (cfs)	=	1.07
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.98
Efficiency (%)	=	100
Gutter Spread (ft)	=	6.12
Gutter Vel (ft/s)	=	2.14
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

A5 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.16
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.16
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.16
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.05
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 6.41
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.16
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.80	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

A3 25YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

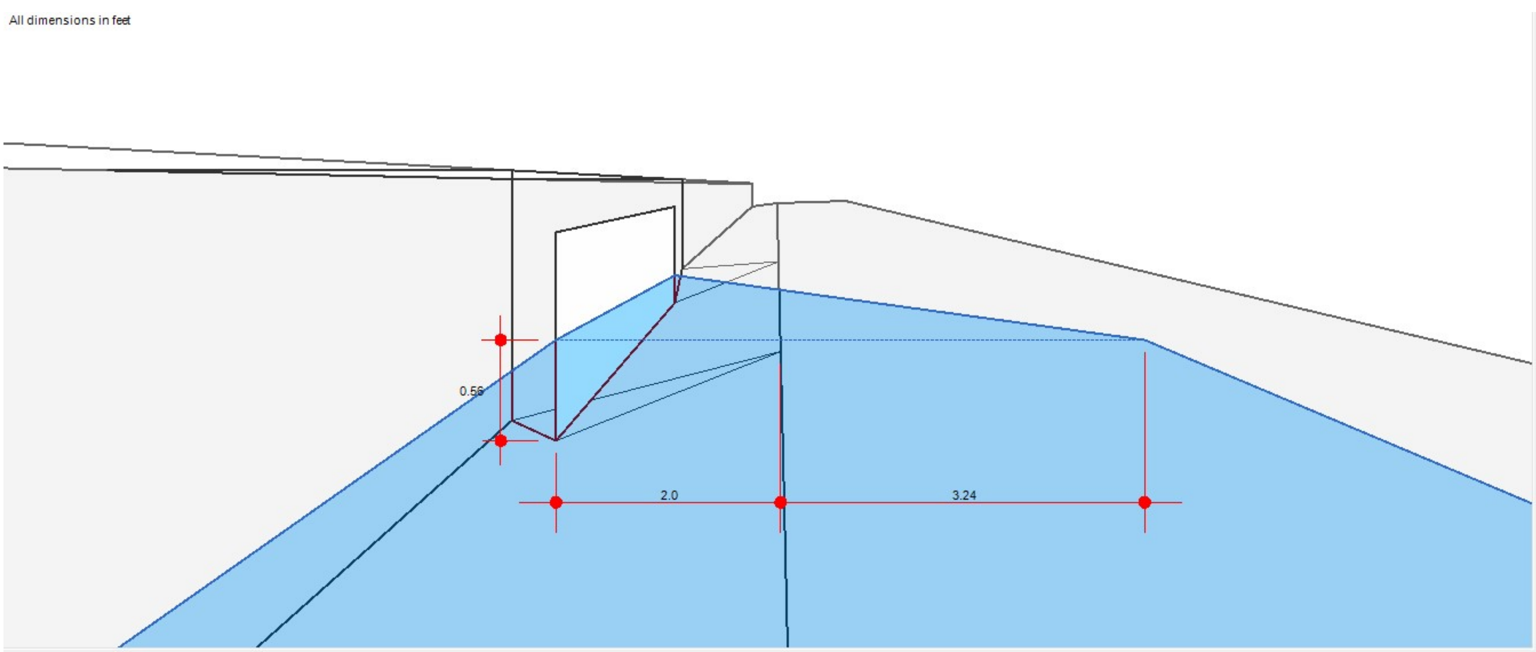
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	1.10
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.98

Highlighted

Q Total (cfs)	=	0.98
Q Capt (cfs)	=	0.98
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.77
Efficiency (%)	=	100
Gutter Spread (ft)	=	5.24
Gutter Vel (ft/s)	=	2.45
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

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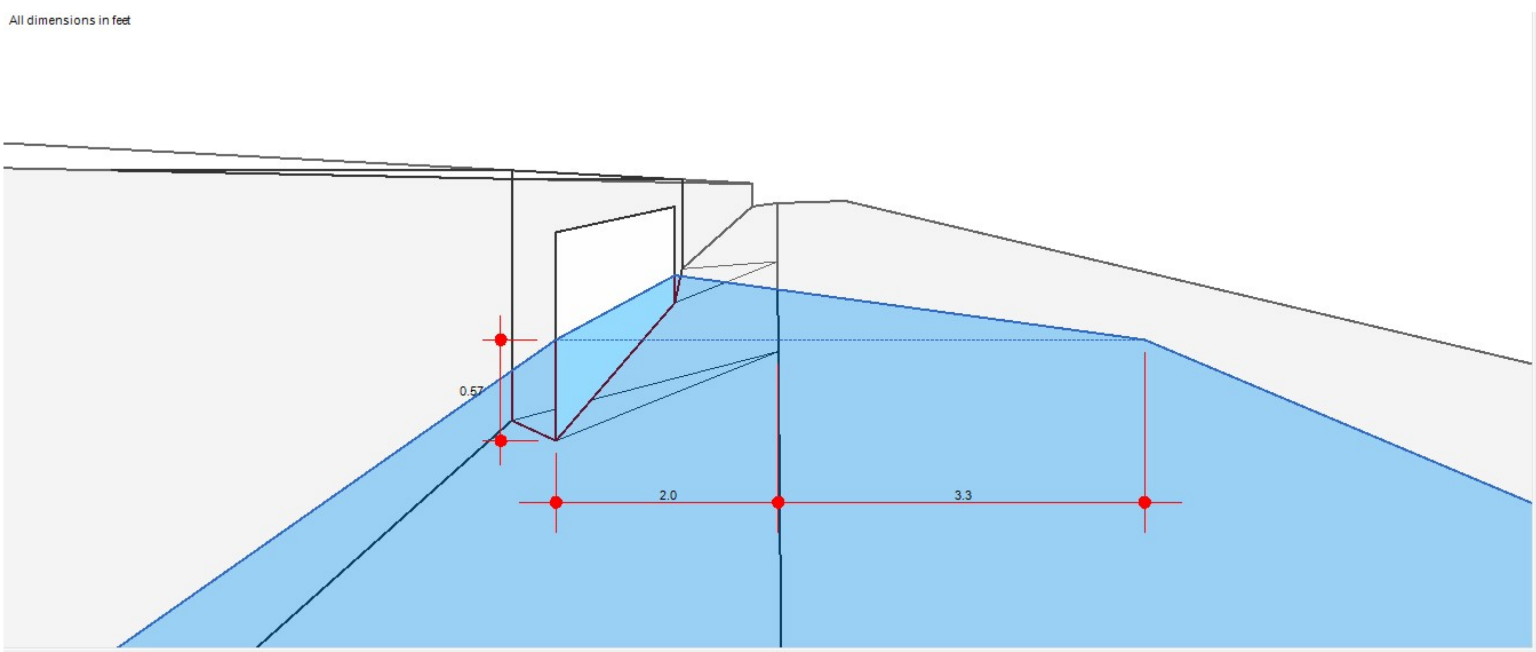
A4 25YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-
Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	1.00
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	0.95
Highlighted		
Q Total (cfs)	=	0.95
Q Capt (cfs)	=	0.95
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.78
Efficiency (%)	=	100
Gutter Spread (ft)	=	5.30
Gutter Vel (ft/s)	=	2.34
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

A2 25YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

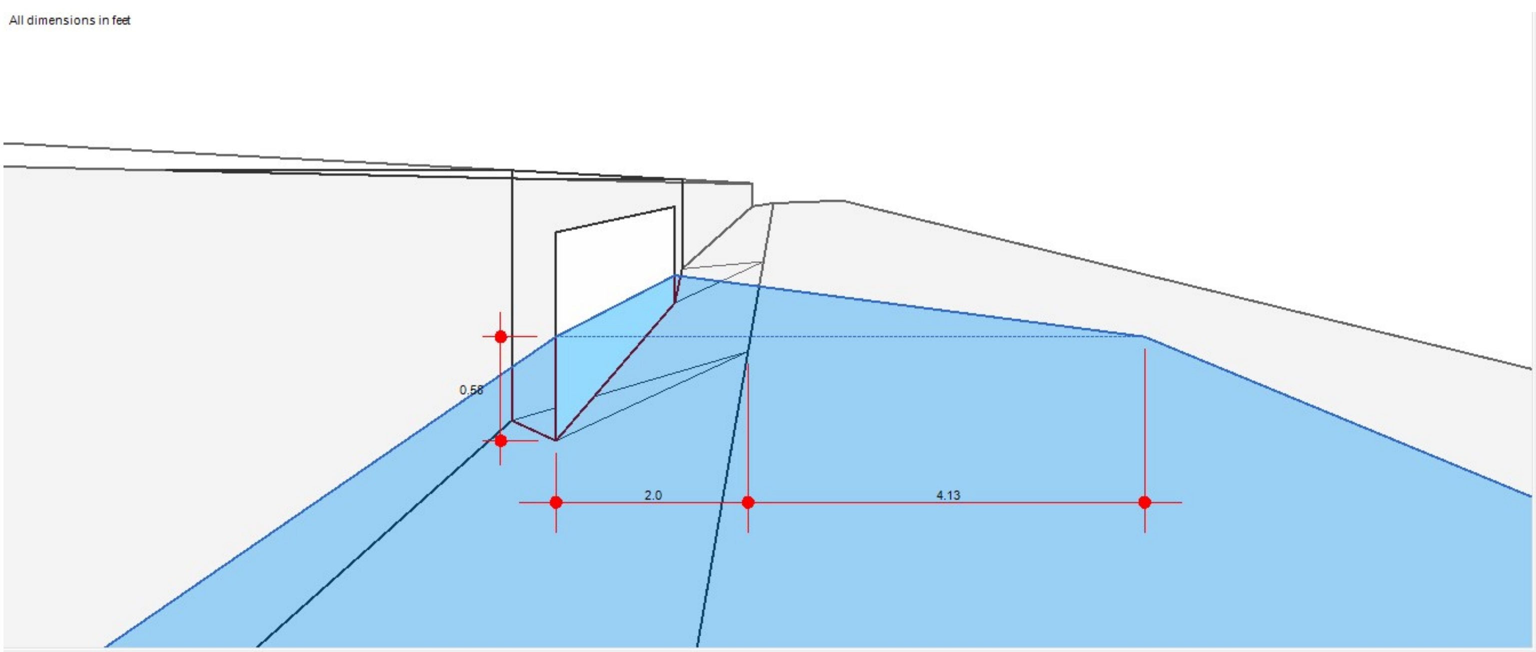
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.60
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.93

Highlighted

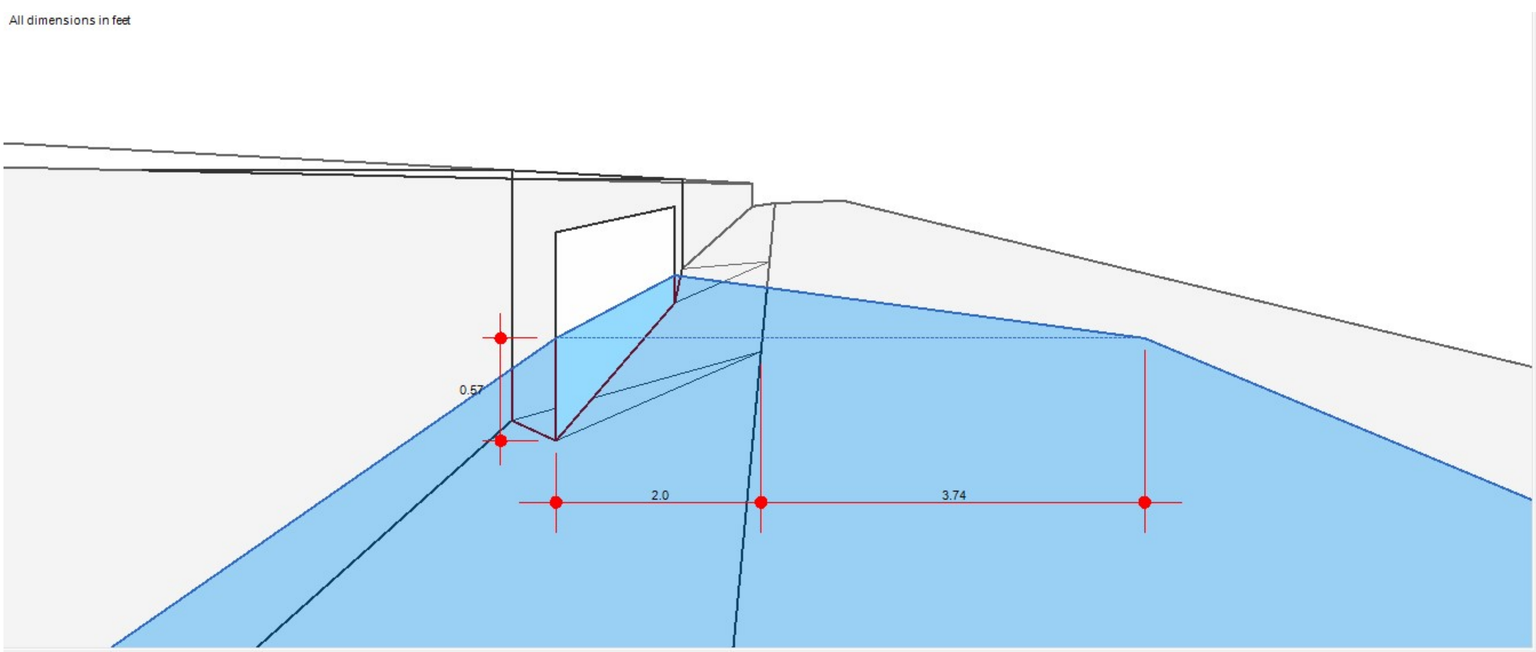
Q Total (cfs)	=	0.93
Q Capt (cfs)	=	0.93
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.98
Efficiency (%)	=	100
Gutter Spread (ft)	=	6.13
Gutter Vel (ft/s)	=	1.85
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

A1 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.59
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.59
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.59
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.89
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 5.74
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.30
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.30	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

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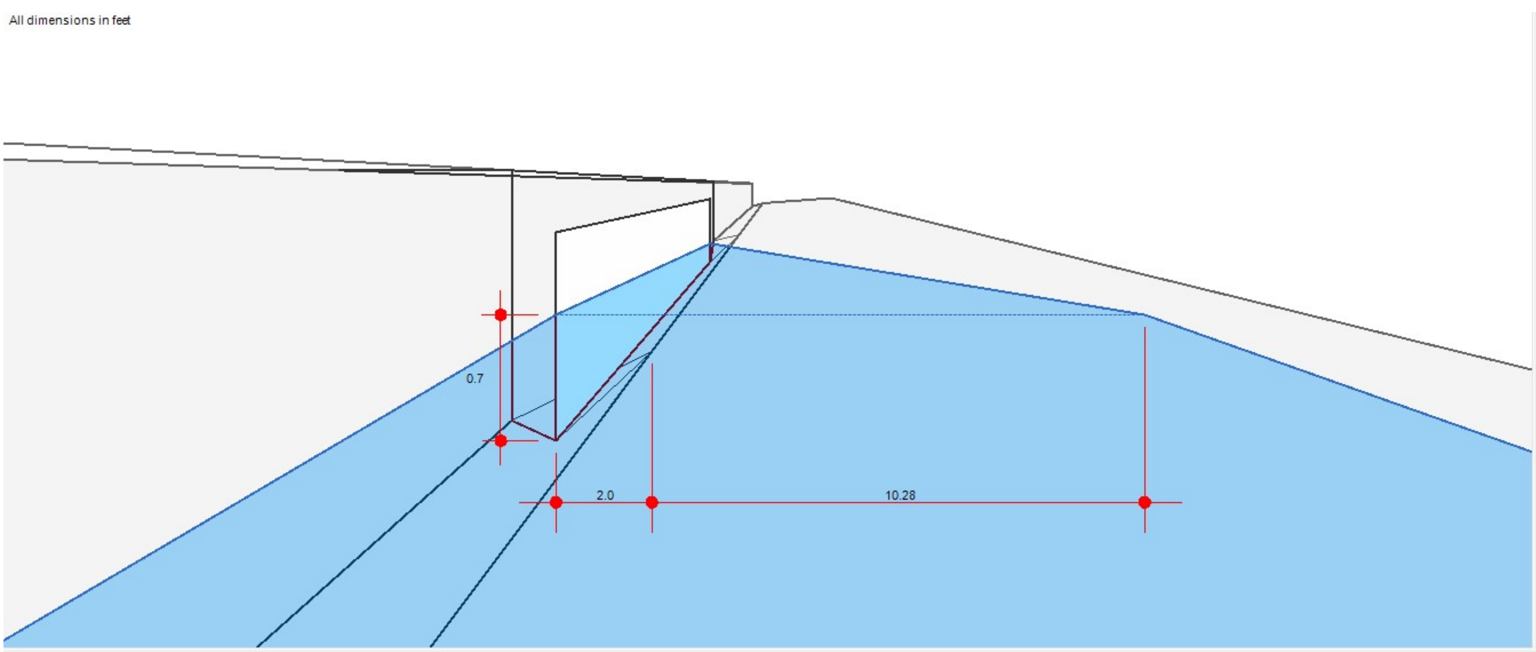
H3 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 14.00	Q (cfs)	= 2.22
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 2.22
Grate Length (ft)	= -0-	Q Capt (cfs)	= 2.22
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.46
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 12.28
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.36
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.20	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

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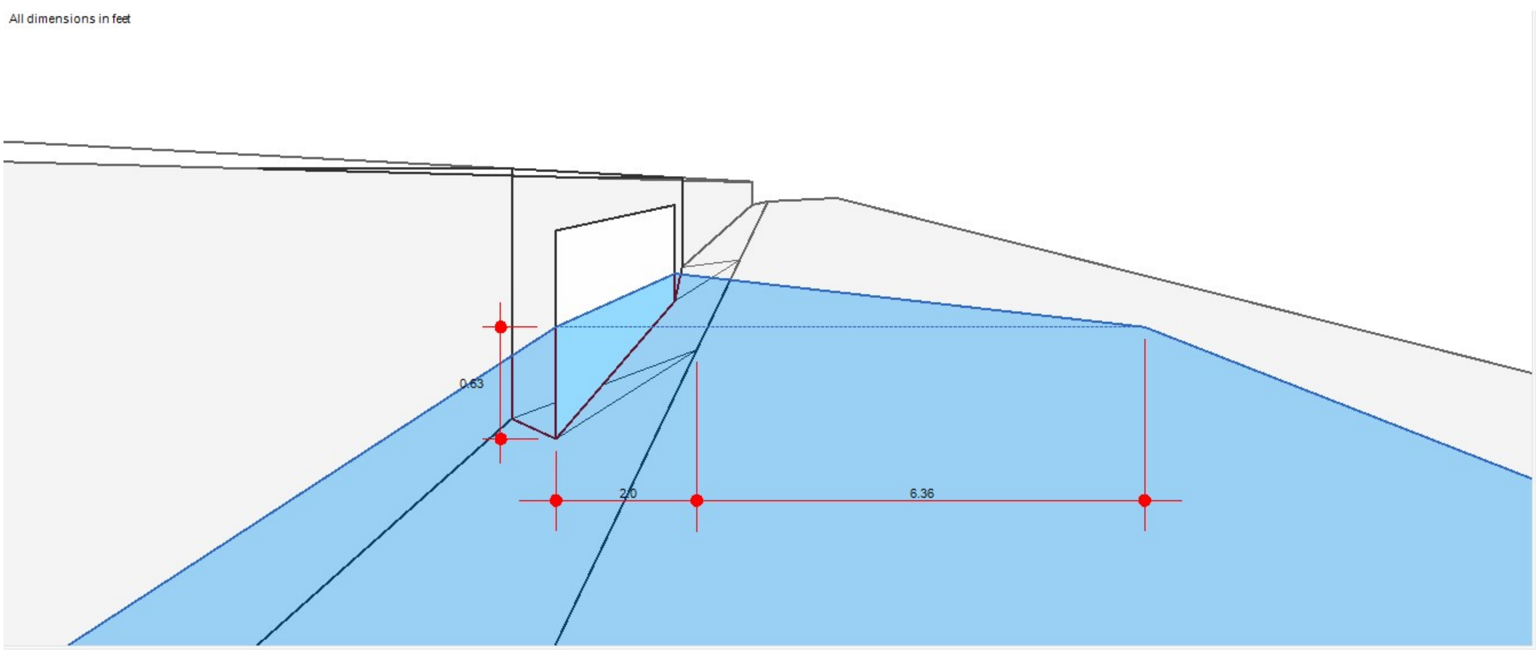
H4 25YR

Curb Inlet			**Calculations**	
Location	= On grade		Compute by:	Known Q
Curb Length (ft)	= 7.00		Q (cfs)	= 1.66
Throat Height (in)	= 6.00			
Grate Area (sqft)	= -0-		**Highlighted**	
Grate Width (ft)	= -0-		Q Total (cfs)	= 1.66
Grate Length (ft)	= -0-		Q Capt (cfs)	= 1.66
			Q Bypass (cfs)	= -0-
Gutter			Depth at Inlet (in)	= 7.52
Slope, Sw (ft/ft)	= 0.083		Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020		Gutter Spread (ft)	= 8.36
Local Depr (in)	= 4.00		Gutter Vel (ft/s)	= 2.01
Gutter Width (ft)	= 2.00		Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.60		Bypass Depth (in)	= -0-
Gutter n-value	= 0.016			



Inlet Report

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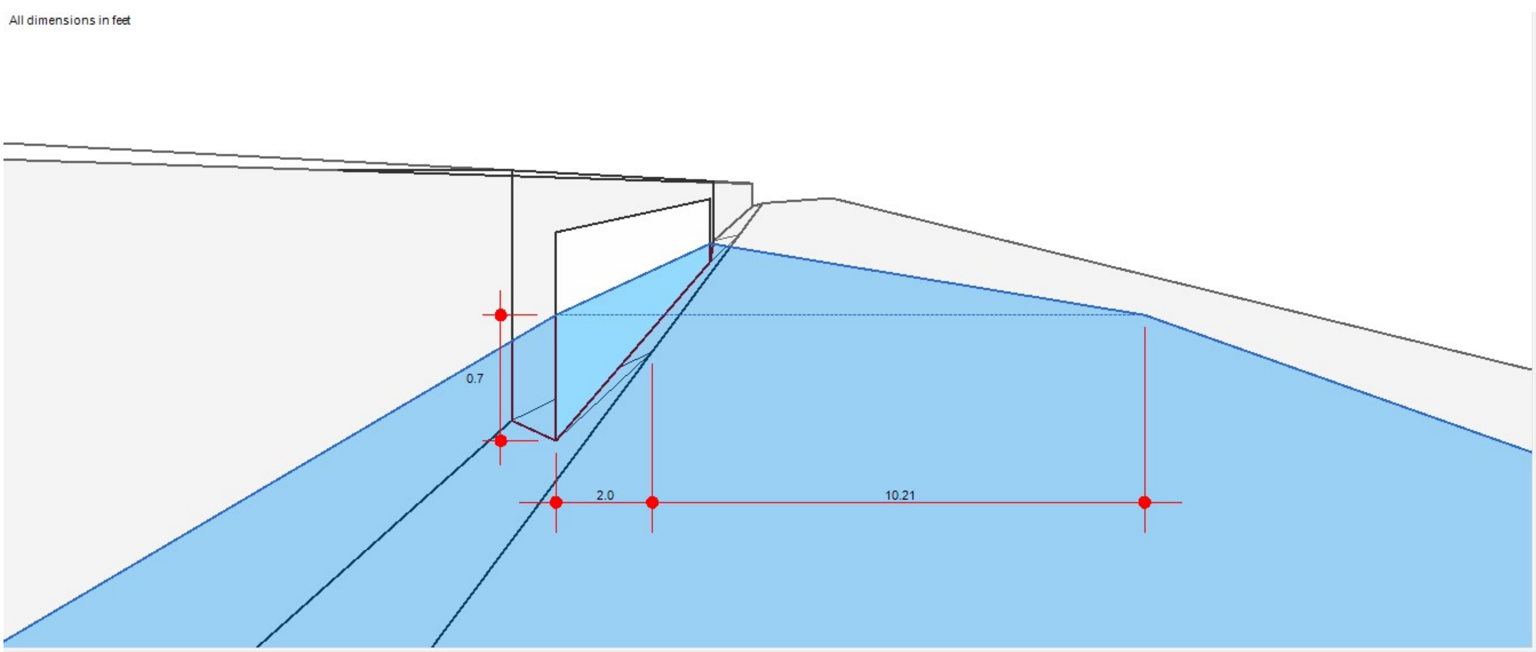
H1 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 14.00	Q (cfs)	= 2.19
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 2.19
Grate Length (ft)	= -0-	Q Capt (cfs)	= 2.19
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.44
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 12.21
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.35
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.20	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

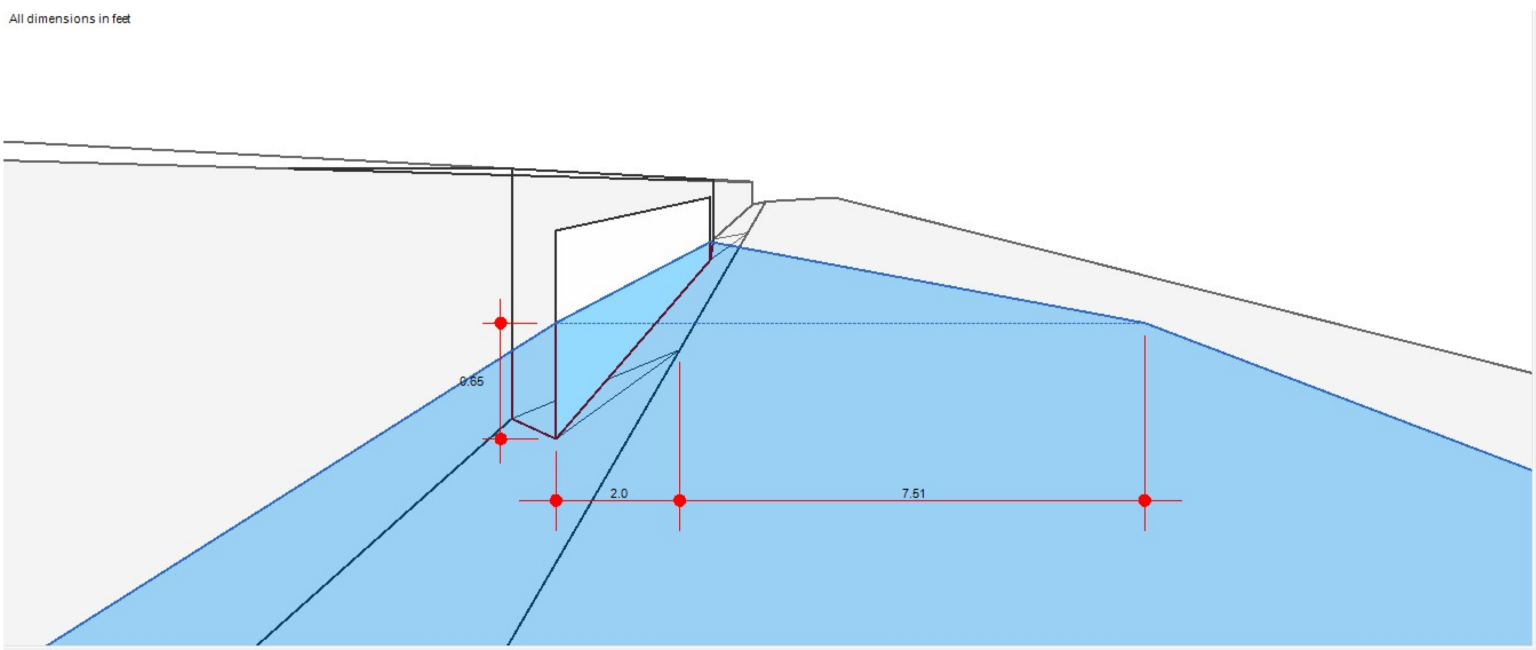


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

H2 25YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 14.00	Q (cfs)	= 2.17
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 2.17
Grate Length (ft)	= -0-	Q Capt (cfs)	= 2.17
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.79
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 9.51
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.11
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.60	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

R1 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

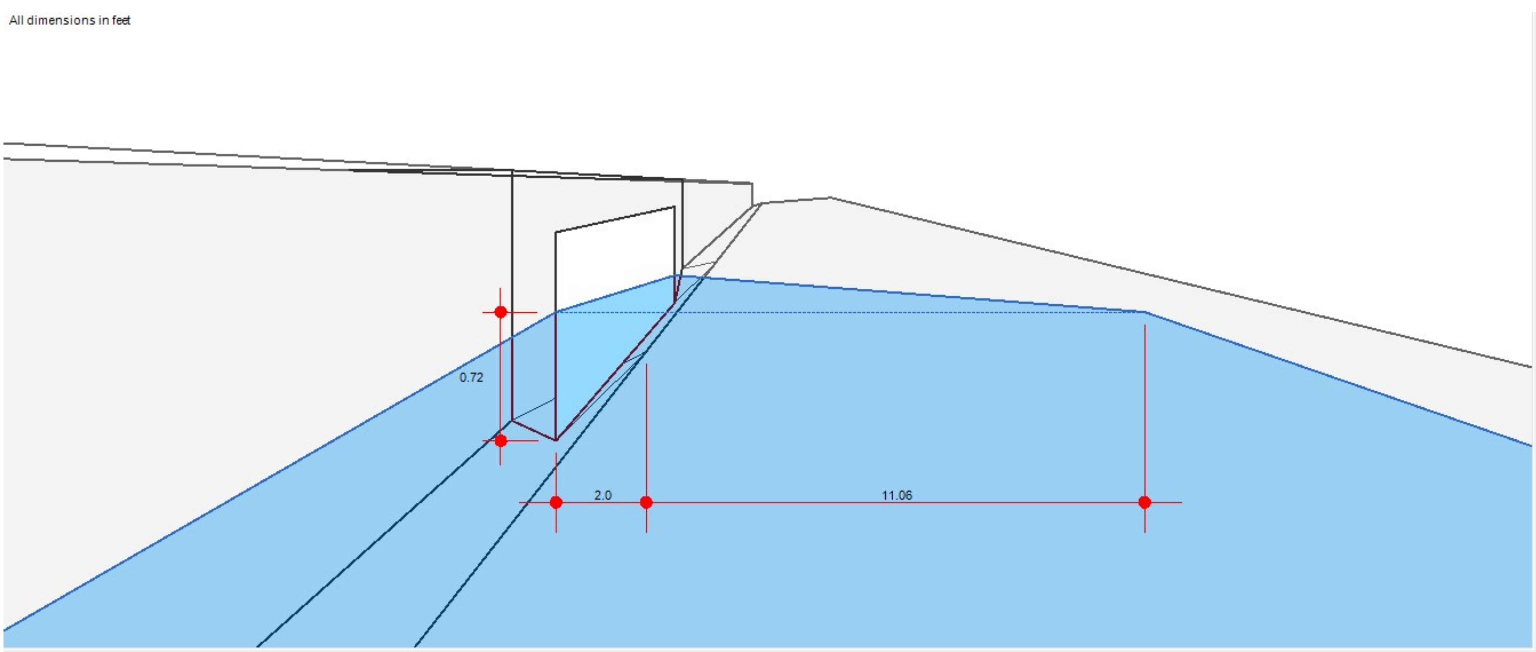
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations

Compute by:		Known Q
Q (cfs)	=	2.23

Highlighted

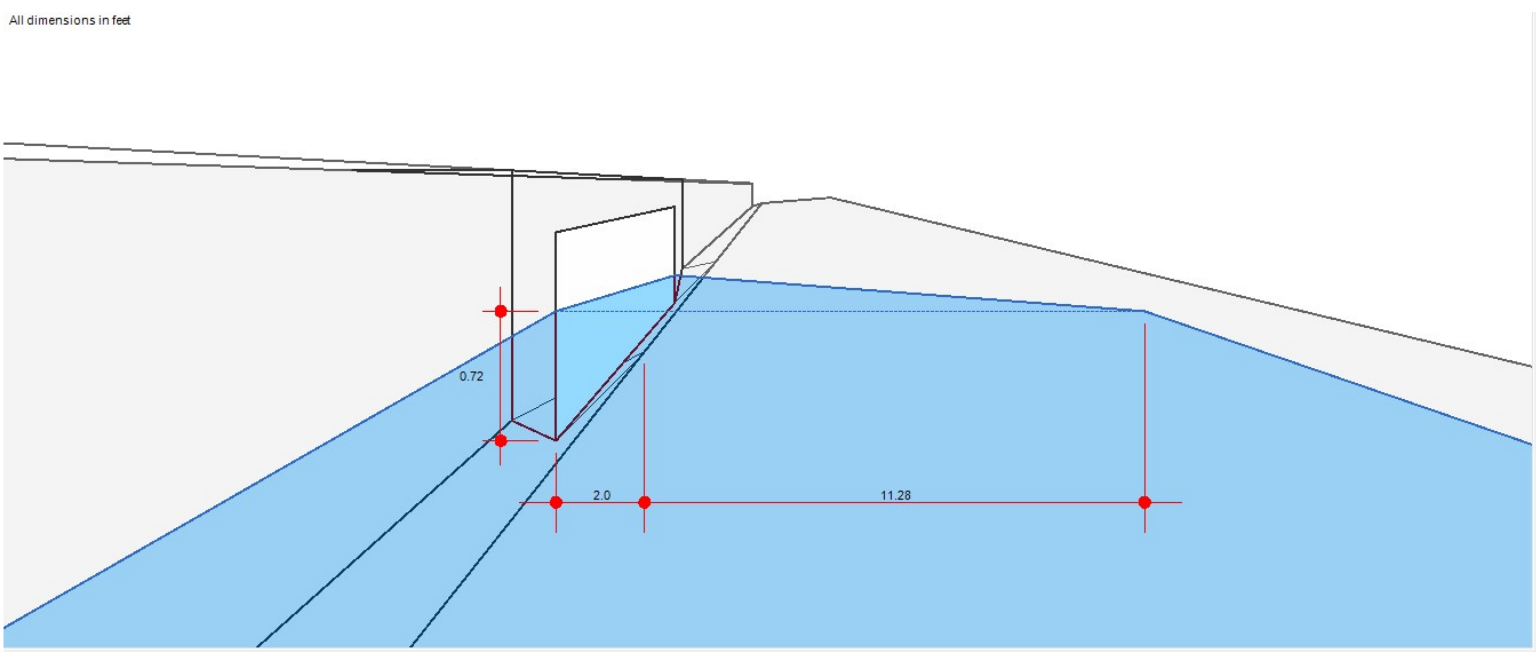
Q Total (cfs)	=	2.23
Q Capt (cfs)	=	2.23
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	8.65
Efficiency (%)	=	100
Gutter Spread (ft)	=	13.06
Gutter Vel (ft/s)	=	1.22
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

V1 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 2.32
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 2.32
Grate Length (ft)	= -0-	Q Capt (cfs)	= 2.32
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.70
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 13.28
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.23
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.013		



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V2 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

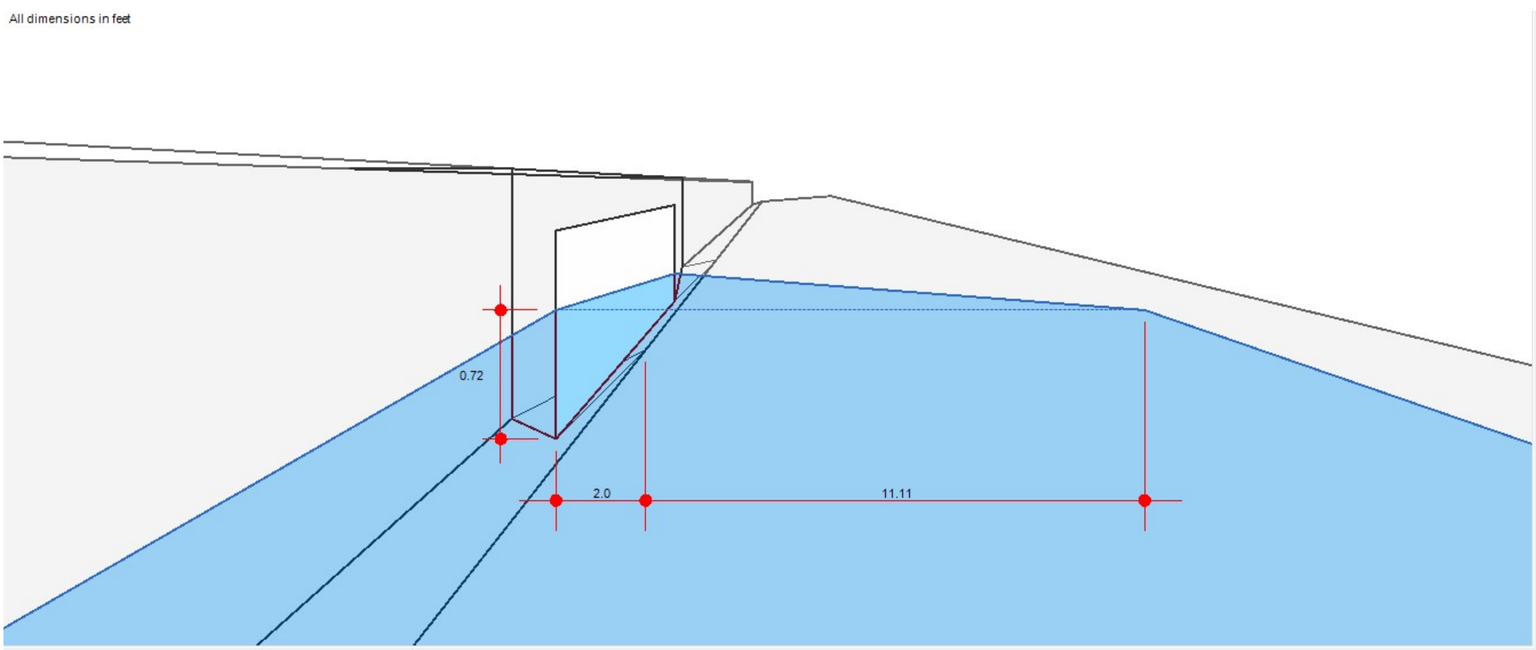
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations

Compute by:		Known Q
Q (cfs)	=	2.25

Highlighted

Q Total (cfs)	=	2.25
Q Capt (cfs)	=	2.25
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	8.66
Efficiency (%)	=	100
Gutter Spread (ft)	=	13.11
Gutter Vel (ft/s)	=	1.22
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



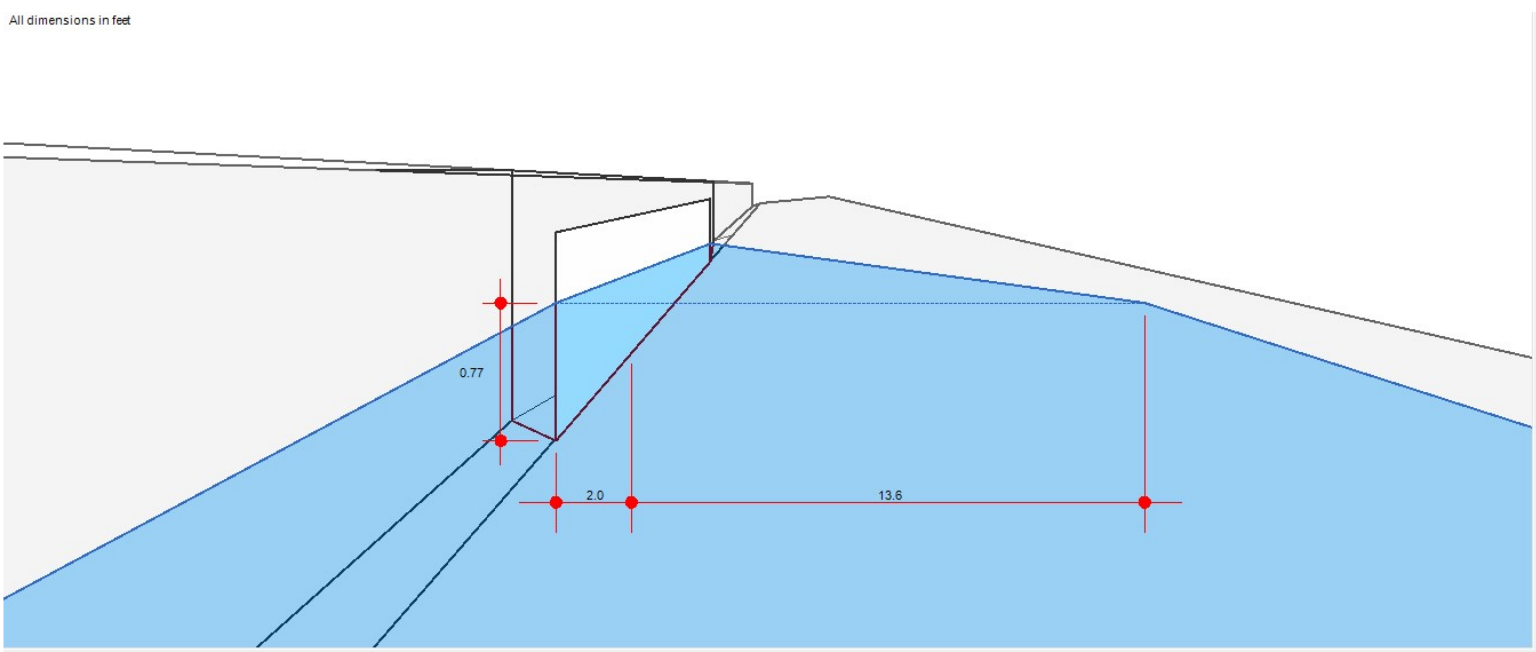
Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V3 100YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	14.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-
Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations		
Compute by:		Known Q
Q (cfs)	=	3.42
Highlighted		
Q Total (cfs)	=	3.42
Q Capt (cfs)	=	3.42
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	9.26
Efficiency (%)	=	100
Gutter Spread (ft)	=	15.60
Gutter Vel (ft/s)	=	1.34
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V4 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	14.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

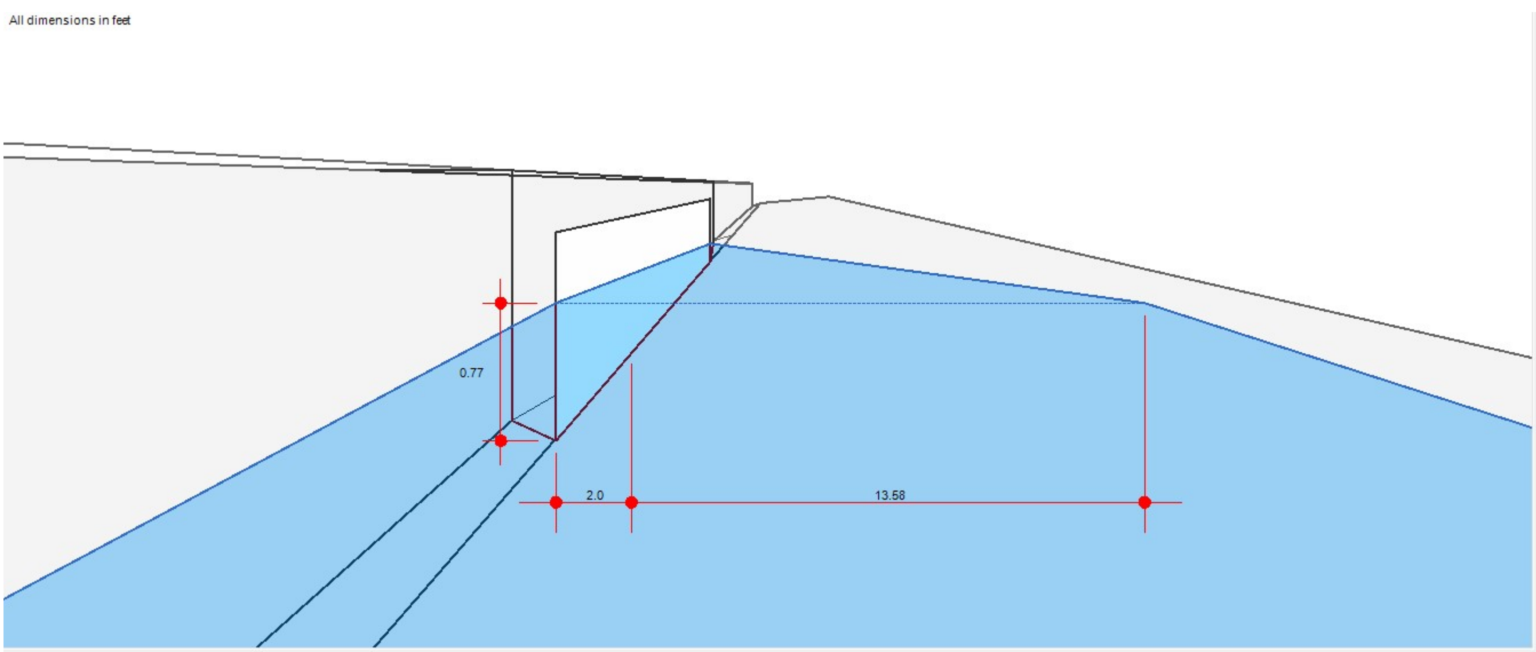
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations

Compute by:		Known Q
Q (cfs)	=	3.41

Highlighted

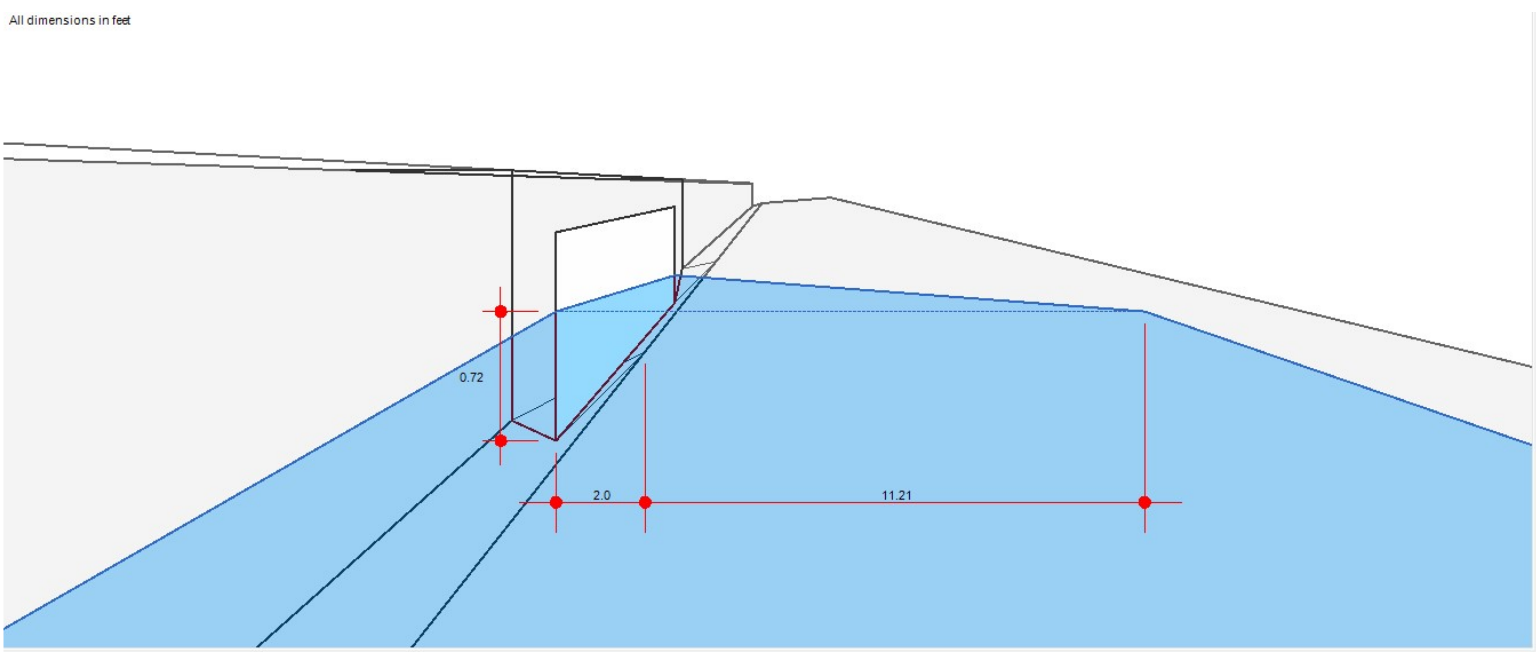
Q Total (cfs)	=	3.41
Q Capt (cfs)	=	3.41
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	9.25
Efficiency (%)	=	100
Gutter Spread (ft)	=	15.58
Gutter Vel (ft/s)	=	1.34
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

V5 100YR

Curb Inlet			Calculations		
Location	=	On grade	Compute by:		Known Q
Curb Length (ft)	=	7.00	Q (cfs)	=	2.29
Throat Height (in)	=	6.00			
Grate Area (sqft)	=	-0-	**Highlighted**		
Grate Width (ft)	=	-0-	Q Total (cfs)	=	2.29
Grate Length (ft)	=	-0-	Q Capt (cfs)	=	2.29
			Q Bypass (cfs)	=	-0-
Gutter			Depth at Inlet (in)	=	8.68
Slope, Sw (ft/ft)	=	0.083	Efficiency (%)	=	100
Slope, Sx (ft/ft)	=	0.020	Gutter Spread (ft)	=	13.21
Local Depr (in)	=	4.00	Gutter Vel (ft/s)	=	1.22
Gutter Width (ft)	=	2.00	Bypass Spread (ft)	=	-0-
Gutter Slope (%)	=	0.10	Bypass Depth (in)	=	-0-
Gutter n-value	=	0.013			



Inlet Report

V6 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

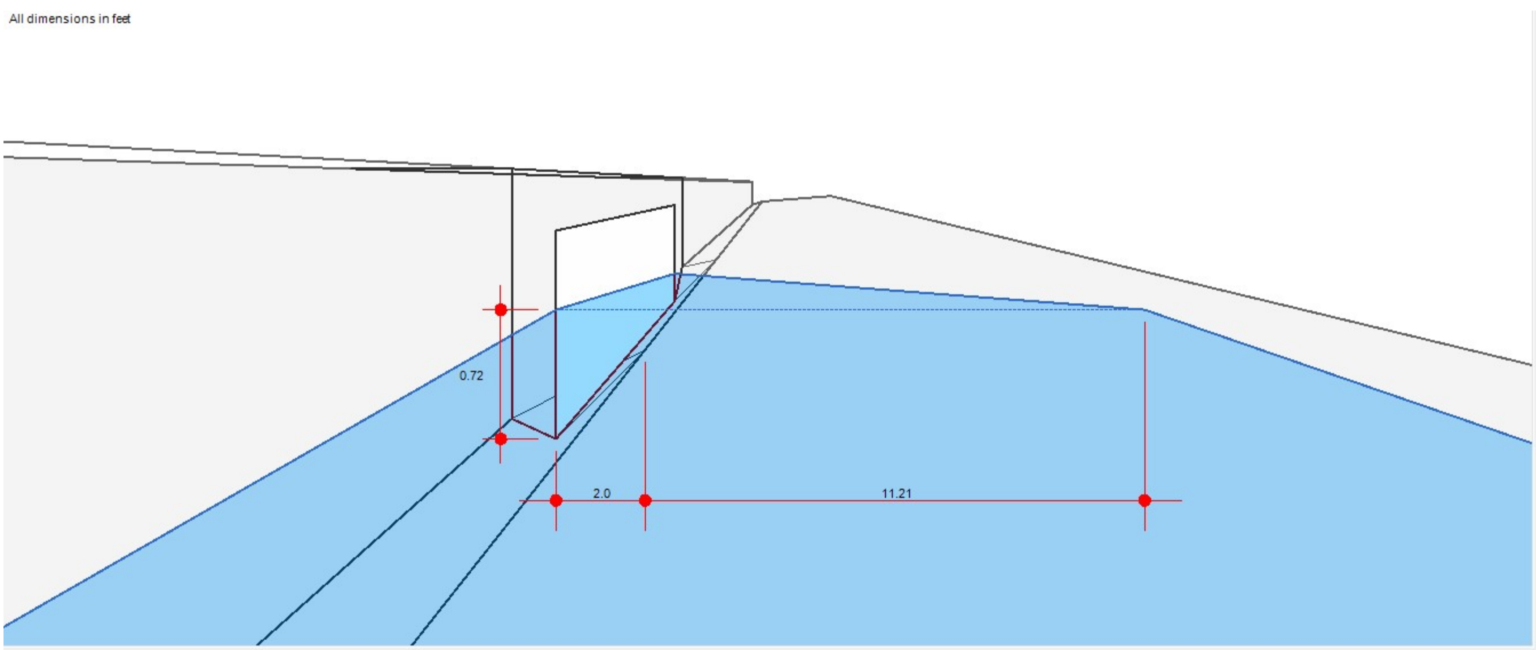
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations

Compute by:		Known Q
Q (cfs)	=	2.29

Highlighted

Q Total (cfs)	=	2.29
Q Capt (cfs)	=	2.29
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	8.68
Efficiency (%)	=	100
Gutter Spread (ft)	=	13.21
Gutter Vel (ft/s)	=	1.22
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

V7 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

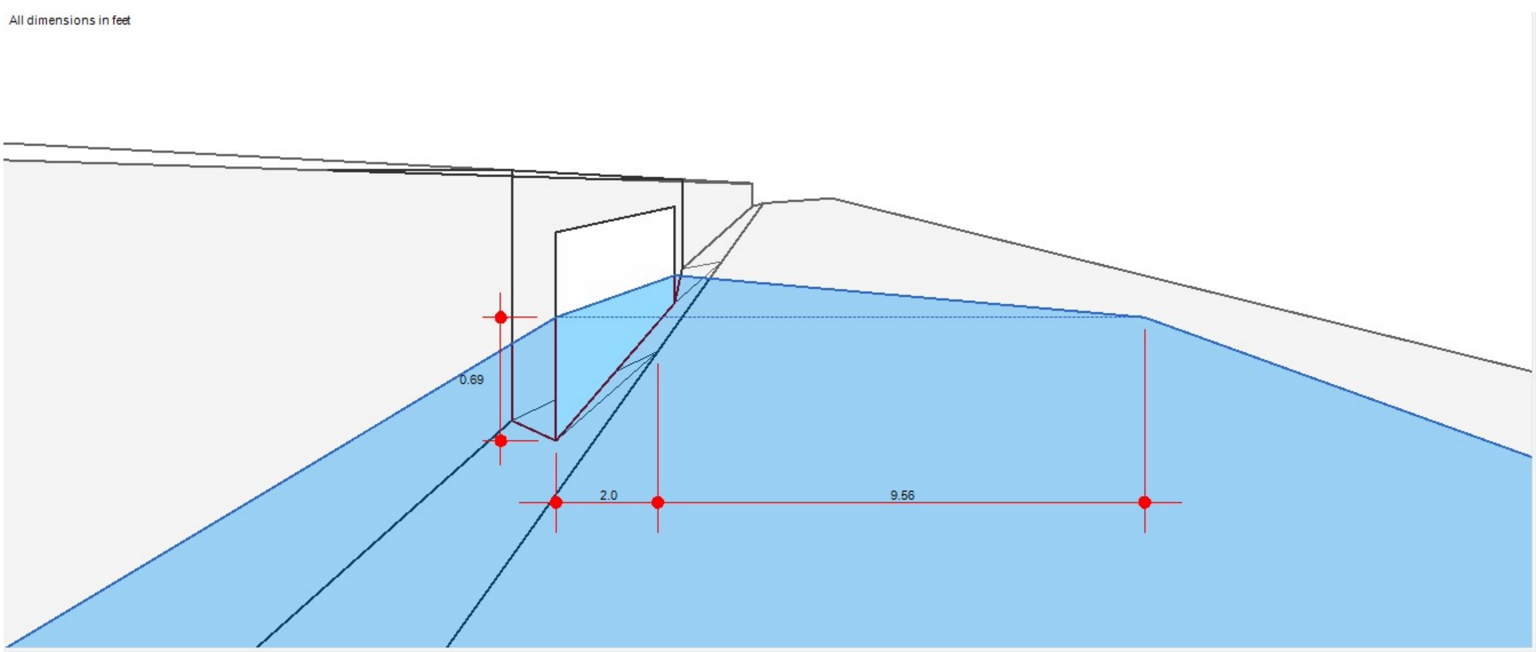
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

Calculations

Compute by:		Known Q
Q (cfs)	=	1.68

Highlighted

Q Total (cfs)	=	1.68
Q Capt (cfs)	=	1.68
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	8.29
Efficiency (%)	=	100
Gutter Spread (ft)	=	11.56
Gutter Vel (ft/s)	=	1.15
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



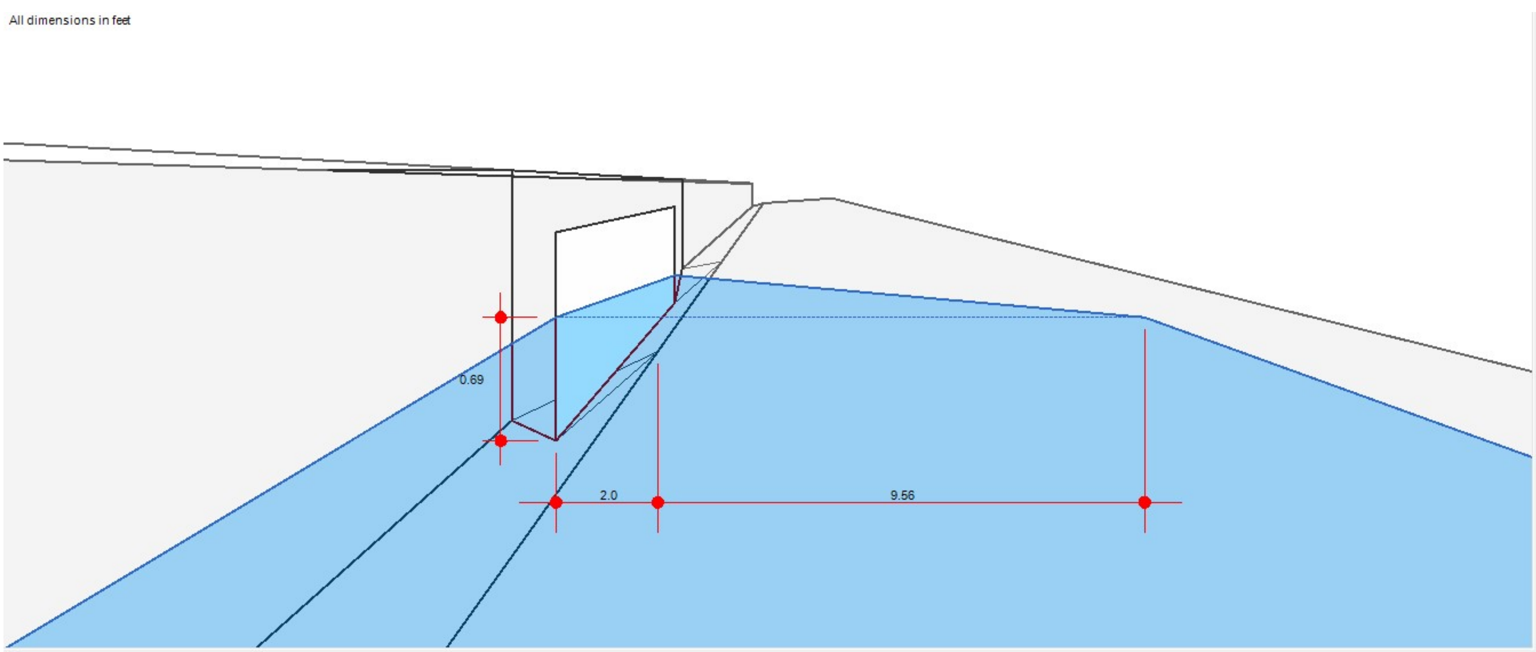
Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

V8 100YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-
Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.013

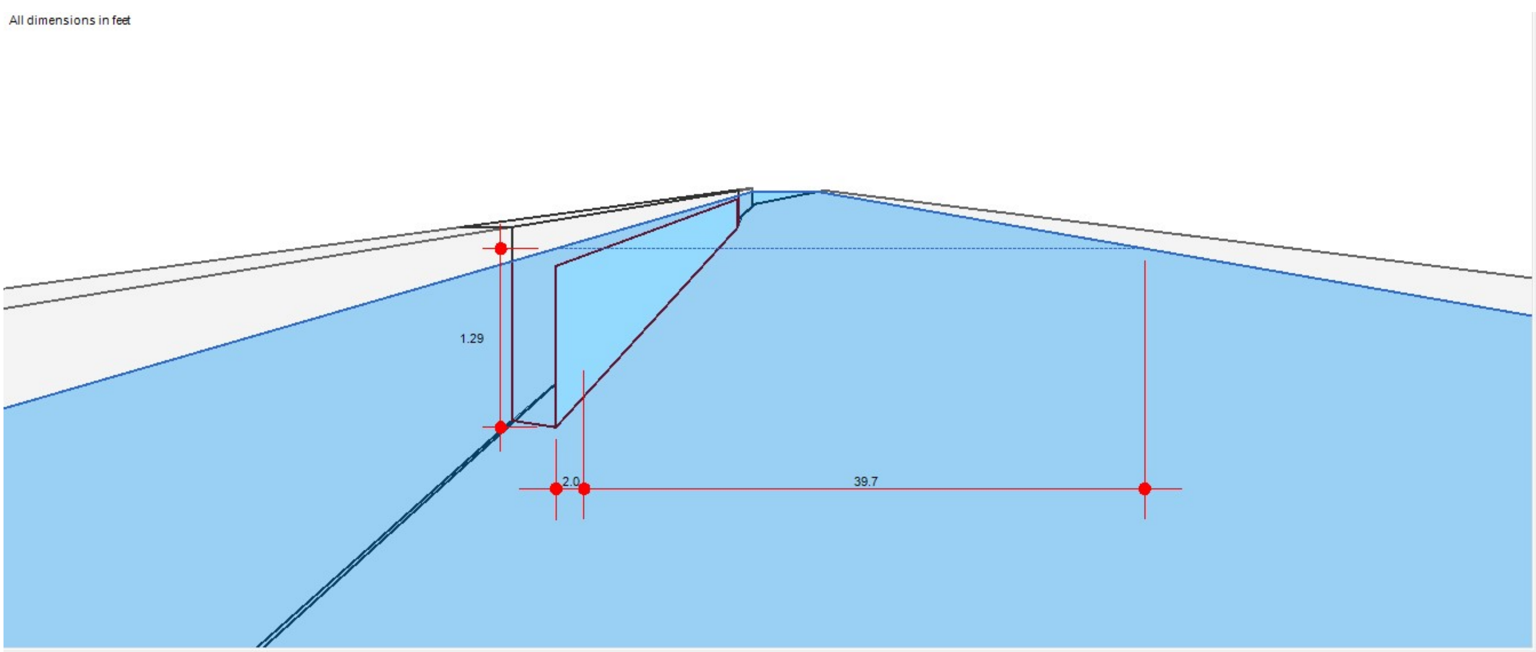
Calculations		
Compute by:		Known Q
Q (cfs)	=	1.68
Highlighted		
Q Total (cfs)	=	1.68
Q Capt (cfs)	=	1.68
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	8.29
Efficiency (%)	=	100
Gutter Spread (ft)	=	11.56
Gutter Vel (ft/s)	=	1.15
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

R2 100YR

Curb Inlet		**Calculations**	
Location	= Sag	Compute by:	Known Q
Curb Length (ft)	= 28.00	Q (cfs)	= 55.36
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 55.36
Grate Length (ft)	= -0-	Q Capt (cfs)	= 55.36
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 15.52
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 41.70
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= -0-
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= -0-	Bypass Depth (in)	= -0-
Gutter n-value	= -0-		



Inlet Report

F3 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

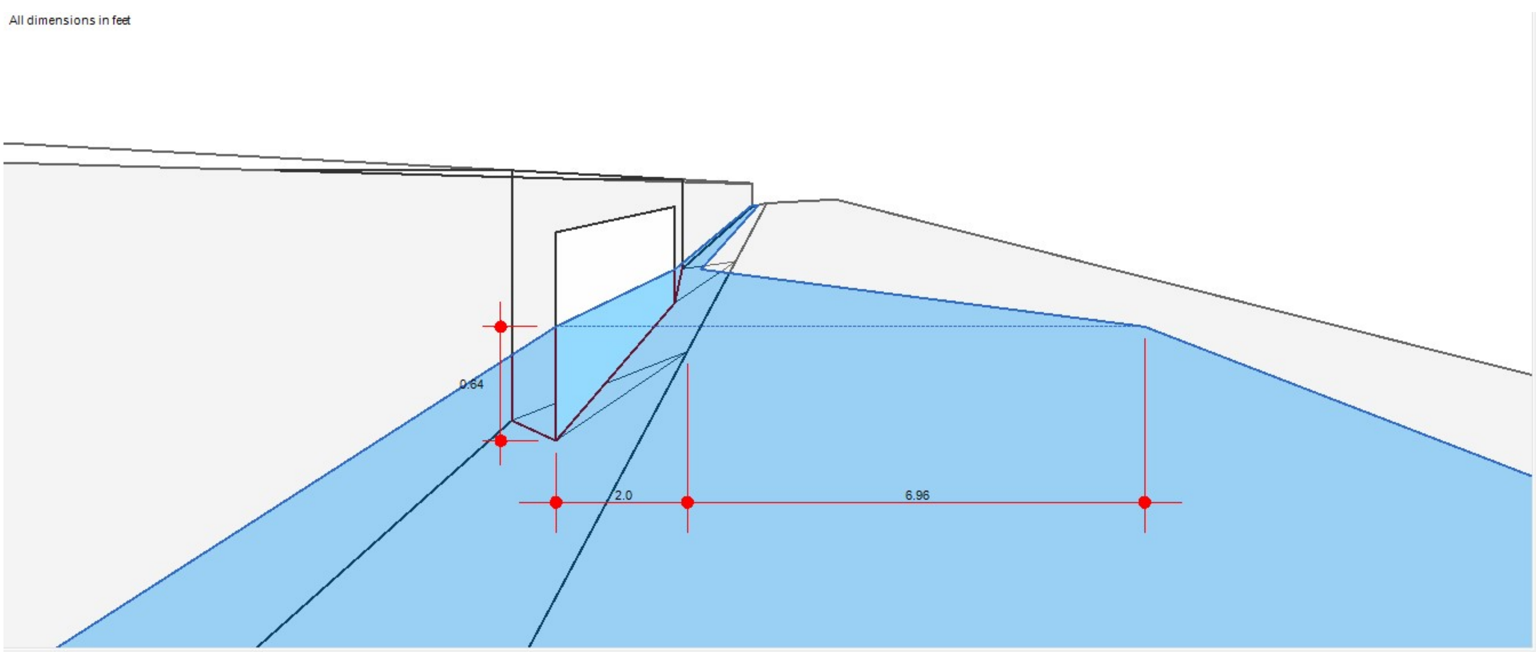
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	1.00
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	2.47

Highlighted

Q Total (cfs)	=	2.47
Q Capt (cfs)	=	2.43
Q Bypass (cfs)	=	0.04
Depth at Inlet (in)	=	7.66
Efficiency (%)	=	98
Gutter Spread (ft)	=	8.96
Gutter Vel (ft/s)	=	2.66
Bypass Spread (ft)	=	0.87
Bypass Depth (in)	=	0.86



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

C6 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

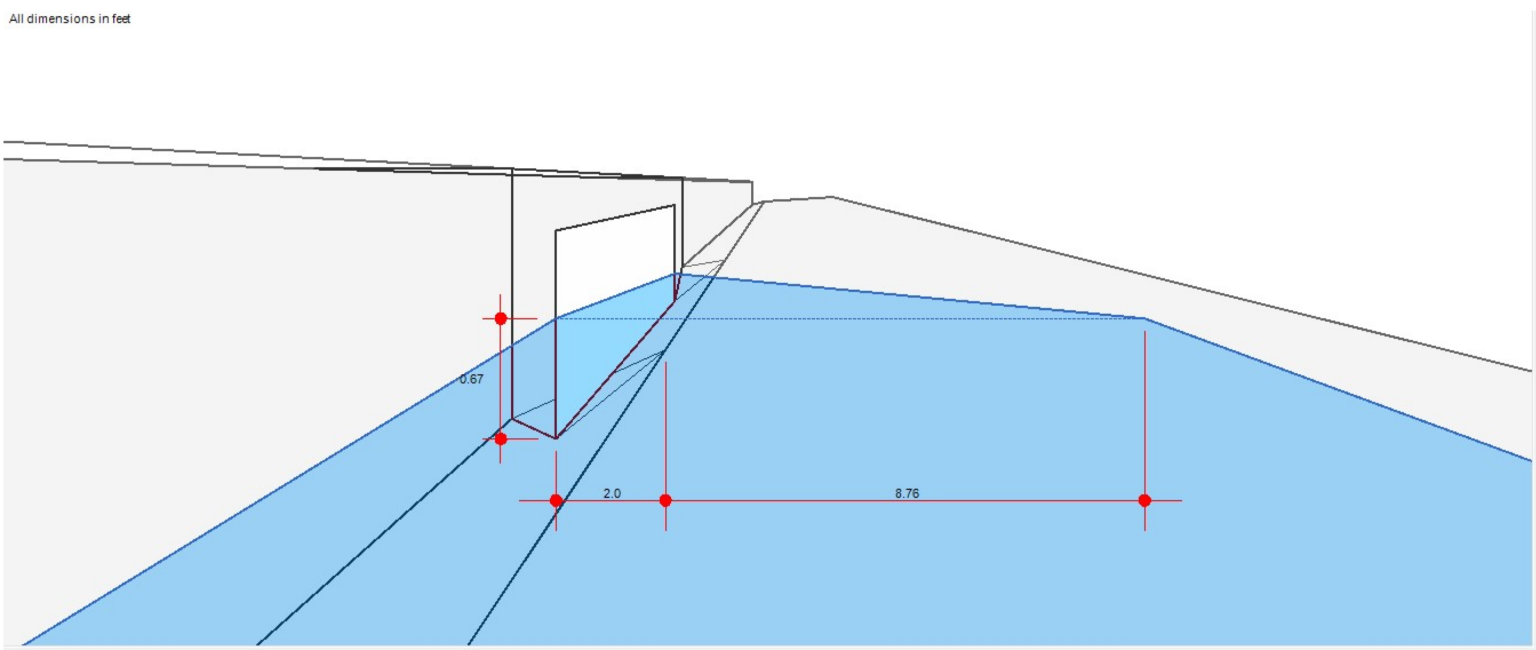
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.30
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	2.01

Highlighted

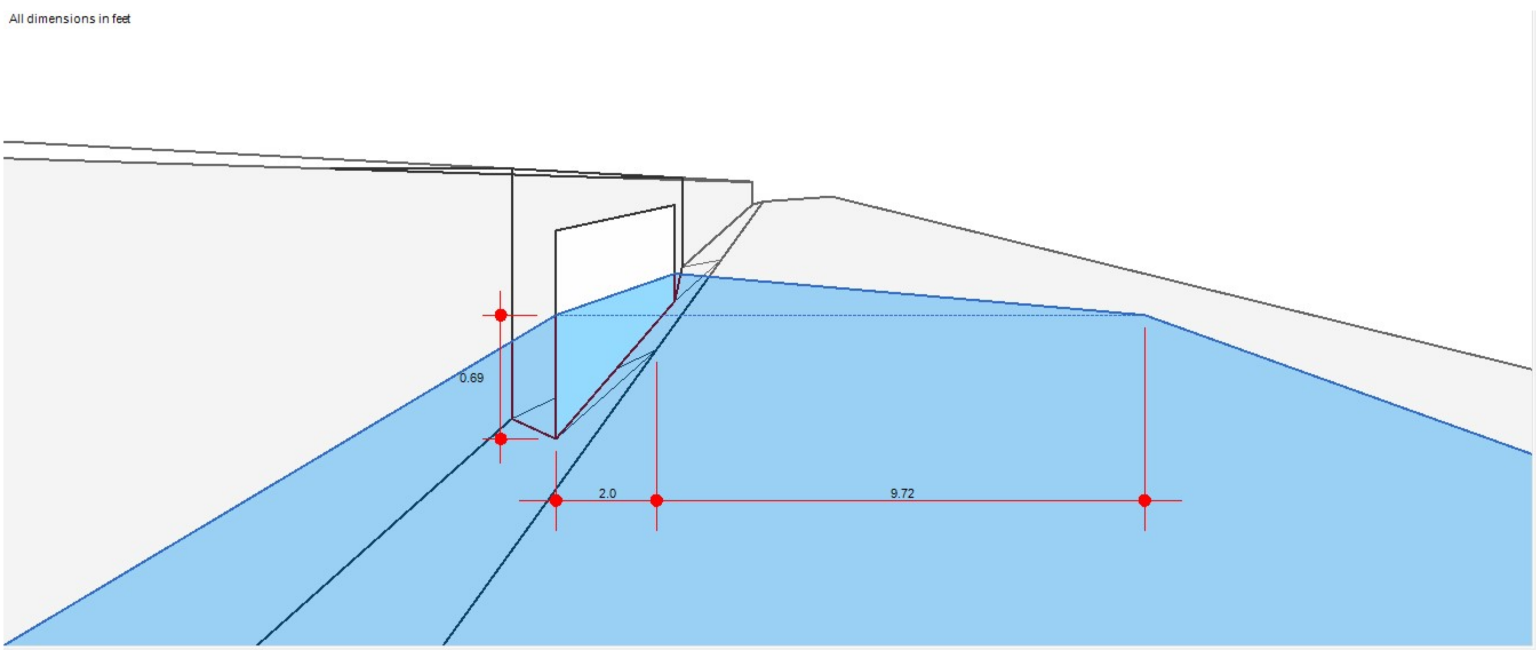
Q Total (cfs)	=	2.01
Q Capt (cfs)	=	2.01
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	8.09
Efficiency (%)	=	100
Gutter Spread (ft)	=	10.76
Gutter Vel (ft/s)	=	1.57
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

C5 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.99
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.99
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.99
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.32
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 11.72
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.33
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.20	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



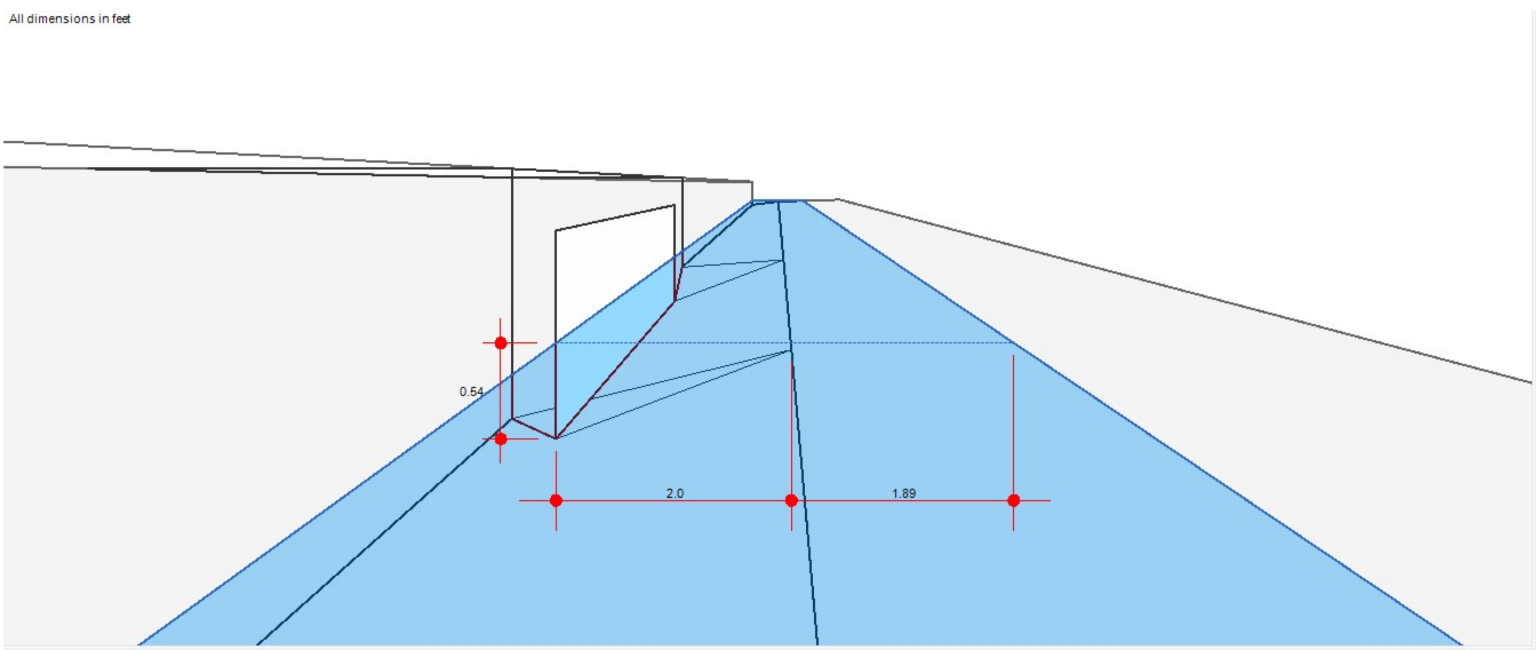
Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

F1 100YR

Curb Inlet		
Location	=	Sag
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-
Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	-0-
Gutter n-value	=	-0-

Calculations		
Compute by:		Known Q
Q (cfs)	=	0.53
Highlighted		
Q Total (cfs)	=	0.53
Q Capt (cfs)	=	0.53
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.45
Efficiency (%)	=	100
Gutter Spread (ft)	=	3.89
Gutter Vel (ft/s)	=	1.33
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

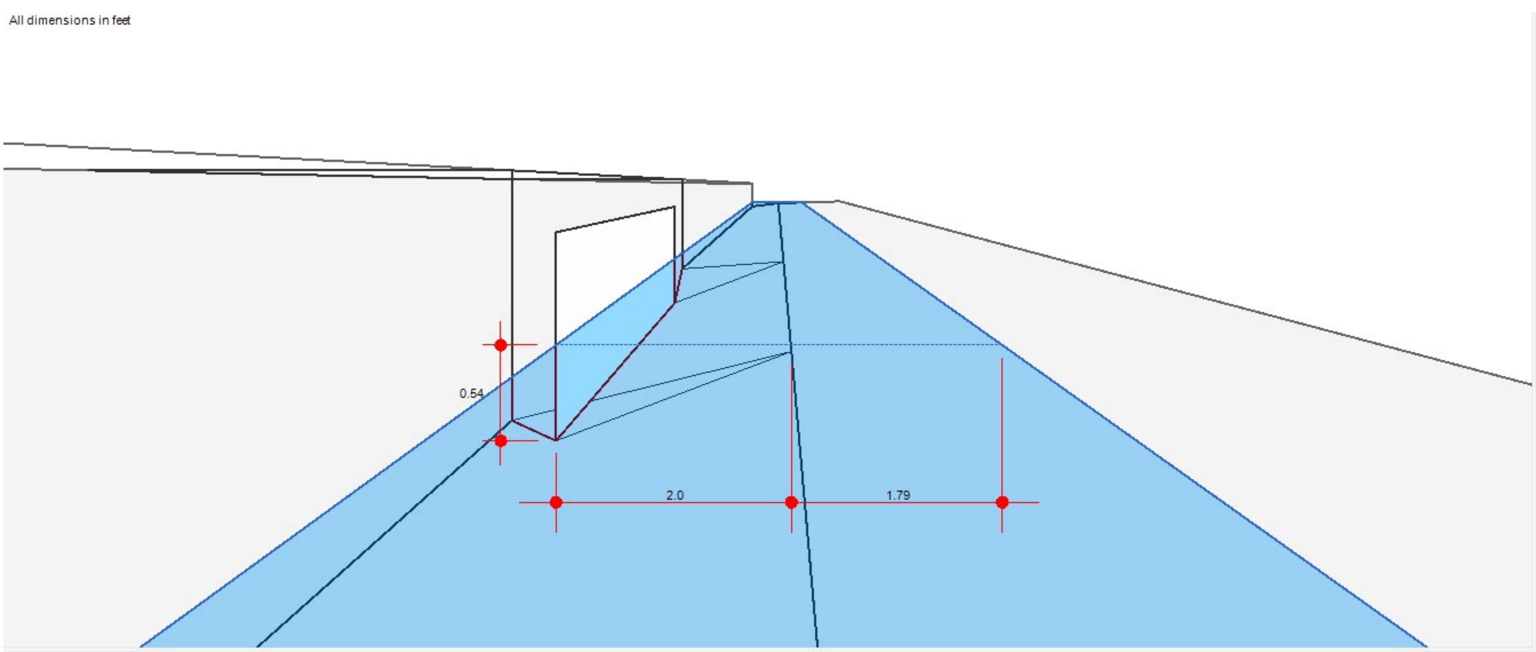


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. — Thursday, May 16 2024

F2 100YR

Curb Inlet		**Calculations**	
Location	= Sag	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.51
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.51
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.51
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.42
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 3.79
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.33
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= -0-	Bypass Depth (in)	= -0-
Gutter n-value	= -0-		



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

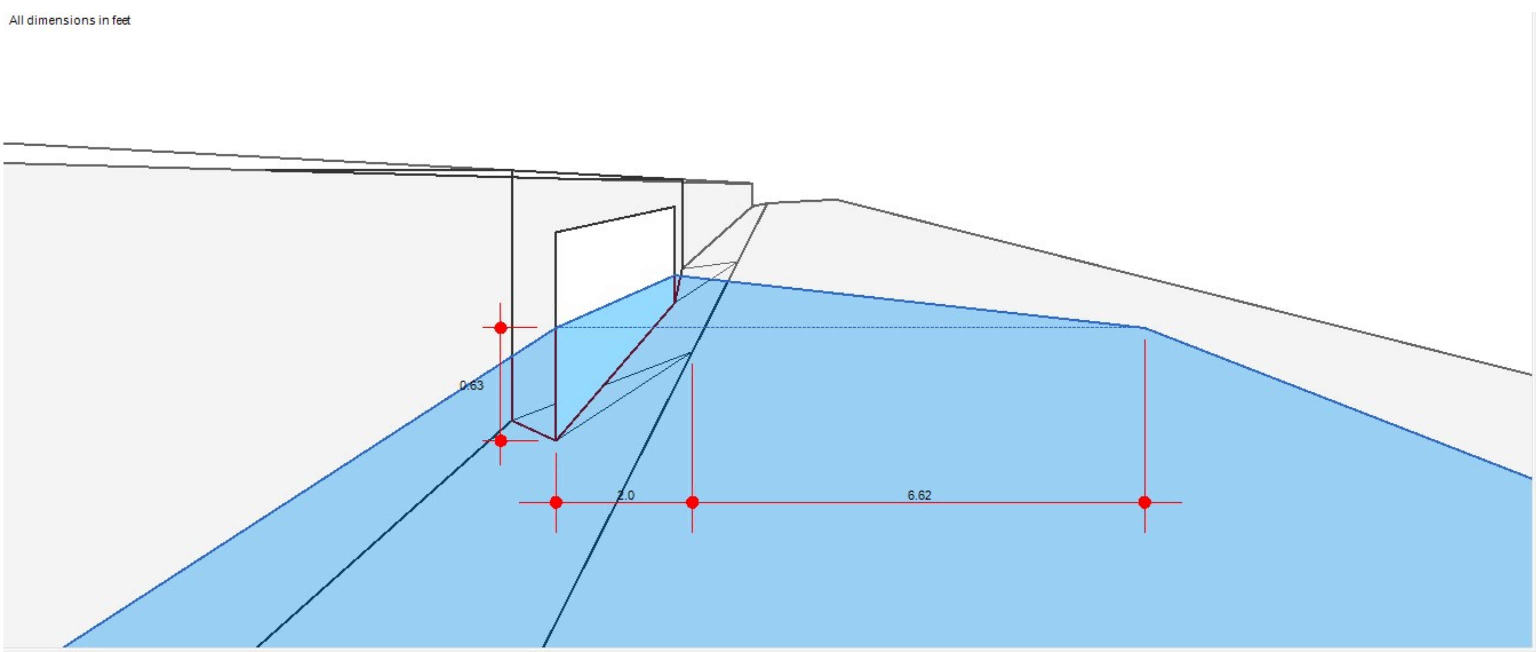
E2 100YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.20
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	1.02

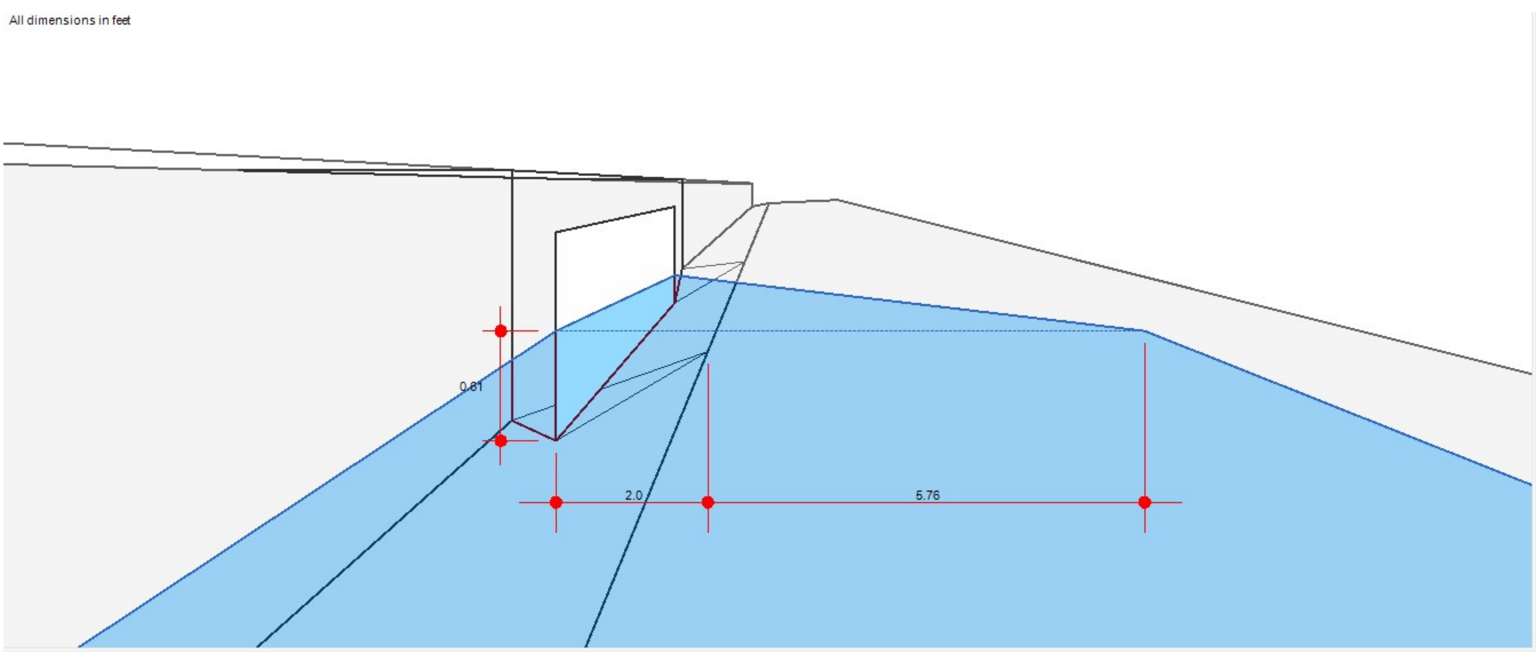
Highlighted		
Q Total (cfs)	=	1.02
Q Capt (cfs)	=	1.02
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.58
Efficiency (%)	=	100
Gutter Spread (ft)	=	8.62
Gutter Vel (ft/s)	=	1.17
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

E1 100YR

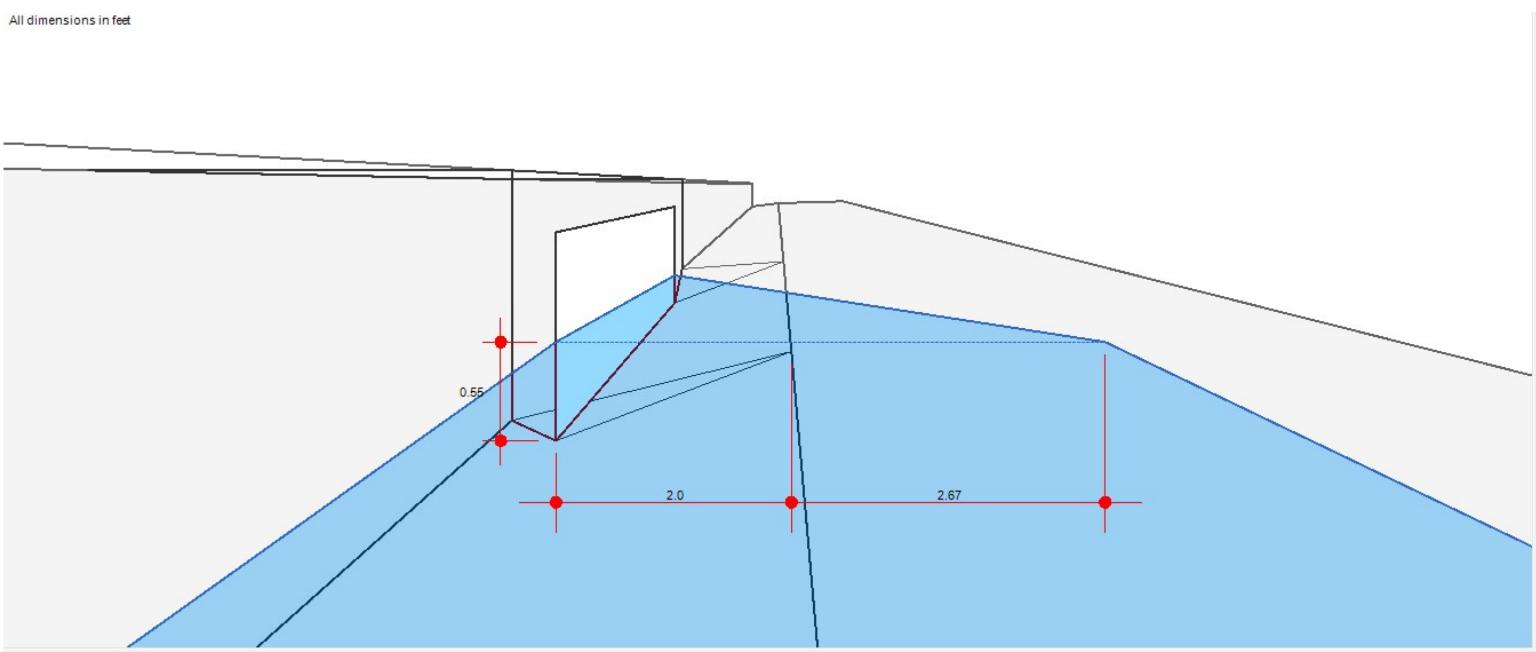
Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.01
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.01
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.01
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.37
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 7.76
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.39
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.30	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

E4 100YR

Curb Inlet		Calculations	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.50
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.50
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.50
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.63
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 4.67
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.46
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.40	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

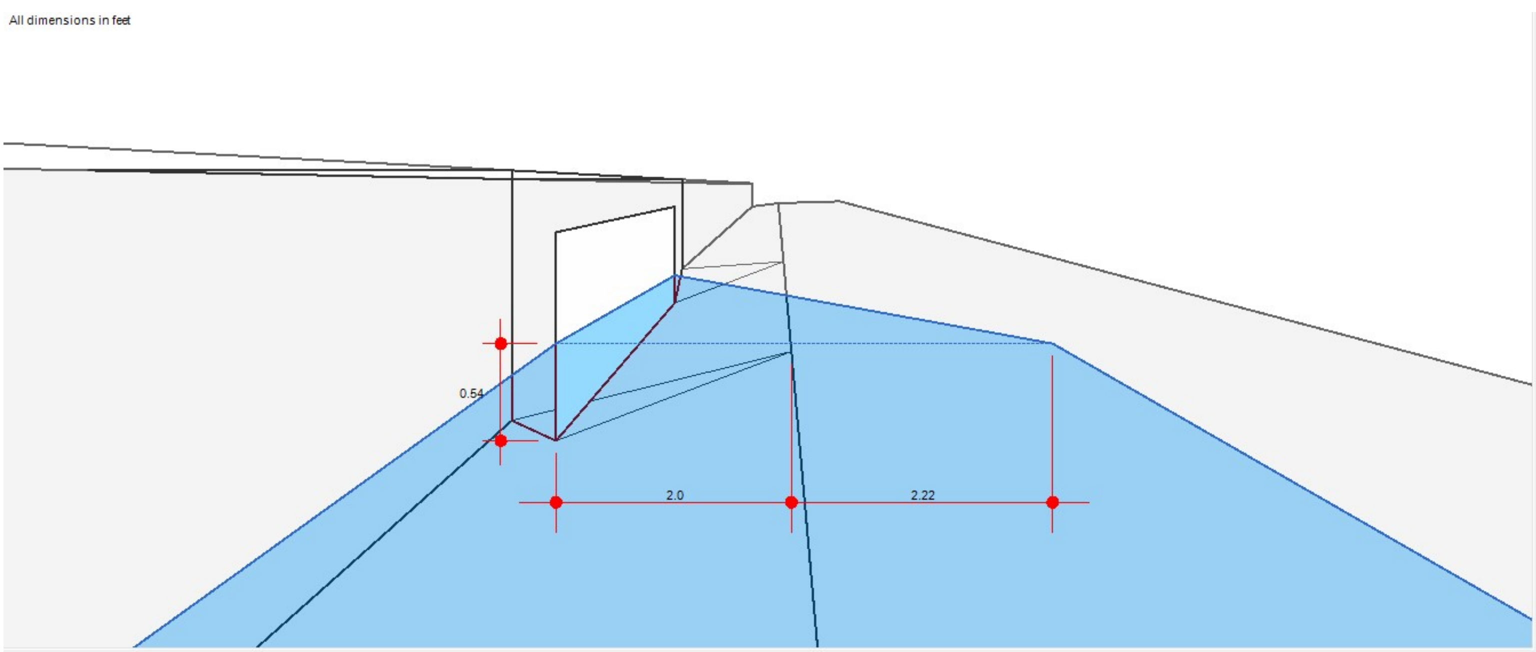


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

E3 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.49
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.49
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.49
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.52
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 4.22
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.61
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.50	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

C2 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

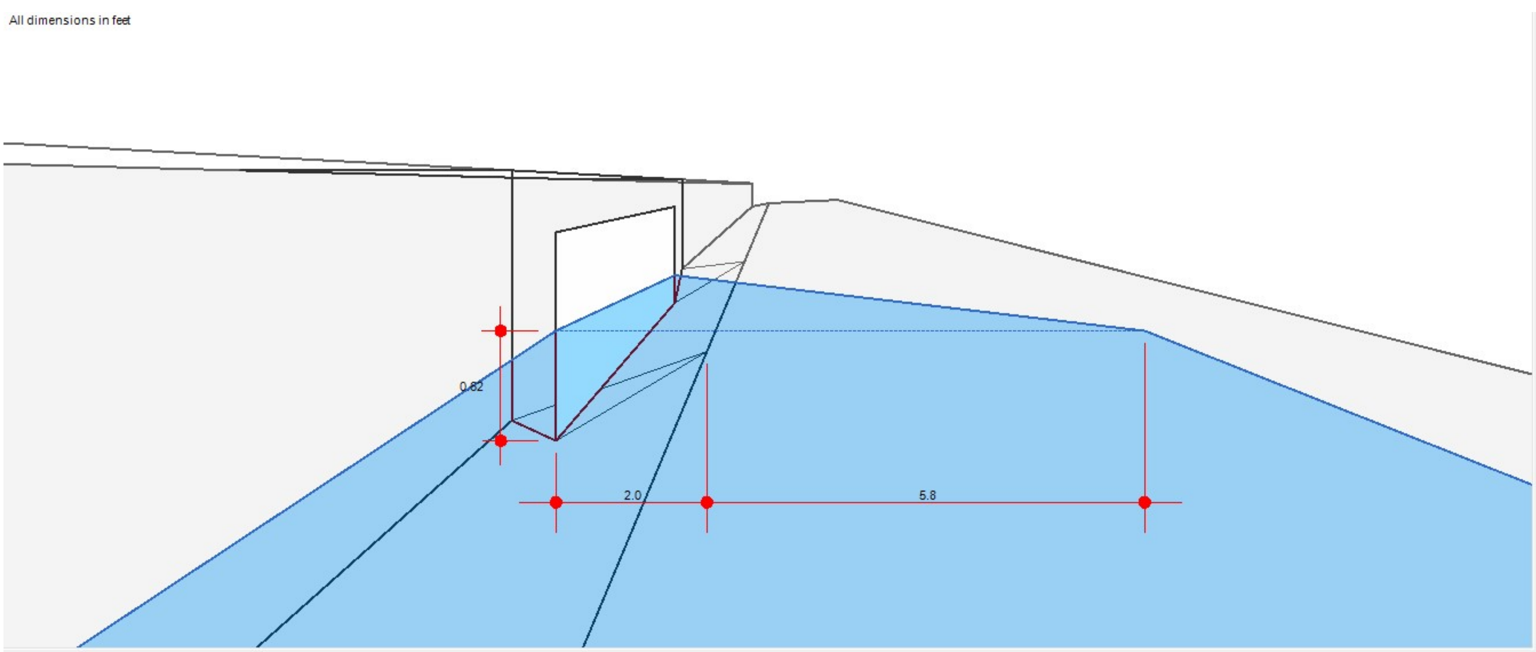
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.50
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	1.32

Highlighted

Q Total (cfs)	=	1.32
Q Capt (cfs)	=	1.32
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.38
Efficiency (%)	=	100
Gutter Spread (ft)	=	7.80
Gutter Vel (ft/s)	=	1.80
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

C1 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

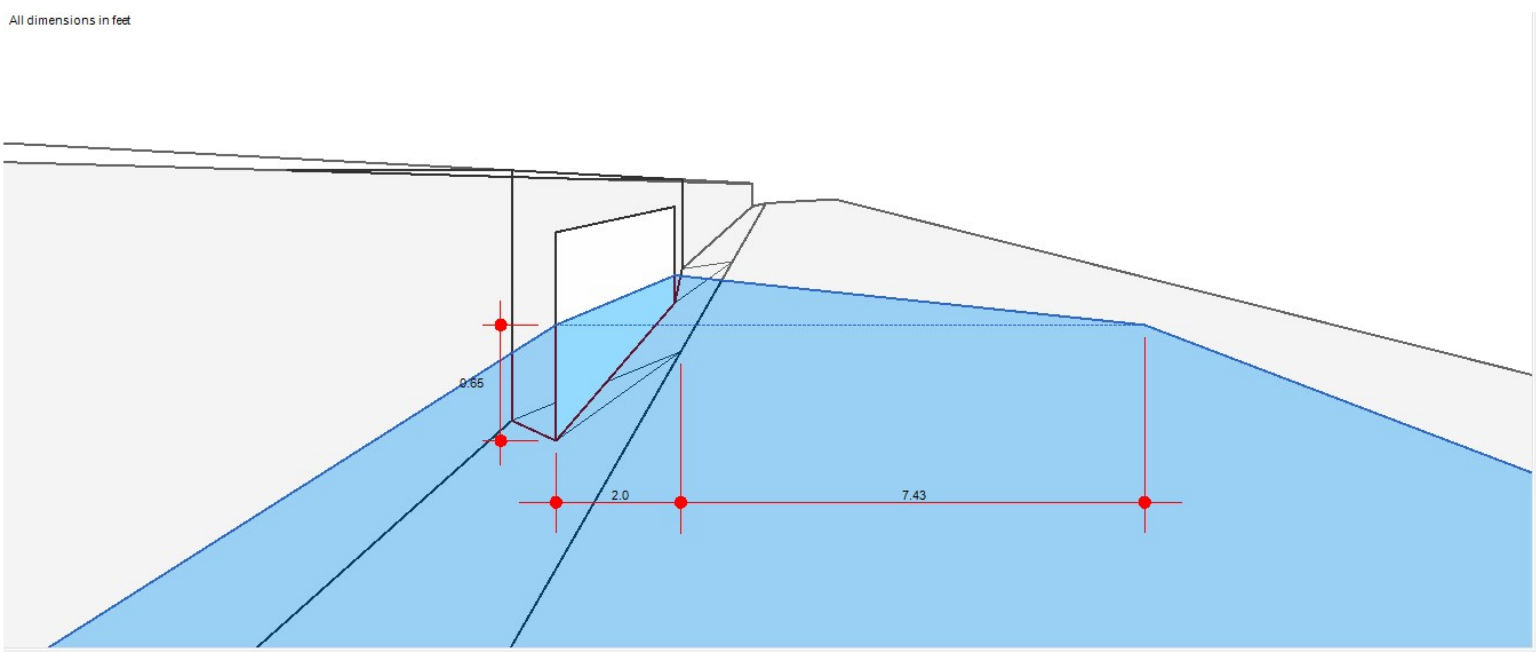
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.20
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	1.23

Highlighted

Q Total (cfs)	=	1.23
Q Capt (cfs)	=	1.23
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.78
Efficiency (%)	=	100
Gutter Spread (ft)	=	9.43
Gutter Vel (ft/s)	=	1.21
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

C4 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

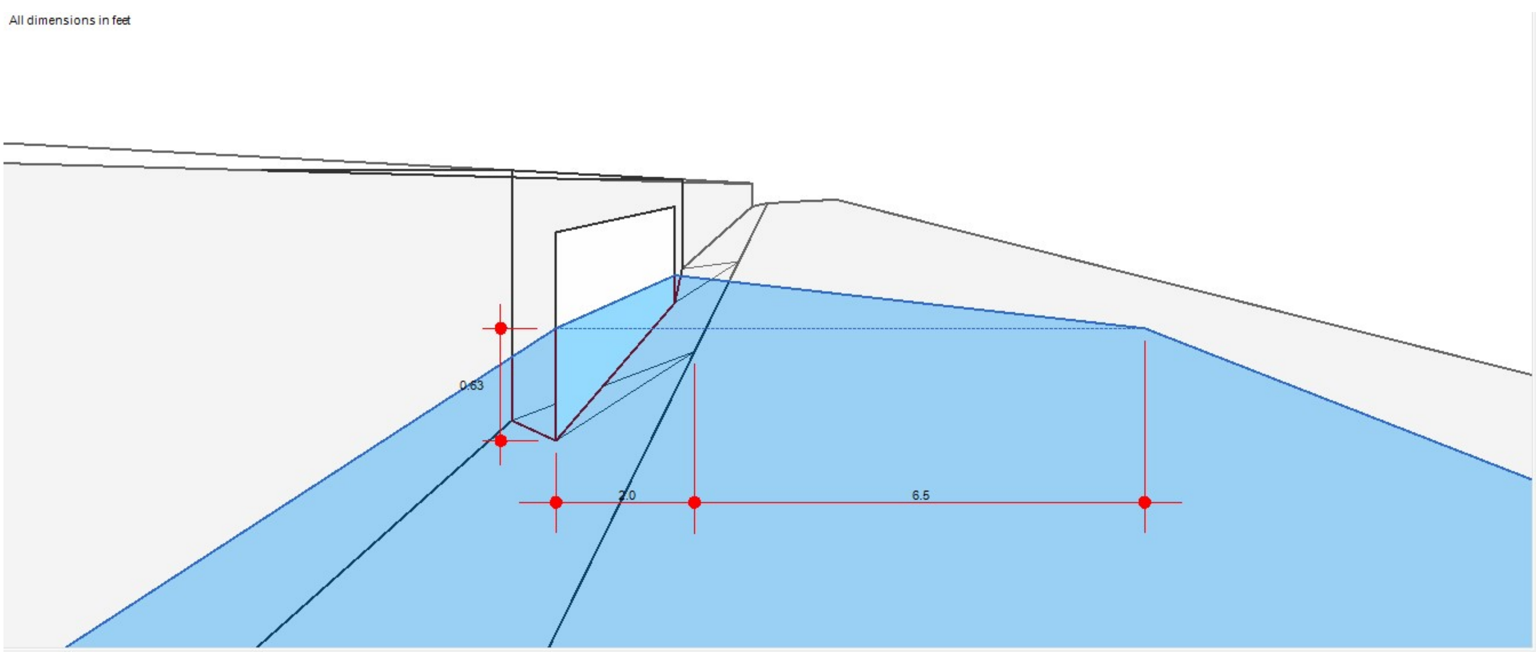
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.40
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	1.40

Highlighted

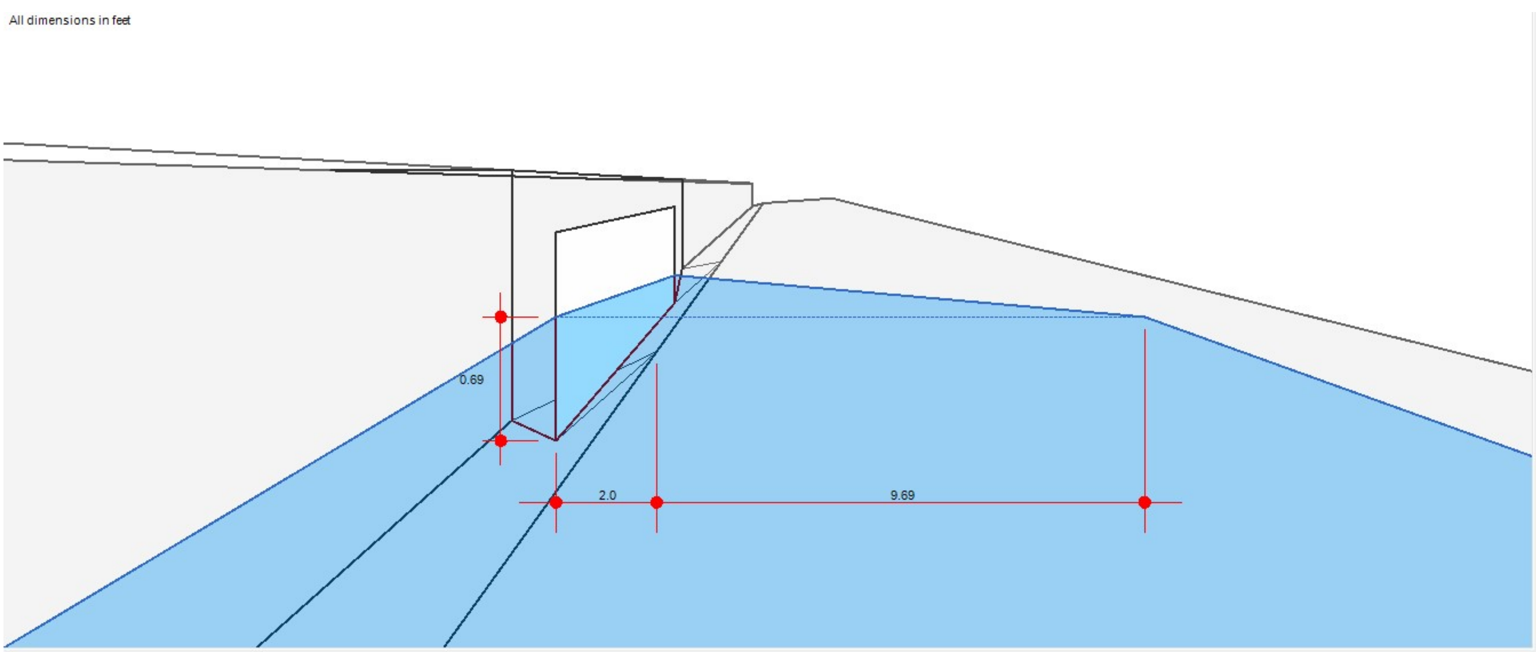
Q Total (cfs)	=	1.40
Q Capt (cfs)	=	1.40
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.55
Efficiency (%)	=	100
Gutter Spread (ft)	=	8.50
Gutter Vel (ft/s)	=	1.65
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

C3 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.40
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.40
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.40
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.32
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 11.69
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 0.94
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

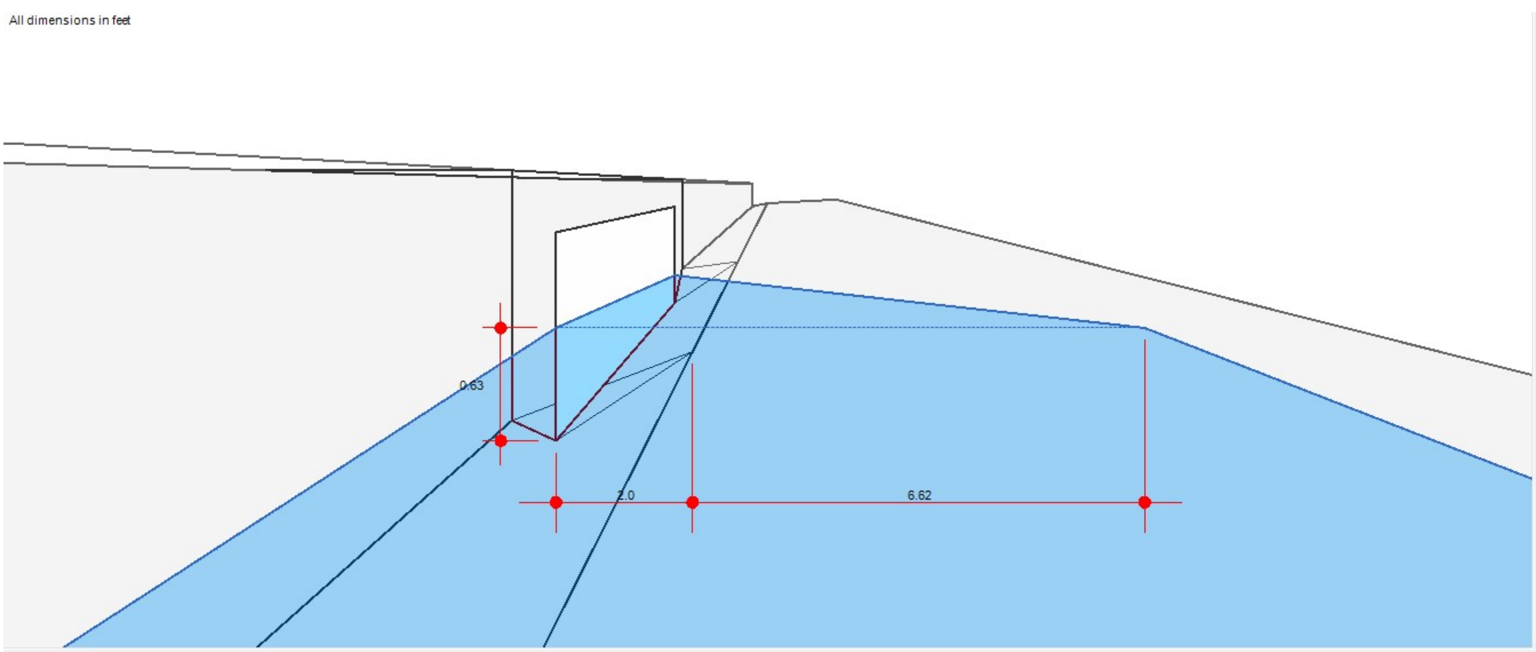


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

A9 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.72
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.72
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.72
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.58
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 8.62
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 0.83
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

A10 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

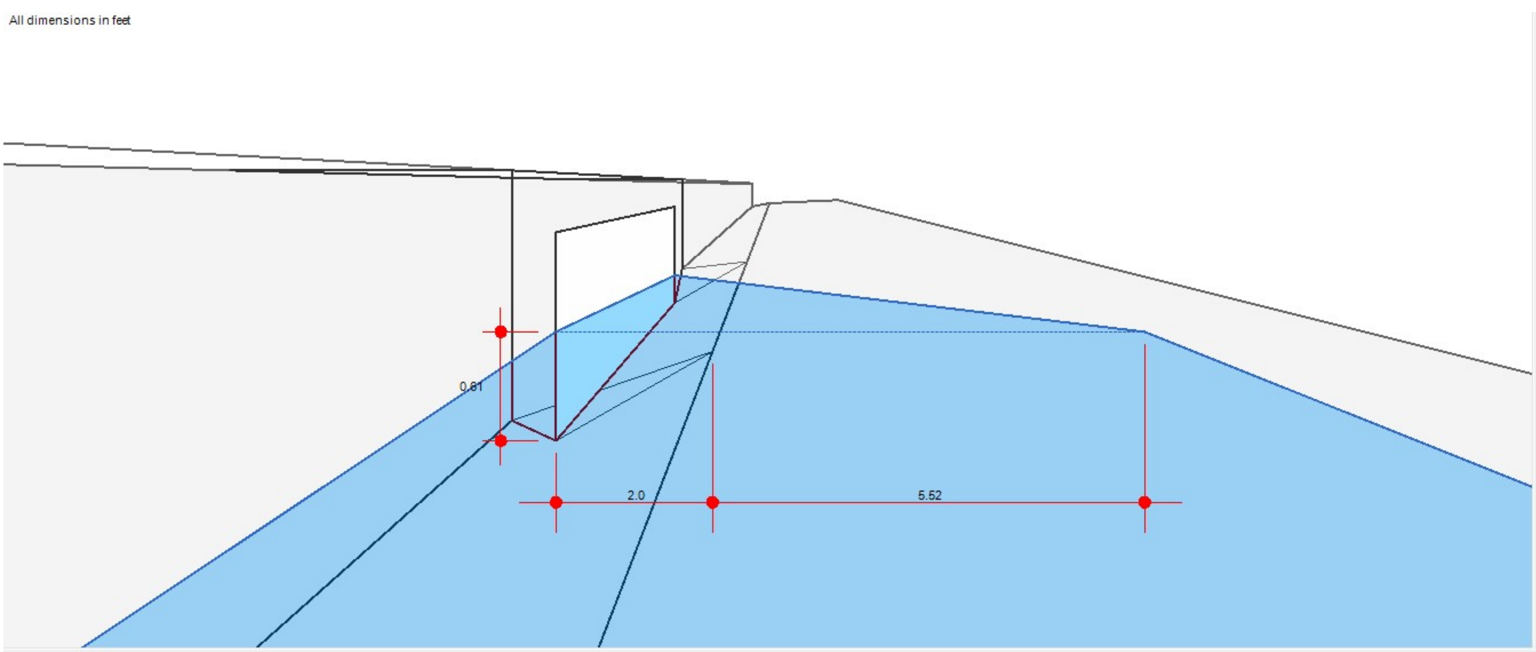
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.10
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	0.55

Highlighted

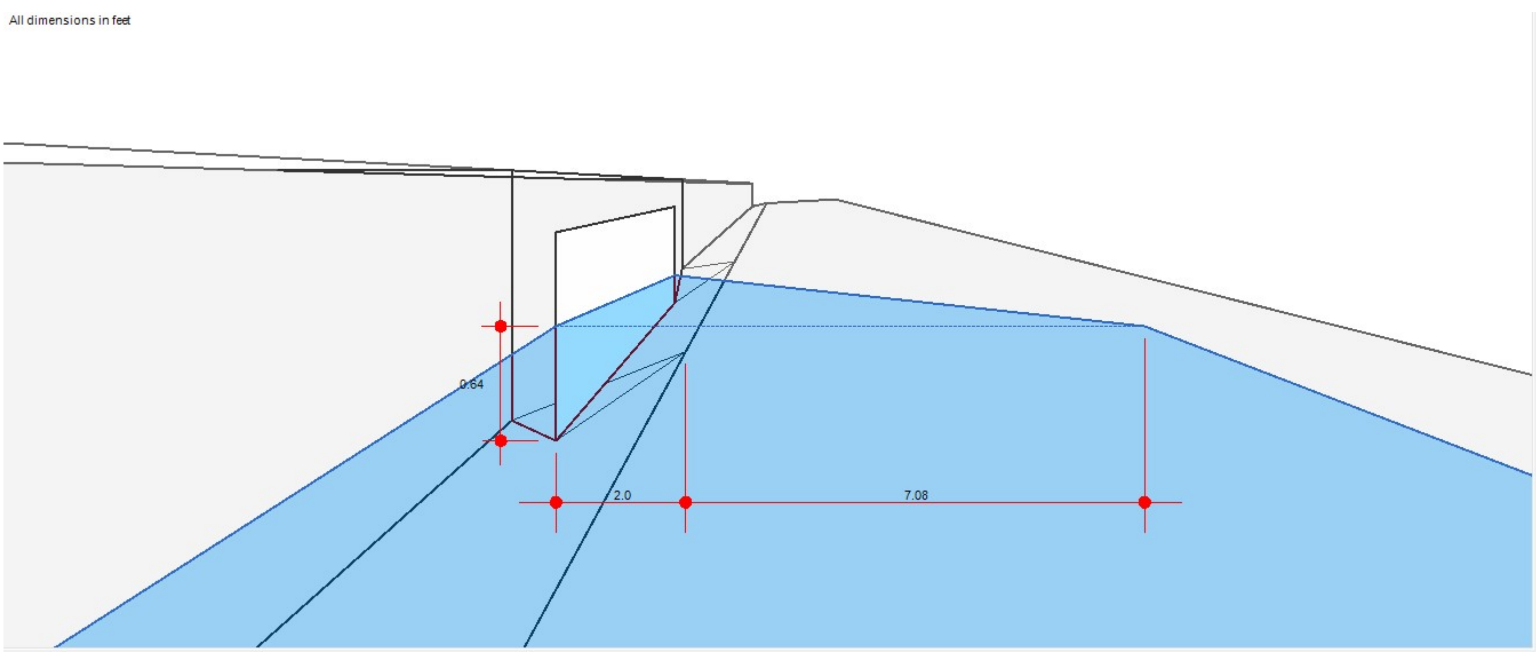
Q Total (cfs)	=	0.55
Q Capt (cfs)	=	0.55
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.32
Efficiency (%)	=	100
Gutter Spread (ft)	=	7.52
Gutter Vel (ft/s)	=	0.80
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

A7 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.39
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.39
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.39
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.69
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 9.08
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.46
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.30	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

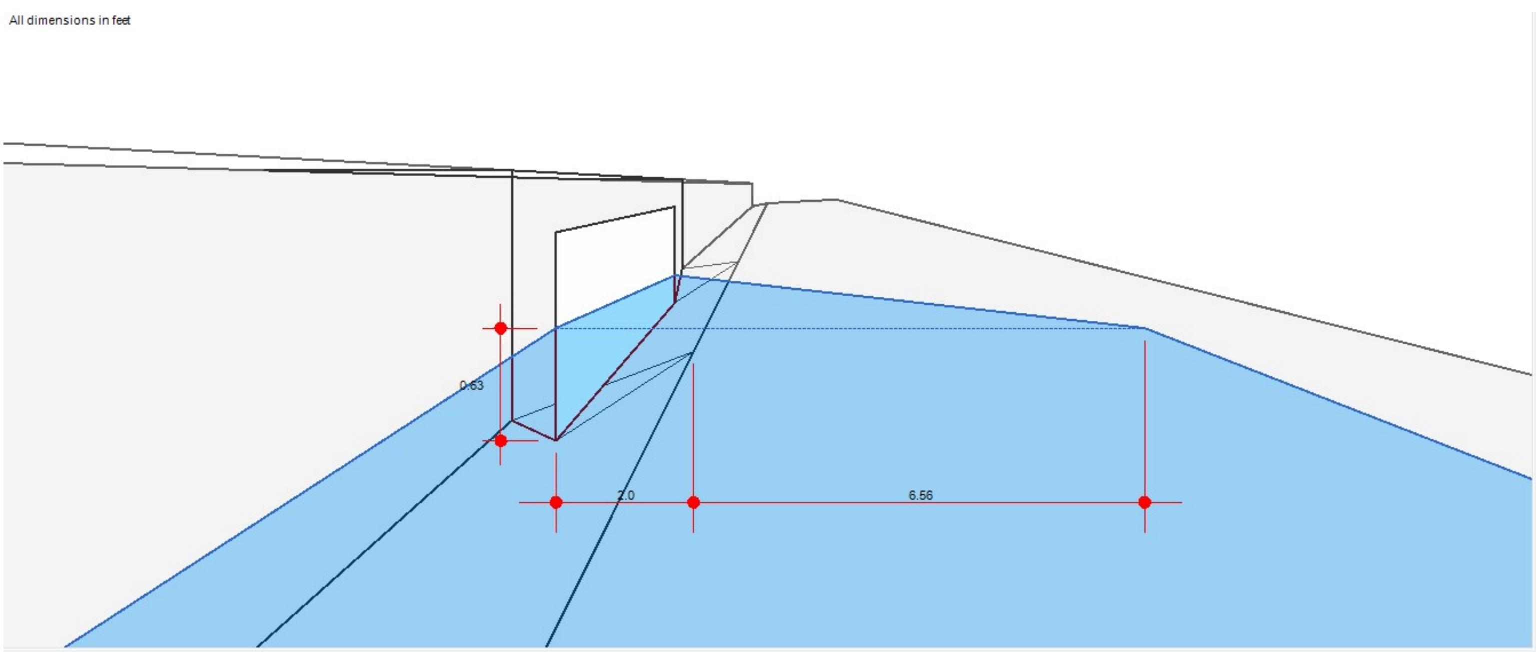


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

A8 100YR

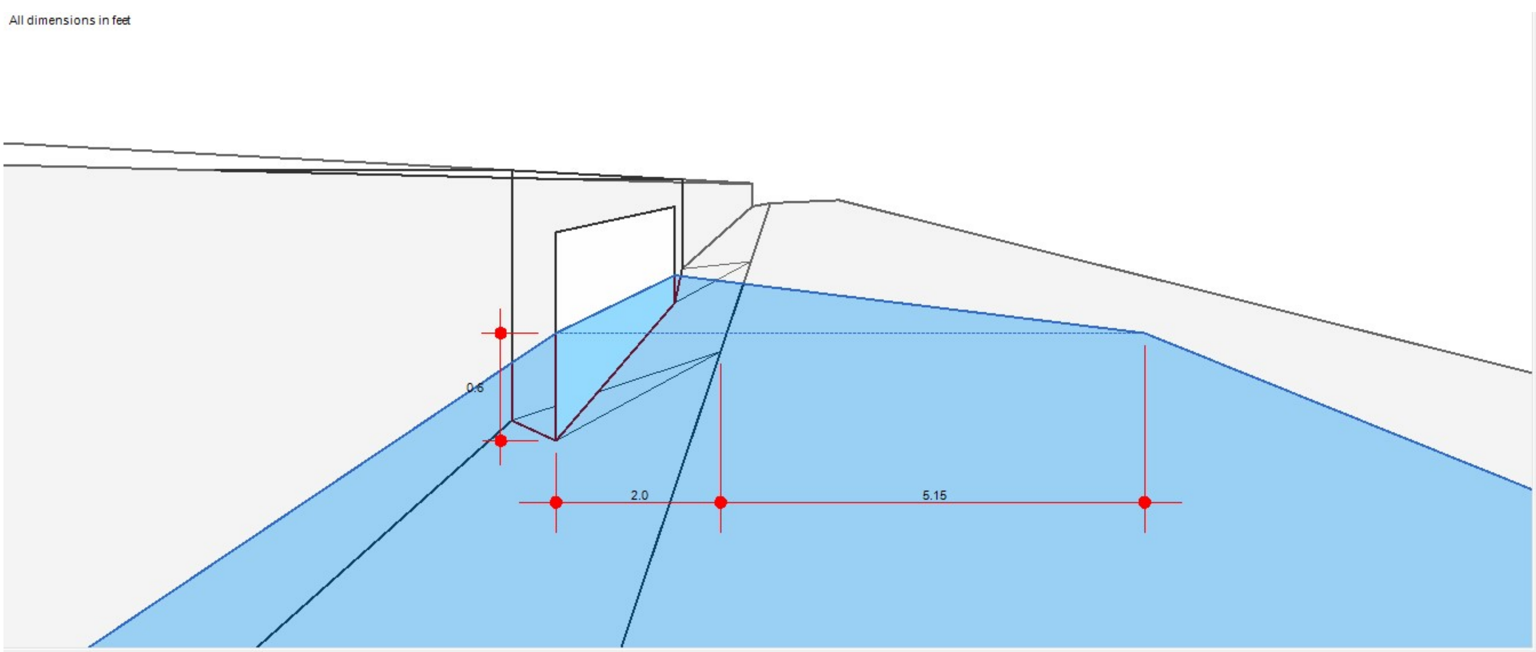
Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.42
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.42
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.42
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.57
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 8.56
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.66
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.40	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

A11 100YR

Curb Inlet			**Calculations**	
Location	= On grade		Compute by:	Known Q
Curb Length (ft)	= 7.00		Q (cfs)	= 1.50
Throat Height (in)	= 6.00			
Grate Area (sqft)	= -0-		**Highlighted**	
Grate Width (ft)	= -0-		Q Total (cfs)	= 1.50
Grate Length (ft)	= -0-		Q Capt (cfs)	= 1.50
			Q Bypass (cfs)	= -0-
Gutter			Depth at Inlet (in)	= 7.23
Slope, Sw (ft/ft)	= 0.083		Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020		Gutter Spread (ft)	= 7.15
Local Depr (in)	= 4.00		Gutter Vel (ft/s)	= 2.35
Gutter Width (ft)	= 2.00		Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.90		Bypass Depth (in)	= -0-
Gutter n-value	= 0.016			



Inlet Report

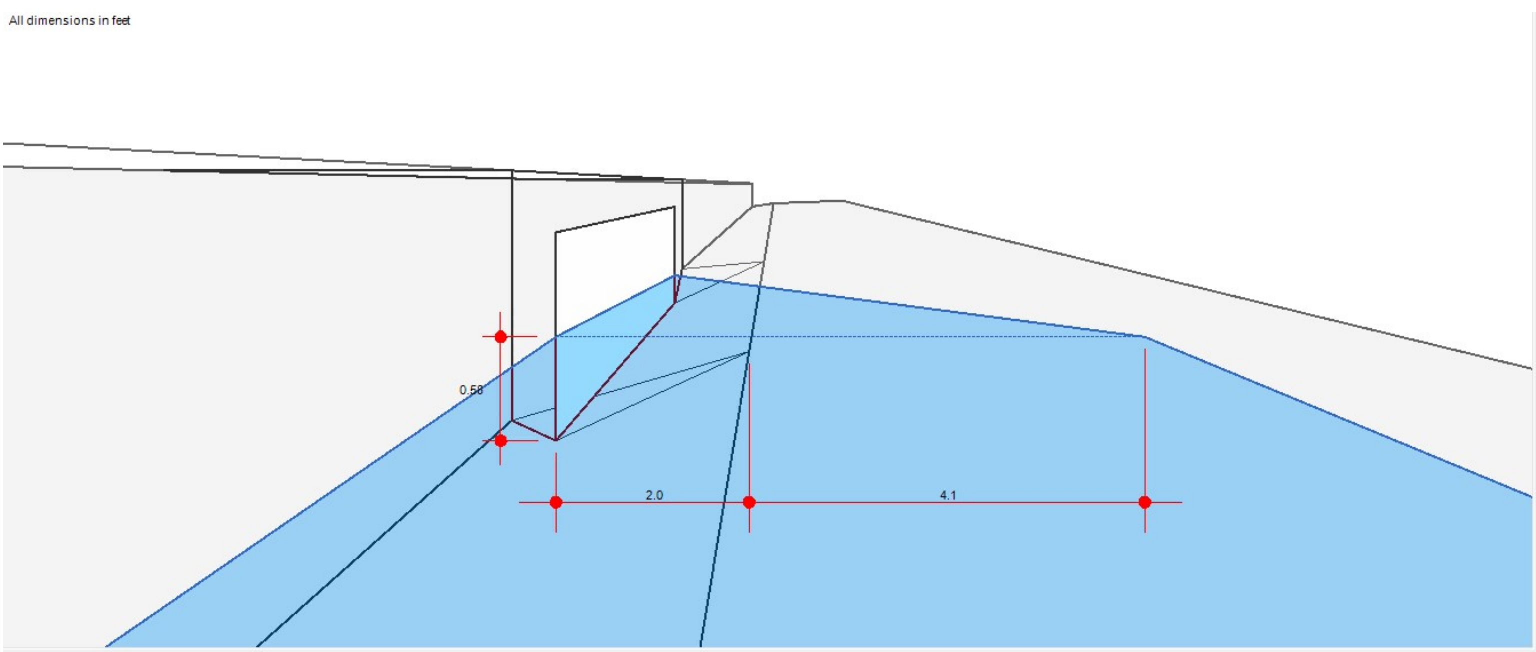
B5 100YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	1.00
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	1.19

Highlighted		
Q Total (cfs)	=	1.19
Q Capt (cfs)	=	1.19
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.97
Efficiency (%)	=	100
Gutter Spread (ft)	=	6.10
Gutter Vel (ft/s)	=	2.39
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



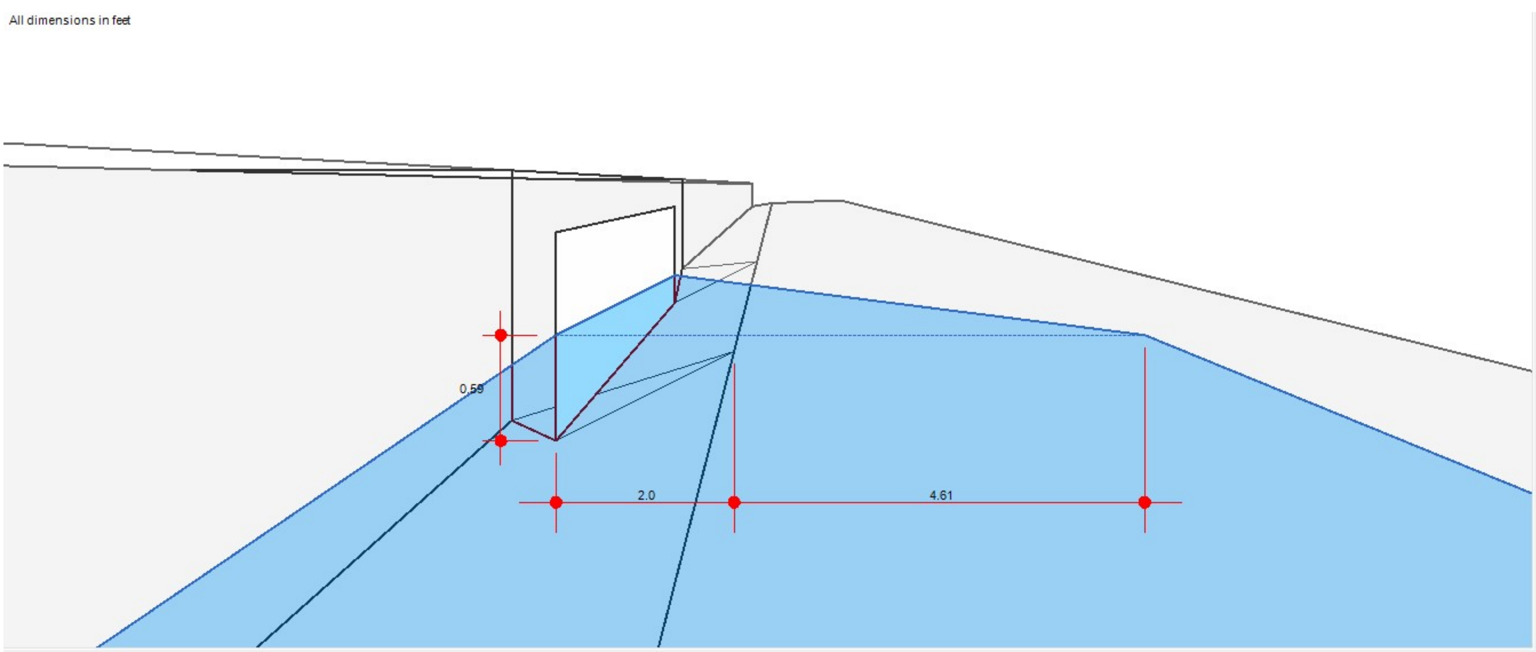
Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

B6 100YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-
Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	1.00
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	1.37
Highlighted		
Q Total (cfs)	=	1.37
Q Capt (cfs)	=	1.37
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.10
Efficiency (%)	=	100
Gutter Spread (ft)	=	6.61
Gutter Vel (ft/s)	=	2.43
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

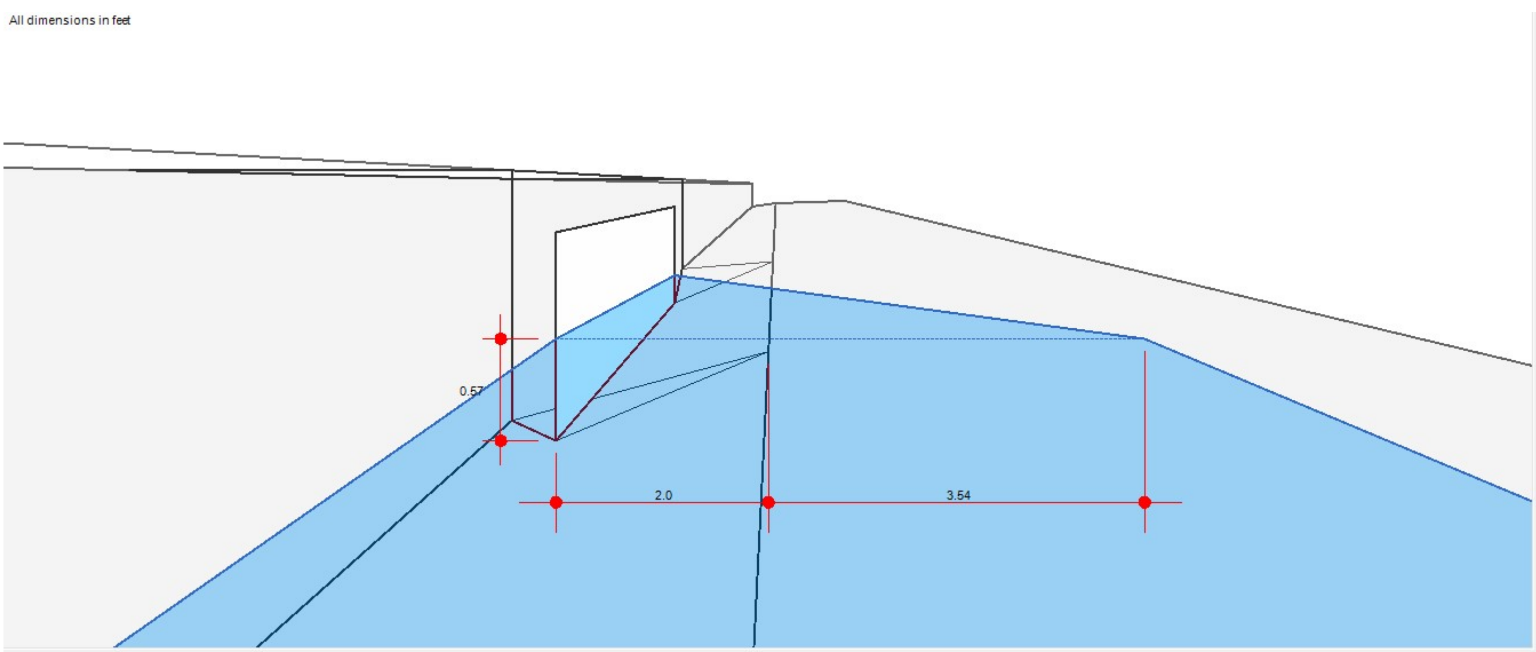


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. — Thursday, May 16 2024

D2 100YR

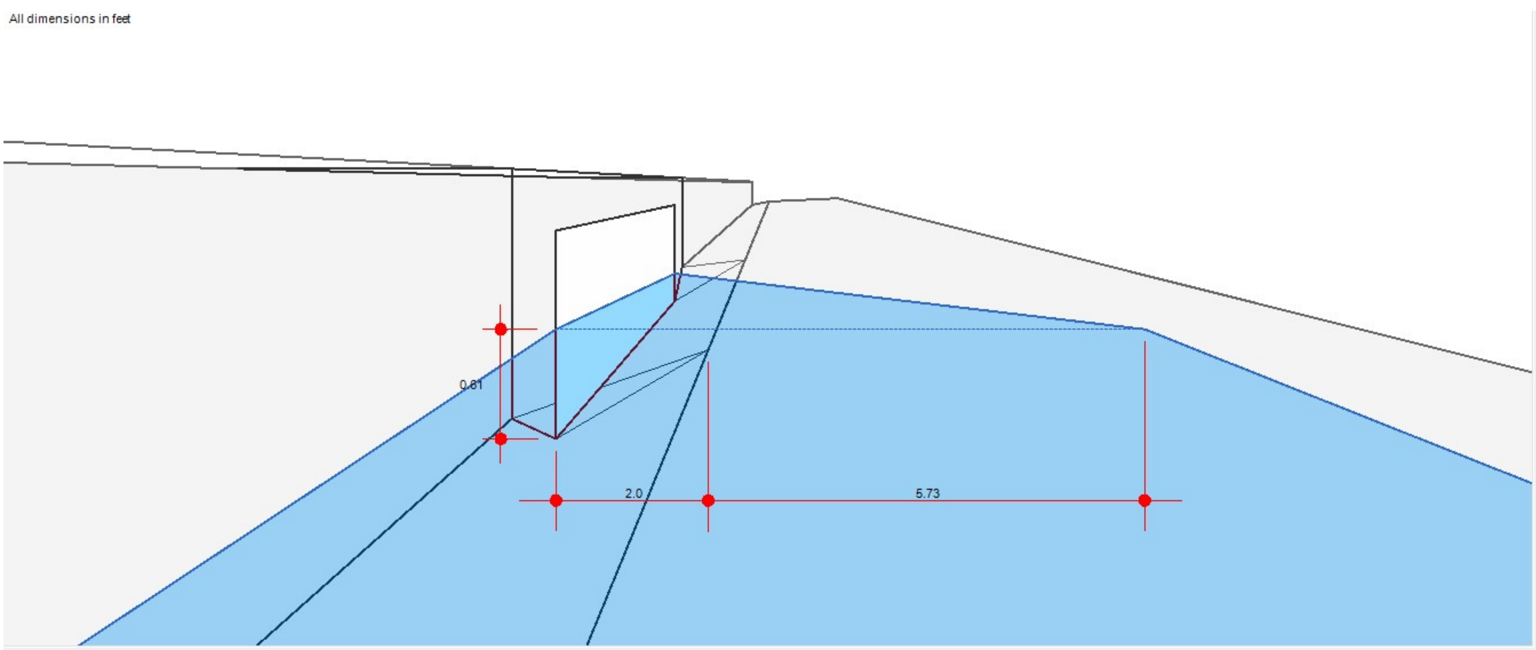
Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.72
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.72
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.72
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.84
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 5.54
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.66
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.50	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

D1 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.58
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.58
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.58
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.37
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 7.73
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 0.80
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.10	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

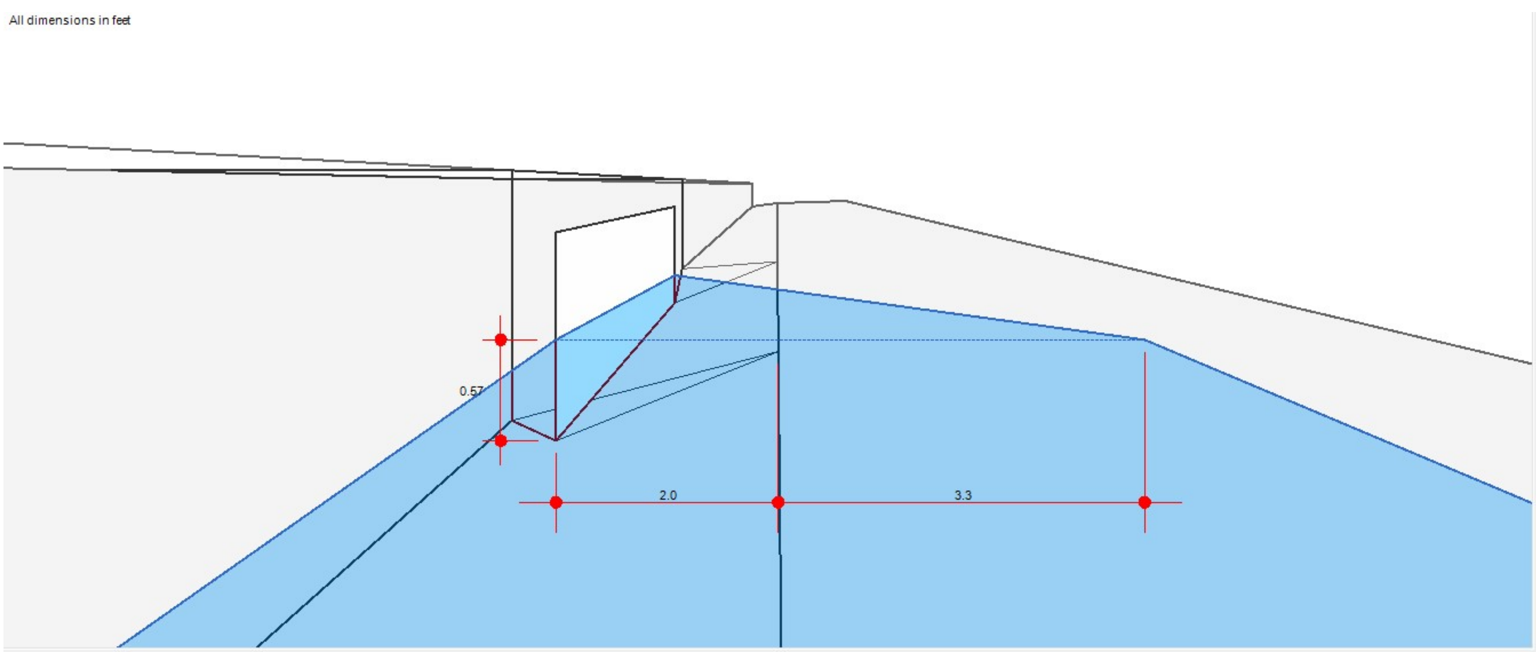


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

B3 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.95
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.95
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.95
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 6.78
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 5.30
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.34
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 1.00	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



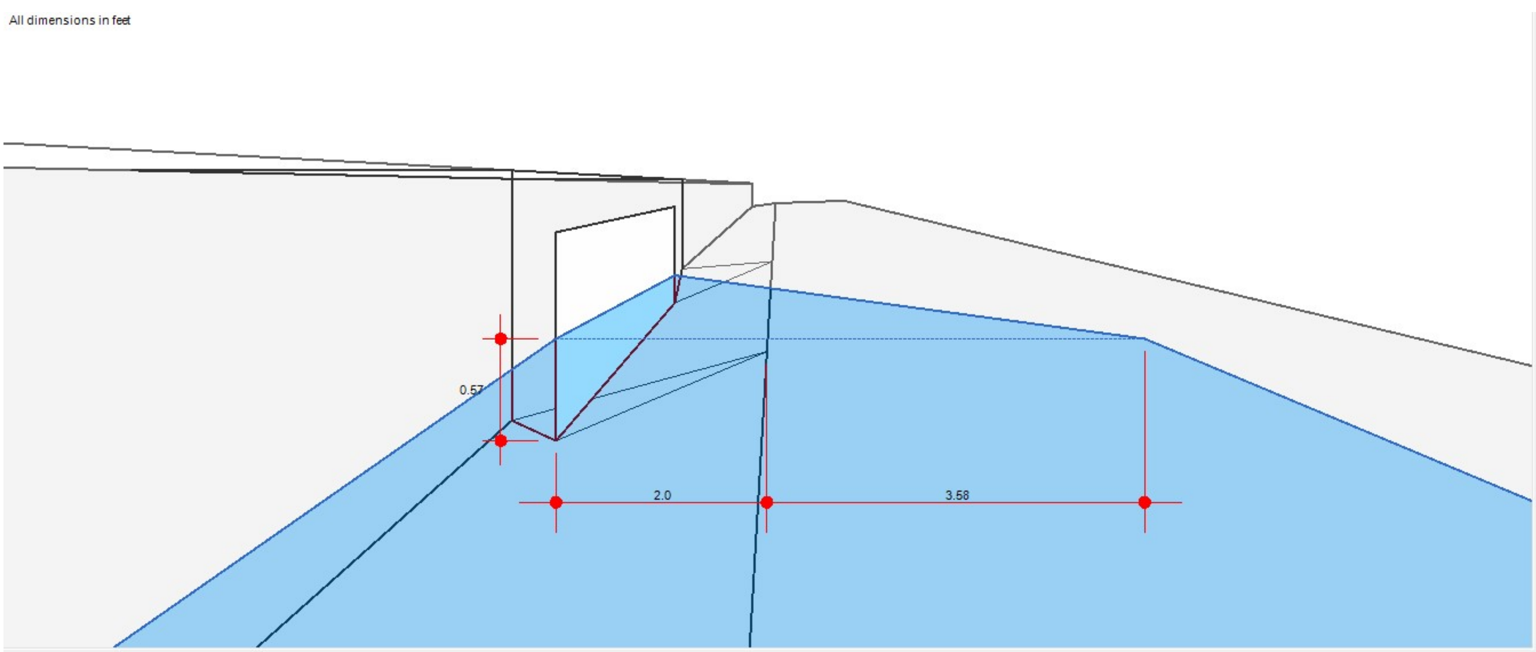
Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

B4 100YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-
Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	1.00
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	1.03
Highlighted		
Q Total (cfs)	=	1.03
Q Capt (cfs)	=	1.03
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	6.85
Efficiency (%)	=	100
Gutter Spread (ft)	=	5.58
Gutter Vel (ft/s)	=	2.36
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-



Inlet Report

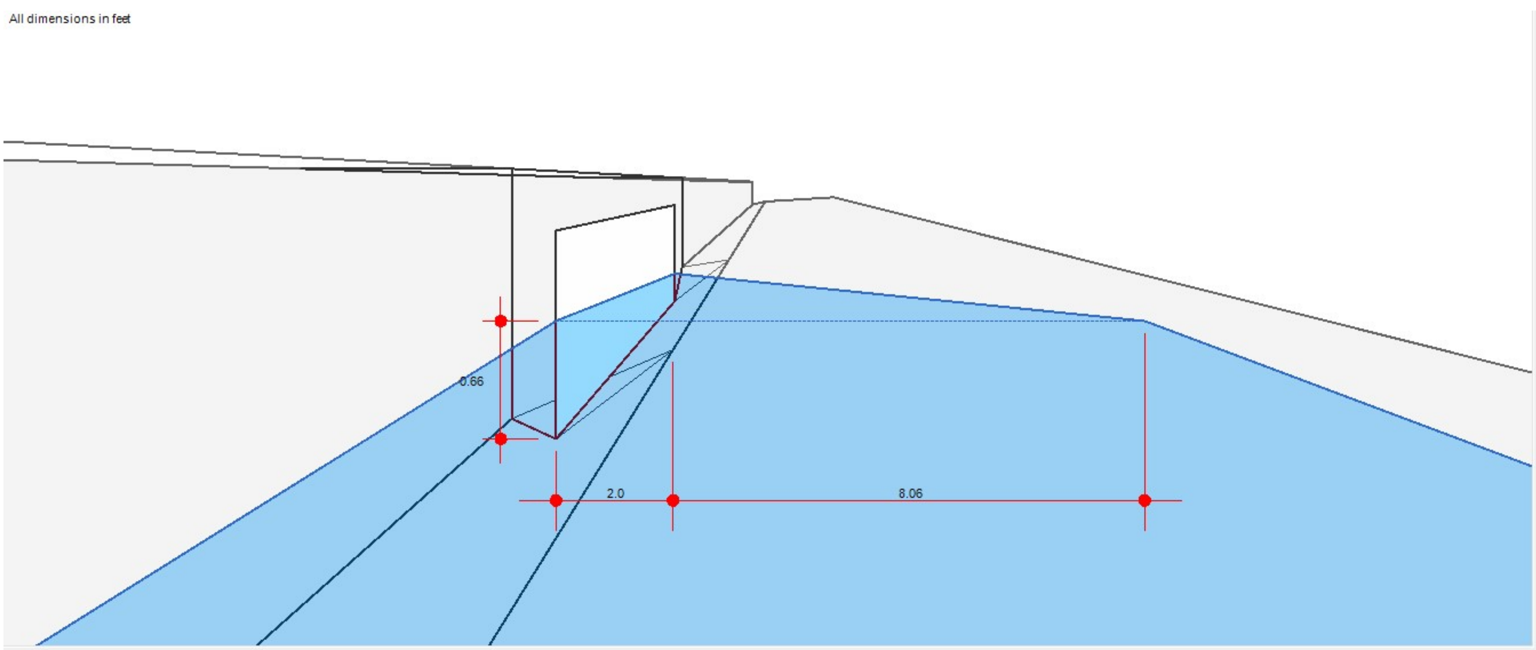
B2 100YR

Curb Inlet
Location = On grade
Curb Length (ft) = 7.00
Throat Height (in) = 6.00
Grate Area (sqft) = -0-
Grate Width (ft) = -0-
Grate Length (ft) = -0-

Gutter
Slope, Sw (ft/ft) = 0.083
Slope, Sx (ft/ft) = 0.020
Local Depr (in) = 4.00
Gutter Width (ft) = 2.00
Gutter Slope (%) = 0.10
Gutter n-value = 0.016

Calculations
Compute by: Known Q
Q (cfs) = 1.00

Highlighted
Q Total (cfs) = 1.00
Q Capt (cfs) = 1.00
Q Bypass (cfs) = -0-
Depth at Inlet (in) = 7.93
Efficiency (%) = 100
Gutter Spread (ft) = 10.06
Gutter Vel (ft/s) = 0.88
Bypass Spread (ft) = -0-
Bypass Depth (in) = -0-

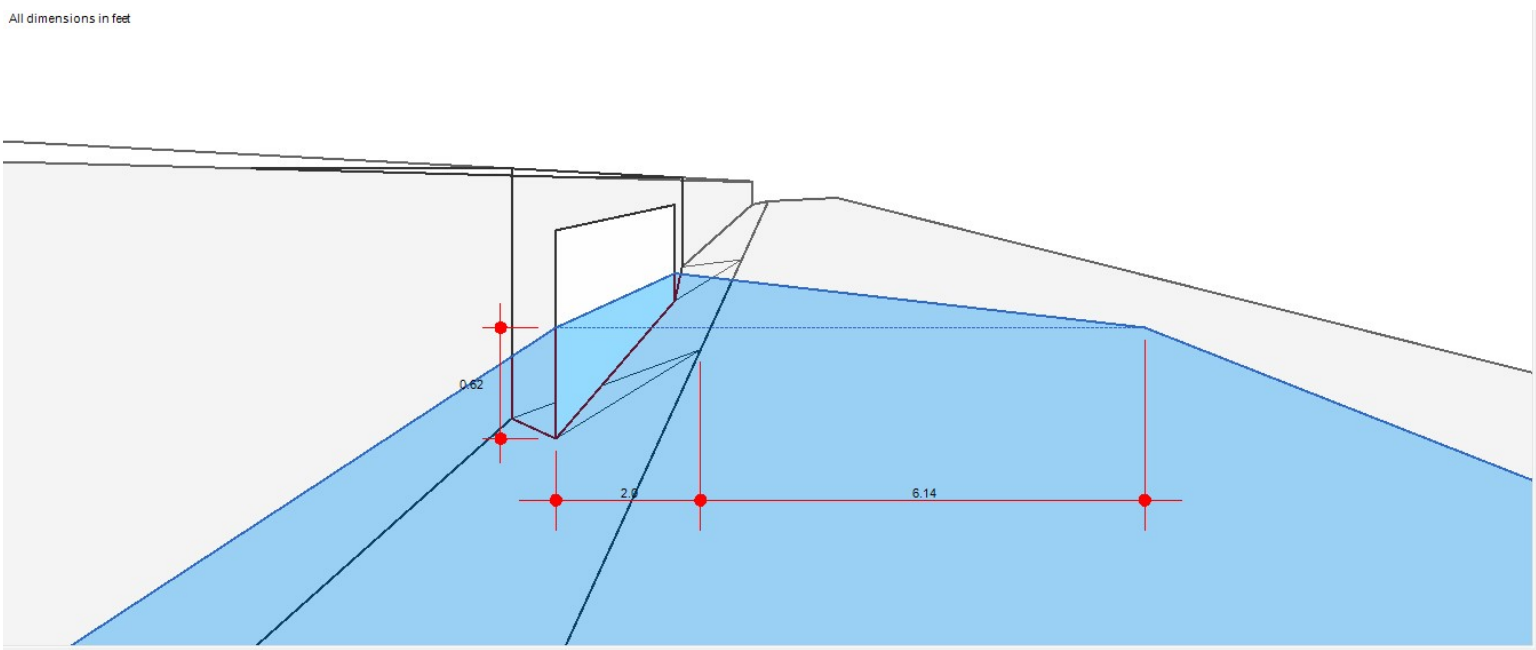


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

B1 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.11
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.11
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.11
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.46
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 8.14
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.41
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.30	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

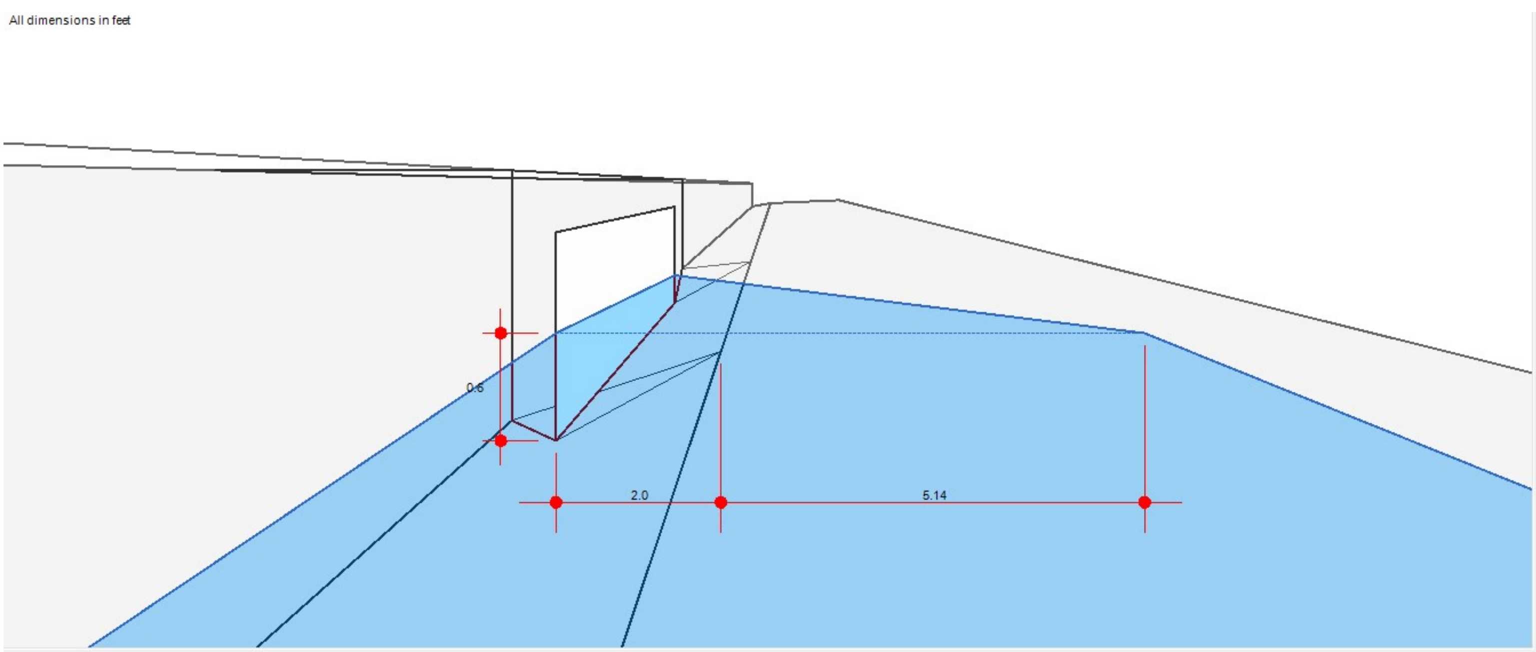
A6 100YR

Curb Inlet		
Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter		
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.80
Gutter n-value	=	0.016

Calculations		
Compute by:		Known Q
Q (cfs)	=	1.41

Highlighted		
Q Total (cfs)	=	1.41
Q Capt (cfs)	=	1.41
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.23
Efficiency (%)	=	100
Gutter Spread (ft)	=	7.14
Gutter Vel (ft/s)	=	2.22
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

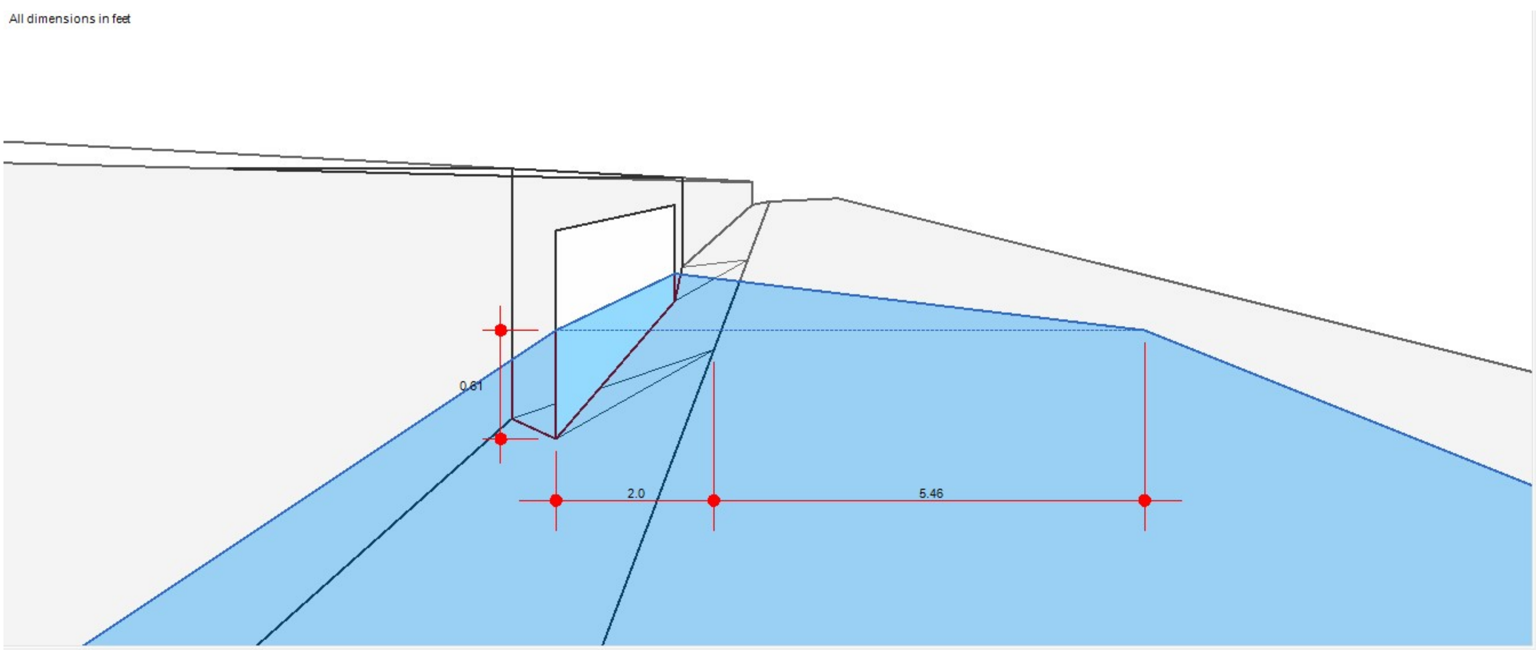


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

A5 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.53
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.53
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.53
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.30
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 7.46
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.24
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.80	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

A3 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

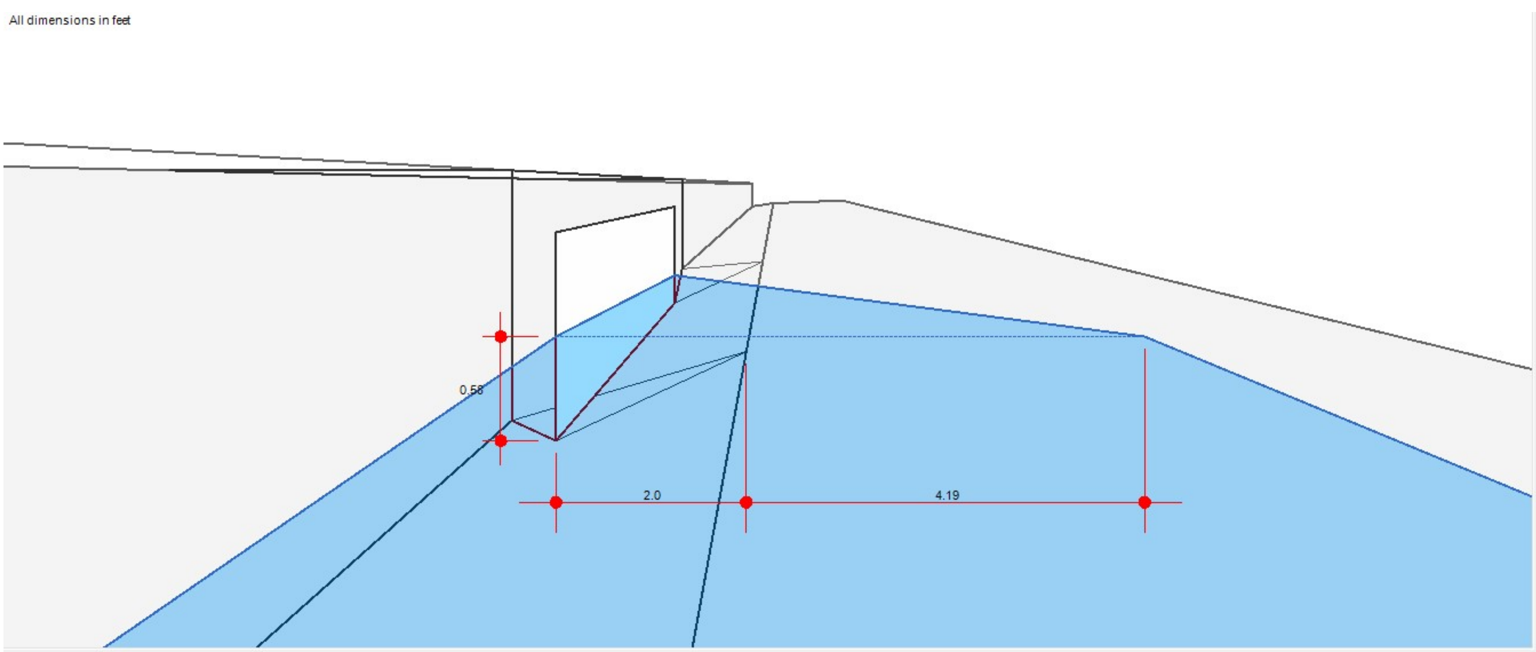
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	1.10
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	1.28

Highlighted

Q Total (cfs)	=	1.28
Q Capt (cfs)	=	1.28
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	7.00
Efficiency (%)	=	100
Gutter Spread (ft)	=	6.19
Gutter Vel (ft/s)	=	2.52
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

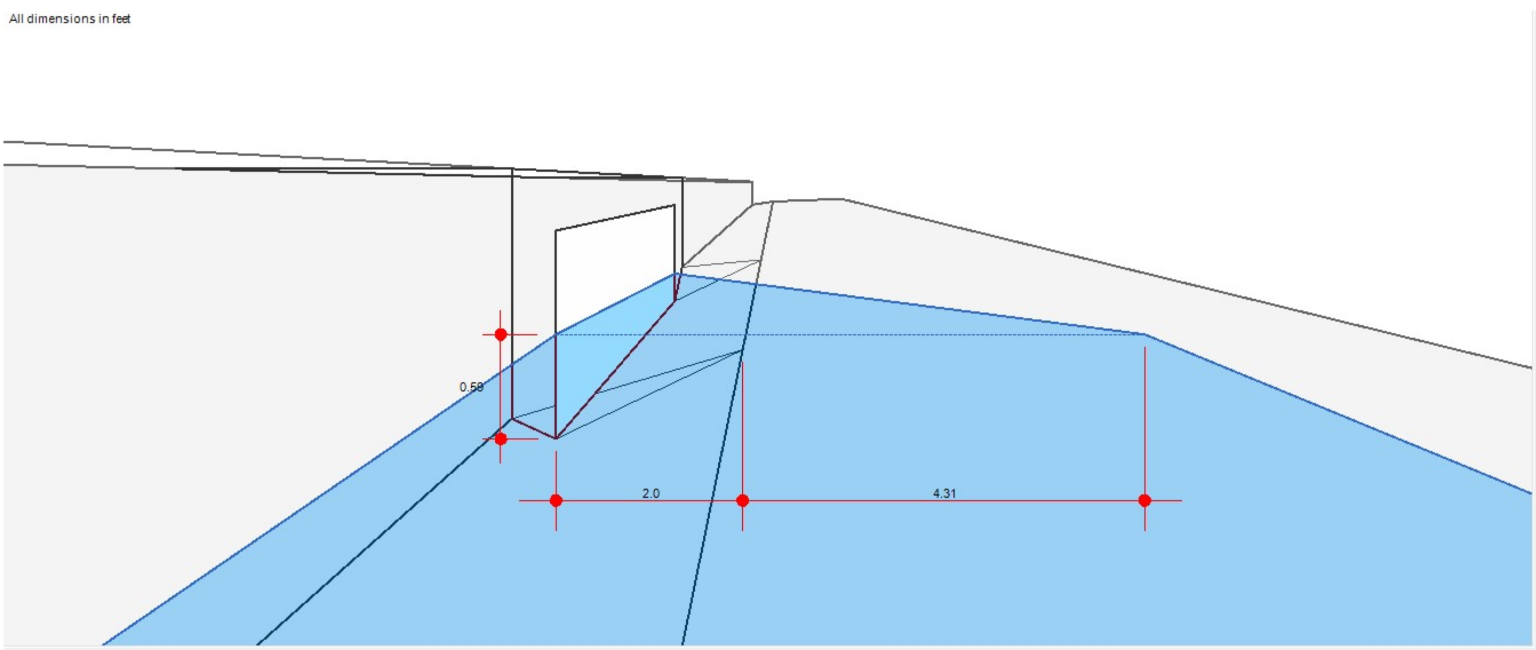


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. — Thursday, May 16 2024

A4 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.26
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.26
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.26
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.03
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 6.31
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.41
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 1.00	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

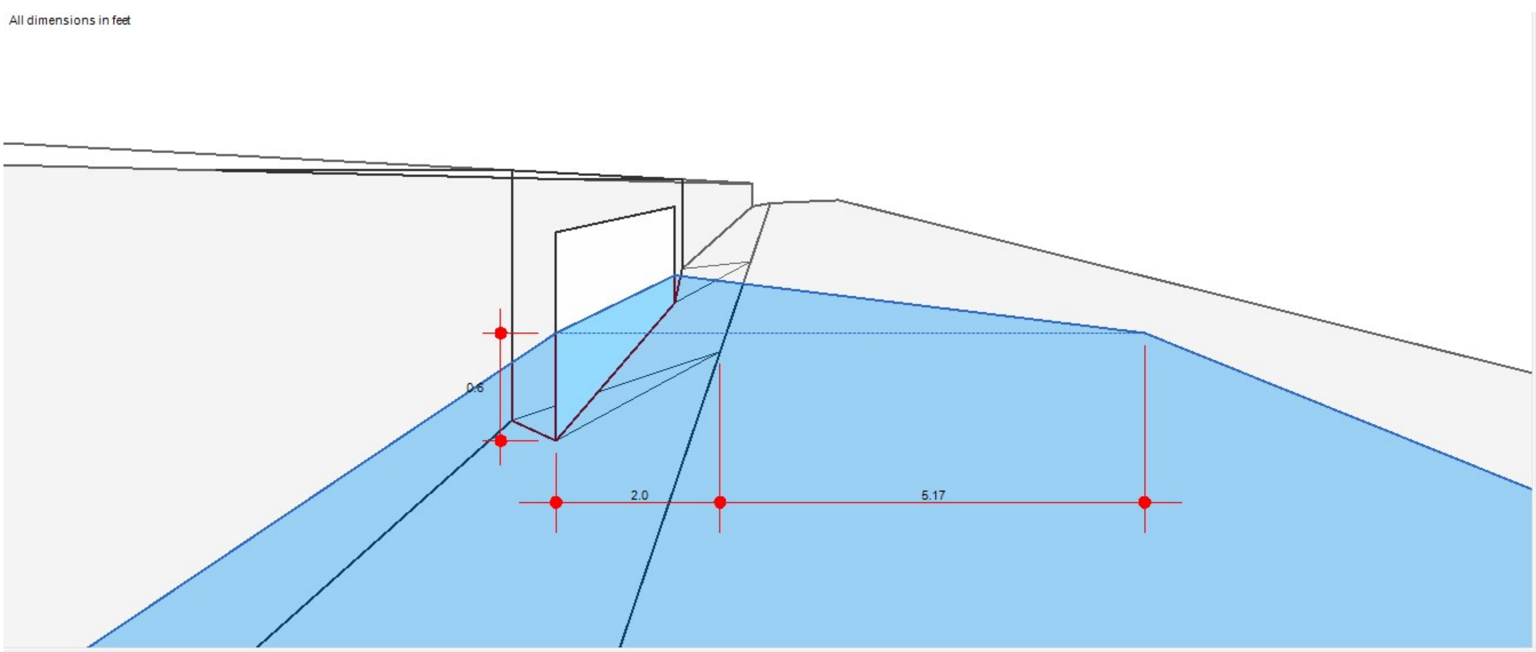


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

A2 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 1.23
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 1.23
Grate Length (ft)	= -0-	Q Capt (cfs)	= 1.23
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.23
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 7.17
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.92
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.60	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		

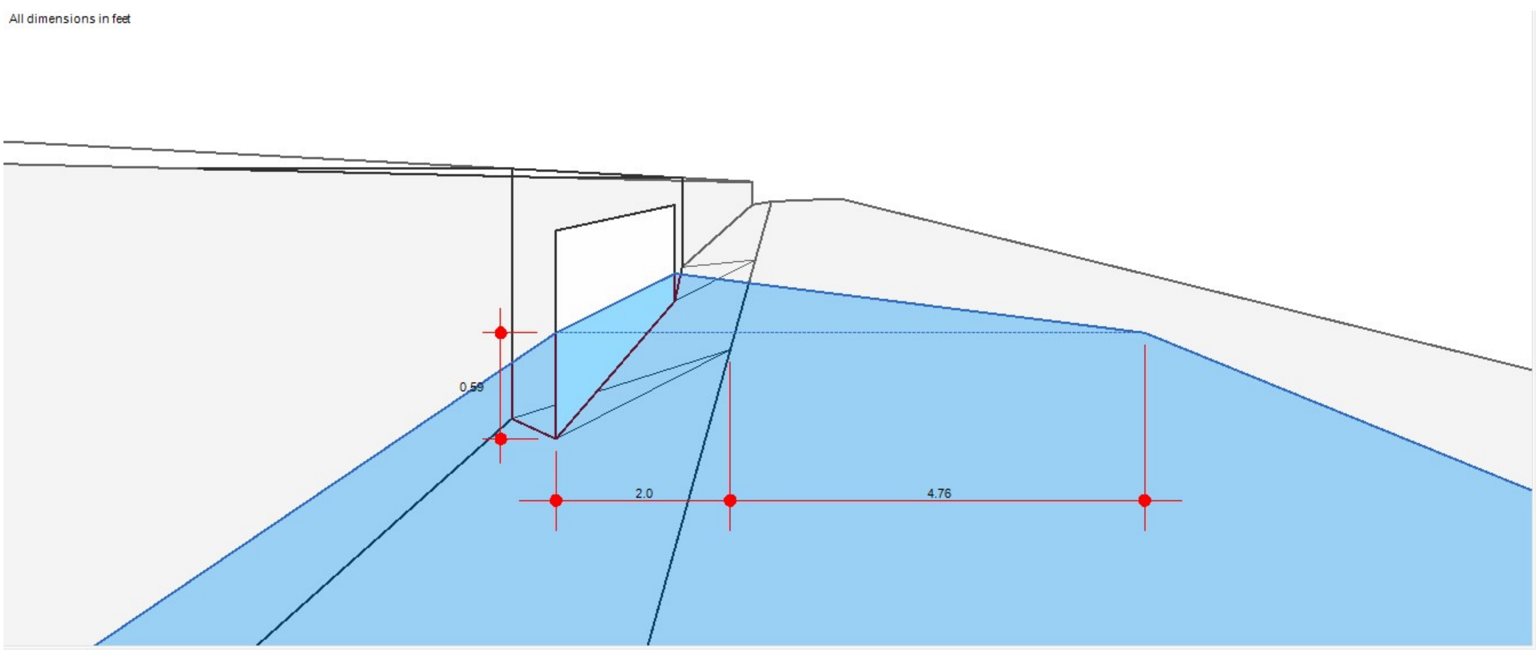


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

A1 100YR

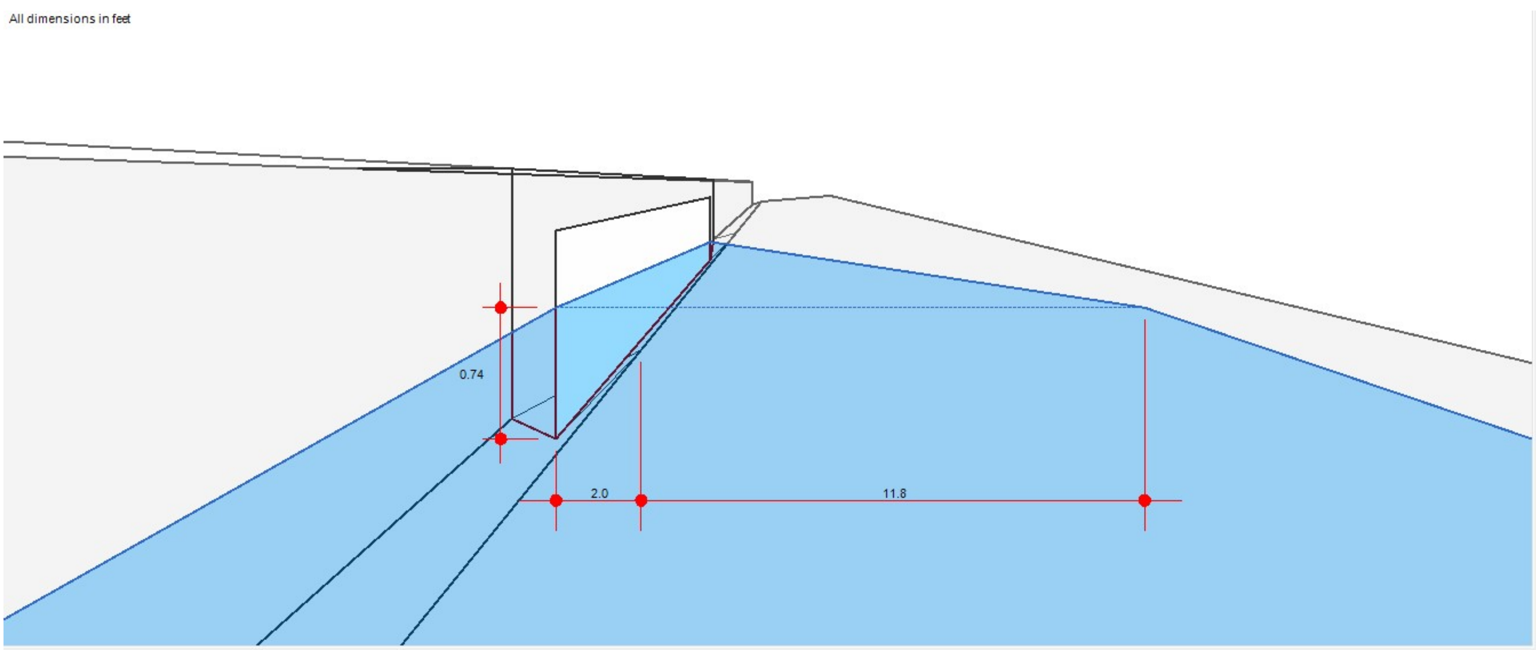
Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 7.00	Q (cfs)	= 0.78
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 0.78
Grate Length (ft)	= -0-	Q Capt (cfs)	= 0.78
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 7.13
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 6.76
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.34
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.30	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

H3 100YR

Curb Inlet		Calculations	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 14.00	Q (cfs)	= 2.92
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 2.92
Grate Length (ft)	= -0-	Q Capt (cfs)	= 2.92
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.82
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 13.80
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.44
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.20	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

H4 100YR

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	7.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

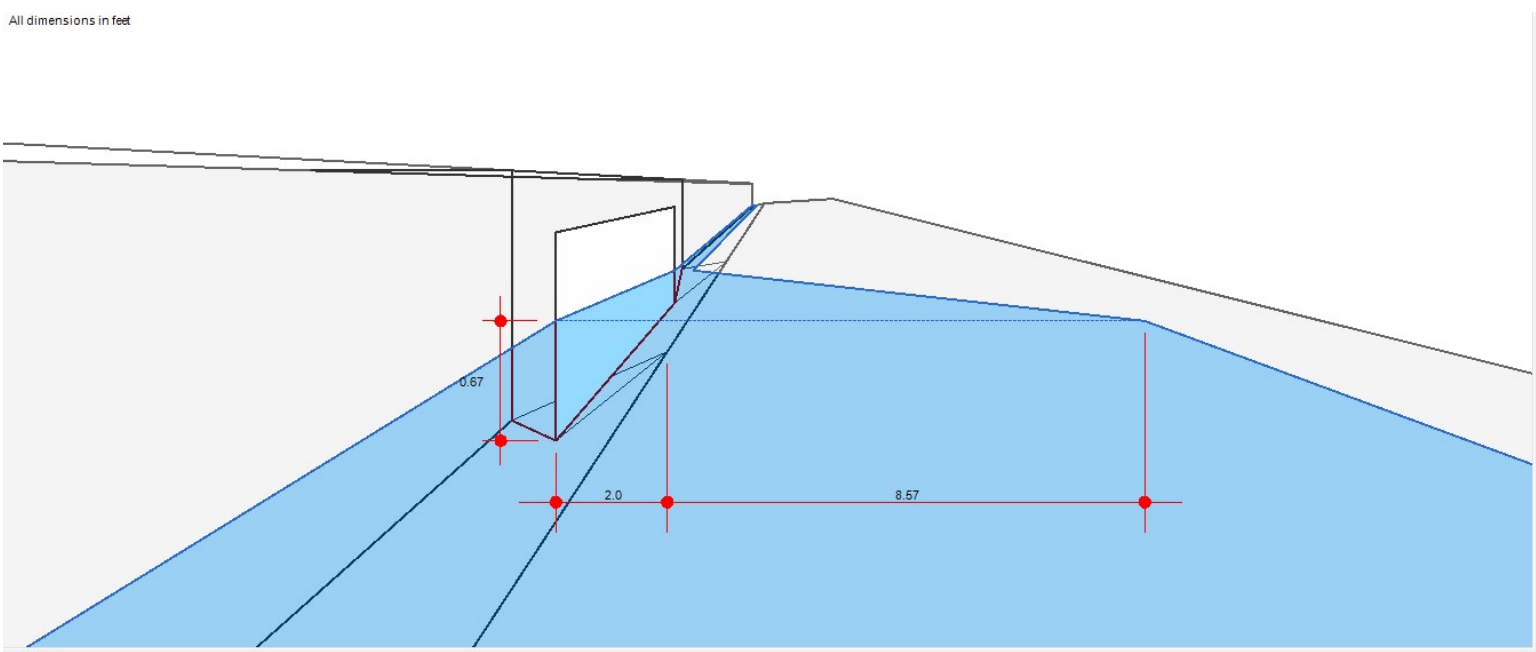
Slope, Sw (ft/ft)	=	0.083
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	4.00
Gutter Width (ft)	=	2.00
Gutter Slope (%)	=	0.60
Gutter n-value	=	0.016

Calculations

Compute by:		Known Q
Q (cfs)	=	2.73

Highlighted

Q Total (cfs)	=	2.73
Q Capt (cfs)	=	2.71
Q Bypass (cfs)	=	0.02
Depth at Inlet (in)	=	8.05
Efficiency (%)	=	99
Gutter Spread (ft)	=	10.57
Gutter Vel (ft/s)	=	2.20
Bypass Spread (ft)	=	0.72
Bypass Depth (in)	=	0.72

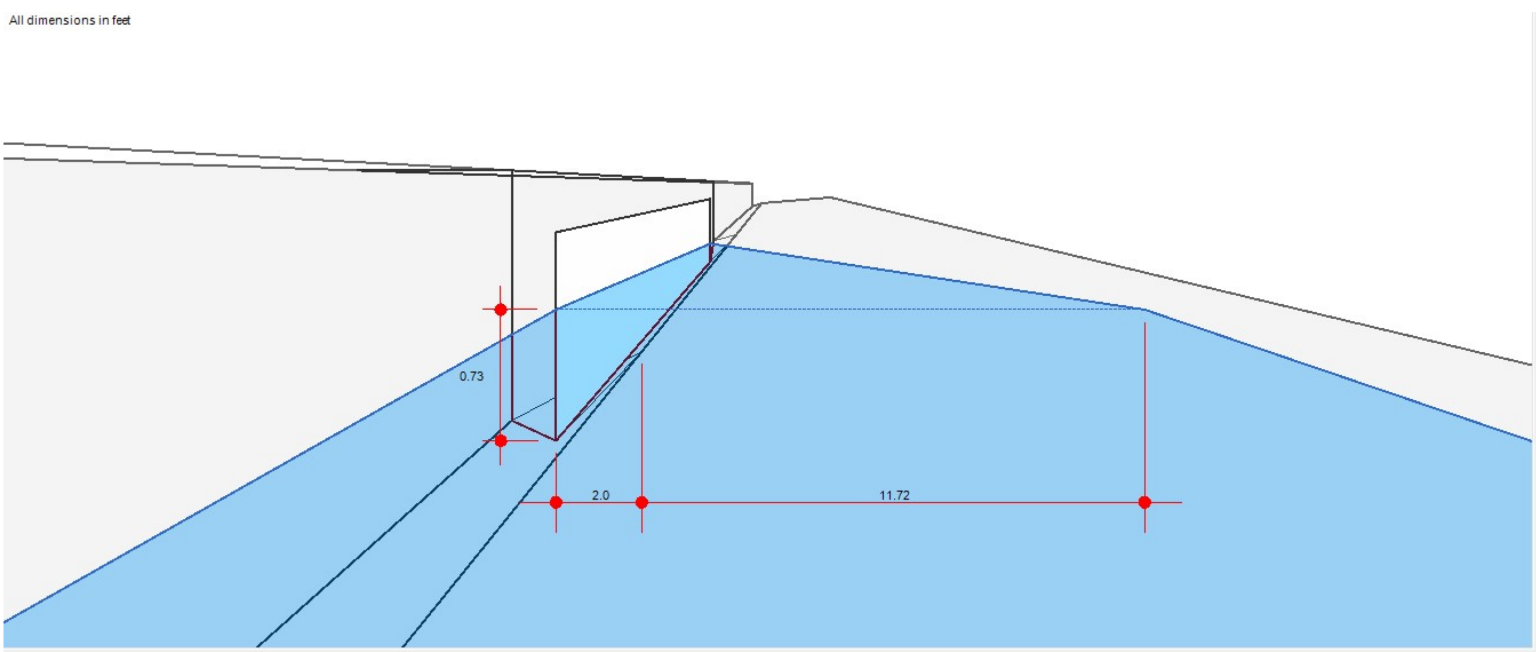


Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 16 2024

H1 100YR

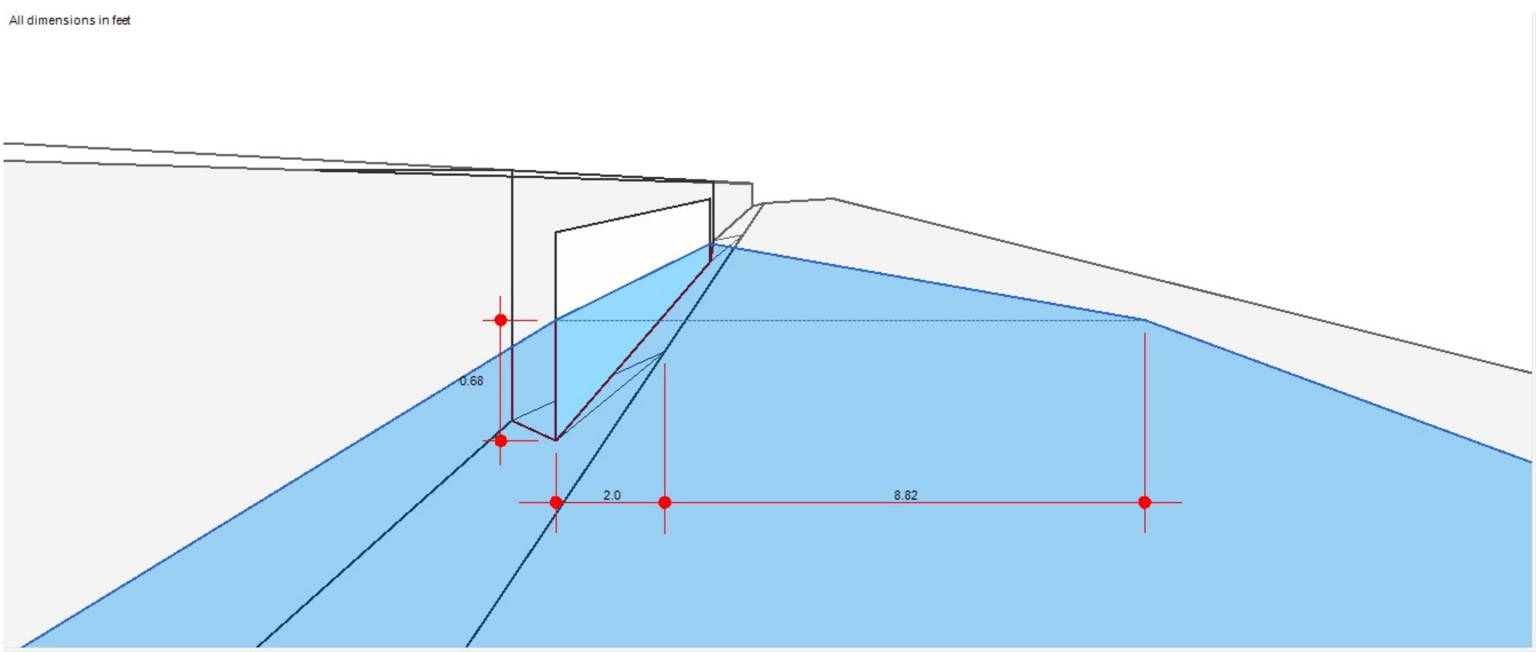
Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 14.00	Q (cfs)	= 2.88
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 2.88
Grate Length (ft)	= -0-	Q Capt (cfs)	= 2.88
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.80
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 13.72
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 1.43
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.20	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



Inlet Report

H2 100YR

Curb Inlet		**Calculations**	
Location	= On grade	Compute by:	Known Q
Curb Length (ft)	= 14.00	Q (cfs)	= 2.88
Throat Height (in)	= 6.00		
Grate Area (sqft)	= -0-	**Highlighted**	
Grate Width (ft)	= -0-	Q Total (cfs)	= 2.88
Grate Length (ft)	= -0-	Q Capt (cfs)	= 2.88
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 8.11
Slope, Sw (ft/ft)	= 0.083	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.020	Gutter Spread (ft)	= 10.82
Local Depr (in)	= 4.00	Gutter Vel (ft/s)	= 2.22
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= 0.60	Bypass Depth (in)	= -0-
Gutter n-value	= 0.016		



APPENDIX C - MASTER DRAINAGE STUDY EXCERPTS

```
****************************************************************************
       RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
     (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
    (c) Copyright 1983-2011 Advanced Engineering Software (aes)
       Ver. 18.0  Release Date: 07/01/2011  License ID 1239

                     Analysis prepared by:

                     HUNSAKER & ASSOCIATES
                           Irvine,Inc
               Planning * Engineering * Surveying
     Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************** DESCRIPTION OF STUDY **************************
 * ONTARIO MASTER PLAN OF DRAINAGE - BASIN IV (AREA G, H, I)              *
 * 100-YEAR HYDROLOGY ANALYSIS                                            *
 * P. PAGADUAN 8-29-2011                                                  *
 **************************************************************************

  FILE NAME: OIVG100.DAT
  TIME/DATE OF STUDY: 16:25 08/29/2011
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                 --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO  STREET-CROSSFALL:  CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL IN-  / OUT-/PARK-  HEIGHT WIDTH  LIP   HIKE  FACTOR
NO.  (FT)    (FT)     SIDE / SIDE/ WAY   (FT)   (FT)  (FT)   (FT)   (n)
===  =====  ========= ================= ====== ===== ====== ===== =======
 1   30.0    20.0     0.018/0.018/0.020  0.67   2.00 0.0313 0.167 0.0150
 2   32.0    27.0     0.020/0.020/0.020  0.67   2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF
    2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
    FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
  USER SPECIFIED RAINFALL VALUES:
      2-YR  6-HR RAINFALL DEPTH(INCH) =  1.50
      2-YR 24-HR RAINFALL DEPTH(INCH) =  2.70
    100-YR  6-HR RAINFALL DEPTH(INCH) =  3.30
    100-YR 24-HR RAINFALL DEPTH(INCH) =  7.00
    SIERRA MADRE DEPTH-AREA FACTORS USED.
                      AREA-AVERAGED
         DURATION    RAINFALL(INCH)
         5-MINUTES         0.48
        30-MINUTES         0.99
          1-HOUR           1.30
          3-HOUR           2.30
          6-HOUR           3.30
         24-HOUR           7.00
 *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD*

****************************************************************************
  FLOW PROCESS FROM NODE    320.10 TO NODE    320.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   750.00
  ELEVATION DATA: UPSTREAM(FEET) =    820.00  DOWNSTREAM(FEET) =    815.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.698
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.467
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        6.20     0.98      0.100     32   11.70
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     18.80
  TOTAL AREA(ACRES) =      6.20   PEAK FLOW RATE(CFS) =      18.80

****************************************************************************
  FLOW PROCESS FROM NODE    320.20 TO NODE    320.30 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    815.00
  DOWNSTREAM NODE ELEVATION(FEET) =    814.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.800
  PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.10000
  MAXIMUM DEPTH(FEET) =   3.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.320
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
```

```
 PUBLIC PARK                 A         1.80      0.98      0.850     32
 COMMERCIAL                  A         9.90      0.98      0.100     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.215
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     35.16
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.76
 AVERAGE FLOW DEPTH(FEET) =   1.39   FLOOD WIDTH(FEET) =   14.85
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.88    Tc(MIN.) =   12.57
 SUBAREA AREA(ACRES) =   11.70       SUBAREA RUNOFF(CFS) =   32.75
 EFFECTIVE AREA(ACRES) =   17.90     AREA-AVERAGED Fm(INCH/HR) =    0.17
 AREA-AVERAGED Fp(INCH/HR) =   0.97  AREA-AVERAGED Ap =   0.18
 TOTAL AREA(ACRES) =      17.9          PEAK FLOW RATE(CFS) =       50.73

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  1.56   FLOOD WIDTH(FEET) =   18.18
 FLOW VELOCITY(FEET/SEC.) =    5.01   DEPTH*VELOCITY(FT*FT/SEC) =   7.80
 LONGEST FLOWPATH FROM NODE     320.10 TO NODE     320.30 =     1000.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     320.30 TO NODE     320.40 IS CODE =  91
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =     814.00
 DOWNSTREAM NODE ELEVATION(FEET) =     810.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    900.00
 "V" GUTTER WIDTH(FEET) =    5.00   GUTTER HIKE(FEET) =  0.800
 PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.10000
 MAXIMUM DEPTH(FEET) =    3.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.955
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                 A         2.00      0.98      0.850     32
 COMMERCIAL                  A        17.90      0.98      0.100     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.175
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     75.61
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =    5.58
 AVERAGE FLOW DEPTH(FEET) =   1.73   FLOOD WIDTH(FEET) =   21.62
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.69    Tc(MIN.) =   15.26
 SUBAREA AREA(ACRES) =   19.90       SUBAREA RUNOFF(CFS) =   49.87
 EFFECTIVE AREA(ACRES) =   37.80     AREA-AVERAGED Fm(INCH/HR) =    0.17
 AREA-AVERAGED Fp(INCH/HR) =   0.98  AREA-AVERAGED Ap =   0.18
 TOTAL AREA(ACRES) =      37.8          PEAK FLOW RATE(CFS) =       94.73

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  1.85   FLOOD WIDTH(FEET) =   24.08
 FLOW VELOCITY(FEET/SEC.) =    5.79   DEPTH*VELOCITY(FT*FT/SEC) =  10.73
 LONGEST FLOWPATH FROM NODE     320.10 TO NODE     320.40 =     1900.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     320.00 TO NODE     321.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    320.00
 ELEVATION DATA: UPSTREAM(FEET) =     820.00  DOWNSTREAM(FEET) =     818.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.392
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.197
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 PUBLIC PARK                 A        6.30      0.98      0.850     32   13.39
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA RUNOFF(CFS) =     13.43
 TOTAL AREA(ACRES) =       6.30   PEAK FLOW RATE(CFS) =      13.43

****************************************************************************
 FLOW PROCESS FROM NODE     321.00 TO NODE     322.00 IS CODE =  91
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =     818.00
 DOWNSTREAM NODE ELEVATION(FEET) =     810.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    970.00
 "V" GUTTER WIDTH(FEET) =    5.00   GUTTER HIKE(FEET) =  0.800
 PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.10000
 MAXIMUM DEPTH(FEET) =    3.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.884
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                 A        19.80      0.98      0.850     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     31.57
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =    6.44
 AVERAGE FLOW DEPTH(FEET) =   1.20   FLOOD WIDTH(FEET) =   11.00
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.51    Tc(MIN.) =   15.90
 SUBAREA AREA(ACRES) =   19.80       SUBAREA RUNOFF(CFS) =   36.62
 EFFECTIVE AREA(ACRES) =   26.10     AREA-AVERAGED Fm(INCH/HR) =    0.83
 AREA-AVERAGED Fp(INCH/HR) =   0.98  AREA-AVERAGED Ap =   0.85
 TOTAL AREA(ACRES) =      26.1          PEAK FLOW RATE(CFS) =       48.28

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  1.37   FLOOD WIDTH(FEET) =   14.46
 FLOW VELOCITY(FEET/SEC.) =    6.79   DEPTH*VELOCITY(FT*FT/SEC) =   9.33
 LONGEST FLOWPATH FROM NODE     320.00 TO NODE     322.00 =     1290.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     322.00 TO NODE     323.00 IS CODE =  91
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =     810.00
```

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DOWNSTREAM NODE ELEVATION(FEET) =    800.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    950.00
"V" GUTTER WIDTH(FEET) =    5.00   GUTTER HIKE(FEET) =  0.800
PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.10000
MAXIMUM DEPTH(FEET) =    3.00
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.691
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
PUBLIC PARK                  A       2.30       0.98      0.850    32
PUBLIC PARK                  A      41.30       0.98      0.850    32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      84.70
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.16
AVERAGE FLOW DEPTH(FEET) =   1.57   FLOOD WIDTH(FEET) =   18.44
"V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.94   Tc(MIN.) =   17.84
SUBAREA AREA(ACRES) =   43.60      SUBAREA RUNOFF(CFS) =   73.09
EFFECTIVE AREA(ACRES) =   69.70    AREA-AVERAGED Fm(INCH/HR) =   0.83
AREA-AVERAGED Fp(INCH/HR) =   0.98  AREA-AVERAGED Ap =   0.85
TOTAL AREA(ACRES) =         69.7        PEAK FLOW RATE(CFS) =     116.85

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) =  1.73   FLOOD WIDTH(FEET) =    21.68
FLOW VELOCITY(FEET/SEC.) =     8.57   DEPTH*VELOCITY(FT*FT/SEC) = 14.87
LONGEST FLOWPATH FROM NODE      320.00 TO NODE      323.00 =    2240.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     323.00 TO NODE     324.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    800.00  DOWNSTREAM(FEET) =    778.00
FLOW LENGTH(FEET) =  1650.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  45.0 INCH PIPE IS  34.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  12.85
ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      116.85
PIPE TRAVEL TIME(MIN.) =   2.14      Tc(MIN.) =    19.98
LONGEST FLOWPATH FROM NODE      320.00 TO NODE      324.00 =    3890.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     324.00 TO NODE     324.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =    19.98
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.515
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
PUBLIC PARK                  A       3.80       0.98      0.850    32
PUBLIC PARK                  A      78.00       0.98      0.850    32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
```

```
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
SUBAREA AREA(ACRES) =   81.80      SUBAREA RUNOFF(CFS) =  124.11
EFFECTIVE AREA(ACRES) =    151.50   AREA-AVERAGED Fm(INCH/HR) =  0.83
AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.85
TOTAL AREA(ACRES) =        151.5        PEAK FLOW RATE(CFS) =     229.87

****************************************************************************
FLOW PROCESS FROM NODE     324.00 TO NODE     345.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    778.00  DOWNSTREAM(FEET) =    770.00
FLOW LENGTH(FEET) =  1340.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  66.0 INCH PIPE IS  53.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  11.14
ESTIMATED PIPE DIAMETER(INCH) =  66.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      229.87
PIPE TRAVEL TIME(MIN.) =   2.01      Tc(MIN.) =    21.99
LONGEST FLOWPATH FROM NODE      320.00 TO NODE      345.00 =    5230.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     345.00 TO NODE     345.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MIN.) =    21.99
RAINFALL INTENSITY(INCH/HR) =    2.37
AREA-AVERAGED Fm(INCH/HR) =  0.83
AREA-AVERAGED Fp(INCH/HR) =  0.98
AREA-AVERAGED Ap =  0.85
EFFECTIVE STREAM AREA(ACRES) =      151.50
TOTAL STREAM AREA(ACRES) =      151.50
PEAK FLOW RATE(CFS) AT CONFLUENCE =      229.87

****************************************************************************
FLOW PROCESS FROM NODE     340.00 TO NODE     341.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =  1000.00
ELEVATION DATA: UPSTREAM(FEET) =    840.00  DOWNSTREAM(FEET) =    830.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.102
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.397
SUBAREA Tc AND LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
COMMERCIAL                   A       2.50       0.98      0.100    32   12.10
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA RUNOFF(CFS) =       7.42
```

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 TOTAL AREA(ACRES) =      2.50   PEAK FLOW RATE(CFS) =       7.42

****************************************************************************
 FLOW PROCESS FROM NODE    341.00 TO NODE    342.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  830.00  DOWNSTREAM ELEVATION(FEET) =  815.00
 STREET LENGTH(FEET) = 1030.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 32.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  27.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.25
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.40
   HALFSTREET FLOOD WIDTH(FEET) =   12.09
   AVERAGE FLOW VELOCITY(FEET/SEC.) =     3.10
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =     1.24
 STREET FLOW TRAVEL TIME(MIN.) =   5.53    Tc(MIN.) =    17.63
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.710
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A        2.40      0.98      0.100     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     2.40     SUBAREA RUNOFF(CFS) =      5.64
 EFFECTIVE AREA(ACRES) =       4.90    AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.9         PEAK FLOW RATE(CFS) =      11.52

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  12.73
 FLOW VELOCITY(FEET/SEC.) =  3.19   DEPTH*VELOCITY(FT*FT/SEC.) =   1.31
 LONGEST FLOWPATH FROM NODE      340.00 TO NODE     342.00 =     2030.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    342.00 TO NODE    342.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   17.63
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.710
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A        7.90      0.98      0.100     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     7.90     SUBAREA RUNOFF(CFS) =    18.58
 EFFECTIVE AREA(ACRES) =      12.80    AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        12.8         PEAK FLOW RATE(CFS) =      30.10

****************************************************************************
 FLOW PROCESS FROM NODE    342.00 TO NODE    342.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   17.63
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.710
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A       15.70      0.98      0.100     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    15.70     SUBAREA RUNOFF(CFS) =    36.92
 EFFECTIVE AREA(ACRES) =      28.50    AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        28.5         PEAK FLOW RATE(CFS) =      67.02

****************************************************************************
 FLOW PROCESS FROM NODE    342.00 TO NODE    343.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   815.00  DOWNSTREAM(FEET) =   805.00
 FLOW LENGTH(FEET) =    700.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  36.0 INCH PIPE IS  27.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.47
 ESTIMATED PIPE DIAMETER(INCH) =  36.00     NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       67.02
 PIPE TRAVEL TIME(MIN.) =   1.02     Tc(MIN.) =    18.65
 LONGEST FLOWPATH FROM NODE      340.00 TO NODE     343.00 =     2730.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    343.00 TO NODE    343.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   18.65
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.621
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A       14.70      0.98      0.100     32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        A        8.70      0.98      0.500     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.249
 SUBAREA AREA(ACRES) =    23.40     SUBAREA RUNOFF(CFS) =    50.09
```

```
  EFFECTIVE AREA(ACRES) =     51.90   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.17
  TOTAL AREA(ACRES) =        51.9       PEAK FLOW RATE(CFS) =      114.81

****************************************************************************
  FLOW PROCESS FROM NODE    343.00 TO NODE    344.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    805.00  DOWNSTREAM(FEET) =    798.00
  FLOW LENGTH(FEET) =   600.00    MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  36.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.06
  ESTIMATED PIPE DIAMETER(INCH) =  45.00     NUMBER OF PIPES =    1
  PIPE-FLOW(CFS) =      114.81
  PIPE TRAVEL TIME(MIN.) =    0.83     Tc(MIN.) =    19.48
  LONGEST FLOWPATH FROM NODE     340.00 TO NODE     344.00 =    3330.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    344.00 TO NODE    344.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    19.48
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.553
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/        SCS SOIL   AREA       Fp          Ap      SCS
       LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                   A       15.50       0.98      0.100     32
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"         A       41.90       0.98      0.500     32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.392
  SUBAREA AREA(ACRES) =    57.40       SUBAREA RUNOFF(CFS) =   112.16
  EFFECTIVE AREA(ACRES) =     109.30   AREA-AVERAGED Fm(INCH/HR) =  0.28
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.29
  TOTAL AREA(ACRES) =       109.3       PEAK FLOW RATE(CFS) =      223.81

****************************************************************************
  FLOW PROCESS FROM NODE    344.00 TO NODE    345.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    798.00  DOWNSTREAM(FEET) =    770.00
  FLOW LENGTH(FEET) =  1980.00    MANNING'S N =  0.013
  DEPTH OF FLOW IN  57.0 INCH PIPE IS  43.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.48
  ESTIMATED PIPE DIAMETER(INCH) =  57.00     NUMBER OF PIPES =    1
  PIPE-FLOW(CFS) =      223.81
  PIPE TRAVEL TIME(MIN.) =    2.13     Tc(MIN.) =    21.61
  LONGEST FLOWPATH FROM NODE     340.00 TO NODE     345.00 =    5310.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    345.00 TO NODE    345.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    21.61
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.399
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/        SCS SOIL   AREA       Fp          Ap      SCS
       LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                   A       22.80       0.98      0.100     32
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"         A       32.90       0.98      0.500     32
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"         A       54.70       0.98      0.200     32
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"         A        2.70       0.98      0.200     32
  COMMERCIAL                   A        4.90       0.98      0.100     32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.260
  SUBAREA AREA(ACRES) =   118.00       SUBAREA RUNOFF(CFS) =   227.83
  EFFECTIVE AREA(ACRES) =     227.30   AREA-AVERAGED Fm(INCH/HR) =  0.27
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =       227.3       PEAK FLOW RATE(CFS) =      436.47

****************************************************************************
  FLOW PROCESS FROM NODE    345.00 TO NODE    345.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    21.61
  RAINFALL INTENSITY(INCH/HR) =    2.40
  AREA-AVERAGED Fm(INCH/HR) =  0.27
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.27
  EFFECTIVE STREAM AREA(ACRES) =      227.30
  TOTAL STREAM AREA(ACRES) =      227.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      436.47

  ** CONFLUENCE DATA **
   STREAM       Q        Tc    Intensity   Fp(Fm)      Ap       Ae      HEADWATER
   NUMBER     (CFS)    (MIN.)  (INCH/HR)  (INCH/HR)           (ACRES)     NODE
      1      229.87    21.99      2.374  0.98( 0.83) 0.85       151.5      320.00
      2      436.47    21.61      2.399  0.98( 0.27) 0.27       227.3      340.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q        Tc    Intensity   Fp(Fm)      Ap       Ae      HEADWATER
   NUMBER     (CFS)    (MIN.)  (INCH/HR)  (INCH/HR)           (ACRES)     NODE
      1      666.02    21.61      2.399  0.98( 0.49) 0.50       376.2      340.00
      2      661.30    21.99      2.374  0.98( 0.49) 0.50       378.8      320.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =     666.02    Tc(MIN.) =     21.61
  EFFECTIVE AREA(ACRES) =     376.22   AREA-AVERAGED Fm(INCH/HR) =  0.49
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.50
  TOTAL AREA(ACRES) =      378.8
  LONGEST FLOWPATH FROM NODE    340.00 TO NODE    345.00 =    5310.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    345.00 TO NODE    345.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    360.00 TO NODE    361.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   950.00
  ELEVATION DATA: UPSTREAM(FEET) =    840.00  DOWNSTREAM(FEET) =    830.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.736
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.460
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  A        1.40      0.98      0.100    32   11.74
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"        A        9.00      0.98      0.200    32   12.51
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.187
  SUBAREA RUNOFF(CFS) =      30.69
  TOTAL AREA(ACRES) =      10.40   PEAK FLOW RATE(CFS) =      30.69

****************************************************************************
  FLOW PROCESS FROM NODE    361.00 TO NODE    362.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  830.00  DOWNSTREAM ELEVATION(FEET) =  825.00
  STREET LENGTH(FEET) =    500.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) =  32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  27.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      40.29
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.62
    HALFSTREET FLOOD WIDTH(FEET) =   22.85
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.72
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.29
  STREET FLOW TRAVEL TIME(MIN.) =   2.24   Tc(MIN.) =   13.97
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.116
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"        A        7.30      0.98      0.200    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =     7.30     SUBAREA RUNOFF(CFS) =    19.19
  EFFECTIVE AREA(ACRES) =      17.70   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =       17.7        PEAK FLOW RATE(CFS) =      46.66

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.64   HALFSTREET FLOOD WIDTH(FEET) =  24.22
  FLOW VELOCITY(FEET/SEC.) =  3.85   DEPTH*VELOCITY(FT*FT/SEC.) =   2.48
  LONGEST FLOWPATH FROM NODE    360.00 TO NODE    362.00 =    1450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    362.00 TO NODE    362.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.97
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.116
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  A        5.30      0.98      0.100    32
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"        A       13.60      0.98      0.500    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.388
  SUBAREA AREA(ACRES) =    18.90     SUBAREA RUNOFF(CFS) =    46.58
  EFFECTIVE AREA(ACRES) =      36.60   AREA-AVERAGED Fm(INCH/HR) =  0.29
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.29
  TOTAL AREA(ACRES) =       36.6        PEAK FLOW RATE(CFS) =      93.24

****************************************************************************
  FLOW PROCESS FROM NODE    362.00 TO NODE    363.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    825.00  DOWNSTREAM(FEET) =   810.00
  FLOW LENGTH(FEET) =  1550.00    MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  32.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.86
  ESTIMATED PIPE DIAMETER(INCH) =  45.00     NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      93.24
  PIPE TRAVEL TIME(MIN.) =   2.38     Tc(MIN.) =   16.35
```

```
 LONGEST FLOWPATH FROM NODE    360.00 TO NODE    363.00 =    3000.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    363.00 TO NODE    363.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   16.35
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.836
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)   CN
 COMMERCIAL                 A        7.40     0.98      0.100     32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"       A       16.00     0.98      0.500     32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"       A        0.10     0.98      0.200     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.373
 SUBAREA AREA(ACRES) =   23.50     SUBAREA RUNOFF(CFS) =   52.29
 EFFECTIVE AREA(ACRES) =     60.10   AREA-AVERAGED Fm(INCH/HR) =  0.32
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.32
 TOTAL AREA(ACRES) =        60.1      PEAK FLOW RATE(CFS) =      136.29

****************************************************************************
 FLOW PROCESS FROM NODE    363.00 TO NODE    364.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   810.00  DOWNSTREAM(FEET) =   778.00
 FLOW LENGTH(FEET) =  2560.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  48.0 INCH PIPE IS  37.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.01
 ESTIMATED PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     136.29
 PIPE TRAVEL TIME(MIN.) =   3.28     Tc(MIN.) =   19.63
 LONGEST FLOWPATH FROM NODE    360.00 TO NODE    364.00 =    5560.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    364.00 TO NODE    364.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   19.63
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.541
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)   CN
 COMMERCIAL                 A       10.90     0.98      0.100     32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"       A       31.00     0.98      0.500     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.396
 SUBAREA AREA(ACRES) =   41.90     SUBAREA RUNOFF(CFS) =   81.27
 EFFECTIVE AREA(ACRES) =    102.00   AREA-AVERAGED Fm(INCH/HR) =  0.34
 AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.35
 TOTAL AREA(ACRES) =       102.0      PEAK FLOW RATE(CFS) =      201.63

****************************************************************************
 FLOW PROCESS FROM NODE    364.00 TO NODE    354.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   778.00  DOWNSTREAM(FEET) =   775.00
 FLOW LENGTH(FEET) =  1330.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  78.0 INCH PIPE IS  58.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.60
 ESTIMATED PIPE DIAMETER(INCH) =  78.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     201.63
 PIPE TRAVEL TIME(MIN.) =   2.92     Tc(MIN.) =   22.55
 LONGEST FLOWPATH FROM NODE    360.00 TO NODE    354.00 =    6890.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    354.00 TO NODE    354.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   22.55
 RAINFALL INTENSITY(INCH/HR) =   2.34
 AREA-AVERAGED Fm(INCH/HR) =  0.34
 AREA-AVERAGED Fp(INCH/HR) =  0.97
 AREA-AVERAGED Ap =  0.35
 EFFECTIVE STREAM AREA(ACRES) =     102.00
 TOTAL STREAM AREA(ACRES) =     102.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     201.63

****************************************************************************
 FLOW PROCESS FROM NODE    350.00 TO NODE    351.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   860.00
 ELEVATION DATA: UPSTREAM(FEET) =   840.00  DOWNSTREAM(FEET) =   832.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.560
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.492
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)   CN  (MIN.)
 COMMERCIAL                 A        8.70     0.98      0.100     32  11.56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) =     26.58
 TOTAL AREA(ACRES) =        8.70   PEAK FLOW RATE(CFS) =      26.58

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    351.00 TO NODE    352.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  832.00  DOWNSTREAM ELEVATION(FEET) =  825.00
 STREET LENGTH(FEET) =  1200.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 32.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  27.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      53.18
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.72
   HALFSTREET FLOOD WIDTH(FEET) =   31.04
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.23
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.33
 STREET FLOW TRAVEL TIME(MIN.) =    6.20   Tc(MIN.) =    17.76
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.699
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A        0.80      0.98      0.100    32
 COMMERCIAL                  A       21.80      0.98      0.100    32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =   22.60     SUBAREA RUNOFF(CFS) =   52.92
 EFFECTIVE AREA(ACRES) =     31.30    AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =      31.3        PEAK FLOW RATE(CFS) =      73.29

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.79   HALFSTREET FLOOD WIDTH(FEET) =  38.21
 FLOW VELOCITY(FEET/SEC.) =  3.42   DEPTH*VELOCITY(FT*FT/SEC.) =   2.72
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
        AND L = 1200.0 FT WITH ELEVATION-DROP =   7.0 FT, IS   60.0 CFS,
        WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE    352.00
 LONGEST FLOWPATH FROM NODE    350.00 TO NODE    352.00 =    2060.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    352.00 TO NODE    352.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    17.76
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.699
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A        4.70      0.98      0.100    32
 COMMERCIAL                  A       14.50      0.98      0.100    32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =   19.20     SUBAREA RUNOFF(CFS) =   44.96
 EFFECTIVE AREA(ACRES) =     50.50    AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =      50.5        PEAK FLOW RATE(CFS) =     118.24

****************************************************************************
 FLOW PROCESS FROM NODE    352.00 TO NODE    353.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   825.00  DOWNSTREAM(FEET) =   805.00
 FLOW LENGTH(FEET) =  1500.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  45.0 INCH PIPE IS  34.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.87
 ESTIMATED PIPE DIAMETER(INCH) =  45.00     NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     118.24
 PIPE TRAVEL TIME(MIN.) =   1.94    Tc(MIN.) =   19.70
 LONGEST FLOWPATH FROM NODE    350.00 TO NODE    353.00 =    3560.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    353.00 TO NODE    353.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   19.70
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.536
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A       21.00      0.98      0.100    32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        A       16.60      0.98      0.500    32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"        A       12.40      0.98      0.200    32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.258
 SUBAREA AREA(ACRES) =   50.00     SUBAREA RUNOFF(CFS) =  102.82
 EFFECTIVE AREA(ACRES) =    100.50    AREA-AVERAGED Fm(INCH/HR) =  0.17
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.18
 TOTAL AREA(ACRES) =     100.5        PEAK FLOW RATE(CFS) =     213.66

****************************************************************************
 FLOW PROCESS FROM NODE    353.00 TO NODE    354.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   805.00  DOWNSTREAM(FEET) =   775.00
 FLOW LENGTH(FEET) =  2560.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  57.0 INCH PIPE IS  45.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.14
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```
ESTIMATED PIPE DIAMETER(INCH) =  57.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =     213.66
PIPE TRAVEL TIME(MIN.) =    3.02     Tc(MIN.) =    22.72
LONGEST FLOWPATH FROM NODE     350.00 TO NODE     354.00 =     6120.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     354.00 TO NODE     354.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =    22.72
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.328
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/      SCS SOIL   AREA       Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)   CN
COMMERCIAL                  A       20.80      0.98      0.100     32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"        A       50.70      0.98      0.500     32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.384
SUBAREA AREA(ACRES) =    71.50      SUBAREA RUNOFF(CFS) =  125.75
EFFECTIVE AREA(ACRES) =     172.00   AREA-AVERAGED Fm(INCH/HR) =  0.26
AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.26
TOTAL AREA(ACRES) =      172.0        PEAK FLOW RATE(CFS) =      320.61

****************************************************************************
FLOW PROCESS FROM NODE     354.00 TO NODE     354.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =    22.72
RAINFALL INTENSITY(INCH/HR) =    2.33
AREA-AVERAGED Fm(INCH/HR) =  0.26
AREA-AVERAGED Fp(INCH/HR) =  0.98
AREA-AVERAGED Ap =  0.26
EFFECTIVE STREAM AREA(ACRES) =      172.00
TOTAL STREAM AREA(ACRES) =      172.00
PEAK FLOW RATE(CFS) AT CONFLUENCE =      320.61

** CONFLUENCE DATA **
 STREAM       Q       Tc   Intensity   Fp(Fm)       Ap      Ae      HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)            (ACRES)     NODE
    1      201.63   22.55     2.339  0.97( 0.34) 0.35      102.0      360.00
    2      320.61   22.72     2.328  0.98( 0.26) 0.26      172.0      350.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
 STREAM       Q       Tc   Intensity   Fp(Fm)       Ap      Ae      HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)            (ACRES)     NODE
    1      521.47   22.55     2.339  0.98( 0.29) 0.30      272.7      360.00
    2      521.19   22.72     2.328  0.98( 0.29) 0.30      274.0      350.00
```

```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      521.47    Tc(MIN.) =     22.55
EFFECTIVE AREA(ACRES) =      272.73   AREA-AVERAGED Fm(INCH/HR) =  0.29
AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.30
TOTAL AREA(ACRES) =       274.0
LONGEST FLOWPATH FROM NODE     360.00 TO NODE     354.00 =     6890.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     354.00 TO NODE     345.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   775.00  DOWNSTREAM(FEET) =   770.00
FLOW LENGTH(FEET) =  1350.00    MANNING'S N =  0.013
DEPTH OF FLOW IN 102.0 INCH PIPE IS  75.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  11.63
ESTIMATED PIPE DIAMETER(INCH) = 102.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =     521.47
PIPE TRAVEL TIME(MIN.) =    1.94     Tc(MIN.) =    24.48
LONGEST FLOWPATH FROM NODE     360.00 TO NODE     345.00 =     8240.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     345.00 TO NODE     345.00 IS CODE =  11
----------------------------------------------------------------------------
>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

** MAIN STREAM CONFLUENCE DATA **
 STREAM       Q       Tc   Intensity   Fp(Fm)       Ap      Ae      HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)            (ACRES)     NODE
    1      521.47   24.48     2.226  0.98( 0.29) 0.30      272.7      360.00
    2      521.19   24.65     2.217  0.98( 0.29) 0.30      274.0      350.00
LONGEST FLOWPATH FROM NODE     360.00 TO NODE     345.00 =     8240.00 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM       Q       Tc   Intensity   Fp(Fm)       Ap      Ae      HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)            (ACRES)     NODE
    1      666.02   21.61     2.399  0.98( 0.49) 0.50      376.2      340.00
    2      661.30   21.99     2.374  0.98( 0.49) 0.50      378.8      320.00
LONGEST FLOWPATH FROM NODE     340.00 TO NODE     345.00 =     5310.00 FEET.

** PEAK FLOW RATE TABLE **
 STREAM       Q       Tc   Intensity   Fp(Fm)       Ap      Ae      HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)            (ACRES)     NODE
    1     1167.45   21.61     2.399  0.98( 0.41) 0.42      617.0      340.00
    2     1165.48   21.99     2.374  0.98( 0.41) 0.42      623.7      320.00
    3     1130.65   24.48     2.226  0.98( 0.41) 0.42      651.5      360.00
    4     1127.18   24.65     2.217  0.98( 0.41) 0.42      652.8      350.00
  TOTAL AREA(ACRES) =       652.8

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =     1167.45  Tc(MIN.) =    21.611
EFFECTIVE AREA(ACRES) =     616.95  AREA-AVERAGED Fm(INCH/HR) =  0.41
AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.42
```

```
 TOTAL AREA(ACRES) =      652.8
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     345.00 =    8240.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    345.00 TO NODE    345.00 IS CODE =  71
----------------------------------------------------------------------------
 >>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
 >>>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<
============================================================================
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.48;30M= 0.99;1H= 1.30;3H= 2.30;6H= 3.30;24H= 7.00
 S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT=  0.0%
          MOUNTAIN=  0.0%;FOOTHILL=  0.0%;DESERT(UNDEV.)=  0.0%
 Tc(HR) = 0.41; LAG(HR) = 0.33; Fm(INCH/HR) = 0.41; Ybar = 0.42
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC  II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 1.00; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =      652.8
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     345.00 =    8240.00 FEET.
  EQUIVALENT BASIN FACTOR APPROXIMATIONS:
  Lca/L=0.3,n=.0316; Lca/L=0.4,n=.0283; Lca/L=0.5,n=.0260;Lca/L=0.6,n=.0243
 TIME OF PEAK FLOW(HR) = 16.42  RUNOFF VOLUME(AF) =     232.32
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) =    1112.07
 TOTAL PEAK FLOW RATE(CFS) =    1112.07 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE(CFS) =    1167.45
  (UPSTREAM NODE PEAK FLOW RATE(CFS) =    1167.45)
 PEAK FLOW RATE(CFS) USED =    1167.45

****************************************************************************
 FLOW PROCESS FROM NODE    345.00 TO NODE    346.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    770.00  DOWNSTREAM(FEET) =    752.00
 FLOW LENGTH(FEET) =   2560.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN 120.0 INCH PIPE IS  92.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  17.96
 ESTIMATED PIPE DIAMETER(INCH) = 120.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =    1167.45
 PIPE TRAVEL TIME(MIN.) =   2.38    Tc(MIN.) =   26.86
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     346.00 =   10800.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    346.00 TO NODE    346.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   26.86
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.106
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap       SCS
      LAND USE            GROUP    (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        1.00      0.98      0.100     32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"       A       70.00      0.98      0.500     32
 COMMERCIAL                 A        9.40      0.98      0.100     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.448
 SUBAREA AREA(ACRES) =    80.40
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.48;30M= 0.99;1H= 1.30;3H= 2.30;6H= 3.30;24H= 7.00
 S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT=  0.0%
          MOUNTAIN=  0.0%;FOOTHILL=  0.0%;DESERT(UNDEV.)=  0.0%
 Tc(HR) = 0.45; LAG(HR) = 0.36; Fm(INCH/HR) = 0.41; Ybar = 0.42
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC  II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 1.00; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =      733.2
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     346.00 =   10800.00 FEET.
  EQUIVALENT BASIN FACTOR APPROXIMATIONS:
  Lca/L=0.3,n=.0280; Lca/L=0.4,n=.0251; Lca/L=0.5,n=.0230;Lca/L=0.6,n=.0215
 TIME OF PEAK FLOW(HR) = 16.42  RUNOFF VOLUME(AF) =     259.54
 UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) =    1191.12
 TOTAL AREA(ACRES) =      733.2        PEAK FLOW RATE(CFS) =    1191.12

****************************************************************************
 FLOW PROCESS FROM NODE    346.00 TO NODE    347.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    752.00  DOWNSTREAM(FEET) =    740.00
 FLOW LENGTH(FEET) =   2530.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN 132.0 INCH PIPE IS  98.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.66
 ESTIMATED PIPE DIAMETER(INCH) = 132.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =    1191.12
 PIPE TRAVEL TIME(MIN.) =   2.69    Tc(MIN.) =   29.55
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     347.00 =   13330.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    347.00 TO NODE    347.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   29.55
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.988
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap       SCS
      LAND USE            GROUP    (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        2.80      0.98      0.100     32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"       A      144.30      0.98      0.500     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.492
 SUBAREA AREA(ACRES) =   147.10
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.48;30M= 0.99;1H= 1.30;3H= 2.30;6H= 3.30;24H= 7.00
 S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT=  0.0%
          MOUNTAIN=  0.0%;FOOTHILL=  0.0%;DESERT(UNDEV.)=  0.0%
 Tc(HR) = 0.49; LAG(HR) = 0.39; Fm(INCH/HR) = 0.42; Ybar = 0.43
```

```
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC  II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
3HR = 0.99; 6HR = 1.00; 24HR= 1.00
UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =      880.3
LONGEST FLOWPATH FROM NODE    360.00 TO NODE    347.00 =   13330.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3,n=.0258; Lca/L=0.4,n=.0231; Lca/L=0.5,n=.0213;Lca/L=0.6,n=.0198
TIME OF PEAK FLOW(HR) = 16.42  RUNOFF VOLUME(AF) =     306.02
UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) =    1294.40
TOTAL AREA(ACRES) =      880.3       PEAK FLOW RATE(CFS) =    1294.40
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =      880.3  TC(MIN.) =     29.55
AREA-AVERAGED Fm(INCH/HR)=  0.42   Ybar =  0.43
PEAK FLOW RATE(CFS)    =   1294.40
============================================================================
============================================================================
END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS
```

```
****************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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 ************************** DESCRIPTION OF STUDY **************************
 * ONTARIO MASTER PLAN OF DRAINAGE - BASIN IV (AREA G, H, I)              *
 * 25-YEAR HYDROLOGY ANALYSIS                                             *
 * P. PAGADUAN 8-29-2011                                                  *
 **************************************************************************

  FILE NAME: OIVG25.DAT
  TIME/DATE OF STUDY: 16:22 08/29/2011
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.900
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.300
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   25.00   1-HOUR INTENSITY(INCH/HOUR) = 1.0385
  SLOPE OF INTENSITY DURATION CURVE = 0.6000

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:  CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP  HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)   (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67   2.00 0.0312 0.167 0.0150
  2   32.0     27.0    0.020/0.020/0.020   0.67   2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
```

```
    WATERSHED LAG = 0.80 * Tc
    USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF
    2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
    FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
  USER SPECIFIED RAINFALL VALUES:
      2-YR  6-HR RAINFALL DEPTH(INCH) =  1.50
      2-YR 24-HR RAINFALL DEPTH(INCH) =  2.70
    100-YR  6-HR RAINFALL DEPTH(INCH) =  3.30
    100-YR 24-HR RAINFALL DEPTH(INCH) =  7.00
    SIERRA MADRE DEPTH-AREA FACTORS USED.
                     AREA-AVERAGED
         DURATION    RAINFALL(INCH)
         5-MINUTES         0.38
        30-MINUTES         0.79
          1-HOUR           1.04
          3-HOUR           1.87
          6-HOUR           2.71
         24-HOUR           5.30
 *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD*


****************************************************************************
  FLOW PROCESS FROM NODE    320.10 TO NODE    320.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   750.00
  ELEVATION DATA: UPSTREAM(FEET) =    820.00  DOWNSTREAM(FEET) =    815.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.698
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.770
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  A       6.20      0.98      0.100     32   11.70
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     14.91
  TOTAL AREA(ACRES) =      6.20   PEAK FLOW RATE(CFS) =     14.91

****************************************************************************
  FLOW PROCESS FROM NODE    320.20 TO NODE    320.30 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    815.00
  DOWNSTREAM NODE ELEVATION(FEET) =    814.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.800
  PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.10000
  MAXIMUM DEPTH(FEET) =    3.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.649
  SUBAREA LOSS RATE DATA(AMC  II):
```

```
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
PUBLIC PARK                  A       1.80      0.98      0.850    32
COMMERCIAL                   A       9.90      0.98      0.100    32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.215
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      27.73
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.62
AVERAGE FLOW DEPTH(FEET) =   1.29   FLOOD WIDTH(FEET) =   12.84
"V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.90   Tc(MIN.) =   12.60
SUBAREA AREA(ACRES) =   11.70      SUBAREA RUNOFF(CFS) =   25.68
EFFECTIVE AREA(ACRES) =   17.90     AREA-AVERAGED Fm(INCH/HR) =   0.17
AREA-AVERAGED Fp(INCH/HR) =   0.97  AREA-AVERAGED Ap =   0.18
TOTAL AREA(ACRES) =        17.9        PEAK FLOW RATE(CFS) =       39.92

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) =  1.45   FLOOD WIDTH(FEET) =   15.96
FLOW VELOCITY(FEET/SEC.) =   4.84   DEPTH*VELOCITY(FT*FT/SEC) =   7.01
LONGEST FLOWPATH FROM NODE     320.10 TO NODE     320.30 =    1000.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     320.30 TO NODE     320.40 IS CODE =  91
----------------------------------------------------------------------------
>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
UPSTREAM NODE ELEVATION(FEET) =     814.00
DOWNSTREAM NODE ELEVATION(FEET) =     810.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    900.00
"V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.800
PAVEMENT LIP(FEET) =  0.100    MANNING'S N = .0150
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.10000
MAXIMUM DEPTH(FEET) =    3.00
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.349
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
PUBLIC PARK                  A       2.00      0.98      0.850    32
COMMERCIAL                   A      17.90      0.98      0.100    32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.175
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      59.38
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.36
AVERAGE FLOW DEPTH(FEET) =   1.61   FLOOD WIDTH(FEET) =   19.18
"V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.80   Tc(MIN.) =   15.40
SUBAREA AREA(ACRES) =   19.90      SUBAREA RUNOFF(CFS) =   39.00
EFFECTIVE AREA(ACRES) =   37.80     AREA-AVERAGED Fm(INCH/HR) =   0.17
AREA-AVERAGED Fp(INCH/HR) =   0.98  AREA-AVERAGED Ap =   0.18
TOTAL AREA(ACRES) =        37.8        PEAK FLOW RATE(CFS) =       74.09

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) =  1.72   FLOOD WIDTH(FEET) =   21.42
FLOW VELOCITY(FEET/SEC.) =   5.55   DEPTH*VELOCITY(FT*FT/SEC) =   9.56
LONGEST FLOWPATH FROM NODE     320.10 TO NODE     320.40 =    1900.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     320.00 TO NODE     321.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =    320.00
ELEVATION DATA: UPSTREAM(FEET) =     820.00  DOWNSTREAM(FEET) =     818.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.392
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.554
SUBAREA Tc AND LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
PUBLIC PARK                  A       6.30      0.98      0.850    32   13.39
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
SUBAREA RUNOFF(CFS) =      9.78
TOTAL AREA(ACRES) =        6.30   PEAK FLOW RATE(CFS) =       9.78

****************************************************************************
FLOW PROCESS FROM NODE     321.00 TO NODE     322.00 IS CODE =  91
----------------------------------------------------------------------------
>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
UPSTREAM NODE ELEVATION(FEET) =     818.00
DOWNSTREAM NODE ELEVATION(FEET) =     810.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    970.00
"V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.800
PAVEMENT LIP(FEET) =  0.100    MANNING'S N = .0150
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.10000
MAXIMUM DEPTH(FEET) =    3.00
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.293
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
PUBLIC PARK                  A      19.80      0.98      0.850    32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      22.61
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.14
AVERAGE FLOW DEPTH(FEET) =   1.07   FLOOD WIDTH(FEET) =    8.50
"V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.63   Tc(MIN.) =   16.02
SUBAREA AREA(ACRES) =   19.80      SUBAREA RUNOFF(CFS) =   26.10
EFFECTIVE AREA(ACRES) =   26.10     AREA-AVERAGED Fm(INCH/HR) =   0.83
AREA-AVERAGED Fp(INCH/HR) =   0.98  AREA-AVERAGED Ap =   0.85
TOTAL AREA(ACRES) =        26.1        PEAK FLOW RATE(CFS) =       34.40

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) =  1.23   FLOOD WIDTH(FEET) =   11.68
FLOW VELOCITY(FEET/SEC.) =   6.51   DEPTH*VELOCITY(FT*FT/SEC) =   8.03
LONGEST FLOWPATH FROM NODE     320.00 TO NODE     322.00 =    1290.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     322.00 TO NODE     323.00 IS CODE =  91
----------------------------------------------------------------------------
>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
==========================================================================
  UPSTREAM NODE ELEVATION(FEET) =    810.00
  DOWNSTREAM NODE ELEVATION(FEET) =    800.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    950.00
  "V" GUTTER WIDTH(FEET) =    5.00   GUTTER HIKE(FEET) =  0.800
  PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.10000
  MAXIMUM DEPTH(FEET) =    3.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.134
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                 A        2.30     0.98      0.850    32
  PUBLIC PARK                 A       41.30     0.98      0.850    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     59.93
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.77
  AVERAGE FLOW DEPTH(FEET) =   1.41   FLOOD WIDTH(FEET) =   15.28
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.04    Tc(MIN.) =   18.06
  SUBAREA AREA(ACRES) =   43.60       SUBAREA RUNOFF(CFS) =   51.23
  EFFECTIVE AREA(ACRES) =   69.70     AREA-AVERAGED Fm(INCH/HR) =   0.83
  AREA-AVERAGED Fp(INCH/HR) =   0.98  AREA-AVERAGED Ap =   0.85
  TOTAL AREA(ACRES) =         69.7         PEAK FLOW RATE(CFS) =       81.89

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  1.56   FLOOD WIDTH(FEET) =   18.14
  FLOW VELOCITY(FEET/SEC.) =    8.11   DEPTH*VELOCITY(FT*FT/SEC) =  12.63
  LONGEST FLOWPATH FROM NODE     320.00 TO NODE     323.00 =     2240.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE     323.00 TO NODE     324.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   800.00  DOWNSTREAM(FEET) =   778.00
  FLOW LENGTH(FEET) =  1650.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  30.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.71
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       81.89
  PIPE TRAVEL TIME(MIN.) =    2.35    Tc(MIN.) =    20.41
  LONGEST FLOWPATH FROM NODE     320.00 TO NODE     324.00 =     3890.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE     324.00 TO NODE     324.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    20.41
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.983
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                 A        3.80     0.98      0.850    32
```

```
  PUBLIC PARK                 A       78.00     0.98      0.850    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =   81.80      SUBAREA RUNOFF(CFS) =    84.99
  EFFECTIVE AREA(ACRES) =    151.50   AREA-AVERAGED Fm(INCH/HR) =  0.83
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.85
  TOTAL AREA(ACRES) =       151.5        PEAK FLOW RATE(CFS) =      157.42

**************************************************************************
  FLOW PROCESS FROM NODE     324.00 TO NODE     345.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    778.00  DOWNSTREAM(FEET) =    770.00
  FLOW LENGTH(FEET) =  1340.00    MANNING'S N =  0.013
  DEPTH OF FLOW IN  60.0 INCH PIPE IS  43.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.33
  ESTIMATED PIPE DIAMETER(INCH) =  60.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      157.42
  PIPE TRAVEL TIME(MIN.) =    2.16     Tc(MIN.) =    22.57
  LONGEST FLOWPATH FROM NODE     320.00 TO NODE     345.00 =     5230.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE     345.00 TO NODE     345.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    22.57
  RAINFALL INTENSITY(INCH/HR) =    1.87
  AREA-AVERAGED Fm(INCH/HR) =  0.83
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.85
  EFFECTIVE STREAM AREA(ACRES) =     151.50
  TOTAL STREAM AREA(ACRES) =      151.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      157.42

**************************************************************************
  FLOW PROCESS FROM NODE     340.00 TO NODE     341.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1000.00
  ELEVATION DATA: UPSTREAM(FEET) =    840.00  DOWNSTREAM(FEET) =    830.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.102
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.714
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap     SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  A        2.50     0.98      0.100    32   12.10
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
```

```
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =       5.89
 TOTAL AREA(ACRES) =       2.50   PEAK FLOW RATE(CFS) =       5.89

****************************************************************************
 FLOW PROCESS FROM NODE    341.00 TO NODE    342.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  830.00  DOWNSTREAM ELEVATION(FEET) =  815.00
 STREET LENGTH(FEET) =  1030.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 32.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  27.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.10
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.38
   HALFSTREET FLOOD WIDTH(FEET) =   10.93
   AVERAGE FLOW VELOCITY(FEET/SEC.) =     2.93
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =     1.10
 STREET FLOW TRAVEL TIME(MIN.) =    5.87   Tc(MIN.) =    17.97
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.141
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS
      LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                   A        2.40      0.98      0.100     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     2.40      SUBAREA RUNOFF(CFS) =     4.41
 EFFECTIVE AREA(ACRES) =       4.90    AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.9          PEAK FLOW RATE(CFS) =       9.01

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  11.46
 FLOW VELOCITY(FEET/SEC.) =  3.00   DEPTH*VELOCITY(FT*FT/SEC.) =   1.16
 LONGEST FLOWPATH FROM NODE     340.00 TO NODE     342.00 =    2030.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    342.00 TO NODE    342.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   17.97
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.141
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS
```

```
      LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                   A        7.90      0.98      0.100     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     7.90      SUBAREA RUNOFF(CFS) =    14.53
 EFFECTIVE AREA(ACRES) =      12.80    AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       12.8          PEAK FLOW RATE(CFS) =      23.54

****************************************************************************
 FLOW PROCESS FROM NODE    342.00 TO NODE    342.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   17.97
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.141
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS
      LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                   A       15.70      0.98      0.100     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    15.70      SUBAREA RUNOFF(CFS) =    28.87
 EFFECTIVE AREA(ACRES) =      28.50    AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       28.5          PEAK FLOW RATE(CFS) =      52.41

****************************************************************************
 FLOW PROCESS FROM NODE    342.00 TO NODE    343.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    815.00  DOWNSTREAM(FEET) =    805.00
 FLOW LENGTH(FEET) =    700.00    MANNING'S N =  0.013
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.81
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      52.41
 PIPE TRAVEL TIME(MIN.) =    1.08     Tc(MIN.) =    19.05
 LONGEST FLOWPATH FROM NODE     340.00 TO NODE     343.00 =    2730.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    343.00 TO NODE    343.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   19.05
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.067
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS
      LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                   A       14.70      0.98      0.100     32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"         A        8.70      0.98      0.500     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
```

```
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.249
 SUBAREA AREA(ACRES) =    23.40      SUBAREA RUNOFF(CFS) =    38.43
 EFFECTIVE AREA(ACRES) =      51.90   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.17
 TOTAL AREA(ACRES) =         51.9       PEAK FLOW RATE(CFS) =       88.95

****************************************************************************
 FLOW PROCESS FROM NODE     343.00 TO NODE     344.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   805.00  DOWNSTREAM(FEET) =   798.00
 FLOW LENGTH(FEET) =   600.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  42.0 INCH PIPE IS  31.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.46
 ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      88.95
 PIPE TRAVEL TIME(MIN.) =   0.87    Tc(MIN.) =    19.92
 LONGEST FLOWPATH FROM NODE     340.00 TO NODE     344.00 =    3330.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     344.00 TO NODE     344.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    19.92
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.012
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A       15.50       0.98      0.100     32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        A       41.90       0.98      0.500     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.392
 SUBAREA AREA(ACRES) =    57.40      SUBAREA RUNOFF(CFS) =    84.21
 EFFECTIVE AREA(ACRES) =     109.30   AREA-AVERAGED Fm(INCH/HR) =  0.28
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.29
 TOTAL AREA(ACRES) =        109.3       PEAK FLOW RATE(CFS) =      170.60

****************************************************************************
 FLOW PROCESS FROM NODE     344.00 TO NODE     345.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   798.00  DOWNSTREAM(FEET) =   770.00
 FLOW LENGTH(FEET) =  1980.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  51.0 INCH PIPE IS  39.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.41
 ESTIMATED PIPE DIAMETER(INCH) =  51.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     170.60
 PIPE TRAVEL TIME(MIN.) =   2.29    Tc(MIN.) =    22.21
 LONGEST FLOWPATH FROM NODE     340.00 TO NODE     345.00 =    5310.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     345.00 TO NODE     345.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    22.21
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.885
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A       22.80       0.98      0.100     32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        A       32.90       0.98      0.500     32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"        A       54.70       0.98      0.200     32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"        A        2.70       0.98      0.200     32
 COMMERCIAL                  A        4.90       0.98      0.100     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.260
 SUBAREA AREA(ACRES) =   118.00      SUBAREA RUNOFF(CFS) =  173.26
 EFFECTIVE AREA(ACRES) =     227.30   AREA-AVERAGED Fm(INCH/HR) =  0.27
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.27
 TOTAL AREA(ACRES) =        227.3       PEAK FLOW RATE(CFS) =      331.34

****************************************************************************
 FLOW PROCESS FROM NODE     345.00 TO NODE     345.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    22.21
 RAINFALL INTENSITY(INCH/HR) =    1.89
 AREA-AVERAGED Fm(INCH/HR) =  0.27
 AREA-AVERAGED Fp(INCH/HR) =  0.98
 AREA-AVERAGED Ap =  0.27
 EFFECTIVE STREAM AREA(ACRES) =      227.30
 TOTAL STREAM AREA(ACRES) =      227.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      331.34

 ** CONFLUENCE DATA **
  STREAM       Q       Tc    Intensity    Fp(Fm)      Ap       Ae      HEADWATER
  NUMBER     (CFS)   (MIN.)  (INCH/HR)  (INCH/HR)            (ACRES)     NODE
     1      157.42    22.57     1.867  0.98( 0.83) 0.85      151.5      320.00
     2      331.34    22.21     1.885  0.98( 0.27) 0.27      227.3      340.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q       Tc    Intensity    Fp(Fm)      Ap       Ae      HEADWATER
  NUMBER     (CFS)   (MIN.)  (INCH/HR)  (INCH/HR)            (ACRES)     NODE
     1      488.75    22.21     1.885  0.98( 0.49) 0.50      376.4      340.00
     2      485.06    22.57     1.867  0.98( 0.49) 0.50      378.8      320.00
```

```
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      488.75    Tc(MIN.) =     22.21
 EFFECTIVE AREA(ACRES) =      376.39   AREA-AVERAGED Fm(INCH/HR) =  0.49
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.50
 TOTAL AREA(ACRES) =       378.8
 LONGEST FLOWPATH FROM NODE     340.00 TO NODE     345.00 =    5310.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    345.00 TO NODE    345.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    360.00 TO NODE    361.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   950.00
 ELEVATION DATA: UPSTREAM(FEET) =    840.00  DOWNSTREAM(FEET) =    830.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.736
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.764
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp        Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 A        1.40     0.98      0.100     32   11.74
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"       A        9.00     0.98      0.200     32   12.51
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.187
 SUBAREA RUNOFF(CFS) =      24.17
 TOTAL AREA(ACRES) =      10.40   PEAK FLOW RATE(CFS) =       24.17

****************************************************************************
 FLOW PROCESS FROM NODE    361.00 TO NODE    362.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  830.00  DOWNSTREAM ELEVATION(FEET) =  825.00
 STREET LENGTH(FEET) =   500.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 32.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  27.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       31.67
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.57
   HALFSTREET FLOOD WIDTH(FEET) =   20.79
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.51
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.01
 STREET FLOW TRAVEL TIME(MIN.) =   2.38   Tc(MIN.) =   14.11
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.475
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp        Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"       A        7.30     0.98      0.200     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA AREA(ACRES) =     7.30     SUBAREA RUNOFF(CFS) =    14.98
 EFFECTIVE AREA(ACRES) =      17.70    AREA-AVERAGED Fm(INCH/HR) =  0.19
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.19
 TOTAL AREA(ACRES) =       17.7        PEAK FLOW RATE(CFS) =      36.44

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.60   HALFSTREET FLOOD WIDTH(FEET) =  21.95
 FLOW VELOCITY(FEET/SEC.) =  3.64   DEPTH*VELOCITY(FT*FT/SEC.) =   2.17
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     362.00 =    1450.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    362.00 TO NODE    362.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    14.11
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.475
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp        Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        5.30     0.98      0.100     32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"       A       13.60     0.98      0.500     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.388
 SUBAREA AREA(ACRES) =    18.90     SUBAREA RUNOFF(CFS) =    35.66
 EFFECTIVE AREA(ACRES) =      36.60   AREA-AVERAGED Fm(INCH/HR) =  0.29
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.29
 TOTAL AREA(ACRES) =       36.6        PEAK FLOW RATE(CFS) =       72.11

****************************************************************************
 FLOW PROCESS FROM NODE    362.00 TO NODE    363.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    825.00  DOWNSTREAM(FEET) =    810.00
 FLOW LENGTH(FEET) =  1550.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  39.0 INCH PIPE IS  31.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =    9.98
 ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
```

```
 PIPE-FLOW(CFS) =       72.11
 PIPE TRAVEL TIME(MIN.) =   2.59    Tc(MIN.) =   16.70
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     363.00 =    3000.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    363.00 TO NODE    363.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   16.70
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.237
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        7.40     0.98     0.100     32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"       A       16.00     0.98     0.500     32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"       A        0.10     0.98     0.200     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.373
 SUBAREA AREA(ACRES) =   23.50      SUBAREA RUNOFF(CFS) =   39.63
 EFFECTIVE AREA(ACRES) =     60.10    AREA-AVERAGED Fm(INCH/HR) =  0.32
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.32
 TOTAL AREA(ACRES) =       60.1        PEAK FLOW RATE(CFS) =     103.90

****************************************************************************
 FLOW PROCESS FROM NODE    363.00 TO NODE    364.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   810.00  DOWNSTREAM(FEET) =   778.00
 FLOW LENGTH(FEET) =  2560.00    MANNING'S N =  0.013
 DEPTH OF FLOW IN  45.0 INCH PIPE IS  32.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.31
 ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      103.90
 PIPE TRAVEL TIME(MIN.) =   3.47    Tc(MIN.) =   20.16
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     364.00 =    5560.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    364.00 TO NODE    364.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   20.16
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.998
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A       10.90     0.98     0.100     32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"       A       31.00     0.98     0.500     32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.396
 SUBAREA AREA(ACRES) =   41.90      SUBAREA RUNOFF(CFS) =   60.78
 EFFECTIVE AREA(ACRES) =    102.00    AREA-AVERAGED Fm(INCH/HR) =  0.34
 AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.35
 TOTAL AREA(ACRES) =      102.0        PEAK FLOW RATE(CFS) =     151.73

****************************************************************************
 FLOW PROCESS FROM NODE    364.00 TO NODE    354.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   778.00  DOWNSTREAM(FEET) =   775.00
 FLOW LENGTH(FEET) =  1330.00    MANNING'S N =  0.013
 DEPTH OF FLOW IN  69.0 INCH PIPE IS  53.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.03
 ESTIMATED PIPE DIAMETER(INCH) =  69.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      151.73
 PIPE TRAVEL TIME(MIN.) =   3.15    Tc(MIN.) =   23.32
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     354.00 =    6890.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    354.00 TO NODE    354.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   23.32
 RAINFALL INTENSITY(INCH/HR) =   1.83
 AREA-AVERAGED Fm(INCH/HR) =  0.34
 AREA-AVERAGED Fp(INCH/HR) =  0.97
 AREA-AVERAGED Ap =  0.35
 EFFECTIVE STREAM AREA(ACRES) =     102.00
 TOTAL STREAM AREA(ACRES) =     102.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     151.73

****************************************************************************
 FLOW PROCESS FROM NODE    350.00 TO NODE    351.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   860.00
 ELEVATION DATA: UPSTREAM(FEET) =   840.00  DOWNSTREAM(FEET) =   832.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  11.560
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.789
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 A        8.70     0.98     0.100     32  11.56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) =     21.08
 TOTAL AREA(ACRES) =       8.70    PEAK FLOW RATE(CFS) =     21.08
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    351.00 TO NODE    352.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  832.00  DOWNSTREAM ELEVATION(FEET) =  825.00
  STREET LENGTH(FEET) =  1200.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  27.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      41.93
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.67
    HALFSTREET FLOOD WIDTH(FEET) =   26.19
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.06
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =     2.06
  STREET FLOW TRAVEL TIME(MIN.) =    6.53   Tc(MIN.) =   18.09
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.132
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                   A       0.80      0.98      0.100    32
  COMMERCIAL                   A      21.80      0.98      0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =   22.60     SUBAREA RUNOFF(CFS) =   41.38
  EFFECTIVE AREA(ACRES) =      31.30    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =          31.3       PEAK FLOW RATE(CFS) =       57.31

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.74   HALFSTREET FLOOD WIDTH(FEET) =  32.62
  FLOW VELOCITY(FEET/SEC.) =  3.28   DEPTH*VELOCITY(FT*FT/SEC.) =   2.42
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L = 1200.0 FT WITH ELEVATION-DROP =   7.0 FT, IS   47.5 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE    352.00
  LONGEST FLOWPATH FROM NODE    350.00 TO NODE    352.00 =    2060.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    352.00 TO NODE    352.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    18.09
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.132
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                   A       4.70      0.98      0.100    32
  COMMERCIAL                   A      14.50      0.98      0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =   19.20     SUBAREA RUNOFF(CFS) =   35.16
  EFFECTIVE AREA(ACRES) =      50.50    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =          50.5       PEAK FLOW RATE(CFS) =       92.47

****************************************************************************
  FLOW PROCESS FROM NODE    352.00 TO NODE    353.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   825.00  DOWNSTREAM(FEET) =   805.00
  FLOW LENGTH(FEET) =  1500.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  30.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.20
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      92.47
  PIPE TRAVEL TIME(MIN.) =   2.05    Tc(MIN.) =   20.14
  LONGEST FLOWPATH FROM NODE    350.00 TO NODE    353.00 =    3560.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    353.00 TO NODE    353.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    20.14
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.999
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                   A      21.00      0.98      0.100    32
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"         A      16.60      0.98      0.500    32
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"         A      12.40      0.98      0.200    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.258
  SUBAREA AREA(ACRES) =   50.00     SUBAREA RUNOFF(CFS) =   78.66
  EFFECTIVE AREA(ACRES) =     100.50    AREA-AVERAGED Fm(INCH/HR) =  0.17
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.18
  TOTAL AREA(ACRES) =         100.5       PEAK FLOW RATE(CFS) =      165.08

****************************************************************************
  FLOW PROCESS FROM NODE    353.00 TO NODE    354.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   805.00  DOWNSTREAM(FEET) =   775.00
  FLOW LENGTH(FEET) =  2560.00   MANNING'S N =  0.013
```

```
DEPTH OF FLOW IN  54.0 INCH PIPE IS  38.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  13.48
ESTIMATED PIPE DIAMETER(INCH) =  54.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      165.08
PIPE TRAVEL TIME(MIN.) =    3.17    Tc(MIN.) =    23.31
LONGEST FLOWPATH FROM NODE     350.00 TO NODE     354.00 =     6120.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     354.00 TO NODE     354.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   23.31
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.831
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp        Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                  A       20.80      0.98      0.100     32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"        A       50.70      0.98      0.500     32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.384
SUBAREA AREA(ACRES) =    71.50     SUBAREA RUNOFF(CFS) =    93.78
EFFECTIVE AREA(ACRES) =     172.00   AREA-AVERAGED Fm(INCH/HR) =  0.26
AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.26
TOTAL AREA(ACRES) =      172.0       PEAK FLOW RATE(CFS) =      243.70

****************************************************************************
FLOW PROCESS FROM NODE     354.00 TO NODE     354.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   23.31
RAINFALL INTENSITY(INCH/HR) =   1.83
AREA-AVERAGED Fm(INCH/HR) =  0.26
AREA-AVERAGED Fp(INCH/HR) =  0.98
AREA-AVERAGED Ap =  0.26
EFFECTIVE STREAM AREA(ACRES) =      172.00
TOTAL STREAM AREA(ACRES) =      172.00
PEAK FLOW RATE(CFS) AT CONFLUENCE =      243.70

** CONFLUENCE DATA **
 STREAM      Q      Tc   Intensity  Fp(Fm)     Ap      Ae     HEADWATER
 NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)     NODE
    1     151.73   23.32     1.831  0.97( 0.34) 0.35     102.0      360.00
    2     243.70   23.31     1.831  0.98( 0.26) 0.26     172.0      350.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
 STREAM      Q      Tc   Intensity  Fp(Fm)     Ap      Ae     HEADWATER
 NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)     NODE
    1     395.42   23.31     1.831  0.98( 0.29) 0.30     274.0      350.00
    2     395.37   23.32     1.831  0.97( 0.29) 0.30     274.0      360.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      395.42    Tc(MIN.) =     23.31
EFFECTIVE AREA(ACRES) =      273.96   AREA-AVERAGED Fm(INCH/HR) =  0.29
AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.30
TOTAL AREA(ACRES) =       274.0
LONGEST FLOWPATH FROM NODE     360.00 TO NODE     354.00 =     6890.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     354.00 TO NODE     345.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    775.00  DOWNSTREAM(FEET) =    770.00
FLOW LENGTH(FEET) =  1350.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  90.0 INCH PIPE IS  69.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  10.76
ESTIMATED PIPE DIAMETER(INCH) =  90.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      395.42
PIPE TRAVEL TIME(MIN.) =    2.09    Tc(MIN.) =    25.40
LONGEST FLOWPATH FROM NODE     360.00 TO NODE     345.00 =     8240.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     345.00 TO NODE     345.00 IS CODE =  11
----------------------------------------------------------------------------
>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

** MAIN STREAM CONFLUENCE DATA **
 STREAM      Q      Tc   Intensity  Fp(Fm)     Ap      Ae     HEADWATER
 NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)     NODE
    1     395.42   25.40     1.739  0.98( 0.29) 0.30     274.0      350.00
    2     395.37   25.41     1.739  0.97( 0.29) 0.30     274.0      360.00
LONGEST FLOWPATH FROM NODE     360.00 TO NODE     345.00 =     8240.00 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM      Q      Tc   Intensity  Fp(Fm)     Ap      Ae     HEADWATER
 NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)     NODE
    1     488.75   22.21     1.885  0.98( 0.49) 0.50     376.4      340.00
    2     485.06   22.57     1.867  0.98( 0.49) 0.50     378.8      320.00
LONGEST FLOWPATH FROM NODE     340.00 TO NODE     345.00 =     5310.00 FEET.

** PEAK FLOW RATE TABLE **
 STREAM      Q      Tc   Intensity  Fp(Fm)     Ap      Ae     HEADWATER
 NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)     NODE
    1     869.32   22.21     1.885  0.98( 0.41) 0.42     616.0      340.00
    2     867.41   22.57     1.867  0.98( 0.41) 0.42     622.3      320.00
    3     835.51   25.40     1.739  0.98( 0.41) 0.42     652.8      350.00
    4     835.34   25.41     1.739  0.98( 0.41) 0.42     652.8      360.00
  TOTAL AREA(ACRES) =       652.8

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      869.32  Tc(MIN.) =    22.212
```

```
 EFFECTIVE AREA(ACRES) =     615.99  AREA-AVERAGED Fm(INCH/HR) =  0.41
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.42
 TOTAL AREA(ACRES) =      652.8
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     345.00 =    8240.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     345.00 TO NODE     345.00 IS CODE =  71
----------------------------------------------------------------------------
 >>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
 >>>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<
============================================================================
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.38;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
 S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT=  0.0%
          MOUNTAIN=  0.0%;FOOTHILL=  0.0%;DESERT(UNDEV.)=  0.0%
 Tc(HR) = 0.42; LAG(HR) = 0.34; Fm(INCH/HR) = 0.41; Ybar = 0.44
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC  II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 1.00; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =       652.8
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     345.00 =    8240.00 FEET.
  EQUIVALENT BASIN FACTOR APPROXIMATIONS:
  Lca/L=0.3,n=.0328; Lca/L=0.4,n=.0294; Lca/L=0.5,n=.0270;Lca/L=0.6,n=.0252
 TIME OF PEAK FLOW(HR) = 16.42  RUNOFF VOLUME(AF) =       169.70
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) =     844.01
 TOTAL PEAK FLOW RATE(CFS) =      844.01 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE(CFS) =      869.32
  (UPSTREAM NODE PEAK FLOW RATE(CFS) =      869.32)
 PEAK FLOW RATE(CFS) USED =      869.32

****************************************************************************
 FLOW PROCESS FROM NODE     345.00 TO NODE     346.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    770.00  DOWNSTREAM(FEET) =    752.00
 FLOW LENGTH(FEET) =  2560.00    MANNING'S N =  0.013
 DEPTH OF FLOW IN 108.0 INCH PIPE IS  82.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.72
 ESTIMATED PIPE DIAMETER(INCH) = 108.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     869.32
 PIPE TRAVEL TIME(MIN.) =   2.55     Tc(MIN.) =   27.96
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     346.00 =   10800.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     346.00 TO NODE     346.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    27.96
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.642
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A         1.00      0.98      0.100    32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        A        70.00      0.98      0.500    32
 COMMERCIAL                  A         9.40      0.98      0.100    32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.448
 SUBAREA AREA(ACRES) =    80.40
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.38;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
 S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT=  0.0%
          MOUNTAIN=  0.0%;FOOTHILL=  0.0%;DESERT(UNDEV.)=  0.0%
 Tc(HR) = 0.47; LAG(HR) = 0.37; Fm(INCH/HR) = 0.41; Ybar = 0.44
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC  II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 1.00; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =       733.2
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     346.00 =   10800.00 FEET.
  EQUIVALENT BASIN FACTOR APPROXIMATIONS:
  Lca/L=0.3,n=.0291; Lca/L=0.4,n=.0261; Lca/L=0.5,n=.0240;Lca/L=0.6,n=.0224
 TIME OF PEAK FLOW(HR) = 16.42  RUNOFF VOLUME(AF) =       189.52
 UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) =     882.28
 TOTAL AREA(ACRES) =      733.2       PEAK FLOW RATE(CFS) =      882.28

****************************************************************************
 FLOW PROCESS FROM NODE     346.00 TO NODE     347.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    752.00  DOWNSTREAM(FEET) =    740.00
 FLOW LENGTH(FEET) =  2530.00    MANNING'S N =  0.013
 DEPTH OF FLOW IN 114.0 INCH PIPE IS  92.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.29
 ESTIMATED PIPE DIAMETER(INCH) = 114.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     882.28
 PIPE TRAVEL TIME(MIN.) =   2.95     Tc(MIN.) =   30.91
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     347.00 =   13330.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     347.00 TO NODE     347.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    30.91
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A         2.80      0.98      0.100    32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        A       144.30      0.98      0.500    32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.492
 SUBAREA AREA(ACRES) =   147.10
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.38;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
 S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT=  0.0%
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         MOUNTAIN=  0.0%;FOOTHILL=  0.0%;DESERT(UNDEV.)=  0.0%
 Tc(HR) = 0.52; LAG(HR) = 0.41; Fm(INCH/HR) = 0.42; Ybar = 0.45
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC  II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =      880.3
 LONGEST FLOWPATH FROM NODE    360.00 TO NODE    347.00 =   13330.00 FEET.
  EQUIVALENT BASIN FACTOR APPROXIMATIONS:
  Lca/L=0.3,n=.0270; Lca/L=0.4,n=.0242; Lca/L=0.5,n=.0222;Lca/L=0.6,n=.0208
 TIME OF PEAK FLOW(HR) = 16.50  RUNOFF VOLUME(AF) =     223.18
 UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) =     971.10
 TOTAL AREA(ACRES) =      880.3         PEAK FLOW RATE(CFS) =     971.10
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =      880.3  TC(MIN.) =     30.91
 AREA-AVERAGED Fm(INCH/HR)=  0.42   Ybar =  0.45
 PEAK FLOW RATE(CFS)    =    971.10
============================================================================
============================================================================
 END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS
```

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****************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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 ************************** DESCRIPTION OF STUDY **************************
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN IV (AREA G, H, I)                *
* 10-YEAR HYDROLOGY ANALYSIS                                               *
* P. PAGADUAN 8-29-2011                                                    *
 **************************************************************************

  FILE NAME: OIVG10.DAT
  TIME/DATE OF STUDY: 16:28 08/29/2011
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO  STREET-CROSSFALL:  CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN- / OUT-/PARK-  HEIGHT  WIDTH  LIP  HIKE  FACTOR
NO.  (FT)     (FT)    SIDE / SIDE/ WAY   (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================= ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020  0.67    2.00 0.0312 0.167 0.0150
  2   32.0     27.0    0.020/0.020/0.020  0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF
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    2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
    FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
  USER SPECIFIED RAINFALL VALUES:
      2-YR  6-HR RAINFALL DEPTH(INCH) =  1.50
      2-YR 24-HR RAINFALL DEPTH(INCH) =  2.70
    100-YR  6-HR RAINFALL DEPTH(INCH) =  3.30
    100-YR 24-HR RAINFALL DEPTH(INCH) =  7.00
    SIERRA MADRE DEPTH-AREA FACTORS USED.
                        AREA-AVERAGED
         DURATION     RAINFALL(INCH)
         5-MINUTES         0.33
        30-MINUTES         0.68
         1-HOUR            0.90
         3-HOUR            1.60
         6-HOUR            2.31
        24-HOUR            4.36
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD*

****************************************************************************
  FLOW PROCESS FROM NODE    320.10 TO NODE    320.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   750.00
  ELEVATION DATA: UPSTREAM(FEET) =    820.00  DOWNSTREAM(FEET) =    815.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.698
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.400
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  A       6.20      1.33      0.100    17   11.70
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     12.65
  TOTAL AREA(ACRES) =       6.20   PEAK FLOW RATE(CFS) =      12.65

****************************************************************************
  FLOW PROCESS FROM NODE    320.20 TO NODE    320.30 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    815.00
  DOWNSTREAM NODE ELEVATION(FEET) =    814.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.800
  PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.10000
  MAXIMUM DEPTH(FEET) =   3.00
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.293
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
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```
 PUBLIC PARK                 A          1.80       1.33      0.850     17
 COMMERCIAL                  A          9.90       1.33      0.100     17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.215
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      23.21
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.51
 AVERAGE FLOW DEPTH(FEET) =   1.22   FLOOD WIDTH(FEET) =   11.43
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.92   Tc(MIN.) =   12.62
 SUBAREA AREA(ACRES) =   11.70        SUBAREA RUNOFF(CFS) =   21.14
 EFFECTIVE AREA(ACRES) =   17.90      AREA-AVERAGED Fm(INCH/HR) =   0.23
 AREA-AVERAGED Fp(INCH/HR) =   1.33  AREA-AVERAGED Ap =   0.18
 TOTAL AREA(ACRES) =        17.9        PEAK FLOW RATE(CFS) =       33.19

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  1.37   FLOOD WIDTH(FEET) =   14.36
 FLOW VELOCITY(FEET/SEC.) =   4.72   DEPTH*VELOCITY(FT*FT/SEC) =   6.46
 LONGEST FLOWPATH FROM NODE    320.10 TO NODE    320.30 =    1000.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    320.30 TO NODE    320.40 IS CODE =  91
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =    814.00
 DOWNSTREAM NODE ELEVATION(FEET) =    810.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    900.00
 "V" GUTTER WIDTH(FEET) =    5.00   GUTTER HIKE(FEET) =  0.800
 PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.10000
 MAXIMUM DEPTH(FEET) =    3.00
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.028
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap       SCS
      LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)   CN
 PUBLIC PARK                 A          2.00       1.33      0.850     17
 COMMERCIAL                  A         17.90       1.33      0.100     17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.175
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      49.23
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.21
 AVERAGE FLOW DEPTH(FEET) =   1.52   FLOOD WIDTH(FEET) =   17.40
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.88   Tc(MIN.) =   15.50
 SUBAREA AREA(ACRES) =   19.90        SUBAREA RUNOFF(CFS) =   32.14
 EFFECTIVE AREA(ACRES) =   37.80      AREA-AVERAGED Fm(INCH/HR) =   0.23
 AREA-AVERAGED Fp(INCH/HR) =   1.33  AREA-AVERAGED Ap =   0.18
 TOTAL AREA(ACRES) =        37.8        PEAK FLOW RATE(CFS) =       61.05

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  1.62   FLOOD WIDTH(FEET) =   19.45
 FLOW VELOCITY(FEET/SEC.) =   5.39   DEPTH*VELOCITY(FT*FT/SEC) =   8.74
 LONGEST FLOWPATH FROM NODE    320.10 TO NODE    320.40 =    1900.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    320.00 TO NODE    321.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    320.00
 ELEVATION DATA: UPSTREAM(FEET) =    820.00  DOWNSTREAM(FEET) =    818.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.392
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.213
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap       SCS   Tc
      LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)   CN  (MIN.)
 PUBLIC PARK                 A          6.30       1.33      0.850     17   13.39
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA RUNOFF(CFS) =      6.15
 TOTAL AREA(ACRES) =        6.30   PEAK FLOW RATE(CFS) =       6.15

****************************************************************************
 FLOW PROCESS FROM NODE    321.00 TO NODE    322.00 IS CODE =  91
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =    818.00
 DOWNSTREAM NODE ELEVATION(FEET) =    810.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    970.00
 "V" GUTTER WIDTH(FEET) =    5.00   GUTTER HIKE(FEET) =  0.800
 PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.10000
 MAXIMUM DEPTH(FEET) =    3.00
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.959
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap       SCS
      LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)   CN
 PUBLIC PARK                 A         19.80       1.33      0.850     17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.30
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.35
 AVERAGE FLOW DEPTH(FEET) =   0.90   FLOOD WIDTH(FEET) =    5.00
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.02   Tc(MIN.) =   16.41
 SUBAREA AREA(ACRES) =   19.80        SUBAREA RUNOFF(CFS) =   14.79
 EFFECTIVE AREA(ACRES) =   26.10      AREA-AVERAGED Fm(INCH/HR) =   1.13
 AREA-AVERAGED Fp(INCH/HR) =   1.33  AREA-AVERAGED Ap =   0.85
 TOTAL AREA(ACRES) =        26.1        PEAK FLOW RATE(CFS) =       19.50

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  1.02   FLOOD WIDTH(FEET) =    7.45
 FLOW VELOCITY(FEET/SEC.) =   5.98   DEPTH*VELOCITY(FT*FT/SEC) =   6.11
 LONGEST FLOWPATH FROM NODE    320.00 TO NODE    322.00 =    1290.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    322.00 TO NODE    323.00 IS CODE =  91
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =    810.00
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```
 DOWNSTREAM NODE ELEVATION(FEET) =    800.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    950.00
 "V" GUTTER WIDTH(FEET) =    5.00   GUTTER HIKE(FEET) =  0.800
 PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.10000
 MAXIMUM DEPTH(FEET) =    3.00
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.817
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                 A        2.30      1.33      0.850    17
 PUBLIC PARK                 A       41.30      1.33      0.850    17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      32.92
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =    7.20
 AVERAGE FLOW DEPTH(FEET) =   1.17   FLOOD WIDTH(FEET) =   10.38
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.20   Tc(MIN.) =   18.61
 SUBAREA AREA(ACRES) =   43.60      SUBAREA RUNOFF(CFS) =   26.99
 EFFECTIVE AREA(ACRES) =    69.70     AREA-AVERAGED Fm(INCH/HR) =    1.13
 AREA-AVERAGED Fp(INCH/HR) =    1.33  AREA-AVERAGED Ap =    0.85
 TOTAL AREA(ACRES) =          69.7        PEAK FLOW RATE(CFS) =       43.15

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  1.28   FLOOD WIDTH(FEET) =   12.52
 FLOW VELOCITY(FEET/SEC.) =    7.45   DEPTH*VELOCITY(FT*FT/SEC) =   9.51
 LONGEST FLOWPATH FROM NODE     320.00 TO NODE     323.00 =    2240.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     323.00 TO NODE     324.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    800.00  DOWNSTREAM(FEET) =    778.00
 FLOW LENGTH(FEET) =  1650.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.19
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       43.15
 PIPE TRAVEL TIME(MIN.) =    2.70     Tc(MIN.) =    21.31
 LONGEST FLOWPATH FROM NODE     320.00 TO NODE     324.00 =    3890.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     324.00 TO NODE     324.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    21.31
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.675
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                 A        3.80      1.33      0.850    17
 PUBLIC PARK                 A       78.00      1.33      0.850    17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =   81.80      SUBAREA RUNOFF(CFS) =   40.21
 EFFECTIVE AREA(ACRES) =    151.50   AREA-AVERAGED Fm(INCH/HR) =  1.13
 AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.85
 TOTAL AREA(ACRES) =        151.5        PEAK FLOW RATE(CFS) =       74.47

****************************************************************************
 FLOW PROCESS FROM NODE     324.00 TO NODE     345.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    778.00  DOWNSTREAM(FEET) =    770.00
 FLOW LENGTH(FEET) =  1340.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  45.0 INCH PIPE IS  33.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.55
 ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       74.47
 PIPE TRAVEL TIME(MIN.) =    2.61     Tc(MIN.) =    23.92
 LONGEST FLOWPATH FROM NODE     320.00 TO NODE     345.00 =    5230.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     345.00 TO NODE     345.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    23.92
 RAINFALL INTENSITY(INCH/HR) =    1.56
 AREA-AVERAGED Fm(INCH/HR) =  1.13
 AREA-AVERAGED Fp(INCH/HR) =  1.33
 AREA-AVERAGED Ap =  0.85
 EFFECTIVE STREAM AREA(ACRES) =      151.50
 TOTAL STREAM AREA(ACRES) =      151.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE =        74.47

****************************************************************************
 FLOW PROCESS FROM NODE     340.00 TO NODE     341.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =  1000.00
 ELEVATION DATA: UPSTREAM(FEET) =    840.00  DOWNSTREAM(FEET) =     830.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.102
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.352
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  A        2.50      1.33      0.100    17   12.10
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      4.99
```

```
  TOTAL AREA(ACRES) =      2.50   PEAK FLOW RATE(CFS) =      4.99

****************************************************************************
  FLOW PROCESS FROM NODE    341.00 TO NODE    342.00 IS CODE = 62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  830.00  DOWNSTREAM ELEVATION(FEET) =  815.00
  STREET LENGTH(FEET) = 1030.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL) =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      6.85
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.36
    HALFSTREET FLOOD WIDTH(FEET) =   10.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.84
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.02
  STREET FLOW TRAVEL TIME(MIN.) =   6.05   Tc(MIN.) =   18.16
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.844
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        2.40      1.33      0.100     17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =   2.40     SUBAREA RUNOFF(CFS) =    3.70
  EFFECTIVE AREA(ACRES) =      4.90   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       4.9       PEAK FLOW RATE(CFS) =      7.55

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  10.56
  FLOW VELOCITY(FEET/SEC.) =  2.89   DEPTH*VELOCITY(FT*FT/SEC.) =   1.07
  LONGEST FLOWPATH FROM NODE     340.00 TO NODE     342.00 =    2030.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    342.00 TO NODE    342.00 IS CODE = 81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   18.16
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.844
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        7.90      1.33      0.100     17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =     7.90      SUBAREA RUNOFF(CFS) =    12.17
  EFFECTIVE AREA(ACRES) =      12.80   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       12.8       PEAK FLOW RATE(CFS) =     19.71

****************************************************************************
  FLOW PROCESS FROM NODE    342.00 TO NODE    342.00 IS CODE = 81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   18.16
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.844
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A       15.70      1.33      0.100     17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =   15.70      SUBAREA RUNOFF(CFS) =    24.18
  EFFECTIVE AREA(ACRES) =      28.50   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       28.5       PEAK FLOW RATE(CFS) =      43.89

****************************************************************************
  FLOW PROCESS FROM NODE    342.00 TO NODE    343.00 IS CODE = 31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   815.00  DOWNSTREAM(FEET) =   805.00
  FLOW LENGTH(FEET) =   700.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  21.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.52
  ESTIMATED PIPE DIAMETER(INCH) =  33.00     NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      43.89
  PIPE TRAVEL TIME(MIN.) =   1.11     Tc(MIN.) =    19.27
  LONGEST FLOWPATH FROM NODE     340.00 TO NODE     343.00 =    2730.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    343.00 TO NODE    343.00 IS CODE = 81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   19.27
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.779
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A       14.70      1.33      0.100     17
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       A        8.70      1.33      0.500     17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.249
  SUBAREA AREA(ACRES) =   23.40      SUBAREA RUNOFF(CFS) =    30.52
```

```
  EFFECTIVE AREA(ACRES) =      51.90   AREA-AVERAGED Fm(INCH/HR) =  0.22
  AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.17
  TOTAL AREA(ACRES) =        51.9        PEAK FLOW RATE(CFS) =       72.75

****************************************************************************
  FLOW PROCESS FROM NODE    343.00 TO NODE    344.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    805.00  DOWNSTREAM(FEET) =    798.00
  FLOW LENGTH(FEET) =   600.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  29.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.90
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      72.75
  PIPE TRAVEL TIME(MIN.) =   0.92     Tc(MIN.) =    20.18
  LONGEST FLOWPATH FROM NODE    340.00 TO NODE    344.00 =    3330.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    344.00 TO NODE    344.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    20.18
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.730
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  A       15.50      1.33      0.100    17
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"        A       41.90      1.33      0.500    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.392
  SUBAREA AREA(ACRES) =    57.40     SUBAREA RUNOFF(CFS) =     62.50
  EFFECTIVE AREA(ACRES) =     109.30   AREA-AVERAGED Fm(INCH/HR) =  0.38
  AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.29
  TOTAL AREA(ACRES) =       109.3        PEAK FLOW RATE(CFS) =      132.96

****************************************************************************
  FLOW PROCESS FROM NODE    344.00 TO NODE    345.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    798.00  DOWNSTREAM(FEET) =    770.00
  FLOW LENGTH(FEET) =  1980.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  34.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.70
  ESTIMATED PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     132.96
  PIPE TRAVEL TIME(MIN.) =   2.41     Tc(MIN.) =    22.59
  LONGEST FLOWPATH FROM NODE    340.00 TO NODE    345.00 =    5310.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    345.00 TO NODE    345.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    22.59
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.617
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  A       22.80      1.33      0.100    17
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"        A       32.90      1.33      0.500    17
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"        A       54.70      1.33      0.200    17
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"        A        2.70      1.33      0.200    17
  COMMERCIAL                  A        4.90      1.33      0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.260
  SUBAREA AREA(ACRES) =   118.00     SUBAREA RUNOFF(CFS) =    135.05
  EFFECTIVE AREA(ACRES) =     227.30   AREA-AVERAGED Fm(INCH/HR) =  0.36
  AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =       227.3        PEAK FLOW RATE(CFS) =      256.87

****************************************************************************
  FLOW PROCESS FROM NODE    345.00 TO NODE    345.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    22.59
  RAINFALL INTENSITY(INCH/HR) =    1.62
  AREA-AVERAGED Fm(INCH/HR) =  0.36
  AREA-AVERAGED Fp(INCH/HR) =  1.33
  AREA-AVERAGED Ap =  0.27
  EFFECTIVE STREAM AREA(ACRES) =       227.30
  TOTAL STREAM AREA(ACRES) =      227.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      256.87

  ** CONFLUENCE DATA **
   STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
      1       74.47   23.92     1.563  1.33( 1.13) 0.85      151.5     320.00
      2      256.87   22.59     1.617  1.33( 0.36) 0.27      227.3     340.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
      1      331.34   22.59     1.617  1.33( 0.66) 0.50      370.4     340.00
      2      320.20   23.92     1.563  1.33( 0.67) 0.50      378.8     320.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
 PEAK FLOW RATE(CFS) =      331.34   Tc(MIN.) =     22.59
 EFFECTIVE AREA(ACRES) =      370.39   AREA-AVERAGED Fm(INCH/HR) =  0.66
 AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.50
 TOTAL AREA(ACRES) =       378.8
 LONGEST FLOWPATH FROM NODE     340.00 TO NODE     345.00 =    5310.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     345.00 TO NODE     345.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE     360.00 TO NODE     361.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   950.00
 ELEVATION DATA: UPSTREAM(FEET) =    840.00  DOWNSTREAM(FEET) =    830.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.736
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.396
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp        Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  A        1.40      1.33     0.100     17   11.74
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"        A        9.00      1.33     0.200     17   12.51
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.187
 SUBAREA RUNOFF(CFS) =      20.10
 TOTAL AREA(ACRES) =      10.40   PEAK FLOW RATE(CFS) =       20.10

****************************************************************************
 FLOW PROCESS FROM NODE     361.00 TO NODE     362.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  830.00  DOWNSTREAM ELEVATION(FEET) =  825.00
 STREET LENGTH(FEET) =     500.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 32.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)   =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 STREET PARKWAY CROSSFALL(DECIMAL)   =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =    0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       26.25
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
```

```
   STREET FLOW DEPTH(FEET) =  0.54
   HALFSTREET FLOOD WIDTH(FEET) =   19.32
   AVERAGE FLOW VELOCITY(FEET/SEC.) =     3.35
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =     1.82
 STREET FLOW TRAVEL TIME(MIN.) =    2.49    Tc(MIN.) =    14.23
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.135
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"        A        7.30      1.33      0.200     17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA AREA(ACRES) =      7.30     SUBAREA RUNOFF(CFS) =    12.28
 EFFECTIVE AREA(ACRES) =      17.70     AREA-AVERAGED Fm(INCH/HR) =  0.26
 AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.19
 TOTAL AREA(ACRES) =       17.7         PEAK FLOW RATE(CFS) =       29.94

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.56   HALFSTREET FLOOD WIDTH(FEET) =  20.32
 FLOW VELOCITY(FEET/SEC.) =  3.47   DEPTH*VELOCITY(FT*FT/SEC.) =   1.96
 LONGEST FLOWPATH FROM NODE     360.00 TO NODE     362.00 =    1450.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     362.00 TO NODE     362.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    14.23
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.135
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A        5.30      1.33      0.100     17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        A       13.60      1.33      0.500     17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.388
 SUBAREA AREA(ACRES) =     18.90     SUBAREA RUNOFF(CFS) =    27.55
 EFFECTIVE AREA(ACRES) =      36.60    AREA-AVERAGED Fm(INCH/HR) =  0.39
 AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.29
 TOTAL AREA(ACRES) =       36.6        PEAK FLOW RATE(CFS) =       57.49

****************************************************************************
 FLOW PROCESS FROM NODE     362.00 TO NODE     363.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    825.00  DOWNSTREAM(FEET) =    810.00
 FLOW LENGTH(FEET) =  1550.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  36.0 INCH PIPE IS  28.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.46
 ESTIMATED PIPE DIAMETER(INCH) =  36.00     NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      57.49
 PIPE TRAVEL TIME(MIN.) =   2.73    Tc(MIN.) =   16.96
```

```
 LONGEST FLOWPATH FROM NODE    360.00 TO NODE    363.00 =    3000.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    363.00 TO NODE    363.00 IS CODE = 81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   16.96
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.921
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)   CN
 COMMERCIAL                  A         7.40       1.33      0.100    17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        A        16.00       1.33      0.500    17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"        A         0.10       1.33      0.200    17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.373
 SUBAREA AREA(ACRES) =   23.50     SUBAREA RUNOFF(CFS) =   30.16
 EFFECTIVE AREA(ACRES) =      60.10   AREA-AVERAGED Fm(INCH/HR) =  0.43
 AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.32
 TOTAL AREA(ACRES) =         60.1       PEAK FLOW RATE(CFS) =      80.62

****************************************************************************
 FLOW PROCESS FROM NODE    363.00 TO NODE    364.00 IS CODE = 31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    810.00  DOWNSTREAM(FEET) =    778.00
 FLOW LENGTH(FEET) =  2560.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  39.0 INCH PIPE IS  31.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.34
 ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       80.62
 PIPE TRAVEL TIME(MIN.) =   3.76     Tc(MIN.) =   20.72
 LONGEST FLOWPATH FROM NODE    360.00 TO NODE    364.00 =    5560.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    364.00 TO NODE    364.00 IS CODE = 81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   20.72
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.703
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)   CN
 COMMERCIAL                  A        10.90       1.33      0.100    17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        A        31.00       1.33      0.500    17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.396
 SUBAREA AREA(ACRES) =   41.90     SUBAREA RUNOFF(CFS) =   44.41
 EFFECTIVE AREA(ACRES) =     102.00   AREA-AVERAGED Fm(INCH/HR) =  0.47
 AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.35
 TOTAL AREA(ACRES) =        102.0       PEAK FLOW RATE(CFS) =     113.26

****************************************************************************
 FLOW PROCESS FROM NODE    364.00 TO NODE    354.00 IS CODE = 31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    778.00  DOWNSTREAM(FEET) =    775.00
 FLOW LENGTH(FEET) =  1330.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  63.0 INCH PIPE IS  46.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.59
 ESTIMATED PIPE DIAMETER(INCH) =  63.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      113.26
 PIPE TRAVEL TIME(MIN.) =   3.37     Tc(MIN.) =   24.08
 LONGEST FLOWPATH FROM NODE    360.00 TO NODE    354.00 =    6890.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    354.00 TO NODE    354.00 IS CODE =  1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   24.08
 RAINFALL INTENSITY(INCH/HR) =   1.56
 AREA-AVERAGED Fm(INCH/HR) =  0.47
 AREA-AVERAGED Fp(INCH/HR) =  1.33
 AREA-AVERAGED Ap =  0.35
 EFFECTIVE STREAM AREA(ACRES) =     102.00
 TOTAL STREAM AREA(ACRES) =     102.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     113.26

****************************************************************************
 FLOW PROCESS FROM NODE    350.00 TO NODE    351.00 IS CODE = 21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    860.00
 ELEVATION DATA: UPSTREAM(FEET) =    840.00  DOWNSTREAM(FEET) =    832.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.560
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.417
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)   CN  (MIN.)
 COMMERCIAL                  A         8.70       1.33      0.100    17   11.56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) =     17.89
 TOTAL AREA(ACRES) =      8.70    PEAK FLOW RATE(CFS) =     17.89

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    351.00 TO NODE    352.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  832.00  DOWNSTREAM ELEVATION(FEET) =  825.00
 STREET LENGTH(FEET) =  1200.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 32.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  27.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       35.32
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.64
   HALFSTREET FLOOD WIDTH(FEET) =   24.12
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.94
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =     1.88
 STREET FLOW TRAVEL TIME(MIN.) =    6.80   Tc(MIN.) =   18.36
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.831
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A       0.80       1.33      0.100    17
 COMMERCIAL                  A      21.80       1.33      0.100    17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =   22.60     SUBAREA RUNOFF(CFS) =   34.55
 EFFECTIVE AREA(ACRES) =      31.30    AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        31.3       PEAK FLOW RATE(CFS) =       47.85

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.70   HALFSTREET FLOOD WIDTH(FEET) =  28.82
 FLOW VELOCITY(FEET/SEC.) =  3.16   DEPTH*VELOCITY(FT*FT/SEC.) =   2.21
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
        AND L = 1200.0 FT WITH ELEVATION-DROP =    7.0 FT, IS   40.2 CFS,
        WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE    352.00
 LONGEST FLOWPATH FROM NODE     350.00 TO NODE     352.00 =     2060.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    352.00 TO NODE    352.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   18.36
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.831
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A       4.70       1.33      0.100    17
 COMMERCIAL                  A      14.50       1.33      0.100    17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =   19.20     SUBAREA RUNOFF(CFS) =    29.35
 EFFECTIVE AREA(ACRES) =      50.50    AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        50.5       PEAK FLOW RATE(CFS) =       77.20

****************************************************************************
 FLOW PROCESS FROM NODE    352.00 TO NODE    353.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    825.00  DOWNSTREAM(FEET) =    805.00
 FLOW LENGTH(FEET) =  1500.00    MANNING'S N =  0.013
 DEPTH OF FLOW IN  39.0 INCH PIPE IS  29.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.64
 ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =         77.20
 PIPE TRAVEL TIME(MIN.) =    2.15     Tc(MIN.) =    20.51
 LONGEST FLOWPATH FROM NODE     350.00 TO NODE     353.00 =     3560.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    353.00 TO NODE    353.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   20.51
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.714
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A      21.00       1.33      0.100    17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        A      16.60       1.33      0.500    17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"        A      12.40       1.33      0.200    17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.258
 SUBAREA AREA(ACRES) =   50.00     SUBAREA RUNOFF(CFS) =    61.73
 EFFECTIVE AREA(ACRES) =     100.50    AREA-AVERAGED Fm(INCH/HR) =  0.24
 AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.18
 TOTAL AREA(ACRES) =       100.5       PEAK FLOW RATE(CFS) =      133.58

****************************************************************************
 FLOW PROCESS FROM NODE    353.00 TO NODE    354.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    805.00  DOWNSTREAM(FEET) =    775.00
 FLOW LENGTH(FEET) =  2560.00    MANNING'S N =  0.013
 DEPTH OF FLOW IN  48.0 INCH PIPE IS  37.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.60
```

```
ESTIMATED PIPE DIAMETER(INCH) = 48.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      133.58
PIPE TRAVEL TIME(MIN.) =   3.39     Tc(MIN.) =    23.89
LONGEST FLOWPATH FROM NODE     350.00 TO NODE    354.00 =    6120.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    354.00 TO NODE    354.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =    23.89
*  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.564
SUBAREA LOSS RATE DATA(AMC  I ):
```

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	20.80	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	50.70	1.33	0.500	17

```
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.384
SUBAREA AREA(ACRES) =     71.50      SUBAREA RUNOFF(CFS) =    67.84
EFFECTIVE AREA(ACRES) =      172.00   AREA-AVERAGED Fm(INCH/HR) =  0.35
AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.26
TOTAL AREA(ACRES) =      172.0       PEAK FLOW RATE(CFS) =     187.84

****************************************************************************
FLOW PROCESS FROM NODE    354.00 TO NODE    354.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =    23.89
RAINFALL INTENSITY(INCH/HR) =    1.56
AREA-AVERAGED Fm(INCH/HR) =  0.35
AREA-AVERAGED Fp(INCH/HR) =  1.33
AREA-AVERAGED Ap =  0.26
EFFECTIVE STREAM AREA(ACRES) =      172.00
TOTAL STREAM AREA(ACRES) =      172.00
PEAK FLOW RATE(CFS) AT CONFLUENCE =      187.84

** CONFLUENCE DATA **
```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	113.26	24.08	1.556	1.33(0.47)	0.35	102.0	360.00
2	187.84	23.89	1.564	1.33(0.35)	0.26	172.0	350.00

```
RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	300.98	23.89	1.564	1.33(0.39)	0.30	273.2	350.00
2	299.97	24.08	1.556	1.33(0.39)	0.30	274.0	360.00

```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      300.98     Tc(MIN.) =     23.89
EFFECTIVE AREA(ACRES) =      273.21   AREA-AVERAGED Fm(INCH/HR) =  0.39
AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.30
TOTAL AREA(ACRES) =       274.0
LONGEST FLOWPATH FROM NODE     360.00 TO NODE    354.00 =    6890.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    354.00 TO NODE    345.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    775.00  DOWNSTREAM(FEET) =    770.00
FLOW LENGTH(FEET) =  1350.00    MANNING'S N =  0.013
DEPTH OF FLOW IN  81.0 INCH PIPE IS  63.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  10.04
ESTIMATED PIPE DIAMETER(INCH) =  81.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      300.98
PIPE TRAVEL TIME(MIN.) =   2.24     Tc(MIN.) =    26.14
LONGEST FLOWPATH FROM NODE     360.00 TO NODE    345.00 =    8240.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    345.00 TO NODE    345.00 IS CODE =  11
----------------------------------------------------------------------------
>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

** MAIN STREAM CONFLUENCE DATA **
```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	300.98	26.14	1.482	1.33(0.39)	0.30	273.2	350.00
2	299.97	26.32	1.475	1.33(0.39)	0.30	274.0	360.00

```
LONGEST FLOWPATH FROM NODE     360.00 TO NODE    345.00 =    8240.00 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	331.34	22.59	1.617	1.33(0.66)	0.50	370.4	340.00
2	320.20	23.92	1.563	1.33(0.67)	0.50	378.8	320.00

```
LONGEST FLOWPATH FROM NODE     340.00 TO NODE    345.00 =    5310.00 FEET.

** PEAK FLOW RATE TABLE **
```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	623.90	22.59	1.617	1.33(0.56)	0.42	606.6	340.00
2	616.15	23.92	1.563	1.33(0.56)	0.42	628.8	320.00
3	592.21	26.14	1.482	1.33(0.55)	0.42	652.0	350.00
4	588.92	26.32	1.475	1.33(0.55)	0.42	652.8	360.00

```
TOTAL AREA(ACRES) =        652.8

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      623.90  Tc(MIN.) =    22.593
EFFECTIVE AREA(ACRES) =      606.56  AREA-AVERAGED Fm(INCH/HR) =  0.56
AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.42
```

```
  TOTAL AREA(ACRES) =      652.8
  LONGEST FLOWPATH FROM NODE     360.00 TO NODE     345.00 =    8240.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     345.00 TO NODE     345.00 IS CODE =  71
----------------------------------------------------------------------------
  >>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
  >>>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<
============================================================================
  UNIT-HYDROGRAPH DATA:
  RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
  S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT=  0.0%
           MOUNTAIN=  0.0%;FOOTHILL=  0.0%;DESERT(UNDEV.)=  0.0%
  Tc(HR) = 0.44; LAG(HR) = 0.35; Fm(INCH/HR) = 0.55; Ybar = 0.45
  USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC  I  CONDITION.
  DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
  3HR = 1.00; 6HR = 1.00; 24HR= 1.00
  UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =      652.8
  LONGEST FLOWPATH FROM NODE     360.00 TO NODE     345.00 =    8240.00 FEET.
   EQUIVALENT BASIN FACTOR APPROXIMATIONS:
   Lca/L=0.3,n=.0339; Lca/L=0.4,n=.0304; Lca/L=0.5,n=.0280;Lca/L=0.6,n=.0261
  TIME OF PEAK FLOW(HR) = 16.42  RUNOFF VOLUME(AF) =     135.92
  UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) =     659.78
  TOTAL PEAK FLOW RATE(CFS) =     659.78 (SOURCE FLOW INCLUDED)
  RATIONAL METHOD PEAK FLOW RATE(CFS) =     623.90
   (UPSTREAM NODE PEAK FLOW RATE(CFS) =     623.90)
  PEAK FLOW RATE(CFS) USED =     659.78

****************************************************************************
  FLOW PROCESS FROM NODE     345.00 TO NODE     346.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    770.00  DOWNSTREAM(FEET) =    752.00
  FLOW LENGTH(FEET) =  2560.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  96.0 INCH PIPE IS  75.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.50
  ESTIMATED PIPE DIAMETER(INCH) =  96.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      659.78
  PIPE TRAVEL TIME(MIN.) =    2.75    Tc(MIN.) =    29.08
  LONGEST FLOWPATH FROM NODE     360.00 TO NODE     346.00 =   10800.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     346.00 TO NODE     346.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    29.08
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.390
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp        Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        1.00      1.33      0.100    17
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       A       70.00      1.33      0.500    17
  COMMERCIAL                 A        9.40      1.33      0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.448
  SUBAREA AREA(ACRES) =    80.40
  UNIT-HYDROGRAPH DATA:
  RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
  S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT=  0.0%
           MOUNTAIN=  0.0%;FOOTHILL=  0.0%;DESERT(UNDEV.)=  0.0%
  Tc(HR) = 0.48; LAG(HR) = 0.39; Fm(INCH/HR) = 0.56; Ybar = 0.45
  USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC  I  CONDITION.
  DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
  3HR = 1.00; 6HR = 1.00; 24HR= 1.00
  UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =      733.2
  LONGEST FLOWPATH FROM NODE     360.00 TO NODE     346.00 =   10800.00 FEET.
   EQUIVALENT BASIN FACTOR APPROXIMATIONS:
   Lca/L=0.3,n=.0303; Lca/L=0.4,n=.0271; Lca/L=0.5,n=.0249;Lca/L=0.6,n=.0233
  TIME OF PEAK FLOW(HR) = 16.42  RUNOFF VOLUME(AF) =     151.76
  UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) =     673.62
  TOTAL AREA(ACRES) =      733.2       PEAK FLOW RATE(CFS) =     673.62

****************************************************************************
  FLOW PROCESS FROM NODE     346.00 TO NODE     347.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    752.00  DOWNSTREAM(FEET) =    740.00
  FLOW LENGTH(FEET) =  2530.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN 108.0 INCH PIPE IS  78.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.63
  ESTIMATED PIPE DIAMETER(INCH) = 108.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      673.62
  PIPE TRAVEL TIME(MIN.) =    3.09    Tc(MIN.) =    32.17
  LONGEST FLOWPATH FROM NODE     360.00 TO NODE     347.00 =   13330.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     347.00 TO NODE     347.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    32.17
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.308
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp        Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        2.80      1.33      0.100    17
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       A      144.30      1.33      0.500    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.492
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  SUBAREA AREA(ACRES) =  147.10
  UNIT-HYDROGRAPH DATA:
  RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
  S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT=  0.0%
```

```
         MOUNTAIN=  0.0%;FOOTHILL=  0.0%;DESERT(UNDEV.)=  0.0%
  Tc(HR) = 0.54; LAG(HR) = 0.43; Fm(INCH/HR) = 0.57; Ybar = 0.46
  USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC  I  CONDITION.
  DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
  3HR = 0.99; 6HR = 1.00; 24HR= 1.00
  UNIT-INTERVAL(MIN) =  5.00   TOTAL AREA(ACRES) =      880.3
  LONGEST FLOWPATH FROM NODE    360.00 TO NODE    347.00 =   13330.00 FEET.
   EQUIVALENT BASIN FACTOR APPROXIMATIONS:
   Lca/L=0.3,n=.0281; Lca/L=0.4,n=.0252; Lca/L=0.5,n=.0231;Lca/L=0.6,n=.0216
  TIME OF PEAK FLOW(HR) = 16.50  RUNOFF VOLUME(AF) =     178.61
  UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) =     762.93
  TOTAL AREA(ACRES) =      880.3       PEAK FLOW RATE(CFS) =     762.93
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      880.3  TC(MIN.) =     32.17
  AREA-AVERAGED Fm(INCH/HR)=  0.57   Ybar =  0.46
  PEAK FLOW RATE(CFS)    =    762.93
============================================================================
============================================================================
  END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS
```

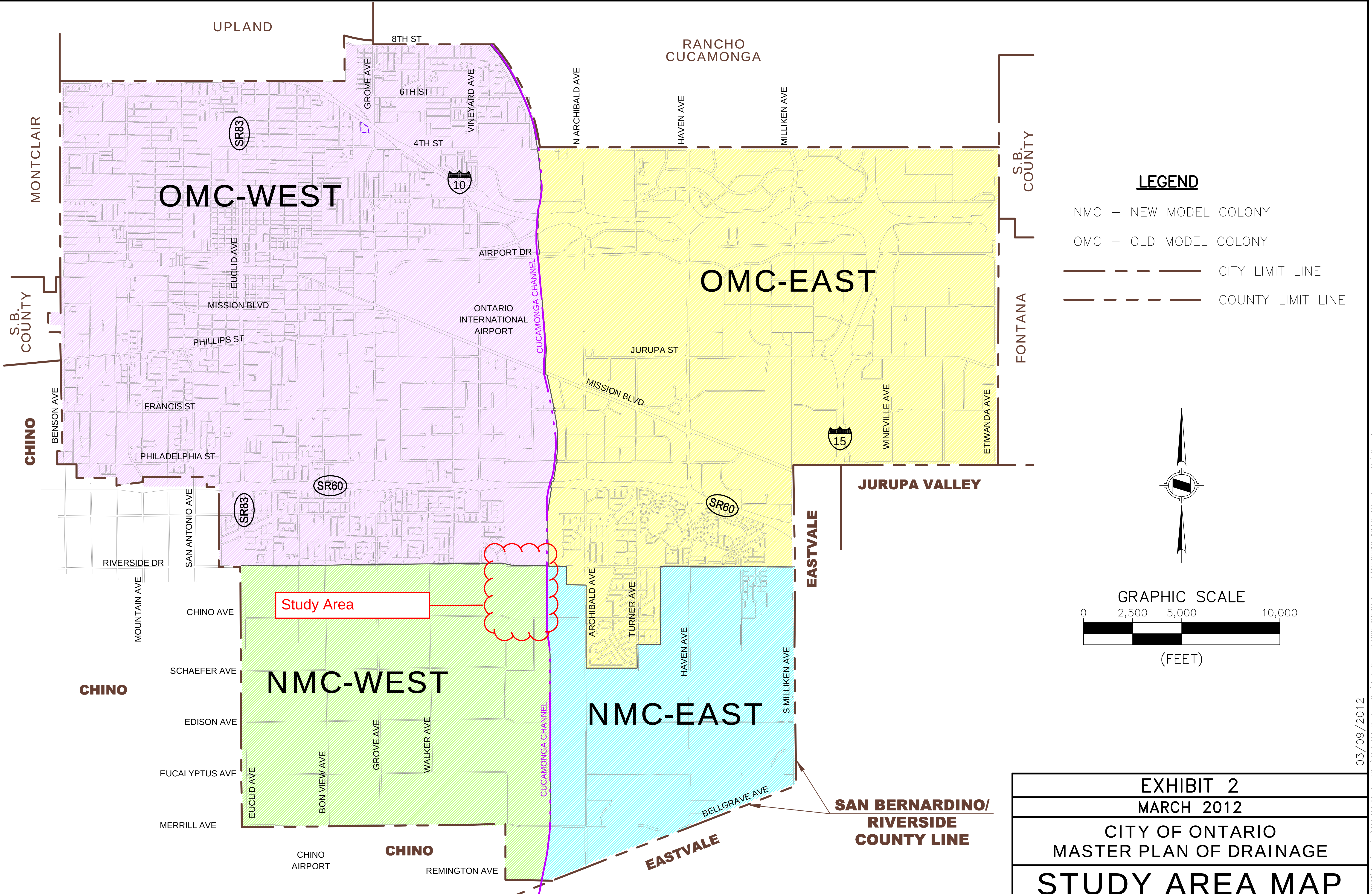


EXHIBIT 2

MARCH 2012

CITY OF ONTARIO
MASTER PLAN OF DRAINAGE

STUDY AREA MAP

F:\0641\Engineering\SY_SD Master Plan\Rpt_SD Master Plan\Exh 3 – EXISTING FACILITIES.dwg

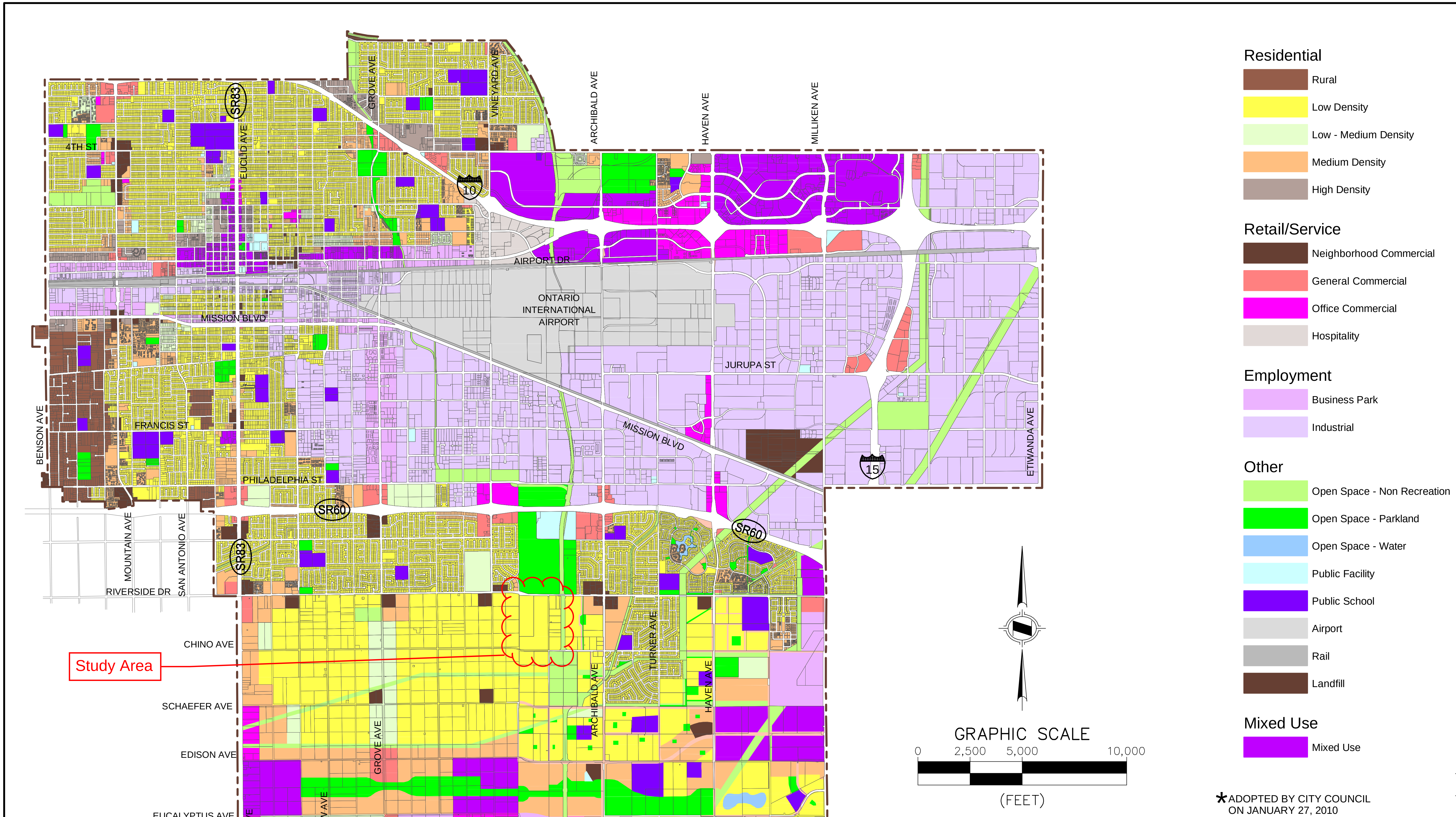
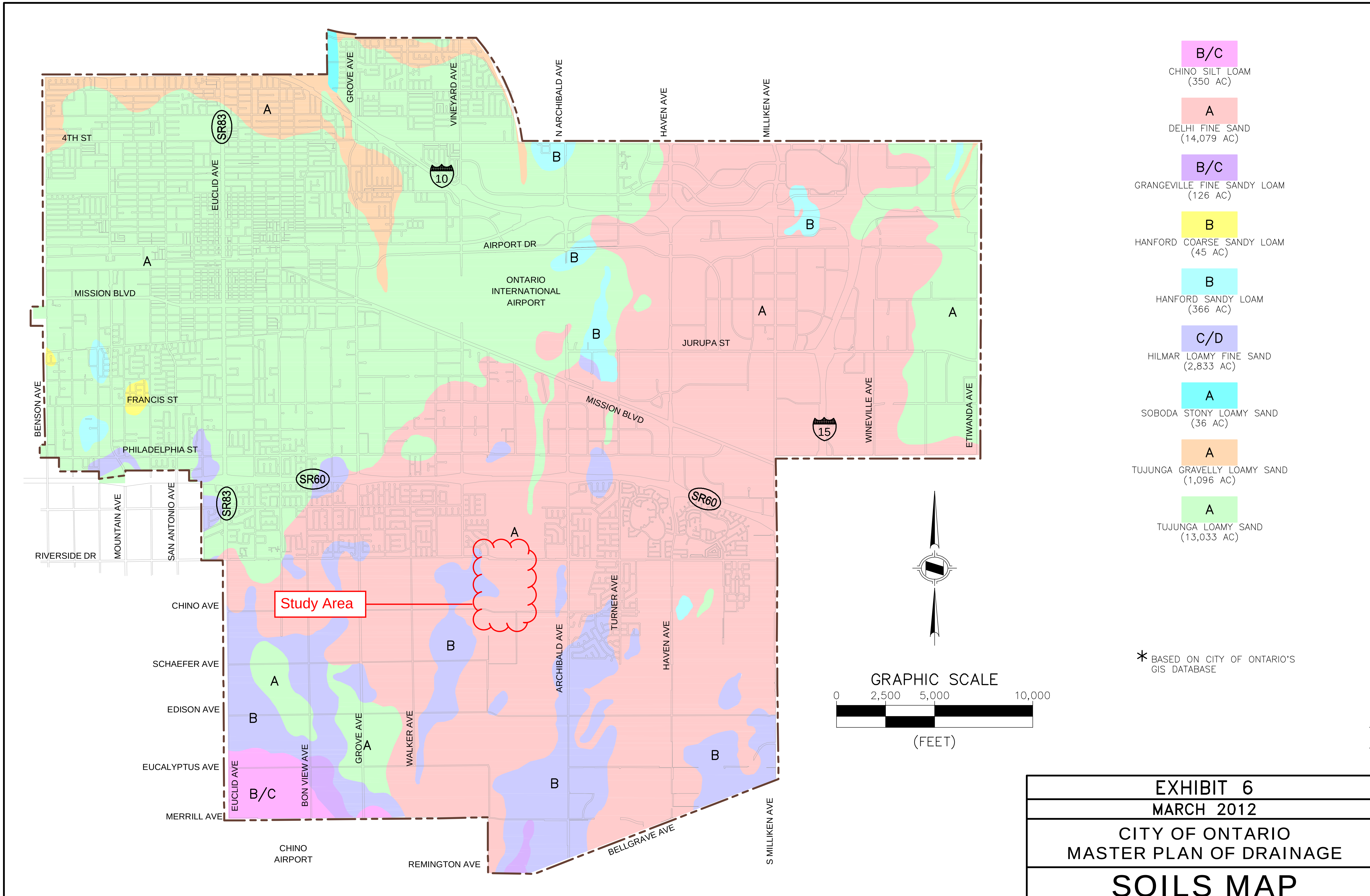


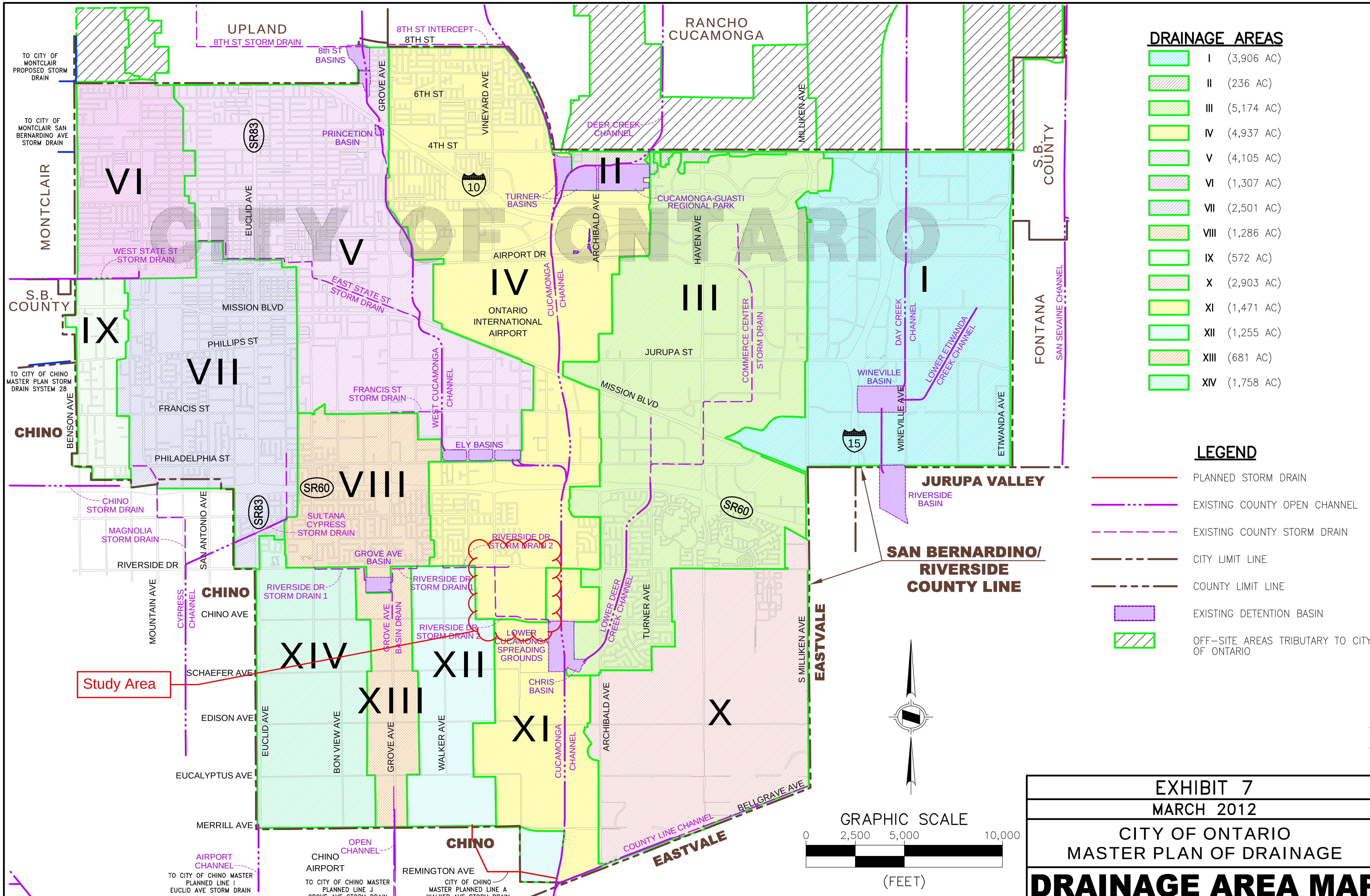
EXHIBIT 4

MARCH 2012

CITY OF ONTARIO
MASTER PLAN OF DRAINAGE

LAND USE PLAN

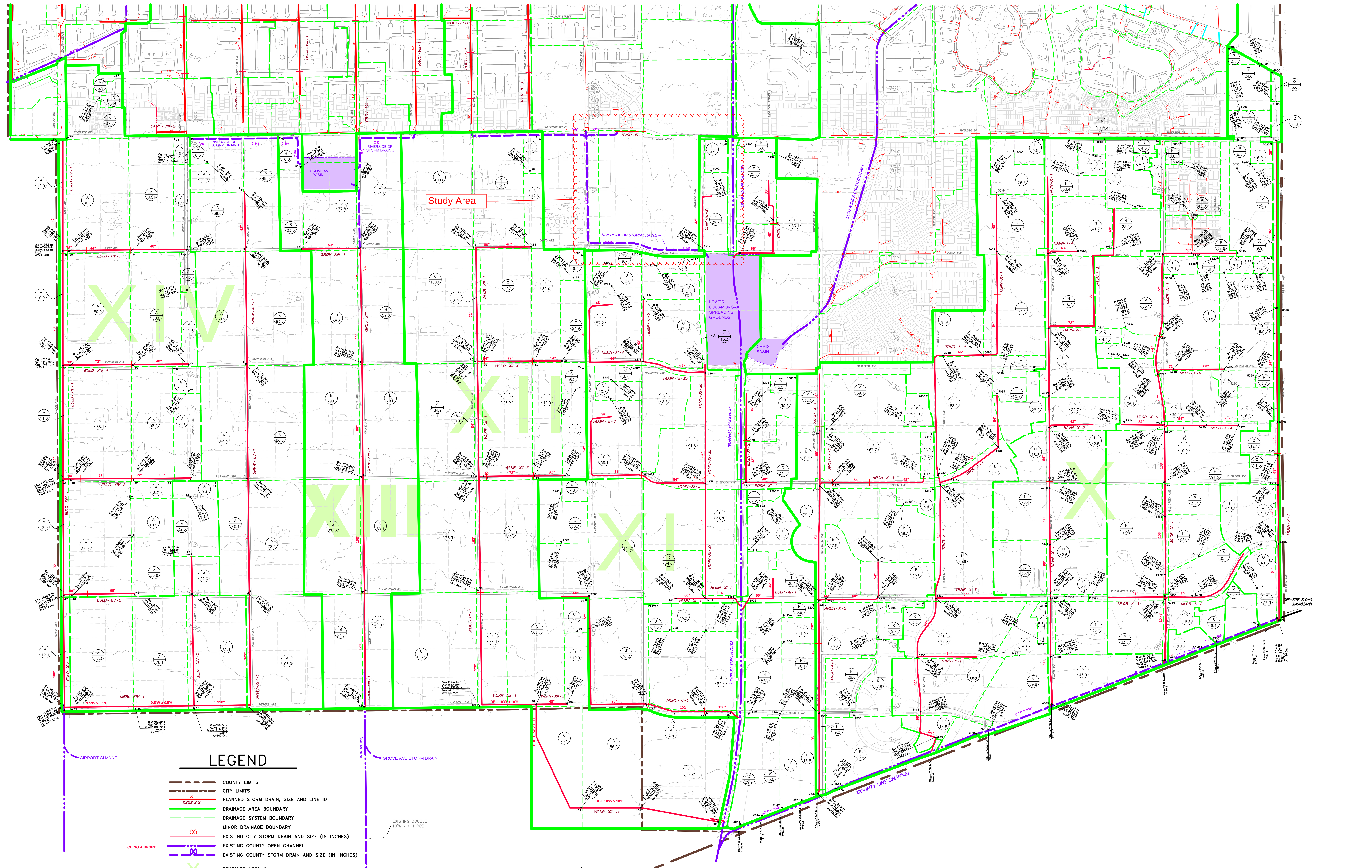

B/C
CHINO SILT LOAM
(350 AC)
A
DELHI FINE SAND
(14,079 AC)
B/C
GRANGEVILLE FINE SANDY LOAM
(126 AC)
B
HANFORD COARSE SANDY LOAM
(45 AC)
B
HANFORD SANDY LOAM
(366 AC)
C/D
HILMAR LOAMY FINE SAND
(2,833 AC)
A
SOBODA STONY LOAMY SAND
(36 AC)
A
TUJUNGA GRAVELLY LOAMY SAND
(1,096 AC)
A
TUJUNGA LOAMY SAND
(13,033 AC)
* BASED ON CITY OF ONTARIO'S GIS DATABASE
GRAPHIC SCALE
0
2,500
5,000
10,000
(FEET)
Study Area
4TH ST
MISSION BLVD
FRANCIS ST
PHILADELPHIA ST
RIVERSIDE DR
CHINO AVE
SCHAEFER AVE
EDISON AVE
EUCALYPTUS AVE
MERRILL AVE
CHINO AIRPORT
REMINGTON AVE
BELLGRAVE AVE
AIRPORT DR
ONTARIO INTERNATIONAL AIRPORT
JURUPA ST
MISSION BLVD
BENSON AVE
MOUNTAIN AVE
SAN ANTONIO AVE
EUCLID AVE
GROVE AVE
VINEYARD AVE
N ARCHIBALD AVE
HAVEN AVE
MILLIKEN AVE
WINEVILLE AVE
ETIWANDA AVE
TURNER AVE
ARCHIBALD AVE
BON VIEW AVE
WALKER AVE
S MILLIKEN AVE
SR83
SR60
10
15
EXHIBIT 6
MARCH 2012
CITY OF ONTARIO
MASTER PLAN OF DRAINAGE
SOILS MAP
03/10/2012


DRAINAGE AREAS
I (3,906 AC)
II (236 AC)
III (5,174 AC)
IV (4,937 AC)
V (4,105 AC)
VI (1,307 AC)
VII (2,501 AC)
VIII (1,286 AC)
IX (572 AC)
X (2,903 AC)
XI (1,471 AC)
XII (1,255 AC)
XIII (681 AC)
XIV (1,758 AC)
LEGEND
PLANNED STORM DRAIN
EXISTING COUNTY OPEN CHANNEL
EXISTING COUNTY STORM DRAIN
CITY LIMIT LINE
COUNTY LIMIT LINE
EXISTING DETENTION BASIN
OFF-SITE AREAS TRIBUTARY TO CITY OF ONTARIO
CITY OF ONTARIO
UPLAND
RANCHO CUCAMONGA
MONTCLAIR
S.B. COUNTY
FONTANA
CHINO
JURUPA VALLEY
EASTVALE
SAN BERNARDINO/ RIVERSIDE COUNTY LINE
ONTARIO INTERNATIONAL AIRPORT
Study Area
TO CITY OF MONTCLAIR PROPOSED STORM DRAIN
TO CITY OF MONTCLAIR SAN BERNARDINO AVE STORM DRAIN
TO CITY OF CHINO MASTER PLAN STORM DRAIN SYSTEM 28
TO CITY OF CHINO MASTER PLANNED LINE I EUCLID AVE STORM DRAIN
TO CITY OF CHINO MASTER PLANNED LINE J GROVE AVE STORM DRAIN
CITY OF CHINO MASTER PLANNED LINE A WALKER AVE STORM DRAIN
8TH ST STORM DRAIN
8TH ST INTERCEPT
8th ST BASINS
PRINCETON BASIN
TURNER BASINS
DEER CREEK CHANNEL
CUCAMONGA-GUASTI REGIONAL PARK
WEST STATE ST STORM DRAIN
EAST STATE ST STORM DRAIN
CUCAMONGA CHANNEL
COMMERCE CENTER STORM DRAIN
DAY CREEK CHANNEL
LOWER ETIWANDA CREEK CHANNEL
WINEVILLE BASIN
SAN SEVAINE CHANNEL
FRANCIS ST STORM DRAIN
WEST CUCAMONGA CHANNEL
ELY BASINS
RIVERSIDE BASIN
CHINO STORM DRAIN
MAGNOLIA STORM DRAIN
SULTANA CYPRESS STORM DRAIN
GROVE AVE BASIN
RIVERSIDE DR STORM DRAIN 1
RIVERSIDE DR STORM DRAIN 2
RIVERSIDE DR STORM DRAIN 2
RIVERSIDE DR STORM DRAIN 2
CYPRESS CHANNEL
GROVE AVE BASIN DRAIN
LOWER CUCAMONGA SPREADING GROUNDS
LOWER DEER CREEK CHANNEL
CHRIS BASIN
AIRPORT CHANNEL
OPEN CHANNEL
CHINO AIRPORT
COUNTY LINE CHANNEL
8TH ST
6TH ST
4TH ST
AIRPORT DR
MISSION BLVD
PHILLIPS ST
FRANCIS ST
PHILADELPHIA ST
JURUPA ST
RIVERSIDE DR
CHINO AVE
SCHAEFER AVE
EDISON AVE
EUCALYPTUS AVE
MERRILL AVE
REMINGTON AVE
BELLGRAVE AVE
GROVE AVE
VINEYARD AVE
EUCLID AVE
ARCHIBALD AVE
HAVEN AVE
MILLIKEN AVE
WINEVILLE AVE
ETIWANDA AVE
BENSON AVE
MOUNTAIN AVE
SAN ANTONIO AVE
BON VIEW AVE
WALKER AVE
TURNER AVE
S MILLIKEN AVE
SR83
SR60
10
15
GRAPHIC SCALE
0 2,500 5,000 10,000
(FEET)
EXHIBIT 7
MARCH 2012
CITY OF ONTARIO
MASTER PLAN OF DRAINAGE
DRAINAGE AREA MAP
03/10/2012
B3-474

CITY OF ONTARIO
MONTCLAIR
UPLAND
RANCHO CUCAMONGA
S.B. COUNTY
FONTANA
CHINO
EASTVALE
JURUPA VALLEY
SAN BERNARDINO/ RIVERSIDE COUNTY LINE
CHINO AIRPORT
Study Area
CUCAMONGA-GUASTI REGIONAL PARK
WINEVILLE BASIN
RIVERSIDE BASIN
ELY BASINS
GROVE AVE BASIN
LOWER CUCAMONGA SPREADING GROUNDS
CHRIS BASIN
TURNER BASINS
PRINCETON BASIN
8th ST BASINS
LEGEND
PLANNED STORM DRAIN, SIZE AND LINE ID
COUNTY LIMIT
CITY LIMIT
DRAINAGE AREA BOUNDARY
DRAINAGE SYSTEM BOUNDARY
EXISTING COUNTY OPEN CHANNEL
EXISTING COUNTY STORM DRAIN AND SIZE (IN INCHES)
EXISTING CALTRANS STORM DRAIN
EXISTING GRASS LINED CHANNEL (MAINTAINED BY PROPERTY OWNER)
EXISTING CITY OPEN CHANNEL
EXISTING CITY STORM DRAIN AND SIZE (IN INCHES)
FUTURE NEIGHBORING CITIES STORM DRAIN AND SIZE (IN INCHES)
EXISTING NEIGHBORING CITIES STORM DRAIN AND SIZE (IN INCHES)
EXISTING DETENTION BASIN (MAINTAINED BY OTHER AGENCIES)
PARALLEL TO EXISTING STORM DRAIN
DRAINAGE AREA #
DRAINAGE SYSTEM NAME
WLKR - XII - 3
DRAINAGE AREA NUMBER
LINE NUMBER
SYSTEM IDENTIFICATION
*NOTES:
(1) SD "FRNS-V-1b" on Campus Avenue (Priority A-13) connects to SD "CAMP-VIII-1" (Priority A-11) , not to "FRNS-V-1a" on Francis Street. "CAMP-VIII-1" to be upsized accordingly.
(2) Revision to Areas XI and XII (Priorities C-12 and C-13).
(3) 39" RCP in Euclid Avenue from Holt Boulevard to G Street does not exist.
(4) 48"-66" RCP in Vineyard Avenue from Francis Street to north of the Ely Basins does not exist.
1600 800 0 1600 4800
GRAPHIC SCALE 1"=1,600'
EXHIBIT 8
MARCH 2012
CITY OF ONTARIO
MASTER PLAN OF DRAINAGE
PLANNED FACILITIES MAP


I-10 SAN BERNARDINO FREEWAY
SAN BERNARDINO FREEWAY
SR-60 POMONA FREEWAY
ONTARIO
INTERNATIONAL
8th ST BASINS
ELY BASINS
GROVE AVE BASIN
LOWER CUCAMONGA SPREADING GROUNDS
CHINO STORM DRAIN
MAGNOLIA STORM DRAIN
SULTANA CYPRESS STORM DRAIN
CYPRESS CHANNEL
WEST STATE STREET STORM DRAIN
EAST STATE ST STORM DRAIN
FRANCIS ST STORM DRAIN
RIVERSIDE DR STORM DRAIN 2
Study Area
LEGEND
COUNTY LIMITS
CITY LIMITS
PLANNED STORM DRAIN, SIZE AND LINE ID
DRAINAGE AREA BOUNDARY
DRAINAGE SYSTEM BOUNDARY
MINOR DRAINAGE BOUNDARY
EXISTING CITY STORM DRAIN AND SIZE (IN INCHES)
EXISTING CITY OPEN CHANNEL
EXISTING COUNTY OPEN CHANNEL
EXISTING COUNTY STORM DRAIN AND SIZE (IN INCHES)
EXISTING CALTRANS STORM DRAIN
EXISTING NEIGHBORING CITIES STORM DRAIN AND SIZE (IN INCHES)
FUTURE NEIGHBORING CITIES STORM DRAIN AND SIZE
EXISTING DETENTION BASIN
DRAINAGE AREA #
DRAINAGE SYSTEM NAME
WLKR - XII - 3
SYSTEM IDENTIFICATION
DRAINAGE AREA NUMBER
LINE NUMBER
AREA DESIGNATION
AREA ACREAGE (IN ACRES)
Q10 =861.0cfs
Q25 =981.1cfs
Q100=1213.7cfs
833.9 AC
NODE 350
PEAK FLOW RATE
AREA (IN ACRES)
NODE NO.
SCALE: 1" = 900'
GRAPHIC SCALE 1"=900'
MARCH 2012
REVISIONS
CITY OF ONTARIO
MASTER PLAN OF DRAINAGE
HYDROLOGY MAP
OLD MODEL COLONY–WEST
1 OF 3
DATED: 7/10/2012 2:49 PM
HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759
F:\0641\Engineering\SY_SD Master Plan\Rpt_SD Master Plan\HYDROLOGY MAPS\HYDROLOGY MAP-OMC-ALL.dwg

TURNER BASINS
CUCAMONGA-GUASTI REGIONAL PARK
AIRPORT
COMMERCE CENTER STORM DRAIN
WINEVILLE BASIN
RIVERSIDE BASIN
SR-60 POMONA FREEWAY
LOWER CUCAMONGA SPREADING GROUNDS
CHRIS BASIN
A Part of Study Area
CUCAMONGA CHANNEL
DAY CREEK CHANNEL
LOWER DEER CREEK CHANNEL
LEGEND
COUNTY LIMITS
CITY LIMITS
PLANNED STORM DRAIN, SIZE AND LINE ID
DRAINAGE AREA BOUNDARY
DRAINAGE SYSTEM BOUNDARY
MINOR DRAINAGE BOUNDARY
EXISTING CITY STORM DRAIN AND SIZE (IN INCHES)
EXISTING CITY OPEN CHANNEL
EXISTING COUNTY OPEN CHANNEL
EXISTING COUNTY STORM DRAIN AND SIZE (IN INCHES)
EXISTING CALTRANS STORM DRAIN
EXISTING DETENTION BASIN
DRAINAGE AREA #
DRAINAGE SYSTEM NAME
WLKR - XII - 3
SYSTEM IDENTIFICATION
DRAINAGE AREA NUMBER
LINE NUMBER
AREA DESIGNATION
AREA ACREAGE (IN ACRES)
Q10 =861.0cfs
Q25 =981.1cfs
Q100 =1213.7cfs
833.9 AC
NODE 350
PEAK FLOW RATE
AREA (IN ACRES)
NODE NO.
SCALE: 1" = 900'
900 450 0 900 2700
GRAPHIC SCALE 1"=900'
REVISIONS
DATED: 3/15/2012 10:33 AM
HUNSAKER & ASSOCIATES
IRVINE, INC
PLANNING • ENGINEERING • SURVEYING
Three Hughes • Irvine, CA 92618 • PH: (949) 583-1010 • FX: (949) 583-0759
MARCH 2012
CITY OF ONTARIO
MASTER PLAN OF DRAINAGE
HYDROLOGY MAP
OLD MODEL COLONY-EAST
2 OF 3
F:\0641\Engineering\SY_SD Master Plan\Rpt_SD Master Plan\HYDROLOGY MAPS\HYDROLOGY MAP-OMC-ALL.dwg



LEGEND

- COUNTY LIMITS
- CITY LIMITS
- X" XXXX-X-X — PLANNED STORM DRAIN, SIZE AND LINE ID
- DRAINAGE AREA BOUNDARY
- DRAINAGE SYSTEM BOUNDARY
- MINOR DRAINAGE BOUNDARY
- (X) — EXISTING CITY STORM DRAIN AND SIZE (IN INCHES)
- EXISTING COUNTY OPEN CHANNEL
- EXISTING COUNTY STORM DRAIN AND SIZE (IN INCHES)
- X — DRAINAGE AREA #

DRAINAGE SYSTEM NAME
WLKR - XII - 3 — SYSTEM IDENTIFICATION
DRAINAGE AREA NUMBER
LINE NUMBER

X / X.X — AREA DESIGNATION / AREA ACREAGE (IN ACRES)

Q_{10} =861.0cfs
Q_{25} =981.1cfs
Q_{100}=1213.7cfs — PEAK FLOW RATE
t=36.1 — TIME OF CONCENTRATION
A=942.7ac — AREA

MARCH 2012

REVISIONS

HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

CITY OF ONTARIO
MASTER PLAN OF DRAINAGE
HYDROLOGY MAP
NEW MODEL COLONY

3 OF 3

PLOTTED 3/15/2012 10:26 AM
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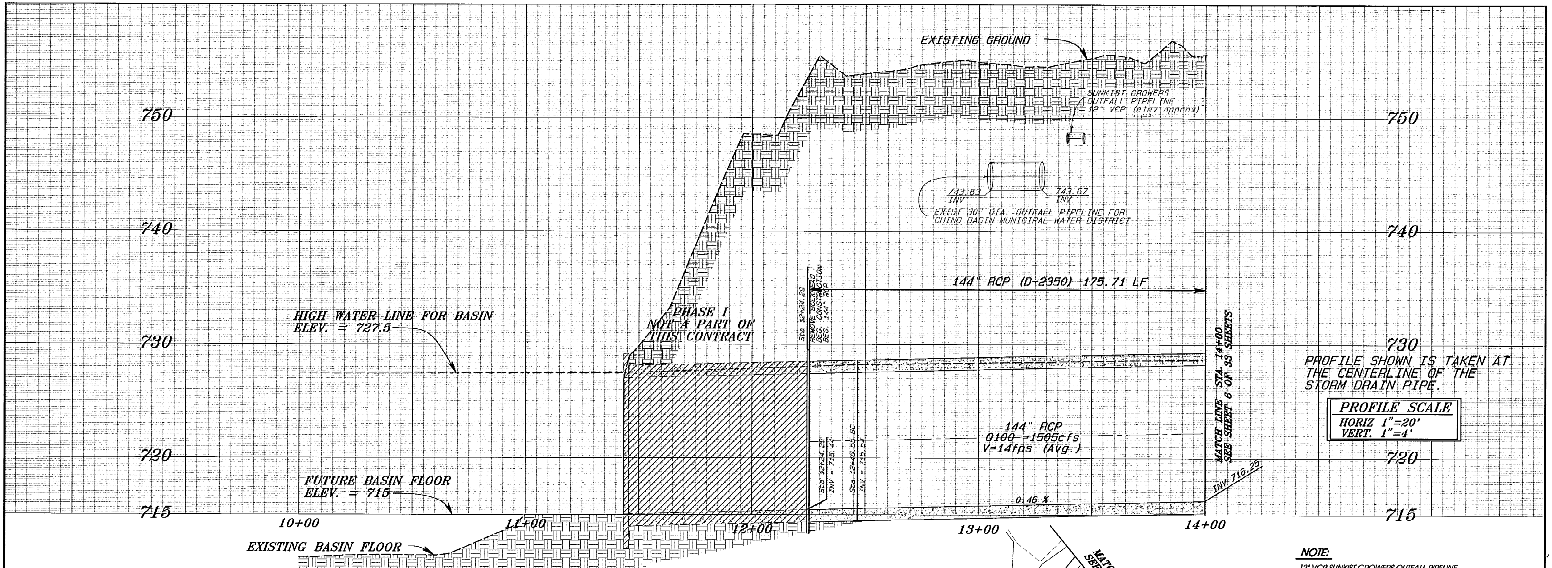
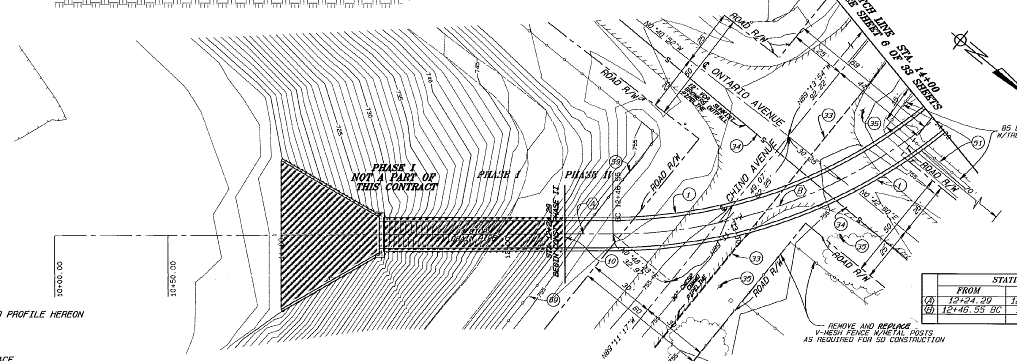
APPENDIX D - STORM DRAIN AS-BUILT EXCERPTS





NOTE:

12" VCP SUNKIST GROWERS OUTFALL PIPELINE, PROTECT IN PLACE, SEE SPECIAL PROVISIONS.

30" CMCSP, CBMWD PIPELINE, PROTECT IN PLACE, SEE SPECIAL PROVISIONS.

APPROVED RECORD DRAWING

RESIDENT ENGINEER 5/18/06 DATE

GRAPHIC SCALE 1"=20'

20 0 20 40 60

NOTE:
SEE SHEET 4 OF 33 FOR LOCATION OF CONSTRUCTION EASEMENTS

CURVE / LINE DATA

	STATIONING FROM	STATIONING TO	DELTA/ BEARING	RAD	LENG/ DIST	TANG
(A)	12+24.29	12+46.55 BC	N38°23'59"W		22.26'	
(B)	12+46.55 BC	14+00.00	39°04'33"	225.00	153.45'	79.84'

CONSTRUCTION NOTES:

(1)—INSTALL 144" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(10)—REMOVE TEMPORARY BULKHEAD.

(33)—PROTECT EXISTING WATER LINE(S) IN PLACE

(34)—PROTECT EXISTING SEWER LINE(S) IN PLACE

(35)—PROTECT EXISTING TELEPHONE LINE(S) IN PLACE

(51)—REMOVE EXIST FENCE FOR CONST., REPLACE AFTER CONST., IN KIND.

(59)—REMOVE AND REINSTALL EXISTING 6' CHAIN LINK FENCE PER SPEC. DWG I AS REQUIRED FOR CONSTRUCTION OR AS DIRECTED BY ENGINEER.

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER · JAMES PATRICK BORCHERT · CIVIL · STATE OF CALIFORNIA

B3480

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT · 1939 · CALIFORNIA

REVISIONS			
MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY: Jim Borcuch 11/18/02
CHIEF, ENGINEERING DIVISION Date

RECOMMENDED BY: 11/19/02
ASSIST. FLOOD CONTROL ENGINEER Date

APPROVED BY: Ken A. Miller 11/19/02
FLOOD CONTROL ENGINEER Date

PROJ. ENG.	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	LOZA	R.H.

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

ONTARIO – CHINO SYSTEM

RIVERSIDE DRIVE STORM DRAIN SEGMENT # 2, PHASE II

PLAN & PROFILE
FROM STA 12+24.29 TO STA 14+00

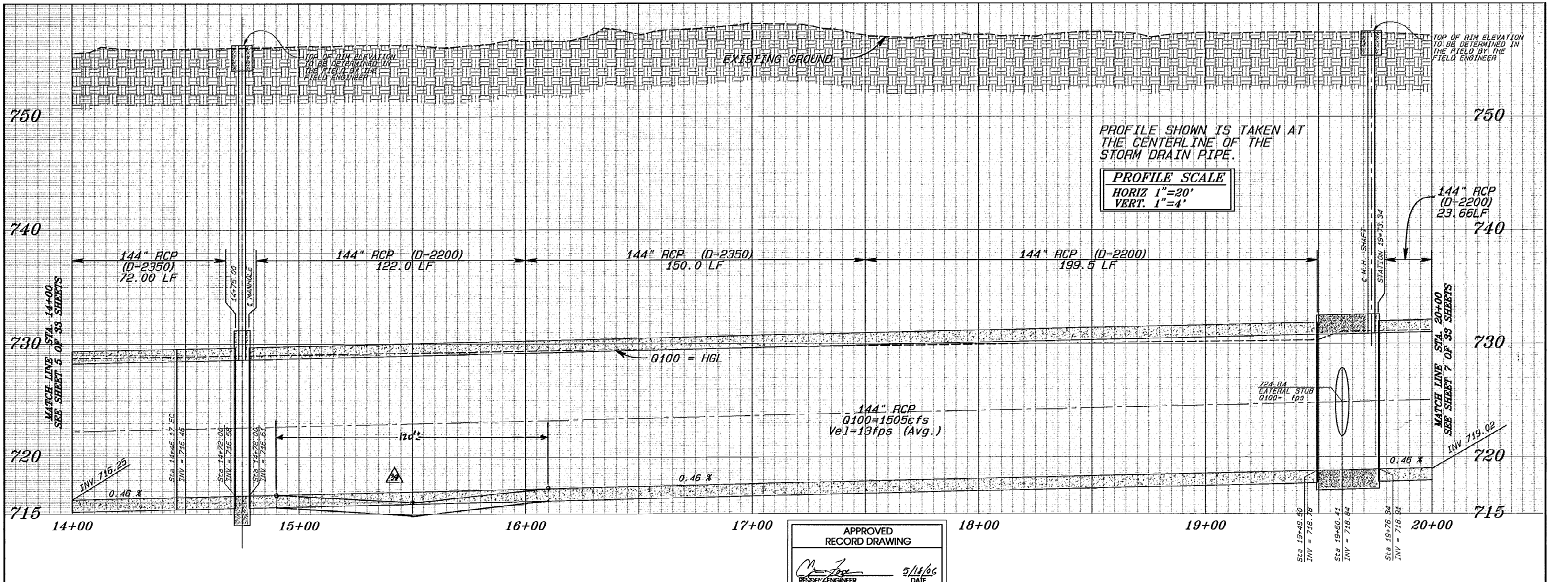
DATE 1-31-02

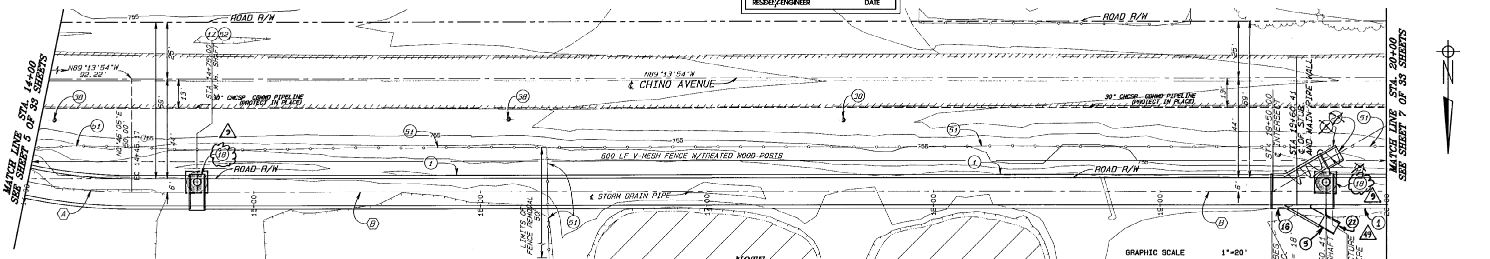
P.B. REF. FB 4006 PG 1421

FILE NO. ~~1-910-00~~

SHEET. NO. 5 OF 34

1-909-03





NOTE:
SEE SHEET 4 OF 33 FOR LOCATION OF CONSTRUCTION EASEMENTS

GRAPHIC SCALE 1"=20'

CONSTRUCTION NOTES:

(1)–INSTALL 144" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(5)–INSTALL 72" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(16)–CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 322-1.

(17)–CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 320-1.

(18)–CONSTRUCT CONCRETE APRON PER DETAILS ON SHEET 31 OF 33 SHEETS.

(22)–CONSTRUCT REINFORCED CONCRETE BULKHEAD PER MODIFIED RIVERSIDE COUNTY STD. PLAN M816

(38)–PROTECT EXISTING WOOD UTILITY POLE(s), IN PLACE.

CONSTRUCTION NOTES CONT.:

(51)–REMOVE EXIST FENCE FOR CONST., REPLACE AFTER CONST., IN KIND.

(52)–CONSTRUCT 36" 'MANHOLE SHAFT' PER A.P.W.A. STD PLAN 326-1. NON PRESSURE MANHOLE SHAFT.

CURVE / LINE DATA

	STATIONING FROM	STATIONING TO	DELTA/ BEARING	RAD	LENG/ DIST	TANG
(A)	14+00.00	14+46.17EC	11°45'26"	225.00'	46.17'	23.16'
(B)	14+46.17EC	20+00.00	N89°13'54"W		553.83'	
(C)	STUB		~~N60°46'05"~~		57.73'	

ENGINEER'S NOTICE TO CONTRACTOR

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REGISTERED PROFESSIONAL ENGINEER JAMES PATRICK BORCHER No. B3-481 Exp 3/31/04 CIVIL STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:
9	10/20/05	CHANGE ROUND APRONS TO 10' SQUARES.	S.G.
39	10/20/05	120'± LONG DIP SECTION: 11'± DEEP AT MIDPOINT (STA 15+50).	S.G.
49	10/20/05	RELOCATE STUB TO OPPOSITE SIDE.	S.G.

SUBMITTED BY: CHIEF, ENGINEERING DIVISION 11/18/02 Date

RECOMMENDED BY: ASSIST. FLOOD CONTROL ENGINEER 11/18/02 Date

APPROVED BY: Ken A. Miller FLOOD CONTROL ENGINEER 11/19/02 Date

PROJ. ENG.	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	LOZA	R.H.

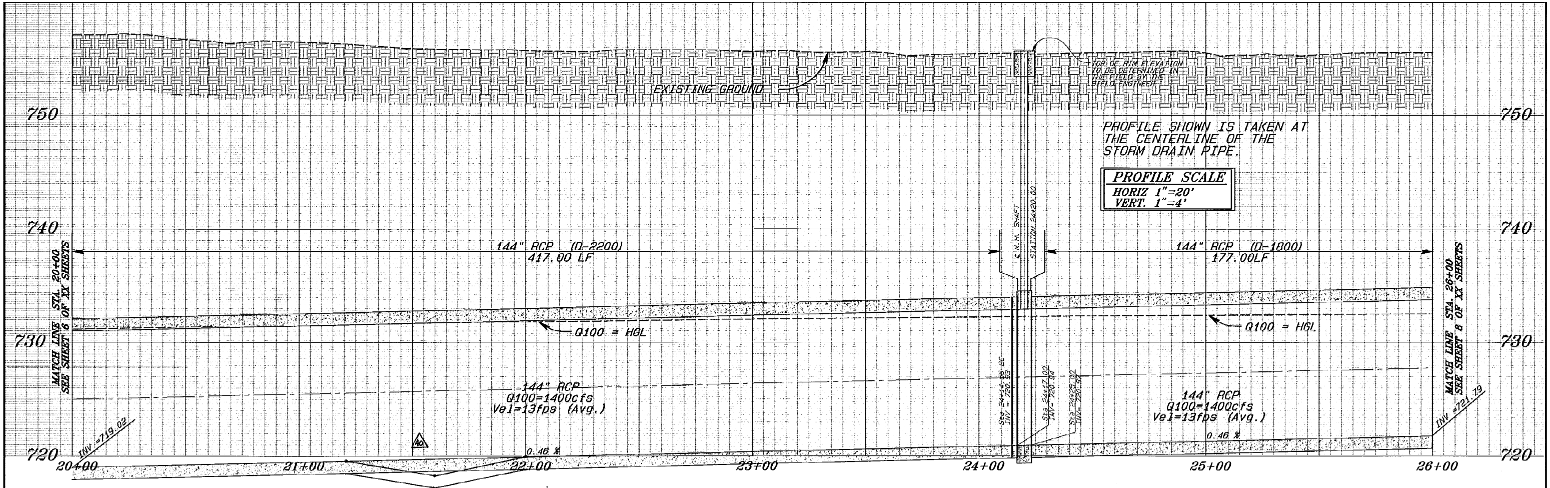
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

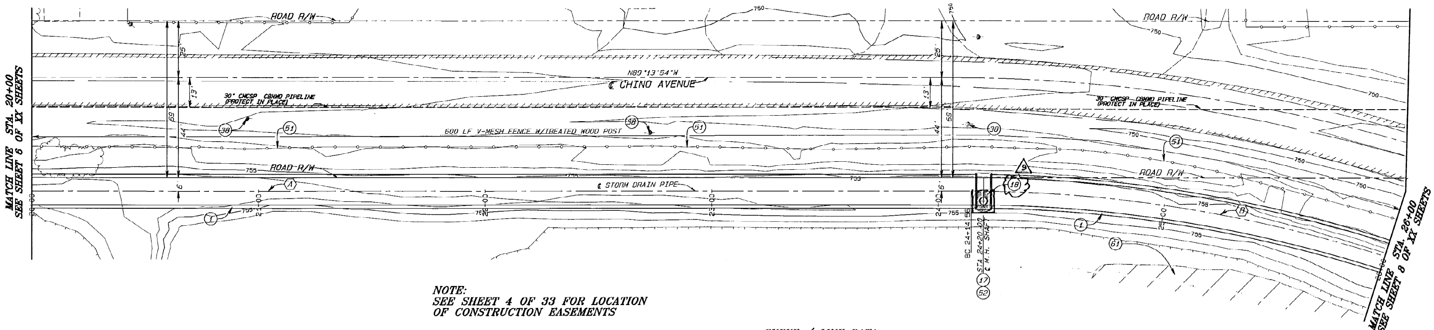
ONTARIO – CHINO SYSTEM

RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II
PHASE II
PLAN & PROFILE
FROM STA 14+00 TO STA 20+00

DATE 1-31-02
F.B. REF. FB 4006 PG 1421
FILE NO. 1-910-00
SHEET. NO. 6 OF 34

1-909-03





NOTE:
SEE SHEET 4 OF 33 FOR LOCATION OF CONSTRUCTION EASEMENTS

CURVE / LINE DATA

	STATIONING FROM	STATIONING TO	DELTA/ BEARING	RAD	LENG/ DIST	TANG
Ⓐ	20+00.00	24+14.56 BC	N89°13'54"W		414.56'	
Ⓑ	24+14.56 BC	26+00.00	17°42'30"	600.00'	185.44'	93.47'

GRAPHIC SCALE 1"=20'
20 0 20 40 60

APPROVED RECORD DRAWING
RESIDENT ENGINEER 5/18/06 DATE

CONSTRUCTION NOTES:

1. INSTALL 144" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)
17. CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 320-1.
18. CONSTRUCT CONCRETE APRON PER DETAILS ON SHEET 31 OF 33 SHEETS.
38. PROTECT EXISTING WOOD UTILITY POLE(s), IN PLACE.
51. REMOVE EXIST FENCE FOR CONST., REPLACE AFTER CONST., IN KIND.
52. CONSTRUCT 36" 'MANHOLE SHAFT' PER A.P.W.A. STD PLAN 326-1. NON PRESSURE MANHOLE SHAFT.
61. MOVE SOUTH LEVEE OF NPDES PONDS NORTH AND DREDGE 1'. SEE SHEETS 32 & 33 OF 33 FOR TEMPORY LEVEE CONSTRUCTION.

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER JAMES PATRICK BOCEK No. 41807 Exp 3/31/04 CIVIL STATE OF CALIFORNIA
B3-482

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:
△- 9	10/20/03	CHANGE ROUND APRONS TO 10' SQUARES.	S.G.
△-40	10/20/03	80'± LONG DIP SECTION: 18"± DEEP AT MIDPOINT (STA 21+60).	S.G.

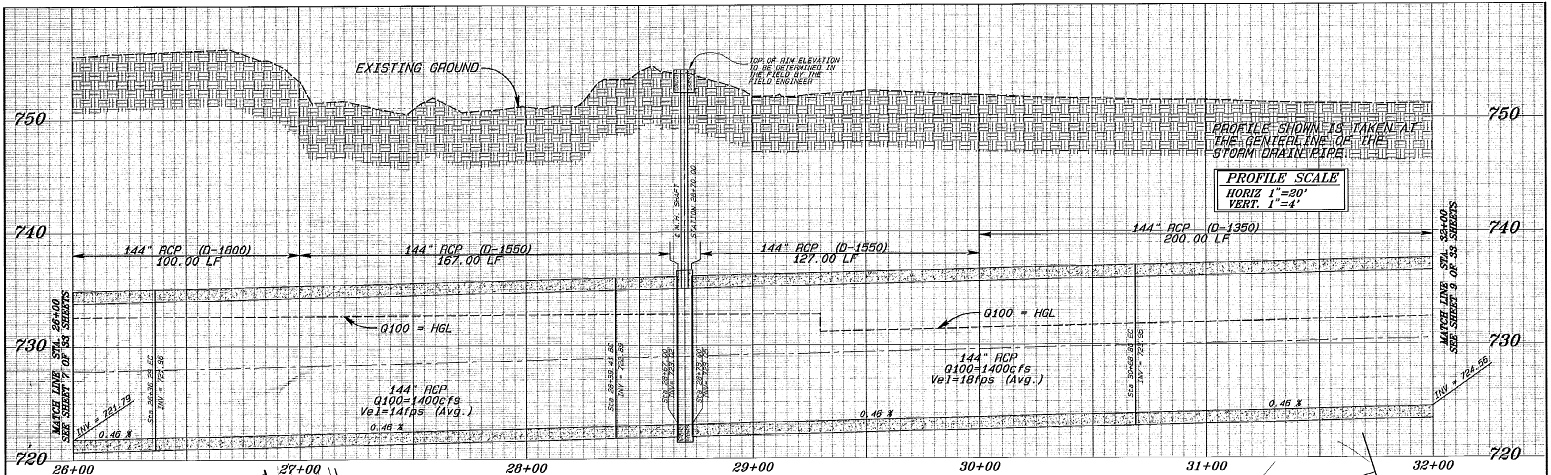
SUBMITTED BY: Jim Bocek 11/18/02 CHIEF, ENGINEERING DIVISION Date
RECOMMENDED BY: 11/19/02 ASSIST. FLOOD CONTROL ENGINEER Date
APPROVED BY: Ken A. Miller 11/19/02 FLOOD CONTROL ENGINEER Date

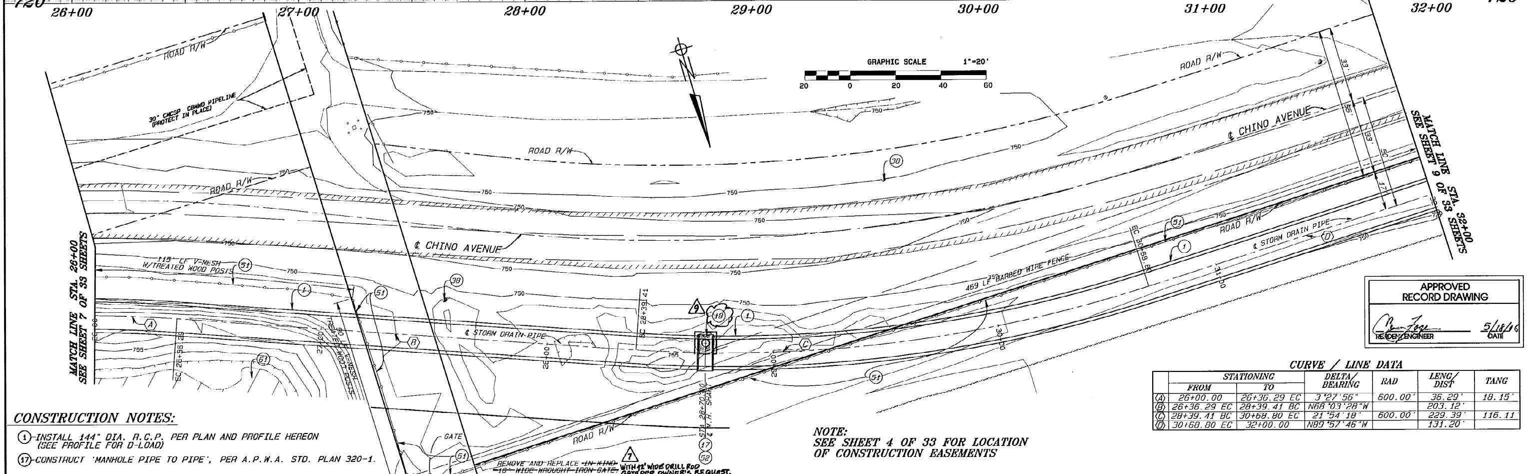
PROJ. ENG..	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	I.OZA	R.H.

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
ONTARIO - CHINO SYSTEM
RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II
PHASE II
PLAN & PROFILE
FROM STA 20+00 TO STA 26+00

DATE 1-31-02
F.B. REF. FB 4000 PG 1421
FILE NO. ~~1-910-00~~
SHEET. NO. 7 OF 34

1-909-03 16 of 43





CONSTRUCTION NOTES:

(1) INSTALL 144" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(17) CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 320-1.

(18) CONSTRUCT CONCRETE APRON PER DETAILS ON SHEET 31 OF 33 SHEETS.

(30) PROTECT EXISTING WOOD UTILITY POLE(s), IN PLACE.

(51) REMOVE EXIST FENCE FOR CONST., REPLACE AFTER CONST., IN KIND.

(52) CONSTRUCT 36" 'MANHOLE SHAFT' PER A.P.W.A. STD PLAN 326-1. NON PRESSURE MANHOLE SHAFT.

(61) MOVE SOUTH LEVEE OF NPDES PONDS NORTH AND DREDGE 1'. SEE SHEETS 32 & 33 OF 33 FOR TEMPORY LEVEE CONSTRUCTION.

NOTE:
SEE SHEET 4 OF 33 FOR LOCATION OF CONSTRUCTION EASEMENTS

APPROVED RECORD DRAWING
RESIDENT ENGINEER 5/18/06
DATE

CURVE / LINE DATA

	STATIONING FROM	STATIONING TO	DELTA/ BEARING	RAD	LENG/ DIST	TANG
A	26+00.00	26+36.29 EC	3°27'56"	600.00'	36.29'	18.15'
B	26+36.29 EC	28+39.41 BC	N68°03'28"W		203.12'	
C	28+39.41 BC	30+68.80 EC	21°54'18"	600.00'	229.39'	116.11
D	30+68.80 EC	32+00.00	N89°57'46"W		131.20'	

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER JAMES PATRICK BORCHERT B3-483 Exp. 3/31/07 CIVIL STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:
△-7	10/20/05	INSTALLED 12' WIDE DRILL ROD GATE PER OWNER'S REQUEST.	S.G.
△-9	10/20/05	CHANGE ROUND APRONS TO 10' SQUARES.	S.G.

SUBMITTED BY: CHIEF, ENGINEERING DIVISION — 11/18/02 Date
RECOMMENDED BY: ASSIST. FLOOD CONTROL ENGINEER — 11/19/02 Date
APPROVED BY: Ken A. Miller, FLOOD CONTROL ENGINEER — 11/19/02 Date

PROJ. ENG.	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	LOZA	R.H.

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

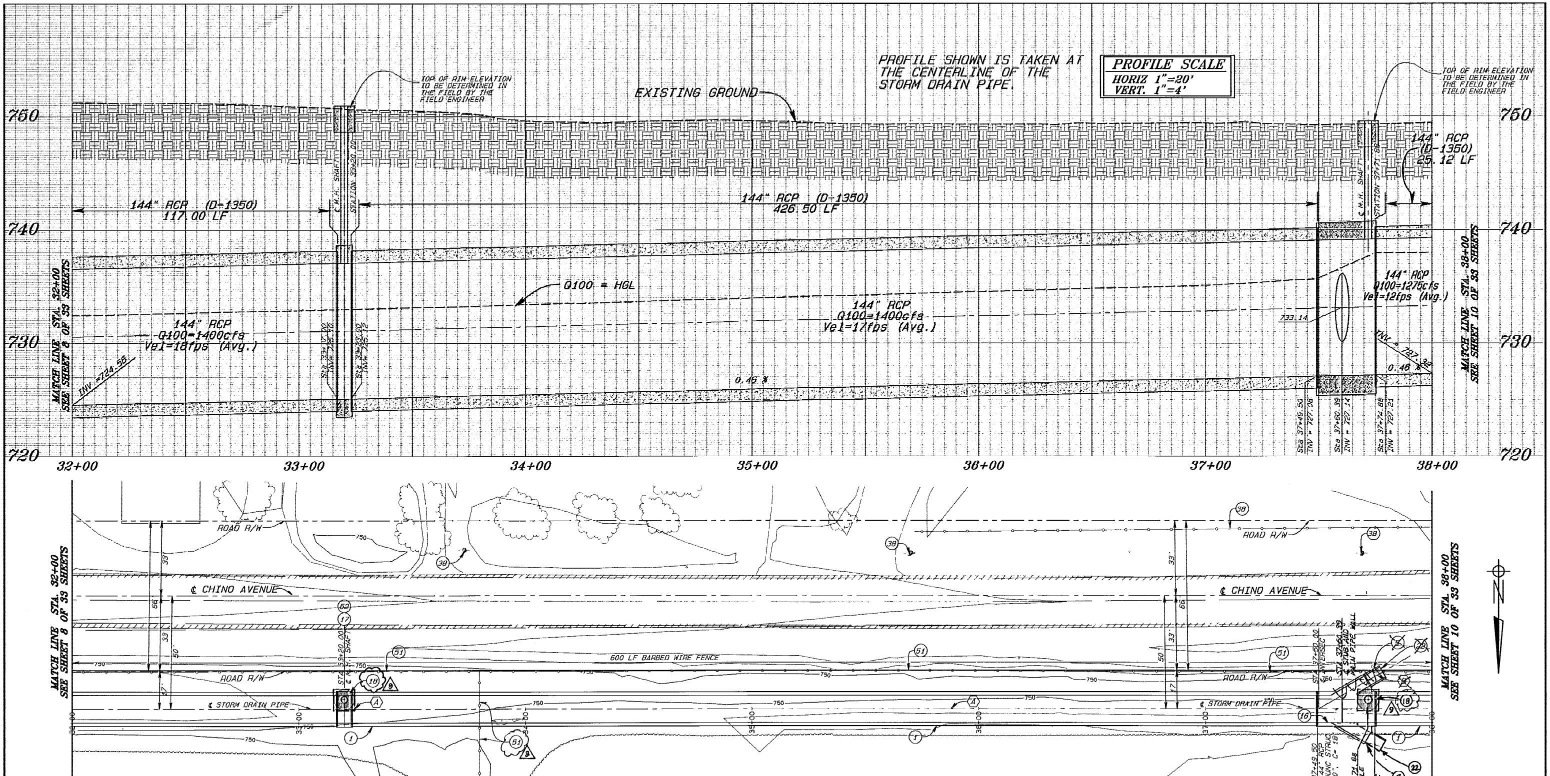
ONTARIO - CHINO SYSTEM

RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II

PHASE II
PLAN & PROFILE
FROM STA 26+00 TO STA 32+00

DATE 1-31-02
F.B. REF. FB 4006 PG 1421
FILE NO. ~~1-910-00~~
SHEET NO. 8 OF 34

1-909-03 17 of 43



NOTE:
SEE SHEET 4 OF 33 FOR LOCATION OF CONSTRUCTION EASEMENTS

GRAPHIC SCALE 1"=20'

20 0 20 40 60

CONSTRUCTION NOTES:

(1)-INSTALL 144" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(5)-INSTALL 72" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(16)-CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 322-1.

(17)-CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 320-1.

(18)-CONSTRUCT CONCRETE APRON PER DETAILS ON SHEET 31 OF 33 SHEETS.

(22)-CONSTRUCT REINFORCED CONCRETE BULKHEAD PER MODIFIED RIVERSIDE COUNTY STD. PLAN M816

(38)-PROTECT EXISTING WOOD UTILITY POLE(S), IN PLACE.

(51)-REMOVE EXIST FENCE FOR CONST., REPLACE AFTER CONST., IN KIND.

(52)-CONSTRUCT 36" 'MANHOLE SHAFT' PER A.P.W.A. STD PLAN 326-1. NON PRESSURE MANHOLE SHAFT.

CURVE / LINE DATA

	STATIONING FROM	STATIONING TO	DELTA/ BEARING	RAD	LENG/ DIST	TANG
(A)	32+00.00	38+00.00	N89°57'46"W		600.00'	
~~(B)~~	STUB		~~N60°02'21"E~~		39.93'	

APPROVED RECORD DRAWING
RESIDENT ENGINEER 5/18/06 DATE

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER JAMES PATRICK BORCHERT B3-484 Exp 12/31/04 CIVIL STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:
△-8	10/20/03	INSTALL 24" WIDE DRILL ROD GATE PER OWNER'S REQUEST.	S.G.
△-9	10/20/03	CHANGE ROUND APRONS TO 10' SQUARES.	S.G.
△-49	10/20/03	RELOCATE STUB TO OPPOSITE SIDE.	S.G.

SUBMITTED BY: Jim Borchert 11/18/02 CHIEF, ENGINEERING DIVISION Date

RECOMMENDED BY: Vance R. Olson 11/19/02 ASSIST. FLOOD CONTROL ENGINEER Date

APPROVED BY: Ken A. Miller 11/19/02 FLOOD CONTROL ENGINEER Date

PROJ. ENG.	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	1.02A	R.H.

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

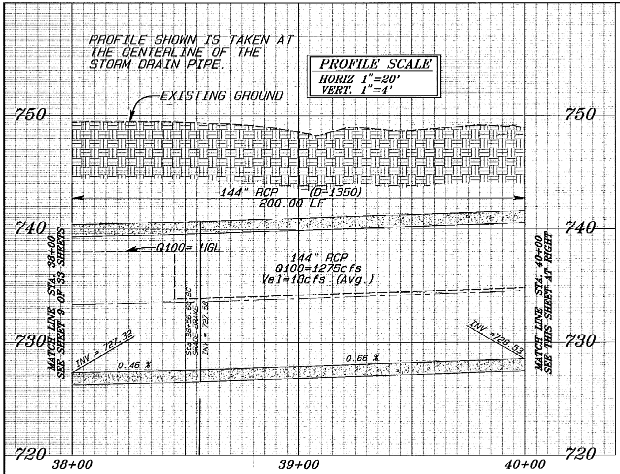
ONTARIO - CHINO SYSTEM

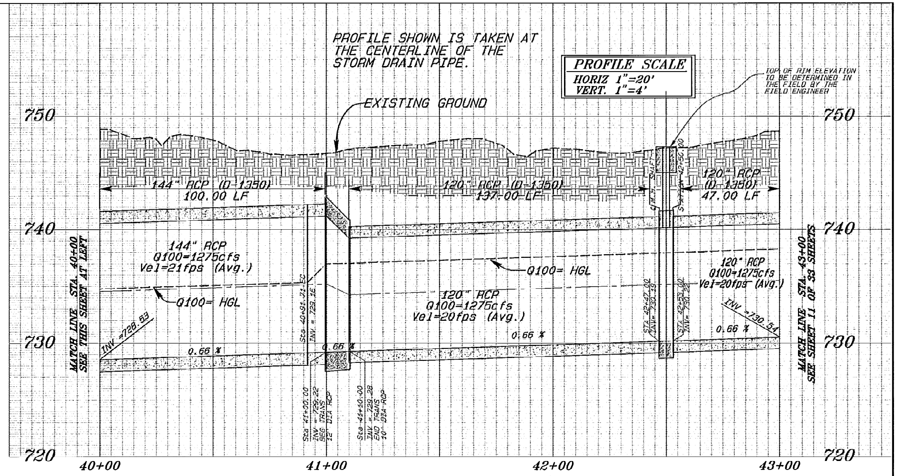
RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II

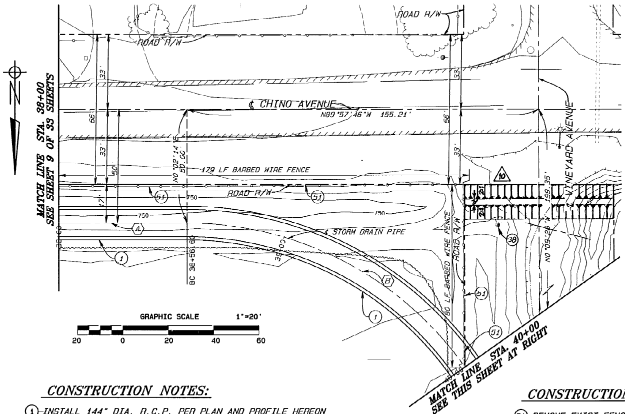
PHASE II
PLAN & PROFILE
FROM STA 32+00 TO STA 38+00

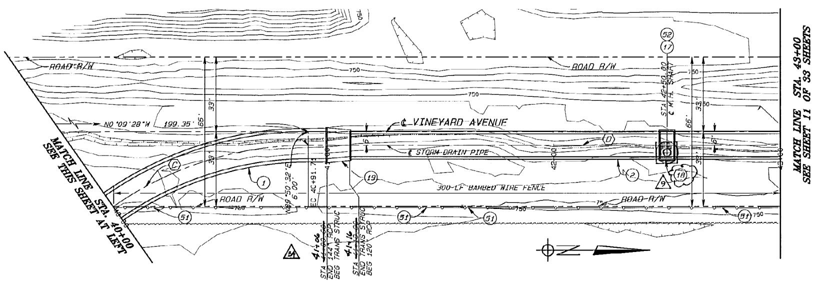
DATE 1-31-02
F.B. REF. FB 4006 PG 1421
FILE NO. ~~1-910-00~~
SHEET. NO. 9 OF 34

1-909-03 18 of 43









NOTE:
SEE SHEET 4 OF 33 FOR LOCATION OF CONSTRUCTION EASEMENTS

GRAPHIC SCALE 1"=20'

CURVE / LINE DATA

	STATIONING		DELTA/ BEARING	RAD	LENG/ DIST	TANG
	FROM	TO				
(A)	38+00.00	38+56.60 BC	N89°57'46"W		56.60'	
(B)	38+56.60 BC	40+00.00	54°46'29"	150.00'	143.40'	77.71'
(C)	40+00.00	40+91.71 EC	35°01'50"	150.00'	91.71'	47.34'
(D)	40+91.71 EC	43+00.00	N00°09'16"W		208.29'	

APPROVED RECORD DRAWING
RESIDENT ENGINEER 5/18/05 DATE

CONSTRUCTION NOTES:

(1) INSTALL 144" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(2) INSTALL 120" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(17) CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 320-1.

(10) CONSTRUCT CONCRETE APRON PER DETAILS ON SHEET 31 OF 33 SHEETS.

(19) CONSTRUCT TRANSITION STRUCTURE PER A.P.W.A. STD. PLAN 340-1.

(38) PROTECT EXISTING WOOD UTILITY POLE(s), IN PLACE.

CONSTRUCTION NOTES CONT:

(51) REMOVE EXIST FENCE FOR CONST., REPLACE AFTER CONST., IN KIND.

(52) CONSTRUCT 36" 'MANHOLE SHAFT' PER A.P.W.A. STD PLAN 326-1. NON PRESSURE MANHOLE SHAFT.

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER JAMES PATRICK BORCUK CIVIL STATE OF CALIFORNIA B3-485

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:
△-9	10/20/03	CHANGE ROUND APRONS TO 10' SQUARES.	S.G.
△-10	10/20/03	3' HIGH DIRT DIKE PER CITY OF ONTARIO.	S.G.
△-54	10-20-05	10' TRANS. STRUC. BEG @ STA 41+06.	S.G.

SUBMITTED BY: [signature] 11/18/02 CHIEF, ENGINEERING DIVISION Date
RECOMMENDED BY: [signature] 11/19/02 ASSIST. FLOOD CONTROL ENGINEER Date
APPROVED BY: Ken A. Miller 11/19/02 FLOOD CONTROL ENGINEER Date

PROJ. ENG..	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	I.OZA	R.H.

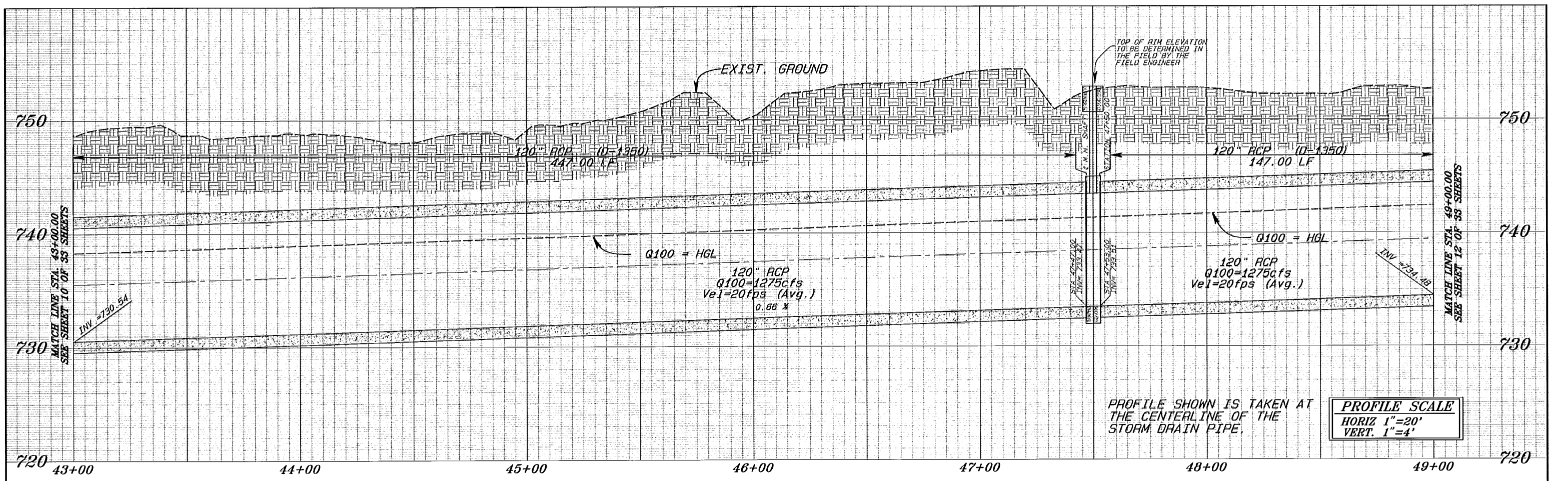
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

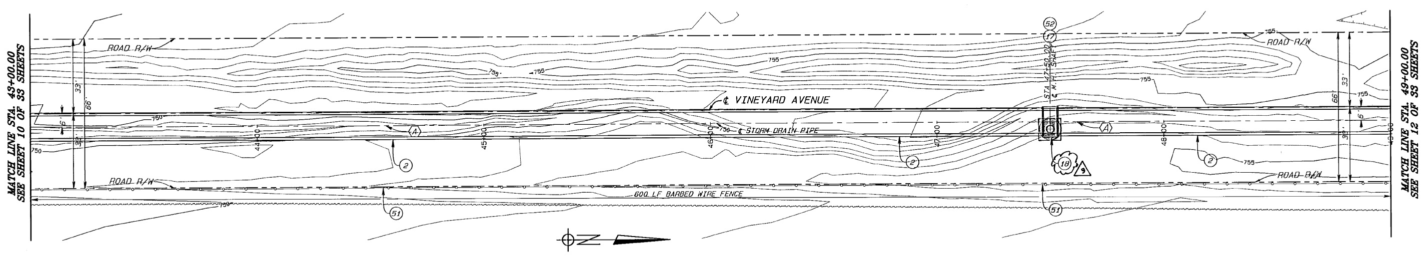
ONTARIO – CHINO SYSTEM

RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II
PHASE II
PLAN & PROFILE
FROM STA 38+00 TO STA 43+00

DATE 1-31-02
P.B. REF. FB 4006 PG 1421
FILE NO. ~~1-910-00~~
SHEET. NO. 10 OF 34

1-909-03 19 of 43





CURVE / LINE DATA

	STATIONING FROM	STATIONING TO	DELTA/ BEARING	RAD	LENG/ DIST	TANG
(A)	43+00.00	49+00.00	N00°09'16"W		600.00'	

GRAPHIC SCALE 1"=20'
20 0 20 40 60

CONSTRUCTION NOTES:

(2)-INSTALL 120" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(18)-CONSTRUCT CONCRETE APRON PER DETAILS ON SHEET 31 OF 33 SHEETS.

(17)-CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 320-1.

(51)-REMOVE EXIST FENCE FOR CONST., REPLACE AFTER CONST., IN KIND.

(52)-CONSTRUCT 36" 'MANHOLE SHAFT' PER A.P.W.A. STD PLAN 326-1. NON PRESSURE MANHOLE SHAFT.

NOTE:
SEE SHEET 4 OF 33 FOR LOCATION OF CONSTRUCTION EASEMENTS

APPROVED RECORD DRAWING
RESIDENT ENGINEER 5/18/06 DATE

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER JAMES PATRICK BORCUK No. 41807 Exp. 3/31/04 CIVIL STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:
△-9	10/20/0	CHANGE ROUND APRONS TO 10' SQUARES.	S.G.

SUBMITTED BY: Jim Borcuk, CHIEF, ENGINEERING DIVISION, 11/18/02 Date

RECOMMENDED BY: ASSIST. FLOOD CONTROL ENGINEER, 11/19/02 Date

APPROVED BY: Ken A. Miller, FLOOD CONTROL ENGINEER, 11/19/02 Date

PROJ. ENG.	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	1.02A	R.H.

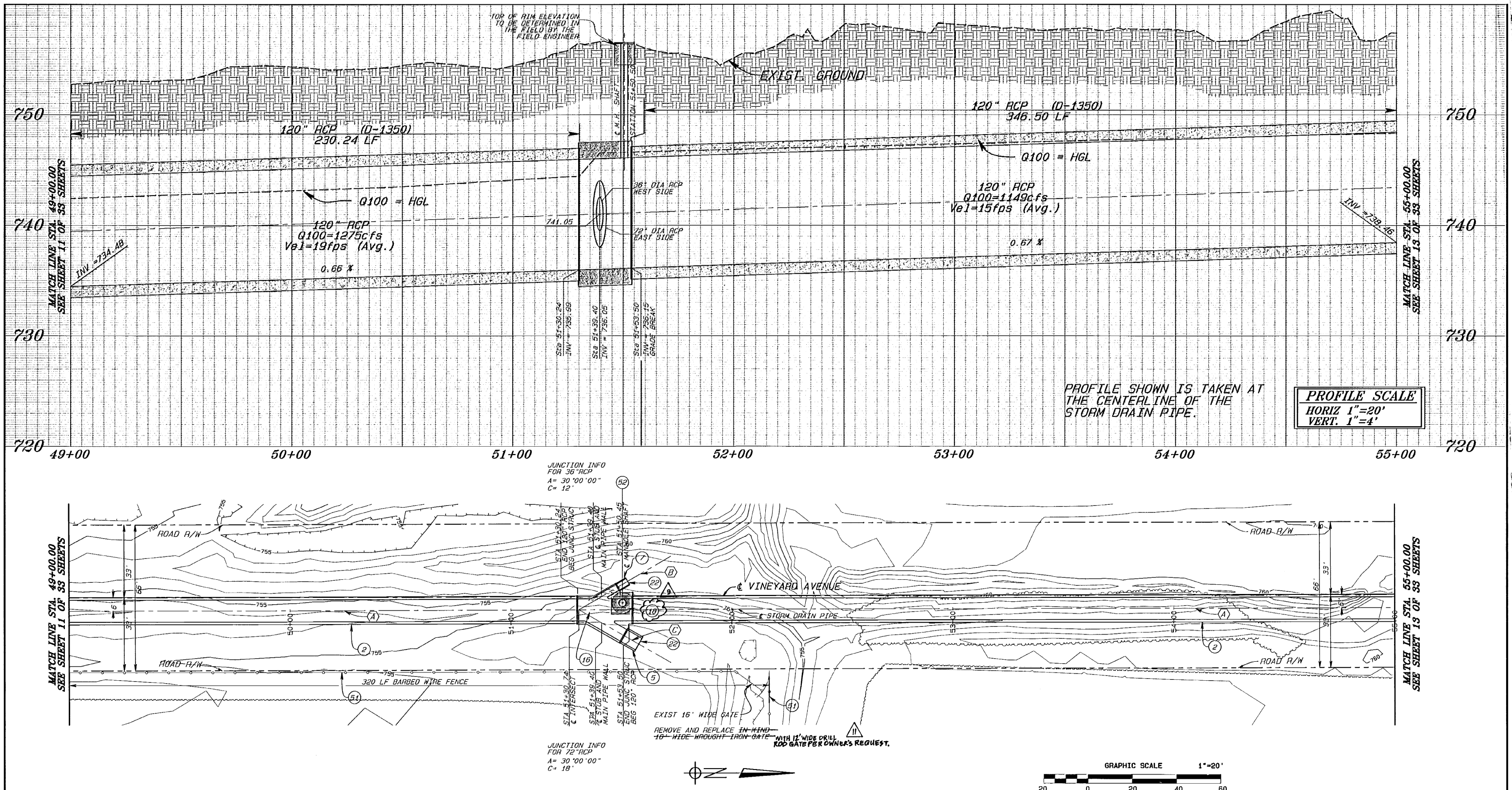
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

ONTARIO - CHINO SYSTEM

RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II
PHASE II
PLAN & PROFILE
STA 43+00 TO STA 49+00

DATE 1-31-02
F.B. REF. FB 4006 PG 1421
FILE NO. ~~1-910-00~~
SHEET. NO. 11 OF 34

1-909-03 20 of 43



CONSTRUCTION NOTES:

(2) INSTALL 120" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(5) INSTALL 72" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(7) INSTALL 36" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(16) CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 322-1.

(18) CONSTRUCT CONCRETE APRON PER DETAILS ON SHEET 31 OF 33 SHEETS.

(22) CONSTRUCT REINFORCED CONCRETE BULKHEAD PER MODIFIED RIVERSIDE COUNTY STD. PLAN M816

(51) REMOVE EXIST FENCE FOR CONST., REPLACE AFTER CONST., IN KIND.

(52) CONSTRUCT 36" 'MANHOLE SHAFT' PER A.P.W.A. STD PLAN 326-1. NON PRESSURE MANHOLE SHAFT.

CURVE / LINE DATA

	STATIONING FROM	STATIONING TO	DELTA/ BEARING	RAD	LENG/ DIST	TANG
A	49+00.00	55+00.00	N00°09'16"W		600.00'	
B	RCP STUB		N30°09'16"W		25.52'	
C	RCP STUB		N29°50'44"E		31.24'	

NOTE:
SEE SHEET 4 OF 33 FOR LOCATION OF CONSTRUCTION EASEMENTS

APPROVED RECORD DRAWING
[signature] RESIDENT ENGINEER 5/18/06 DATE

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER JAMES PATRICK BORCUK No. 41807 Exp 3/31/04 CIVIL STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:
△-9	10/20/0[illegible]	CHANGE ROUND APRONS TO 10' SQUARES.	S.G.
△-11	10/20/0[illegible]	12' WIDE DRILL ROD GATE INSTALLED PER OWNER'S REQUEST INSTEAD OF 16' GATE.	S.G.

SUBMITTED BY: [signature] CHIEF, ENGINEERING DIVISION 11/18/02 Date

RECOMMENDED BY: [signature] ASSIST. FLOOD CONTROL ENGINEER 11/19/02 Date

APPROVED BY: Ken A. Miller FLOOD CONTROL ENGINEER 11/19/02 Date

PROJ. ENG.	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	I.02A	R.H.

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

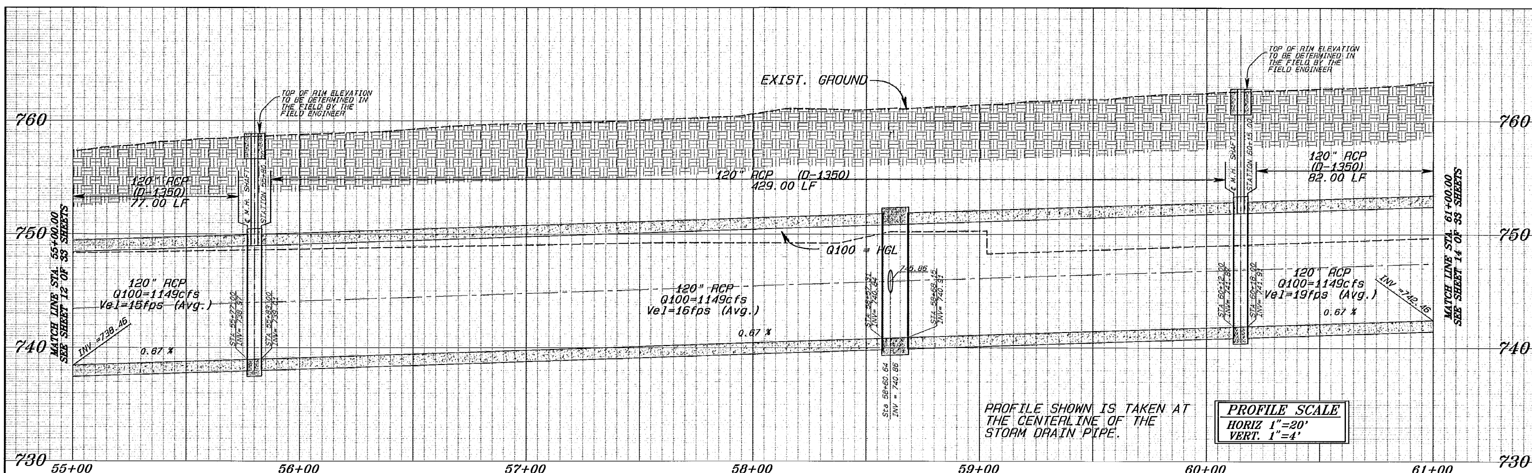
ONTARIO - CHINO SYSTEM

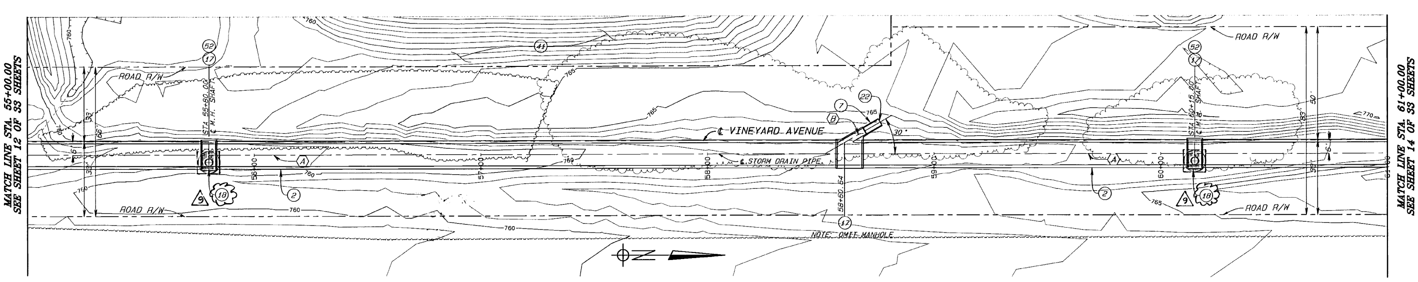
RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II

PHASE II
PLAN & PROFILE
STA 49+00 TO STA 55+00

DATE 1-31-02
F.B. REF. FB 4006 PG 1421
FILE NO. ~~1-910-00~~
SHEET NO. 12 OF 34

1-909-03 21 of 43





CURVE / LINE DATA

	STATIONING FROM	STATIONING TO	DELTA/ BEARING	RAD	LENG/ DIST	TANG
A	55+00.00	61+00.00	N00°09'16"W		600.00'	
B	STUB OUT		N30°19'16"W			

GRAPHIC SCALE 1"=20'
20 0 20 40 60

CONSTRUCTION NOTES:

(2)-INSTALL 120" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(7)-INSTALL 36" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(17)-CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 320-1.

(18)-CONSTRUCT CONCRETE APRON PER DETAILS ON SHEET 31 OF 33 SHEETS.

(22)-CONSTRUCT REINFORCED CONCRETE BULKHEAD PER MODIFIED RIVERSIDE COUNTY STD. PLAN M816

(41)-PROTECT IN PLACE NPDES PONDS.

(52)-CONSTRUCT 36" 'MANHOLE SHAFT' PER A.P.W.A. STD PLAN 326-1. NON PRESSURE MANHOLE SHAFT.

NOTE:
SEE SHEET 4 OF 33 FOR LOCATION OF CONSTRUCTION EASEMENTS

APPROVED RECORD DRAWING
RESIDENT ENGINEER 5/18/06 DATE

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER JAMES PATRICK BORCUK No. 41807 Exp. 3/31/04 CIVIL STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:
△- 9	10/20/05	CHANGE ROUND APRONS TO 10' SQUARES.	S.G.

SUBMITTED BY: Jim Borcuk, CHIEF, ENGINEERING DIVISION, 11/18/02 Date
RECOMMENDED BY: ASSIST. FLOOD CONTROL ENGINEER, 11/19/02 Date
APPROVED BY: Ken A. Miller, FLOOD CONTROL ENGINEER, 11/19/02 Date

PROJ. ENG.	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	LOZA	R.H.

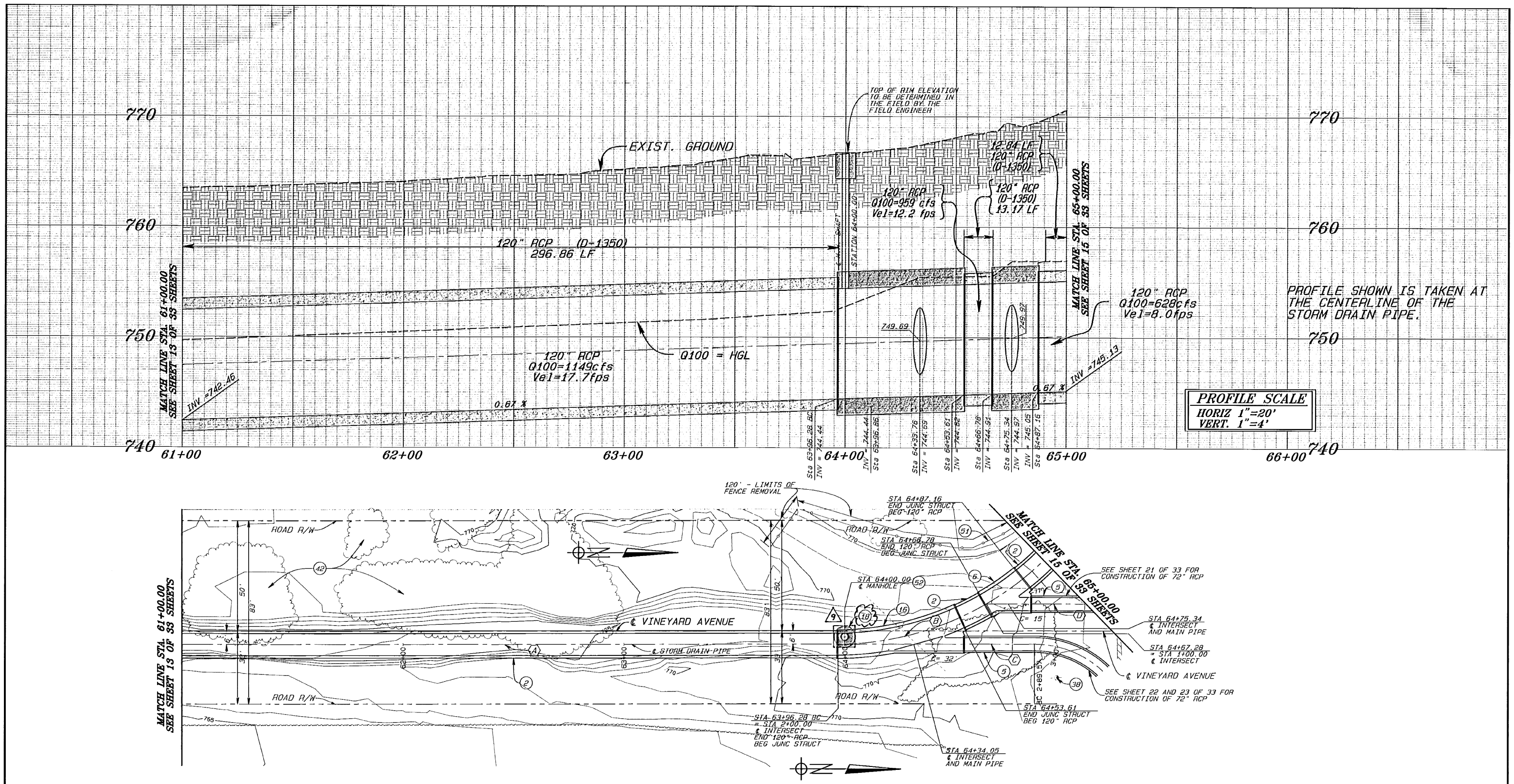
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

ONTARIO – CHINO SYSTEM

RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II
PHASE II
PLAN & PROFILE
STA 55+00 TO STA 61+00

DATE 1-31-02
F.B. REF. FB 4006 PG 1421
FILE NO. ~~1-910-00~~
SHEET NO. 13 OF 34

1-909-03 22 of 43



CONSTRUCTION NOTES:

(2)-INSTALL 120" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(5)-INSTALL 72" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(6)-CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 322-1. MODIFIED (OMIT MANHOLE).

(16)-CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 322-1.

(18)-CONSTRUCT CONCRETE APRON PER DETAILS ON SHEET 31 OF 33 SHEETS.

(38)-PROTECT EXISTING WOOD UTILITY POLE(s), IN PLACE.

(42)-REMOVE TREES AS NECESSARY FOR CONSTRUCTION.

(51)-REMOVE EXIST FENCE FOR CONST., REPLACE AFTER CONST., IN KIND.

(52)-CONSTRUCT 36" 'MANHOLE SHAFT' PER A.P.W.A. STD PLAN 326-1. NON PRESSURE MANHOLE SHAFT.

CURVE / LINE DATA

	STATIONING		DELTA/ BEARING	RAD	LENG/ DIST	TANG
	FROM	TO				
A	61+00.00	63+96.28 BC	N00°09'16"W		296.28'	
B	63+96.28 BC	65+00.00	44°01'12"	135.00'	103.72'	54.57'
C	2+00.00	STUB	N00°09'49"W			
D	1+00.00	STUB	N00°00'08"E			

GRAPHIC SCALE 1"=20'
20 0 20 40 60

NOTE:
SEE SHEET 4 OF 33 FOR LOCATION OF CONSTRUCTION EASEMENTS

APPROVED RECORD DRAWING
RESIDENT ENGINEER 3/18/06 DATE

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER JAMES PATRICK BORCUK No. 41807 Exp. 3/31/04 CIVIL STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:
△- 9	10/20/05	CHANGE ROUND APRONS TO 10' SQUARES.	S.G.

SUBMITTED BY: CHIEF, ENGINEERING DIVISION 11/18/02 Date
RECOMMENDED BY: Vana R. Olson ASSIST. FLOOD CONTROL ENGINEER 11/19/02 Date
APPROVED BY: Ken A. Miller FLOOD CONTROL ENGINEER 11/19/02 Date

PROJ. ENG.	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	LOZA	R.H.

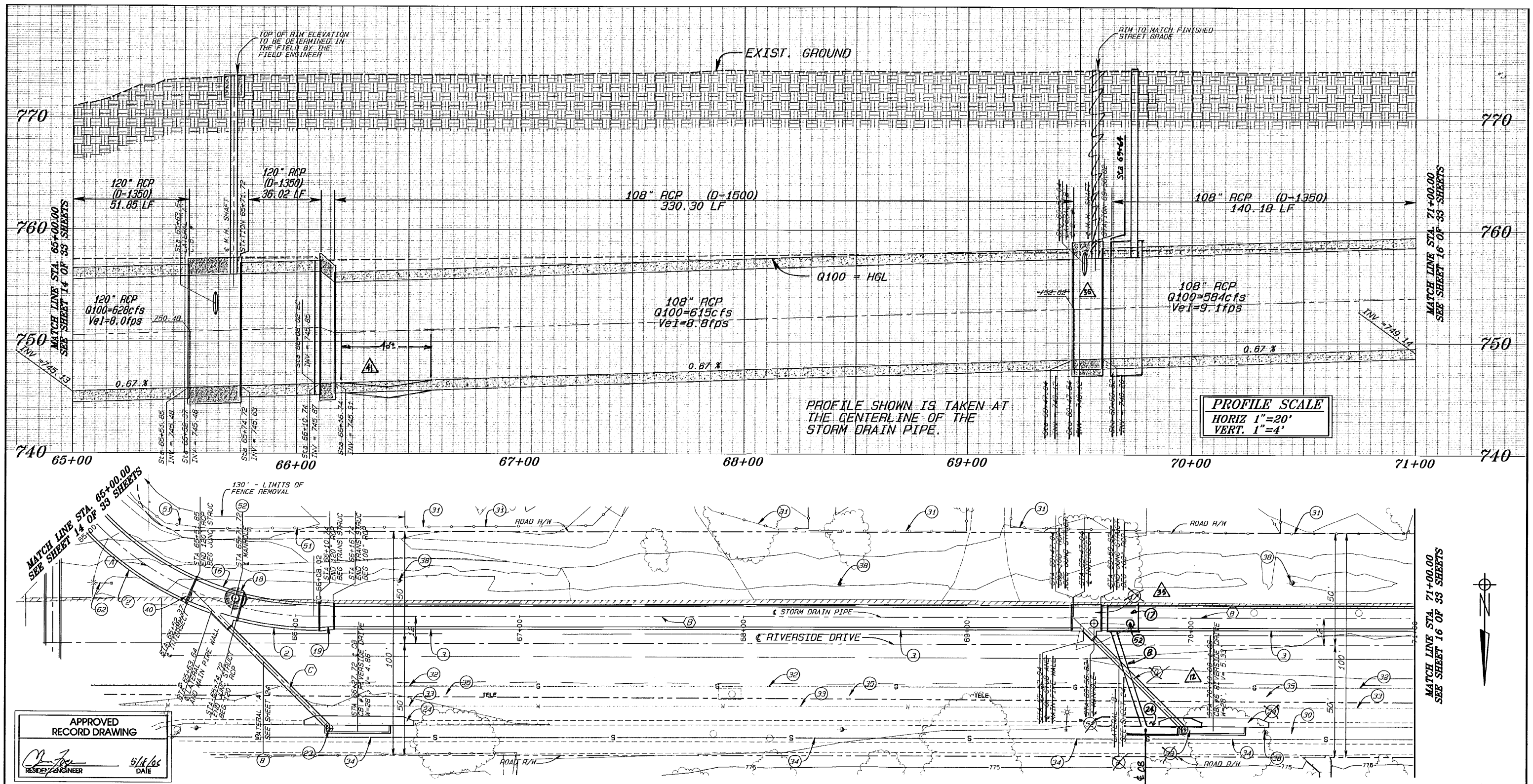
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

ONTARIO - CHINO SYSTEM

RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II
PHASE II
PLAN & PROFILE
STA 61+00 TO STA 65+00

DATE 1-31-02
F.B. REF. FB 4006 PG 1421
FILE NO. 1-910-00
SHEET NO. 14 OF 34

1-909-03 23 of 43



APPROVED RECORD DRAWING

RESIDENT ENGINEER 5/16/06 DATE

CONSTRUCTION NOTES:

(2)-INSTALL 120" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(3)-INSTALL 108" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(8)-INSTALL 24" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(16)-CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 322-1.

(17)-CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 320-1.

(18)-CONSTRUCT CONCRETE APRON PER DETAILS ON SHEET 31 OF 33 SHEETS.

(19)-CONSTRUCT TRANSITION STRUCTURE PER A.P.W.A. STD. PLAN 340-1.

(23)-CONSTRUCT CURB OPENING CATCH BASIN PER A.P.W.A. STD. PLAN 300-2

(24)-CONSTRUCT LOCAL DEPRESSION AT CATCH BASINS PER A.P.W.A. STD. PLAN 313-1 (CASE-A)

(30)-PARKWAY DRAIN AND UNDER SIDEWALK DRAIN, PROTECT IN PLACE.

CONSTRUCTION NOTES CONT.:

(33)-PROTECT EXISTING WATER LINE(S) IN PLACE

(34)-PROTECT EXISTING SEWER LINE(S) IN PLACE

(35)-PROTECT EXISTING TELEPHONE LINE(S) IN PLACE

(31)-PROTECT EXISTING FENCE(S) IN PLACE

(32)-PROTECT EXISTING GAS LINE(S) IN PLACE

CONSTRUCTION NOTES CONT.:

(38)-PROTECT EXISTING WOOD UTILITY POLE(s), IN PLACE.

(51)-REMOVE EXIST FENCE FOR CONST., REPLACE AFTER CONST., IN KIND.

(52)-CONSTRUCT 36" 'MANHOLE SHAFT' PER A.P.W.A. STD PLAN 326-1. NON PRESSURE MANHOLE SHAFT.

(62)-TEMPORALLY RELOCATE TRAFFIC SIGNAL.

STA 96+80 ℄ CB #6 (23)

CURVE / LINE DATA

	STATIONING FROM	STATIONING TO	DELTA/ BEARING	RAD	LENG/ DIST	TANG
(A)	65+00.00	66+08.02 EC	45°50'42"	135.00'	108.02'	57.09'
(B)	66+08.02 EC	71+00.00	S89°58'54"W		491.98'	
(C)	LATERAL "A"		S89°58'54"W	——	——	——
~~(D)~~	LATERAL "B"		~~S89°58'54"W~~	——	——	——

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER JAMES PATRICK BORCUK No. 41807 Exp. 3/31/04 CIVIL STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:
△-12	10/20/05	LOCATION CHANGED TO STA 69+80 FOR CB#6 DUE TO TREE.	S.G.
△-35	10/20/05	LOCATION CHANGED TO STA 69+64 FOR JS PLANNED AT STA 69+47.04.	S.G.
△-41	10/20/05	40'± LONG DIP SECTION: 6"± DEEP AT MIDPOINT (STA 66+40).	S.G.

SUBMITTED BY: Jim Borcuk 11/18/02 CHIEF, ENGINEERING DIVISION Date

RECOMMENDED BY: Vana R. Olson 11/19/02 ASSIST. FLOOD CONTROL ENGINEER Date

APPROVED BY: Ken A. Miller 11/19/02 FLOOD CONTROL ENGINEER Date

PROJ. ENG.	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	LOZA	R.H.

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

ONTARIO - CHINO SYSTEM

RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II
PHASE II
PLAN & PROFILE
STA 65+00 TO STA 71+00

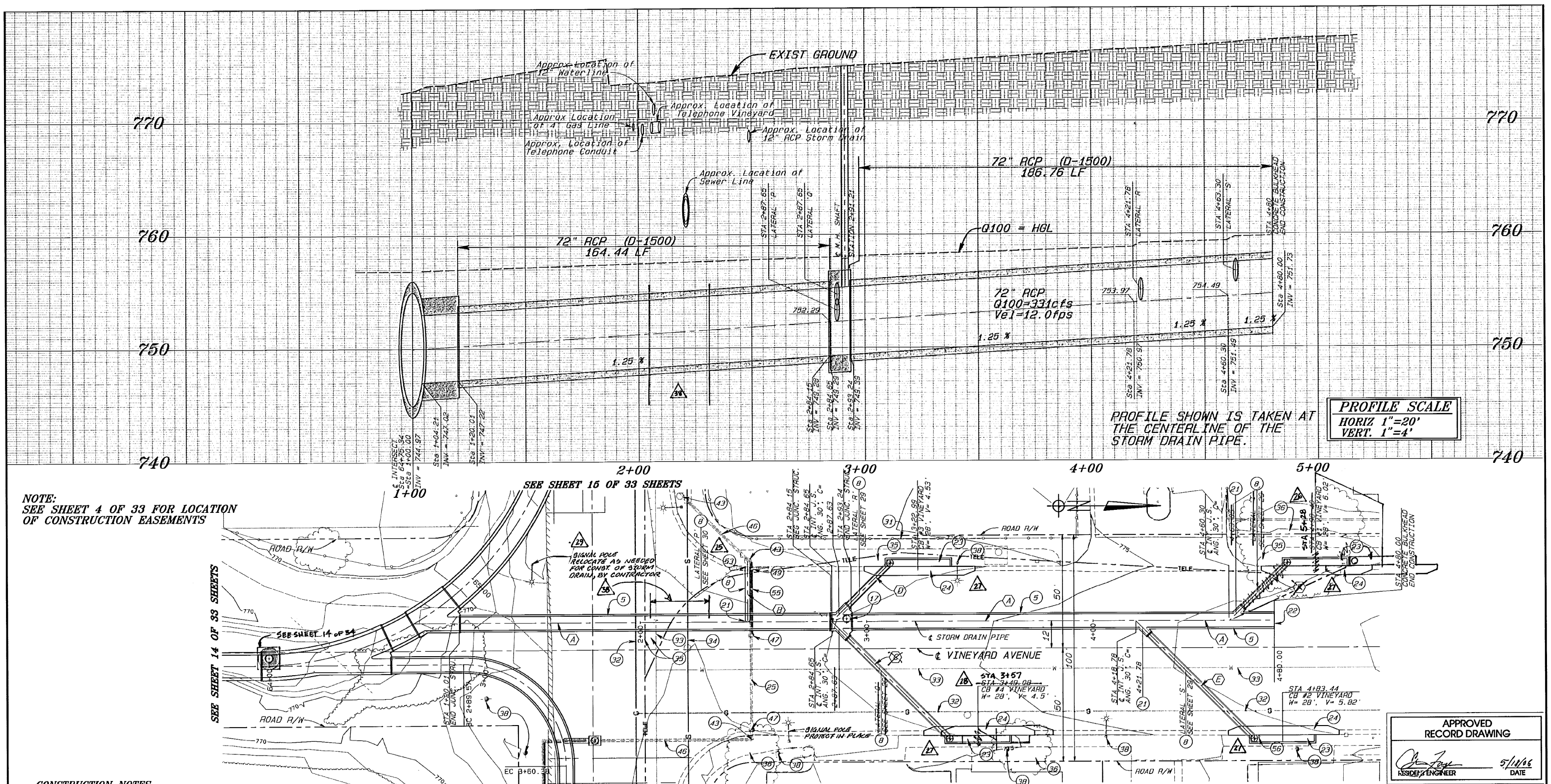
DATE 1-31-02

F.B. REF. FB 4006 PG 1421

FILE NO. ~~1-910-00~~

SHEET. NO. 15 OF 34

1-909-03 24 of 43



APPROVED
RECORD DRAWING
RESIDENT ENGINEER 5/18/06
DATE

GRAPHIC SCALE 1"=20'
20 0 20 40 60

CONSTRUCTION NOTES

(5)-INSTALL 72" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)
(8)-INSTALL 24" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)
(17)-CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 320-1.
(22)-CONSTRUCT REINFORCED CONCRETE BULKHEAD PER MODIFIED RIVERSIDE COUNTY STD. PLAN M816
(25)-FILL EXISTING 12" RCP WITH GROUT AND ABANDON IN PLACE.
(21)-CONSTRUCT JUNCTION STRUCTURE PER APWA STD PLAN 331-2
(23)-CONSTRUCT CURB OPENING CATCH BASIN PER A.P.W.A. STD. PLAN 300-2
(31)-PROTECT EXISTING FENCE(S) IN PLACE
(32)-PROTECT EXISTING GAS LINE(S) IN PLACE
(33)-PROTECT EXISTING WATER LINE(S) IN PLACE
(34)-PROTECT EXISTING SEWER LINE(S) IN PLACE

CONSTRUCTION NOTES CONT.

(35)-PROTECT EXISTING TELEPHONE LINE(S) IN PLACE
(36)-PROTECT EXISTING TREE(s) IN PLACE.
(38)-PROTECT EXISTING WOOD UTILITY POLE(s), IN PLACE.
(43)-PROTECT EXISITING CATCH BASIN IN PLACE.
(46)-PROTECT 12" RCP IN PLACE

CONSTRUCTION NOTES CONT.

(47)-CONSTRUCT CONCRETE PLUG IN EXISTING 12" RCP.
(49)-PLUG EXISTING 12" OPENING IN CATCH BASIN.
(53)-CONNECT 24" RCP TO EXISTING CATCH BASIN.
(55)-REMOVE AND DISPOSE OF EXIST 12" RCP.
(56)-RELOCATE STREET SIGN AS DIRECTED IN THE FIELD.

CURVE / LINE DATA

	STATIONING FROM	STATIONING TO	DELTA/ BEARING	RAD	LENG/ DIST	TANG
(A)	1+00.00	4+80.00	N0°00'08"E		380.00'	
(B)	LATERAL "P"		N89°59'52"W	—	—	—
(C)	LATERAL "Q"		~~N45°00'08"E~~	—	—	—
(D)	LATERAL "R"		N44°59'52"W	—	—	—
(E)	LATERAL "S"		N45°00'08"E	—	—	—
(F)	LATERAL "T"		~~N44°59'52"W~~	—	—	—

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER JAMES PATRICK BORCUK No. 41807 Exp. 3/31/04 CIVIL STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:
△-29	10/20/05	REMOV'D & RESET POLE PER DIRECTION BY CITY, POUR'D NEW FOUNDATION.	S.G.
△-38	10/20/05	72" RCP JACKED UNDER RIVERSIDE DR.	S.G.
△-25	10/20/05	FORM'D & POUR'D PCC FOR 24" RCP LAT. OVER EXISTING 12" WATER LINE.	S.G.
△-26	10/20/05	MOVED CB#1 FROM 4+98.40 TO 5+28 DUE TO TREE.	S.G.
△-27	10/20/05	CITY ELEC. CONDUITS REROUTED AROUND BACK OF CB. (CONDUITS NOT SHOWN)	S.G.
△-28	10/20/05	MOVED CB#4 FROM 3+49.08 TO 3+57 DUE TO EXISTING WATER LINE.	S.G.

SUBMITTED BY: Jim Borcuk 11/18/02
CHIEF, ENGINEERING DIVISION Date

RECOMMENDED BY: 11/19/02
ASSIST. FLOOD CONTROL ENGINEER Date

APPROVED BY: Ken A. Miller 11/19/02
FLOOD CONTROL ENGINEER Date

PROJ. ENG.	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	I.OZA	R.H.

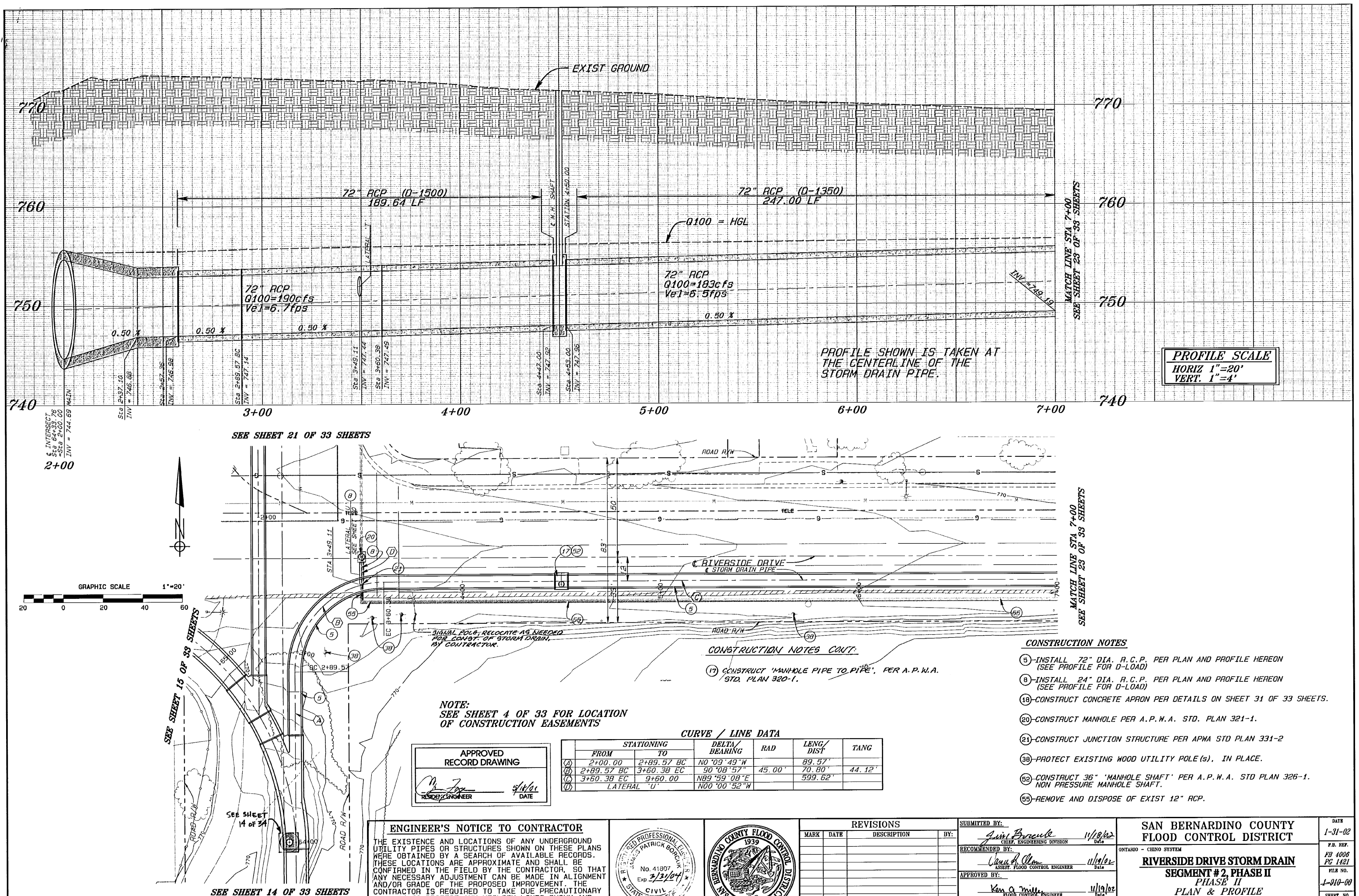
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

ONTARIO – CHINO SYSTEM

RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II
PHASE II
PLAN & PROFILE
VINEYARD AVENUE LATERAL SD
FROM STA 1+00 TO STA 4+80

DATE 1-31-02
F.B. REF. FB 4006 PG 1421
FILE NO. ~~1-910-00~~
SHEET. NO. 21 OF 34

1-909-03 30 of 43



CONSTRUCTION NOTES CONT:

(17) CONSTRUCT 'MANHOLE PIPE TO PIPE', PER A.P.W.A. STD. PLAN 320-1.

NOTE:
SEE SHEET 4 OF 33 FOR LOCATION OF CONSTRUCTION EASEMENTS

CURVE / LINE DATA

	STATIONING FROM	STATIONING TO	DELTA/ BEARING	RAD	LENG/ DIST	TANG
A	2+00.00	2+89.57 BC	N0°09'49"W		89.57'	
B	2+89.57 BC	3+60.38 EC	90°08'57"	45.00'	70.80'	44.12'
C	3+60.38 EC	9+60.00	N89°59'08"E		599.62'	
D	LATERAL 'U'		N00°00'52"W			

APPROVED RECORD DRAWING
RESIDENT ENGINEER 5/18/01 DATE

CONSTRUCTION NOTES

(5)-INSTALL 72" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(8)-INSTALL 24" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(18)-CONSTRUCT CONCRETE APRON PER DETAILS ON SHEET 31 OF 33 SHEETS.

(20)-CONSTRUCT MANHOLE PER A.P.W.A. STD. PLAN 321-1.

(21)-CONSTRUCT JUNCTION STRUCTURE PER APWA STD PLAN 331-2

(38)-PROTECT EXISTING WOOD UTILITY POLE(s). IN PLACE.

(52)-CONSTRUCT 36" 'MANHOLE SHAFT' PER A.P.W.A. STD PLAN 326-1. NON PRESSURE MANHOLE SHAFT.

(55)-REMOVE AND DISPOSE OF EXIST 12" RCP.

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER JAMES PATRICK BORCUK No. 41807 Exp. 3/31/04 CIVIL STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT 1939 CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY: CHIEF, ENGINEERING DIVISION 11/18/02 Date
RECOMMENDED BY: ASSIST. FLOOD CONTROL ENGINEER 11/19/02 Date
APPROVED BY: FLOOD CONTROL ENGINEER 11/19/02 Date

PROJ. ENG.	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	LOZA	R.H.

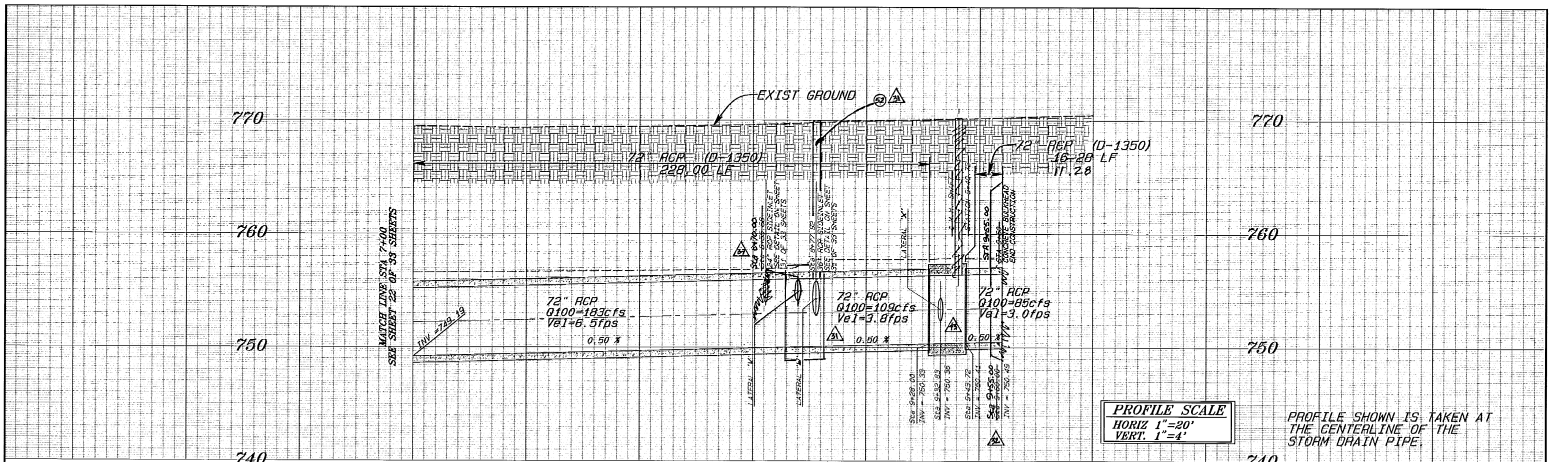
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

ONTARIO - CHINO SYSTEM

RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II
PHASE II
PLAN & PROFILE
RIVERSIDE DRIVE LATERAL SD
FROM STA 2+00 TO STA 7+00

DATE 1-31-02
F.B. REF. FB 4006 PG 1421
FILE NO. 1-910-00
SHEET NO. 22 OF 34

1-909-03 31 of 43



CONSTRUCTION NOTES

(5)-INSTALL 72" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(7)-INSTALL 36" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(8)-INSTALL 24" DIA. R.C.P. PER PLAN AND PROFILE HEREON (SEE PROFILE FOR D-LOAD)

(17)-CONSTRUCT MANHOLE JUNCTION PER A.P.W.A. STD. PLAN 320-1.

(20)-CONSTRUCT MANHOLE PER A.P.W.A. STD. PLAN 321-1.

(21)-CONSTRUCT JUNCTION STRUCTURE PER APWA STD PLAN 331-2

(22)-CONSTRUCT REINFORCED CONCRETE BULKHEAD PER MODIFIED RIVERSIDE COUNTY STD. PLAN M816

(23)-CONSTRUCT CURB OPENING CATCH BASIN PER A.P.W.A. STD. PLAN 300-2

(24)-CONSTRUCT LOCAL DEPRESSION AT CATCH BASINS PER A.P.W.A. STD. PLAN 313-1 (CASE-A)

(32)-PROTECT EXISTING GAS LINE(S) IN PLACE

(33)-PROTECT EXISTING WATER LINE(S) IN PLACE

(34)-PROTECT EXISTING SEWER LINE(S) IN PLACE

(35)-PROTECT EXISTING TELEPHONE LINE(S) IN PLACE

(38)-PROTECT EXISTING WOOD UTILITY POLE(s), IN PLACE.

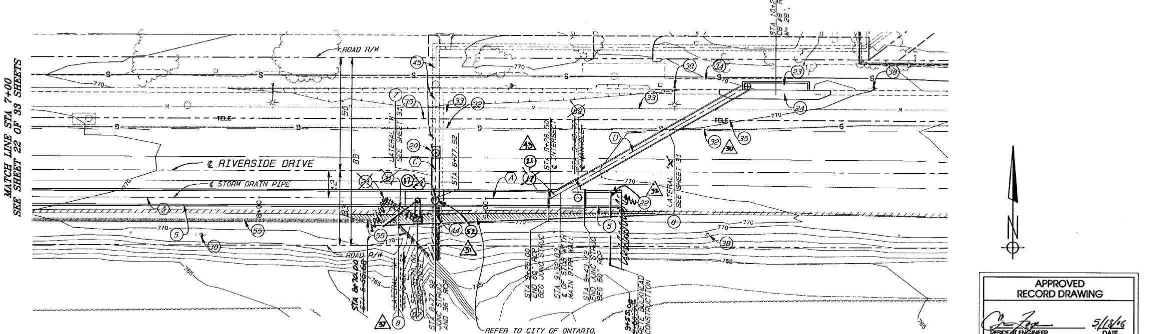
(44)-REMOVE AND DISPOSE OF EXISTING 36" CSP.

(45)-PROTECT EXISTING 36" CSP IN PLACE.

(52)-CONSTRUCT 36" 'MANHOLE SHAFT' PER A.P.W.A. STD PLAN 326-1. NON PRESSURE MANHOLE SHAFT.

(55)-REMOVE AND DISPOSE OF EXIST 12" RCP.

(57)-CONSTRUCT DROP INLET PER CALTRANS STD. D73, TYPE G1.



CURVE / LINE DATA

	STATIONING FROM	STATIONING TO	DELTA/ BEARING	RAD	LENG/ DIST	TANG
(A)	7+00.00	9+60.00	N89°59'08"E		260.00'	
(B)	LATERAL "V"		S60°00'52"E	—	—	—
(C)	LATERAL "W"		N00°00'52"W	—	—	—
(D)	LATERAL "X"		N59°59'08"E	—	—	—

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURE TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER — JAMES PATRICK BORCUK — No. 41807 — Exp. 3/31/04 — CIVIL — STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT — 1939 — CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:
△-30	10/20/05	2 EA.-POURED COLLARS ALONG LAT. 'X' DUE TO EXISTING TEL & GAS LINES.	S.G.
△-31	10/20/05	LOCATION CHANGED TO STA 8+77.92 FOR JS & MH PLANNED AT STA 9+40.72.	S.G.
△-32	10/20/05	END 72" RCP CONSTRUCTION AT STA 9+55	S.G.
△-37	10/20/05	INSTALL LAT. 'V' & COLLAR IN JS AT STA 8+70.	S.G.
△-43	10/20/05	CHNG JS TYPE TO APWA 331-2.	S.G.

SUBMITTED BY: Jim Borcuk, CHIEF, ENGINEERING DIVISION — 11/18/02 Date

RECOMMENDED BY: Jane R. Olson, ASSIST. FLOOD CONTROL ENGINEER — 11/19/02 Date

APPROVED BY: Ken A. Miller, FLOOD CONTROL ENGINEER — 11/19/02 Date

PROJ. ENG.	DES. BY:	REV'D BY:	DRAWN BY:
MM	R.M.H.	LOZA	R.H.

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

ONTARIO - CHINO SYSTEM

RIVERSIDE DRIVE STORM DRAIN
SEGMENT # 2, PHASE II
PHASE II
PLAN & PROFILE
RIVERSIDE DRIVE LATERAL SD
FROM STA 7+00 TO STA 9+60

DATE 1-31-02
F.B. REF. FB 4006 PG 1421
FILE NO. 1-910-00
SHEET NO. 23 OF 34

1-909-03 32 of 43

Appendix C. ORSC Geotechnical Investigation

Appendix

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GEOTECHNICAL INVESTIGATION
FOR
ONTARIO SPORTS PARK
SE CORNER OF EAST RIVERSIDE DR AND ONTARIO AVE
ONTARIO, CA

for

City of Ontario
1425 S Bon View Ave.
Ontario, CA 91761

April 16, 2024

00-232255-01

RMA Group
Every *Project* **Matters** | www.rmacompanies.com

April 16, 2024

City of Ontario
1425 S Bon View Ave.
Ontario, CA 91761

Attention: Daniel Beers, Design & Construction – Principal Project Manager

Subject: Geotechnical Investigation for
Ontario Sports Park
SE Corner of East Riverside Dr and Ontario Ave
Ontario, CA

Dear Mr. Beers:

In accordance with your request, a geotechnical investigation has been completed for the above referenced project. The report addresses both engineering geologic and geotechnical conditions. The results of the investigation are presented in the accompanying report, which includes a description of site conditions, results of our field exploration, laboratory testing, conclusions, and recommendations.

We appreciate this opportunity to be of continued service to you. If you have any questions regarding this report, please do not hesitate to contact us at your convenience.

Respectfully submitted,

RMA Group

Ken Dowell, PG, CEG
Project Geologist
CEG 2470

PROFESSIONAL GEOLOGIST
KENNETH R. DOWELL
No. 2470
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Haitham Dawood, PhD|PE|GE
Engineering Manager
GE 3227

REGISTERED PROFESSIONAL ENGINEER
HAITHAM DAWOOD
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GEOTECHNICAL
STATE OF CALIFORNIA

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APPENDICES

1.00 INTRODUCTION

1.01 Purpose

A draft geotechnical investigation has been completed for the proposed Sports Park to be located at the southeast corner of Vineyard Avenue and East Riverside Drive in the City of Ontario, California, California. The purpose of the investigation was to summarize geotechnical and geologic conditions at the site, to assess their potential impact on the proposed development, and to develop geotechnical and engineering geologic design parameters.

The area of the project east of Ontario Avenue was not accessible for exploration at the date of this report.

1.02 Scope of the Investigation

The general scope of this investigation included the following:

- Review of published and unpublished geologic, seismic, groundwater and geotechnical literature.
- Examination of aerial photographs.
- Contacting of underground service alert to locate onsite utility lines.
- Logging, sampling and backfilling of 17 exploratory borings drilled with a CME-75 drill rig for this portion of the project.
- Logging, sampling and backfilling of 8 exploratory trenches excavated with a tractor mounted backhoe.
- Performance of 4 soil infiltration tests in accordance with the borehole method and 2 with the double ring infiltrometer method as detailed in the San Bernardino County Technical Guidance for Water Quality Management Plans.
- Laboratory testing of representative soil samples.
- Geotechnical evaluation of the compiled data.
- Preparation of this report presenting our findings, conclusions and recommendations.

Our scope of work did not include a preliminary site assessment for the potential of hazardous materials onsite.

1.03 Site Location and Description

The proposed sports Park will be located at the southeast corner of southeast corner of East Riverside Drive and Vineyard Avenue in the southeast portion of the City of Ontario, San Bernardino County, California. Ontario Avenue crosses the site. A proposed baseball stadium and parking structure is located in the northeast portion of the overall site, athletic fields are proposed for most of the west and south portions of the site. A gymnasium and sport academy buildings are planned in the southeast corner of the site.

The site is bounded by East Riverside Drive to the north, the Cucamonga Creek Channel to the east, Chino Avenue to the south and, a nursery, and RV and boat storage property, and agricultural fields to the west (Figure 1). Its geographic position is at Latitude 34.017890° and Longitude -117.604962°. Elevation range from 750 to 780 feet above sea level.

1.04 Current and Past Land Usage

The site is currently utilized for various purposes. A dairy is located in the northeast part, agricultural fields are located on the south half of the site and an unused field is located in the northwest portion of the site. The dairy includes animal pens, a milk barn, other structures used for residences, office, equipment and feed storage. The pens are surrounded by metal pipe fencing and there are additional perimeter and some interior barbed wire fencing. The portion of the site between Ontario Avenue and the Cucamonga Creek Channel is used for nurseries, a few residential structures and horse stables. Five basins used to hold dairy water is located south of the dairy. The basins are surrounded by earthen berms. An earthen berm is located at the south end of the site, along Chino Avenue. Three dry basins surrounded by earthen berms are also located in the southeast corner of the site. The remaining portion of the site west of Ontario Avenue has been used most recently for agriculture. The southern half of the site was used to grow crops such as corn and the northwest quarter has been fallowed.

Historically, the site was used as orchards and agricultural fields since before 1938 until the late 1950's and early 1960's when the dairy was constructed. Based on aerial photographs the dairy operated up until 2013 then was vacant until it was reactivated in 2021. The east half of the current dairy was at this time used to house and train racehorses. The area south of the existing dairy basins was previously used for holding and dispersal of dairy water. Based upon the aerial photographs and conditions encountered in our exploratory borings and trenches, this area contained water periodically at depths of only a few feet deep. The basins were created using small berms wiped out by plowing after 2013 of the area for planting of crops. The existing basins had included small berms along the southern sides during the earlier dairy operations. During the most recent dairy operations, the southern portion of the basin berms were strengthened and created their current configuration.

The portion of the site east of Ontario Avenue had a dairy constructed on the north half in the late 1950's. A few residential structures and agricultural fields appear in the south half in the 1980's. The current nursery appears in the 2010's on the north half of this area. The south half of this area is currently used for three residential properties, a stable and vehicle storage.

1.05 Planned Usage

It is our understanding that the proposed construction will consist of a minor league baseball stadium, a hotel, two parking structures, a gymnasium building, athletic academy, community center buildings, community pool, a skate park retail structures, several sports fields including soccer, baseball and tennis courts and associated surface paved parking and roads.

Our investigation was performed prior to the preparation of grading or foundation plans. To aid in preparation of this report, we utilized the following assumptions:

- Maximum foundation loads of 2 to 3 kips per linear foot for continuous footings and 50 kips for isolated spread footings. As foundation loads are known they should be provided to determine if revised recommendations would be needed.
- Cuts and fills will be less than 5 feet except in the area of the baseball stadium where excavation of up to 20 feet is proposed.

1.06 Investigation Methods

Our investigation consisted of office research, field exploration, laboratory testing, review of the compiled data, and preparation of this report. It has been performed in a manner consistent with generally accepted engineering and geologic principles and practices, and has incorporated applicable requirements of California Building Code. Definitions of technical terms and symbols used in this report include those of the ASTM International, the California Building Code, and commonly used geologic nomenclature.

Technical supporting data are presented in the attached appendices. Appendix A presents a description of the methods and equipment used in performing the field exploration and logs of our subsurface exploration. Appendix B presents a description of our laboratory testing and the test results. Standard grading specifications and references are presented in Appendices C and D, respectively.

2.00 FINDINGS

2.01 Geologic Setting

The site is located on a deep structural depression known as the upper Santa Ana River Valley. According to Fife and others (1976), the alluvial deposits beneath the site are approximately 700 to 900 feet thick and rest on a basement of granitic bedrock.

The upper Santa Ana River Valley is bordered by the San Gabriel Mountains and the active Cucamonga fault to the north, and the Puente Hills and potentially active Chino fault to the west. To the south are the Jurupa Mountains and other resistant granitic and metamorphic hills. The eastern boundary of the valley is the San Bernardino Mountains and the active San Andreas fault.

According to regional geologic mapping by Bedrossian, Hayhurst and Roffers (2010), the site is underlain by Holocene to late Pleistocene age young eolian and dune deposits (Figure 2).

2.02 Earth Materials

Our subsurface investigation encountered manure and manure impacted soil, asphalt, concrete, artificial fill and alluvium.

The manure and manure impacted soils were encountered and observed in the animal pens. The manure and manure impacted soils thickness ranged from only a few inches up to a couple feet. The manure and manure impacted soils were thicker along the edges of the pens and, particularly, between the feed aisle and shade structures in the pens where the cows congregate. Actual thickness of the manure and manure impacted soils will vary. It is typical that dairy operators will drag the pens to limit wet manure buildup by redistributing the surface by dragging the surface and moving areas of wet manure. They will also typically remove manure buildup prior to winter and then again after winter. The areas of thicker manure are the pens used for the dairy cows. The pens not used for dairy cows have thinner amounts of manure. The basins should be expected to include manure impacted soil at their bottom, but how much is unknown at this time since the basins contained water at the time of our field investigation and thus inaccessible.

Thin areas of manure were also encountered in the southeastern field area where the former shallow basing were located. The manure and organic matter encountered was within the upper 2 feet of the soil and most likely buried as part of the plowing of the fields as part of the agriculture operations in this area.

Asphalt was observed as pavement throughout the dairy and is three to four inches or less in thickness. The concrete was observed and encountered as pavement, particularly in the feed aisles between the pens. The concrete pavement is assumed to be six to eight inches thick. Other area of concrete pavement was found to be three to four inches thick.

Artificial fill was encountered consisting of gray silty sand in the pens that was encountered under the manure and was about a foot thick. This fill is expected to range from a few inches to up to three feet in the pens. The fill was placed to create drainage in the pens away from the feed aisles to the rear of the pens. Artificial fill was also encountered in the. Artificial fill was also observed as earthen berm around the basins and in the southern portion of the site. The soil in the berms appears to be excavated from the basins and is similar to the alluvial soil.

Alluvial soils encountered in our borings and observed around the site consisted of consisted of light brown to grayish-brown, gray and brown silty fine sand to sand with silt with thin layers of clay, sandy silt and trace to minor amounts of gravel. Isolated filled old stream channels were also encountered where layers of sand were encountered in a boring, but these sand layers were not continuous across the site between borings. The areas were sand with silt was encountered was in Boring B-12 at depths below 8 feet and Boring B-24 at depths 25 feet. This variation in stratigraphy is typical of alluvial depositional environments.

The subsurface soils encountered in the exploratory borings drilled at the site are described in greater detail on the logs contained in Appendix A.

2.03 Expansive Soils

Expansion testing performed in accordance with ASTM D4829 indicates that earth materials underlying the site have an expansion classification of very low.

Results of expansion test and other soil index tests are presented in Appendix B. Since site grading will redistribute earth materials, potential expansive properties should be verified at the completion of rough grading.

2.04 Surface and Groundwater Conditions

Areas of ponding or standing water were present at the time of our study. Standing water was observed within the dairy wash ponds located in the east center of the site. Based upon the topography of the site, the depth of water within the basins is expected to be less than 10 feet. Water within these basins is from runoff of wash water from the milk barn and not surface expression of groundwater levels and subsurface infiltration from the basins is expected to yield very limited saturated soils around the base of the basins, particularly south of the basins due to the natural gradient of the site. Since the basins will be pumped dry and filled with engineered fill, the water in the basins will not affect the proposed development. Other areas of local standing water were observed around the site after rainstorms and were only a foot or less deep. These areas included the lower ends of the dairy pens and the southern ends of the fields.

No springs or areas of natural seepage were found. According to Carson and Matti, 1985, the depth to groundwater beneath the project is ranges from 150 to 175 feet below the ground surface. A water well (State well 340045N1176407W001) located about 2 miles southwest of the site had a groundwater measurement on April 14, 2022 of 136 feet below the ground surface. The ground surface elevation at the well is 30 to 60 feet below the site, therefore the depth to groundwater based on the well measurement would be about 160 to 190 feet below the ground surface.

2.05 Faults

The site is not located within the boundaries of an Earthquake Fault Zone for fault-rupture hazard as defined by the Alquist-Priolo Earthquake Fault Zoning Act and no faults are known to pass through the property. The nearest Earthquake Fault Zone is located about 7 miles to the west of the site along the Chino Central Avenue fault.

The nearest fault is the Chino Central Avenue fault located approximately 7 miles to the west.

The accompanying Regional Fault Map (Figure 4) illustrates the location of the site with respect to major faults in the region. The distance to notable faults within 100 kilometers of the site is presented on Table 1.

2.06 Historic Seismicity

The nearest historic strong earthquakes were epicentered within about 18 miles from the site. They were the 6.0 magnitude San Bernardino Earthquake that occurred in 1923 on the San Jacinto Fault and the 6.0 magnitude that occurred in the San Bernardino area in 1858. Historic strong earthquakes in the southern California region are summarized on Table 2.

Strong earthquakes that have occurred in this region in historic time and their approximate epicentral distances are summarized in Table 2.

2.07 Flooding Potential

According to the Federal Emergency Management Agency (F.I.R.M. Map No. 06071C8638H, dated August 28, 2008) the site is located in a flood hazard zone designated Zone X with 0.2 percent annual chance flood hazard, typically referred to a 500-year flood zone.

Control of surface runoff originating from within and outside of the site should, of course, be included in design of the project.

2.08 Landslides

Due to the low gradient of the site and surrounding area, landsliding is not a hazard at this property.

3.00 Conclusions and Recommendations

3.01 General Conclusion

Based on specific data and information contained in this report, our understanding of the project and our general experience in engineering geology and geotechnical engineering, it is our professional judgment that the proposed development is geologically and geotechnically feasible. This is provided that the recommendations presented below are fully implemented during design, grading and construction.

3.02 General Earthwork and Grading

All grading should be performed in accordance with the General Earthwork and Grading Specifications outlined in Appendix C, unless specifically revised or amended below. Recommendations contained in Appendix C are general specifications for typical grading projects and may not be entirely applicable to this project.

It is also recommended that all earthwork and grading be performed in accordance with Appendix J of the 2022 California Building Code and all applicable governmental agency requirements. In the event of conflicts between this report and Appendix J, this report shall govern.

3.03 Earthwork Shrinkage and Subsidence

Shrinkage is the decrease in volume of soil upon removal and recompaction expressed as a percentage of the original in-place volume. Subsidence occurs as natural ground is densified to receive fill. These factors account for changes in earth volumes that will occur during grading. Our estimates are as follows:

- Shrinkage factor = 7% - 15% for soil removed and replaced as compacted fill based upon insitu relative compaction of the soil at the date of this report. This may vary depending upon moisture content of the soil and vegetation cover at the time of grading. Soil within the upper 2 feet of the surface will have larger shrinkage due to the use of most of the western and southern areas for agriculture that included regular plowing of the soil. Depending upon the conditions at the site prior to grading, shrinkage may increase if there is a heavy cover of weeds and other vegetation that may require removal of the upper 1 to 2 feet due to roots of the plants. The soil located in the berms should be assumed to have much higher shrinkage numbers, closer to 20 to 30 percent depending upon compaction of the soil in the berm.
- Subsidence factor = 0.15 foot.

The degree to which fill soils are compacted and variations in the insitu density of existing soils will influence earth volume changes. Consequently, some adjustments in grades near the completion of grading could be required to balance the earthwork.

3.04 Removals and Overexcavation

All vegetation, trash and debris should be cleared from the grading area and removed from the site. Prior to placement of compacted fills, all non-engineered fills and loose, porous, or compressible soils will need to be removed down to competent ground. Removal and requirements will also apply to cut areas, if the depth of cut is not sufficient to reach competent ground. Removed and/or overexcavated soils may be moisture-conditioned and recompacted as engineered fill, except for soils containing detrimental amounts of organic material. Estimated depths of removals are as follows:

- Non-engineered fill ranging from less than 1 foot to 3 feet deep was encountered and observed within the property, particularly within the existing cattle pens. Non-engineered fill ranging from 1 to 10 feet in height was also observed as earthen berms around the dairy basins and in the southern portion of the site. Complete removal of these fills and underlying compressible native soils will need to be performed. If other non-engineered fills are encountered during grading, they will also need to be removed along with any underlying compressible native soils.
- Manure and manure impacted soils were encountered and observed within the existing cattle pens and

in the southeastern field. At the time of our field investigation, manure in the pens ranged from only a few inches up to 2 to 3 feet thick. The amount of manure on the surface of the pens will vary and the actual thickness when dairy operations cease will be different than what was encountered during our field investigation. Additional investigation of manure and manure impacted soil may be done after dairy operations have ceased and the pens cleaned of manure to dairy standards or during demolition and cleanup of the dairies and prior to commencement of grading to determine actual removals needed. It is expected that manure impacted soils will be found at the bottom of the dairy wash ponds, however at the time of our field investigation they were full of water and inaccessible. Actual depth of removal of these soils should be reviewed once the basing have been pumped dry after the dairy operations cease.

Manure and organic impacted soils were also observed in the upper 2 to 3 feet of the southeastern field. This is due to the prior use of this area as dairy water containment and the plowing operations after 2013 that mixed surface organics and manure into the upper 2 feet of the soil. Removals in this area should extend to a depth of 3 feet to remove any organic and manure impacted soil.

- Loose, porous and compressible native soils were encountered to depths of about 2 to 5 feet below existing grades. The average depth of removal of these soils is expected to be 4 feet with some local areas extending to 6 feet below the existing ground surface or the base of existing non-engineered fill.

- Areas of deep excavations, such as the baseball stadium that is planned for excavation to reach field level of over 15 feet, that competent native soil will be encountered. At these deeper removals, once design elevation is reached the geotechnical engineer's representative should review soil conditions and if found suitable the surface should be scarified to a minimum depth of 12 inches, moisture conditioned and compacted to at least 90 percent of the maximum dry density.

- It is expected that competent native soils will be encountered in cuts deeper than approximately 3 to 5 feet below existing grade or the base of existing non-engineered fill. Provided competent soils are exposed, these cut surfaces should be scarified to a minimum depth of 12 inches, moisture conditioned and compacted to at least 90 percent of the maximum dry density, provided that footing overexcavation requirements are met.

- Soils disturbed by demolition of existing structures will need to be over-excavated to competent native ground and then scarified to a minimum depth of 12 inches, moisture conditioned and compacted to at least 90 percent of the maximum dry density

- The asphalt and concrete currently onsite may be either processed and placed in the compacted fill, or hauled off the site. If the asphalt and concrete is use as fill material, it must be broken down to approximately 4 to 8-inch particles and mixed thoroughly with on-site soils. No large and flat pieces are to be used for fill. If asphalt is processed by grinding, it cannot be used in fills and must be removed from the site.

In addition to the above requirements, overexcavation will also need to meet the following criteria for the building pads, concrete flatwork and pavement areas:

- All footing areas, both continuous and spread, shall be undercut, moistened, and compacted as necessary to produce soils compacted to a minimum of 90% relative compaction to a depth equal to the width of the footing below the bottom of the footing or to a depth of 3 feet below the bottom of the footing, whichever is less. Footing areas shall be defined as the area extending from the edge of the footing for a distance of 5 feet.

- All floor slabs shall be underlain by a minimum of 12 inches of soil compacted to a minimum of 90% relative compaction.

- All concrete flatwork and paved areas shall be underlain by a minimum of 12 inches of soil compacted to a minimum of 95% relative compaction. The 12 inches of compacted soil may be achieved by scarifying, moisture conditioning and compacting the soil at finish subgrade elevations.

- Overexcavation will not be required for the pole foundations.

The exposed soils beneath all overexcavation should be scarified an additional 12 inches, moisture conditioned and compacted to a minimum of 90% relative compaction.

The above recommendations are based on the assumption that soils encountered during field exploration are representative of soils throughout the site. However, there can be unforeseen and unanticipated variations in soils between points of subsurface exploration. Hence, overexcavation depths must be verified, and adjusted if necessary, at the time of grading. The overexcavated materials may be moisture-conditioned and re-compacted as engineered fill.

3.05 Rippability and Rock Disposal

Our exploratory borings were advanced without difficulty and no oversize materials were encountered in our subsurface investigation. Accordingly we expect that all earth materials will be rippable with conventional heavy duty grading equipment and oversized materials are not expected.

3.06 Subdrains

Groundwater and surface water were not encountered during the course of our investigation, the proposed grading is will not fill any large canyons and the underlying soils are fairly permeable. Consequently, installation of canyon subdrains is not expected to be necessary.

3.07 Permanent Fill and Cut Slopes

Fill and cut slopes constructed at inclinations of 2 horizontal to 1 vertical or flatter are expected to be grossly and surficially stable. This is provided that fill slopes are properly keyed and compacted, as indicated in Appendix C, and cut slopes expose competent native soils. Cut and fill slope stability should be further reviewed upon development of a grading plan.

3.08 Faulting

Since the site is not located within the boundaries of an Earthquake Fault Zone and no faults are known to pass through the property, surface fault rupture within the site is considered unlikely.

3.09 Seismic Design Parameters

The potential damaging effects of regional earthquake activity must be considered in the design of structures.

ASCE 7-16, Site-Specific Response Spectra

A site-specific seismic hazard has been performed using the SCEC UGMS MCER Tool available at https://data2.scec.org/ugms-mcerGM-tool_v18.4/ in accordance with the 2022 California Building Code and Section 21 of ASCE 7-16. A risk category of III was also utilized. The methodology and results of the site-specific analysis are presented in Appendix D. The recommended site-specific seismic design parameters are summarized in the table below.

Site Specific Design Parameters

Design Acceleration Parameter	Value (g)
S_{DS}	1.349
S_{D1}	0.806
S_{MS}	2.024
S_{M1}	1.210

The numerical values for the site-specific MCE_R and Design response spectra are provided in the table below.

Period (s)	Site Specific MCER Sa (g)	Site Specific Design Response Spectrum (g)
0.01	0.932	0.621
0.02	0.936	0.624
0.03	0.955	0.637
0.05	1.066	0.711
0.075	1.269	0.846
0.1	1.442	0.961
0.15	1.716	1.144
0.2	1.928	1.285
0.25	2.111	1.408
0.3	2.249	1.499
0.4	2.24	1.493
0.5	2.07	1.38
0.75	1.58	1.054
1	1.21	0.806
1.5	0.785	0.523
2	0.559	0.372
3	0.348	0.232
4	0.248	0.165
5	0.192	0.128
7.5	0.117	0.078
10.0	0.077	0.052

The Seismic Design Category is D for all Risk Categories (CBC Section 1613A.5.6). Consequently, as required for Seismic Design Categories D through F by CBC Section 1803A.5.12, lateral pressures for earthquake ground motions, liquefaction and soil strength loss have been evaluated (see Sections 3.10 and 3.16).

In addition, the calculated maximum considered earthquake geometric mean peak ground acceleration (MCE_G) is PGA_M = 0.778g.

3.10 Liquefaction and Secondary Earthquake Hazards

Potential secondary seismic hazards that can affect land development projects include liquefaction, tsunamis, seiches, seismically induced settlement, seismically induced flooding and seismically induced landsliding.

Liquefaction

Liquefaction is a phenomenon where earthquake-induced ground motions increase the pore pressure in saturated, sand-like soils until it is equal to the confining, overburden pressure. When this occurs, the soil can completely lose its shear strength and enter a liquefied state. The possibility of liquefaction is dependent upon grain size, relative density, confining pressure, saturation of the soils, and intensity and duration of ground motion. In order for liquefaction to occur, three criteria must be met: underlying loose, sand-like soils, a groundwater depth of less than about 50 feet, and a potential for seismic shaking from nearby large-magnitude earthquake.

As ground water table was not encountered in the upper 50 ft and per Section 2.04 above, the ground water table may be much deeper, liquefaction at the site is unlikely to occur and hence it is not a design concern.

Tsunamis and Seiches

Tsunamis are sea waves that are generated in response to large-magnitude earthquakes. When these waves reach shorelines, they sometimes produce coastal flooding. Seiches are the oscillation of large bodies of standing water, such as lakes, that can occur in response to ground shaking. Tsunamis and seiches do not pose hazards due to the inland location of the site and lack of nearby bodies of standing water.

Seismically Induced Settlement

Seismically induced settlement occurs most frequently in areas underlain by loose, granular sediments. Damage as a result of seismically induced settlement is most dramatic when differential settlement occurs in areas with large variations in the thickness of underlying sediments. Settlement caused by ground shaking is often non-uniformly distributed, which can result in differential settlement.

Seismic settlement was evaluated for the Design Earthquake event using an empirical method developed by Tokimatsu and Seed (1987) based on site-specific SPT blow count and grain size data obtained from our borings. We estimate 0.70-inch of total seismically induced ground settlement may occur at the site when subjected to a Design Earthquake event (see calculations in Appendix D). In our opinion, differential seismic settlement may be taken as one-half of the computed total seismic settlement over 30 feet. Calculations of seismically induced settlements are presented in Appendix D.

Seismically Induced Flooding

According to City of Ontario General Plan (2010), the site is located in the potential inundation area of San Antonio Dam.

Seismically Induced Landsliding

Due to the low gradient of the site, the potential for seismically induced landsliding is nil. This assumes that any slopes created during development of the site will be properly designed and constructed. It should be noted that the California Geological Survey has not yet prepared a Seismic Hazard Zone Map of potential earthquake-induced landslide hazards for the quadrangle in which the site is located.

3.11 Foundations

Isolated spread footings and/or continuous wall footings are recommended to support the proposed structures. If the recommendations in the section on grading are followed and footings are established in firm native soils or compacted fill materials, footings may be designed using the following allowable soil bearing values:

- Continuous Wall Footings:

  Footings having a minimum width of 12 inches and a minimum depth of 12 inches below the lowest adjacent grade have allowable bearing capacity of 2,000 pounds per square foot (psf). This value may be increased by 10% for each additional foot of width and/or depth to a maximum value of 3,500 psf.

- Isolated Spread Footings:

  Footings having a minimum width of 12 inches and a minimum depth of 12 inches below the lowest adjacent grade have allowable bearing capacity of 2,000 psf. This value may be increased by 10% for each additional foot of width or depth to a maximum value of 3,500 psf.

- Retaining Wall Footings:

  Footings for retaining walls should be founded a minimum depth of 12 inches and have a minimum width of 12 inches. Footings may be designed using the allowable bearing capacity and lateral resistance values recommended for building footings. However, when calculating passive resistance, the upper 6 inches of the footings should be ignored in areas where the footings will not be covered with concrete flatwork. This value may also be increased by 10% for each additional foot of width or depth to a maximum value of 3,000 psf. Reinforcement should be provided for structural considerations as determined by the design engineer.

- Sitework Element Footings:

  Footings for sitework elements (i.e. seat walls, planters, site/screening walls not retaining soil, and ball walls should be founded a minimum depth of 12 inches and have a minimum width of 12 inches. Footings may be designed using the allowable bearing capacity and lateral resistance values recommended for building footings. This value may also be increased by 10% for each additional foot of width or depth to a maximum value of 3,500 psf. Reinforcement should be provided for structural considerations as determined by the design engineer.

- Lateral Earth Resistance for Pole Foundations:

  Lateral bearing pressures of 150 psf/ft below design grade may be used.

  Construction

  Exploratory borings drilled for this investigation were advanced using continuous augers. Therefore, there is no indication as to the amount of caving that should be anticipated. However, caving of granular soils would be expected to occur during installation of pole foundations. It should be cautioned that the diameter of the piles may vary along their lengths possibly due to over-drilling or soil caving during construction. The contractor should be prepared to employ proper equipment for successful drilling. The contractor shall be prepared to employ temporary casing at his discretion, or to utilize other methods of advancing the pole foundations or other temporary shoring elements, to mitigate the potential of soil caving. Excavations should not be allowed to stand open overnight; excavations should be poured as soon as possible after inspection. The actual required depths should be field verified by the project geotechnical engineer or his representative.

- Musco Lighting Pole Foundations:

  The following may be used for pier/pole foundation recommendations for Musco Lighting light poles:

  Allowable skin friction / vertical bearing pressure: 500psf

  The allowable lateral bearing pressure shall be taken as 150 psf/ft with allowable increase of 50% for depths greater than 12 feet.

  The effective width for lateral bearing pressure will be 3 times the diameter of the pier footing.

  The minimum distance of the pole foundations from the adjacent building shall be no less than 3 times the diameter of the pole foundation to prevent surcharging the adjacent building foundations. If this minimum distance cannot be maintained, then the design shall neglect the passive pressure to a depth equal to 3 times the diameter of the pile below the ground surface.

  There are no requirements for casing during construction. Groundwater was not encountered in our borings and not expected during excavation for the pole foundation.

The above bearing capacities represent an allowable net increase in soil pressure over existing soil pressure and may be increased by one-third for short-term wind or seismic loads. The maximum expected settlement of footings designed with the recommended allowable bearing capacity is expected to be on the order of ½ inch with differential settlement on the order of ¼ inch.

3.12 Foundation Setbacks from Slopes

Setbacks for footings adjacent to slopes should conform to the requirements of the California Building Code. Specifically, footings should maintain a horizontal distance or setback between any adjacent slope face and the bottom outer edge of the footing.

For slopes descending away from the foundation, the horizontal distance may be calculated by using h/3, where h is the height of the slope. The horizontal setback should not be less than 5 feet, nor need not be greater than 40 feet per the California Building Code. Where structures encroach within the zone of h/3 from the top of the slope the setback may be maintained by deepening the foundations. Flatwork and utilities within the zone of h/3 from the top of slope may be subject to lateral distortion caused by gradual downslope creep. Walls, fences and landscaping improvements constructed at the top of descending slopes should be designed with consideration of the potential for gradual downslope creep.

For ascending slopes, the horizontal setback required may be calculated by using h/2 where h is the height of the slope. The horizontal setback need not be greater than 15 feet per the California Building Code.

3.13 Slabs on Grade

We recommend the use of unreinforced slabs on grade for structures. These floor slabs should have a minimum thickness of 4 inches and should be divided into squares or rectangles using weakened plane joints (contraction joints), each with maximum dimensions not exceeding 15 feet. Contraction joints should be made in accordance with American Concrete Institute (ACI) guidelines. If weakened plane joints are not used, then the slabs shall be reinforced with at a minimum 6x6-10/10 welded wire fabric placed at mid-height of the slab. The project structural engineer may require additional reinforcement.

If heavy concentrated or moving loads are anticipated, slabs should be designed using a modulus of subgrade reaction (k) of 150psi/in when soils are prepared in conformance with the grading recommendations contained within the report.

Special care should be taken on floors slabs to be covered with thin-set tile or other inflexible coverings. These areas may be reinforced with 6x6-10/10 welded wire fabric placed at mid-height of the slab, to mitigate drying shrinkage cracks. Alternatively, inflexible flooring may be installed with unbonded fabric or liners to prevent reflection of slab cracks through the flooring.

A moisture vapor retarder/barrier is recommended beneath all slabs-on-grade that will be covered by moisture-sensitive flooring materials such as vinyl, linoleum, wood, carpet, rubber, rubber-backed carpet, tile, impermeable floor coatings, adhesives, or where moisture-sensitive equipment, products, or environments will exist. We recommend that design and construction of the vapor retarder or barrier conform to Section 1805 of the 2019 California Building Code (CBC) and pertinent sections of American Concrete Institute (ACI) guidance documents 302.1R-04, 302.2R-06 and 360R-10.

The moisture vapor retarder/barrier should consist of a minimum 10 mils thick polyethylene with a maximum perm rating of 0.3 in accordance with ASTM E 1745. Seams in the moisture vapor retarder/barrier should be overlapped no less than 6 inches or in accordance with the manufacturer's recommendations. Joints and penetrations should be sealed with the manufacturer's recommended adhesives, pressure-sensitive tape, or both. The contractor must avoid damaging or puncturing the vapor retarder/barrier and repair any punctures with additional polyethylene properly lapped and sealed.

ACI guidelines allow for the placement of moisture vapor retarder/barriers either directly beneath floor slabs or below an intermediate granular soil layer.

Placing the moisture retarder/barrier directly beneath the floor slab will provide improved curing of the slab bottom and will eliminate potential problems caused by water being trapped in a granular fill layer. Concrete slabs poured directly on a vapor retarder/barrier can experience shrinkage cracking and curling due to differential rates of curing through the thickness of the slab. Therefore, for concrete placed directly on the vapor retarded, we recommend a maximum water cement ratio of 0.45 and the use of water-reducing admixtures to increase workability and decrease bleeding.

If granular soil is placed over the vapor retarder/barrier, we recommend that the layer be at least 2 inches thick in accordance with traditional practice in southern California. Granular fill should consist of clean fine graded materials with 10 to 30% passing the No. 100 sieve and free from clay or silt. The granular layer should be uniformly compacted and trimmed to provide the full design thickness of the proposed slab. The granular fill layer should not be left exposed to rain or other sources of water such as wet-grinding, power washing, pipe leaks or other processes, and should be dry at the time of concrete placement. Granular fill layers that become saturated should be removed and replaced prior to concrete placement.

An additional layer of sand may be placed beneath the vapor retarder/barrier at the developer's discretion to minimize the potential of the retarder/barrier being punctured by underlying soils.

3.14 Miscellaneous Concrete Flatwork

Miscellaneous concrete flatwork and walkways may be designed with a minimum thickness of 4 inches. Large slabs should be reinforced with a minimum of 6x6-10/10 welded wire mesh placed at mid-height in the slab. Control joints should be constructed to create squares or rectangles with a maximum spacing of 15 feet.

Walkways may be constructed without reinforcement. Walkways should be separated from foundations with a thick expansion joint filler. Control joints should be constructed into non-reinforced walkways at a maximum of 5 feet spacing.

The subgrade soils beneath all miscellaneous concrete flatwork should be compacted to a minimum of 90 percent relative compaction for a minimum depth of 12 inches. The geotechnical engineer should monitor the compaction of the subgrade soils and perform testing to verify that proper compaction has been obtained.

3.15 Footing Excavation and Slab Preparations

All footing excavations should be observed by the geotechnical consultant to verify that they have been excavated into competent soils. The foundation excavations should be observed prior to the placement of forms, reinforcement steel, or concrete. These excavations should be evenly trimmed and level. Prior to concrete placement, any loose or soft soils should be removed. Excavated soils should not be placed on slab or footing areas unless properly compacted.

Prior to the placement of the moisture barrier and sand, the subgrade soils underlying the slab should be observed by the geotechnical consultant to verify that all under-slab utility trenches have been properly backfilled and compacted, that no loose or soft soils are present, and that the slab subgrade has been properly compacted to a minimum of 90 percent relative compaction within the upper 12 inches.

Footings may experience and overall loss in bearing capacity or an increased potential to settle where located in close proximity to existing or future utility trenches. Furthermore, stresses imposed by the footings on the utility lines may cause cracking, collapse and/or a loss of serviceability. To reduce this risk, footings should extend below a 1:1 plane projected upward from the closest bottom of the trench.

Slabs on grade and walkways should be brought to a minimum of 2% and a maximum of 6% above their optimum moisture content for a depth of 18 inches prior to the placement of concrete. The geotechnical consultant should perform insitu moisture tests to verify that the appropriate moisture content has been achieved a maximum of 24 hours prior to the placement of concrete or moisture barriers.

3.16 Lateral Load Resistance

Lateral loads may be resisted by soil friction and the passive resistance of the soil. The following parameters are recommended.

- Passive Earth Pressure = 500 pcf (equivalent fluid weight).
- Coefficient of Friction (soil to footing) = 0.48
- Retaining structures should be designed to resist the following lateral active earth pressures:

Surface Slope of Retained Materials (Horizontal:Vertical)	Equivalent Fluid Weight (pcf)
Level	30
5:1	32
4:1	33
3:1	35
2:1	41

These active earth pressures are only applicable if the retained earth is allowed to strain sufficiently to achieve the active state. The required minimum horizontal strain to achieve the active state is approximately 0.0025H. Retaining structures should be designed to resist an at-rest lateral earth pressure if this horizontal strain cannot be achieved.

- At-rest Lateral Earth Pressure = 50 pcf (equivalent fluid weight)

The Mononobe-Okabe method is commonly utilized for calculating seismically induced active and passive lateral earth pressures and is based on the limit equilibrium Coulomb theory for static stress conditions. This method entails three fundamental assumptions (e.g., Seed and Whitman, 1970): Wall movement is sufficient to ensure either active or passive conditions, the driving soil wedge inducing the lateral earth pressures is formed by a planar failure surface starting at the heel of the wall and extending to the free surface of the backfill, and the driving soil wedge and the retaining structure act as rigid bodies, and therefore, experiences uniform accelerations throughout the respective bodies (U.S. Army Corps of Engineers, 2003, Engineering and Design - Stability Analysis of Concrete Structures).

- Seismic Lateral Earth Pressure = 21 pcf (equivalent fluid weight).

The seismic lateral earth pressure given above is a triangle increasing with depth, and the resultant of this pressure is an increment of force which should be applied to the back of the wall at 1/3 of the wall height from the wall base. The seismic increment of earth pressure should be added to the static active earth pressure. Even for the at-rest

(Ko) condition, the seismic increment of earth pressure should be added to the static active earth pressure, not to the at-rest static earth pressure (SEAOC Seismology Committee 2019).

Per 2022 CBC Section 1803.5.12 dynamic seismic lateral earth pressures shall be applied to foundation walls and retaining walls supporting more than 6 feet of backfill. Dynamic seismic lateral earth pressures may also be applied to shorter walls at the discretion of the structural engineer.

3.17 Drainage and Moisture Proofing

Surface drainage should be directed away from the proposed structure into suitable drainage devices. Neither excess irrigation nor rainwater should be allowed to collect or pond against building foundations or within low-lying or level areas of the lot. Surface waters should be diverted away from the tops of slopes and prevented from draining over the top of slopes and down the slope face.

Walls and portions thereof that retain soil and enclose interior spaces and floors below grade should be waterproofed and dampproofed in accordance with CBC Section 1805.

Retaining structures should be drained to prevent the accumulation of subsurface water behind the walls. Backdrains should be installed behind all retaining walls exceeding 3 feet in height. A typical detail for retaining wall back drains is presented in Appendix C. All backdrains should be outlet to suitable drainage devices. Retaining wall less than 3 feet in height should be provided with backdrains or weep holes. Dampproofing and/or waterproofing should also be provided on all retaining walls exceeding 3 feet in height.

3.18 Cement Type and Corrosion Potential

Soluble sulfate tests indicate that concrete at the subject site will have a negligible exposure to water-soluble sulfate in the soil. Our recommendations for concrete exposed to sulfate-containing soils are presented in the table below.

Recommendations for Concrete exposed to Sulfate-containing Soils

Sulfate Exposure	Water Soluble Sulfate (SO_4) in Soil (% by Weight)	Sulfate (SO_4) in Water (ppm)	Cement Type (ASTM C150)	Maximum Water-Cement Ratio (by Weight)	Minimum Compressive Strength (psi)
Negligible	0.00 - 0.10	0-150	--	--	2,500
Moderate	0.10 - 0.20	150-1,500	II	0.50	4,000
Severe	0.20 - 2.00	1,500-10,000	V	0.45	4,500
Very Severe	Over 2.00	Over 10,000	V plus pozzolan or slag	0.45	4,500

Use of alternate combinations of cementitious materials may be permitted if the combinations meet design recommendations contained in American Concrete Institute guideline ACI 318-11.

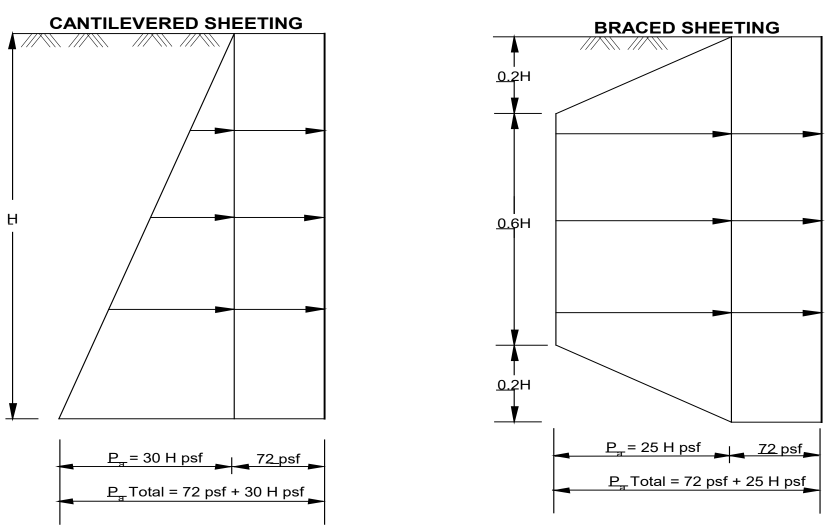
The soils were also tested for soil reactivity (pH), electrical resistivity (ohm-cm) and chloride content. The test results indicate that the on-site soils have a soil reactivity of 6.8, an electrical resistivity of 770 ohm-cm, and a chloride content of 153 ppm. Note that:

- A neutral or non-corrosive soil has a pH value ranging from 5.5 to 8.4.
- Generally, soils that could be considered moderately corrosive to ferrous metals have resistivity values of about 3,000 ohm-cm to 10,000 ohm-cm. Soils with resistivity values less than 3,000 ohm-cm can be considered corrosive and soils with resistivity values less than 1,000 ohm-cm can be considered extremely corrosive.
- Chloride contents of approximately 500 ppm or greater are generally considered corrosive.

Based on our analysis, it appears that the underlying onsite soils are corrosive to ferrous metals. Protection of buried pipes utilizing coatings on all underground pipes; clean backfills and a cathodic protection system can be effective in controlling corrosion. A qualified corrosion engineer may be consulted to further assess the corrosive properties of the soil.

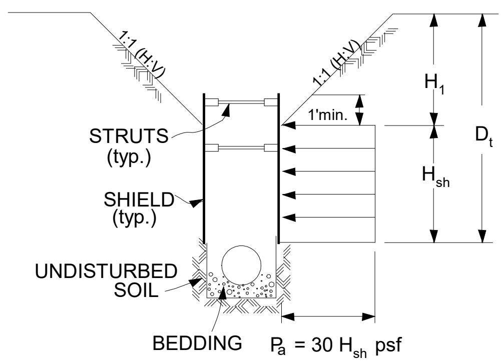
3.19 Temporary Slopes

Excavation of utility trenches will require either temporary sloped excavations or shoring. Temporary excavations in existing alluvial soils may be safely made at an inclination of 1:1 or flatter. If vertical sidewalls are required in excavations greater than 5 feet in depth, the use of cantilevered or braced shoring is recommended. Excavations less than 5 feet in depth may be constructed with vertical sidewalls without shoring or shielding. Our recommendations for lateral earth pressures to be used in the design of cantilevered and/or braced shoring are presented below. These values incorporate a uniform lateral pressure of 72 psf to provide for the normal construction loads imposed by vehicles, equipment, materials, and workmen on the surface adjacent to the trench excavation. However, if vehicles, equipment, materials, etc., are kept a minimum distance equal to the height of the excavation away from the edge of the excavation, this surcharge load need not be applied.



SHORING DESIGN: LATERAL SHORING PRESSURES

Design of the shield struts should be based on a value of 0.65 times the indicated pressure, Pa, for the approximate trench depth. The wales and sheeting can be designed for a value of 2/3 the design strut value.



HEIGHT OF SHIELD, H_{sh} = DEPTH OF TRENCH, D_t , MINUS DEPTH OF SLOPE, H_1

TYPICAL SHORING
DETAIL

Placement of the shield may be made after the excavation is completed or driven down as the material is excavated from inside of the shield. If placed after the excavation, some overexcavation may be required to allow for the shield width and advancement of the shield. The shield may be placed at either the top or the bottom of the pipe zone. Due to the anticipated thinness of the shield walls, removal of the shield after construction should have negligible effects on the load factor of pipes. Shields may be successively placed with conventional trenching equipment.

Vehicles, equipment, materials, etc. should be set back away from the edge of temporary excavations a minimum distance of 15 feet from the top edge of the excavation. Surface waters should be diverted away from temporary excavations and prevented from draining over the top of the excavation and down the slope face. During periods of heavy rain, the slope face should be protected with sandbags to prevent drainage over the edge of the slope, and a visqueen liner placed on the slope face to prevent erosion of the slope face.

Periodic observations of the excavations should be made by the geotechnical consultant to verify that the soil conditions have not varied from those anticipated and to monitor the overall condition of the temporary excavations over time. If at any time during construction conditions are encountered which differ from those anticipated, the geotechnical consultant should be contacted and allowed to analyze the field conditions prior to commencing work within the excavation.

Cal/OSHA construction safety orders should be observed during all underground work.

3.20 Soil Infiltration Testing

Four soil infiltration tests were performed using the bore hole percolation test procedure and three infiltration tests per the dual ring infiltrometer method as described in the San Bernardino County Stormwater Program Technical Guidance Document for Water Quality Management Plans (WQMP).

The testing was performed in 8-inch diameter borings that were drilled with a truck mounted CME-75 drill rig. The test holes extended to depths of 10 feet below the existing ground surface. The tests were performed in alluvial soil consisting of silty fine sand in Boring B-11 and sand in Boring B-12, classified as SM and SP, respectively, by the Unified Soil Classification System.

Prior to performing the tests, the auger used to drill the test holes was rotated until cuttings were removed from the hole. A 3-inch diameter perforated PVC pipe was then inserted into each test boring through the auger. A filter sock was installed around the pipe prior to placement in the boring in lieu of gravel or sand packing to prevent siltation in the pipe during testing and to facilitate removal of the pipe at the conclusion of the testing. Water levels were measured to the nearest 0.01 of a foot using an electronic well sounder. The test holes were presoaked for 60 minutes and water levels were measured every 30 minutes in B-11 and 10 minutes in B-12 because the initial water seeped away in less than 30 minutes. A total of 6 measurements were made following completion of presoaking.

The infiltrometer equipment consisted of two calibrated plastic cylinders, two aluminum rings, constant level float values, shutoff values, and plastic tubing to connect the cylinders and aluminum rings. Calibrations were marked directly on the plastic cylinders. The cylinder feeding the inner ring was graduated to 5,000 ml and the cylinder feeding the outer ring was graduated to 13,000 ml. The cylinders were connected to special supports to prevent tipping and to maintain proper height. The aluminum rings were 12 and 24 inches in diameter and 20 inches high. The float valves were used to maintain a constant water level in the aluminum rings. Infiltration rate of water during the test was determined by monitoring volume changes in the calibrated cylinders. Testing continued until a relatively uniform infiltration rate was obtained.

Results of the testing are summarized in the table below.

Soil Infiltration Rates

Test No.	Depth (ft)	Soil Type	Infiltration Rate (in/hr)
B-11	10	SM	1.25
B-12	10	SP	13.25
B-18	10	SM	1.07
B-20	10	SM	1.06
T-1	1	SM	1.00
T-3	1	SM	1.07
T-5	1	SM	1.06

Design of the infiltration systems should include an appropriate factor of safety to account for degradation of soil conditions by fine grained materials carried by runoff, potential growth of vegetation, accumulation of trash and other appropriate considerations. The factor of safety should be determined in accordance with the methodology presented in San Bernardino County Program – Technical Guidance Document for Water Quality Management Plans (Appendix D, Section VII) using a medium concern for the assessment method, low concerns for texture class (granular soils) and soil variability (relatively homogeneous soils), a low concern for groundwater (depth to groundwater greater than 100 feet), and appropriate design related considerations. Per the Technical Guidance Document, the factor a safety should not be less than 2. We recommend that the slowest field test rate (P-1, 1.07 in/hr) be used to determine the design rate for the proposed infiltration systems. As discussed in Section 2.02, the sand layers encountered in some of our borings are most likely buried paleo-channels within the overall alluvial deposition pattern and are not continuous across the borings and are considered incongruous. Infiltration systems that are located within these paleo-channels may exhibit lowered infiltration rates as the wetted front encounters the prevalent silty fine sand.

The infiltrometer results were completed within 1 foot of the existing ground surface to determine intrinsic infiltration of the near surface soils for use in designing the turf field surfaces. These rates were obtained from the existing ground conditions. The actual conditions during construction are liable to be different, especially due to construction activities that will compact the surface soil. Therefore, the minimum infiltration rate of the surface soil should have a factor of safety of at least 2 applied to account for the compaction of the surface soil during construction.

The above rates apply to existing natural soils. Compaction of soils will reduce infiltration rates. Therefore soils at the bottom of the proposed infiltration systems should not be rolled or otherwise compacted, and construction traffic should not be allowed in the area where the infiltration systems will be constructed. A maintenance plan should also be developed and implemented to restore infiltration properties of soils that may be impacted by sedimentation or other adverse conditions.

The test data sheets for the soil infiltration tests are presented in Appendix A.

3.21 Utility Trench Backfill

The onsite fill soils will not be suitable for use as pipe bedding for buried utilities. All pipes should be bedded in a sand, gravel or crushed aggregate imported material complying with the requirements of the Standard Specifications for Public Works Construction Section 306-1.2.1. Crushed rock products that do not contain appreciable fines should not be utilized as pipe bedding and/or backfill. Bedding materials should be densified to at least 90% relative compaction (ASTM D1557) by mechanical methods. The geotechnical consultant should review and approve of proposed bedding materials prior to use.

All utility trench backfill within street right of way, utility easements, under or adjacent to sidewalks, driveways, or building pads should be observed and tested by the geotechnical consultant to verify proper compaction. Trenches excavated adjacent to foundations should not extend within the footing influence zone defined as the area within a line projected at a 1:1 drawn from the bottom edge of the footing. Trenches crossing perpendicular to foundations should be excavated and backfilled prior to the construction of the foundations. The excavations should be backfilled in the presence of the geotechnical engineer and tested to verify adequate compaction beneath the proposed footing.

Cal/OSHA construction safety orders should be observed during all underground work.

3.22 Pavement Sections

An R-value test was performed on the anticipated subgrade soil at the site in order to provide information on their soil properties for design of pavement structural sections. The R-value test was done in compliance with CTM-301. Structural sections were designed using the procedures outlined in Chapter 630 of the California Highway Design Manual (Caltrans, 2023) and the Caltrans Mechanistic-Emperical Tool program that utilizes an equivalent resilient modulus, traffic index and project climate to calculate asphalt pavement sections. This procedure uses the principle that the pavement structural section must be of adequate thickness to distribute the load from the design traffic index (TI) to the subgrade soils in such a manner that the stresses from the applied loads do not exceed the resilient modulus (M_r) of the soil.

Development of the design traffic indexes on the basis of a traffic study is beyond the scope of this report; however, our experience indicates that a traffic index of 5.0 is typical for automobile traffic lanes and parking and that a traffic index of 7.0 is typical for truck driving lanes and parking. We have provided alternate structural sections for each traffic index. Selection of the final pavement structural section should be based on economic considerations which are beyond the scope of this investigation. Recommended structural sections are as follows:

- Auto parking and minor streets (TI=5, R-Value=35 (M_r=20.5ksi)):
  4.0 inches of asphaltic concrete over
  4.5 inches of crushed aggregate base

- Truck and bus lanes and collector streets (TI=7, R-Value=35 (M_r=20.5ksi)):
  5.5 inches of asphaltic concrete over
  6.0 inches of crushed aggregate base

Vehicular Concrete Paver Pavement Sections

Recommended concrete vehicular pavement structural sections are based on the procedures outlined in Technical Specifications for interlocking concrete pavement prepared by the Interlocking Concrete Paver Institute (2023) and our engineering judgment. The specifications utilize similar procedures similar to the California Highway Design Manual in that the pavement structural section must be of adequate thickness to distribute the load from the design traffic (TI) to the subgrade soils in such a manner that the stresses from the applied loads do not exceed the strength of the soil (R value). The specifications also consider soil type and drainage characteristics. Recommended sections are as follows:

Vehicular Concrete Paver Areas with Light Vehicle Traffic:
80 mm (3.14 inches) concrete pavers on
1 inch of bedding sand on
16 inches of crushed aggregate base
or
80 mm (3.14 inches) concrete pavers on
1 inch of bedding sand on
5 inches of Portland cement concrete (PCC) on
12 inches of crushed miscellaneous base

Vehicular Concrete Paver Areas with Delivery Truck Traffic:
80 mm (3.14 inches) concrete pavers on
1 inch of bedding sand on
18 inches of crushed miscellaneous base
or
80 mm (3.14 inches) concrete pavers on
1 inch of bedding sand on
5 inches of Portland cement concrete (PCC) on
12 inches of crushed miscellaneous base

Portland cement concrete (PCC) pavements

Portland cement concrete (PCC) pavements for areas which are not subject to traffic loads may be designed with a minimum thickness of 4.0 inches of Portland cement concrete on compacted non-expansive engineered fill soils. If traffic loads are anticipated, PCC pavements should be designed for a minimum thickness of 6.0 inches of Portland cement concrete on 12.0 inches of crushed aggregate base. Control joints to limit cracking of the concrete pavement should be spaced no more than 10 feet apart. According to ACI 330, reinforcement to control is not necessary when pavement is jointed to form short panel lengths of 15 feet or less. Reinforcement in the concrete paving will not add to the load carrying capacity of the concrete. Any reinforcement of concrete paving may be included in design as desired, to limit cracking of the concrete with at least number 4 reinforcing steel placed mid-height of the concrete at 18-inches on center typical.

Prior to paving, the subgrade soils should be scarified and the moisture adjusted to within 2% of the optimum moisture content. The subgrade soils should be compacted to a minimum of 95% relative compaction. All aggregate base courses should be compacted to a minimum of 95% relative compaction.

3.23 Plan Review

Once a formal grading and foundation plans are prepared for the subject property, this office should review the plans from a geotechnical viewpoint, comment on changes from the plan used during preparation of this report and revise the recommendations of this report where necessary.

3.24 Geotechnical Observation and Testing During Rough Grading

The geotechnical engineer should be contacted to provide observation and testing during the following stages of grading:

- During the clearing and grubbing of the site.
- During the demolition of any existing structures, buried utilities or other existing improvements.
- During excavation and overexcavation of compressible soils.
- During all phases of grading including ground preparation and filling operations.
- When any unusual conditions are encountered during grading.

A final geotechnical report summarizing conditions encountered during grading should be submitted upon completion of the rough grading operations.

3.25 Post-Grading Geotechnical Observation and Testing

After the completion of grading the geotechnical engineer should be contacted to provide additional observation and testing during the following construction activities:

- During trenching and backfilling operations of buried improvements and utilities to verify proper backfill and compaction of the utility trenches.
- After excavation and prior to placement of reinforcing steel or concrete within footing trenches to verify that footings are properly founded in competent materials.
- During fine or precise grading involving the placement of any fills underlying driveways, sidewalks, walkways, or other miscellaneous concrete flatwork to verify proper placement, mixing and compaction of fills.
- When any unusual conditions are encountered during construction.

4.00 CLOSURE

The findings, conclusions and recommendations in this report were prepared in accordance with generally accepted engineering and geologic principles and practices. No other warranty, either expressed or implied, is made. This report has been prepared for City of Ontario to be used solely for design purposes. Anyone using this report for any other purpose must draw their own conclusions regarding required construction procedures and subsurface conditions.

The geotechnical and geologic consultant should be retained during the earthwork and foundation phases of construction to monitor compliance with the design concepts and recommendations and to provide additional recommendations as needed. Should subsurface conditions be encountered during construction that are different from those described in this report, this office should be notified immediately so that our recommendations may be re-evaluated.

FIGURES AND TABLES

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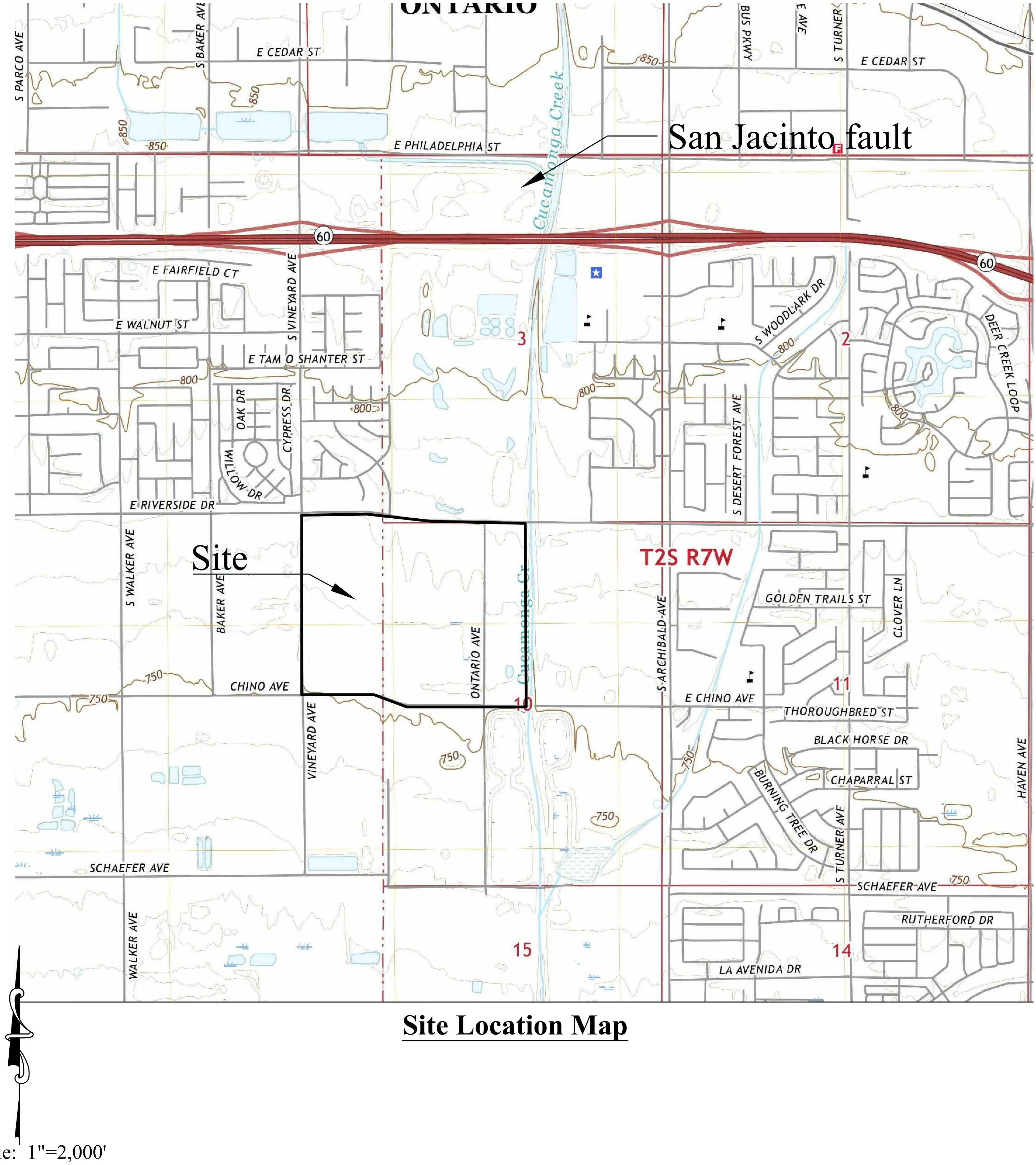

Site Location Map

Scale: 1"=2,000'

Base Map: USGS, 2021, Guast 7.5-minute Topographic Quadrangle

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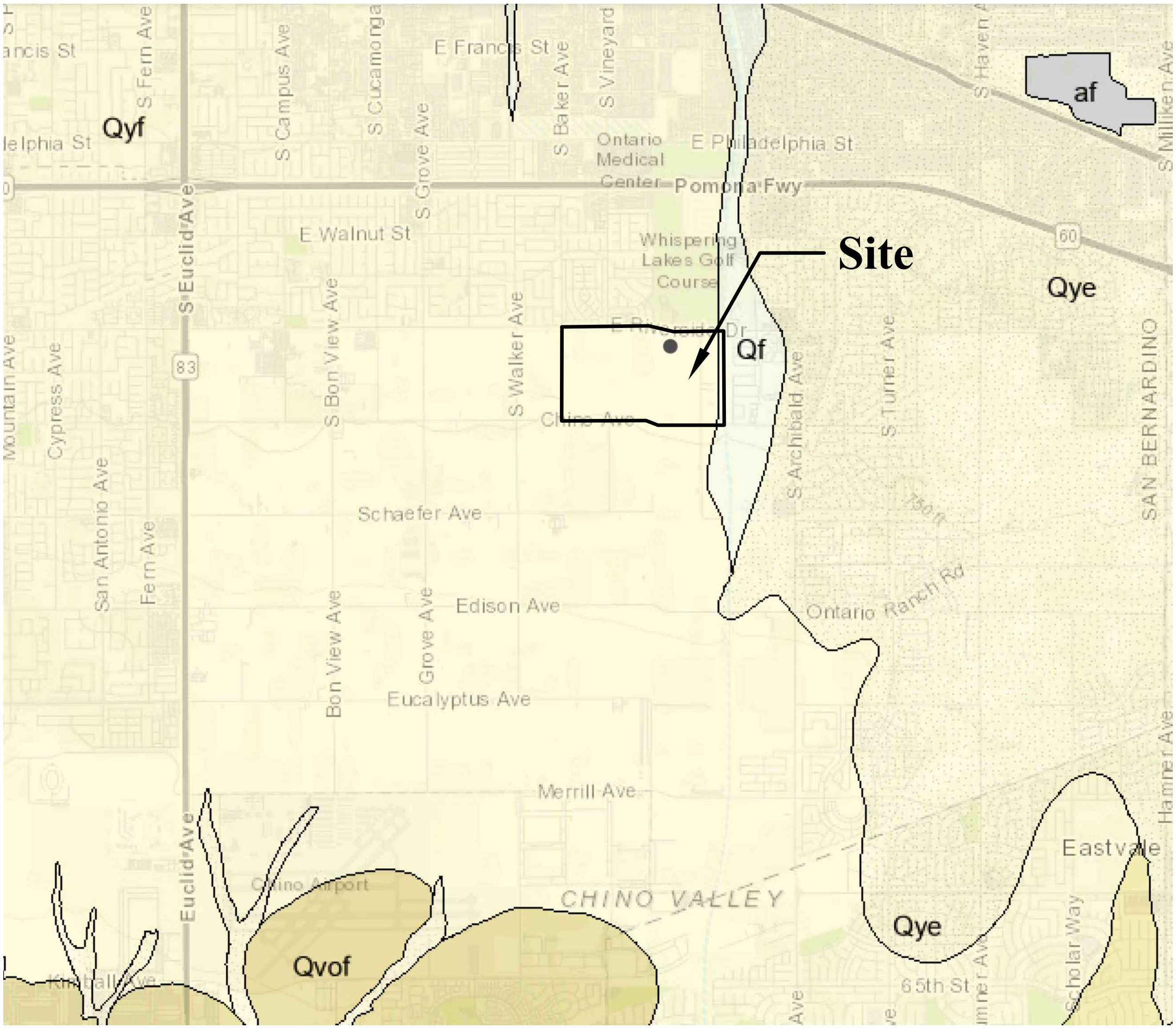


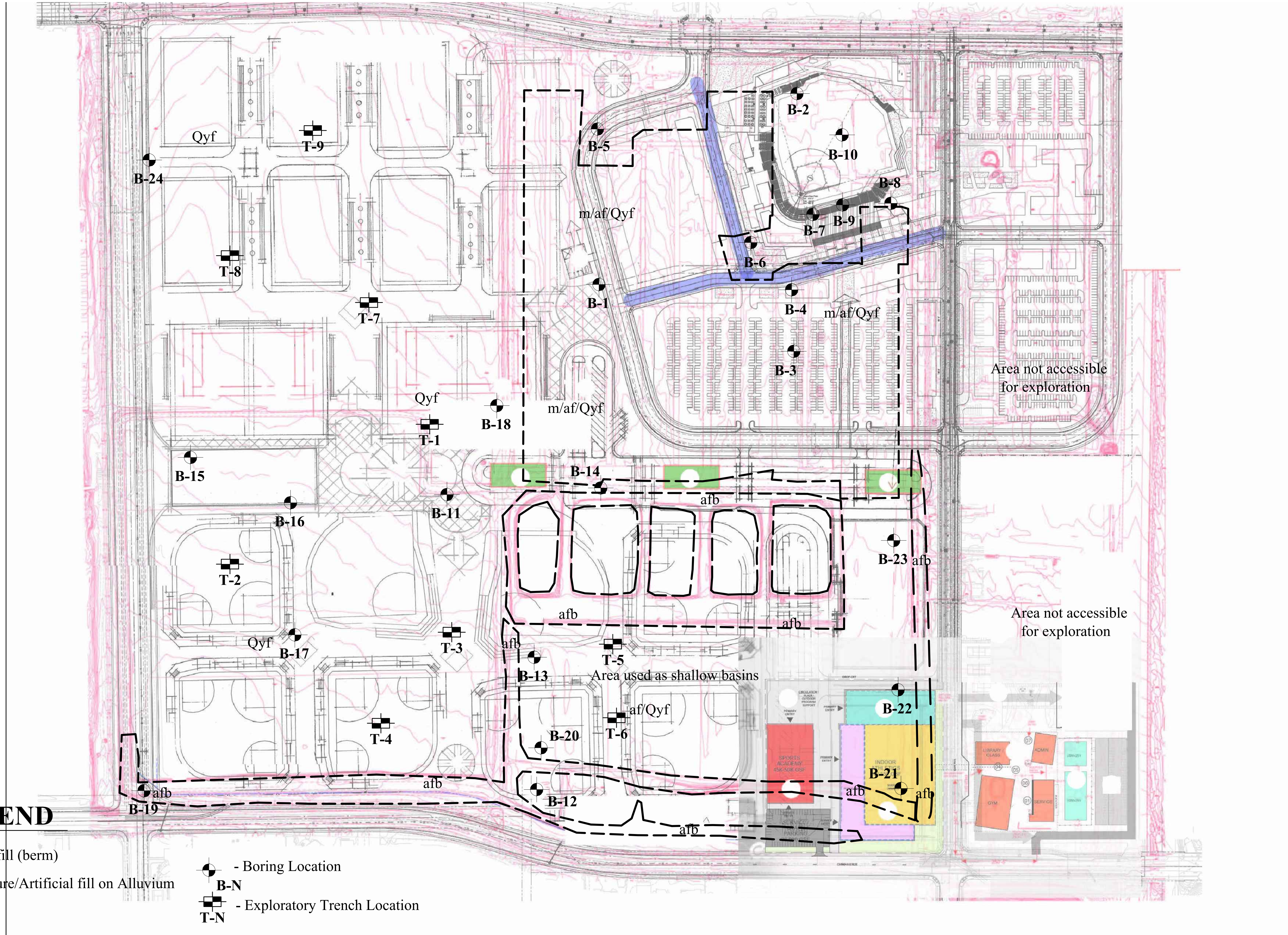
REGIONAL GEOLOGIC MAP

Partial Legend

af - Artificial Fill
Qye -Late Holocene Wash Deposits
Qyf - Holocene to Late Pleistocene Young Eolian and Dune Deposits
Qvof - Late to Middle Pleistocene Old Alluvial fan Deposits

Scale: 1"=3,000'

Source Map: Bedrossian, T.L., Hayhurst, C. A. and Roffers, P.D., 2010, Geologic Compilation of Quaternary Surficial Deposits in Southern California, San Bernardino 30' x 60' Quadrangle: California Geological Survey Special Report 217, Plate 13.



LEGEND

afb - Artificial fill (berm)

m/af/Qyf - Thin manure/Artificial fill on Alluvium

Qyf - Alluvium

B-N - Boring Location

T-N - Exploratory Trench Location

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GEOTECHNICAL ENGINEERING CONSTRUCTION INSPECTION MATERIALS TESTING

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DRAWN BY: DKR

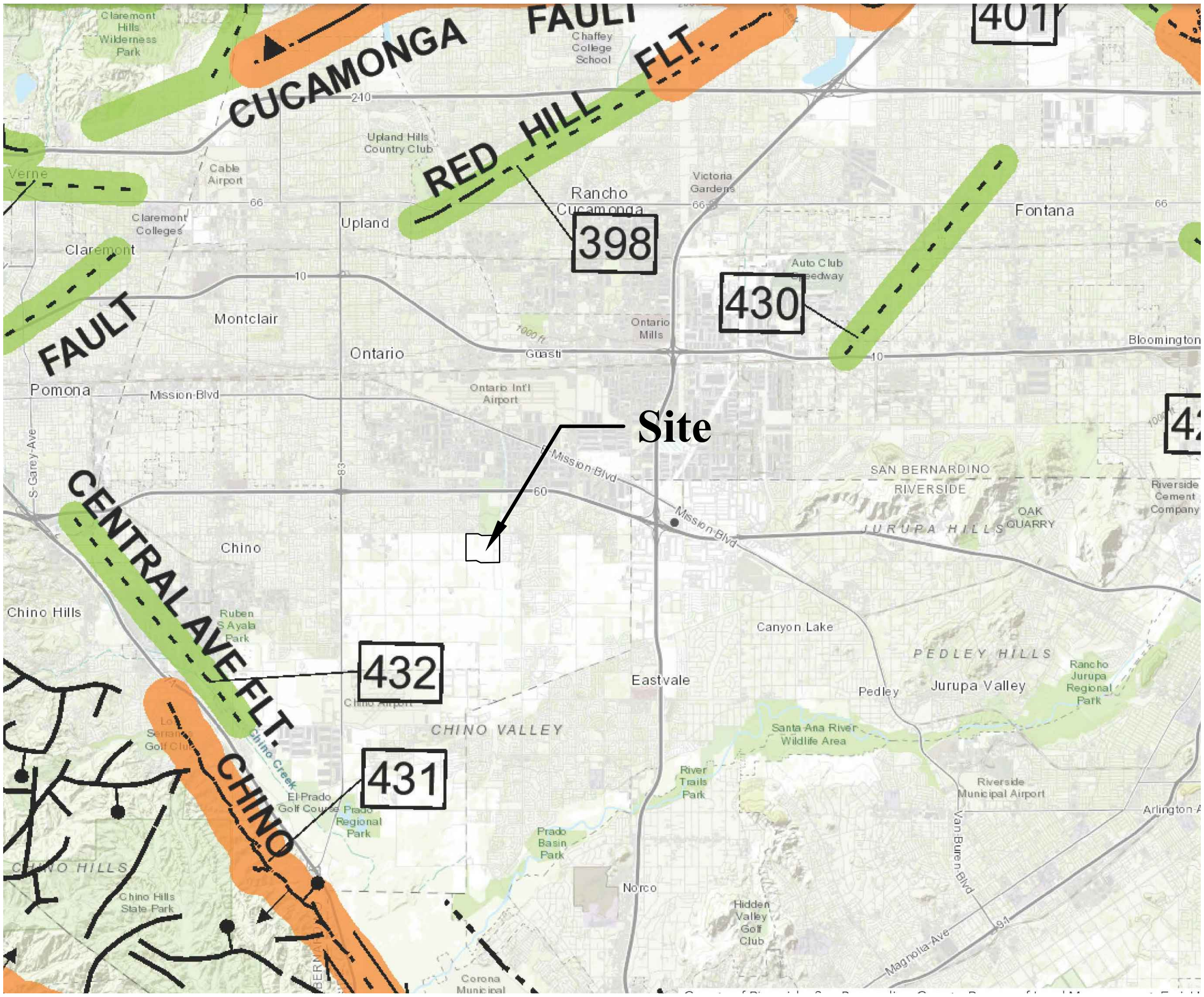
DATE: April 2024

Ontario Sports Park

RMA JOB NO.: 00-232255-01

SHEET NO.: 1 OF 1

FIGURE NO.: 3



REGIONAL FAULT MAP

Scale: 1" ≈ 3 miles

Partial Legend

Orange - Holocene fault displacement

Green - Late Quaternary fault displacement

Purple - Quaternary fault

Black - Pre-Quaternary fault

Base Map: California Geological Survey Fault Activity Map of California, 2010

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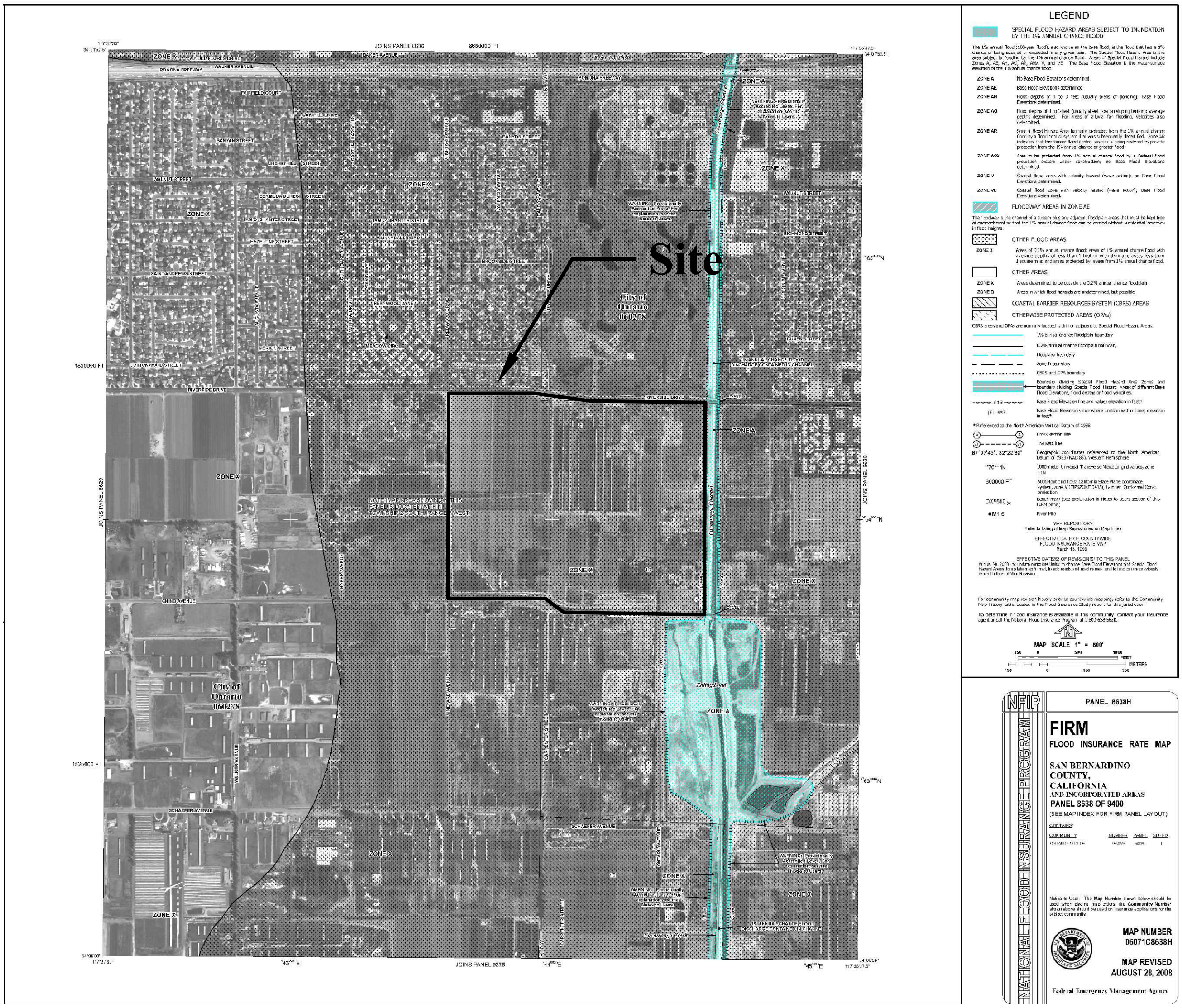

FEMA FLOOD ZONE MAP

NOTABLE FAULTS WITHIN 100 KILOMETERS AND SEISMIC DATA

Fault Zone & geometry	Distance (km)	Distance (mi.)	Maximum Moment Magnitude	Slip Rate (mm/yr)
Anacapa-Dume (r-ll-o)	88	55	7.5	3.0
Chino-Central Ave. (rl-r-o)	11	7	6.7	1.0
Clamshell-Sawpit (r)	33	21	6.5	0.5
Cleghorn (ll-ss)	35	22	6.5	3.0
Coronado Bank (rl-ss)	86	53	7.4	3.0
Cucamonga (r)	15	9	6.9	5.0
Elsinore - Temecula (rl-ss)	44	27	6.8	5.0
Elsinore - Glen Ivy (rl-ss)	19	12	6.8	5.0
Helendale - S Lockhart (rl-ss)	76	47	7.3	0.6
Hollywood (ll-r-o)	59	37	6.4	1.0
Holser (r)	98	61	6.5	0.4
Lenwood-Lockhart - Old Woman Spring	96	60	7.5	0.6
Malibu Coast (ll-r-o)	85	53	6.7	0.3
Newport-Inglewood (rl-ss)	52	32	6.9	1.5
Newport-Inglewood - Offshore (rl-ss)	55	34	7.1	1.5
North Frontal - Western (r)	45	28	7.2	1.0
North Frontal - Eastern (r)	82	51	6.7	0.5
Northridge (r)	78	48	7.0	1.5
Palos Verde (rl-ss)	67	42	7.3	3.0
Pinto Mountain (ll-ss)	82	51	7.2	2.5
Puente Hills Blind Thrust (r)	28	17	7.1	0.7
Raymond (ll-r-o)	39	24	6.5	1.5
San Andreas - Coachella (rl-ss)	38	24	7.2	25.0
San Andreas (rl-ss)	31	19	7.5	24.0
San Gabriel (rl-ss)	71	44	7.2	1.0
San Jacinto - San Jacinto Valley (rl-ss)	34	21	6.9	12.0
San Jacinto - San Bernardino (rl-ss)	26	16	6.7	12.0
San Joaquin Hills (r)	42	26	6.6	0.5
San Jose (ll-r-o)	13	8	6.4	0.5
Santa Monica (ll-r-o)	64	40	6.6	1.0
Sierra Madre (r)	17	11	7.2	2.0
San Fernando (r)	70	43	6.7	2.0
Upper Elysian Park (r)	46	29	6.4	1.3
Verdugo (r)	52	32	6.9	0.5

Notes:

Fault geometry - (ss) strike slip, (r) reverse, (n) normal, (rl) right lateral, (ll) left lateral, (o) oblique

Fault and Seismic Data - California Geological Survey (Cao), 2003

HISTORIC STRONG EARTHQUAKES IN SOUTHERN CALIFORNIA SINCE 1812

Date	Event	Causitive Fault	Magnitude	Epicentral Distance (miles)
Dec. 12, 1812	Wrightwood	San Andreas?	7.3	28
Jan. 9, 1857	Fort Tejon	San Andreas	7.9	242
Dec. 16, 1858	San Bernardino Area	uncertain	6.0	18
Feb. 9,1890	San Jacinto	uncertain	6.3	88
May 28, 1892	San Jacinto	uncertain	6.3	88
July 30, 1894	Lytle Creek	uncertain	6.0	20
July 22, 1899	Cajon Pass	uncertain	6.4	21
Dec.25, 1899	San Jacinto	San Jacinto	6.7	39
Sept. 20, 1907	San Bernardino Area	uncertain	5.3	32
May 15, 1910	Elsinore	Elsinore	6.0	25
April 21, 1918	Hemet	San Jacinto	6.8	40
July 23, 1923	San Bernardino	San Jacinto	6.0	18
March 11, 1933	Long Beach	Newport-Inglewood	6.4	32
April 10, 1947	Manix	Manix	6.4	92
Dec. 4, 1948	Desert Hot Springs	San Andreas or Banning	6.5	72
July 21, 1952	Wheeler Ridge	White Wolf	7.3	108
Feb. 9, 1971	San Fernando	San Fernando	6.6	54
July 8, 1986	North Palm Springs	Banning or Garnet Hills	5.6	59
Oct. 1, 1987	Whittier Narrows	Puente Hills Thrust	6.0	28
Feb. 28, 1990	Upland	San Jose	5.5	10
June 28, 1991	Sierra Madre	Clamshell Sawpit	5.8	29
April 22, 1992	Joshua Tree	Eureka Peak	6.1	76
June 28, 1992	Landers	Johnson Valley & others	7.3	70
June 28, 1992	Big Bear	uncertain	6.5	47
Jan. 17, 1994	Northridge	Northridge Thrust	6.7	57
Oct. 16, 1999	Hector Mine	Lavic Lake	7.1	89
July 4, 2019	Searles Valley	Eastern Calif. Shear Zone	6.4	117
July 5, 2019	Searles Valley	Eastern Calif. Shear Zone	7.1	122

Notes:

Earthquake data: U.S. Geological Survey P.P. 1515 & online data, Southern California Earthquake Center & California Geological Survey online data

Magnitudes prior to 1932 are estimated from intensity.

Magnitudes after 1932 are moment, local or surface wave magnitudes.

Site Location:

Site Longitude: - 117.604962

Site Latitude: 34.01789

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APPENDIX A

FIELD INVESTIGATION

APPENDIX A

FIELD INVESTIGATION

A-1.00 FIELD EXPLORATION

A-1.01 Number of Borings

Our subsurface investigation consisted of 10 borings drilled with a CME-75 drill rig.

A-1.02 Location of Borings

A Site Geologic Map showing the approximate locations of the borings is presented as Figure 3.

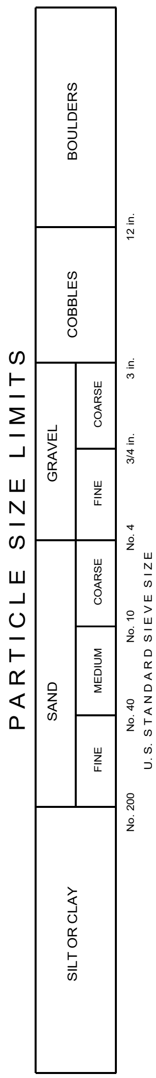
A-1.03 Boring Logging

Logs of borings were prepared by one of our staff and are attached in this appendix. The logs contain factual information and interpretation of subsurface conditions between samples. The strata indicated on these logs represent the approximate boundary between earth units and the transition may be gradual. The logs show subsurface conditions at the dates and locations indicated, and may not be representative of subsurface conditions at other locations and times.

Identification of the soils encountered during the subsurface exploration was made using the field identification procedure of the Unified Soils Classification System (ASTM D2488). A legend indicating the symbols and definitions used in this classification system and a legend defining the terms used in describing the relative compaction, consistency or firmness of the soil are attached in this appendix. Bag samples of the major earth units were obtained for laboratory inspection and testing, and the in-place density of the various strata encountered in the exploration was determined

A-1.04 Soil Infiltration Testing

Two soil infiltration tests were performed using the boring percolation test procedure described in the San Bernardino County Stormwater Program Technical Guidance Document for Water Quality Management Plans (WQMP). Locations of the tests are shown on Figure 3.



MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size.	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravel, gravel-sand mixtures. little or no fines.
			GP	Poorly graded gravel or gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatamaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

UNIFIED SOIL CLASSIFICATION SYSTEM

I. SOIL STRENGTH/DENSITY

BASED ON STANDARD PENETRATION TESTS

Apparent Density of sand		Consistency of clay	
Penetration Resistance N (blows/Ft)	Apparent Density	Penetration Resistance N (blows/ft)	Consistency
0-4	Very Loose	<2	Very Soft
4-10	Loose	2-4	Soft
10-30	Medium Dense	4-8	Medium Stiff
30-50	Dense	8-15	Stiff
>50	Very Dense	15-30	Very Stiff
		>30	Hard

N = Number of blows of 140 lb. weight falling 30 in. to drive 2-in OD sampler 1 ft.

BASED ON RELATIVE COMPACTION

Compactness of sand		Consistency of clay	
% Compaction	Compactness	% Compaction	Consistency
<75	Loose	<80	Soft
75-83	Medium Dense	80-85	Medium Stiff
83-90	Dense	85-90	Stiff
>90	Very Dense	>90	Very Stiff

II. SOIL MOISTURE

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but not visible water
Wet	Visible free water, usually soil is below water table

SOIL DESCRIPTION LEGEND

Exploratory Boring Log

Boring No. B-1
Sheet 1 of 1

Date Drilled: 09/21/2023
Logged By: SL
Location: See Site Geologic Map

Drilling Equipment: CME-75
Boring Hole Diameter: 8"
Drive Weights: 140 lbs.
Drop: 30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
						SM		12" Manure on surface then concrete 3" Artificial fill (af): Gray silty fine to coarse sand, moist ,dense.
						SM		Young alluvial fan deposits (Qyf): Light brown to gray brown silty fine to medium sand, moist, non-porous, medium dense
5	R	12	Bulk	7.2	100.4			Becomes brown in color
10	R	23		8.4				
								Trace of gravel
15	S	30		3.9				
20	S	77		4.5				
								Light brown to brown silty fine to coarse sand, trace gravel
25	S	69		4.0				
								Total depth 26.5' No groundwater Hole backfilled

Sample Types:
R - Ring Sample
Bulk Sample
Groundwater
T - Tube Sample
S - SPT Sample
End of Boring

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Exploratory Boring Log

Boring No. B-2
Sheet 1 of 1

Date Drilled:	09/21/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Material Description

This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
0						SM		Young alluvial fan deposits (Qyf): Light brown to gray brown silty fine to medium sand, moist, non-porous, medium dense
5	R	17		5.0	119.5			Becomes brown in color
10	R	55		5.0	105.1			Trace of gravel
			Bulk					Decrease in gravel
15	S	33		4.2				
20	S	50 for 6"		1.8				Trace to minor gravel
25	S	23		10.9				
								Gravel absent,silty fine to medium sand
								Trace of gravel, silty fine to coarse sand
30	S	52		12.2				

Total depth 31.5'
No groundwater
Hole backfilled

Sample Types:
R - Ring Sample
Bulk Sample
Groundwater
T - Tube Sample
S - SPT Sample
End of Boring

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Exploratory Boring Log

Boring No. B-3

Date Drilled:	09/21/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0						SM		Young alluvial fan deposits (Qyf): Light brown to gray brown silty fine to medium sand, moist, non-porous, medium dense
5	R	50 for 6"		1.1				Becomes brown in color
10	R	58		8.4				Trace of gravel
			Bulk					Decrease in gravel
15	S	45		5.0				
20	S	54		6.5				Gravel absent, silty fine to medium sand and trace clay
25	S	65		17.4				Trace to minor grave, silty fine to coarse sand
30	S	85		6.8				

Total depth 31.5'
No groundwater
Hole backfilled

Sample Types:

- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-4
Sheet 1 of 1

Date Drilled:	09/21/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0						SM		6 inches manure Young alluvial fan deposits (Qyf): Light brown to brown silty fine to medium sand, trace gravel, moist, non-porous, medium dense
5	R	72	Bulk (approx. 2–5 ft)	1.7				
10	R	55		9..9				Increase in gravel
15	S	44		4.5				Trace to minor gravel
20	S	58		10.1				
25	S	42		17.6				Gravel decreases ,silty fine to medium sand
30	S	41		N/A				Total depth 31.5' No groundwater

Sample Types:

- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-5

Sheet 1 of 2

Date Drilled:	09/21/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Sample Type	Blows (blows/ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0						SM		6 inches manure Young alluvial fan deposits (Qyf): Light brown to brown silty fine to medium sand, trace gravel, moist, non-porous, dense
2–5			Bulk					
5	R	55		6.8				
10	R	45		4.8				Slight increase in gravel
12–15			Bulk					
15	S	34		4.4				Trace to minor gravel
20	S	32		7				
25	S	41		5.5				Gravel decreases ,silty fine to medium sand

Sample Types:

- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-5

Date Drilled:	09/21/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Material Description: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Material Description
	S	73		5.0		CL	Brown sandy clay, moist, slightly plastic, hard 57.8% passing #200
						SM	Brown silty fine to cvoarse sand with trace gravel, moist, poorly sorted, dense to very dense
35	S	50 for 6"		4.8			
40	S	82		5.7			
45	S	50-6"		10.7			17.3% passing #200
						SP-SM	Poorly graded fine to coarse sand with silt with trace to minor gravel, fine to medium sand, very dense, poorly sorted 7.3% passing #200
50	S	50-6"		15.5			Total depth 50.5' No groundwater Hole backfilled
55							

Sample Types:
- R - Ring Sample
- T - Tube Sample
- Bulk Sample
- S - SPT Sample
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-6

Sheet 1 of 3

Date Drilled: 09/22/2023
Logged By: SL
Location: See Geologic Map

Drilling Equipment: CME-75
Boring Hole Diameter: 8"
Drive Weights: 140 lbs.
Drop: 30"

Depth (ft)	Sample Type	Blows (blows/ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
0						SM		Artificial fill (af): Gray silty fine to coarse sand with gravel, moist ,dense.
						SM		Young alluvial fan deposits (Qyf): Light brown to brown silty fine to medium sand, minor coarse sand, trace gravel, moist, non-porous, medium dense
5	R	21	Bulk	3.8				
10	R	36		3.5				Increase in silt content and trace clay and gravel 24.1% passing #200
15	S	37	Bulk	4.9				
20	S	36						Increase in gravel content, 32.0% (passing #200)
25	S	38		4.9				

This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Sample Types:
R - Ring Sample
Bulk Sample
Groundwater
T - Tube Sample
S - SPT Sample
End of Boring

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Exploratory Boring Log

Boring No. B-6

Date Drilled: 09/22/2023
Logged By: SL
Location: See Geologic Map

Drilling Equipment: CME-75
Boring Hole Diameter: 8"
Drive Weights: 140 lbs.
Drop: 30"

Depth (ft)	Sample Type	Blows (blows/ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
	S	27		5.0		CL		Brown sandy clay, moist, slightly plastic, hard 60.3% passing #200
						SM		Brown silty fine to cvoarse sand with trace gravel, moist, poorly sorted, dense to very dense
35	S	38		13.7				
40	S	35		12.7				
45	S	43		10.5				
						CL		Brown sandy clay, moist, slightly plastic, hard 63.0% passing #200
50	S	28		21.5				
55	S	34		10.2				
						SM		Brown silty fine to cvoarse sand with trace gravel, moist, poorly sorted, dense to very dense

Material Description: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Sample Types:
- R - Ring Sample
- T - Tube Sample
- Bulk Sample
- S - SPT Sample
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-6

Date Drilled:	09/22/2023	Drilling Equipment:	CME -55
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
	S	34		21.5		SM		Brown silty fine to cvoarse sand with trace gravel, moist, poorly sorted, dense to very dense
65	S	41		10.2				
70	S	40						24.2% passing #200
75								
								Total depth 70.5' No groundwater Hole backfilled

Sample Types:

- R - Ring Sample
- T - Tube Sample
- Bulk Sample
- S - SPT Sample
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-7

Date Drilled: 09/22/2023
Logged By: SL
Location: See Site Geologic Map

Drilling Equipment: CME-75
Boring Hole Diameter: 8"
Drive Weights: 140 lbs.
Drop: 30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
0						SM		Young alluvial fan deposits (Qyf): Light brown to brown silty fine to medium sand, trace gravel, moist, non-porous, medium dense
5	R	22		4.3				
10	R	21		10.2				
15	S	22		2.7				Increase in gravel, trace clay
20	S	26		11.2				
25	S	25		14.9				Gravel decreases ,silty fine to medium sand
30	S	33						Total depth 31.5' No groundwater

Material Description: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Sample Types:
- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-8
Sheet 1 of 1

Date Drilled:	09/22/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0						SM		3 inches asphalt Young alluvial fan deposits (Qyf): Light brown to brown silty fine to coarse sand, trace gravel, moist, non-porous, medium dense
2-5			Bulk					
5	R	17		4.9				
10	R	24		12.1				Increase in gravel
15	S	24		2.9				
20	S	14		4.5				Gravel decreases ,silty fine to medium sand
25	S	29		12.3				
30	S	24		11.2				Total depth 31.5' No groundwater

Sample Types:

- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-9

Date Drilled:	09/22/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0						SM		3 inches asphalt Young alluvial fan deposits (Qyf): Light brown to brown silty fine to coarse sand, trace gravel, moist, non-porous, medium dense
5	R	13		4.9				
10	R	17		12.1				Increase in gravel
			Bulk					
15	S	36		3.7				Dense
20	S	65		4.9				Gravel decreases ,silty fine to medium sand
						ML		Brown sandy silt, moist, fine sand, stiff
25	S	15		13.0				
								Total depth 26.5' No groundwater

Sample Types:

- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-10
Sheet 1 of 1

Date Drilled:	09/22/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0						SM		3 inches asphalt Young alluvial fan deposits (Qyf): Light brown to brown silty fine to medium sand, trace gravel, moist, non-porous, medium dense
5	R	17		4.7				
10	R	19		4.2				Silty fine to coarse sand
15	S	29		2.9				Coarse sand, dense
20	S	19		13.9				Trace to minor gravel
25	S	22		6.6		ML		Brown sandy silt, moist, fine sand, stiff
								Total depth 26.5' No groundwater

Sample Types:

- R - Ring Sample
- T - Tube Sample
- Bulk Sample
- S - SPT Sample
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-11

Sheet 1 of 1

Date Drilled:	10/13/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0						SM		Young alluvial fan deposits (Qyf): Light brown to brown silty fine to medium sand, trace gravel, moist
2–4			Bulk					
5	R	12						
								Hit patch of gravel, pebble to cobble size, moist
10	R	18						Total depth 10.5' No groundwater
15								
20								
25								

Sample Types:

- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-12

Sheet 1 of 1

Date Drilled:	10/13/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0						SM		Young alluvial fan deposits (Qyf): Light brown to brown fine to medium sand, trace gravel, moist
5	R	12						
						SP-SM		Poorly graded fine to coarse sand with silt with trace gravel, fine to medium sand, medium dense, poorly sorted
10	R	15						Total depth 10.5' No groundwater
15								
20								
25								

Sample Types:

- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-13
Sheet 1 of 1

Date Drilled:	10/13/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
						SM		Young alluvial fan deposits (Qyf): Light brown to brown fine to medium sand, trace gravel, moist
5	R	11						
10	R	32						Increase in medium to coarse sand
15	S	36						
								Sand with some pebble size gravel, course sand, moist, light brown to tan
20	S	47						
								Increase in silt and decrease in gravel
25	S	50-6"						Dark clay layer about 5' thick, Tan to brown, Moist
								Total depth 30.5' No groundwater

Material Description: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Sample Types:
R - Ring Sample
Bulk Sample
Groundwater
T - Tube Sample
S - SPT Sample
End of Boring

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Exploratory Boring Log

Boring No. B-14
Sheet 1 of 1

Date Drilled:	10/13/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0						SM		Young alluvial fan deposits (Qyf): Light brown to gray-brown fine to medium sand, trace gravel, moist
5	R	11						
								Increase in medium to coarse sand
10	R	29						
15	S	57						
								Sand with some pebble size gravel, course sand, moist, light brown to tan
20	S	72						
								Course sand with silt, moist, light brown to tan
25	S	45						Total depth 25.5' No groundwater

Sample Types:
- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-15
Sheet 1 of 1

Date Drilled:	10/13/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
						SM		Young alluvial fan deposits (Qyf): Light brown to brown fine to medium sand, trace gravel, moist
5	R	11						
								Increase in medium to coarse sand
10	R	22						
								Increase in clay content with course to fine sand, dark brown, moist
15	S	44						
20	S	54						
25	S	37						Total depth 25.5' No groundwater

Material Description: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Sample Types:
- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-16

Date Drilled: 10/13/2023
Logged By: SL
Location: See Site Geologic Map

Drilling Equipment: CME-75
Boring Hole Diameter: 8"
Drive Weights: 140 lbs.
Drop: 30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0						SM		Young alluvial fan deposits (Qyf): Light brown to brown fine to medium sand, trace gravel, moist
5	S	14						
								Layer of 3'-4' with medium to coarse sand
10	S	27						
15	S	18						Increase in clay content with course to fine sand, dark brown, moist
20	S	29						Total depth 20.5' No groundwater
25								

Sample Types:
R - Ring Sample; Bulk Sample; Groundwater
T - Tube Sample; S - SPT Sample; End of Boring

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Exploratory Boring Log

Boring No. B-17
Sheet 1 of 1

Date Drilled:	10/13/2023	Drilling Equipment:	CME-75
Logged By:	SL	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Material Description: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
0						SM		Young alluvial fan deposits (Qyf): Light brown to brown fine to medium sand, trace gravel, moist
5	R	10						
10	R	18						Layer of 7-10' with medium to coarse sand
15	S	22						
20	S	37						Increase in clay content with course to fine sand, dark brown, moist
25	S	68						Total depth 25.5' No groundwater

Sample Types:
- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-18

Date Drilled:	04/7/2024	Drilling Equipment:	CME-75
Logged By:	MK	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Material Description: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
						SM		Young alluvial fan deposits (Qyf): Light brown to gray-brown fine to medium sand, trace gravel, moist
	R	7		8.5	110.4			
5	S	12		11.2				Occasional fine gravel
10	S	17		8.0				
								Total depth 11.5' No groundwater
15								
20								
25								

Sample Types:

- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-19
Sheet 1 of 2

Date Drilled: 04/7/2024
Logged By: MK
Location: See Site Geologic Map

Drilling Equipment: CME-75
Boring Hole Diameter: 8"
Drive Weights: 140 lbs.
Drop: 30"

Material Description: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Depth (ft)	Sample Type	Blows (blows/ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Material Description
						SM	Berm fill (af): Dark brown to gray-brown silty fine to medium sand, moist dense.
	R	39	Bulk	6.2	122.9		
5	R	65		9.7	120.4		
							Increase in medium to coarse sand
							Young alluvial fan deposits (Qyf): G gray-brown to brown-gray fine to medium sand, trace gravel, moist, medium dense to dense
10	R	22		11.7			
15	S	34		11.3			Light brown in color
20	S	14		12.1			
25	S	17		7.5			Light gray-brown in color, increasing sand content

Sample Types:
R - Ring Sample
Bulk Sample
Groundwater
T - Tube Sample
S - SPT Sample
End of Boring

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Exploratory Boring Log

Boring No. B-19

Date Drilled: 04/7/2024
Logged By: MK
Location: See Geologic Map

Drilling Equipment: CME-75
Boring Hole Diameter: 8"
Drive Weights: 140 lbs.
Drop: 30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
	R	14	Bulk	20.9		SM		Gray-brown silty fine to medium sand, moist, medium dense, increasing silt content
35	R	17		17.1				
							End of Boring	Total depth 36.5' No groundwater
40								
45								
50								
55								

Material Description note: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Sample Types:
R - Ring Sample
Bulk Sample
Groundwater
T - Tube Sample
S - SPT Sample
End of Boring

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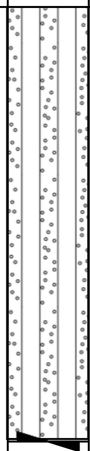
Exploratory Boring Log

Boring No. B-20

Date Drilled:	04/7/2023	Drilling Equipment:	CME-75
Logged By:	MK	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
						SM		Young alluvial fan deposits (Qyf): Light brown to gray-brown fine to medium sand, moist
	R	29		8.4	111.2			
5	R	13		5.8				Increasing sand content, grades to sand with silt with depth
10	S	12		7.3				
								Total depth 11.5' No groundwater
15								
20								
25								

Sample Types:
R - Ring Sample
Bulk Sample
- Groundwater
T - Tube Sample
S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-21
Sheet 1 of 2

Date Drilled:	04/7/2024	Drilling Equipment:	CME-75
Logged By:	MK	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Material Description: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Material Description
0						SM	Young alluvial fan deposits (Qyf): Gray to brown-gray fine to medium sand, trace gravel, moist, medium dense to dense
2	R	12	Bulk	9.1	106.2		
5	R	8		6.2	106.6		Dark gray-brown in color
10	R	18		4.4			
14.5						ML	Gray sandy silt, fine to medium sand, moist, stiff
15	S	11		17.7			
19						SM	Gray to brown-gray fine to medium sand, trace gravel, moist, medium dense to dense
20	S	26		7.2			
24.5						ML	Gray sandy silt, fine to medium sand, moist, very stiff
25	S	23		14.3			

Sample Types:
R - Ring Sample
Bulk Sample
Groundwater
T - Tube Sample
S - SPT Sample
End of Boring

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Exploratory Boring Log

Boring No. B-21
Sheet 2 of 2

Date Drilled:	04/7/2024	Drilling Equipment:	CME-75
Logged By:	MK	Boring Hole Diameter:	8"
Location:	See Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
	R	21	Bulk	14.0		ML		Gray sandy silt, fine to medium sand, moist, very stiff
						SM		Gray-brown silty fine to medium sand, moist, medium dense, increasing silt content
35	R	45		5.2				
								Total depth 36.5' No groundwater
40								
45								
50								
55								

Sample Types:
- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-22
Sheet 1 of 1

Date Drilled:	04/7/2024	Drilling Equipment:	CME-75
Logged By:	MK	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Material Description: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Depth (ft)	Sample Type	Blows (blows/ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Material Description
0						SM	Young alluvial fan deposits (Qyf): Gray to brown-gray fine to medium sand, trace gravel, moist, medium dense to dense
2	R	16	Bulk	20.5	98.3		
5	R	27		8.1	113.3		
10	R	12		5.4			Trace coarse sand
15	S	17		12.0		ML	Gray sandy silt, fine to medium sand, moist, stiff
20	S	24		5.9		SM	Gray to brown-gray fine to medium sand, trace gravel, moist, medium dense to dense
25	S	18		17.8		ML	Gray-brown sandy silt, fine to medium sand, moist, very stiff Total depth 26.5' No groundwater

Sample Types:
R - Ring Sample
Bulk Sample
Groundwater
T - Tube Sample
S - SPT Sample
End of Boring

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Exploratory Boring Log

Boring No. B-23
Sheet 1 of 1

Date Drilled:	04/7/2024	Drilling Equipment:	CME-75
Logged By:	MK	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Material Description

This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Material Description
0						SM	Young alluvial fan deposits (Qyf): Gray to brown-gray fine to medium sand, trace gravel, moist, medium dense to dense
2	R	14	Bulk	8.8	107.7		
5	R	21		3.5	106.7		Trace coarse sand and fine gravel
10	R	34		3.3			Gray in color
15	S	22		4.6			Brown-gray in color
20	S	18		10.0			Light brown to brown, gravel absent
25	S	25		16.1		ML	Gray-brown sandy silt, fine to medium sand, moist, very stiff Total depth 26.5' No groundwater

Sample Types:

- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-24
Sheet 1 of 1

Date Drilled:	04/7/2024	Drilling Equipment:	CME-75
Logged By:	MK	Boring Hole Diameter:	8"
Location:	See Site Geologic Map	Drive Weights:	140 lbs.
		Drop:	30"

Material Description

This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Material Description
						SM	Young alluvial fan deposits (Qyf): Gray to brown-gray fine to medium sand, trace gravel, moist, medium dense to dense
	R	17	Bulk	4.1	123.1		
5	R	13		8.0	106.3		
10	R	7		12.9			Light gray in color
15	S	15		10.8			Increasing sand content
20	S	17		18.6			
25	S	46		2.2		SP-SM	Light gray-brown sand with silt, fine to medium sand, trace gravel, dry to slightly moist, dense

Sample Types:
- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Boring Log

Boring No. B-24

Date Drilled: 04/7/2024
Logged By: MK
Location: See Geologic Map

Drilling Equipment: CME-75
Boring Hole Diameter: 8"
Drive Weights: 140 lbs.
Drop: 30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
	R	28	Bulk	4.3		SP-SM		Light gray-brown sand with silt, continued, gravel absent
35	R	35		5.5				
							End of Boring	Total depth 36.5' No groundwater
40								
45								
50								
55								

Sample Types:
- R - Ring Sample
- Bulk Sample
- Groundwater
- T - Tube Sample
- S - SPT Sample
- End of Boring

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Exploratory Trench Log

Location: See Geologic Map

Logged By: KRD

Equipment: Backhoe

Trench No. T-1

Date Excavated: 04/7/2024

Depth (ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)		USCS	Graphic Symbol	Material Description
					SM		Young alluvial fan deposits (Qyf): Brown fine to medium sand, few gravel, moist, upper 2 feet loose (plowed zone) then medium dense
		6.7	103.8				
							At 2.5 feet becomes yellow-brown to light brown in color.
		14.1	111.4				
5							Total depth 5 feet No groundwater Trench backfilled
10							
15							

Material Description: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Exploratory Trench Log

Location: See Geologic Map

469'

Logged By: KRD

Equipment: CAT 430F Backhoe

Trench No. T-2

Date Excavated: 04/7/2024

Depth (ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)		USCS	Graphic Symbol	Material Description
					SM		Young alluvial fan deposits (Qyf): Brown fine to medium sand, few gravel, moist, upper 2 feet loose (plowed zone) then medium dense
		16.7	98.7				
		12.7	108.9				At 2 feet becomes yellow-brown to light brown in color.
5							Total depth 5 feet No groundwater Trench backfilled
10							
15							

Material Description: This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

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Exploratory Trench Log

Location: See Geologic Map
469'

Logged By: KRD
Equipment: CAT 430F Backhoe

Trench No. T-3
Date Excavated: 04/7/2024

Depth (ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)		USCS	Graphic Symbol	Material Description
							This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
					SM		Young alluvial fan deposits (Qyf): Brown fine to medium sand, few gravel, moist, upper 2 feet loose (plowed zone) then medium dense
		7.5	102.6				
		8.2	106.9				At 2 feet becomes yellow-brown to light brown in color.
5							Total depth 5 feet No groundwater Trench backfilled
10							
15							

Exploratory Trench Log

Location: See Geologic Map
469'

Logged By: KRD
Equipment: CAT 430F Backhoe

Trench No. T-4
Date Excavated: 04/7/2024

Depth (ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)		USCS	Graphic Symbol	Material Description
							This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
					SM		Young alluvial fan deposits (Qyf): Brown fine to medium sand, few gravel, moist, upper 2 feet loose (plowed zone) then medium dense
		9.2	100.1				
		7.6	105.4				At 2 feet becomes yellow-brown to light brown in color.
5							Total depth 5 feet No groundwater Trench backfilled
10							
15							

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Exploratory Trench Log

Location: See Geologic Map

Logged By: KRD

Equipment: CAT 430F Backhoe

Trench No. T-5

Date Excavated: 04/7/2024

Depth (ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)		USCS	Graphic Symbol	Material Description
							This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
		9.7	101.2		SM		Artificial fill (af): Brown fine to medium sand, few gravel, trace organics (manure, decaying organic material) to 3 feet, moist, upper 2 feet loose (plowed zone) then medium dense
		6.8	112.4		SM		Young alluvial fan deposits (Qyf): Gray silty sand to sand with silt, fine to medium sand, moist, medium dense
5							Total depth 5 feet No groundwater Trench backfilled
10							
15							

Exploratory Trench Log

Location: See Geologic Map

468'

Logged By: KRD

Equipment: CAT 430F Backhoe

Trench No. T-6

Date Excavated: 04/7/2024

Depth (ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)		USCS	Graphic Symbol	Material Description
							This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
					SM		Artificial fill (af): Brown fine to medium sand, few gravel, trace organics (manure, decaying organic material) to 2.5 feet, moist, upper 2 feet loose (plowed zone) then medium dense
					SM		Young alluvial fan deposits (Qyf): Gray silty sand to sand with silt, fine to medium sand, moist, medium dense
5							Total depth 5 feet No groundwater Trench backfilled
10							
15							

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Exploratory Trench Log

Location: See Geologic Map

Logged By: KRD

Equipment: CAT 430F Backhoe

Trench No. T-7

Date Excavated: 04/7/2024

Depth (ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)		USCS	Graphic Symbol	Material Description
							This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
		7.9	101.7		SM		Young alluvial fan deposits (Qyf): Brown fine to medium sand, few gravel, moist, upper 2 feet loose (plowed zone) then medium dense
		9.1	105.4				At 2 feet becomes yellow-brown to light brown in color.
5							Total depth 5 feet No groundwater Trench backfilled
10							
15							

Exploratory Trench Log

Location: See Geologic Map

468'

Logged By: KRD

Equipment: CAT 430F Backhoe

Trench No. T-8

Date Excavated: 04/7/2024

Depth (ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)		USCS	Graphic Symbol	Material Description
							This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
		9.7	99.7		SM		Young alluvial fan deposits (Qyf): Brown fine to medium sand, few gravel, moist, upper 2 feet loose (plowed zone) then medium dense
		8.9	106.1				At 2 feet becomes yellow-brown to light brown in color.
5							Total depth 5 feet No groundwater Trench backfilled
10							
15							

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Exploratory Trench Log

Location: See Geologic Map

Logged By: KRD

Equipment: CAT 430F Backhoe

Trench No. T-9

Date Excavated: 04/7/2024

Depth (ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)		USCS	Graphic Symbol	Material Description This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
					SM		Young alluvial fan deposits (Qyf): Brown fine to medium sand, few gravel, moist, upper 2 feet loose (plowed zone) then medium dense
		8.4	99.7				
		9.6	103.2				At 2 feet becomes yellow-brown to light brown in color.
5							Total depth 5 feet No groundwater Trench backfilled
10							
15							

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Percolation Test Data Sheet

Project:	Ontario MiLB Stadium		Project No.:	00-232255-0		Date:	10/16/2023
Test Hole No.:		B-11	Tested By:	SL			
Test Hole Depth (In.) , D_T:		120	USCS Soil Classification:		SM		
Test Hole Dimensions (inches)					Length	Width	
Diameter In.) if round=		8	Sides (if rectangular)=				
Sandy Soil Criteria*							
Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or equal to 6"? (y/n)
1	8:30 AM	9:00 AM	30	24.0	32.0	8.0	Y
2	9:00 AM	9:30 AM	30	24.0	30.4	6.4	Y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight.

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (In.)	D_f Final Depth to Water (In.)	ΔD Change in Water Level (In.)	Percolation Rate (min./in.)
1	9:40 AM	10:10 AM	30	12.0	48.2	36.2	0.829
2	10:10 AM	10:40 PM	30	48.2	72.1	23.9	1.258
3	10:40 AM	11:10 AM	30	72.1	84.2	12.2	2.469
4	11:10 AM	11:40 PM	30	84.2	94.8	10.6	2.830
5	11:50 AM	12:10 PM	30	84.3	94.7	10.4	2.885
6	12:10 PM	12:40:00 PM	30	84.6	94.7	10.1	2.970

Infiltration Rate (in/hr) = $(\Delta H*60min/hr*r)/\Delta t\ (r+2Havg)$

H avg = $(H_o - Hf)/2$

Infiltration Rate (in/hr): 1.25

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Percolation Test Data Sheet							
Project:	Ontario MiLB Stadium		Project No.:	00-232576-2		Date:	10/16/2023
Test Hole No.:		B-12	Tested By:	SL			
Test Hole Depth (In.) , D_T:		120	USCS Soil Classification:		SP		
Test Hole Dimensions (inches)					Length	Width	
Diameter In.) if round=		8	Sides (if rectangular)=				
Sandy Soil Criteria*							
Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or equal to 6"? (y/n)
1	12:10 PM	12:40 PM	30	16.0	120.0	104.0	Y
2	12:45 PM	1:15 PM	30	16.0	120.0	104.0	Y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight.

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (In.)	D_f Final Depth to Water (In.)	ΔD Change in Water Level (In.)	Percolation Rate (min./in.)
1	12:30 PM	12:40 PM	10	12.0	86.4	74.4	0.134
2	12:45 PM	12:55 PM	10	12.0	93.0	81.0	0.123
3	1:00 PM	1:10 PM	10	12.0	90.4	78.4	0.128
4	1:15 PM	1:25 PM	10	12.0	90.2	78.2	0.128
5	1:25 PM	1:35 PM	10	12.0	90.1	78.1	0.128
6	1:35 PM	1:45 PM	10	12.0	89.8	77.8	0.129

COMMENT: Infiltration Rate (in/hr) = $(\Delta H*60min/hr*r)/\Delta t\ (r+2Havg)$

H avg = $(H_o - Hf)/2$

Infiltration Rate (in/hr): 13.24

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Percolation Test Data Sheet

Project:	Ontario Spots Park		Project No.:	00-232255-01		Date:	4/10/2024
Test Hole No.:		B-18	Tested By:	KD			
Test Hole Depth (In.) , D_T:		120	USCS Soil Classification:		SM		
Test Hole Dimensions (inches)					Length	Width	
Diameter In.) if round=		8	Sides (if rectangular)=				

Sandy Soil Criteria*

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or equal to 6"? (y/n)
1	8:00 AM	8:25 PM	25	78.0	86.0	8.0	Y
2	8:25 AM	8:50 AM	25	72.0	79.6	7.6	Y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight.

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (In.)	D_f Final Depth to Water (In.)	ΔD Change in Water Level (In.)	Percolation Rate (min./in.)
1	8:50 AM	9:00 AM	10	86.40	94.36	8.0	1.256
2	9:00 AM	9:10 AM	10	64.56	70.32	5.8	1.736
3	9:10 AM	9:20 AM	10	67.32	72.12	4.8	2.083
4	9:20 AM	9:30 AM	10	67.72	72.32	4.6	2.174
5	9:30 AM	9:40 AM	10	70.04	74.30	4.3	2.347
6	9:40 AM	9:50 AM	10	73.20	77.60	4.4	2.273
7	9:50 AM	10:00 AM	10	70.56	75.16	4.6	2.174
8	10:00 AM	10:10 AM	10	71.68	76.28	4.6	2.174
6	10:10 AM	10:20 AM	10	74.00	78.62	4.6	2.165

COMMENT Infiltration Rate (in/hr) = $(\Delta H*60min/hr*r)/\Delta t\ (r+2Havg)$

H avg = $(H_o - Hf)/2$

Infiltration Rate (in/hr): 1.07

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Percolation Test Data Sheet

Project:	Ontario Spots Park		Project No.:	00-232255-01		Date:	4/10/2024
Test Hole No.:		B-20	Tested By:	KD			
Test Hole Depth (In.) , D_T:		120	USCS Soil Classification:		SM		
Test Hole Dimensions (inches)					Length	Width	
Diameter In.) if round=		8	Sides (if rectangular)=				
Sandy Soil Criteria*							
Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or equal to 6"? (y/n)
1	11:15 AM	11:40 AM	25	61.8	78.2	16.4	Y
2	11:40 AM	11:05 AM	25	65.2	77.9	12.7	Y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight.

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (In.)	D_f Final Depth to Water (In.)	ΔD Change in Water Level (In.)	Percolation Rate (min./in.)
1	11:06 AM	11:16 AM	10	61.90	74.52	12.6	0.792
2	11:16 AM	11:26 AM	10	74.52	82.20	7.7	1.302
3	11:26 AM	11:36 AM	10	72.00	84.00	12.0	0.833
4	11:36 AM	11:46 AM	10	57.60	64.40	6.8	1.471
5	11:46 AM	11:56 AM	10	64.40	69.80	5.4	1.852
6	11:56 AM	12:06 PM	10	64.80	70.20	5.4	1.852
7	12:06 PM	12:16 PM	10	67.20	72.84	5.6	1.773
8	12:16 PM	12:26 PM	10	71.84	77.24	5.4	1.852
6	12:26 PM	12:36 PM	10	76.24	81.64	5.4	1.852

COMMEN' Infiltration Rate (in/hr) = $(\Delta H*60min/hr*r)/\Delta t\ (r+2Havg)$

H avg = $(H_o - Hf)/2$

Infiltration Rate (in/hr): 1.06

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INFILTRATION TEST RESULTS

Project ID	00-232255-01	Constants	Area (cm^2)	Depth of Liq (cm)
Test Location	T-1	Inner Ring	707	11.5
Tested By	520DKR	Anlr. Space	2106	9.0
Date	4/10/24			
Depth to Water Table		Air Temp		

No.	S or E	Date Yr 2024	Time hr (min)	Elpd Time (min)	Flow Readings: Inner Ring Rg (cm^3)	Inner Ring Flow (cm^3)	Anlr Space Ring (cm^3)	Anlr Space Flow (cm^3)	Iner Infil Rate Inr (cm/hr)	Iner Infil Rate Anlr (cm/hr)	Iner Infil Rate Inr (in/hr)	Iner Infil Rate Anlr (ft/min)	Remarks
1	S	4/10	8:40:00	0	0	550	0	2,950	9.335	16.809	3.6753	6.6177	
	E	4/10	8:45:00	5.00	550		2,950						
2	S	4/10	8:45:00	5.00	550	300	2,950	1,800	5.092	10.256	2.0047	4.0379	
	E	4/10	8:50:00	10.00	850		4,750						
3	S	4/10	8:50:00	5.00	850	250	4,750	1,750	4.243	9.972	1.6706	3.9258	
	E	4/10	8:55:00	15.00	1,100		6,500						
4	S	4/10	8:55:00	5.00	1,100	150	6,500	1,700	2.546	9.687	1.0023	3.8136	
	E	4/10	9:00:00	20.00	1,250		8,200						
5	S	4/10	9:00:00	5.00	1,250	150	8,200	1,500	2.546	8.547	1.0023	3.3650	
	E	4/10	9:05:00	25.00	1,400		9,700						
6	S	4/10	9:05:00	5.00	1,400	150	9,700	1,500	2.546	8.547	1.0023	3.3650	
	E	4/10	9:10:00	30.00	1,550		11,200						

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INFILTRATION TEST RESULTS

Project ID	00-232255-01		Constants	Area (cm^2)	Depth of Liq (cm)
Test Location	T-3		Inner Ring	707	11.5
Tested By	520DKR		Anlr. Space	2106	9.0
Date	4/10/24				
Depth to Water Table			Air Temp		

No.	S or E	Date Yr 2024	Time hr (min)	Elpd Time (min)	Flow Readings: Inner Ring Rg (cm^3)	Inner Ring Flow (cm^3)	Anlr Space Ring (cm^3)	Anlr Space Flow (cm^3)	Iner Infil Rate Inr (cm/hr)	Iner Infil Rate Anlr (cm/hr)	Iner Infil Rate Inr (in/hr)	Iner Infil Rate Anlr (ft/min)	Remarks
1	S	4/10	9:30:00	0	0	650	0	3,200	11.033	18.234	4.3435	7.1786	
	E	4/10	9:35:00	5.00	650		3,200						
2	S	4/10	9:35:00	5.00	650	325	3,200	1,800	5.516	10.256	2.1718	4.0379	
	E	4/10	9:40:00	10.00	975		5,000						
3	S	4/10	9:40:00	5.00	975	225	5,000	1,700	3.819	9.687	1.5035	3.8136	
	E	4/10	9:45:00	15.00	1,200		6,700						
4	S	4/10	9:45:00	5.00	1,200	175	6,700	1,600	2.970	9.117	1.1694	3.5893	
	E	4/10	9:55:00	20.00	1,375		8,300						
5	S	4/10	9:55:00	5.00	1,375	175	8,300	1,600	2.970	9.117	1.1694	3.5893	
	E	4/10	10:00:00	25.00	1,550		9,900						
6	S	4/10	10:00:00	5.00	1,550	175	9,900	1,600	2.970	9.117	1.1694	3.5893	
	E	4/10	10:10:00	30.00	1,725		11,500						

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INFILTRATION TEST RESULTS

				Area	Depth of Liq
Project ID	00-232255-01		Constants	(cm^2)	(cm)
Test Location	T-5		Inner Ring	707	11.5
Tested By	520DKR		Anlr. Space	2106	9.0
Date	4/10/24				
Depth to Water Table			Air Temp		

No.	S or E	Date Yr 2024	Time hr (min)	Elpd Time (min)	Flow Readings: Inner Ring Rg (cm^3)	Inner Ring Flow (cm^3)	Anlr Space Ring (cm^3)	Anlr Space Flow (cm^3)	Iner Infil Rate Inr (cm/hr)	Iner Infil Rate Anlr (cm/hr)	Iner Infil Rate Inr (in/hr)	Iner Infil Rate Anlr (ft/min)	Remarks
1	S	4/10	10:24:00	0	0	400	0	2,950	6.789	16.809	2.6729	6.6177	
	E	4/10	10:29:00	5.00	400		2,950						
2	S	4/10	10:29:00	5.00	400	250	2,950	1,800	4.243	10.256	1.6706	4.0379	
	E	4/10	10:34:00	10.00	650		4,750						
3	S	4/10	10:34:00	5.00	650	250	4,750	1,750	4.243	9.972	1.6706	3.9258	
	E	4/10	10:39:00	15.00	900		6,500						
4	S	4/10	10:39:00	5.00	900	200	6,500	1,700	3.395	9.687	1.3365	3.8136	
	E	4/10	10:44:00	20.00	1,100		8,200						
5	S	4/10	10:44:00	5.00	1,100	175	8,200	1,500	2.970	8.547	1.1694	3.3650	
	E	4/10	10:49:00	25.00	1,275		9,700						
6	S	4/10	10:49:00	5.00	1,275	175	9,700	1,400	2.970	7.977	1.1694	3.1406	
	E	4/10	10:54:00	30.00	1,450		11,100						
7	S	4/10	10:54:00	5.00	1,450	175	11,100	1,300	2.970	7.407	1.1694	2.9163	
	E	4/10	10:59:00	35.00	1,625		12,400						

APPENDIX B

LABORATORY TESTS

APPENDIX B

LABORATORY TESTS

B-1.00 LABORATORY TESTS

B-1.01 Maximum Density

Maximum density - optimum moisture relationships for the major soil types encountered during the field exploration were performed in the laboratory using the standard procedures of ASTM D1557.

B-1.02 Atterberg Limits

The liquid limit, plastic limit, and the plasticity index of the major soil types encountered in the test holes were determined using the standard test methods of ASTM D4318.

B-1.03 Expansion Tests

Expansion index tests were performed on representative samples of the major soil types encountered by the test methods outlined in ASTM D4829.

B-1.04 Soluble Sulfates and Chlorides

A test was performed on representative sample encountered during the investigation using the Caltrans Test Methods CTM 417 and CTM 422.

B-1.05 Sand Equivalence

Sand Equivalent tests were performed on representative samples of the major soil types encountered by the test methods of ASTM D2419.

B-1.06 Soil Reactivity (pH) and Electrical Resistivity

Representative soil sample was tested for soil reactivity (pH) and electrical resistivity using California Test Method 643. The pH measurement determines the degree of acidity or alkalinity in the soils.

B-1.07 Particle Size Analysis

Particle size analysis was performed on representative samples of the major soils types in accordance to the standard test methods of the ASTM D422. The hydrometer portion of the standard procedure was not performed and the material retained on the #200 screen was washed.

B-1.08 Direct Shear

Direct shear tests were performed on representative samples of the major soil types encountered in the test holes using the standard test method of ASTM D3080 (consolidated and drained). Tests were performed on remolded samples. Remolded samples were tested at 90 percent relative compaction.

Shear tests were performed on a direct shear machine of the strain-controlled type. To simulate possible adverse field conditions, the samples were saturated prior to shearing. Several samples were sheared at varying normal loads and the results plotted to establish the angle of the internal friction and cohesion of the tested samples.

B-1.09 Resistance Value (R-Value)

Resistance Value tests were performed on representative samples of the major soil types encountered by the test methods outlined in California 301.

B-1.10 Moisture Determination

Moisture content of the soil samples was performed in accordance to standard method for determination of water content of soil by drying oven, ASTM D2216. The mass of material remaining after oven drying is used as the mass of the solid particles.

B-1.11 Density of Split-Barrel Samples

Soil samples were obtained by using a split-barrel sampler in accordance to standard method of ASTM D1586.

B-1.12 Test Results

Test results for all laboratory tests performed on the subject project are presented in this appendix.

SAMPLE INFORMATION

Sample Number	Sample Description	Sample Location Boring No.	Depth (ft)
1	Light brown silty sand	B-1	2-5 feet
2	Light brown silty sand	B-2	2-5 feet
3	Light brown silty sand	B-3	12-15 feet
4	Light brown silty sand	B-4	2-5 feet
5	Light brown silty sand	B-5	12-16 feet
7	Light brown silty sand	B-7	2-5 feet
8	Brown to gray-brown silty sand	B-19	2-5 feet
9	Gray-brown silty sand	B-19	30-35 feet
10	Gray to brown-gray silty sand	B-21	2-5 feet
11	Gray sandy silt	B-21	30-35 feet
12	Gray to brown-gray silty sand	B-22	2-5 feet
13	Gray to brown-gray silty sand	B-23	2-5 feet
14	Gray to brown-gray silty sand	B-24	2-5 feet
15	Light gray-brown sand with silt	B-24	30-35 feet

MAXIMUM DENSITY - OPTIMUM MOISTURE

Test Method: ASTM D1557

Sample Number	Optimum Moisture (Percent)	Maximum Density (lbs/ft^3)
1	9.9	129.9
2	9.2	130.3
5	8.5	133.7
11	9.9	129.5
13	13.6	112.9
15	9.2	130.2

ATTERBERG LIMITS

Test Method: ASTM D4318

Sample Location	Liquid Limit	Plastic Index	Soil Classification
B-6 @ 50 feet	34	16	CL

EXPANSION TEST

Test Method: ASTM D4829

Sample Number	Molding Moisture Content (Percent)	Final Moisture Content (Percent)	Initial Dry Density (lbs/ft^3)	Expansion Index	Expansion Classification
1	7.5	15.1	117.6	4	Very low
7	6.2	14.8	118.3	2	Very low

SOLUBLE SULFATES AND CHLORIDES

Test Method: CTM 417 and CTM 422

Sample Number	Soluble Sulfate (% by weight)	Soluble Chloride (ppm)
3	0.0261	153

SOIL REACTIVITY (pH) AND ELECTRICAL RESISTIVITY

Test Method: CTM 643

Sample Number	pH	Resistivity (Ohm-cm)
3	6.8	770

SAND EQUIVALENT

Test Method: ASTM D2419

Sample Number	Sand Equivalent
2	19

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PERCENT PASSING #200 SIEVE

Test Method: ASTM D422

Sample Location	Percent Passing #200 Sieve
B-1 @ 5 feet	37.6%
B-6 @10 feet	24.1%
B-6 @ 20 feet	32.0%
B-5 @ 30 feet	57.8%
B-5 @ 45 feet	17.3%
B-5 @ 50 feet	7.3%
B-6 @ 30 feet	60.3%
B-6 @ 50 feet	63.0%
B-6 @ 70 feet	24.2%

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PARTICLE SIZE ANALYSIS

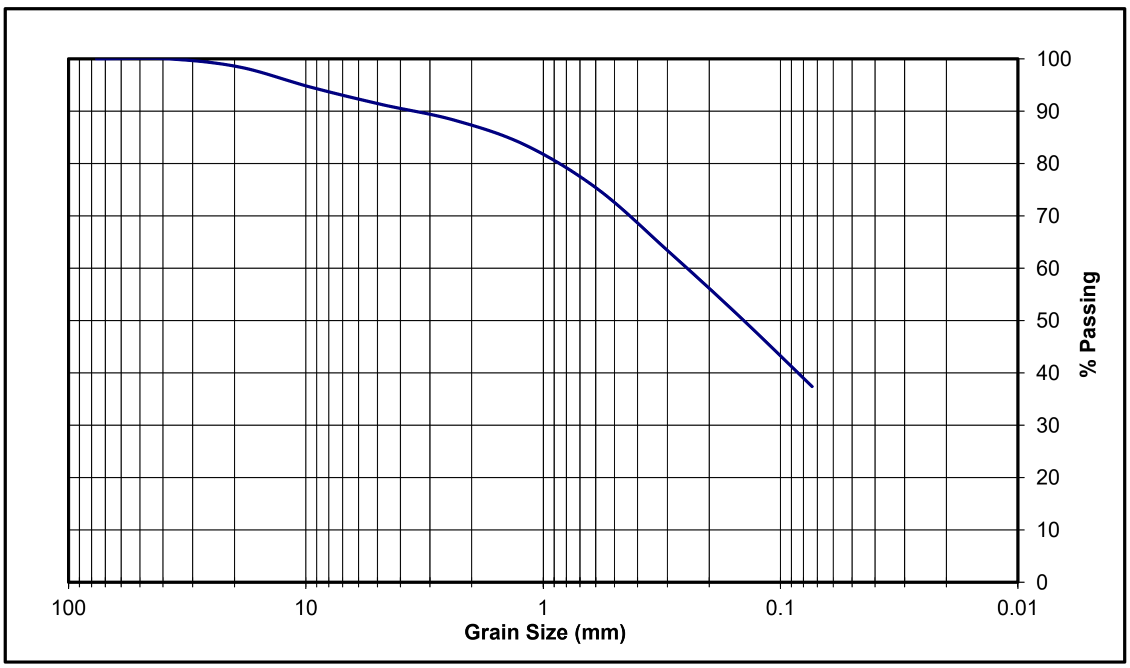
ASTM D422

Sample ID: 1
Location: B-1 @ 2-5 feet

Fraction A: Dry Net Weight (gms): 5,444
Fraction B: Dry Net Weight (gms): 486

	Screen Size	Net Retained Weight (gms)	Net Passing Weight (gms)	% Passing
Fraction A:	3"	0	5444	100
	1-1/2"	0	5444	100
	3/4"	85	5359	98
	3/8"	295	5149	95
	#4	477	4967	91

	Screen Size	Net Retained Weight (gms)	Net Passing Weight (gms)	% Passing
Fraction B:	#8	15.6	470.4	88
	#16	41.0	445.0	84
	#30	85.9	400.1	75
	#50	149.1	336.9	63
	#100	214.9	271.1	51
	#200	286.8	199.2	37



PARTICLE SIZE ANALYSIS

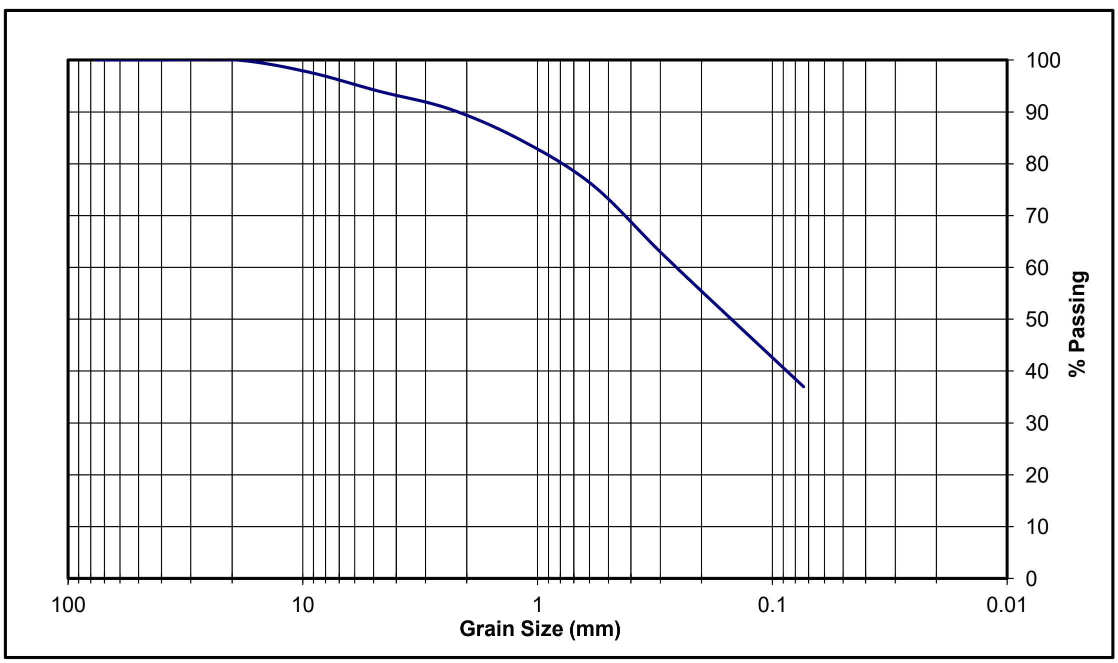
ASTM D422

Sample ID: 5
Location: B-5 @ 12-16 feet

Fraction A: Dry Net Weight (gms): 4,888
Fraction B: Dry Net Weight (gms): 523.8

	Screen Size	Net Retained Weight (gms)	Net Passing Weight (gms)	% Passing
Fraction A:	3"	0	4888	100
	1-1/2"	0	4888	100
	3/4"	0	4888	100
	3/8"	112	4776	98
	#4	294	4594	94

	Screen Size	Net Retained Weight (gms)	Net Passing Weight (gms)	% Passing
Fraction B:	#8	19.0	504.8	91
	#16	52.0	471.8	85
	#30	100.0	423.8	76
	#50	174.0	349.8	63
	#100	245.0	278.8	50
	#200	317.8	206.0	37



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PARTICLE SIZE ANALYSIS

ASTM D422

Sample ID: 7

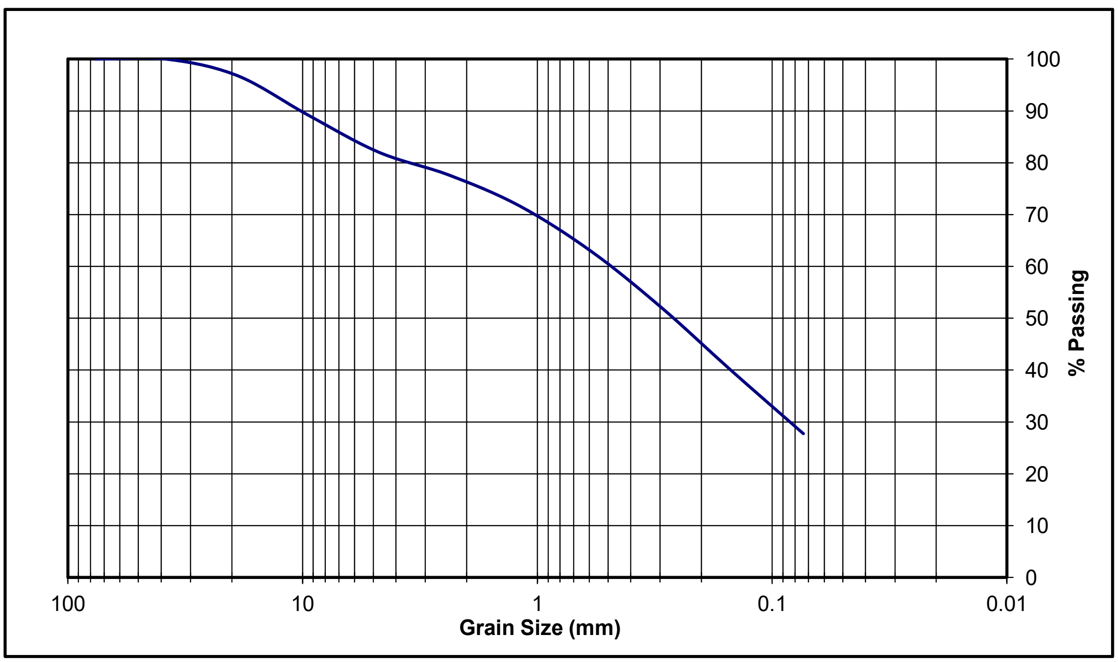
Location: B-7 @ 2-5 feet

Fraction A: Dry Net Weight (gms): 18,947

Fraction B: Dry Net Weight (gms): 508.4

	Screen Size	Net Retained Weight (gms)	Net Passing Weight (gms)	% Passing
Fraction A:	3"	0	18947	100
	1-1/2"	0	18947	100
	3/4"	597	18350	97
	3/8"	2036	16911	89
	#4	3400	15547	82

	Screen Size	Net Retained Weight (gms)	Net Passing Weight (gms)	% Passing
Fraction B:	#8	27.4	481.0	78
	#16	64.3	444.1	72
	#30	118.7	389.7	63
	#50	185.5	322.9	52
	#100	260.7	247.7	40
	#200	336.5	171.9	28



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PARTICLE SIZE ANALYSIS

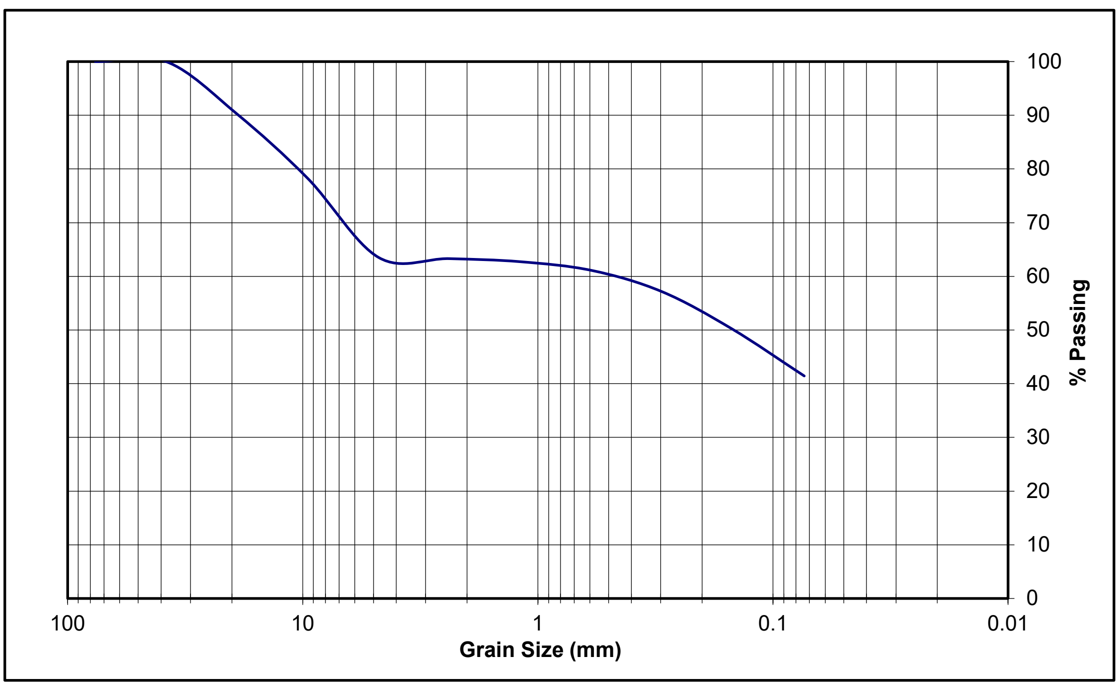
ASTM D422

Sample ID: 9
Location: B-19 @30-35 feet

Fraction A: Dry Net Weight (gms): 5,222
Fraction B: Dry Net Weight (gms): 503.8

	Screen Size	Net Retained Weight (gms)	Net Passing Weight (gms)	% Passing
Fraction A:	3"	0	5222	100
	1-1/2"	0	5222	100
	3/4"	509	4713	90
	3/8"	1136	4086	78
	#4	1906	3316	64

	Screen Size	Net Retained Weight (gms)	Net Passing Weight (gms)	% Passing
Fraction B:	#8	1.6	502.2	63
	#16	6.1	497.7	63
	#30	19.1	484.7	61
	#50	50.3	453.5	57
	#100	105.2	398.6	50
	#200	175.0	328.8	41



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PARTICLE SIZE ANALYSIS

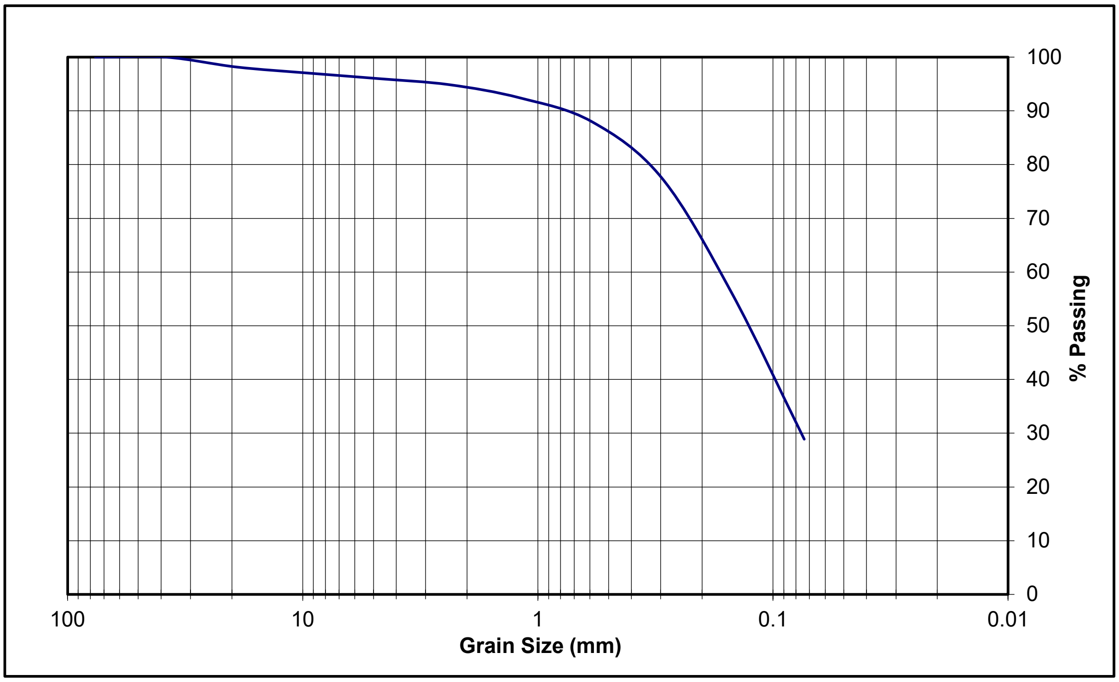
ASTM D422

Sample ID: 10
Location: B-21 @2-5 feet

Fraction A: Dry Net Weight (gms): 4,231
Fraction B: Dry Net Weight (gms): 511.6

	Screen Size	Net Retained Weight (gms)	Net Passing Weight (gms)	% Passing
Fraction A:	3"	0	4231	100
	1-1/2"	0	4231	100
	3/4"	78	4153	98
	3/8"	125	4106	97
	#4	169	4062	96

	Screen Size	Net Retained Weight (gms)	Net Passing Weight (gms)	% Passing
Fraction B:	#8	6.0	505.6	95
	#16	19.1	492.5	92
	#30	42.7	468.9	88
	#50	98.5	413.1	78
	#100	212.5	299.1	56
	#200	357.6	154.0	29



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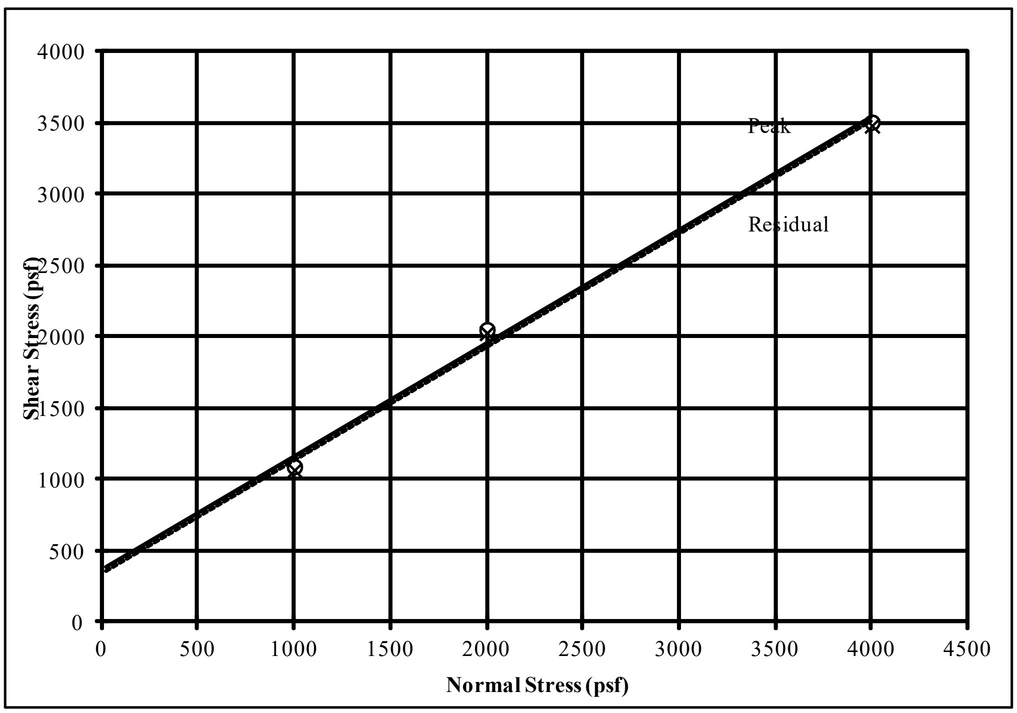
DIRECT SHEAR TEST
ASTM D3080

Sample ID: 1

Maximum Dry Density (pcf) =	130.3
Optimum Moisture Content (%) =	9.2
Initial Dry Density (pcf) =	117.3
Initial Moisture Content (%) =	9.9
Final Moisture Content (%) =	14.6

Normal Pressure	Peak Shear Resist	Residual Shear Resist
1000	1092	1068
2000	2052	2028
4000	3504	3480

	Peak	Residual
Cohesion (psf) =	370	340
Friction Angle (deg) =	38	38



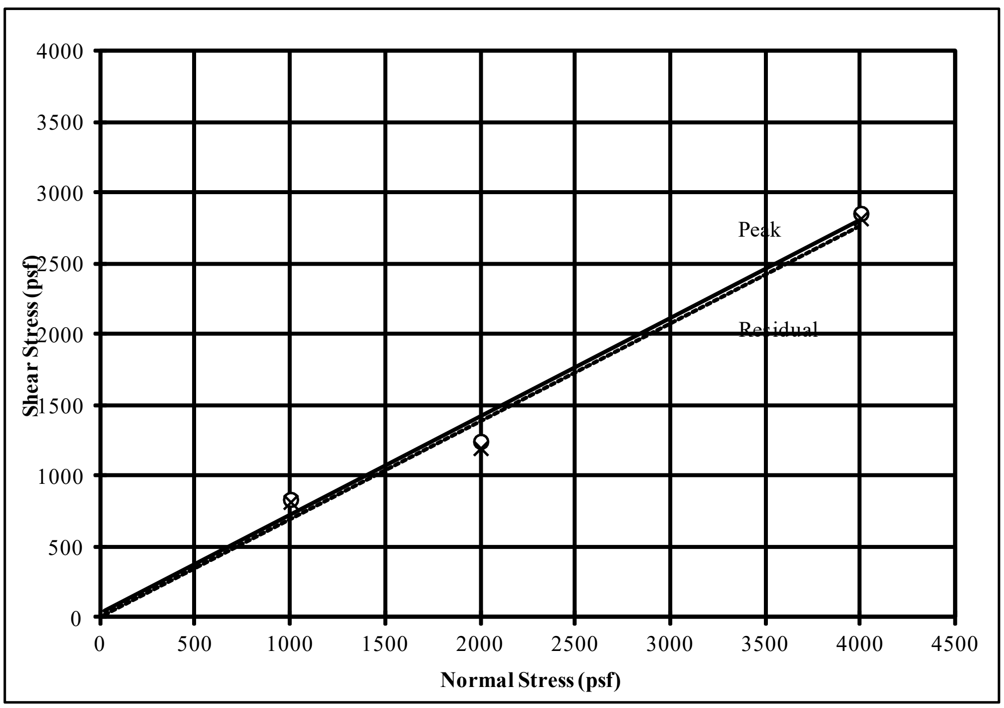
DIRECT SHEAR TEST
ASTM D3080

Sample ID: 5

Maximum Dry Density (pcf) =	133.7
Optimum Moisture Content (%) =	8.5
Initial Dry Density (pcf) =	120.3
Initial Moisture Content (%) =	8.6
Final Moisture Content (%) =	15.7

Normal Pressure	Peak Shear Resist	Residual Shear Resist
1000	838	820
2000	1248	1200
4000	2856	2820

	Peak	Residual
Cohesion (psf) =	30	10
Friction Angle (deg) =	35	34



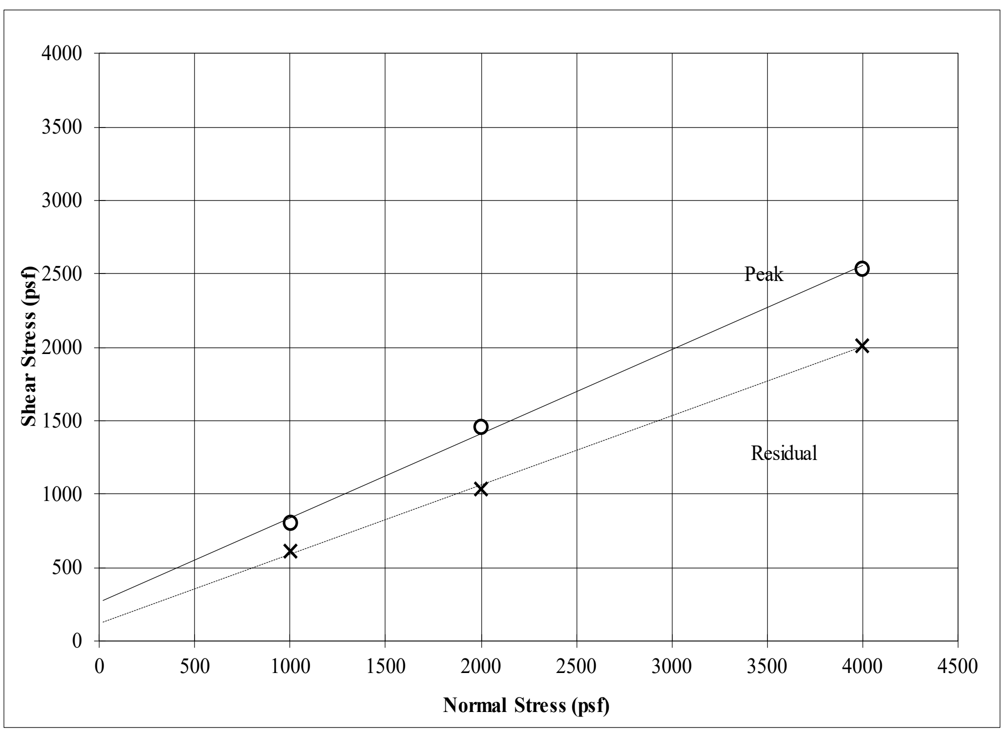
DIRECT SHEAR TEST
ASTM D3080

Sample ID: 13

Maximum Dry Density (pcf) =	112.9
Optimum Moisture Content (%) =	13.6
Initial Dry Density (pcf) =	101.6
Initial Moisture Content (%) =	8.6
Final Moisture Content (%) =	22.5

Normal Pressure	Peak Shear Resist	Residual Shear Resist
1000	804	612
2000	1464	1038
4000	2540	2012

	Peak	Residual
Cohesion (psf) =	270	130
Friction Angle (deg) =	30	25



CTM 301 - DETERMINATION OF RESISTANCE "R" VALUE OF TREATED AND UNTREATED BASES, SUBBASES, AND BASEMENT SOILS BY THE STABILOMETER

Sample ID: 1

Specimen No	A	B	C
Moisture Content (%)	10.6	10.0	10.3
Dry Density (pcf)	120.0	120.0	119.5
Exudation Pressure (psi)	191	796	553
Stabilometer R Value	23	74	61
Expansion Pressure Dial	0	0	0

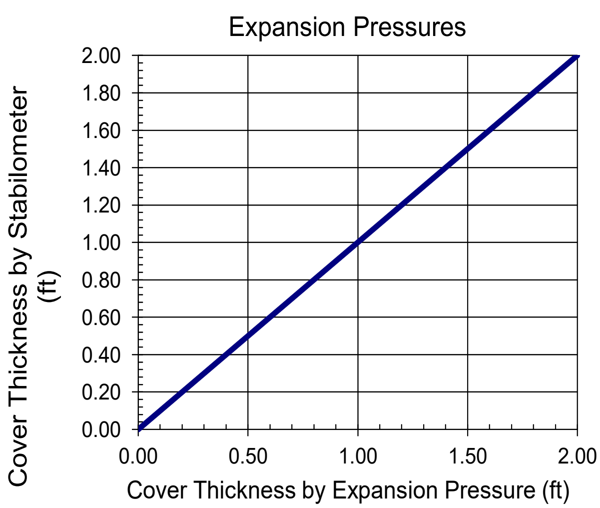
Use: Traffic Index = 6.0 Gravel Factor = 1.00

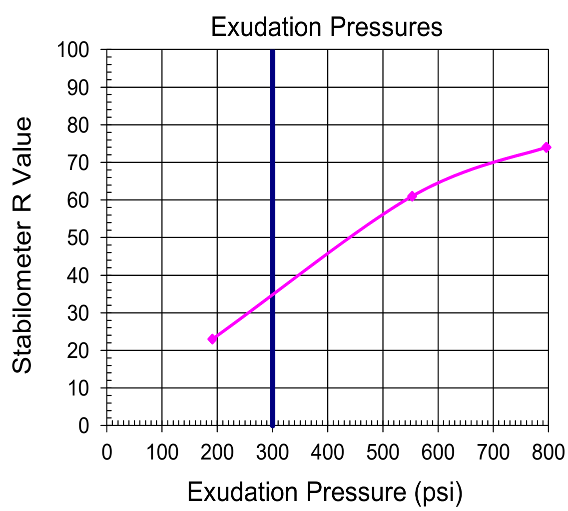
Thickness by Expansion (ft)			
Thickness by Stabilometer (ft)	1.48	0.50	0.75
Equilibrium Thick (ft)		-	

Equilibrium Pressure R Value **n/a**

Exudation Pressure R Value @ 300 psi **35**

Use Exudation R Value





Expansion Pressure R-Value is based on the following structural section:

Thickness of AC (ft)=	**0.42**	G_f(ac) =	2.31	W(ac) =	145
Thickness of Aggregate Base (ft)=	**0.50**	G_f(base) =	1.10	W(base) =	130
		G_f(avg) =	1.65	W(avg) =	137

CTM 301 - DETERMINATION OF RESISTANCE "R" VALUE OF TREATED AND UNTREATED BASES, SUBBASES, AND BASEMENT SOILS BY THE STABILOMETER

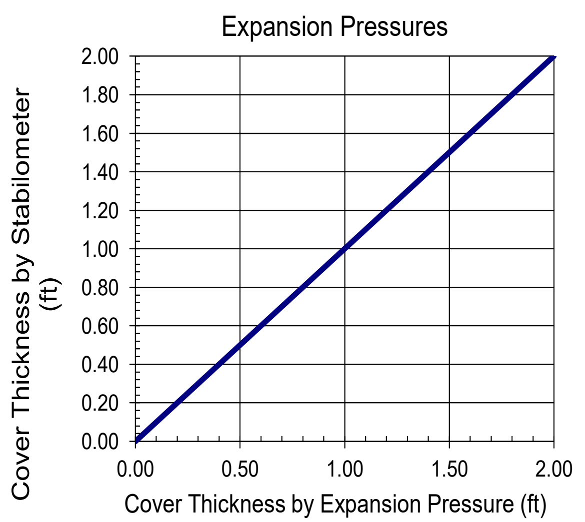
Sample ID: 2

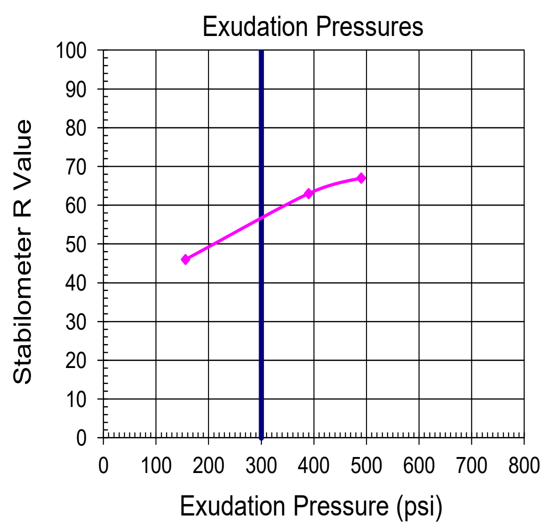
Specimen No	A	B	C
Moisture Content (%)	11.2	10.2	9.7
Dry Density (pcf)	119.7	121.6	122.3
Exudation Pressure (psi)	156	390	490
Stabilometer R Value	46	63	67
Expansion Pressure Dial	0	0	0

Use: Traffic Index = 6.0 Gravel Factor = 1.00

Thickness by Expansion (ft)			
Thickness by Stabilometer (ft)	1.04	0.71	0.63
Equilibrium Thick (ft)		-	
Equilibrium Pressure R Value		**n/a**	
Exudation Pressure R Value @ 300 psi		**57**	

Use Exudation R Value





Expansion Pressure R-Value is based on the following structural section:

Thickness of AC (ft)=	**0.42**	G_f(ac) =	2.31	W(ac) =	145
Thickness of Aggregate Base (ft)=	**0.50**	G_f(base) =	1.10	W(base) =	130
		G_f(avg) =	1.65	W(avg) =	137

APPENDIX C

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

APPENDIX C

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

C-1.00 GENERAL DESCRIPTION

C-1.01 Introduction

These specifications present our general recommendations for earthwork and grading as shown on the approved grading plans for the subject project. These specifications shall cover all clearing and grubbing, removal of existing structures, preparation of land to be filled, filling of the land, spreading, compaction and control of the fill, and all subsidiary work necessary to complete the grading of the filled areas to conform with the lines, grades and slopes as shown on the approved plans.

The recommendations contained in the geotechnical report of which these general specifications are a part of shall supersede the provisions contained hereinafter in case of conflict.

C-1.02 Laboratory Standard and Field Test Methods

The laboratory standard used to establish the maximum density and optimum moisture shall be ASTM D1557.

The insitu density of earth materials (field compaction tests) shall be determined by the sand cone method (ASTM D1556), direct transmission nuclear method (ASTM D6938) or other test methods as considered appropriate by the geotechnical consultant.

Relative compaction is defined, for purposes of these specifications, as the ratio of the in-place density to the maximum density as determined in the previously mentioned laboratory standard.

C-2.00 CLEARING

C-2.01 Surface Clearing

All structures marked for removal, timber, logs, trees, brush and other rubbish shall be removed and disposed of off the site. Any trees to be removed shall be pulled in such a manner so as to remove as much of the root system as possible.

C-2.02 Subsurface Removals

A thorough search should be made for possible underground storage tanks and/or septic tanks and cesspools. If found, tanks should be removed and cesspools pumped dry.

Any concrete irrigation lines shall be crushed in place and all metal underground lines shall be removed from the site.

C-2.03 Backfill of Cavities

All cavities created or exposed during clearing and grubbing operations or by previous use of the site shall be cleared of deleterious material and backfilled with native soils or other materials approved by the soil engineer. Said backfill shall be compacted to a minimum of 90% relative compaction.

C-3.00 ORIGINAL GROUND PREPARATION

C-3.01 Stripping of Vegetation

After the site has been properly cleared, all vegetation and topsoil containing the root systems of former vegetation shall be stripped from areas to be graded. Materials removed in this stripping process may be used as fill in areas designated by the soil engineer, provided the vegetation is mixed with a sufficient amount of soil to assure that no appreciable settlement or other detriment will occur due to decaying of the organic matter. Soil materials containing more than 3% organics shall not be used as structural fill.

C-3.02 Removals of Non-Engineered Fills

Any non-engineered fills encountered during grading shall be completely removed and the underlying ground shall be prepared in accordance to the recommendations for original ground preparation contained in this section. After cleansing of any organic matter the fill material may be used for engineered fill.

C-3.03 Overexcavation of Fill Areas

The existing ground in all areas determined to be satisfactory for the support of fills shall be scarified to a minimum depth of 6 inches. Scarification shall continue until the soils are broken down and free from lumps or clods and until the scarified zone is uniform. The moisture content of the scarified zone shall be adjusted to within 2% of optimum moisture. The scarified zone shall then be uniformly compacted to 90% relative compaction.

Where fill material is to be placed on ground with slopes steeper than 5:1 (H:V) the sloping ground shall be benched. The lowermost bench shall be a minimum of 15 feet wide, shall be a minimum of 2 feet deep, and shall expose firm material as determined by the geotechnical consultant. Other benches shall be excavated to firm material as determined by the geotechnical consultant and shall have a minimum width of 4 feet.

Existing ground that is determined to be unsatisfactory for the support of fills shall be overexcavated in accordance to the recommendations contained in the geotechnical report of which these general specifications are a part.

C-4.00 FILL MATERIALS

C-4.01 General

Materials for the fill shall be free from vegetable matter and other deleterious substances, shall not contain rocks or lumps of a greater dimension than is recommended by the geotechnical consultant, and shall be approved by the geotechnical consultant. Soils of poor gradation, expansion, or strength properties shall be placed in areas designated by the geotechnical consultant or shall be mixed with other soils providing satisfactory fill material.

C-4.02 Oversize Material

Oversize material, rock or other irreducible material with a maximum dimension greater than 12 inches, shall not be placed in fills, unless the location, materials, and disposal methods are specifically approved by the geotechnical consultant. Oversize material shall be placed in such a manner that nesting of oversize material does not occur and in such a manner that the oversize material is completely surrounded by fill material compacted to a minimum of 90% relative compaction. Oversize material shall not be placed within 10 feet of finished grade without the approval of the geotechnical consultant.

C-4.03 Import

Material imported to the site shall conform to the requirements of Section 4.01 of these specifications. Potential import material shall be approved by the geotechnical consultant prior to importation to the subject site.

C-5.00 Placing and Spreading of Fill

C-5.01 Fill Lifts

The selected fill material shall be placed in nearly horizontal layers which when compacted will not exceed approximately 6 inches in thickness. Thicker lifts may be placed if testing indicates the compaction procedures are such that the required compaction is being achieved and the geotechnical consultant approves their use.
Each layer shall be spread evenly and shall be thoroughly blade mixed during the spreading to insure uniformity of material in each layer.

C-5.02 Fill Moisture

When the moisture content of the fill material is below that recommended by the soils engineer, water shall then be added until he moisture content is as specified to assure thorough bonding during the compacting process.

When the moisture content of the fill material is above that recommended by the soils engineer, the fill material shall be aerated by blading or other satisfactory methods until the moisture content is as specified.

C-5.03 Fill Compaction

After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted to not less than 90% relative compaction. Compaction shall be by sheepsfoot rollers, multiple-wheel pneumatic tired rollers, or other types approved by the soil engineer.

Rolling shall be accomplished while the fill material is at the specified moisture content. Rolling of each layer shall be continuous over its entire area and the roller shall make sufficient trips to insure that the desired density has been obtained.

C-5.04 Fill Slopes

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compacting of the slopes may be done progressively in increments of 3 to 4 feet in fill height. At the completion of grading, the slope face shall be compacted to a minimum of 90% relative compaction. This may require track rolling or rolling with a grid roller attached to a tractor mounted side-boom.

Slopes may be over filled and cut back in such a manner that the exposed slope faces are compacted to a minimum of 90% relative compaction.

The fill operation shall be continued in six inch (6") compacted layers, or as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

C-5.05 Compaction Testing

Field density tests shall be made by the geotechnical consultant of the compaction of each layer of fill. Density tests shall be made at locations selected by the geotechnical consultant.

Frequency of field density tests shall be not less than one test for each 2.0 feet of fill height and at least every one thousand cubic yards of fill. Where fill slopes exceed four feet in height their finished faces shall be tested at a frequency of one test for each 1000 square feet of slope face.

Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density reading shall be taken in the compacted material below the disturbed surface. When these readings indicate that the density of any layer of fill or portion thereof is below the required density, the particular layer or portion shall be reworked until the required density has been obtained.

C-6.00 SUBDRAINS

C-6.01 Subdrain Material

Subdrains shall be constructed of a minimum 4-inch diameter pipe encased in a suitable filter material. The subdrain pipe shall be Schedule 40 Acrylonitrile Butadiene Styrene (ABS) or Schedule 40 Polyvinyl Chloride Plastic (PVC) pipe or approved equivalent. Subdrain pipe shall be installed with perforations down. Filter material shall consist of 3/4" to 1 1/2" clean gravel wrapped in an envelope of filter fabric consisting of Mirafi 140N or approved equivalent.

C-6.02 Subdrain Installation

Subdrain systems, if required, shall be installed in approved ground to conform the approximate alignment and details shown on the plans or herein. The subdrain locations shall not be changed or modified without the approval of the geotechnical consultant. The geotechnical consultant may recommend and direct changes in the subdrain line, grade or material upon approval by the design civil engineer and the appropriate governmental agencies.

C-7.00 EXCAVATIONS

C-7.01 General

Excavations and cut slopes shall be examined by the geotechnical consultant. If determined necessary by the geotechnical consultant, further excavation or overexcavation and refilling of overexcavated areas shall be performed, and/or remedial grading of cut slopes shall be performed.

C-7.02 Fill-Over-Cut Slopes

Where fill-over-cut slopes are to be graded the cut portion of the slope shall be made and approved by the geotechnical consultant prior to placement of materials for construction of the fill portion of the slope.

C-8.00 Trench Backfill

C-.01 General

Trench backfill within street right of ways shall be compacted to 90% relative compaction as determined by the ASTM D1557 test method. Backfill may be jetted as a means of initial compaction; however, mechanical compaction will be required to obtain the required percentage of relative compaction. If trenches are jetted, there must be a suitable delay for drainage of excess water before mechanical compaction is applied.

C-9.00 Seasonal Limits

C-9.01 General

No fill material shall be placed, spread or rolled while it is frozen or thawing or during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests by the soils engineer indicate that the moisture content and density of the fill are as previously specified.

C-10.00 Supervision

C-10.01 Prior to Grading

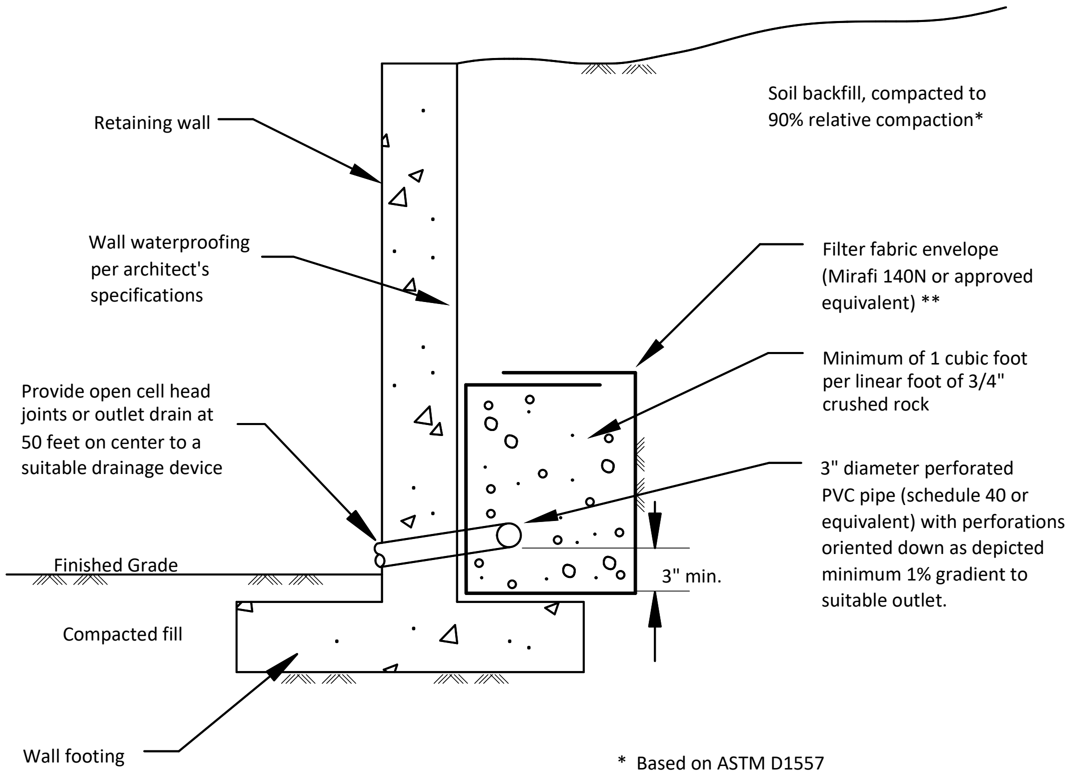
The site shall be observed by the geotechnical consultant upon completion of clearing and grubbing, prior to the preparation of any original ground for preparation of fill.

The supervisor of the grading contractor and the field representative of the geotechnical consultant shall have a meeting and discuss the geotechnical aspects of the earthwork prior to commencement of grading.

C-10.02 During Grading

Site preparation of all areas to receive fill shall be tested and approved by the geotechnical consultant prior to the placement of any fill.

The geotechnical consultant or his representative shall observe the fill and compaction operations so that he can provide an opinion regarding the conformance of the work to the recommendations contained in this report.



* Based on ASTM D1557

** If class 2 permeable material (See gradation to left) is used in place of 3/4" - 1 1/2" gravel. Filter fabric may be deleted. Class 2 permeable material compacted to 90% relative compaction. *

SPECIFICATIONS FOR CLASS 2
PERMEABLE MATERIAL
(CAL TRANS SPECIFICATIONS)

Sieve Size	% Passing
1"	100
3/4"	90-100
3/8"	40-100
No.4	25-40
No.8	18-33
No.30	5-15
No.50	0-7
No.200	0-3

RETAINING WALL DRAINAGE DETAIL

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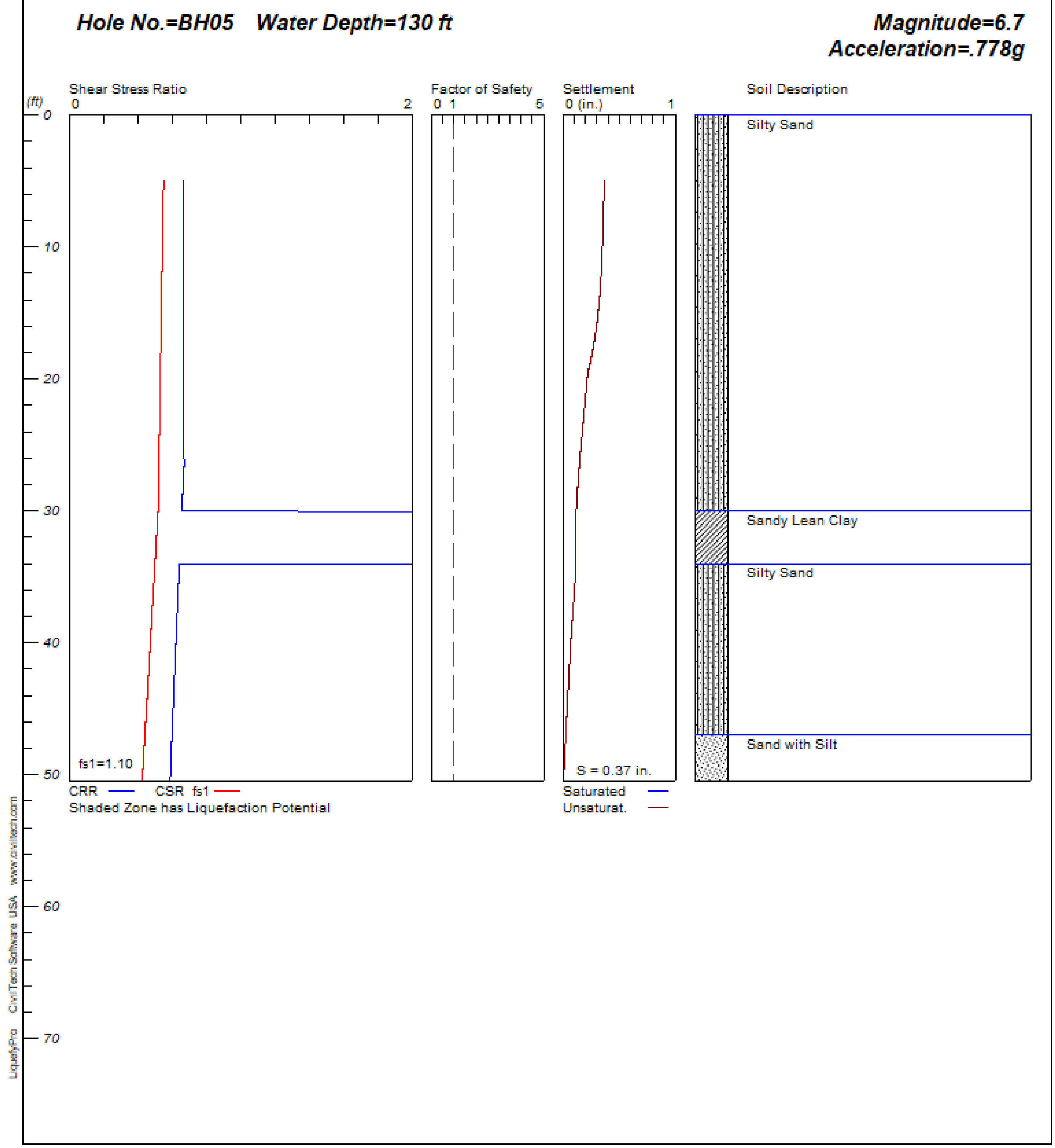
APPENDIX D

CALCULATIONS OF LIQUEFACTION POTENTIAL AND SEISMICALLY INDUCED SETTLEMENTS

LIQUEFACTION ANALYSIS

Ontario Sports Park



CivilTech Corporation

Plate A-1

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LIQUEFACTION ANALYSIS SUMMARY
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Input File Name: C:\Users\jmeneses\Desktop\HMD\00-23-2255--Ontario Sport Complex\Settlement\BH05.liq
Title: Ontario Sports Park
Subtitle:

Surface Elev.=
Hole No.=BH05
Depth of Hole= 50.50 ft
Water Table during Earthquake= 130.00 ft
Water Table during In-Situ Testing= 130.00 ft
Max. Acceleration= 0.78 g
Earthquake Magnitude= 6.70

Input Data:

Surface Elev.=
Hole No.=BH05
Depth of Hole=50.50 ft
Water Table during Earthquake= 130.00 ft
Water Table during In-Situ Testing= 130.00 ft
Max. Acceleration=0.78 g
Earthquake Magnitude=6.70
No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu, M-correction
3. Fines Correction for Liquefaction: Idriss/Seed
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.25
7. Borehole Diameter, Cb= 1
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1.1
   Plot one CSR curve (fs1=User)
10. Use Curve Smoothing: Yes*

* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
5.00	55.00	125.00	12.00
10.00	45.00	125.00	12.00
15.00	34.00	125.00	12.00
20.00	32.00	125.00	12.00
25.00	41.00	125.00	12.00
30.00	73.00	110.00	NoLiq
35.00	100.00	125.00	17.30
40.00	82.00	125.00	17.30
45.00	100.00	125.00	17.30
50.00	100.00	125.00	7.30

Output Results:

Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=0.37 in.
Total Settlement of Saturated and Unsaturated Sands=0.37 in.
Differential Settlement=0.183 to 0.241 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
5.00	0.67	0.55	5.00	0.00	0.37	0.37
5.05	0.67	0.55	5.00	0.00	0.36	0.36
5.10	0.67	0.55	5.00	0.00	0.36	0.36
5.15	0.67	0.55	5.00	0.00	0.36	0.36
5.20	0.67	0.55	5.00	0.00	0.36	0.36
5.25	0.67	0.55	5.00	0.00	0.36	0.36
5.30	0.67	0.55	5.00	0.00	0.36	0.36
5.35	0.67	0.55	5.00	0.00	0.36	0.36
5.40	0.67	0.55	5.00	0.00	0.36	0.36
5.45	0.67	0.55	5.00	0.00	0.36	0.36
5.50	0.67	0.55	5.00	0.00	0.36	0.36

5.55	0.67	0.55	5.00	0.00	0.36	0.36
5.60	0.67	0.55	5.00	0.00	0.36	0.36
5.65	0.67	0.55	5.00	0.00	0.36	0.36
5.70	0.67	0.55	5.00	0.00	0.36	0.36
5.75	0.67	0.55	5.00	0.00	0.36	0.36
5.80	0.67	0.55	5.00	0.00	0.36	0.36
5.85	0.67	0.55	5.00	0.00	0.36	0.36
5.90	0.67	0.55	5.00	0.00	0.36	0.36
5.95	0.67	0.55	5.00	0.00	0.36	0.36
6.00	0.67	0.55	5.00	0.00	0.36	0.36
6.05	0.67	0.55	5.00	0.00	0.36	0.36
6.10	0.67	0.55	5.00	0.00	0.36	0.36
6.15	0.67	0.55	5.00	0.00	0.36	0.36
6.20	0.67	0.55	5.00	0.00	0.36	0.36
6.25	0.67	0.55	5.00	0.00	0.36	0.36
6.30	0.67	0.55	5.00	0.00	0.36	0.36
6.35	0.67	0.55	5.00	0.00	0.36	0.36
6.40	0.67	0.55	5.00	0.00	0.36	0.36
6.45	0.67	0.55	5.00	0.00	0.36	0.36
6.50	0.67	0.55	5.00	0.00	0.36	0.36
6.55	0.67	0.55	5.00	0.00	0.36	0.36
6.60	0.67	0.55	5.00	0.00	0.36	0.36
6.65	0.67	0.55	5.00	0.00	0.36	0.36
6.70	0.67	0.55	5.00	0.00	0.36	0.36
6.75	0.67	0.55	5.00	0.00	0.36	0.36
6.80	0.67	0.55	5.00	0.00	0.36	0.36
6.85	0.67	0.55	5.00	0.00	0.36	0.36
6.90	0.67	0.55	5.00	0.00	0.36	0.36
6.95	0.67	0.55	5.00	0.00	0.36	0.36
7.00	0.67	0.55	5.00	0.00	0.36	0.36
7.05	0.67	0.55	5.00	0.00	0.36	0.36
7.10	0.67	0.55	5.00	0.00	0.36	0.36
7.15	0.67	0.55	5.00	0.00	0.36	0.36
7.20	0.67	0.55	5.00	0.00	0.36	0.36
7.25	0.67	0.55	5.00	0.00	0.36	0.36
7.30	0.67	0.55	5.00	0.00	0.36	0.36
7.35	0.67	0.55	5.00	0.00	0.36	0.36
7.40	0.67	0.55	5.00	0.00	0.36	0.36
7.45	0.67	0.55	5.00	0.00	0.36	0.36
7.50	0.67	0.55	5.00	0.00	0.36	0.36
7.55	0.67	0.55	5.00	0.00	0.36	0.36
7.60	0.67	0.55	5.00	0.00	0.36	0.36
7.65	0.67	0.55	5.00	0.00	0.36	0.36
7.70	0.67	0.55	5.00	0.00	0.36	0.36
7.75	0.67	0.55	5.00	0.00	0.36	0.36
7.80	0.67	0.55	5.00	0.00	0.36	0.36
7.85	0.67	0.55	5.00	0.00	0.36	0.36
7.90	0.67	0.55	5.00	0.00	0.36	0.36
7.95	0.67	0.55	5.00	0.00	0.36	0.36
8.00	0.67	0.55	5.00	0.00	0.36	0.36
8.05	0.67	0.55	5.00	0.00	0.36	0.36
8.10	0.67	0.55	5.00	0.00	0.36	0.36
8.15	0.67	0.55	5.00	0.00	0.36	0.36
8.20	0.67	0.55	5.00	0.00	0.36	0.36
8.25	0.67	0.55	5.00	0.00	0.36	0.36
8.30	0.67	0.55	5.00	0.00	0.36	0.36
8.35	0.67	0.55	5.00	0.00	0.36	0.36
8.40	0.67	0.55	5.00	0.00	0.36	0.36
8.45	0.67	0.55	5.00	0.00	0.36	0.36
8.50	0.67	0.55	5.00	0.00	0.36	0.36
8.55	0.67	0.55	5.00	0.00	0.35	0.35
8.60	0.67	0.55	5.00	0.00	0.35	0.35
8.65	0.67	0.55	5.00	0.00	0.35	0.35
8.70	0.67	0.54	5.00	0.00	0.35	0.35
8.75	0.67	0.54	5.00	0.00	0.35	0.35
8.80	0.67	0.54	5.00	0.00	0.35	0.35
8.85	0.67	0.54	5.00	0.00	0.35	0.35
8.90	0.67	0.54	5.00	0.00	0.35	0.35
8.95	0.67	0.54	5.00	0.00	0.35	0.35
9.00	0.67	0.54	5.00	0.00	0.35	0.35
9.05	0.67	0.54	5.00	0.00	0.35	0.35
9.10	0.67	0.54	5.00	0.00	0.35	0.35
9.15	0.67	0.54	5.00	0.00	0.35	0.35
9.20	0.67	0.54	5.00	0.00	0.35	0.35
9.25	0.67	0.54	5.00	0.00	0.35	0.35
9.30	0.67	0.54	5.00	0.00	0.35	0.35
9.35	0.67	0.54	5.00	0.00	0.35	0.35
9.40	0.67	0.54	5.00	0.00	0.35	0.35
9.45	0.67	0.54	5.00	0.00	0.35	0.35

9.50	0.67	0.54	5.00	0.00	0.35	0.35
9.55	0.67	0.54	5.00	0.00	0.35	0.35
9.60	0.67	0.54	5.00	0.00	0.35	0.35
9.65	0.67	0.54	5.00	0.00	0.35	0.35
9.70	0.67	0.54	5.00	0.00	0.35	0.35
9.75	0.67	0.54	5.00	0.00	0.35	0.35
9.80	0.67	0.54	5.00	0.00	0.35	0.35
9.85	0.67	0.54	5.00	0.00	0.35	0.35
9.90	0.67	0.54	5.00	0.00	0.35	0.35
9.95	0.67	0.54	5.00	0.00	0.35	0.35
10.00	0.67	0.54	5.00	0.00	0.35	0.35
10.05	0.67	0.54	5.00	0.00	0.35	0.35
10.10	0.67	0.54	5.00	0.00	0.35	0.35
10.15	0.67	0.54	5.00	0.00	0.35	0.35
10.20	0.67	0.54	5.00	0.00	0.35	0.35
10.25	0.67	0.54	5.00	0.00	0.35	0.35
10.30	0.67	0.54	5.00	0.00	0.35	0.35
10.35	0.67	0.54	5.00	0.00	0.35	0.35
10.40	0.67	0.54	5.00	0.00	0.35	0.35
10.45	0.67	0.54	5.00	0.00	0.35	0.35
10.50	0.67	0.54	5.00	0.00	0.35	0.35
10.55	0.67	0.54	5.00	0.00	0.35	0.35
10.60	0.67	0.54	5.00	0.00	0.35	0.35
10.65	0.67	0.54	5.00	0.00	0.35	0.35
10.70	0.67	0.54	5.00	0.00	0.35	0.35
10.75	0.67	0.54	5.00	0.00	0.35	0.35
10.80	0.67	0.54	5.00	0.00	0.35	0.35
10.85	0.67	0.54	5.00	0.00	0.35	0.35
10.90	0.67	0.54	5.00	0.00	0.34	0.34
10.95	0.67	0.54	5.00	0.00	0.34	0.34
11.00	0.67	0.54	5.00	0.00	0.34	0.34
11.05	0.67	0.54	5.00	0.00	0.34	0.34
11.10	0.67	0.54	5.00	0.00	0.34	0.34
11.15	0.67	0.54	5.00	0.00	0.34	0.34
11.20	0.67	0.54	5.00	0.00	0.34	0.34
11.25	0.67	0.54	5.00	0.00	0.34	0.34
11.30	0.67	0.54	5.00	0.00	0.34	0.34
11.35	0.67	0.54	5.00	0.00	0.34	0.34
11.40	0.67	0.54	5.00	0.00	0.34	0.34
11.45	0.67	0.54	5.00	0.00	0.34	0.34
11.50	0.67	0.54	5.00	0.00	0.34	0.34
11.55	0.67	0.54	5.00	0.00	0.34	0.34
11.60	0.67	0.54	5.00	0.00	0.34	0.34
11.65	0.67	0.54	5.00	0.00	0.34	0.34
11.70	0.67	0.54	5.00	0.00	0.34	0.34
11.75	0.67	0.54	5.00	0.00	0.34	0.34
11.80	0.67	0.54	5.00	0.00	0.34	0.34
11.85	0.67	0.54	5.00	0.00	0.34	0.34
11.90	0.67	0.54	5.00	0.00	0.34	0.34
11.95	0.67	0.54	5.00	0.00	0.34	0.34
12.00	0.67	0.54	5.00	0.00	0.34	0.34
12.05	0.67	0.54	5.00	0.00	0.34	0.34
12.10	0.67	0.54	5.00	0.00	0.34	0.34
12.15	0.67	0.54	5.00	0.00	0.34	0.34
12.20	0.67	0.54	5.00	0.00	0.34	0.34
12.25	0.67	0.54	5.00	0.00	0.34	0.34
12.30	0.67	0.54	5.00	0.00	0.34	0.34
12.35	0.67	0.54	5.00	0.00	0.34	0.34
12.40	0.67	0.54	5.00	0.00	0.34	0.34
12.45	0.67	0.54	5.00	0.00	0.34	0.34
12.50	0.67	0.54	5.00	0.00	0.34	0.34
12.55	0.67	0.54	5.00	0.00	0.33	0.33
12.60	0.67	0.54	5.00	0.00	0.33	0.33
12.65	0.67	0.54	5.00	0.00	0.33	0.33
12.70	0.67	0.54	5.00	0.00	0.33	0.33
12.75	0.67	0.54	5.00	0.00	0.33	0.33
12.80	0.67	0.54	5.00	0.00	0.33	0.33
12.85	0.67	0.54	5.00	0.00	0.33	0.33
12.90	0.67	0.54	5.00	0.00	0.33	0.33
12.95	0.67	0.54	5.00	0.00	0.33	0.33
13.00	0.67	0.54	5.00	0.00	0.33	0.33
13.05	0.67	0.54	5.00	0.00	0.33	0.33
13.10	0.67	0.54	5.00	0.00	0.33	0.33
13.15	0.67	0.54	5.00	0.00	0.33	0.33
13.20	0.67	0.54	5.00	0.00	0.33	0.33
13.25	0.67	0.54	5.00	0.00	0.33	0.33
13.30	0.67	0.54	5.00	0.00	0.33	0.33
13.35	0.67	0.54	5.00	0.00	0.33	0.33
13.40	0.67	0.54	5.00	0.00	0.33	0.33

13.45	0.67	0.54	5.00	0.00	0.33	0.33
13.50	0.67	0.54	5.00	0.00	0.33	0.33
13.55	0.67	0.54	5.00	0.00	0.33	0.33
13.60	0.67	0.54	5.00	0.00	0.33	0.33
13.65	0.67	0.54	5.00	0.00	0.33	0.33
13.70	0.67	0.54	5.00	0.00	0.32	0.32
13.75	0.67	0.54	5.00	0.00	0.32	0.32
13.80	0.67	0.54	5.00	0.00	0.32	0.32
13.85	0.67	0.54	5.00	0.00	0.32	0.32
13.90	0.67	0.54	5.00	0.00	0.32	0.32
13.95	0.67	0.54	5.00	0.00	0.32	0.32
14.00	0.67	0.54	5.00	0.00	0.32	0.32
14.05	0.67	0.54	5.00	0.00	0.32	0.32
14.10	0.67	0.54	5.00	0.00	0.32	0.32
14.15	0.67	0.54	5.00	0.00	0.32	0.32
14.20	0.67	0.54	5.00	0.00	0.32	0.32
14.25	0.67	0.54	5.00	0.00	0.32	0.32
14.30	0.67	0.54	5.00	0.00	0.32	0.32
14.35	0.67	0.54	5.00	0.00	0.32	0.32
14.40	0.67	0.54	5.00	0.00	0.32	0.32
14.45	0.67	0.54	5.00	0.00	0.32	0.32
14.50	0.67	0.54	5.00	0.00	0.32	0.32
14.55	0.67	0.54	5.00	0.00	0.32	0.32
14.60	0.67	0.54	5.00	0.00	0.31	0.31
14.65	0.67	0.54	5.00	0.00	0.31	0.31
14.70	0.67	0.54	5.00	0.00	0.31	0.31
14.75	0.67	0.54	5.00	0.00	0.31	0.31
14.80	0.67	0.54	5.00	0.00	0.31	0.31
14.85	0.67	0.54	5.00	0.00	0.31	0.31
14.90	0.67	0.54	5.00	0.00	0.31	0.31
14.95	0.67	0.54	5.00	0.00	0.31	0.31
15.00	0.67	0.54	5.00	0.00	0.31	0.31
15.05	0.67	0.54	5.00	0.00	0.31	0.31
15.10	0.67	0.54	5.00	0.00	0.31	0.31
15.15	0.67	0.54	5.00	0.00	0.31	0.31
15.20	0.67	0.54	5.00	0.00	0.31	0.31
15.25	0.67	0.54	5.00	0.00	0.31	0.31
15.30	0.67	0.54	5.00	0.00	0.31	0.31
15.35	0.67	0.54	5.00	0.00	0.31	0.31
15.40	0.67	0.54	5.00	0.00	0.30	0.30
15.45	0.67	0.54	5.00	0.00	0.30	0.30
15.50	0.67	0.54	5.00	0.00	0.30	0.30
15.55	0.67	0.54	5.00	0.00	0.30	0.30
15.60	0.67	0.54	5.00	0.00	0.30	0.30
15.65	0.67	0.54	5.00	0.00	0.30	0.30
15.70	0.67	0.54	5.00	0.00	0.30	0.30
15.75	0.67	0.54	5.00	0.00	0.30	0.30
15.80	0.67	0.54	5.00	0.00	0.30	0.30
15.85	0.67	0.54	5.00	0.00	0.30	0.30
15.90	0.67	0.54	5.00	0.00	0.30	0.30
15.95	0.67	0.54	5.00	0.00	0.30	0.30
16.00	0.67	0.54	5.00	0.00	0.30	0.30
16.05	0.67	0.54	5.00	0.00	0.30	0.30
16.10	0.67	0.54	5.00	0.00	0.29	0.29
16.15	0.67	0.54	5.00	0.00	0.29	0.29
16.20	0.67	0.54	5.00	0.00	0.29	0.29
16.25	0.67	0.54	5.00	0.00	0.29	0.29
16.30	0.67	0.54	5.00	0.00	0.29	0.29
16.35	0.67	0.54	5.00	0.00	0.29	0.29
16.40	0.67	0.53	5.00	0.00	0.29	0.29
16.45	0.67	0.53	5.00	0.00	0.29	0.29
16.50	0.67	0.53	5.00	0.00	0.29	0.29
16.55	0.67	0.53	5.00	0.00	0.29	0.29
16.60	0.67	0.53	5.00	0.00	0.29	0.29
16.65	0.67	0.53	5.00	0.00	0.29	0.29
16.70	0.67	0.53	5.00	0.00	0.28	0.28
16.75	0.67	0.53	5.00	0.00	0.28	0.28
16.80	0.67	0.53	5.00	0.00	0.28	0.28
16.85	0.67	0.53	5.00	0.00	0.28	0.28
16.90	0.67	0.53	5.00	0.00	0.28	0.28
16.95	0.67	0.53	5.00	0.00	0.28	0.28
17.00	0.67	0.53	5.00	0.00	0.28	0.28
17.05	0.67	0.53	5.00	0.00	0.28	0.28
17.10	0.67	0.53	5.00	0.00	0.28	0.28
17.15	0.67	0.53	5.00	0.00	0.28	0.28
17.20	0.67	0.53	5.00	0.00	0.28	0.28
17.25	0.67	0.53	5.00	0.00	0.27	0.27
17.30	0.67	0.53	5.00	0.00	0.27	0.27
17.35	0.67	0.53	5.00	0.00	0.27	0.27

17.40	0.67	0.53	5.00	0.00	0.27	0.27
17.45	0.67	0.53	5.00	0.00	0.27	0.27
17.50	0.67	0.53	5.00	0.00	0.27	0.27
17.55	0.67	0.53	5.00	0.00	0.27	0.27
17.60	0.67	0.53	5.00	0.00	0.27	0.27
17.65	0.67	0.53	5.00	0.00	0.27	0.27
17.70	0.67	0.53	5.00	0.00	0.27	0.27
17.75	0.67	0.53	5.00	0.00	0.26	0.26
17.80	0.67	0.53	5.00	0.00	0.26	0.26
17.85	0.67	0.53	5.00	0.00	0.26	0.26
17.90	0.67	0.53	5.00	0.00	0.26	0.26
17.95	0.67	0.53	5.00	0.00	0.26	0.26
18.00	0.67	0.53	5.00	0.00	0.26	0.26
18.05	0.67	0.53	5.00	0.00	0.26	0.26
18.10	0.67	0.53	5.00	0.00	0.26	0.26
18.15	0.67	0.53	5.00	0.00	0.26	0.26
18.20	0.67	0.53	5.00	0.00	0.25	0.25
18.25	0.67	0.53	5.00	0.00	0.25	0.25
18.30	0.67	0.53	5.00	0.00	0.25	0.25
18.35	0.67	0.53	5.00	0.00	0.25	0.25
18.40	0.67	0.53	5.00	0.00	0.25	0.25
18.45	0.67	0.53	5.00	0.00	0.25	0.25
18.50	0.67	0.53	5.00	0.00	0.25	0.25
18.55	0.67	0.53	5.00	0.00	0.25	0.25
18.60	0.67	0.53	5.00	0.00	0.24	0.24
18.65	0.67	0.53	5.00	0.00	0.24	0.24
18.70	0.67	0.53	5.00	0.00	0.24	0.24
18.75	0.67	0.53	5.00	0.00	0.24	0.24
18.80	0.67	0.53	5.00	0.00	0.24	0.24
18.85	0.67	0.53	5.00	0.00	0.24	0.24
18.90	0.67	0.53	5.00	0.00	0.24	0.24
18.95	0.67	0.53	5.00	0.00	0.23	0.23
19.00	0.67	0.53	5.00	0.00	0.23	0.23
19.05	0.67	0.53	5.00	0.00	0.23	0.23
19.10	0.67	0.53	5.00	0.00	0.23	0.23
19.15	0.67	0.53	5.00	0.00	0.23	0.23
19.20	0.67	0.53	5.00	0.00	0.23	0.23
19.25	0.67	0.53	5.00	0.00	0.23	0.23
19.30	0.67	0.53	5.00	0.00	0.22	0.22
19.35	0.67	0.53	5.00	0.00	0.22	0.22
19.40	0.67	0.53	5.00	0.00	0.22	0.22
19.45	0.67	0.53	5.00	0.00	0.22	0.22
19.50	0.67	0.53	5.00	0.00	0.22	0.22
19.55	0.67	0.53	5.00	0.00	0.22	0.22
19.60	0.67	0.53	5.00	0.00	0.22	0.22
19.65	0.67	0.53	5.00	0.00	0.22	0.22
19.70	0.67	0.53	5.00	0.00	0.22	0.22
19.75	0.67	0.53	5.00	0.00	0.22	0.22
19.80	0.67	0.53	5.00	0.00	0.22	0.22
19.85	0.67	0.53	5.00	0.00	0.21	0.21
19.90	0.67	0.53	5.00	0.00	0.21	0.21
19.95	0.67	0.53	5.00	0.00	0.21	0.21
20.00	0.67	0.53	5.00	0.00	0.21	0.21
20.05	0.67	0.53	5.00	0.00	0.21	0.21
20.10	0.67	0.53	5.00	0.00	0.21	0.21
20.15	0.67	0.53	5.00	0.00	0.21	0.21
20.20	0.67	0.53	5.00	0.00	0.21	0.21
20.25	0.67	0.53	5.00	0.00	0.21	0.21
20.30	0.67	0.53	5.00	0.00	0.21	0.21
20.35	0.67	0.53	5.00	0.00	0.21	0.21
20.40	0.67	0.53	5.00	0.00	0.21	0.21
20.45	0.67	0.53	5.00	0.00	0.21	0.21
20.50	0.67	0.53	5.00	0.00	0.21	0.21
20.55	0.67	0.53	5.00	0.00	0.21	0.21
20.60	0.67	0.53	5.00	0.00	0.21	0.21
20.65	0.67	0.53	5.00	0.00	0.21	0.21
20.70	0.67	0.53	5.00	0.00	0.21	0.21
20.75	0.67	0.53	5.00	0.00	0.21	0.21
20.80	0.67	0.53	5.00	0.00	0.20	0.20
20.85	0.67	0.53	5.00	0.00	0.20	0.20
20.90	0.67	0.53	5.00	0.00	0.20	0.20
20.95	0.67	0.53	5.00	0.00	0.20	0.20
21.00	0.67	0.53	5.00	0.00	0.20	0.20
21.05	0.67	0.53	5.00	0.00	0.20	0.20
21.10	0.67	0.53	5.00	0.00	0.20	0.20
21.15	0.67	0.53	5.00	0.00	0.20	0.20
21.20	0.67	0.53	5.00	0.00	0.20	0.20
21.25	0.67	0.53	5.00	0.00	0.20	0.20
21.30	0.67	0.53	5.00	0.00	0.20	0.20

21.35	0.67	0.53	5.00	0.00	0.20	0.20
21.40	0.67	0.53	5.00	0.00	0.20	0.20
21.45	0.67	0.53	5.00	0.00	0.20	0.20
21.50	0.67	0.53	5.00	0.00	0.20	0.20
21.55	0.67	0.53	5.00	0.00	0.20	0.20
21.60	0.67	0.53	5.00	0.00	0.20	0.20
21.65	0.67	0.53	5.00	0.00	0.20	0.20
21.70	0.67	0.53	5.00	0.00	0.20	0.20
21.75	0.67	0.53	5.00	0.00	0.19	0.19
21.80	0.67	0.53	5.00	0.00	0.19	0.19
21.85	0.67	0.53	5.00	0.00	0.19	0.19
21.90	0.67	0.53	5.00	0.00	0.19	0.19
21.95	0.67	0.53	5.00	0.00	0.19	0.19
22.00	0.67	0.53	5.00	0.00	0.19	0.19
22.05	0.67	0.53	5.00	0.00	0.19	0.19
22.10	0.67	0.53	5.00	0.00	0.19	0.19
22.15	0.67	0.53	5.00	0.00	0.19	0.19
22.20	0.67	0.53	5.00	0.00	0.19	0.19
22.25	0.67	0.53	5.00	0.00	0.19	0.19
22.30	0.67	0.53	5.00	0.00	0.19	0.19
22.35	0.67	0.53	5.00	0.00	0.19	0.19
22.40	0.67	0.53	5.00	0.00	0.19	0.19
22.45	0.67	0.53	5.00	0.00	0.19	0.19
22.50	0.67	0.53	5.00	0.00	0.19	0.19
22.55	0.67	0.53	5.00	0.00	0.19	0.19
22.60	0.67	0.53	5.00	0.00	0.19	0.19
22.65	0.67	0.53	5.00	0.00	0.19	0.19
22.70	0.67	0.53	5.00	0.00	0.18	0.18
22.75	0.67	0.53	5.00	0.00	0.18	0.18
22.80	0.67	0.53	5.00	0.00	0.18	0.18
22.85	0.67	0.53	5.00	0.00	0.18	0.18
22.90	0.67	0.53	5.00	0.00	0.18	0.18
22.95	0.67	0.53	5.00	0.00	0.18	0.18
23.00	0.67	0.53	5.00	0.00	0.18	0.18
23.05	0.67	0.53	5.00	0.00	0.18	0.18
23.10	0.67	0.53	5.00	0.00	0.18	0.18
23.15	0.67	0.53	5.00	0.00	0.18	0.18
23.20	0.67	0.53	5.00	0.00	0.18	0.18
23.25	0.67	0.53	5.00	0.00	0.18	0.18
23.30	0.67	0.53	5.00	0.00	0.18	0.18
23.35	0.67	0.53	5.00	0.00	0.18	0.18
23.40	0.67	0.53	5.00	0.00	0.18	0.18
23.45	0.67	0.53	5.00	0.00	0.18	0.18
23.50	0.67	0.53	5.00	0.00	0.18	0.18
23.55	0.67	0.53	5.00	0.00	0.18	0.18
23.60	0.67	0.53	5.00	0.00	0.17	0.17
23.65	0.67	0.53	5.00	0.00	0.17	0.17
23.70	0.67	0.53	5.00	0.00	0.17	0.17
23.75	0.67	0.53	5.00	0.00	0.17	0.17
23.80	0.67	0.53	5.00	0.00	0.17	0.17
23.85	0.67	0.53	5.00	0.00	0.17	0.17
23.90	0.67	0.53	5.00	0.00	0.17	0.17
23.95	0.67	0.53	5.00	0.00	0.17	0.17
24.00	0.67	0.53	5.00	0.00	0.17	0.17
24.05	0.67	0.53	5.00	0.00	0.17	0.17
24.10	0.67	0.53	5.00	0.00	0.17	0.17
24.15	0.67	0.52	5.00	0.00	0.17	0.17
24.20	0.67	0.52	5.00	0.00	0.17	0.17
24.25	0.67	0.52	5.00	0.00	0.17	0.17
24.30	0.67	0.52	5.00	0.00	0.17	0.17
24.35	0.67	0.52	5.00	0.00	0.17	0.17
24.40	0.67	0.52	5.00	0.00	0.17	0.17
24.45	0.67	0.52	5.00	0.00	0.16	0.16
24.50	0.67	0.52	5.00	0.00	0.16	0.16
24.55	0.67	0.52	5.00	0.00	0.16	0.16
24.60	0.67	0.52	5.00	0.00	0.16	0.16
24.65	0.67	0.52	5.00	0.00	0.16	0.16
24.70	0.67	0.52	5.00	0.00	0.16	0.16
24.75	0.67	0.52	5.00	0.00	0.16	0.16
24.80	0.67	0.52	5.00	0.00	0.16	0.16
24.85	0.67	0.52	5.00	0.00	0.16	0.16
24.90	0.67	0.52	5.00	0.00	0.16	0.16
24.95	0.67	0.52	5.00	0.00	0.16	0.16
25.00	0.67	0.52	5.00	0.00	0.16	0.16
25.05	0.67	0.52	5.00	0.00	0.16	0.16
25.10	0.67	0.52	5.00	0.00	0.16	0.16
25.15	0.67	0.52	5.00	0.00	0.16	0.16
25.20	0.67	0.52	5.00	0.00	0.16	0.16
25.25	0.67	0.52	5.00	0.00	0.16	0.16

25.30	0.67	0.52	5.00	0.00	0.15	0.15
25.35	0.67	0.52	5.00	0.00	0.15	0.15
25.40	0.67	0.52	5.00	0.00	0.15	0.15
25.45	0.67	0.52	5.00	0.00	0.15	0.15
25.50	0.67	0.52	5.00	0.00	0.15	0.15
25.55	0.67	0.52	5.00	0.00	0.15	0.15
25.60	0.67	0.52	5.00	0.00	0.15	0.15
25.65	0.67	0.52	5.00	0.00	0.15	0.15
25.70	0.67	0.52	5.00	0.00	0.15	0.15
25.75	0.67	0.52	5.00	0.00	0.15	0.15
25.80	0.67	0.52	5.00	0.00	0.15	0.15
25.85	0.67	0.52	5.00	0.00	0.15	0.15
25.90	0.67	0.52	5.00	0.00	0.15	0.15
25.95	0.67	0.52	5.00	0.00	0.15	0.15
26.00	0.67	0.52	5.00	0.00	0.15	0.15
26.05	0.67	0.52	5.00	0.00	0.15	0.15
26.10	0.67	0.52	5.00	0.00	0.15	0.15
26.15	0.67	0.52	5.00	0.00	0.15	0.15
26.20	0.67	0.52	5.00	0.00	0.15	0.15
26.25	0.67	0.52	5.00	0.00	0.15	0.15
26.30	0.67	0.52	5.00	0.00	0.15	0.15
26.35	0.67	0.52	5.00	0.00	0.14	0.14
26.40	0.67	0.52	5.00	0.00	0.14	0.14
26.45	0.67	0.52	5.00	0.00	0.14	0.14
26.50	0.67	0.52	5.00	0.00	0.14	0.14
26.55	0.67	0.52	5.00	0.00	0.14	0.14
26.60	0.67	0.52	5.00	0.00	0.14	0.14
26.65	0.67	0.52	5.00	0.00	0.14	0.14
26.70	0.67	0.52	5.00	0.00	0.14	0.14
26.75	0.67	0.52	5.00	0.00	0.14	0.14
26.80	0.67	0.52	5.00	0.00	0.14	0.14
26.85	0.67	0.52	5.00	0.00	0.14	0.14
26.90	0.67	0.52	5.00	0.00	0.14	0.14
26.95	0.67	0.52	5.00	0.00	0.14	0.14
27.00	0.67	0.52	5.00	0.00	0.14	0.14
27.05	0.67	0.52	5.00	0.00	0.14	0.14
27.10	0.67	0.52	5.00	0.00	0.14	0.14
27.15	0.67	0.52	5.00	0.00	0.14	0.14
27.20	0.67	0.52	5.00	0.00	0.14	0.14
27.25	0.67	0.52	5.00	0.00	0.14	0.14
27.30	0.67	0.52	5.00	0.00	0.14	0.14
27.35	0.67	0.52	5.00	0.00	0.14	0.14
27.40	0.67	0.52	5.00	0.00	0.14	0.14
27.45	0.67	0.52	5.00	0.00	0.14	0.14
27.50	0.67	0.52	5.00	0.00	0.13	0.13
27.55	0.67	0.52	5.00	0.00	0.13	0.13
27.60	0.67	0.52	5.00	0.00	0.13	0.13
27.65	0.67	0.52	5.00	0.00	0.13	0.13
27.70	0.66	0.52	5.00	0.00	0.13	0.13
27.75	0.66	0.52	5.00	0.00	0.13	0.13
27.80	0.66	0.52	5.00	0.00	0.13	0.13
27.85	0.66	0.52	5.00	0.00	0.13	0.13
27.90	0.66	0.52	5.00	0.00	0.13	0.13
27.95	0.66	0.52	5.00	0.00	0.13	0.13
28.00	0.66	0.52	5.00	0.00	0.13	0.13
28.05	0.66	0.52	5.00	0.00	0.13	0.13
28.10	0.66	0.52	5.00	0.00	0.13	0.13
28.15	0.66	0.52	5.00	0.00	0.13	0.13
28.20	0.66	0.52	5.00	0.00	0.13	0.13
28.25	0.66	0.52	5.00	0.00	0.13	0.13
28.30	0.66	0.52	5.00	0.00	0.13	0.13
28.35	0.66	0.52	5.00	0.00	0.13	0.13
28.40	0.66	0.52	5.00	0.00	0.13	0.13
28.45	0.66	0.52	5.00	0.00	0.13	0.13
28.50	0.66	0.52	5.00	0.00	0.13	0.13
28.55	0.66	0.52	5.00	0.00	0.13	0.13
28.60	0.66	0.52	5.00	0.00	0.13	0.13
28.65	0.66	0.52	5.00	0.00	0.13	0.13
28.70	0.66	0.52	5.00	0.00	0.13	0.13
28.75	0.66	0.52	5.00	0.00	0.12	0.12
28.80	0.66	0.52	5.00	0.00	0.12	0.12
28.85	0.66	0.52	5.00	0.00	0.12	0.12
28.90	0.66	0.52	5.00	0.00	0.12	0.12
28.95	0.66	0.52	5.00	0.00	0.12	0.12
29.00	0.66	0.52	5.00	0.00	0.12	0.12
29.05	0.66	0.52	5.00	0.00	0.12	0.12
29.10	0.66	0.52	5.00	0.00	0.12	0.12
29.15	0.66	0.52	5.00	0.00	0.12	0.12
29.20	0.66	0.52	5.00	0.00	0.12	0.12

29.25	0.66	0.52	5.00	0.00	0.12	0.12
29.30	0.66	0.52	5.00	0.00	0.12	0.12
29.35	0.66	0.52	5.00	0.00	0.12	0.12
29.40	0.66	0.52	5.00	0.00	0.12	0.12
29.45	0.66	0.52	5.00	0.00	0.12	0.12
29.50	0.66	0.52	5.00	0.00	0.12	0.12
29.55	0.66	0.52	5.00	0.00	0.12	0.12
29.60	0.66	0.52	5.00	0.00	0.12	0.12
29.65	0.66	0.52	5.00	0.00	0.12	0.12
29.70	0.66	0.52	5.00	0.00	0.12	0.12
29.75	0.66	0.52	5.00	0.00	0.12	0.12
29.80	0.66	0.52	5.00	0.00	0.12	0.12
29.85	0.66	0.52	5.00	0.00	0.12	0.12
29.90	0.66	0.52	5.00	0.00	0.12	0.12
29.95	0.66	0.52	5.00	0.00	0.12	0.12
30.00	0.66	0.52	5.00	0.00	0.12	0.12
30.05	2.00	0.52	5.00	0.00	0.12	0.12
30.10	2.00	0.52	5.00	0.00	0.12	0.12
30.15	2.00	0.52	5.00	0.00	0.12	0.12
30.20	2.00	0.52	5.00	0.00	0.12	0.12
30.25	2.00	0.52	5.00	0.00	0.12	0.12
30.30	2.00	0.52	5.00	0.00	0.12	0.12
30.35	2.00	0.52	5.00	0.00	0.12	0.12
30.40	2.00	0.52	5.00	0.00	0.12	0.12
30.45	2.00	0.52	5.00	0.00	0.12	0.12
30.50	2.00	0.51	5.00	0.00	0.12	0.12
30.55	2.00	0.51	5.00	0.00	0.12	0.12
30.60	2.00	0.51	5.00	0.00	0.12	0.12
30.65	2.00	0.51	5.00	0.00	0.12	0.12
30.70	2.00	0.51	5.00	0.00	0.12	0.12
30.75	2.00	0.51	5.00	0.00	0.12	0.12
30.80	2.00	0.51	5.00	0.00	0.12	0.12
30.85	2.00	0.51	5.00	0.00	0.12	0.12
30.90	2.00	0.51	5.00	0.00	0.12	0.12
30.95	2.00	0.51	5.00	0.00	0.12	0.12
31.00	2.00	0.51	5.00	0.00	0.12	0.12
31.05	2.00	0.51	5.00	0.00	0.12	0.12
31.10	2.00	0.51	5.00	0.00	0.12	0.12
31.15	2.00	0.51	5.00	0.00	0.12	0.12
31.20	2.00	0.51	5.00	0.00	0.12	0.12
31.25	2.00	0.51	5.00	0.00	0.12	0.12
31.30	2.00	0.51	5.00	0.00	0.12	0.12
31.35	2.00	0.51	5.00	0.00	0.12	0.12
31.40	2.00	0.51	5.00	0.00	0.12	0.12
31.45	2.00	0.51	5.00	0.00	0.12	0.12
31.50	2.00	0.51	5.00	0.00	0.12	0.12
31.55	2.00	0.51	5.00	0.00	0.12	0.12
31.60	2.00	0.51	5.00	0.00	0.12	0.12
31.65	2.00	0.51	5.00	0.00	0.12	0.12
31.70	2.00	0.51	5.00	0.00	0.12	0.12
31.75	2.00	0.51	5.00	0.00	0.12	0.12
31.80	2.00	0.51	5.00	0.00	0.12	0.12
31.85	2.00	0.51	5.00	0.00	0.12	0.12
31.90	2.00	0.51	5.00	0.00	0.12	0.12
31.95	2.00	0.51	5.00	0.00	0.12	0.12
32.00	2.00	0.51	5.00	0.00	0.12	0.12
32.05	2.00	0.51	5.00	0.00	0.12	0.12
32.10	2.00	0.51	5.00	0.00	0.12	0.12
32.15	2.00	0.51	5.00	0.00	0.12	0.12
32.20	2.00	0.51	5.00	0.00	0.12	0.12
32.25	2.00	0.51	5.00	0.00	0.12	0.12
32.30	2.00	0.51	5.00	0.00	0.12	0.12
32.35	2.00	0.51	5.00	0.00	0.12	0.12
32.40	2.00	0.51	5.00	0.00	0.12	0.12
32.45	2.00	0.51	5.00	0.00	0.12	0.12
32.50	2.00	0.51	5.00	0.00	0.12	0.12
32.55	2.00	0.51	5.00	0.00	0.12	0.12
32.60	2.00	0.51	5.00	0.00	0.12	0.12
32.65	2.00	0.51	5.00	0.00	0.12	0.12
32.70	2.00	0.51	5.00	0.00	0.12	0.12
32.75	2.00	0.50	5.00	0.00	0.12	0.12
32.80	2.00	0.50	5.00	0.00	0.12	0.12
32.85	2.00	0.50	5.00	0.00	0.12	0.12
32.90	2.00	0.50	5.00	0.00	0.12	0.12
32.95	2.00	0.50	5.00	0.00	0.12	0.12
33.00	2.00	0.50	5.00	0.00	0.12	0.12
33.05	2.00	0.50	5.00	0.00	0.12	0.12
33.10	2.00	0.50	5.00	0.00	0.12	0.12
33.15	2.00	0.50	5.00	0.00	0.12	0.12

33.20	2.00	0.50	5.00	0.00	0.12	0.12
33.25	2.00	0.50	5.00	0.00	0.12	0.12
33.30	2.00	0.50	5.00	0.00	0.12	0.12
33.35	2.00	0.50	5.00	0.00	0.12	0.12
33.40	2.00	0.50	5.00	0.00	0.12	0.12
33.45	2.00	0.50	5.00	0.00	0.12	0.12
33.50	2.00	0.50	5.00	0.00	0.12	0.12
33.55	2.00	0.50	5.00	0.00	0.12	0.12
33.60	2.00	0.50	5.00	0.00	0.12	0.12
33.65	2.00	0.50	5.00	0.00	0.12	0.12
33.70	2.00	0.50	5.00	0.00	0.12	0.12
33.75	2.00	0.50	5.00	0.00	0.12	0.12
33.80	2.00	0.50	5.00	0.00	0.12	0.12
33.85	2.00	0.50	5.00	0.00	0.12	0.12
33.90	2.00	0.50	5.00	0.00	0.12	0.12
33.95	2.00	0.50	5.00	0.00	0.12	0.12
34.00	2.00	0.50	5.00	0.00	0.12	0.12
34.05	0.64	0.50	5.00	0.00	0.12	0.12
34.10	0.64	0.50	5.00	0.00	0.12	0.12
34.15	0.64	0.50	5.00	0.00	0.11	0.11
34.20	0.64	0.50	5.00	0.00	0.11	0.11
34.25	0.64	0.50	5.00	0.00	0.11	0.11
34.30	0.64	0.50	5.00	0.00	0.11	0.11
34.35	0.64	0.50	5.00	0.00	0.11	0.11
34.40	0.64	0.50	5.00	0.00	0.11	0.11
34.45	0.64	0.50	5.00	0.00	0.11	0.11
34.50	0.64	0.50	5.00	0.00	0.11	0.11
34.55	0.64	0.50	5.00	0.00	0.11	0.11
34.60	0.64	0.50	5.00	0.00	0.11	0.11
34.65	0.64	0.50	5.00	0.00	0.11	0.11
34.70	0.64	0.50	5.00	0.00	0.11	0.11
34.75	0.64	0.50	5.00	0.00	0.11	0.11
34.80	0.64	0.50	5.00	0.00	0.11	0.11
34.85	0.64	0.50	5.00	0.00	0.11	0.11
34.90	0.64	0.50	5.00	0.00	0.11	0.11
34.95	0.64	0.49	5.00	0.00	0.11	0.11
35.00	0.64	0.49	5.00	0.00	0.11	0.11
35.05	0.64	0.49	5.00	0.00	0.11	0.11
35.10	0.64	0.49	5.00	0.00	0.11	0.11
35.15	0.64	0.49	5.00	0.00	0.11	0.11
35.20	0.64	0.49	5.00	0.00	0.11	0.11
35.25	0.64	0.49	5.00	0.00	0.11	0.11
35.30	0.64	0.49	5.00	0.00	0.11	0.11
35.35	0.64	0.49	5.00	0.00	0.10	0.10
35.40	0.64	0.49	5.00	0.00	0.10	0.10
35.45	0.64	0.49	5.00	0.00	0.10	0.10
35.50	0.64	0.49	5.00	0.00	0.10	0.10
35.55	0.64	0.49	5.00	0.00	0.10	0.10
35.60	0.64	0.49	5.00	0.00	0.10	0.10
35.65	0.64	0.49	5.00	0.00	0.10	0.10
35.70	0.64	0.49	5.00	0.00	0.10	0.10
35.75	0.64	0.49	5.00	0.00	0.10	0.10
35.80	0.64	0.49	5.00	0.00	0.10	0.10
35.85	0.64	0.49	5.00	0.00	0.10	0.10
35.90	0.64	0.49	5.00	0.00	0.10	0.10
35.95	0.64	0.49	5.00	0.00	0.10	0.10
36.00	0.64	0.49	5.00	0.00	0.10	0.10
36.05	0.64	0.49	5.00	0.00	0.10	0.10
36.10	0.63	0.49	5.00	0.00	0.10	0.10
36.15	0.63	0.49	5.00	0.00	0.10	0.10
36.20	0.63	0.49	5.00	0.00	0.10	0.10
36.25	0.63	0.49	5.00	0.00	0.10	0.10
36.30	0.63	0.49	5.00	0.00	0.10	0.10
36.35	0.63	0.49	5.00	0.00	0.10	0.10
36.40	0.63	0.49	5.00	0.00	0.10	0.10
36.45	0.63	0.49	5.00	0.00	0.10	0.10
36.50	0.63	0.49	5.00	0.00	0.10	0.10
36.55	0.63	0.49	5.00	0.00	0.09	0.09
36.60	0.63	0.49	5.00	0.00	0.09	0.09
36.65	0.63	0.49	5.00	0.00	0.09	0.09
36.70	0.63	0.49	5.00	0.00	0.09	0.09
36.75	0.63	0.49	5.00	0.00	0.09	0.09
36.80	0.63	0.49	5.00	0.00	0.09	0.09
36.85	0.63	0.49	5.00	0.00	0.09	0.09
36.90	0.63	0.49	5.00	0.00	0.09	0.09
36.95	0.63	0.49	5.00	0.00	0.09	0.09
37.00	0.63	0.49	5.00	0.00	0.09	0.09
37.05	0.63	0.49	5.00	0.00	0.09	0.09
37.10	0.63	0.49	5.00	0.00	0.09	0.09

37.15	0.63	0.48	5.00	0.00	0.09	0.09
37.20	0.63	0.48	5.00	0.00	0.09	0.09
37.25	0.63	0.48	5.00	0.00	0.09	0.09
37.30	0.63	0.48	5.00	0.00	0.09	0.09
37.35	0.63	0.48	5.00	0.00	0.09	0.09
37.40	0.63	0.48	5.00	0.00	0.09	0.09
37.45	0.63	0.48	5.00	0.00	0.09	0.09
37.50	0.63	0.48	5.00	0.00	0.09	0.09
37.55	0.63	0.48	5.00	0.00	0.09	0.09
37.60	0.63	0.48	5.00	0.00	0.09	0.09
37.65	0.63	0.48	5.00	0.00	0.09	0.09
37.70	0.63	0.48	5.00	0.00	0.09	0.09
37.75	0.63	0.48	5.00	0.00	0.08	0.08
37.80	0.63	0.48	5.00	0.00	0.08	0.08
37.85	0.63	0.48	5.00	0.00	0.08	0.08
37.90	0.63	0.48	5.00	0.00	0.08	0.08
37.95	0.63	0.48	5.00	0.00	0.08	0.08
38.00	0.63	0.48	5.00	0.00	0.08	0.08
38.05	0.63	0.48	5.00	0.00	0.08	0.08
38.10	0.63	0.48	5.00	0.00	0.08	0.08
38.15	0.63	0.48	5.00	0.00	0.08	0.08
38.20	0.63	0.48	5.00	0.00	0.08	0.08
38.25	0.63	0.48	5.00	0.00	0.08	0.08
38.30	0.63	0.48	5.00	0.00	0.08	0.08
38.35	0.63	0.48	5.00	0.00	0.08	0.08
38.40	0.63	0.48	5.00	0.00	0.08	0.08
38.45	0.63	0.48	5.00	0.00	0.08	0.08
38.50	0.63	0.48	5.00	0.00	0.08	0.08
38.55	0.63	0.48	5.00	0.00	0.08	0.08
38.60	0.63	0.48	5.00	0.00	0.08	0.08
38.65	0.63	0.48	5.00	0.00	0.08	0.08
38.70	0.63	0.48	5.00	0.00	0.08	0.08
38.75	0.63	0.48	5.00	0.00	0.08	0.08
38.80	0.63	0.48	5.00	0.00	0.08	0.08
38.85	0.63	0.48	5.00	0.00	0.07	0.07
38.90	0.62	0.48	5.00	0.00	0.07	0.07
38.95	0.62	0.48	5.00	0.00	0.07	0.07
39.00	0.62	0.48	5.00	0.00	0.07	0.07
39.05	0.62	0.48	5.00	0.00	0.07	0.07
39.10	0.62	0.48	5.00	0.00	0.07	0.07
39.15	0.62	0.48	5.00	0.00	0.07	0.07
39.20	0.62	0.48	5.00	0.00	0.07	0.07
39.25	0.62	0.48	5.00	0.00	0.07	0.07
39.30	0.62	0.48	5.00	0.00	0.07	0.07
39.35	0.62	0.47	5.00	0.00	0.07	0.07
39.40	0.62	0.47	5.00	0.00	0.07	0.07
39.45	0.62	0.47	5.00	0.00	0.07	0.07
39.50	0.62	0.47	5.00	0.00	0.07	0.07
39.55	0.62	0.47	5.00	0.00	0.07	0.07
39.60	0.62	0.47	5.00	0.00	0.07	0.07
39.65	0.62	0.47	5.00	0.00	0.07	0.07
39.70	0.62	0.47	5.00	0.00	0.07	0.07
39.75	0.62	0.47	5.00	0.00	0.07	0.07
39.80	0.62	0.47	5.00	0.00	0.07	0.07
39.85	0.62	0.47	5.00	0.00	0.07	0.07
39.90	0.62	0.47	5.00	0.00	0.07	0.07
39.95	0.62	0.47	5.00	0.00	0.07	0.07
40.00	0.62	0.47	5.00	0.00	0.07	0.07
40.05	0.62	0.47	5.00	0.00	0.06	0.06
40.10	0.62	0.47	5.00	0.00	0.06	0.06
40.15	0.62	0.47	5.00	0.00	0.06	0.06
40.20	0.62	0.47	5.00	0.00	0.06	0.06
40.25	0.62	0.47	5.00	0.00	0.06	0.06
40.30	0.62	0.47	5.00	0.00	0.06	0.06
40.35	0.62	0.47	5.00	0.00	0.06	0.06
40.40	0.62	0.47	5.00	0.00	0.06	0.06
40.45	0.62	0.47	5.00	0.00	0.06	0.06
40.50	0.62	0.47	5.00	0.00	0.06	0.06
40.55	0.62	0.47	5.00	0.00	0.06	0.06
40.60	0.62	0.47	5.00	0.00	0.06	0.06
40.65	0.62	0.47	5.00	0.00	0.06	0.06
40.70	0.62	0.47	5.00	0.00	0.06	0.06
40.75	0.62	0.47	5.00	0.00	0.06	0.06
40.80	0.62	0.47	5.00	0.00	0.06	0.06
40.85	0.62	0.47	5.00	0.00	0.06	0.06
40.90	0.62	0.47	5.00	0.00	0.06	0.06
40.95	0.62	0.47	5.00	0.00	0.06	0.06
41.00	0.62	0.47	5.00	0.00	0.06	0.06
41.05	0.62	0.47	5.00	0.00	0.06	0.06

41.10	0.62	0.47	5.00	0.00	0.06	0.06
41.15	0.62	0.47	5.00	0.00	0.06	0.06
41.20	0.62	0.47	5.00	0.00	0.06	0.06
41.25	0.62	0.47	5.00	0.00	0.06	0.06
41.30	0.62	0.47	5.00	0.00	0.06	0.06
41.35	0.62	0.47	5.00	0.00	0.06	0.06
41.40	0.62	0.47	5.00	0.00	0.06	0.06
41.45	0.62	0.47	5.00	0.00	0.06	0.06
41.50	0.62	0.47	5.00	0.00	0.06	0.06
41.55	0.62	0.46	5.00	0.00	0.06	0.06
41.60	0.62	0.46	5.00	0.00	0.05	0.05
41.65	0.62	0.46	5.00	0.00	0.05	0.05
41.70	0.62	0.46	5.00	0.00	0.05	0.05
41.75	0.62	0.46	5.00	0.00	0.05	0.05
41.80	0.62	0.46	5.00	0.00	0.05	0.05
41.85	0.61	0.46	5.00	0.00	0.05	0.05
41.90	0.61	0.46	5.00	0.00	0.05	0.05
41.95	0.61	0.46	5.00	0.00	0.05	0.05
42.00	0.61	0.46	5.00	0.00	0.05	0.05
42.05	0.61	0.46	5.00	0.00	0.05	0.05
42.10	0.61	0.46	5.00	0.00	0.05	0.05
42.15	0.61	0.46	5.00	0.00	0.05	0.05
42.20	0.61	0.46	5.00	0.00	0.05	0.05
42.25	0.61	0.46	5.00	0.00	0.05	0.05
42.30	0.61	0.46	5.00	0.00	0.05	0.05
42.35	0.61	0.46	5.00	0.00	0.05	0.05
42.40	0.61	0.46	5.00	0.00	0.05	0.05
42.45	0.61	0.46	5.00	0.00	0.05	0.05
42.50	0.61	0.46	5.00	0.00	0.05	0.05
42.55	0.61	0.46	5.00	0.00	0.05	0.05
42.60	0.61	0.46	5.00	0.00	0.05	0.05
42.65	0.61	0.46	5.00	0.00	0.05	0.05
42.70	0.61	0.46	5.00	0.00	0.05	0.05
42.75	0.61	0.46	5.00	0.00	0.05	0.05
42.80	0.61	0.46	5.00	0.00	0.05	0.05
42.85	0.61	0.46	5.00	0.00	0.05	0.05
42.90	0.61	0.46	5.00	0.00	0.05	0.05
42.95	0.61	0.46	5.00	0.00	0.05	0.05
43.00	0.61	0.46	5.00	0.00	0.05	0.05
43.05	0.61	0.46	5.00	0.00	0.05	0.05
43.10	0.61	0.46	5.00	0.00	0.05	0.05
43.15	0.61	0.46	5.00	0.00	0.05	0.05
43.20	0.61	0.46	5.00	0.00	0.05	0.05
43.25	0.61	0.46	5.00	0.00	0.04	0.04
43.30	0.61	0.46	5.00	0.00	0.04	0.04
43.35	0.61	0.46	5.00	0.00	0.04	0.04
43.40	0.61	0.46	5.00	0.00	0.04	0.04
43.45	0.61	0.46	5.00	0.00	0.04	0.04
43.50	0.61	0.46	5.00	0.00	0.04	0.04
43.55	0.61	0.46	5.00	0.00	0.04	0.04
43.60	0.61	0.46	5.00	0.00	0.04	0.04
43.65	0.61	0.46	5.00	0.00	0.04	0.04
43.70	0.61	0.46	5.00	0.00	0.04	0.04
43.75	0.61	0.46	5.00	0.00	0.04	0.04
43.80	0.61	0.45	5.00	0.00	0.04	0.04
43.85	0.61	0.45	5.00	0.00	0.04	0.04
43.90	0.61	0.45	5.00	0.00	0.04	0.04
43.95	0.61	0.45	5.00	0.00	0.04	0.04
44.00	0.61	0.45	5.00	0.00	0.04	0.04
44.05	0.61	0.45	5.00	0.00	0.04	0.04
44.10	0.61	0.45	5.00	0.00	0.04	0.04
44.15	0.61	0.45	5.00	0.00	0.04	0.04
44.20	0.61	0.45	5.00	0.00	0.04	0.04
44.25	0.61	0.45	5.00	0.00	0.04	0.04
44.30	0.61	0.45	5.00	0.00	0.04	0.04
44.35	0.61	0.45	5.00	0.00	0.04	0.04
44.40	0.61	0.45	5.00	0.00	0.04	0.04
44.45	0.61	0.45	5.00	0.00	0.04	0.04
44.50	0.61	0.45	5.00	0.00	0.04	0.04
44.55	0.61	0.45	5.00	0.00	0.04	0.04
44.60	0.61	0.45	5.00	0.00	0.04	0.04
44.65	0.61	0.45	5.00	0.00	0.04	0.04
44.70	0.61	0.45	5.00	0.00	0.04	0.04
44.75	0.61	0.45	5.00	0.00	0.04	0.04
44.80	0.61	0.45	5.00	0.00	0.04	0.04
44.85	0.61	0.45	5.00	0.00	0.04	0.04
44.90	0.61	0.45	5.00	0.00	0.03	0.03
44.95	0.60	0.45	5.00	0.00	0.03	0.03
45.00	0.60	0.45	5.00	0.00	0.03	0.03

45.05	0.60	0.45	5.00	0.00	0.03	0.03
45.10	0.60	0.45	5.00	0.00	0.03	0.03
45.15	0.60	0.45	5.00	0.00	0.03	0.03
45.20	0.60	0.45	5.00	0.00	0.03	0.03
45.25	0.60	0.45	5.00	0.00	0.03	0.03
45.30	0.60	0.45	5.00	0.00	0.03	0.03
45.35	0.60	0.45	5.00	0.00	0.03	0.03
45.40	0.60	0.45	5.00	0.00	0.03	0.03
45.45	0.60	0.45	5.00	0.00	0.03	0.03
45.50	0.60	0.45	5.00	0.00	0.03	0.03
45.55	0.60	0.45	5.00	0.00	0.03	0.03
45.60	0.60	0.45	5.00	0.00	0.03	0.03
45.65	0.60	0.45	5.00	0.00	0.03	0.03
45.70	0.60	0.45	5.00	0.00	0.03	0.03
45.75	0.60	0.45	5.00	0.00	0.03	0.03
45.80	0.60	0.45	5.00	0.00	0.03	0.03
45.85	0.60	0.45	5.00	0.00	0.03	0.03
45.90	0.60	0.45	5.00	0.00	0.03	0.03
45.95	0.60	0.45	5.00	0.00	0.03	0.03
46.00	0.60	0.44	5.00	0.00	0.03	0.03
46.05	0.60	0.44	5.00	0.00	0.03	0.03
46.10	0.60	0.44	5.00	0.00	0.03	0.03
46.15	0.60	0.44	5.00	0.00	0.03	0.03
46.20	0.60	0.44	5.00	0.00	0.03	0.03
46.25	0.60	0.44	5.00	0.00	0.03	0.03
46.30	0.60	0.44	5.00	0.00	0.03	0.03
46.35	0.60	0.44	5.00	0.00	0.03	0.03
46.40	0.60	0.44	5.00	0.00	0.03	0.03
46.45	0.60	0.44	5.00	0.00	0.03	0.03
46.50	0.60	0.44	5.00	0.00	0.03	0.03
46.55	0.60	0.44	5.00	0.00	0.03	0.03
46.60	0.60	0.44	5.00	0.00	0.02	0.02
46.65	0.60	0.44	5.00	0.00	0.02	0.02
46.70	0.60	0.44	5.00	0.00	0.02	0.02
46.75	0.60	0.44	5.00	0.00	0.02	0.02
46.80	0.60	0.44	5.00	0.00	0.02	0.02
46.85	0.60	0.44	5.00	0.00	0.02	0.02
46.90	0.60	0.44	5.00	0.00	0.02	0.02
46.95	0.60	0.44	5.00	0.00	0.02	0.02
47.00	0.60	0.44	5.00	0.00	0.02	0.02
47.05	0.60	0.44	5.00	0.00	0.02	0.02
47.10	0.60	0.44	5.00	0.00	0.02	0.02
47.15	0.60	0.44	5.00	0.00	0.02	0.02
47.20	0.60	0.44	5.00	0.00	0.02	0.02
47.25	0.60	0.44	5.00	0.00	0.02	0.02
47.30	0.60	0.44	5.00	0.00	0.02	0.02
47.35	0.60	0.44	5.00	0.00	0.02	0.02
47.40	0.60	0.44	5.00	0.00	0.02	0.02
47.45	0.60	0.44	5.00	0.00	0.02	0.02
47.50	0.60	0.44	5.00	0.00	0.02	0.02
47.55	0.60	0.44	5.00	0.00	0.02	0.02
47.60	0.60	0.44	5.00	0.00	0.02	0.02
47.65	0.60	0.44	5.00	0.00	0.02	0.02
47.70	0.60	0.44	5.00	0.00	0.02	0.02
47.75	0.60	0.44	5.00	0.00	0.02	0.02
47.80	0.60	0.44	5.00	0.00	0.02	0.02
47.85	0.60	0.44	5.00	0.00	0.02	0.02
47.90	0.60	0.44	5.00	0.00	0.02	0.02
47.95	0.60	0.44	5.00	0.00	0.02	0.02
48.00	0.60	0.44	5.00	0.00	0.02	0.02
48.05	0.60	0.44	5.00	0.00	0.02	0.02
48.10	0.60	0.44	5.00	0.00	0.02	0.02
48.15	0.59	0.44	5.00	0.00	0.02	0.02
48.20	0.59	0.43	5.00	0.00	0.01	0.01
48.25	0.59	0.43	5.00	0.00	0.01	0.01
48.30	0.59	0.43	5.00	0.00	0.01	0.01
48.35	0.59	0.43	5.00	0.00	0.01	0.01
48.40	0.59	0.43	5.00	0.00	0.01	0.01
48.45	0.59	0.43	5.00	0.00	0.01	0.01
48.50	0.59	0.43	5.00	0.00	0.01	0.01
48.55	0.59	0.43	5.00	0.00	0.01	0.01
48.60	0.59	0.43	5.00	0.00	0.01	0.01
48.65	0.59	0.43	5.00	0.00	0.01	0.01
48.70	0.59	0.43	5.00	0.00	0.01	0.01
48.75	0.59	0.43	5.00	0.00	0.01	0.01
48.80	0.59	0.43	5.00	0.00	0.01	0.01
48.85	0.59	0.43	5.00	0.00	0.01	0.01
48.90	0.59	0.43	5.00	0.00	0.01	0.01
48.95	0.59	0.43	5.00	0.00	0.01	0.01

49.00	0.59	0.43	5.00	0.00	0.01	0.01
49.05	0.59	0.43	5.00	0.00	0.01	0.01
49.10	0.59	0.43	5.00	0.00	0.01	0.01
49.15	0.59	0.43	5.00	0.00	0.01	0.01
49.20	0.59	0.43	5.00	0.00	0.01	0.01
49.25	0.59	0.43	5.00	0.00	0.01	0.01
49.30	0.59	0.43	5.00	0.00	0.01	0.01
49.35	0.59	0.43	5.00	0.00	0.01	0.01
49.40	0.59	0.43	5.00	0.00	0.01	0.01
49.45	0.59	0.43	5.00	0.00	0.01	0.01
49.50	0.59	0.43	5.00	0.00	0.01	0.01
49.55	0.59	0.43	5.00	0.00	0.01	0.01
49.60	0.59	0.43	5.00	0.00	0.01	0.01
49.65	0.59	0.43	5.00	0.00	0.01	0.01
49.70	0.59	0.43	5.00	0.00	0.01	0.01
49.75	0.59	0.43	5.00	0.00	0.00	0.00
49.80	0.59	0.43	5.00	0.00	0.00	0.00
49.85	0.59	0.43	5.00	0.00	0.00	0.00
49.90	0.59	0.43	5.00	0.00	0.00	0.00
49.95	0.59	0.43	5.00	0.00	0.00	0.00
50.00	0.59	0.43	5.00	0.00	0.00	0.00
50.05	0.59	0.43	5.00	0.00	0.00	0.00
50.10	0.59	0.43	5.00	0.00	0.00	0.00
50.15	0.59	0.43	5.00	0.00	0.00	0.00
50.20	0.59	0.43	5.00	0.00	0.00	0.00
50.25	0.59	0.43	5.00	0.00	0.00	0.00
50.30	0.59	0.43	5.00	0.00	0.00	0.00
50.35	0.59	0.43	5.00	0.00	0.00	0.00
50.40	0.59	0.42	5.00	0.00	0.00	0.00
50.45	0.59	0.42	5.00	0.00	0.00	0.00
50.50	0.59	0.42	5.00	0.00	0.00	0.00

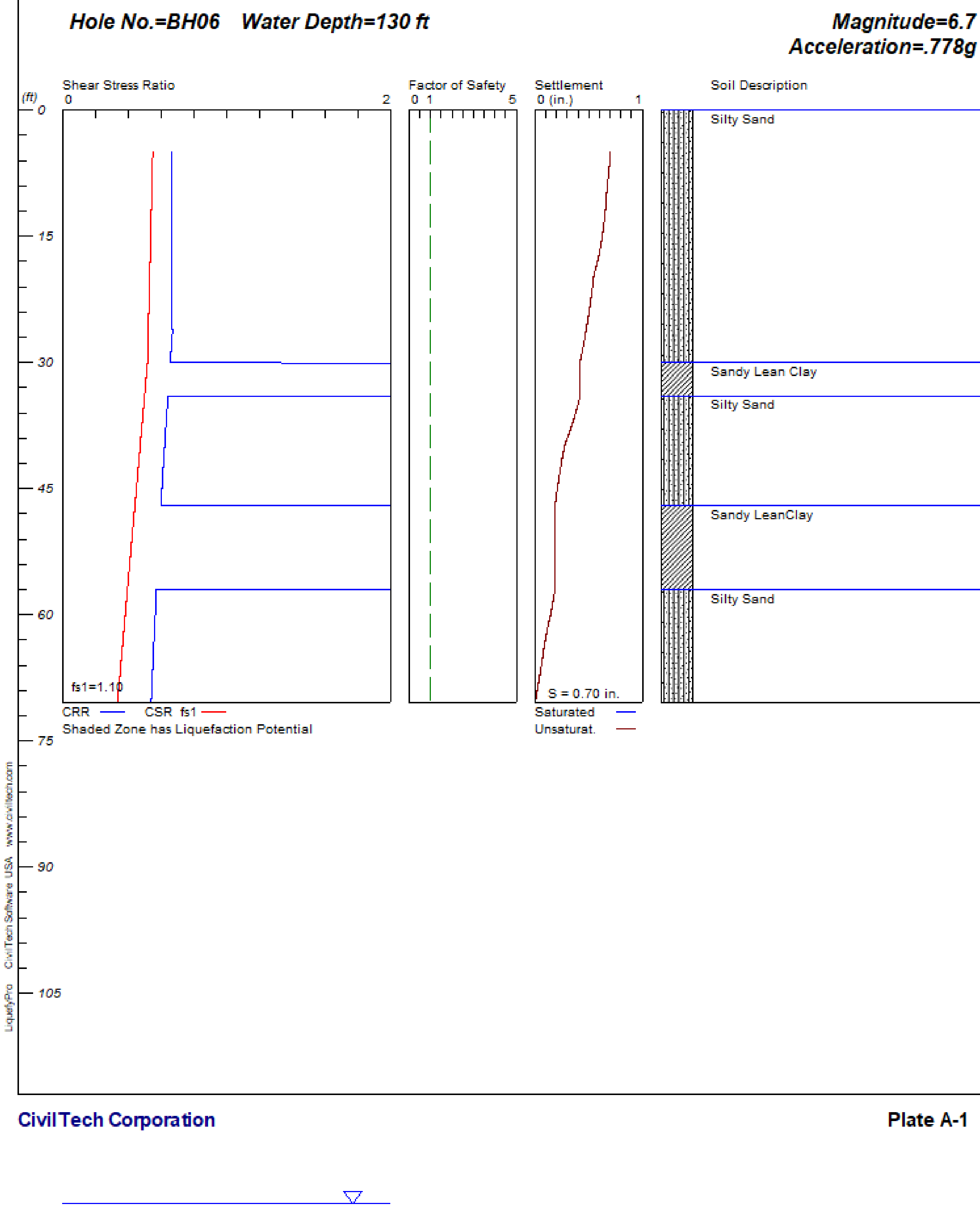
* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

1 atm (atmosphere) = 1 tsf (ton/ft2)
CRRm Cyclic resistance ratio from soils
CSRsf Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S. Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat Settlement from saturated sands
S_dry Settlement from Unsaturated Sands
S_all Total Settlement from Saturated and Unsaturated Sands
NoLiq No-Liquefy Soils

LIQUEFACTION ANALYSIS

Ontario Sports Park



CivilTech Corporation

Plate A-1

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LIQUEFACTION ANALYSIS SUMMARY
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Input File Name: C:\Users\jmeneses\Desktop\HMD\00-23-2255--Ontario Sport Complex\Settlement\BH06.liq
Title: Ontario Sports Park
Subtitle:

Surface Elev.=
Hole No.=BH06
Depth of Hole= 70.50 ft
Water Table during Earthquake= 130.00 ft
Water Table during In-Situ Testing= 130.00 ft
Max. Acceleration= 0.78 g
Earthquake Magnitude= 6.70

Input Data:

Surface Elev.=
Hole No.=BH06
Depth of Hole=70.50 ft
Water Table during Earthquake= 130.00 ft
Water Table during In-Situ Testing= 130.00 ft
Max. Acceleration=0.78 g
Earthquake Magnitude=6.70
No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu, M-correction
3. Fines Correction for Liquefaction: Idriss/Seed
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.25
7. Borehole Diameter, Cb= 1
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1.1
   Plot one CSR curve (fs1=User)
10. Use Curve Smoothing: Yes*
* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
5.00	21.00	125.00	12.00
10.00	36.00	125.00	12.00
15.00	37.00	125.00	12.00
20.00	36.00	125.00	12.00
25.00	38.00	125.00	12.00
30.00	27.00	110.00	NoLiq
35.00	38.00	125.00	12.00
40.00	35.00	125.00	12.00
45.00	43.00	125.00	12.00
50.00	28.00	110.00	NoLiq
55.00	34.00	110.00	NoLiq
60.00	34.00	125.00	24.20
65.00	41.00	125.00	24.20
70.00	40.00	125.00	24.20

Output Results:

Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=0.70 in.
Total Settlement of Saturated and Unsaturated Sands=0.70 in.
Differential Settlement=0.350 to 0.462 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
5.00	0.67	0.55	5.00	0.00	0.70	0.70
5.05	0.67	0.55	5.00	0.00	0.70	0.70
5.10	0.67	0.55	5.00	0.00	0.70	0.70
5.15	0.67	0.55	5.00	0.00	0.70	0.70
5.20	0.67	0.55	5.00	0.00	0.70	0.70
5.25	0.67	0.55	5.00	0.00	0.70	0.70
5.30	0.67	0.55	5.00	0.00	0.70	0.70

5.35	0.67	0.55	5.00	0.00	0.70	0.70
5.40	0.67	0.55	5.00	0.00	0.70	0.70
5.45	0.67	0.55	5.00	0.00	0.70	0.70
5.50	0.67	0.55	5.00	0.00	0.70	0.70
5.55	0.67	0.55	5.00	0.00	0.70	0.70
5.60	0.67	0.55	5.00	0.00	0.70	0.70
5.65	0.67	0.55	5.00	0.00	0.70	0.70
5.70	0.67	0.55	5.00	0.00	0.70	0.70
5.75	0.67	0.55	5.00	0.00	0.70	0.70
5.80	0.67	0.55	5.00	0.00	0.70	0.70
5.85	0.67	0.55	5.00	0.00	0.70	0.70
5.90	0.67	0.55	5.00	0.00	0.70	0.70
5.95	0.67	0.55	5.00	0.00	0.70	0.70
6.00	0.67	0.55	5.00	0.00	0.70	0.70
6.05	0.67	0.55	5.00	0.00	0.70	0.70
6.10	0.67	0.55	5.00	0.00	0.70	0.70
6.15	0.67	0.55	5.00	0.00	0.70	0.70
6.20	0.67	0.55	5.00	0.00	0.70	0.70
6.25	0.67	0.55	5.00	0.00	0.69	0.69
6.30	0.67	0.55	5.00	0.00	0.69	0.69
6.35	0.67	0.55	5.00	0.00	0.69	0.69
6.40	0.67	0.55	5.00	0.00	0.69	0.69
6.45	0.67	0.55	5.00	0.00	0.69	0.69
6.50	0.67	0.55	5.00	0.00	0.69	0.69
6.55	0.67	0.55	5.00	0.00	0.69	0.69
6.60	0.67	0.55	5.00	0.00	0.69	0.69
6.65	0.67	0.55	5.00	0.00	0.69	0.69
6.70	0.67	0.55	5.00	0.00	0.69	0.69
6.75	0.67	0.55	5.00	0.00	0.69	0.69
6.80	0.67	0.55	5.00	0.00	0.69	0.69
6.85	0.67	0.55	5.00	0.00	0.69	0.69
6.90	0.67	0.55	5.00	0.00	0.69	0.69
6.95	0.67	0.55	5.00	0.00	0.69	0.69
7.00	0.67	0.55	5.00	0.00	0.69	0.69
7.05	0.67	0.55	5.00	0.00	0.69	0.69
7.10	0.67	0.55	5.00	0.00	0.69	0.69
7.15	0.67	0.55	5.00	0.00	0.69	0.69
7.20	0.67	0.55	5.00	0.00	0.69	0.69
7.25	0.67	0.55	5.00	0.00	0.69	0.69
7.30	0.67	0.55	5.00	0.00	0.69	0.69
7.35	0.67	0.55	5.00	0.00	0.69	0.69
7.40	0.67	0.55	5.00	0.00	0.69	0.69
7.45	0.67	0.55	5.00	0.00	0.69	0.69
7.50	0.67	0.55	5.00	0.00	0.69	0.69
7.55	0.67	0.55	5.00	0.00	0.69	0.69
7.60	0.67	0.55	5.00	0.00	0.69	0.69
7.65	0.67	0.55	5.00	0.00	0.69	0.69
7.70	0.67	0.55	5.00	0.00	0.69	0.69
7.75	0.67	0.55	5.00	0.00	0.68	0.68
7.80	0.67	0.55	5.00	0.00	0.68	0.68
7.85	0.67	0.55	5.00	0.00	0.68	0.68
7.90	0.67	0.55	5.00	0.00	0.68	0.68
7.95	0.67	0.55	5.00	0.00	0.68	0.68
8.00	0.67	0.55	5.00	0.00	0.68	0.68
8.05	0.67	0.55	5.00	0.00	0.68	0.68
8.10	0.67	0.55	5.00	0.00	0.68	0.68
8.15	0.67	0.55	5.00	0.00	0.68	0.68
8.20	0.67	0.55	5.00	0.00	0.68	0.68
8.25	0.67	0.55	5.00	0.00	0.68	0.68
8.30	0.67	0.55	5.00	0.00	0.68	0.68
8.35	0.67	0.55	5.00	0.00	0.68	0.68
8.40	0.67	0.55	5.00	0.00	0.68	0.68
8.45	0.67	0.55	5.00	0.00	0.68	0.68
8.50	0.67	0.55	5.00	0.00	0.68	0.68
8.55	0.67	0.55	5.00	0.00	0.68	0.68
8.60	0.67	0.55	5.00	0.00	0.68	0.68
8.65	0.67	0.55	5.00	0.00	0.68	0.68
8.70	0.67	0.54	5.00	0.00	0.68	0.68
8.75	0.67	0.54	5.00	0.00	0.68	0.68
8.80	0.67	0.54	5.00	0.00	0.67	0.67
8.85	0.67	0.54	5.00	0.00	0.67	0.67
8.90	0.67	0.54	5.00	0.00	0.67	0.67
8.95	0.67	0.54	5.00	0.00	0.67	0.67
9.00	0.67	0.54	5.00	0.00	0.67	0.67
9.05	0.67	0.54	5.00	0.00	0.67	0.67
9.10	0.67	0.54	5.00	0.00	0.67	0.67
9.15	0.67	0.54	5.00	0.00	0.67	0.67
9.20	0.67	0.54	5.00	0.00	0.67	0.67
9.25	0.67	0.54	5.00	0.00	0.67	0.67

9.30	0.67	0.54	5.00	0.00	0.67	0.67
9.35	0.67	0.54	5.00	0.00	0.67	0.67
9.40	0.67	0.54	5.00	0.00	0.67	0.67
9.45	0.67	0.54	5.00	0.00	0.67	0.67
9.50	0.67	0.54	5.00	0.00	0.67	0.67
9.55	0.67	0.54	5.00	0.00	0.67	0.67
9.60	0.67	0.54	5.00	0.00	0.67	0.67
9.65	0.67	0.54	5.00	0.00	0.67	0.67
9.70	0.67	0.54	5.00	0.00	0.67	0.67
9.75	0.67	0.54	5.00	0.00	0.67	0.67
9.80	0.67	0.54	5.00	0.00	0.67	0.67
9.85	0.67	0.54	5.00	0.00	0.67	0.67
9.90	0.67	0.54	5.00	0.00	0.67	0.67
9.95	0.67	0.54	5.00	0.00	0.67	0.67
10.00	0.67	0.54	5.00	0.00	0.67	0.67
10.05	0.67	0.54	5.00	0.00	0.67	0.67
10.10	0.67	0.54	5.00	0.00	0.67	0.67
10.15	0.67	0.54	5.00	0.00	0.67	0.67
10.20	0.67	0.54	5.00	0.00	0.67	0.67
10.25	0.67	0.54	5.00	0.00	0.67	0.67
10.30	0.67	0.54	5.00	0.00	0.67	0.67
10.35	0.67	0.54	5.00	0.00	0.67	0.67
10.40	0.67	0.54	5.00	0.00	0.66	0.66
10.45	0.67	0.54	5.00	0.00	0.66	0.66
10.50	0.67	0.54	5.00	0.00	0.66	0.66
10.55	0.67	0.54	5.00	0.00	0.66	0.66
10.60	0.67	0.54	5.00	0.00	0.66	0.66
10.65	0.67	0.54	5.00	0.00	0.66	0.66
10.70	0.67	0.54	5.00	0.00	0.66	0.66
10.75	0.67	0.54	5.00	0.00	0.66	0.66
10.80	0.67	0.54	5.00	0.00	0.66	0.66
10.85	0.67	0.54	5.00	0.00	0.66	0.66
10.90	0.67	0.54	5.00	0.00	0.66	0.66
10.95	0.67	0.54	5.00	0.00	0.66	0.66
11.00	0.67	0.54	5.00	0.00	0.66	0.66
11.05	0.67	0.54	5.00	0.00	0.66	0.66
11.10	0.67	0.54	5.00	0.00	0.66	0.66
11.15	0.67	0.54	5.00	0.00	0.66	0.66
11.20	0.67	0.54	5.00	0.00	0.66	0.66
11.25	0.67	0.54	5.00	0.00	0.66	0.66
11.30	0.67	0.54	5.00	0.00	0.66	0.66
11.35	0.67	0.54	5.00	0.00	0.66	0.66
11.40	0.67	0.54	5.00	0.00	0.66	0.66
11.45	0.67	0.54	5.00	0.00	0.66	0.66
11.50	0.67	0.54	5.00	0.00	0.66	0.66
11.55	0.67	0.54	5.00	0.00	0.66	0.66
11.60	0.67	0.54	5.00	0.00	0.66	0.66
11.65	0.67	0.54	5.00	0.00	0.66	0.66
11.70	0.67	0.54	5.00	0.00	0.66	0.66
11.75	0.67	0.54	5.00	0.00	0.66	0.66
11.80	0.67	0.54	5.00	0.00	0.66	0.66
11.85	0.67	0.54	5.00	0.00	0.66	0.66
11.90	0.67	0.54	5.00	0.00	0.66	0.66
11.95	0.67	0.54	5.00	0.00	0.65	0.65
12.00	0.67	0.54	5.00	0.00	0.65	0.65
12.05	0.67	0.54	5.00	0.00	0.65	0.65
12.10	0.67	0.54	5.00	0.00	0.65	0.65
12.15	0.67	0.54	5.00	0.00	0.65	0.65
12.20	0.67	0.54	5.00	0.00	0.65	0.65
12.25	0.67	0.54	5.00	0.00	0.65	0.65
12.30	0.67	0.54	5.00	0.00	0.65	0.65
12.35	0.67	0.54	5.00	0.00	0.65	0.65
12.40	0.67	0.54	5.00	0.00	0.65	0.65
12.45	0.67	0.54	5.00	0.00	0.65	0.65
12.50	0.67	0.54	5.00	0.00	0.65	0.65
12.55	0.67	0.54	5.00	0.00	0.65	0.65
12.60	0.67	0.54	5.00	0.00	0.65	0.65
12.65	0.67	0.54	5.00	0.00	0.65	0.65
12.70	0.67	0.54	5.00	0.00	0.65	0.65
12.75	0.67	0.54	5.00	0.00	0.65	0.65
12.80	0.67	0.54	5.00	0.00	0.65	0.65
12.85	0.67	0.54	5.00	0.00	0.65	0.65
12.90	0.67	0.54	5.00	0.00	0.65	0.65
12.95	0.67	0.54	5.00	0.00	0.65	0.65
13.00	0.67	0.54	5.00	0.00	0.65	0.65
13.05	0.67	0.54	5.00	0.00	0.65	0.65
13.10	0.67	0.54	5.00	0.00	0.65	0.65
13.15	0.67	0.54	5.00	0.00	0.65	0.65
13.20	0.67	0.54	5.00	0.00	0.64	0.64

13.25	0.67	0.54	5.00	0.00	0.64	0.64
13.30	0.67	0.54	5.00	0.00	0.64	0.64
13.35	0.67	0.54	5.00	0.00	0.64	0.64
13.40	0.67	0.54	5.00	0.00	0.64	0.64
13.45	0.67	0.54	5.00	0.00	0.64	0.64
13.50	0.67	0.54	5.00	0.00	0.64	0.64
13.55	0.67	0.54	5.00	0.00	0.64	0.64
13.60	0.67	0.54	5.00	0.00	0.64	0.64
13.65	0.67	0.54	5.00	0.00	0.64	0.64
13.70	0.67	0.54	5.00	0.00	0.64	0.64
13.75	0.67	0.54	5.00	0.00	0.64	0.64
13.80	0.67	0.54	5.00	0.00	0.64	0.64
13.85	0.67	0.54	5.00	0.00	0.64	0.64
13.90	0.67	0.54	5.00	0.00	0.64	0.64
13.95	0.67	0.54	5.00	0.00	0.64	0.64
14.00	0.67	0.54	5.00	0.00	0.64	0.64
14.05	0.67	0.54	5.00	0.00	0.64	0.64
14.10	0.67	0.54	5.00	0.00	0.64	0.64
14.15	0.67	0.54	5.00	0.00	0.64	0.64
14.20	0.67	0.54	5.00	0.00	0.63	0.63
14.25	0.67	0.54	5.00	0.00	0.63	0.63
14.30	0.67	0.54	5.00	0.00	0.63	0.63
14.35	0.67	0.54	5.00	0.00	0.63	0.63
14.40	0.67	0.54	5.00	0.00	0.63	0.63
14.45	0.67	0.54	5.00	0.00	0.63	0.63
14.50	0.67	0.54	5.00	0.00	0.63	0.63
14.55	0.67	0.54	5.00	0.00	0.63	0.63
14.60	0.67	0.54	5.00	0.00	0.63	0.63
14.65	0.67	0.54	5.00	0.00	0.63	0.63
14.70	0.67	0.54	5.00	0.00	0.63	0.63
14.75	0.67	0.54	5.00	0.00	0.63	0.63
14.80	0.67	0.54	5.00	0.00	0.63	0.63
14.85	0.67	0.54	5.00	0.00	0.63	0.63
14.90	0.67	0.54	5.00	0.00	0.63	0.63
14.95	0.67	0.54	5.00	0.00	0.63	0.63
15.00	0.67	0.54	5.00	0.00	0.63	0.63
15.05	0.67	0.54	5.00	0.00	0.62	0.62
15.10	0.67	0.54	5.00	0.00	0.62	0.62
15.15	0.67	0.54	5.00	0.00	0.62	0.62
15.20	0.67	0.54	5.00	0.00	0.62	0.62
15.25	0.67	0.54	5.00	0.00	0.62	0.62
15.30	0.67	0.54	5.00	0.00	0.62	0.62
15.35	0.67	0.54	5.00	0.00	0.62	0.62
15.40	0.67	0.54	5.00	0.00	0.62	0.62
15.45	0.67	0.54	5.00	0.00	0.62	0.62
15.50	0.67	0.54	5.00	0.00	0.62	0.62
15.55	0.67	0.54	5.00	0.00	0.62	0.62
15.60	0.67	0.54	5.00	0.00	0.62	0.62
15.65	0.67	0.54	5.00	0.00	0.62	0.62
15.70	0.67	0.54	5.00	0.00	0.62	0.62
15.75	0.67	0.54	5.00	0.00	0.62	0.62
15.80	0.67	0.54	5.00	0.00	0.62	0.62
15.85	0.67	0.54	5.00	0.00	0.62	0.62
15.90	0.67	0.54	5.00	0.00	0.61	0.61
15.95	0.67	0.54	5.00	0.00	0.61	0.61
16.00	0.67	0.54	5.00	0.00	0.61	0.61
16.05	0.67	0.54	5.00	0.00	0.61	0.61
16.10	0.67	0.54	5.00	0.00	0.61	0.61
16.15	0.67	0.54	5.00	0.00	0.61	0.61
16.20	0.67	0.54	5.00	0.00	0.61	0.61
16.25	0.67	0.54	5.00	0.00	0.61	0.61
16.30	0.67	0.54	5.00	0.00	0.61	0.61
16.35	0.67	0.54	5.00	0.00	0.61	0.61
16.40	0.67	0.53	5.00	0.00	0.61	0.61
16.45	0.67	0.53	5.00	0.00	0.61	0.61
16.50	0.67	0.53	5.00	0.00	0.61	0.61
16.55	0.67	0.53	5.00	0.00	0.61	0.61
16.60	0.67	0.53	5.00	0.00	0.60	0.60
16.65	0.67	0.53	5.00	0.00	0.60	0.60
16.70	0.67	0.53	5.00	0.00	0.60	0.60
16.75	0.67	0.53	5.00	0.00	0.60	0.60
16.80	0.67	0.53	5.00	0.00	0.60	0.60
16.85	0.67	0.53	5.00	0.00	0.60	0.60
16.90	0.67	0.53	5.00	0.00	0.60	0.60
16.95	0.67	0.53	5.00	0.00	0.60	0.60
17.00	0.67	0.53	5.00	0.00	0.60	0.60
17.05	0.67	0.53	5.00	0.00	0.60	0.60
17.10	0.67	0.53	5.00	0.00	0.60	0.60
17.15	0.67	0.53	5.00	0.00	0.60	0.60

17.20	0.67	0.53	5.00	0.00	0.60	0.60
17.25	0.67	0.53	5.00	0.00	0.59	0.59
17.30	0.67	0.53	5.00	0.00	0.59	0.59
17.35	0.67	0.53	5.00	0.00	0.59	0.59
17.40	0.67	0.53	5.00	0.00	0.59	0.59
17.45	0.67	0.53	5.00	0.00	0.59	0.59
17.50	0.67	0.53	5.00	0.00	0.59	0.59
17.55	0.67	0.53	5.00	0.00	0.59	0.59
17.60	0.67	0.53	5.00	0.00	0.59	0.59
17.65	0.67	0.53	5.00	0.00	0.59	0.59
17.70	0.67	0.53	5.00	0.00	0.59	0.59
17.75	0.67	0.53	5.00	0.00	0.59	0.59
17.80	0.67	0.53	5.00	0.00	0.59	0.59
17.85	0.67	0.53	5.00	0.00	0.58	0.58
17.90	0.67	0.53	5.00	0.00	0.58	0.58
17.95	0.67	0.53	5.00	0.00	0.58	0.58
18.00	0.67	0.53	5.00	0.00	0.58	0.58
18.05	0.67	0.53	5.00	0.00	0.58	0.58
18.10	0.67	0.53	5.00	0.00	0.58	0.58
18.15	0.67	0.53	5.00	0.00	0.58	0.58
18.20	0.67	0.53	5.00	0.00	0.58	0.58
18.25	0.67	0.53	5.00	0.00	0.58	0.58
18.30	0.67	0.53	5.00	0.00	0.58	0.58
18.35	0.67	0.53	5.00	0.00	0.57	0.57
18.40	0.67	0.53	5.00	0.00	0.57	0.57
18.45	0.67	0.53	5.00	0.00	0.57	0.57
18.50	0.67	0.53	5.00	0.00	0.57	0.57
18.55	0.67	0.53	5.00	0.00	0.57	0.57
18.60	0.67	0.53	5.00	0.00	0.57	0.57
18.65	0.67	0.53	5.00	0.00	0.57	0.57
18.70	0.67	0.53	5.00	0.00	0.57	0.57
18.75	0.67	0.53	5.00	0.00	0.57	0.57
18.80	0.67	0.53	5.00	0.00	0.57	0.57
18.85	0.67	0.53	5.00	0.00	0.56	0.56
18.90	0.67	0.53	5.00	0.00	0.56	0.56
18.95	0.67	0.53	5.00	0.00	0.56	0.56
19.00	0.67	0.53	5.00	0.00	0.56	0.56
19.05	0.67	0.53	5.00	0.00	0.56	0.56
19.10	0.67	0.53	5.00	0.00	0.56	0.56
19.15	0.67	0.53	5.00	0.00	0.56	0.56
19.20	0.67	0.53	5.00	0.00	0.56	0.56
19.25	0.67	0.53	5.00	0.00	0.55	0.55
19.30	0.67	0.53	5.00	0.00	0.55	0.55
19.35	0.67	0.53	5.00	0.00	0.55	0.55
19.40	0.67	0.53	5.00	0.00	0.55	0.55
19.45	0.67	0.53	5.00	0.00	0.55	0.55
19.50	0.67	0.53	5.00	0.00	0.55	0.55
19.55	0.67	0.53	5.00	0.00	0.55	0.55
19.60	0.67	0.53	5.00	0.00	0.55	0.55
19.65	0.67	0.53	5.00	0.00	0.55	0.55
19.70	0.67	0.53	5.00	0.00	0.55	0.55
19.75	0.67	0.53	5.00	0.00	0.55	0.55
19.80	0.67	0.53	5.00	0.00	0.55	0.55
19.85	0.67	0.53	5.00	0.00	0.54	0.54
19.90	0.67	0.53	5.00	0.00	0.54	0.54
19.95	0.67	0.53	5.00	0.00	0.54	0.54
20.00	0.67	0.53	5.00	0.00	0.54	0.54
20.05	0.67	0.53	5.00	0.00	0.54	0.54
20.10	0.67	0.53	5.00	0.00	0.54	0.54
20.15	0.67	0.53	5.00	0.00	0.54	0.54
20.20	0.67	0.53	5.00	0.00	0.54	0.54
20.25	0.67	0.53	5.00	0.00	0.54	0.54
20.30	0.67	0.53	5.00	0.00	0.54	0.54
20.35	0.67	0.53	5.00	0.00	0.54	0.54
20.40	0.67	0.53	5.00	0.00	0.54	0.54
20.45	0.67	0.53	5.00	0.00	0.54	0.54
20.50	0.67	0.53	5.00	0.00	0.54	0.54
20.55	0.67	0.53	5.00	0.00	0.54	0.54
20.60	0.67	0.53	5.00	0.00	0.54	0.54
20.65	0.67	0.53	5.00	0.00	0.54	0.54
20.70	0.67	0.53	5.00	0.00	0.54	0.54
20.75	0.67	0.53	5.00	0.00	0.54	0.54
20.80	0.67	0.53	5.00	0.00	0.54	0.54
20.85	0.67	0.53	5.00	0.00	0.54	0.54
20.90	0.67	0.53	5.00	0.00	0.54	0.54
20.95	0.67	0.53	5.00	0.00	0.53	0.53
21.00	0.67	0.53	5.00	0.00	0.53	0.53
21.05	0.67	0.53	5.00	0.00	0.53	0.53
21.10	0.67	0.53	5.00	0.00	0.53	0.53

21.15	0.67	0.53	5.00	0.00	0.53	0.53
21.20	0.67	0.53	5.00	0.00	0.53	0.53
21.25	0.67	0.53	5.00	0.00	0.53	0.53
21.30	0.67	0.53	5.00	0.00	0.53	0.53
21.35	0.67	0.53	5.00	0.00	0.53	0.53
21.40	0.67	0.53	5.00	0.00	0.53	0.53
21.45	0.67	0.53	5.00	0.00	0.53	0.53
21.50	0.67	0.53	5.00	0.00	0.53	0.53
21.55	0.67	0.53	5.00	0.00	0.53	0.53
21.60	0.67	0.53	5.00	0.00	0.53	0.53
21.65	0.67	0.53	5.00	0.00	0.53	0.53
21.70	0.67	0.53	5.00	0.00	0.53	0.53
21.75	0.67	0.53	5.00	0.00	0.53	0.53
21.80	0.67	0.53	5.00	0.00	0.53	0.53
21.85	0.67	0.53	5.00	0.00	0.53	0.53
21.90	0.67	0.53	5.00	0.00	0.53	0.53
21.95	0.67	0.53	5.00	0.00	0.52	0.52
22.00	0.67	0.53	5.00	0.00	0.52	0.52
22.05	0.67	0.53	5.00	0.00	0.52	0.52
22.10	0.67	0.53	5.00	0.00	0.52	0.52
22.15	0.67	0.53	5.00	0.00	0.52	0.52
22.20	0.67	0.53	5.00	0.00	0.52	0.52
22.25	0.67	0.53	5.00	0.00	0.52	0.52
22.30	0.67	0.53	5.00	0.00	0.52	0.52
22.35	0.67	0.53	5.00	0.00	0.52	0.52
22.40	0.67	0.53	5.00	0.00	0.52	0.52
22.45	0.67	0.53	5.00	0.00	0.52	0.52
22.50	0.67	0.53	5.00	0.00	0.52	0.52
22.55	0.67	0.53	5.00	0.00	0.52	0.52
22.60	0.67	0.53	5.00	0.00	0.52	0.52
22.65	0.67	0.53	5.00	0.00	0.52	0.52
22.70	0.67	0.53	5.00	0.00	0.52	0.52
22.75	0.67	0.53	5.00	0.00	0.52	0.52
22.80	0.67	0.53	5.00	0.00	0.52	0.52
22.85	0.67	0.53	5.00	0.00	0.52	0.52
22.90	0.67	0.53	5.00	0.00	0.51	0.51
22.95	0.67	0.53	5.00	0.00	0.51	0.51
23.00	0.67	0.53	5.00	0.00	0.51	0.51
23.05	0.67	0.53	5.00	0.00	0.51	0.51
23.10	0.67	0.53	5.00	0.00	0.51	0.51
23.15	0.67	0.53	5.00	0.00	0.51	0.51
23.20	0.67	0.53	5.00	0.00	0.51	0.51
23.25	0.67	0.53	5.00	0.00	0.51	0.51
23.30	0.67	0.53	5.00	0.00	0.51	0.51
23.35	0.67	0.53	5.00	0.00	0.51	0.51
23.40	0.67	0.53	5.00	0.00	0.51	0.51
23.45	0.67	0.53	5.00	0.00	0.51	0.51
23.50	0.67	0.53	5.00	0.00	0.51	0.51
23.55	0.67	0.53	5.00	0.00	0.51	0.51
23.60	0.67	0.53	5.00	0.00	0.51	0.51
23.65	0.67	0.53	5.00	0.00	0.51	0.51
23.70	0.67	0.53	5.00	0.00	0.51	0.51
23.75	0.67	0.53	5.00	0.00	0.50	0.50
23.80	0.67	0.53	5.00	0.00	0.50	0.50
23.85	0.67	0.53	5.00	0.00	0.50	0.50
23.90	0.67	0.53	5.00	0.00	0.50	0.50
23.95	0.67	0.53	5.00	0.00	0.50	0.50
24.00	0.67	0.53	5.00	0.00	0.50	0.50
24.05	0.67	0.53	5.00	0.00	0.50	0.50
24.10	0.67	0.53	5.00	0.00	0.50	0.50
24.15	0.67	0.52	5.00	0.00	0.50	0.50
24.20	0.67	0.52	5.00	0.00	0.50	0.50
24.25	0.67	0.52	5.00	0.00	0.50	0.50
24.30	0.67	0.52	5.00	0.00	0.50	0.50
24.35	0.67	0.52	5.00	0.00	0.50	0.50
24.40	0.67	0.52	5.00	0.00	0.50	0.50
24.45	0.67	0.52	5.00	0.00	0.50	0.50
24.50	0.67	0.52	5.00	0.00	0.50	0.50
24.55	0.67	0.52	5.00	0.00	0.50	0.50
24.60	0.67	0.52	5.00	0.00	0.49	0.49
24.65	0.67	0.52	5.00	0.00	0.49	0.49
24.70	0.67	0.52	5.00	0.00	0.49	0.49
24.75	0.67	0.52	5.00	0.00	0.49	0.49
24.80	0.67	0.52	5.00	0.00	0.49	0.49
24.85	0.67	0.52	5.00	0.00	0.49	0.49
24.90	0.67	0.52	5.00	0.00	0.49	0.49
24.95	0.67	0.52	5.00	0.00	0.49	0.49
25.00	0.67	0.52	5.00	0.00	0.49	0.49
25.05	0.67	0.52	5.00	0.00	0.49	0.49

25.10	0.67	0.52	5.00	0.00	0.49	0.49
25.15	0.67	0.52	5.00	0.00	0.49	0.49
25.20	0.67	0.52	5.00	0.00	0.49	0.49
25.25	0.67	0.52	5.00	0.00	0.49	0.49
25.30	0.67	0.52	5.00	0.00	0.49	0.49
25.35	0.67	0.52	5.00	0.00	0.49	0.49
25.40	0.67	0.52	5.00	0.00	0.48	0.48
25.45	0.67	0.52	5.00	0.00	0.48	0.48
25.50	0.67	0.52	5.00	0.00	0.48	0.48
25.55	0.67	0.52	5.00	0.00	0.48	0.48
25.60	0.67	0.52	5.00	0.00	0.48	0.48
25.65	0.67	0.52	5.00	0.00	0.48	0.48
25.70	0.67	0.52	5.00	0.00	0.48	0.48
25.75	0.67	0.52	5.00	0.00	0.48	0.48
25.80	0.67	0.52	5.00	0.00	0.48	0.48
25.85	0.67	0.52	5.00	0.00	0.48	0.48
25.90	0.67	0.52	5.00	0.00	0.48	0.48
25.95	0.67	0.52	5.00	0.00	0.48	0.48
26.00	0.67	0.52	5.00	0.00	0.48	0.48
26.05	0.67	0.52	5.00	0.00	0.48	0.48
26.10	0.67	0.52	5.00	0.00	0.48	0.48
26.15	0.67	0.52	5.00	0.00	0.48	0.48
26.20	0.67	0.52	5.00	0.00	0.47	0.47
26.25	0.67	0.52	5.00	0.00	0.47	0.47
26.30	0.67	0.52	5.00	0.00	0.47	0.47
26.35	0.67	0.52	5.00	0.00	0.47	0.47
26.40	0.67	0.52	5.00	0.00	0.47	0.47
26.45	0.67	0.52	5.00	0.00	0.47	0.47
26.50	0.67	0.52	5.00	0.00	0.47	0.47
26.55	0.67	0.52	5.00	0.00	0.47	0.47
26.60	0.67	0.52	5.00	0.00	0.47	0.47
26.65	0.67	0.52	5.00	0.00	0.47	0.47
26.70	0.67	0.52	5.00	0.00	0.47	0.47
26.75	0.67	0.52	5.00	0.00	0.47	0.47
26.80	0.67	0.52	5.00	0.00	0.47	0.47
26.85	0.67	0.52	5.00	0.00	0.47	0.47
26.90	0.67	0.52	5.00	0.00	0.47	0.47
26.95	0.67	0.52	5.00	0.00	0.47	0.47
27.00	0.67	0.52	5.00	0.00	0.46	0.46
27.05	0.67	0.52	5.00	0.00	0.46	0.46
27.10	0.67	0.52	5.00	0.00	0.46	0.46
27.15	0.67	0.52	5.00	0.00	0.46	0.46
27.20	0.67	0.52	5.00	0.00	0.46	0.46
27.25	0.67	0.52	5.00	0.00	0.46	0.46
27.30	0.67	0.52	5.00	0.00	0.46	0.46
27.35	0.67	0.52	5.00	0.00	0.46	0.46
27.40	0.67	0.52	5.00	0.00	0.46	0.46
27.45	0.67	0.52	5.00	0.00	0.46	0.46
27.50	0.67	0.52	5.00	0.00	0.46	0.46
27.55	0.67	0.52	5.00	0.00	0.46	0.46
27.60	0.67	0.52	5.00	0.00	0.46	0.46
27.65	0.67	0.52	5.00	0.00	0.46	0.46
27.70	0.66	0.52	5.00	0.00	0.45	0.45
27.75	0.66	0.52	5.00	0.00	0.45	0.45
27.80	0.66	0.52	5.00	0.00	0.45	0.45
27.85	0.66	0.52	5.00	0.00	0.45	0.45
27.90	0.66	0.52	5.00	0.00	0.45	0.45
27.95	0.66	0.52	5.00	0.00	0.45	0.45
28.00	0.66	0.52	5.00	0.00	0.45	0.45
28.05	0.66	0.52	5.00	0.00	0.45	0.45
28.10	0.66	0.52	5.00	0.00	0.45	0.45
28.15	0.66	0.52	5.00	0.00	0.45	0.45
28.20	0.66	0.52	5.00	0.00	0.45	0.45
28.25	0.66	0.52	5.00	0.00	0.45	0.45
28.30	0.66	0.52	5.00	0.00	0.45	0.45
28.35	0.66	0.52	5.00	0.00	0.44	0.44
28.40	0.66	0.52	5.00	0.00	0.44	0.44
28.45	0.66	0.52	5.00	0.00	0.44	0.44
28.50	0.66	0.52	5.00	0.00	0.44	0.44
28.55	0.66	0.52	5.00	0.00	0.44	0.44
28.60	0.66	0.52	5.00	0.00	0.44	0.44
28.65	0.66	0.52	5.00	0.00	0.44	0.44
28.70	0.66	0.52	5.00	0.00	0.44	0.44
28.75	0.66	0.52	5.00	0.00	0.44	0.44
28.80	0.66	0.52	5.00	0.00	0.44	0.44
28.85	0.66	0.52	5.00	0.00	0.44	0.44
28.90	0.66	0.52	5.00	0.00	0.44	0.44
28.95	0.66	0.52	5.00	0.00	0.44	0.44
29.00	0.66	0.52	5.00	0.00	0.43	0.43

29.05	0.66	0.52	5.00	0.00	0.43	0.43
29.10	0.66	0.52	5.00	0.00	0.43	0.43
29.15	0.66	0.52	5.00	0.00	0.43	0.43
29.20	0.66	0.52	5.00	0.00	0.43	0.43
29.25	0.66	0.52	5.00	0.00	0.43	0.43
29.30	0.66	0.52	5.00	0.00	0.43	0.43
29.35	0.66	0.52	5.00	0.00	0.43	0.43
29.40	0.66	0.52	5.00	0.00	0.43	0.43
29.45	0.66	0.52	5.00	0.00	0.43	0.43
29.50	0.66	0.52	5.00	0.00	0.43	0.43
29.55	0.66	0.52	5.00	0.00	0.42	0.42
29.60	0.66	0.52	5.00	0.00	0.42	0.42
29.65	0.66	0.52	5.00	0.00	0.42	0.42
29.70	0.66	0.52	5.00	0.00	0.42	0.42
29.75	0.66	0.52	5.00	0.00	0.42	0.42
29.80	0.66	0.52	5.00	0.00	0.42	0.42
29.85	0.66	0.52	5.00	0.00	0.42	0.42
29.90	0.66	0.52	5.00	0.00	0.42	0.42
29.95	0.66	0.52	5.00	0.00	0.42	0.42
30.00	0.66	0.52	5.00	0.00	0.42	0.42
30.05	2.00	0.52	5.00	0.00	0.42	0.42
30.10	2.00	0.52	5.00	0.00	0.42	0.42
30.15	2.00	0.52	5.00	0.00	0.42	0.42
30.20	2.00	0.52	5.00	0.00	0.42	0.42
30.25	2.00	0.52	5.00	0.00	0.42	0.42
30.30	2.00	0.52	5.00	0.00	0.42	0.42
30.35	2.00	0.52	5.00	0.00	0.42	0.42
30.40	2.00	0.52	5.00	0.00	0.42	0.42
30.45	2.00	0.52	5.00	0.00	0.42	0.42
30.50	2.00	0.51	5.00	0.00	0.42	0.42
30.55	2.00	0.51	5.00	0.00	0.42	0.42
30.60	2.00	0.51	5.00	0.00	0.42	0.42
30.65	2.00	0.51	5.00	0.00	0.42	0.42
30.70	2.00	0.51	5.00	0.00	0.42	0.42
30.75	2.00	0.51	5.00	0.00	0.42	0.42
30.80	2.00	0.51	5.00	0.00	0.42	0.42
30.85	2.00	0.51	5.00	0.00	0.42	0.42
30.90	2.00	0.51	5.00	0.00	0.42	0.42
30.95	2.00	0.51	5.00	0.00	0.42	0.42
31.00	2.00	0.51	5.00	0.00	0.42	0.42
31.05	2.00	0.51	5.00	0.00	0.42	0.42
31.10	2.00	0.51	5.00	0.00	0.42	0.42
31.15	2.00	0.51	5.00	0.00	0.42	0.42
31.20	2.00	0.51	5.00	0.00	0.42	0.42
31.25	2.00	0.51	5.00	0.00	0.42	0.42
31.30	2.00	0.51	5.00	0.00	0.42	0.42
31.35	2.00	0.51	5.00	0.00	0.42	0.42
31.40	2.00	0.51	5.00	0.00	0.42	0.42
31.45	2.00	0.51	5.00	0.00	0.42	0.42
31.50	2.00	0.51	5.00	0.00	0.42	0.42
31.55	2.00	0.51	5.00	0.00	0.42	0.42
31.60	2.00	0.51	5.00	0.00	0.42	0.42
31.65	2.00	0.51	5.00	0.00	0.42	0.42
31.70	2.00	0.51	5.00	0.00	0.42	0.42
31.75	2.00	0.51	5.00	0.00	0.42	0.42
31.80	2.00	0.51	5.00	0.00	0.42	0.42
31.85	2.00	0.51	5.00	0.00	0.42	0.42
31.90	2.00	0.51	5.00	0.00	0.42	0.42
31.95	2.00	0.51	5.00	0.00	0.42	0.42
32.00	2.00	0.51	5.00	0.00	0.42	0.42
32.05	2.00	0.51	5.00	0.00	0.42	0.42
32.10	2.00	0.51	5.00	0.00	0.42	0.42
32.15	2.00	0.51	5.00	0.00	0.42	0.42
32.20	2.00	0.51	5.00	0.00	0.42	0.42
32.25	2.00	0.51	5.00	0.00	0.42	0.42
32.30	2.00	0.51	5.00	0.00	0.42	0.42
32.35	2.00	0.51	5.00	0.00	0.42	0.42
32.40	2.00	0.51	5.00	0.00	0.42	0.42
32.45	2.00	0.51	5.00	0.00	0.42	0.42
32.50	2.00	0.51	5.00	0.00	0.42	0.42
32.55	2.00	0.51	5.00	0.00	0.42	0.42
32.60	2.00	0.51	5.00	0.00	0.42	0.42
32.65	2.00	0.51	5.00	0.00	0.42	0.42
32.70	2.00	0.51	5.00	0.00	0.42	0.42
32.75	2.00	0.50	5.00	0.00	0.42	0.42
32.80	2.00	0.50	5.00	0.00	0.42	0.42
32.85	2.00	0.50	5.00	0.00	0.42	0.42
32.90	2.00	0.50	5.00	0.00	0.42	0.42
32.95	2.00	0.50	5.00	0.00	0.42	0.42

33.00	2.00	0.50	5.00	0.00	0.42	0.42
33.05	2.00	0.50	5.00	0.00	0.42	0.42
33.10	2.00	0.50	5.00	0.00	0.42	0.42
33.15	2.00	0.50	5.00	0.00	0.42	0.42
33.20	2.00	0.50	5.00	0.00	0.42	0.42
33.25	2.00	0.50	5.00	0.00	0.42	0.42
33.30	2.00	0.50	5.00	0.00	0.42	0.42
33.35	2.00	0.50	5.00	0.00	0.42	0.42
33.40	2.00	0.50	5.00	0.00	0.42	0.42
33.45	2.00	0.50	5.00	0.00	0.42	0.42
33.50	2.00	0.50	5.00	0.00	0.42	0.42
33.55	2.00	0.50	5.00	0.00	0.42	0.42
33.60	2.00	0.50	5.00	0.00	0.42	0.42
33.65	2.00	0.50	5.00	0.00	0.42	0.42
33.70	2.00	0.50	5.00	0.00	0.42	0.42
33.75	2.00	0.50	5.00	0.00	0.42	0.42
33.80	2.00	0.50	5.00	0.00	0.42	0.42
33.85	2.00	0.50	5.00	0.00	0.42	0.42
33.90	2.00	0.50	5.00	0.00	0.42	0.42
33.95	2.00	0.50	5.00	0.00	0.42	0.42
34.00	2.00	0.50	5.00	0.00	0.42	0.42
34.05	0.64	0.50	5.00	0.00	0.42	0.42
34.10	0.64	0.50	5.00	0.00	0.42	0.42
34.15	0.64	0.50	5.00	0.00	0.42	0.42
34.20	0.64	0.50	5.00	0.00	0.41	0.41
34.25	0.64	0.50	5.00	0.00	0.41	0.41
34.30	0.64	0.50	5.00	0.00	0.41	0.41
34.35	0.64	0.50	5.00	0.00	0.41	0.41
34.40	0.64	0.50	5.00	0.00	0.41	0.41
34.45	0.64	0.50	5.00	0.00	0.41	0.41
34.50	0.64	0.50	5.00	0.00	0.41	0.41
34.55	0.64	0.50	5.00	0.00	0.41	0.41
34.60	0.64	0.50	5.00	0.00	0.41	0.41
34.65	0.64	0.50	5.00	0.00	0.41	0.41
34.70	0.64	0.50	5.00	0.00	0.41	0.41
34.75	0.64	0.50	5.00	0.00	0.40	0.40
34.80	0.64	0.50	5.00	0.00	0.40	0.40
34.85	0.64	0.50	5.00	0.00	0.40	0.40
34.90	0.64	0.50	5.00	0.00	0.40	0.40
34.95	0.64	0.49	5.00	0.00	0.40	0.40
35.00	0.64	0.49	5.00	0.00	0.40	0.40
35.05	0.64	0.49	5.00	0.00	0.40	0.40
35.10	0.64	0.49	5.00	0.00	0.40	0.40
35.15	0.64	0.49	5.00	0.00	0.40	0.40
35.20	0.64	0.49	5.00	0.00	0.39	0.39
35.25	0.64	0.49	5.00	0.00	0.39	0.39
35.30	0.64	0.49	5.00	0.00	0.39	0.39
35.35	0.64	0.49	5.00	0.00	0.39	0.39
35.40	0.64	0.49	5.00	0.00	0.39	0.39
35.45	0.64	0.49	5.00	0.00	0.39	0.39
35.50	0.64	0.49	5.00	0.00	0.39	0.39
35.55	0.64	0.49	5.00	0.00	0.39	0.39
35.60	0.64	0.49	5.00	0.00	0.39	0.39
35.65	0.64	0.49	5.00	0.00	0.39	0.39
35.70	0.64	0.49	5.00	0.00	0.38	0.38
35.75	0.64	0.49	5.00	0.00	0.38	0.38
35.80	0.64	0.49	5.00	0.00	0.38	0.38
35.85	0.64	0.49	5.00	0.00	0.38	0.38
35.90	0.64	0.49	5.00	0.00	0.38	0.38
35.95	0.64	0.49	5.00	0.00	0.38	0.38
36.00	0.64	0.49	5.00	0.00	0.38	0.38
36.05	0.64	0.49	5.00	0.00	0.38	0.38
36.10	0.63	0.49	5.00	0.00	0.37	0.37
36.15	0.63	0.49	5.00	0.00	0.37	0.37
36.20	0.63	0.49	5.00	0.00	0.37	0.37
36.25	0.63	0.49	5.00	0.00	0.37	0.37
36.30	0.63	0.49	5.00	0.00	0.37	0.37
36.35	0.63	0.49	5.00	0.00	0.37	0.37
36.40	0.63	0.49	5.00	0.00	0.37	0.37
36.45	0.63	0.49	5.00	0.00	0.37	0.37
36.50	0.63	0.49	5.00	0.00	0.37	0.37
36.55	0.63	0.49	5.00	0.00	0.36	0.36
36.60	0.63	0.49	5.00	0.00	0.36	0.36
36.65	0.63	0.49	5.00	0.00	0.36	0.36
36.70	0.63	0.49	5.00	0.00	0.36	0.36
36.75	0.63	0.49	5.00	0.00	0.36	0.36
36.80	0.63	0.49	5.00	0.00	0.36	0.36
36.85	0.63	0.49	5.00	0.00	0.36	0.36
36.90	0.63	0.49	5.00	0.00	0.36	0.36

36.95	0.63	0.49	5.00	0.00	0.36	0.36
37.00	0.63	0.49	5.00	0.00	0.35	0.35
37.05	0.63	0.49	5.00	0.00	0.35	0.35
37.10	0.63	0.49	5.00	0.00	0.35	0.35
37.15	0.63	0.48	5.00	0.00	0.35	0.35
37.20	0.63	0.48	5.00	0.00	0.35	0.35
37.25	0.63	0.48	5.00	0.00	0.35	0.35
37.30	0.63	0.48	5.00	0.00	0.35	0.35
37.35	0.63	0.48	5.00	0.00	0.35	0.35
37.40	0.63	0.48	5.00	0.00	0.34	0.34
37.45	0.63	0.48	5.00	0.00	0.34	0.34
37.50	0.63	0.48	5.00	0.00	0.34	0.34
37.55	0.63	0.48	5.00	0.00	0.34	0.34
37.60	0.63	0.48	5.00	0.00	0.34	0.34
37.65	0.63	0.48	5.00	0.00	0.34	0.34
37.70	0.63	0.48	5.00	0.00	0.34	0.34
37.75	0.63	0.48	5.00	0.00	0.34	0.34
37.80	0.63	0.48	5.00	0.00	0.33	0.33
37.85	0.63	0.48	5.00	0.00	0.33	0.33
37.90	0.63	0.48	5.00	0.00	0.33	0.33
37.95	0.63	0.48	5.00	0.00	0.33	0.33
38.00	0.63	0.48	5.00	0.00	0.33	0.33
38.05	0.63	0.48	5.00	0.00	0.33	0.33
38.10	0.63	0.48	5.00	0.00	0.33	0.33
38.15	0.63	0.48	5.00	0.00	0.32	0.32
38.20	0.63	0.48	5.00	0.00	0.32	0.32
38.25	0.63	0.48	5.00	0.00	0.32	0.32
38.30	0.63	0.48	5.00	0.00	0.32	0.32
38.35	0.63	0.48	5.00	0.00	0.32	0.32
38.40	0.63	0.48	5.00	0.00	0.32	0.32
38.45	0.63	0.48	5.00	0.00	0.32	0.32
38.50	0.63	0.48	5.00	0.00	0.31	0.31
38.55	0.63	0.48	5.00	0.00	0.31	0.31
38.60	0.63	0.48	5.00	0.00	0.31	0.31
38.65	0.63	0.48	5.00	0.00	0.31	0.31
38.70	0.63	0.48	5.00	0.00	0.31	0.31
38.75	0.63	0.48	5.00	0.00	0.31	0.31
38.80	0.63	0.48	5.00	0.00	0.31	0.31
38.85	0.63	0.48	5.00	0.00	0.30	0.30
38.90	0.62	0.48	5.00	0.00	0.30	0.30
38.95	0.62	0.48	5.00	0.00	0.30	0.30
39.00	0.62	0.48	5.00	0.00	0.30	0.30
39.05	0.62	0.48	5.00	0.00	0.30	0.30
39.10	0.62	0.48	5.00	0.00	0.30	0.30
39.15	0.62	0.48	5.00	0.00	0.30	0.30
39.20	0.62	0.48	5.00	0.00	0.29	0.29
39.25	0.62	0.48	5.00	0.00	0.29	0.29
39.30	0.62	0.48	5.00	0.00	0.29	0.29
39.35	0.62	0.47	5.00	0.00	0.29	0.29
39.40	0.62	0.47	5.00	0.00	0.29	0.29
39.45	0.62	0.47	5.00	0.00	0.29	0.29
39.50	0.62	0.47	5.00	0.00	0.28	0.28
39.55	0.62	0.47	5.00	0.00	0.28	0.28
39.60	0.62	0.47	5.00	0.00	0.28	0.28
39.65	0.62	0.47	5.00	0.00	0.28	0.28
39.70	0.62	0.47	5.00	0.00	0.28	0.28
39.75	0.62	0.47	5.00	0.00	0.28	0.28
39.80	0.62	0.47	5.00	0.00	0.28	0.28
39.85	0.62	0.47	5.00	0.00	0.28	0.28
39.90	0.62	0.47	5.00	0.00	0.27	0.27
39.95	0.62	0.47	5.00	0.00	0.27	0.27
40.00	0.62	0.47	5.00	0.00	0.27	0.27
40.05	0.62	0.47	5.00	0.00	0.27	0.27
40.10	0.62	0.47	5.00	0.00	0.27	0.27
40.15	0.62	0.47	5.00	0.00	0.27	0.27
40.20	0.62	0.47	5.00	0.00	0.27	0.27
40.25	0.62	0.47	5.00	0.00	0.27	0.27
40.30	0.62	0.47	5.00	0.00	0.27	0.27
40.35	0.62	0.47	5.00	0.00	0.27	0.27
40.40	0.62	0.47	5.00	0.00	0.27	0.27
40.45	0.62	0.47	5.00	0.00	0.27	0.27
40.50	0.62	0.47	5.00	0.00	0.26	0.26
40.55	0.62	0.47	5.00	0.00	0.26	0.26
40.60	0.62	0.47	5.00	0.00	0.26	0.26
40.65	0.62	0.47	5.00	0.00	0.26	0.26
40.70	0.62	0.47	5.00	0.00	0.26	0.26
40.75	0.62	0.47	5.00	0.00	0.26	0.26
40.80	0.62	0.47	5.00	0.00	0.26	0.26
40.85	0.62	0.47	5.00	0.00	0.26	0.26

40.90	0.62	0.47	5.00	0.00	0.26	0.26
40.95	0.62	0.47	5.00	0.00	0.26	0.26
41.00	0.62	0.47	5.00	0.00	0.26	0.26
41.05	0.62	0.47	5.00	0.00	0.26	0.26
41.10	0.62	0.47	5.00	0.00	0.26	0.26
41.15	0.62	0.47	5.00	0.00	0.26	0.26
41.20	0.62	0.47	5.00	0.00	0.25	0.25
41.25	0.62	0.47	5.00	0.00	0.25	0.25
41.30	0.62	0.47	5.00	0.00	0.25	0.25
41.35	0.62	0.47	5.00	0.00	0.25	0.25
41.40	0.62	0.47	5.00	0.00	0.25	0.25
41.45	0.62	0.47	5.00	0.00	0.25	0.25
41.50	0.62	0.47	5.00	0.00	0.25	0.25
41.55	0.62	0.46	5.00	0.00	0.25	0.25
41.60	0.62	0.46	5.00	0.00	0.25	0.25
41.65	0.62	0.46	5.00	0.00	0.25	0.25
41.70	0.62	0.46	5.00	0.00	0.25	0.25
41.75	0.62	0.46	5.00	0.00	0.25	0.25
41.80	0.62	0.46	5.00	0.00	0.25	0.25
41.85	0.61	0.46	5.00	0.00	0.25	0.25
41.90	0.61	0.46	5.00	0.00	0.24	0.24
41.95	0.61	0.46	5.00	0.00	0.24	0.24
42.00	0.61	0.46	5.00	0.00	0.24	0.24
42.05	0.61	0.46	5.00	0.00	0.24	0.24
42.10	0.61	0.46	5.00	0.00	0.24	0.24
42.15	0.61	0.46	5.00	0.00	0.24	0.24
42.20	0.61	0.46	5.00	0.00	0.24	0.24
42.25	0.61	0.46	5.00	0.00	0.24	0.24
42.30	0.61	0.46	5.00	0.00	0.24	0.24
42.35	0.61	0.46	5.00	0.00	0.24	0.24
42.40	0.61	0.46	5.00	0.00	0.24	0.24
42.45	0.61	0.46	5.00	0.00	0.24	0.24
42.50	0.61	0.46	5.00	0.00	0.24	0.24
42.55	0.61	0.46	5.00	0.00	0.24	0.24
42.60	0.61	0.46	5.00	0.00	0.24	0.24
42.65	0.61	0.46	5.00	0.00	0.24	0.24
42.70	0.61	0.46	5.00	0.00	0.23	0.23
42.75	0.61	0.46	5.00	0.00	0.23	0.23
42.80	0.61	0.46	5.00	0.00	0.23	0.23
42.85	0.61	0.46	5.00	0.00	0.23	0.23
42.90	0.61	0.46	5.00	0.00	0.23	0.23
42.95	0.61	0.46	5.00	0.00	0.23	0.23
43.00	0.61	0.46	5.00	0.00	0.23	0.23
43.05	0.61	0.46	5.00	0.00	0.23	0.23
43.10	0.61	0.46	5.00	0.00	0.23	0.23
43.15	0.61	0.46	5.00	0.00	0.23	0.23
43.20	0.61	0.46	5.00	0.00	0.23	0.23
43.25	0.61	0.46	5.00	0.00	0.23	0.23
43.30	0.61	0.46	5.00	0.00	0.23	0.23
43.35	0.61	0.46	5.00	0.00	0.23	0.23
43.40	0.61	0.46	5.00	0.00	0.23	0.23
43.45	0.61	0.46	5.00	0.00	0.23	0.23
43.50	0.61	0.46	5.00	0.00	0.22	0.22
43.55	0.61	0.46	5.00	0.00	0.22	0.22
43.60	0.61	0.46	5.00	0.00	0.22	0.22
43.65	0.61	0.46	5.00	0.00	0.22	0.22
43.70	0.61	0.46	5.00	0.00	0.22	0.22
43.75	0.61	0.46	5.00	0.00	0.22	0.22
43.80	0.61	0.45	5.00	0.00	0.22	0.22
43.85	0.61	0.45	5.00	0.00	0.22	0.22
43.90	0.61	0.45	5.00	0.00	0.22	0.22
43.95	0.61	0.45	5.00	0.00	0.22	0.22
44.00	0.61	0.45	5.00	0.00	0.22	0.22
44.05	0.61	0.45	5.00	0.00	0.22	0.22
44.10	0.61	0.45	5.00	0.00	0.22	0.22
44.15	0.61	0.45	5.00	0.00	0.22	0.22
44.20	0.61	0.45	5.00	0.00	0.22	0.22
44.25	0.61	0.45	5.00	0.00	0.22	0.22
44.30	0.61	0.45	5.00	0.00	0.22	0.22
44.35	0.61	0.45	5.00	0.00	0.21	0.21
44.40	0.61	0.45	5.00	0.00	0.21	0.21
44.45	0.61	0.45	5.00	0.00	0.21	0.21
44.50	0.61	0.45	5.00	0.00	0.21	0.21
44.55	0.61	0.45	5.00	0.00	0.21	0.21
44.60	0.61	0.45	5.00	0.00	0.21	0.21
44.65	0.61	0.45	5.00	0.00	0.21	0.21
44.70	0.61	0.45	5.00	0.00	0.21	0.21
44.75	0.61	0.45	5.00	0.00	0.21	0.21
44.80	0.61	0.45	5.00	0.00	0.21	0.21

44.85	0.61	0.45	5.00	0.00	0.21	0.21
44.90	0.61	0.45	5.00	0.00	0.21	0.21
44.95	0.60	0.45	5.00	0.00	0.21	0.21
45.00	0.60	0.45	5.00	0.00	0.21	0.21
45.05	0.60	0.45	5.00	0.00	0.21	0.21
45.10	0.60	0.45	5.00	0.00	0.21	0.21
45.15	0.60	0.45	5.00	0.00	0.21	0.21
45.20	0.60	0.45	5.00	0.00	0.20	0.20
45.25	0.60	0.45	5.00	0.00	0.20	0.20
45.30	0.60	0.45	5.00	0.00	0.20	0.20
45.35	0.60	0.45	5.00	0.00	0.20	0.20
45.40	0.60	0.45	5.00	0.00	0.20	0.20
45.45	0.60	0.45	5.00	0.00	0.20	0.20
45.50	0.60	0.45	5.00	0.00	0.20	0.20
45.55	0.60	0.45	5.00	0.00	0.20	0.20
45.60	0.60	0.45	5.00	0.00	0.20	0.20
45.65	0.60	0.45	5.00	0.00	0.20	0.20
45.70	0.60	0.45	5.00	0.00	0.20	0.20
45.75	0.60	0.45	5.00	0.00	0.20	0.20
45.80	0.60	0.45	5.00	0.00	0.20	0.20
45.85	0.60	0.45	5.00	0.00	0.20	0.20
45.90	0.60	0.45	5.00	0.00	0.20	0.20
45.95	0.60	0.45	5.00	0.00	0.20	0.20
46.00	0.60	0.44	5.00	0.00	0.20	0.20
46.05	0.60	0.44	5.00	0.00	0.19	0.19
46.10	0.60	0.44	5.00	0.00	0.19	0.19
46.15	0.60	0.44	5.00	0.00	0.19	0.19
46.20	0.60	0.44	5.00	0.00	0.19	0.19
46.25	0.60	0.44	5.00	0.00	0.19	0.19
46.30	0.60	0.44	5.00	0.00	0.19	0.19
46.35	0.60	0.44	5.00	0.00	0.19	0.19
46.40	0.60	0.44	5.00	0.00	0.19	0.19
46.45	0.60	0.44	5.00	0.00	0.19	0.19
46.50	0.60	0.44	5.00	0.00	0.19	0.19
46.55	0.60	0.44	5.00	0.00	0.19	0.19
46.60	0.60	0.44	5.00	0.00	0.19	0.19
46.65	0.60	0.44	5.00	0.00	0.19	0.19
46.70	0.60	0.44	5.00	0.00	0.19	0.19
46.75	0.60	0.44	5.00	0.00	0.19	0.19
46.80	0.60	0.44	5.00	0.00	0.19	0.19
46.85	0.60	0.44	5.00	0.00	0.19	0.19
46.90	0.60	0.44	5.00	0.00	0.19	0.19
46.95	0.60	0.44	5.00	0.00	0.19	0.19
47.00	0.60	0.44	5.00	0.00	0.18	0.18
47.05	2.00	0.44	5.00	0.00	0.18	0.18
47.10	2.00	0.44	5.00	0.00	0.18	0.18
47.15	2.00	0.44	5.00	0.00	0.18	0.18
47.20	2.00	0.44	5.00	0.00	0.18	0.18
47.25	2.00	0.44	5.00	0.00	0.18	0.18
47.30	2.00	0.44	5.00	0.00	0.18	0.18
47.35	2.00	0.44	5.00	0.00	0.18	0.18
47.40	2.00	0.44	5.00	0.00	0.18	0.18
47.45	2.00	0.44	5.00	0.00	0.18	0.18
47.50	2.00	0.44	5.00	0.00	0.18	0.18
47.55	2.00	0.44	5.00	0.00	0.18	0.18
47.60	2.00	0.44	5.00	0.00	0.18	0.18
47.65	2.00	0.44	5.00	0.00	0.18	0.18
47.70	2.00	0.44	5.00	0.00	0.18	0.18
47.75	2.00	0.44	5.00	0.00	0.18	0.18
47.80	2.00	0.44	5.00	0.00	0.18	0.18
47.85	2.00	0.44	5.00	0.00	0.18	0.18
47.90	2.00	0.44	5.00	0.00	0.18	0.18
47.95	2.00	0.44	5.00	0.00	0.18	0.18
48.00	2.00	0.44	5.00	0.00	0.18	0.18
48.05	2.00	0.44	5.00	0.00	0.18	0.18
48.10	2.00	0.44	5.00	0.00	0.18	0.18
48.15	2.00	0.44	5.00	0.00	0.18	0.18
48.20	2.00	0.43	5.00	0.00	0.18	0.18
48.25	2.00	0.43	5.00	0.00	0.18	0.18
48.30	2.00	0.43	5.00	0.00	0.18	0.18
48.35	2.00	0.43	5.00	0.00	0.18	0.18
48.40	2.00	0.43	5.00	0.00	0.18	0.18
48.45	2.00	0.43	5.00	0.00	0.18	0.18
48.50	2.00	0.43	5.00	0.00	0.18	0.18
48.55	2.00	0.43	5.00	0.00	0.18	0.18
48.60	2.00	0.43	5.00	0.00	0.18	0.18
48.65	2.00	0.43	5.00	0.00	0.18	0.18
48.70	2.00	0.43	5.00	0.00	0.18	0.18
48.75	2.00	0.43	5.00	0.00	0.18	0.18

48.80	2.00	0.43	5.00	0.00	0.18	0.18
48.85	2.00	0.43	5.00	0.00	0.18	0.18
48.90	2.00	0.43	5.00	0.00	0.18	0.18
48.95	2.00	0.43	5.00	0.00	0.18	0.18
49.00	2.00	0.43	5.00	0.00	0.18	0.18
49.05	2.00	0.43	5.00	0.00	0.18	0.18
49.10	2.00	0.43	5.00	0.00	0.18	0.18
49.15	2.00	0.43	5.00	0.00	0.18	0.18
49.20	2.00	0.43	5.00	0.00	0.18	0.18
49.25	2.00	0.43	5.00	0.00	0.18	0.18
49.30	2.00	0.43	5.00	0.00	0.18	0.18
49.35	2.00	0.43	5.00	0.00	0.18	0.18
49.40	2.00	0.43	5.00	0.00	0.18	0.18
49.45	2.00	0.43	5.00	0.00	0.18	0.18
49.50	2.00	0.43	5.00	0.00	0.18	0.18
49.55	2.00	0.43	5.00	0.00	0.18	0.18
49.60	2.00	0.43	5.00	0.00	0.18	0.18
49.65	2.00	0.43	5.00	0.00	0.18	0.18
49.70	2.00	0.43	5.00	0.00	0.18	0.18
49.75	2.00	0.43	5.00	0.00	0.18	0.18
49.80	2.00	0.43	5.00	0.00	0.18	0.18
49.85	2.00	0.43	5.00	0.00	0.18	0.18
49.90	2.00	0.43	5.00	0.00	0.18	0.18
49.95	2.00	0.43	5.00	0.00	0.18	0.18
50.00	2.00	0.43	5.00	0.00	0.18	0.18
50.05	2.00	0.43	5.00	0.00	0.18	0.18
50.10	2.00	0.43	5.00	0.00	0.18	0.18
50.15	2.00	0.43	5.00	0.00	0.18	0.18
50.20	2.00	0.43	5.00	0.00	0.18	0.18
50.25	2.00	0.43	5.00	0.00	0.18	0.18
50.30	2.00	0.43	5.00	0.00	0.18	0.18
50.35	2.00	0.43	5.00	0.00	0.18	0.18
50.40	2.00	0.42	5.00	0.00	0.18	0.18
50.45	2.00	0.42	5.00	0.00	0.18	0.18
50.50	2.00	0.42	5.00	0.00	0.18	0.18
50.55	2.00	0.42	5.00	0.00	0.18	0.18
50.60	2.00	0.42	5.00	0.00	0.18	0.18
50.65	2.00	0.42	5.00	0.00	0.18	0.18
50.70	2.00	0.42	5.00	0.00	0.18	0.18
50.75	2.00	0.42	5.00	0.00	0.18	0.18
50.80	2.00	0.42	5.00	0.00	0.18	0.18
50.85	2.00	0.42	5.00	0.00	0.18	0.18
50.90	2.00	0.42	5.00	0.00	0.18	0.18
50.95	2.00	0.42	5.00	0.00	0.18	0.18
51.00	2.00	0.42	5.00	0.00	0.18	0.18
51.05	2.00	0.42	5.00	0.00	0.18	0.18
51.10	2.00	0.42	5.00	0.00	0.18	0.18
51.15	2.00	0.42	5.00	0.00	0.18	0.18
51.20	2.00	0.42	5.00	0.00	0.18	0.18
51.25	2.00	0.42	5.00	0.00	0.18	0.18
51.30	2.00	0.42	5.00	0.00	0.18	0.18
51.35	2.00	0.42	5.00	0.00	0.18	0.18
51.40	2.00	0.42	5.00	0.00	0.18	0.18
51.45	2.00	0.42	5.00	0.00	0.18	0.18
51.50	2.00	0.42	5.00	0.00	0.18	0.18
51.55	2.00	0.42	5.00	0.00	0.18	0.18
51.60	2.00	0.42	5.00	0.00	0.18	0.18
51.65	2.00	0.42	5.00	0.00	0.18	0.18
51.70	2.00	0.42	5.00	0.00	0.18	0.18
51.75	2.00	0.42	5.00	0.00	0.18	0.18
51.80	2.00	0.42	5.00	0.00	0.18	0.18
51.85	2.00	0.42	5.00	0.00	0.18	0.18
51.90	2.00	0.42	5.00	0.00	0.18	0.18
51.95	2.00	0.42	5.00	0.00	0.18	0.18
52.00	2.00	0.42	5.00	0.00	0.18	0.18
52.05	2.00	0.42	5.00	0.00	0.18	0.18
52.10	2.00	0.42	5.00	0.00	0.18	0.18
52.15	2.00	0.42	5.00	0.00	0.18	0.18
52.20	2.00	0.42	5.00	0.00	0.18	0.18
52.25	2.00	0.42	5.00	0.00	0.18	0.18
52.30	2.00	0.42	5.00	0.00	0.18	0.18
52.35	2.00	0.42	5.00	0.00	0.18	0.18
52.40	2.00	0.42	5.00	0.00	0.18	0.18
52.45	2.00	0.42	5.00	0.00	0.18	0.18
52.50	2.00	0.42	5.00	0.00	0.18	0.18
52.55	2.00	0.42	5.00	0.00	0.18	0.18
52.60	2.00	0.41	5.00	0.00	0.18	0.18
52.65	2.00	0.41	5.00	0.00	0.18	0.18
52.70	2.00	0.41	5.00	0.00	0.18	0.18

52.75	2.00	0.41	5.00	0.00	0.18	0.18
52.80	2.00	0.41	5.00	0.00	0.18	0.18
52.85	2.00	0.41	5.00	0.00	0.18	0.18
52.90	2.00	0.41	5.00	0.00	0.18	0.18
52.95	2.00	0.41	5.00	0.00	0.18	0.18
53.00	2.00	0.41	5.00	0.00	0.18	0.18
53.05	2.00	0.41	5.00	0.00	0.18	0.18
53.10	2.00	0.41	5.00	0.00	0.18	0.18
53.15	2.00	0.41	5.00	0.00	0.18	0.18
53.20	2.00	0.41	5.00	0.00	0.18	0.18
53.25	2.00	0.41	5.00	0.00	0.18	0.18
53.30	2.00	0.41	5.00	0.00	0.18	0.18
53.35	2.00	0.41	5.00	0.00	0.18	0.18
53.40	2.00	0.41	5.00	0.00	0.18	0.18
53.45	2.00	0.41	5.00	0.00	0.18	0.18
53.50	2.00	0.41	5.00	0.00	0.18	0.18
53.55	2.00	0.41	5.00	0.00	0.18	0.18
53.60	2.00	0.41	5.00	0.00	0.18	0.18
53.65	2.00	0.41	5.00	0.00	0.18	0.18
53.70	2.00	0.41	5.00	0.00	0.18	0.18
53.75	2.00	0.41	5.00	0.00	0.18	0.18
53.80	2.00	0.41	5.00	0.00	0.18	0.18
53.85	2.00	0.41	5.00	0.00	0.18	0.18
53.90	2.00	0.41	5.00	0.00	0.18	0.18
53.95	2.00	0.41	5.00	0.00	0.18	0.18
54.00	2.00	0.41	5.00	0.00	0.18	0.18
54.05	2.00	0.41	5.00	0.00	0.18	0.18
54.10	2.00	0.41	5.00	0.00	0.18	0.18
54.15	2.00	0.41	5.00	0.00	0.18	0.18
54.20	2.00	0.41	5.00	0.00	0.18	0.18
54.25	2.00	0.41	5.00	0.00	0.18	0.18
54.30	2.00	0.41	5.00	0.00	0.18	0.18
54.35	2.00	0.41	5.00	0.00	0.18	0.18
54.40	2.00	0.41	5.00	0.00	0.18	0.18
54.45	2.00	0.41	5.00	0.00	0.18	0.18
54.50	2.00	0.41	5.00	0.00	0.18	0.18
54.55	2.00	0.41	5.00	0.00	0.18	0.18
54.60	2.00	0.41	5.00	0.00	0.18	0.18
54.65	2.00	0.41	5.00	0.00	0.18	0.18
54.70	2.00	0.41	5.00	0.00	0.18	0.18
54.75	2.00	0.41	5.00	0.00	0.18	0.18
54.80	2.00	0.40	5.00	0.00	0.18	0.18
54.85	2.00	0.40	5.00	0.00	0.18	0.18
54.90	2.00	0.40	5.00	0.00	0.18	0.18
54.95	2.00	0.40	5.00	0.00	0.18	0.18
55.00	2.00	0.40	5.00	0.00	0.18	0.18
55.05	2.00	0.40	5.00	0.00	0.18	0.18
55.10	2.00	0.40	5.00	0.00	0.18	0.18
55.15	2.00	0.40	5.00	0.00	0.18	0.18
55.20	2.00	0.40	5.00	0.00	0.18	0.18
55.25	2.00	0.40	5.00	0.00	0.18	0.18
55.30	2.00	0.40	5.00	0.00	0.18	0.18
55.35	2.00	0.40	5.00	0.00	0.18	0.18
55.40	2.00	0.40	5.00	0.00	0.18	0.18
55.45	2.00	0.40	5.00	0.00	0.18	0.18
55.50	2.00	0.40	5.00	0.00	0.18	0.18
55.55	2.00	0.40	5.00	0.00	0.18	0.18
55.60	2.00	0.40	5.00	0.00	0.18	0.18
55.65	2.00	0.40	5.00	0.00	0.18	0.18
55.70	2.00	0.40	5.00	0.00	0.18	0.18
55.75	2.00	0.40	5.00	0.00	0.18	0.18
55.80	2.00	0.40	5.00	0.00	0.18	0.18
55.85	2.00	0.40	5.00	0.00	0.18	0.18
55.90	2.00	0.40	5.00	0.00	0.18	0.18
55.95	2.00	0.40	5.00	0.00	0.18	0.18
56.00	2.00	0.40	5.00	0.00	0.18	0.18
56.05	2.00	0.40	5.00	0.00	0.18	0.18
56.10	2.00	0.40	5.00	0.00	0.18	0.18
56.15	2.00	0.40	5.00	0.00	0.18	0.18
56.20	2.00	0.40	5.00	0.00	0.18	0.18
56.25	2.00	0.40	5.00	0.00	0.18	0.18
56.30	2.00	0.40	5.00	0.00	0.18	0.18
56.35	2.00	0.40	5.00	0.00	0.18	0.18
56.40	2.00	0.40	5.00	0.00	0.18	0.18
56.45	2.00	0.40	5.00	0.00	0.18	0.18
56.50	2.00	0.40	5.00	0.00	0.18	0.18
56.55	2.00	0.40	5.00	0.00	0.18	0.18
56.60	2.00	0.40	5.00	0.00	0.18	0.18
56.65	2.00	0.40	5.00	0.00	0.18	0.18

56.70	2.00	0.40	5.00	0.00	0.18	0.18
56.75	2.00	0.40	5.00	0.00	0.18	0.18
56.80	2.00	0.40	5.00	0.00	0.18	0.18
56.85	2.00	0.40	5.00	0.00	0.18	0.18
56.90	2.00	0.40	5.00	0.00	0.18	0.18
56.95	2.00	0.40	5.00	0.00	0.18	0.18
57.00	2.00	0.40	5.00	0.00	0.18	0.18
57.05	0.57	0.39	5.00	0.00	0.18	0.18
57.10	0.57	0.39	5.00	0.00	0.18	0.18
57.15	0.57	0.39	5.00	0.00	0.18	0.18
57.20	0.57	0.39	5.00	0.00	0.18	0.18
57.25	0.57	0.39	5.00	0.00	0.18	0.18
57.30	0.57	0.39	5.00	0.00	0.18	0.18
57.35	0.57	0.39	5.00	0.00	0.18	0.18
57.40	0.57	0.39	5.00	0.00	0.18	0.18
57.45	0.57	0.39	5.00	0.00	0.18	0.18
57.50	0.57	0.39	5.00	0.00	0.18	0.18
57.55	0.57	0.39	5.00	0.00	0.18	0.18
57.60	0.57	0.39	5.00	0.00	0.18	0.18
57.65	0.57	0.39	5.00	0.00	0.18	0.18
57.70	0.57	0.39	5.00	0.00	0.18	0.18
57.75	0.57	0.39	5.00	0.00	0.17	0.17
57.80	0.57	0.39	5.00	0.00	0.17	0.17
57.85	0.57	0.39	5.00	0.00	0.17	0.17
57.90	0.57	0.39	5.00	0.00	0.17	0.17
57.95	0.57	0.39	5.00	0.00	0.17	0.17
58.00	0.57	0.39	5.00	0.00	0.17	0.17
58.05	0.57	0.39	5.00	0.00	0.17	0.17
58.10	0.57	0.39	5.00	0.00	0.17	0.17
58.15	0.57	0.39	5.00	0.00	0.17	0.17
58.20	0.57	0.39	5.00	0.00	0.17	0.17
58.25	0.57	0.39	5.00	0.00	0.17	0.17
58.30	0.57	0.39	5.00	0.00	0.17	0.17
58.35	0.57	0.39	5.00	0.00	0.17	0.17
58.40	0.57	0.39	5.00	0.00	0.17	0.17
58.45	0.57	0.39	5.00	0.00	0.17	0.17
58.50	0.57	0.39	5.00	0.00	0.16	0.16
58.55	0.57	0.39	5.00	0.00	0.16	0.16
58.60	0.57	0.39	5.00	0.00	0.16	0.16
58.65	0.57	0.39	5.00	0.00	0.16	0.16
58.70	0.57	0.39	5.00	0.00	0.16	0.16
58.75	0.57	0.39	5.00	0.00	0.16	0.16
58.80	0.57	0.39	5.00	0.00	0.16	0.16
58.85	0.57	0.39	5.00	0.00	0.16	0.16
58.90	0.57	0.39	5.00	0.00	0.16	0.16
58.95	0.57	0.39	5.00	0.00	0.16	0.16
59.00	0.57	0.39	5.00	0.00	0.16	0.16
59.05	0.57	0.39	5.00	0.00	0.16	0.16
59.10	0.57	0.39	5.00	0.00	0.16	0.16
59.15	0.57	0.39	5.00	0.00	0.16	0.16
59.20	0.57	0.39	5.00	0.00	0.15	0.15
59.25	0.57	0.38	5.00	0.00	0.15	0.15
59.30	0.57	0.38	5.00	0.00	0.15	0.15
59.35	0.57	0.38	5.00	0.00	0.15	0.15
59.40	0.57	0.38	5.00	0.00	0.15	0.15
59.45	0.57	0.38	5.00	0.00	0.15	0.15
59.50	0.57	0.38	5.00	0.00	0.15	0.15
59.55	0.57	0.38	5.00	0.00	0.15	0.15
59.60	0.57	0.38	5.00	0.00	0.15	0.15
59.65	0.57	0.38	5.00	0.00	0.15	0.15
59.70	0.57	0.38	5.00	0.00	0.15	0.15
59.75	0.57	0.38	5.00	0.00	0.15	0.15
59.80	0.57	0.38	5.00	0.00	0.15	0.15
59.85	0.57	0.38	5.00	0.00	0.14	0.14
59.90	0.57	0.38	5.00	0.00	0.14	0.14
59.95	0.57	0.38	5.00	0.00	0.14	0.14
60.00	0.56	0.38	5.00	0.00	0.14	0.14
60.05	0.56	0.38	5.00	0.00	0.14	0.14
60.10	0.56	0.38	5.00	0.00	0.14	0.14
60.15	0.56	0.38	5.00	0.00	0.14	0.14
60.20	0.56	0.38	5.00	0.00	0.14	0.14
60.25	0.56	0.38	5.00	0.00	0.14	0.14
60.30	0.56	0.38	5.00	0.00	0.14	0.14
60.35	0.56	0.38	5.00	0.00	0.14	0.14
60.40	0.56	0.38	5.00	0.00	0.13	0.13
60.45	0.56	0.38	5.00	0.00	0.13	0.13
60.50	0.56	0.38	5.00	0.00	0.13	0.13
60.55	0.56	0.38	5.00	0.00	0.13	0.13
60.60	0.56	0.38	5.00	0.00	0.13	0.13

60.65	0.56	0.38	5.00	0.00	0.13	0.13
60.70	0.56	0.38	5.00	0.00	0.13	0.13
60.75	0.56	0.38	5.00	0.00	0.13	0.13
60.80	0.56	0.38	5.00	0.00	0.13	0.13
60.85	0.56	0.38	5.00	0.00	0.13	0.13
60.90	0.56	0.38	5.00	0.00	0.13	0.13
60.95	0.56	0.38	5.00	0.00	0.13	0.13
61.00	0.56	0.38	5.00	0.00	0.12	0.12
61.05	0.56	0.38	5.00	0.00	0.12	0.12
61.10	0.56	0.38	5.00	0.00	0.12	0.12
61.15	0.56	0.38	5.00	0.00	0.12	0.12
61.20	0.56	0.38	5.00	0.00	0.12	0.12
61.25	0.56	0.38	5.00	0.00	0.12	0.12
61.30	0.56	0.38	5.00	0.00	0.12	0.12
61.35	0.56	0.38	5.00	0.00	0.12	0.12
61.40	0.56	0.38	5.00	0.00	0.12	0.12
61.45	0.56	0.37	5.00	0.00	0.12	0.12
61.50	0.56	0.37	5.00	0.00	0.12	0.12
61.55	0.56	0.37	5.00	0.00	0.12	0.12
61.60	0.56	0.37	5.00	0.00	0.11	0.11
61.65	0.56	0.37	5.00	0.00	0.11	0.11
61.70	0.56	0.37	5.00	0.00	0.11	0.11
61.75	0.56	0.37	5.00	0.00	0.11	0.11
61.80	0.56	0.37	5.00	0.00	0.11	0.11
61.85	0.56	0.37	5.00	0.00	0.11	0.11
61.90	0.56	0.37	5.00	0.00	0.11	0.11
61.95	0.56	0.37	5.00	0.00	0.11	0.11
62.00	0.56	0.37	5.00	0.00	0.11	0.11
62.05	0.56	0.37	5.00	0.00	0.11	0.11
62.10	0.56	0.37	5.00	0.00	0.11	0.11
62.15	0.56	0.37	5.00	0.00	0.11	0.11
62.20	0.56	0.37	5.00	0.00	0.11	0.11
62.25	0.56	0.37	5.00	0.00	0.10	0.10
62.30	0.56	0.37	5.00	0.00	0.10	0.10
62.35	0.56	0.37	5.00	0.00	0.10	0.10
62.40	0.56	0.37	5.00	0.00	0.10	0.10
62.45	0.56	0.37	5.00	0.00	0.10	0.10
62.50	0.56	0.37	5.00	0.00	0.10	0.10
62.55	0.56	0.37	5.00	0.00	0.10	0.10
62.60	0.56	0.37	5.00	0.00	0.10	0.10
62.65	0.56	0.37	5.00	0.00	0.10	0.10
62.70	0.56	0.37	5.00	0.00	0.10	0.10
62.75	0.56	0.37	5.00	0.00	0.10	0.10
62.80	0.56	0.37	5.00	0.00	0.10	0.10
62.85	0.56	0.37	5.00	0.00	0.10	0.10
62.90	0.56	0.37	5.00	0.00	0.10	0.10
62.95	0.56	0.37	5.00	0.00	0.09	0.09
63.00	0.56	0.37	5.00	0.00	0.09	0.09
63.05	0.56	0.37	5.00	0.00	0.09	0.09
63.10	0.56	0.37	5.00	0.00	0.09	0.09
63.15	0.56	0.37	5.00	0.00	0.09	0.09
63.20	0.56	0.37	5.00	0.00	0.09	0.09
63.25	0.56	0.37	5.00	0.00	0.09	0.09
63.30	0.56	0.37	5.00	0.00	0.09	0.09
63.35	0.56	0.37	5.00	0.00	0.09	0.09
63.40	0.56	0.37	5.00	0.00	0.09	0.09
63.45	0.56	0.37	5.00	0.00	0.09	0.09
63.50	0.56	0.37	5.00	0.00	0.09	0.09
63.55	0.56	0.37	5.00	0.00	0.09	0.09
63.60	0.56	0.37	5.00	0.00	0.09	0.09
63.65	0.56	0.36	5.00	0.00	0.08	0.08
63.70	0.56	0.36	5.00	0.00	0.08	0.08
63.75	0.56	0.36	5.00	0.00	0.08	0.08
63.80	0.56	0.36	5.00	0.00	0.08	0.08
63.85	0.56	0.36	5.00	0.00	0.08	0.08
63.90	0.56	0.36	5.00	0.00	0.08	0.08
63.95	0.56	0.36	5.00	0.00	0.08	0.08
64.00	0.55	0.36	5.00	0.00	0.08	0.08
64.05	0.55	0.36	5.00	0.00	0.08	0.08
64.10	0.55	0.36	5.00	0.00	0.08	0.08
64.15	0.55	0.36	5.00	0.00	0.08	0.08
64.20	0.55	0.36	5.00	0.00	0.08	0.08
64.25	0.55	0.36	5.00	0.00	0.08	0.08
64.30	0.55	0.36	5.00	0.00	0.08	0.08
64.35	0.55	0.36	5.00	0.00	0.08	0.08
64.40	0.55	0.36	5.00	0.00	0.08	0.08
64.45	0.55	0.36	5.00	0.00	0.07	0.07
64.50	0.55	0.36	5.00	0.00	0.07	0.07
64.55	0.55	0.36	5.00	0.00	0.07	0.07

64.60	0.55	0.36	5.00	0.00	0.07	0.07
64.65	0.55	0.36	5.00	0.00	0.07	0.07
64.70	0.55	0.36	5.00	0.00	0.07	0.07
64.75	0.55	0.36	5.00	0.00	0.07	0.07
64.80	0.55	0.36	5.00	0.00	0.07	0.07
64.85	0.55	0.36	5.00	0.00	0.07	0.07
64.90	0.55	0.36	5.00	0.00	0.07	0.07
64.95	0.55	0.36	5.00	0.00	0.07	0.07
65.00	0.55	0.36	5.00	0.00	0.07	0.07
65.05	0.55	0.36	5.00	0.00	0.07	0.07
65.10	0.55	0.36	5.00	0.00	0.07	0.07
65.15	0.55	0.36	5.00	0.00	0.07	0.07
65.20	0.55	0.36	5.00	0.00	0.07	0.07
65.25	0.55	0.36	5.00	0.00	0.07	0.07
65.30	0.55	0.36	5.00	0.00	0.06	0.06
65.35	0.55	0.36	5.00	0.00	0.06	0.06
65.40	0.55	0.36	5.00	0.00	0.06	0.06
65.45	0.55	0.36	5.00	0.00	0.06	0.06
65.50	0.55	0.36	5.00	0.00	0.06	0.06
65.55	0.55	0.36	5.00	0.00	0.06	0.06
65.60	0.55	0.36	5.00	0.00	0.06	0.06
65.65	0.55	0.36	5.00	0.00	0.06	0.06
65.70	0.55	0.36	5.00	0.00	0.06	0.06
65.75	0.55	0.36	5.00	0.00	0.06	0.06
65.80	0.55	0.36	5.00	0.00	0.06	0.06
65.85	0.55	0.35	5.00	0.00	0.06	0.06
65.90	0.55	0.35	5.00	0.00	0.06	0.06
65.95	0.55	0.35	5.00	0.00	0.06	0.06
66.00	0.55	0.35	5.00	0.00	0.06	0.06
66.05	0.55	0.35	5.00	0.00	0.06	0.06
66.10	0.55	0.35	5.00	0.00	0.06	0.06
66.15	0.55	0.35	5.00	0.00	0.05	0.05
66.20	0.55	0.35	5.00	0.00	0.05	0.05
66.25	0.55	0.35	5.00	0.00	0.05	0.05
66.30	0.55	0.35	5.00	0.00	0.05	0.05
66.35	0.55	0.35	5.00	0.00	0.05	0.05
66.40	0.55	0.35	5.00	0.00	0.05	0.05
66.45	0.55	0.35	5.00	0.00	0.05	0.05
66.50	0.55	0.35	5.00	0.00	0.05	0.05
66.55	0.55	0.35	5.00	0.00	0.05	0.05
66.60	0.55	0.35	5.00	0.00	0.05	0.05
66.65	0.55	0.35	5.00	0.00	0.05	0.05
66.70	0.55	0.35	5.00	0.00	0.05	0.05
66.75	0.55	0.35	5.00	0.00	0.05	0.05
66.80	0.55	0.35	5.00	0.00	0.05	0.05
66.85	0.55	0.35	5.00	0.00	0.05	0.05
66.90	0.55	0.35	5.00	0.00	0.05	0.05
66.95	0.55	0.35	5.00	0.00	0.04	0.04
67.00	0.55	0.35	5.00	0.00	0.04	0.04
67.05	0.55	0.35	5.00	0.00	0.04	0.04
67.10	0.55	0.35	5.00	0.00	0.04	0.04
67.15	0.55	0.35	5.00	0.00	0.04	0.04
67.20	0.55	0.35	5.00	0.00	0.04	0.04
67.25	0.55	0.35	5.00	0.00	0.04	0.04
67.30	0.55	0.35	5.00	0.00	0.04	0.04
67.35	0.55	0.35	5.00	0.00	0.04	0.04
67.40	0.55	0.35	5.00	0.00	0.04	0.04
67.45	0.55	0.35	5.00	0.00	0.04	0.04
67.50	0.55	0.35	5.00	0.00	0.04	0.04
67.55	0.55	0.35	5.00	0.00	0.04	0.04
67.60	0.55	0.35	5.00	0.00	0.04	0.04
67.65	0.55	0.35	5.00	0.00	0.04	0.04
67.70	0.55	0.35	5.00	0.00	0.04	0.04
67.75	0.55	0.35	5.00	0.00	0.04	0.04
67.80	0.55	0.35	5.00	0.00	0.03	0.03
67.85	0.55	0.35	5.00	0.00	0.03	0.03
67.90	0.55	0.35	5.00	0.00	0.03	0.03
67.95	0.55	0.35	5.00	0.00	0.03	0.03
68.00	0.55	0.35	5.00	0.00	0.03	0.03
68.05	0.55	0.35	5.00	0.00	0.03	0.03
68.10	0.55	0.34	5.00	0.00	0.03	0.03
68.15	0.55	0.34	5.00	0.00	0.03	0.03
68.20	0.54	0.34	5.00	0.00	0.03	0.03
68.25	0.54	0.34	5.00	0.00	0.03	0.03
68.30	0.54	0.34	5.00	0.00	0.03	0.03
68.35	0.54	0.34	5.00	0.00	0.03	0.03
68.40	0.54	0.34	5.00	0.00	0.03	0.03
68.45	0.54	0.34	5.00	0.00	0.03	0.03
68.50	0.54	0.34	5.00	0.00	0.03	0.03

68.55	0.54	0.34	5.00	0.00	0.03	0.03
68.60	0.54	0.34	5.00	0.00	0.02	0.02
68.65	0.54	0.34	5.00	0.00	0.02	0.02
68.70	0.54	0.34	5.00	0.00	0.02	0.02
68.75	0.54	0.34	5.00	0.00	0.02	0.02
68.80	0.54	0.34	5.00	0.00	0.02	0.02
68.85	0.54	0.34	5.00	0.00	0.02	0.02
68.90	0.54	0.34	5.00	0.00	0.02	0.02
68.95	0.54	0.34	5.00	0.00	0.02	0.02
69.00	0.54	0.34	5.00	0.00	0.02	0.02
69.05	0.54	0.34	5.00	0.00	0.02	0.02
69.10	0.54	0.34	5.00	0.00	0.02	0.02
69.15	0.54	0.34	5.00	0.00	0.02	0.02
69.20	0.54	0.34	5.00	0.00	0.02	0.02
69.25	0.54	0.34	5.00	0.00	0.02	0.02
69.30	0.54	0.34	5.00	0.00	0.02	0.02
69.35	0.54	0.34	5.00	0.00	0.01	0.01
69.40	0.54	0.34	5.00	0.00	0.01	0.01
69.45	0.54	0.34	5.00	0.00	0.01	0.01
69.50	0.54	0.34	5.00	0.00	0.01	0.01
69.55	0.54	0.34	5.00	0.00	0.01	0.01
69.60	0.54	0.34	5.00	0.00	0.01	0.01
69.65	0.54	0.34	5.00	0.00	0.01	0.01
69.70	0.54	0.34	5.00	0.00	0.01	0.01
69.75	0.54	0.34	5.00	0.00	0.01	0.01
69.80	0.54	0.34	5.00	0.00	0.01	0.01
69.85	0.54	0.34	5.00	0.00	0.01	0.01
69.90	0.54	0.34	5.00	0.00	0.01	0.01
69.95	0.54	0.34	5.00	0.00	0.01	0.01
70.00	0.54	0.34	5.00	0.00	0.01	0.01
70.05	0.54	0.34	5.00	0.00	0.01	0.01
70.10	0.54	0.34	5.00	0.00	0.01	0.01
70.15	0.54	0.34	5.00	0.00	0.00	0.00
70.20	0.54	0.34	5.00	0.00	0.00	0.00
70.25	0.54	0.34	5.00	0.00	0.00	0.00
70.30	0.54	0.33	5.00	0.00	0.00	0.00
70.35	0.54	0.33	5.00	0.00	0.00	0.00
70.40	0.54	0.33	5.00	0.00	0.00	0.00
70.45	0.54	0.33	5.00	0.00	0.00	0.00
70.50	0.54	0.33	5.00	0.00	0.00	0.00

* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5, CRR is limited to 2,   CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

1 atm (atmosphere) = 1 tsf (ton/ft2)

CRRm	Cyclic resistance ratio from soils
CSRsf	Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S.	Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat	Settlement from saturated sands
S_dry	Settlement from Unsaturated Sands
S_all	Total Settlement from Saturated and Unsaturated Sands
NoLiq	No-Liquefy Soils

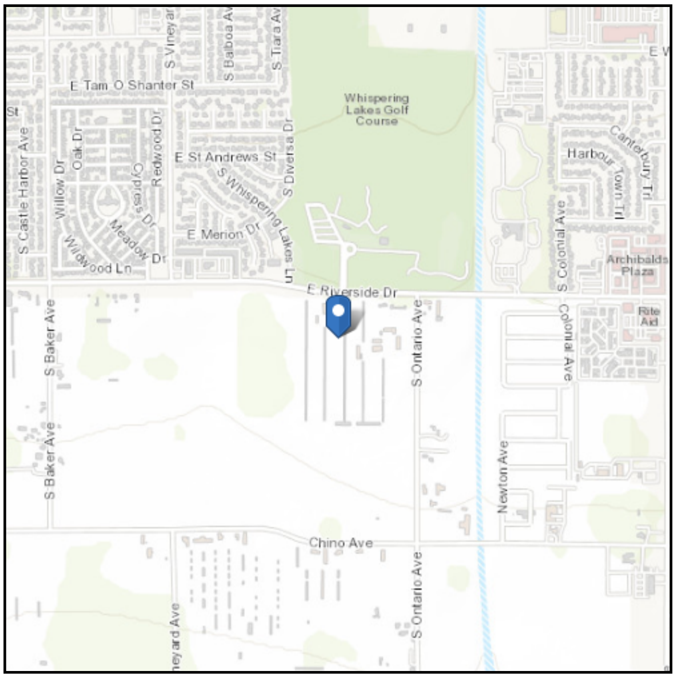
ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

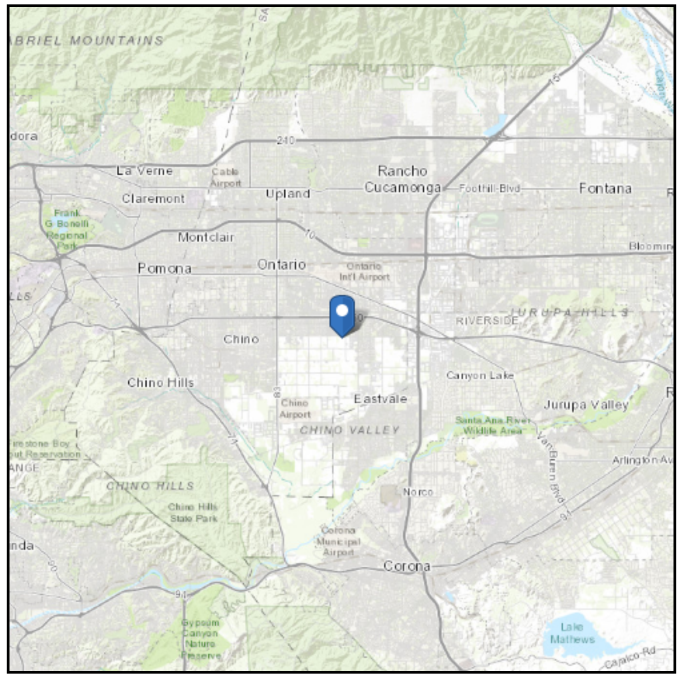
ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: I
Soil Class: D - Stiff Soil

Latitude: 34.01789
Longitude: -117.604962
Elevation: 768.6973176987071 ft (NAVD 88)





Seismic

Site Soil Class: D - Stiff Soil

Results:

S_S :	1.607	S_{D1} :	N/A
S_1 :	0.581	T_L :	8
F_a :	1	PGA :	0.669
F_v :	N/A	PGA_M :	0.736
S_{MS} :	1.607	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1
S_{DS} :	1.071	C_v :	1.421

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Tue Oct 17 2023

Date Source: [USGS Seismic Design Maps]

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new USGS Earthquake Hazard Toolbox for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

34.01789

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

-117.604962

Site Class

259 m/s (Site class D)

Hazard Curve

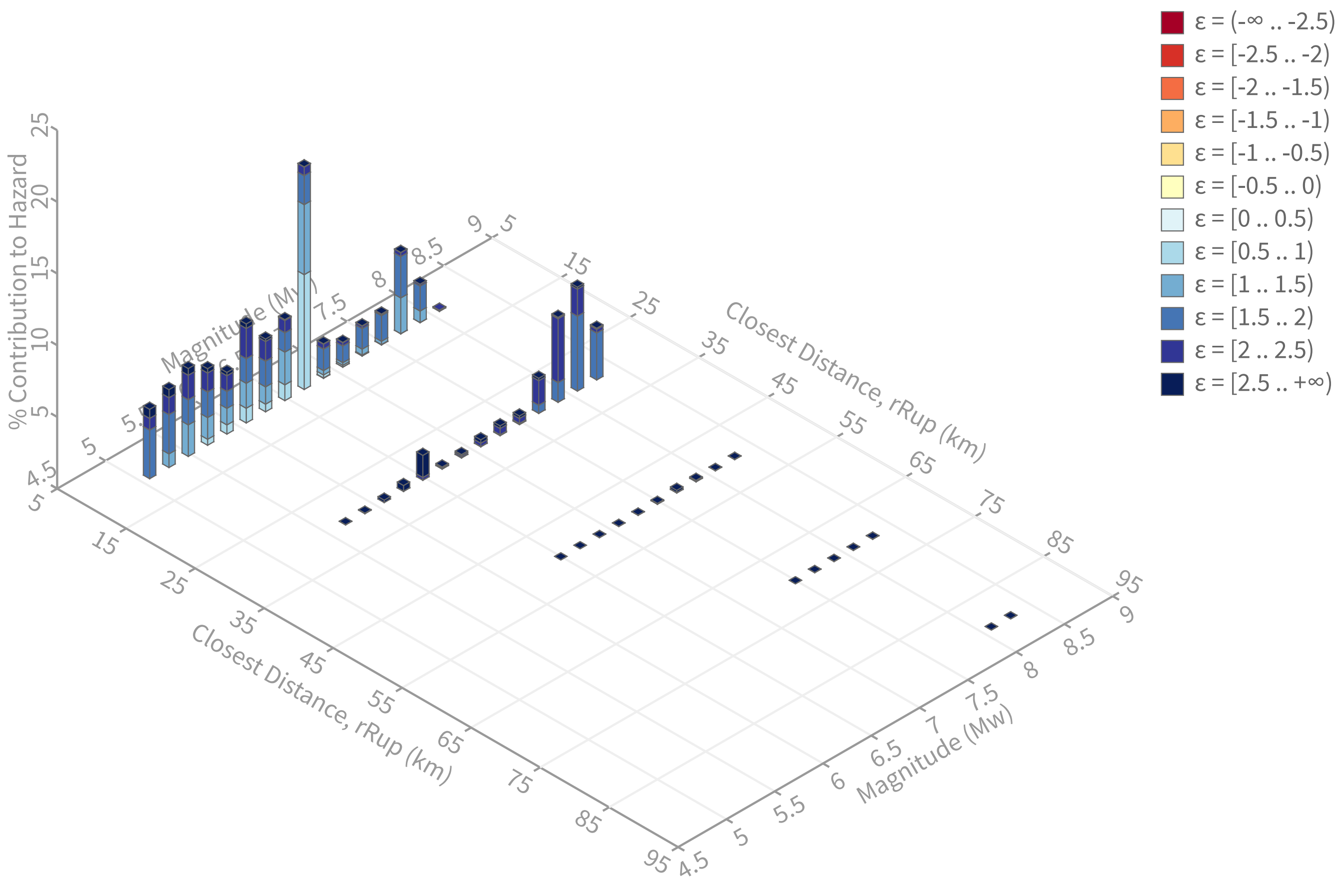
Please select “Edition”, “Location” & “Site Class” above to compute a hazard curve.

Compute Hazard Curve

Deaggregation

Component

Total


ε = (-∞ .. -2.5)
ε = [-2.5 .. -2)
ε = [-2 .. -1.5)
ε = [-1.5 .. -1)
ε = [-1 .. -0.5)
ε = [-0.5 .. 0)
ε = [0 .. 0.5)
ε = [0.5 .. 1)
ε = [1 .. 1.5)
ε = [1.5 .. 2)
ε = [2 .. 2.5)
ε = [2.5 .. +∞)
% Contribution to Hazard
Closest Distance, rRup (km)
Magnitude (Mw)

Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.75789666 g

Recovered targets

Return period: 3042.2855 yrs
Exceedance rate: 0.00032870025 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.06 %

Mean (over all sources)

m: 6.7
r: 13.84 km
ε_0: 1.7 σ

Mode (largest m-r bin)

m: 6.65
r: 5.33 km
ε_0: 1.1 σ
Contribution: 15.52 %

Mode (largest m-r-ε_0 bin)

m: 6.64
r: 3.79 km
ε_0: 0.8 σ
Contribution: 8.01 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM31	System							31.62
Fontana (Seismicity) [2]		3.84	6.61	0.93	117.580°W	33.995°N	137.58	7.68
San Andreas (San Bernardino N) [2]		31.05	7.97	2.10	117.404°W	34.242°N	36.53	4.27
San Jacinto (San Bernardino) [2]		26.98	8.09	1.91	117.353°W	34.141°N	59.26	3.50
Whittier alt 1 [1]		17.41	7.49	1.70	117.663°W	33.863°N	197.20	3.07
Chino alt 1 [1]		11.79	6.48	2.01	117.703°W	33.950°N	230.32	2.83
Cucamonga [3]		16.79	7.73	1.65	117.671°W	34.158°N	338.85	1.82
Elsinore (Glen Ivy) rev [0]		21.10	6.63	2.51	117.590°W	33.829°N	176.24	1.18
Chino alt 1 [2]		11.79	6.69	1.91	117.703°W	33.950°N	230.32	1.13
San Jacinto (Lytle Creek connector) [1]		23.54	8.06	1.81	117.438°W	34.178°N	40.76	1.01
UC33brAvg_FM32	System							28.88
Fontana (Seismicity) [2]		3.84	6.61	0.93	117.580°W	33.995°N	137.58	6.29
San Andreas (San Bernardino N) [2]		31.05	7.97	2.10	117.404°W	34.242°N	36.53	4.36
San Jacinto (San Bernardino) [2]		26.98	8.08	1.91	117.353°W	34.141°N	59.26	3.44
Whittier alt 2 [1]		17.89	7.57	1.70	117.671°W	33.864°N	199.71	2.83
Chino alt 2 [1]		11.47	6.84	1.81	117.700°W	33.952°N	230.28	2.77
Cucamonga [3]		16.79	7.75	1.64	117.671°W	34.158°N	338.85	1.86
Elsinore (Glen Ivy) rev [0]		21.10	6.61	2.52	117.590°W	33.829°N	176.24	1.19
UC33brAvg_FM31 (opt)	Grid							19.97
PointSourceFinite: -117.605, 34.040		5.64	5.66	1.38	117.605°W	34.040°N	0.00	5.44
PointSourceFinite: -117.605, 34.040		5.64	5.66	1.38	117.605°W	34.040°N	0.00	5.44
PointSourceFinite: -117.605, 34.103		9.89	5.87	1.93	117.605°W	34.103°N	0.00	2.07
PointSourceFinite: -117.605, 34.103		9.89	5.87	1.93	117.605°W	34.103°N	0.00	2.07
UC33brAvg_FM32 (opt)	Grid							19.53
PointSourceFinite: -117.605, 34.040		5.64	5.66	1.38	117.605°W	34.040°N	0.00	5.34
PointSourceFinite: -117.605, 34.040		5.64	5.66	1.38	117.605°W	34.040°N	0.00	5.34
PointSourceFinite: -117.605, 34.103		9.89	5.87	1.93	117.605°W	34.103°N	0.00	2.07
PointSourceFinite: -117.605, 34.103		9.89	5.87	1.93	117.605°W	34.103°N	0.00	2.07

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APPENDIX E

REFERENCES

APPENDIX E

REFERENCES

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HMMH

300 S. Harbor Boulevard, Suite 516
Anaheim, California 92805
781.229.0707

MEMORANDUM

To:	Nicole Vermillion Placeworks 3 MacArthur Pl #1100 Santa Ana, CA 92707
From:	Dillon Tannler, Scott Noel AICP, INCE, and Tara Cruz HMMH
Date:	May 30th, 2024
Subject:	Appendix D supporting materials---Concert Noise and Degradation Analysis
Reference:	HMMH Project Number 23-0251A

Introduction

At the request of the City of Ontario, HMMH performed additional analysis of the stadium noise analysis and performed a degradation analysis for all noise studies for the Ontario Sports Park due to comments received from Californians Allied for a Responsible Economy (CARE CA). Below are tables showing the revised concert noise levels at all receivers and a degradation analysis which compares ambient noise levels to existing noise levels across all noise study disciplines for construction noise, operational noise, stadium noise, athletic field noise, and commercial noise. There is also a graphic depicting the updated concert noise contour.

Included are summary tables and full results for the degradation analysis.

Updated Stadium Noise

Description

HMMH revised the input to the SoundPLAN source levels for concert events from a SPL of 75 dBA LwA for festivals to an SPL of 100 dBA LwA for band on pavilion. The results are depicted below in Table 1.

Table 1. Revised Stadium Noise Results Ontario Plan

Noise Zone[1]	Land Use	Daytime[2] Exterior L_{eq} Criteria (dBA)	Predicted CNEL (dBA) Range[2]					
			RCV Group 1	RCV Group 2	RCV Group 3	RCV Group 4	RCV Group 5	RCV Group 6
I	Single-Family Residential	65	17 - 27	17 - 38	NA	30 - 32	10 - 36	19 - 22
II	Multi-Family Residential, Mobile Home Parks	65	14 - 34	16 - 37	NA	NA	NA	NA
V	Manufacturing and Industrial, other Uses	70	NA	NA	35 - 41	30 - 36	30 - 36	NA

Notes:

1. Pursuant to §5-29.11, the maximum permissible noise level limit established for Noise Zone I applies to the exterior of schools, daycare centers, hospitals or other similar healthcare institutions, churches, libraries, or museums during hours of use.
2. The City of Ontario's noise code includes both "daytime" (7:00 a.m. – 10:00 p.m.) and "nighttime" (10:00 p.m – 7:00 p.m) limits. Since the proposed ORSC is only open between 8:00 a.m. and 10:00 p.m, the "nighttime" limits do not apply.

   Source: HMMH, 2023.

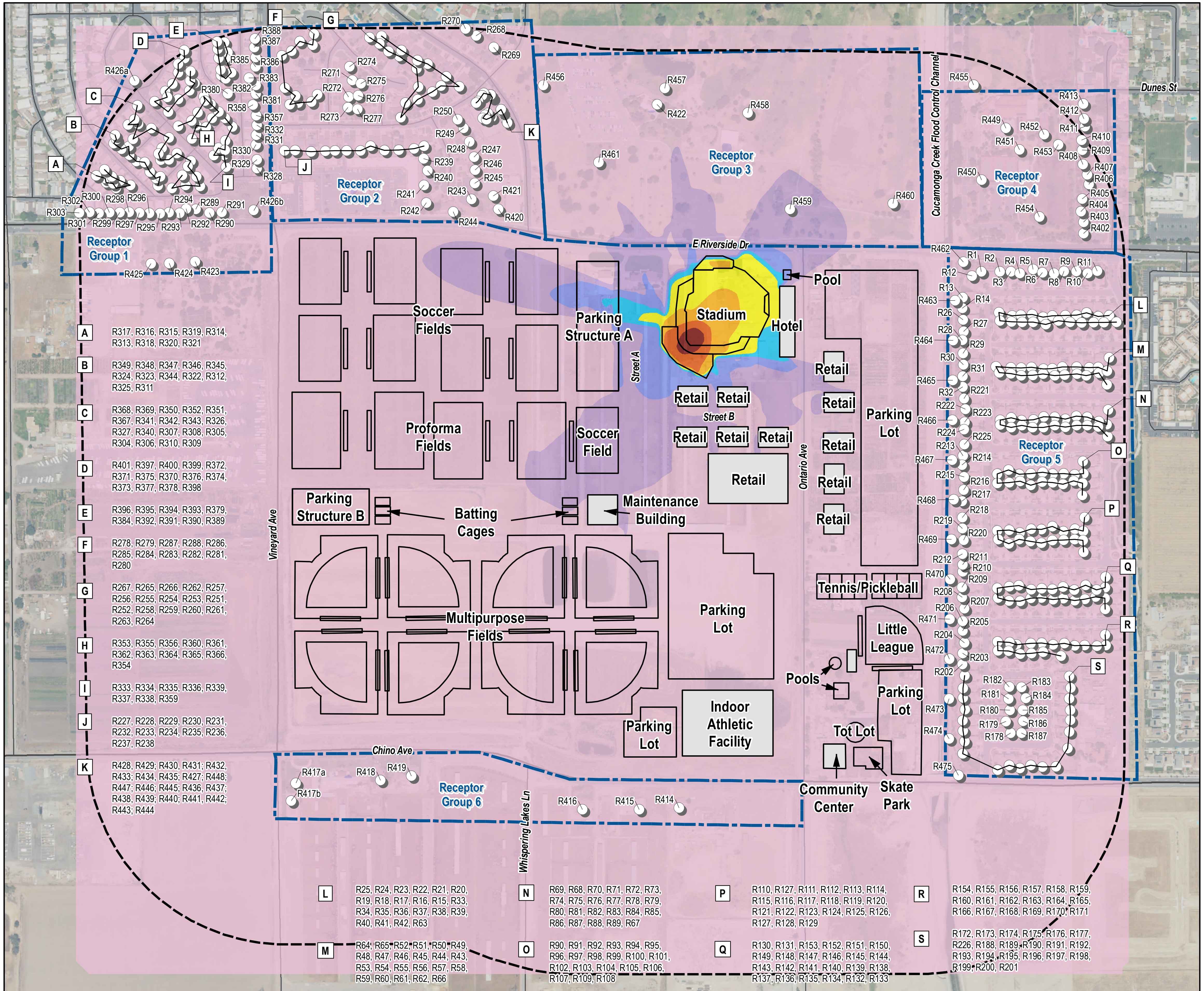

Figure 3
Predicted $L_{eq(1h)}$ (dBA)
Scenario 2: Concert

Ontario Regional Sports Complex EIR

Ontario, California

$L_{eq(1h)}$ Level

- Greater than 75 dBA
- 70 - 75 dBA
- 65 - 70 dBA
- 60 - 65 dBA
- 55 - 60 dBA
- 50 - 55 dBA
- 45 - 50 dBA
- 40 - 45 dBA
- Less then 40 dBA

Receptor Location and Number

Top Floor Receptor

Bottom Floor Receptor

Note: Grouped Receptor Labels are in order of Leader Occurrence.

- Sports Complex Feature
- Sports Complex Building
- Receptor Group
- Study Area

0 500 1,000 Feet

hmmh

Degradation Analysis Results

Table 2. Stadium Noise

Predicted $L_{eq(h)}$ (dBA) Range							
Receiver Group		RCV Group 1	RCV Group 2	RCV Group 3	RCV Group 4	RCV Group 5	RCV Group 6
Ambient	**Day**	53	53	52	52	52	53
	Evening	52	52	51	51	51	52
	Night	51	51	53	53	53	51
Total	**Day**	52-52	52-53	53-54	52-53	52-53	52-52
	Evening	51-52	51-52	52-53	51-52	51-52	51-51
	Night	53-53	53-54	53-54	53-54	53-54	53-53
Increase	**Day**	0-0	0-1	1-2	0-1	0-1	0-0
	Evening	0-1	0-1	1-2	0-1	0-1	0-0
	Night	0-0	0-1	0-1	0-1	0-1	0-0

Table 3. Athletic Field Games

Predicted $L_{eq(h)}$ (dBA) Range							
Receiver Group		RCV Group 1	RCV Group 2	RCV Group 3	RCV Group 4	RCV Group 5	RCV Group 6
Ambient	Day	53	53	52	52	52	53
	Evening	52	52	51	51	51	52
	Night	51	51	53	53	53	51
Range of Predicted Noise Levels, Leq(h), dBA	Day	53-55	53-57	53-57	52-53	52-56	53-53
	Evening	52-55	52-57	52-57	51-52	51-55	52-52
	Night	51-54	51-56	54-57	53-54	53-56	51-51
Range of Increases over Ambient	Day	0-2	0-4	1-5	0-1	0-4	0-0
	Evening	0-3	0-5	1-6	0-1	0-4	0-0
	Night	0-3	0-5	1-4	0-1	0-3	0-0

Table 4. Athletic Field Practices

Predicted $L_{eq(h)}$ (dBA) Range							
Receiver Group		RCV Group 1	RCV Group 2	RCV Group 3	RCV Group 4	RCV Group 5	RCV Group 6
Ambient	Day	53	53	52	52	52	53

Receiver Group		RCV Group 1	RCV Group 2	RCV Group 3	RCV Group 4	RCV Group 5	RCV Group 6
		Predicted $L_{eq(h)}$ (dBA) Range					
	Evening	52	52	51	51	51	52
	Night	51	51	53	53	53	51
Range of Predicted Noise Levels, Leq(h), dBA	Day	53-55	53-57	53-57	52-53	52-56	53-53
	Evening	52-55	52-57	52-57	51-52	51-56	52-52
	Night	51-54	51-57	54-57	53-54	53-56	51-51
Range of Increases over Ambient	Day	0-2	0-4	1-5	0-1	0-4	0-0
	Evening	0-3	0-5	1-6	0-1	0-5	0-0
	Night	0-3	0-6	1-4	0-1	0-3	0-0

Table 5. Athletic Field Tournaments

Receiver Groups		RCV Group 1	RCV Group 2	RCV Group 3	RCV Group 4	RCV Group 5	RCV Group 6
		Predicted $L_{eq(h)}$ (dBA) Range					
Ambient	Day	53	53	52	52	52	53
	Evening	52	52	51	51	51	52
	Night	51	51	53	53	53	51
Range of Predicted Noise Levels, Leq(h), dBA	Day	53-55	53-57	53-57	52-53	52-56	53-53
	Evening	52-55	52-57	52-57	51-52	51-55	52-52
	Night	51-54	51-56	54-57	53-54	53-56	51-51
Range of Increases over Ambient	Day	0-2	0-4	1-5	0-1	0-4	0-0
	Evening	0-3	0-5	1-6	0-1	0-4	0-0
	Night	0-3	0-5	1-4	0-1	0-3	0-0

Table 6. Construction Noise Summary

Project Component		Work Phase	Construction Noise - Increases over Ambient Noise Levels, Nighttime (10 PM - 6 AM)					
			1	2	3	4	5	6
Parking Structures	Parking Structure A	Phase 1B	0-0	0-2	1-4	0-1	0-2	0-0
	Parking Structure B	Phase 2	0-2	0-4	0-1	0-0	0-0	0-1
Stadium	All Activities	Phase 1B	0-1	0-4	0-7	0-2	0-3	0-0

Table 7. Construction Noise Day Night

Month/Year	Construction Noise - Increases over Ambient Noise Levels, Daytime (7 AM - 7 PM)					
	1	2	3	4	5	6
09/24	2-20	2-27	11-21	8-11	1-19	2-21
10/24	1-23	0-30	13-24	10-14	0-22	0-24
11/24	1-21	0-27	13-23	11-14	0-22	2-25
12/24	2-20	0-27	13-22	11-14	0-21	2-21
01/25	2-21	0-28	13-22	10-13	0-21	7-21
02/25	1-22	0-29	13-23	10-14	0-20	3-21
03/25	1-22	0-29	13-22	9-13	0-20	2-21
04/25	0-20	0-27	12-21	9-13	0-20	1-21
05/25	0-20	0-27	12-21	9-13	0-20	8-22
06/25	0-20	0-27	11-21	9-12	0-19	9-23
07/25	0-20	0-27	11-21	8-12	0-19	2-22
08/25	0-20	0-27	11-21	8-12	0-19	2-21
09/25	0-20	0-27	12-21	8-12	0-19	3-21
10/25	0-20	0-27	12-21	9-12	0-20	2-22
11/25	0-20	0-27	11-21	8-12	0-19	3-21
12/25	0-20	0-27	11-21	7-11	0-19	1-21
01/26	0-20	0-27	11-21	7-11	0-19	1-21
02/26	0-20	0-27	11-21	8-12	0-19	1-21
03/26	0-20	0-27	11-21	7-11	0-19	0-21
04/26	0-20	0-27	10-21	7-11	0-19	0-21
05/26	0-20	0-27	10-21	7-11	0-19	0-21
06/26	0-20	0-27	10-21	7-11	0-19	1-21
07/26	0-20	0-27	10-21	7-11	0-19	0-21
08/26	0-20	0-27	10-21	7-11	0-19	0-21
09/26	0-20	0-27	10-21	7-11	0-19	0-21
10/26	0-20	0-27	10-21	7-11	0-19	0-21

Month/Year	Construction Noise - Increases over Ambient Noise Levels, Daytime (7 AM - 7 PM)					
	1	2	3	4	5	6
11/26	0-20	0-27	10-21	7-11	0-19	0-21
12/26	0-20	0-27	10-21	7-11	0-19	0-21
01/27	0-20	0-27	10-21	7-11	0-19	0-21
02/27	0-20	0-27	10-21	7-11	0-19	0-21
03/27	0-20	0-27	10-21	7-11	0-19	0-21
04/27	0-20	0-27	10-21	7-11	0-19	0-21
05/27	0-20	0-27	10-21	7-11	0-19	0-21
06/27	0-20	0-27	10-21	7-11	0-19	0-21
07/27	0-20	0-27	10-21	7-11	0-19	0-21
08/27	0-20	0-27	10-21	7-11	0-19	0-21
09/27	0-20	0-27	10-21	7-11	0-19	0-21

Table 8. Concert Analysis

Predicted Leq(h) (dBA) Range							
Receiver Groups		RCV Group 1	RCV Group 2	RCV Group 3	RCV Group 4	RCV Group 5	RCV Group 6
Ambient	**Day**	53	53	52	52	52	53
	Evening	52	52	51	51	51	52
	Night	51	51	53	53	53	51
Total	**Day**	52-52	52-53	53-54	52-53	52-53	52-52
	Evening	51-52	51-52	52-53	51-52	51-52	51-51
	Night	53-53	53-54	53-54	53-54	53-54	53-53
Increase	**Day**	0-0	0-1	1-2	0-1	0-1	0-0
	Evening	0-1	0-1	1-2	0-1	0-1	0-0
	Night	0-0	0-1	0-1	0-1	0-1	0-0

Appendix E. Resumes from Comment Letter O2

Appendix

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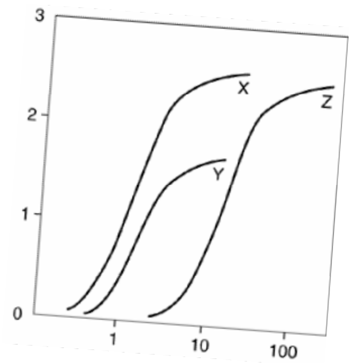

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James J. J. Clark, Ph.D.

Principal Toxicologist

Toxicology/Exposure Assessment Modeling

Risk Assessment/Analysis/Dispersion Modeling

Education:

Ph.D., Environmental Health Science, University of California, 1995
M.S., Environmental Health Science, University of California, 1993
B.S., Biophysical and Biochemical Sciences, University of Houston, 1987

Professional Experience:

Dr. Clark is a well recognized toxicologist, air modeler, and health scientist. He has 20 years of experience in researching the effects of environmental contaminants on human health including environmental fate and transport modeling (SCREEN3, AEROMOD, ISCST3, Johnson-Ettinger Vapor Intrusion Modeling); exposure assessment modeling (partitioning of contaminants in the environment as well as PBPK modeling); conducting and managing human health risk assessments for regulatory compliance and risk-based clean-up levels; and toxicological and medical literature research.

Significant projects performed by Dr. Clark include the following:

LITIGATION SUPPORT

Case: James Harold Caygle, et al, v. Drummond Company, Inc. Circuit Court for the Tenth Judicial Circuit, Jefferson County, Alabama. Civil Action. CV-2009

Client: Environmental Litgation Group, Birmingham, Alabama

Dr. Clark performed an air quality assessment of emissions from a coke factory located in Tarrant, Alabama. The assessment reviewed include a comprehensive review of air quality standards, measured concentrations of pollutants from factory, an inspection of the facility and detailed assessment of the impacts on the community. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: Rose Roper V. Nissan North America, et al. Superior Court of the State Of California for the County Of Los Angeles – Central Civil West. Civil Action. NC041739

Client: Rose, Klein, Marias, LLP, Long Beach, California

Dr. Clark performed a toxicological assessment of an individual occupationally exposed to multiple chemicals, including benzene, who later developed a respiratory distress. A review of the individual's medical and occupational history was performed to prepare an exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to respiratory irritants. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: O'Neil V. Sherwin Williams, et al. United States District Court Central District of California

Client: Rose, Klein, Marias, LLP, Long Beach, California

Dr. Clark performed a toxicological assessment of an individual occupationally exposed to petroleum distillates who later developed a bladder cancer. A review of the individual's medical and occupational history was performed to prepare a quantitative exposure assessment. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Summary judgment for defendants.

Case: Moore V., Shell Oil Company, et al. Superior Court of the State Of California for the County Of Los Angeles

Client: Rose, Klein, Marias, LLP, Long Beach, California

Dr. Clark performed a toxicological assessment of an individual occupationally exposed to chemicals while benzene who later developed a leukogenic disease. A review of the individual's medical and occupational history was performed to prepare a quantitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to refined petroleum hydrocarbons. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: Raymond Saltonstall V. Fuller O'Brien, KILZ, and Zinsser, et al. United States District Court Central District of California

Client: Rose, Klein, Marias, LLP, Long Beach, California

Dr. Clark performed a toxicological assessment of an individual occupationally exposed to benzene who later developed a leukogenic disease. A review of the individual's medical and occupational history was performed to prepare a quantitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to refined petroleum hydrocarbons. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: Richard Boyer and Elizabeth Boyer, husband and wife, V. DESCO Corporation, et al. Circuit Court of Brooke County, West Virginia. Civil Action Number 04-C-7G.

Client: Frankovitch, Anetakis, Colantonio & Simon, Morgantown, West Virginia.

Dr. Clark performed a toxicological assessment of a family exposed to chlorinated solvents released from the defendant's facility into local drinking water supplies. A review of the individual's medical and occupational history was performed to prepare a qualitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to chlorinated solvents. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: JoAnne R. Cook, V. DESCO Corporation, et al. Circuit Court of Brooke County, West Virginia. Civil Action Number 04-C-9R

Client: Frankovitch, Anetakis, Colantonio & Simon, Morgantown, West Virginia.

Dr. Clark performed a toxicological assessment of an individual exposed to chlorinated solvents released from the defendant's facility into local drinking water supplies. A review of the individual's medical and occupational history was performed to prepare a qualitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to chlorinated solvents. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: Patrick Allen And Susan Allen, husband and wife, and Andrew Allen, a minor, V. DESCO Corporation, et al. Circuit Court of Brooke County, West Virginia. Civil Action Number 04-C-W

Client: Frankovitch, Anetakis, Colantonio & Simon, Morgantown, West Virginia.

Dr. Clark performed a toxicological assessment of a family exposed to chlorinated solvents released from the defendant's facility into local drinking water supplies. A review of the individual's medical and occupational history was performed to prepare a qualitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to chlorinated solvents. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: Michael Fahey, Susan Fahey V. Atlantic Richfield Company, et al. United States District Court Central District of California Civil Action Number CV-06 7109 JCL.

Client: Rose, Klein, Marias, LLP, Long Beach, California

Dr. Clark performed a toxicological assessment of an individual occupationally exposed to refined petroleum hydrocarbons who later developed a leukogenic disease. A review of the individual's medical and occupational history was performed to prepare a qualitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to refined petroleum hydrocarbons. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: Constance Acevedo, et al., V. California Spray-Chemical Company, et al., Superior Court of the State Of California, County Of Santa Cruz. Case No. CV 146344

Dr. Clark performed a comprehensive exposure assessment of community members exposed to toxic metals from a former lead arsenate manufacturing facility. The former manufacturing site had undergone a DTSC mandated removal action/remediation for the presence of the toxic metals at the site. Opinions were presented regarding the elevated levels of arsenic and lead (in attic dust and soils) found throughout the community and the potential for harm to the plaintiffs in question.

Case Result: Settlement in favor of defendant.

Case: Michael Nawrocki V. The Coastal Corporation, Kurk Fuel Company, Pautler Oil Service, State of New York Supreme Court, County of Erie, Index Number I2001-11247

Client: Richard G. Berger Attorney At Law, Buffalo, New York

Dr. Clark performed a toxicological assessment of an individual occupationally exposed to refined petroleum hydrocarbons who later developed a leukogenic disease. A review of the individual's medical and occupational history was performed to prepare a qualitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to refined petroleum hydrocarbons. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Judgement in favor of defendant.

SELECTED AIR MODELING RESEARCH/PROJECTS

Client – Confidential

Dr. Clark performed a comprehensive evaluation of criteria pollutants, air toxins, and particulate matter emissions from a carbon black production facility to determine the impacts on the surrounding communities. The results of the dispersion model will be used to estimate acute and chronic exposure concentrations to multiple contaminants and will be incorporated into a comprehensive risk evaluation.

Client – Confidential

Dr. Clark performed a comprehensive evaluation of air toxins and particulate matter emissions from a railroad tie manufacturing facility to determine the impacts on the surrounding communities. The results of the dispersion model have been used to estimate acute and chronic exposure concentrations to multiple contaminants and have been incorporated into a comprehensive risk evaluation.

Client – Los Angeles Alliance for a New Economy (LAANE), Los Angeles, California

Dr. Clark is advising the LAANE on air quality issues related to current flight operations at the Los Angeles International Airport (LAX) operated by the Los Angeles World Airport (LAWA) Authority. He is working with the LAANE and LAX staff to develop a comprehensive strategy for meeting local community concerns over emissions from flight operations and to engage federal agencies on the issue of local impacts of community airports.

Client – City of Santa Monica, Santa Monica, California

Dr. Clark is advising the City of Santa Monica on air quality issues related to current flight operations at the facility. He is working with the City staff to develop a comprehensive strategy for meeting local community concerns over emissions from flight operations and to engage federal agencies on the issue of local impacts of community airports.

Client: Omnitrans, San Bernardino, California

Dr. Clark managed a public health survey of three communities near transit fueling facilities in San Bernardino and Montclair California in compliance with California Senate Bill 1927. The survey included an epidemiological survey of the effected communities, emission surveys of local businesses, dispersion modeling to determine potential emission concentrations within the communities, and a comprehensive risk assessment of each community. The results of the study were presented to the Governor as mandated by Senate Bill 1927.

Client: Confidential, San Francisco, California

Summarized cancer types associated with exposure to metals and smoking. Researched the specific types of cancers associated with exposure to metals and smoking. Provided causation analysis of the association between cancer types and exposure for use by non-public health professionals.

Client: Confidential, Minneapolis, Minnesota

Prepared human health risk assessment of workers exposed to VOCs from neighboring petroleum storage/transport facility. Reviewed the systems in place for distribution of petroleum hydrocarbons to identify chemicals of concern (COCs), prepared comprehensive toxicological summaries of COCs, and quantified potential risks from carcinogens and non-carcinogens to receptors at or adjacent to site. This evaluation was used in the support of litigation.

Client – United Kingdom Environmental Agency

Dr. Clark is part of team that performed comprehensive evaluation of soil vapor intrusion of VOCs from former landfill adjacent residences for the United Kingdom's Environment

Agency. The evaluation included collection of liquid and soil vapor samples at site, modeling of vapor migration using the Johnson Ettinger Vapor Intrusion model, and calculation of site-specific health based vapor thresholds for chlorinated solvents, aromatic hydrocarbons, and semi-volatile organic compounds. The evaluation also included a detailed evaluation of the use, chemical characteristics, fate and transport, and toxicology of chemicals of concern (COC). The results of the evaluation have been used as a briefing tool for public health professionals.

EMERGING/PERSISTENT CONTAMINANT RESEARCH/PROJECTS

Client: Ameren Services, St. Louis, Missouri

Managed the preparation of a comprehensive human health risk assessment of workers and residents at or near an NPL site in Missouri. The former operations at the Property included the servicing and repair of electrical transformers, which resulted in soils and groundwater beneath the Property and adjacent land becoming impacted with PCB and chlorinated solvent compounds. The results were submitted to U.S. EPA for evaluation and will be used in the final ROD.

Client: City of Santa Clarita, Santa Clarita, California

Dr. Clark is managing the oversight of the characterization, remediation and development activities of a former 1,000 acre munitions manufacturing facility for the City of Santa Clarita. The site is impacted with a number of contaminants including perchlorate, unexploded ordinance, and volatile organic compounds (VOCs). The site is currently under a number of regulatory consent orders, including an Immanent and Substantial Endangerment Order. Dr. Clark is assisting the impacted municipality with the development of remediation strategies, interaction with the responsible parties and stakeholders, as well as interfacing with the regulatory agency responsible for oversight of the site cleanup.

Client: Confidential, Los Angeles, California

Prepared comprehensive evaluation of perchlorate in environment. Dr. Clark evaluated the production, use, chemical characteristics, fate and transport, toxicology, and remediation of perchlorate. Perchlorates form the basis of solid rocket fuels and have recently been detected in water supplies in the United States. The results of this research were presented to the USEPA, National GroundWater, and ultimately published in a recent book entitled *Perchlorate in the Environment*.

Client – Confidential, Los Angeles, California

Dr. Clark is performing a comprehensive review of the potential for pharmaceuticals and their by-products to impact groundwater and surface water supplies. This evaluation will include a review if available data on the history of pharmaceutical production in the United States; the chemical characteristics of various pharmaceuticals; environmental fate and transport; uptake by xenobiotics; the potential effects of pharmaceuticals on water treatment systems; and the potential threat to public health. The results of the evaluation may be used as a briefing tool for non-public health professionals.

PUBLIC HEALTH/TOXICOLOGY

Client: Brayton Purcell, Novato, California

Dr. Clark performed a toxicological assessment of residents exposed to methyl-tertiary butyl ether (MTBE) from leaking underground storage tanks (LUSTs) adjacent to the subject property. The symptomology of residents and guests of the subject property were evaluated against the known outcomes in published literature to exposure to MTBE. The study found that residents had been exposed to MTBE in their drinking water; that concentrations of MTBE detected at the site were above regulatory guidelines; and, that the symptoms and outcomes expressed by residents and guests were consistent with symptoms and outcomes documented in published literature.

Client: Confidential, San Francisco, California

Identified and analyzed fifty years of epidemiological literature on workplace exposures to heavy metals. This research resulted in a summary of the types of cancer and non-cancer diseases associated with occupational exposure to chromium as well as the mortality and morbidity rates.

Client: Confidential, San Francisco, California

Summarized major public health research in United States. Identified major public health research efforts within United States over last twenty years. Results were used as a briefing tool for non-public health professionals.

Client: Confidential, San Francisco, California

Quantified the potential multi-pathway dose received by humans from a pesticide applied indoors. Part of team that developed exposure model and evaluated exposure concentrations in a comprehensive report on the plausible range of doses received by a specific person. This evaluation was used in the support of litigation.

Client: Covanta Energy, Westwood, California

Evaluated health risk from metals in biosolids applied as soil amendment on agricultural lands. The biosolids were created at a forest waste cogeneration facility using 96% whole tree wood chips and 4 percent green waste. Mass loading calculations were used to estimate Cr(VI) concentrations in agricultural soils based on a maximum loading rate of 40 tons of biomass per acre of agricultural soil. The results of the study were used by the Regulatory agency to determine that the application of biosolids did not constitute a health risk to workers applying the biosolids or to residences near the agricultural lands.

Client – United Kingdom Environmental Agency

Oversaw a comprehensive toxicological evaluation of methyl-*tertiary* butyl ether (M*t*BE) for the United Kingdom's Environment Agency. The evaluation included available data on the production, use, chemical characteristics, fate and transport, toxicology, and remediation of M*t*BE. The results of the evaluation have been used as a briefing tool for public health professionals.

Client – Confidential, Los Angeles, California

Prepared comprehensive evaluation of *tertiary* butyl alcohol (TBA) in municipal drinking water system. TBA is the primary breakdown product of M*t*BE, and is suspected to be the primary cause of M*t*BE toxicity. This evaluation will include available information on the production, use, chemical characteristics, fate and transport in the environment, absorption, distribution, routes of detoxification, metabolites, carcinogenic potential, and remediation of TBA. The results of the evaluation were used as a briefing tool for non-public health professionals.

Client – Confidential, Los Angeles, California

Prepared comprehensive evaluation of methyl *tertiary* butyl ether (MTBE) in municipal drinking water system. MTBE is a chemical added to gasoline to increase the octane rating and to meet Federally mandated emission criteria. The evaluation included available data on the production, use, chemical characteristics, fate and transport, toxicology, and remediation of MTBE. The results of the evaluation have been were used as a briefing tool for non-public health professionals.

Client – Ministry of Environment, Lands & Parks, British Columbia

Dr. Clark assisted in the development of water quality guidelines for methyl tertiary-butyl ether (MTBE) to protect water uses in British Columbia (BC). The water uses to be considered includes freshwater and marine life, wildlife, industrial, and agricultural (e.g., irrigation and livestock watering) water uses. Guidelines from other jurisdictions for the protection of drinking water, recreation and aesthetics were to be identified.

Client: Confidential, Los Angeles, California

Prepared physiologically based pharmacokinetic (PBPK) assessment of lead risk of receptors at middle school built over former industrial facility. This evaluation is being used to determine cleanup goals and will be basis for regulatory closure of site.

Client: Kaiser Venture Incorporated, Fontana, California

Prepared PBPK assessment of lead risk of receptors at a 1,100-acre former steel mill. This evaluation was used as the basis for granting closure of the site by lead regulatory agency.

RISK ASSESSMENTS/REMEDIAL INVESTIGATIONS

Client: Confidential, Atlanta, Georgia

Researched potential exposure and health risks to community members potentially exposed to creosote, polycyclic aromatic hydrocarbons, pentachlorophenol, and dioxin compounds used at a former wood treatment facility. Prepared a comprehensive toxicological summary of the chemicals of concern, including the chemical characteristics, absorption, distribution, and carcinogenic potential. Prepared risk characterization of the carcinogenic and non-carcinogenic chemicals based on the exposure assessment to quantify the potential risk to members of the surrounding community. This evaluation was used to help settle class-action tort.

Client: Confidential, Escondido, California

Prepared comprehensive Preliminary Endangerment Assessment (PEA) of dense non-aqueous liquid phase hydrocarbon (chlorinated solvents) contamination at a former printed circuit board manufacturing facility. This evaluation was used for litigation support and may be used as the basis for reaching closure of the site with the lead regulatory agency.

Client: Confidential, San Francisco, California

Summarized epidemiological evidence for connective tissue and autoimmune diseases for product liability litigation. Identified epidemiological research efforts on the health effects of medical prostheses. This research was used in a meta-analysis of the health effects and as a briefing tool for non-public health professionals.

Client: Confidential, Bogotá, Columbia

Prepared comprehensive evaluation of the potential health risks associated with the redevelopment of a 13.7 hectares plastic manufacturing facility in Bogotá, Colombia The risk assessment was used as the basis for the remedial goals and closure of the site.

Client: Confidential, Los Angeles, California

Prepared comprehensive human health risk assessment of students, staff, and residents potentially exposed to heavy metals (principally cadmium) and VOCs from soil and soil vapor at 12-acre former crude oilfield and municipal landfill. The site is currently used as a middle school housing approximately 3,000 children. The evaluation determined that the site was safe for the current and future uses and was used as the basis for regulatory closure of site.

Client: Confidential, Los Angeles, California

Managed remedial investigation (RI) of heavy metals and volatile organic chemicals (VOCs) for a 15-acre former manufacturing facility. The RI investigation of the site included over 800 different sampling locations and the collection of soil, soil gas, and groundwater samples. The site is currently used as a year round school housing approximately 3,000 children. The Remedial Investigation was performed in a manner that did not interrupt school activities and met the time restrictions placed on the project by the overseeing regulatory agency. The RI Report identified the off-site source of metals that impacted groundwater beneath the site and the sources of VOCs in soil gas and groundwater. The RI included a numerical model of vapor intrusion into the buildings at the site from the vadose zone to determine exposure concentrations and an air dispersion model of VOCs from the proposed soil vapor treatment system. The Feasibility Study for the Site is currently being drafted and may be used as the basis for granting closure of the site by DTSC.

Client: Confidential, Los Angeles, California

Prepared comprehensive human health risk assessment of students, staff, and residents potentially exposed to heavy metals (principally lead), VOCs, SVOCs, and PCBs from soil, soil vapor, and groundwater at 15-acre former manufacturing facility. The site is currently used as a year round school housing approximately 3,000 children. The evaluation determined that the site was safe for the current and future uses and will be basis for regulatory closure of site.

Client: Confidential, Los Angeles, California

Prepared comprehensive evaluation of VOC vapor intrusion into classrooms of middle school that was former 15-acre industrial facility. Using the Johnson-Ettinger Vapor Intrusion model, the evaluation determined acceptable soil gas concentrations at the site that did not pose health threat to students, staff, and residents. This evaluation is being used to determine cleanup goals and will be basis for regulatory closure of site.

Client –Dominguez Energy, Carson, California

Prepared comprehensive evaluation of the potential health risks associated with the redevelopment of 6-acre portion of a 500-acre oil and natural gas production facility in Carson, California. The risk assessment was used as the basis for closure of the site.

Kaiser Ventures Incorporated, Fontana, California

Prepared health risk assessment of semi-volatile organic chemicals and metals for a fifty-year old wastewater treatment facility used at a 1,100-acre former steel mill. This evaluation was used as the basis for granting closure of the site by lead regulatory agency.

ANR Freight - Los Angeles, California

Prepared a comprehensive Preliminary Endangerment Assessment (PEA) of petroleum hydrocarbon and metal contamination of a former freight depot. This evaluation was as the basis for reaching closure of the site with lead regulatory agency.

Kaiser Ventures Incorporated, Fontana, California

Prepared comprehensive health risk assessment of semi-volatile organic chemicals and metals for 23-acre parcel of a 1,100-acre former steel mill. The health risk assessment was used to determine clean up goals and as the basis for granting closure of the site by lead regulatory agency. Air dispersion modeling using ISCST3 was performed to determine downwind exposure point concentrations at sensitive receptors within a 1 kilometer radius of the site. The results of the health risk assessment were presented at a public meeting sponsored by the Department of Toxic Substances Control (DTSC) in the community potentially affected by the site.

Unocal Corporation - Los Angeles, California

Prepared comprehensive assessment of petroleum hydrocarbons and metals for a former petroleum service station located next to sensitive population center (elementary school). The assessment used a probabilistic approach to estimate risks to the community and was used as the basis for granting closure of the site by lead regulatory agency.

Client: Confidential, Los Angeles, California

Managed oversight of remedial investigation most contaminated heavy metal site in California. Lead concentrations in soil excess of 68,000,000 parts per billion (ppb) have been measured at the site. This State Superfund Site was a former hard chrome plating operation that operated for approximately 40-years.

Client: Confidential, San Francisco, California

Coordinator of regional monitoring program to determine background concentrations of metals in air. Acted as liaison with SCAQMD and CARB to perform co-location sampling and comparison of accepted regulatory method with ASTM methodology.

Client: Confidential, San Francisco, California

Analyzed historical air monitoring data for South Coast Air Basin in Southern California and potential health risks related to ambient concentrations of carcinogenic metals and volatile organic compounds. Identified and reviewed the available literature and calculated risks from toxins in South Coast Air Basin.

IT Corporation, North Carolina

Prepared comprehensive evaluation of potential exposure of workers to air-borne VOCs at hazardous waste storage facility under SUPERFUND cleanup decree. Assessment used in developing health based clean-up levels.

Professional Associations

American Public Health Association (APHA)

Association for Environmental Health and Sciences (AEHS)

American Chemical Society (ACS)

California Redevelopment Association (CRA)

International Society of Environmental Forensics (ISEF)

Society of Environmental Toxicology and Chemistry (SETAC)

Publications and Presentations:

Books and Book Chapters

Sullivan, P., **J.J. J. Clark,** F.J. Agardy, and P.E. Rosenfeld. (2007). *Synthetic Toxins In The Food, Water and Air of American Cities*. Elsevier, Inc. Burlington, MA.

Sullivan, P. and **J.J. J. Clark**. 2006. *Choosing Safer Foods, A Guide To Minimizing Synthetic Chemicals In Your Diet*. Elsevier, Inc. Burlington, MA.

Sullivan, P., Agardy, F.J., and **J.J.J. Clark**. 2005. *The Environmental Science of Drinking Water*. Elsevier, Inc. Burlington, MA.

Sullivan, P.J., Agardy, F.J., **Clark, J.J.J.** 2002. *America's Threatened Drinking Water: Hazards and Solutions*. Trafford Publishing, Victoria B.C.

Clark, J.J.J. 2001. "TBA: Chemical Properties, Production & Use, Fate and Transport, Toxicology, Detection in Groundwater, and Regulatory Standards" in *Oxygenates in the Environment.* Art Diaz, Ed.. Oxford University Press: New York.

Clark, J.J.J. 2000. "Toxicology of Perchlorate" in *Perchlorate in the Environment.* Edward Urbansky, Ed. Kluwer/Plenum: New York.

Clark, J.J.J. 1995. Probabilistic Forecasting of Volatile Organic Compound Concentrations At The Soil Surface From Contaminated Groundwater. UMI.

Baker, J.; **Clark, J.J.J.**; Stanford, J.T. 1994. Ex Situ Remediation of Diesel Contaminated Railroad Sand by Soil Washing. Principles and Practices for Diesel Contaminated Soils, Volume III. P.T. Kostecki, E.J. Calabrese, and C.P.L. Barkan, eds. Amherst Scientific Publishers, Amherst, MA. pp 89-96.

Journal and Proceeding Articles

Tam L. K.., Wu C. D., Clark J. J. and **Rosenfeld, P.E.** (2008) A Statistical Analysis Of Attic Dust And Blood Lipid Concentrations Of Tetrachloro-p-Dibenzodioxin (TCDD) Toxicity Equialency Quotients (TEQ) In Two Populations Near Wood Treatment Facilities. Organohalogen Compounds, Volume 70 (2008) page 002254.

Tam L. K.., Wu C. D., Clark J. J. and **Rosenfeld, P.E.** (2008) Methods For Collect Samples For Assessing Dioxins And Other Environmental Contaminants In Attic Dust: A Review. Organohalogen Compounds, Volume 70 (2008) page 000527

Hensley A.R., Scott, A., Rosenfeld P.E., **Clark, J.J.J.** (2007). "Attic Dust And Human Blood Samples Collected Near A Former Wood Treatment Facility." *Environmental Research.* 105:194-199.

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WILSON IHRIG
ACOUSTICS, NOISE & VIBRATION

ANI TONCHEVA

Senior Consultant

Since joining the firm in 2011, Ani has conducted analyses for transit systems, vibration sensitive research facilities, public infrastructure, construction, and other environmental noise. She has contributed to literature reviews, including research on current practices of historical preservation. She has extensive experience working on construction projects in New York City and is well versed in local noise codes.

Education

- B.A., Physics; Bard College, New York

Professional Associations

- *Member*, National Council of Acoustical Consultants (NCAC)
- *Member*, Acoustical Society of America (ASA)
- *Board Member,* Transportation Research Forum (TRF), NY Chapter and International board

Research Paper

- NCHRP 25-25, *Current Practices to Address Construction Vibration and Potential Effects to Historic Buildings Adjacent to Transportation Projects*

Relevant Experience

BART Berryessa Station Transit Noise Impact and Mitigation, San Jose, CA Assisted with noise predictions and barrier design recommendations.

Massachusetts Bay Transportation Authority (MBTA) Green Line Extension (GLX), Boston, MA Lead analyst on noise predictions and barrier design.

RTD Eagle P3 Northwest Corridor Noise and Impacts, Denver, CO Assisted with data analysis and helped prepare final technical report.

Alameda CTC, I-880 Interchange Improvements Project (Whipple Road-Industrial Southwest and Industrial Parkway West), Hayward, CA Project Manager for traffic noise study.

Alameda CTC, I-80/Ashby Avenue Interchange Improvements, Berkeley, CA Project Manager for traffic noise study.

Millennium Bulk Terminal, Longview, WA Prepared noise analysis for the project's NEPA and SEPA environmental impact statements.

Peninsula Humane Society & SPCA Haskin Hill Sanctuary, Loma Mar, CA Prepared an environmental study for a planned animal sanctuary in Loma Mar.

Analog (ArtX) Hotel, Palo Alto, CA Prepared preliminary basis of design guidelines for a new five-story boutique hotel in a residential area.

Sunnydale Block 3A & 3B Mixed-Use Residential Development, San Francisco, CA Prepared a CCR Title 24 Noise Study Report for two, mixed-use, 5-story buildings.

Columbia University Medical Center Medical and Graduate Education Building, New York, NY
Conducted baseline noise survey and performed attended noise measurements during preliminary construction work.

Hudson Yards Tower C Foundations and Utilities, New York, NY Conducted a baseline noise survey prior to construction work including a combination of long-term unattended and short-term attended noise measurements.

PANYNJ Lincoln Tunnel Helix Rehabilitation, NJ Assisted in developing construction noise control and mitigation plan and implementing a remote long-term noise monitoring program at three locations.

MSK 74th Street, New York, NY Conducted baseline noise survey, assisted in developing construction noise control and mitigation plan, and implemented a long-term noise monitoring program at two locations.

NY MTA No. 7 Line Subway Extension Ventilation Facility Construction, New York, NY The project involved mining and lining of two shafts and construction of a 2-story ventilation building.

NY MTA ESA/LIRR Grand Central Terminal Fit-Out, New York, NY Prepared the Contractor's noise and vibration control plan updates for fit-out work conducted underground at the Grand Central Terminal Suburban Level.

San Francisco Planning Department, Alameda Street Wet Weather Tunnel and Folsom Area Sewer Improvement, San Francisco, CA Noise and vibration analysis for Folsom Area stormwater infrastructure improvements.

World Trade Center Vehicle Security Center, New York, NY Conducted baseline noise surveys, assisted in developing construction noise control plans, and implementing a remote long-term noise monitoring program.

50 Pine Street Condominiums, New York, NY
Project involved evaluating mechanical noise at residential dwelling units for NYC noise code

Uptown Newport, Newport Beach, CA
Evaluation of noise levels due to mechanical equipment at adjacent property.

Appendix F. Generator Emissions Modeling Results

Generators Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Generators
Operational Year	2027
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	3.60
Precipitation (days)	6.00
Location	38.59745556567643, -121.58106993805383
County	Yolo
City	Unincorporated
Air District	Yolo/Solano AQMD
Air Basin	Sacramento Valley
TAZ	312
EDFZ	4
Electric Utility	Pacific Gas & Electric Company
Gas Utility	Pacific Gas & Electric
App Version	2022.1.1.23

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
Industrial Park	0.00	1000sqft	0.00	0.00	0.00	0.00	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.4. Operations Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.72	0.66	2.14	2.38	< 0.005	0.10	0.00	0.10	0.10	0.00	0.10	0.00	336	336	0.01	< 0.005	0.00	337
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.72	0.66	2.14	2.38	< 0.005	0.10	0.00	0.10	0.10	0.00	0.10	0.00	336	336	0.01	< 0.005	0.00	337
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.20	0.18	0.59	0.65	< 0.005	0.03	0.00	0.03	0.03	0.00	0.03	0.00	92.0	92.0	< 0.005	< 0.005	0.00	92.3
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.04	0.03	0.11	0.12	< 0.005	< 0.005	0.00	< 0.005	< 0.005	0.00	< 0.005	0.00	15.2	15.2	< 0.005	< 0.005	0.00	15.3

2.5. Operations Emissions by Sector, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Sector	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Mobile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Area	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Waste	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00
Stationary	0.72	0.66	2.14	2.38	< 0.005	0.10	0.00	0.10	0.10	0.00	0.10	0.00	336	336	0.01	< 0.005	0.00	337
Total	0.72	0.66	2.14	2.38	< 0.005	0.10	0.00	0.10	0.10	0.00	0.10	0.00	336	336	0.01	< 0.005	0.00	337
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Area	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Waste	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00
Stationary	0.72	0.66	2.14	2.38	< 0.005	0.10	0.00	0.10	0.10	0.00	0.10	0.00	336	336	0.01	< 0.005	0.00	337
Total	0.72	0.66	2.14	2.38	< 0.005	0.10	0.00	0.10	0.10	0.00	0.10	0.00	336	336	0.01	< 0.005	0.00	337
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Area	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Waste	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00

Stationar	0.20	0.18	0.59	0.65	< 0.005	0.03	0.00	0.03	0.03	0.00	0.03	0.00	92.0	92.0	< 0.005	< 0.005	0.00	92.3
Total	0.20	0.18	0.59	0.65	< 0.005	0.03	0.00	0.03	0.03	0.00	0.03	0.00	92.0	92.0	< 0.005	< 0.005	0.00	92.3
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Area	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Waste	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00
Stationary	0.04	0.03	0.11	0.12	< 0.005	< 0.005	0.00	< 0.005	< 0.005	0.00	< 0.005	0.00	15.2	15.2	< 0.005	< 0.005	0.00	15.3
Total	0.04	0.03	0.11	0.12	< 0.005	< 0.005	0.00	< 0.005	< 0.005	0.00	< 0.005	0.00	15.2	15.2	< 0.005	< 0.005	0.00	15.3

4. Operations Emissions Details

4.1. Mobile Emissions by Land Use

4.1.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Industrial Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4.2. Energy

4.2.1. Electricity Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00

4.2.3. Natural Gas Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00

4.3. Area Emissions by Source

4.3.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Source	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Consumer Products	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	—	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00

4.4. Water Emissions by Land Use

4.4.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00

4.5. Waste Emissions by Land Use

4.5.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00

4.6. Refrigerant Emissions by Land Use

4.6.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Industrial Park	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Park	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00

4.7. Offroad Emissions By Equipment Type

4.7.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.8. Stationary Emissions By Equipment Type

4.8.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Emergency Generator	0.72	0.66	2.14	2.38	< 0.005	0.10	0.00	0.10	0.10	0.00	0.10	0.00	336	336	0.01	< 0.005	0.00	337
Total	0.72	0.66	2.14	2.38	< 0.005	0.10	0.00	0.10	0.10	0.00	0.10	0.00	336	336	0.01	< 0.005	0.00	337
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Emergency Generator	0.72	0.66	2.14	2.38	< 0.005	0.10	0.00	0.10	0.10	0.00	0.10	0.00	336	336	0.01	< 0.005	0.00	337
Total	0.72	0.66	2.14	2.38	< 0.005	0.10	0.00	0.10	0.10	0.00	0.10	0.00	336	336	0.01	< 0.005	0.00	337
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Emergency Generator	0.04	0.03	0.11	0.12	< 0.005	< 0.005	0.00	< 0.005	< 0.005	0.00	< 0.005	0.00	15.2	15.2	< 0.005	< 0.005	0.00	15.3
Total	0.04	0.03	0.11	0.12	< 0.005	< 0.005	0.00	< 0.005	< 0.005	0.00	< 0.005	0.00	15.2	15.2	< 0.005	< 0.005	0.00	15.3

4.9. User Defined Emissions By Equipment Type

4.9.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.9. Operational Mobile Sources

5.9.1. Unmitigated

Land Use Type	Trips/Weekday	Trips/Saturday	Trips/Sunday	Trips/Year	VMT/Weekday	VMT/Saturday	VMT/Sunday	VMT/Year
Industrial Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

5.10. Operational Area Sources

5.10.1. Hearths

5.10.1.1. Unmitigated

5.10.2. Architectural Coatings

Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)
0	0.00	0.00	0.00	—

5.10.3. Landscape Equipment

Season	Unit	Value
Snow Days	day/yr	0.00
Summer Days	day/yr	180

5.11. Operational Energy Consumption

5.11.1. Unmitigated

Electricity (kWh/yr) and CO2 and CH4 and N2O and Natural Gas (kBTU/yr)

Land Use	Electricity (kWh/yr)	CO2	CH4	N2O	Natural Gas (kBTU/yr)
Industrial Park	0.00	204	0.0330	0.0040	0.00

5.12. Operational Water and Wastewater Consumption

5.12.1. Unmitigated

Land Use	Indoor Water (gal/year)	Outdoor Water (gal/year)
Industrial Park	0.00	0.00

5.13. Operational Waste Generation

5.13.1. Unmitigated

Land Use	Waste (ton/year)	Cogeneration (kWh/year)
Industrial Park	0.00	—

5.14. Operational Refrigeration and Air Conditioning Equipment

5.14.1. Unmitigated

Land Use Type	Equipment Type	Refrigerant	GWP	Quantity (kg)	Operations Leak Rate	Service Leak Rate	Times Serviced
Industrial Park	Other commercial A/C and heat pumps	R-410A	2,088	0.30	4.00	4.00	18.0

5.15. Operational Off-Road Equipment

5.15.1. Unmitigated

Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor

5.16. Stationary Sources

5.16.1. Emergency Generators and Fire Pumps

Equipment Type	Fuel Type	Number per Day	Hours per Day	Hours per Year	Horsepower	Load Factor
Emergency Generator	Diesel	4.00	1.00	100	100	0.73

5.16.2. Process Boilers

Equipment Type	Fuel Type	Number	Boiler Rating (MMBtu/hr)	Daily Heat Input (MMBtu/day)	Annual Heat Input (MMBtu/yr)

5.17. User Defined

Equipment Type	Fuel Type

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	23.8	annual days of extreme heat

Extreme Precipitation	5.15	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	11.4	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	55.4
AQ-PM	24.1
AQ-DPM	18.8
Drinking Water	35.6
Lead Risk Housing	78.4
Pesticides	81.9

Toxic Releases	33.1
Traffic	18.9
Effect Indicators	—
CleanUp Sites	76.7
Groundwater	84.1
Haz Waste Facilities/Generators	94.1
Impaired Water Bodies	99.2
Solid Waste	91.8
Sensitive Population	—
Asthma	83.2
Cardio-vascular	87.0
Low Birth Weights	67.2
Socioeconomic Factor Indicators	—
Education	81.1
Housing	47.1
Linguistic	81.2
Poverty	74.5
Unemployment	79.7

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	19.59450789
Employed	19.97946875
Median HI	20.42858976
Education	—

Bachelor's or higher	24.94546388
High school enrollment	16.64314128
Preschool enrollment	11.90812267
Transportation	—
Auto Access	22.25073784
Active commuting	76.00410625
Social	—
2-parent households	13.74310278
Voting	12.30591557
Neighborhood	—
Alcohol availability	39.84344925
Park access	57.05119979
Retail density	18.11882459
Supermarket access	47.94045939
Tree canopy	86.15424099
Housing	—
Homeownership	25.25343257
Housing habitability	41.28063647
Low-inc homeowner severe housing cost burden	51.35377903
Low-inc renter severe housing cost burden	75.61914539
Uncrowded housing	39.88194534
Health Outcomes	—
Insured adults	43.11561658
Arthritis	0.0
Asthma ER Admissions	19.4
High Blood Pressure	0.0
Cancer (excluding skin)	0.0

Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	24.3
Cognitively Disabled	4.4
Physically Disabled	5.2
Heart Attack ER Admissions	11.3
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	19.6
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	0.0
SLR Inundation Area	0.0
Children	22.0
Elderly	39.0
English Speaking	13.9
Foreign-born	71.2
Outdoor Workers	15.8
Climate Change Adaptive Capacity	—

Impervious Surface Cover	55.2
Traffic Density	14.2
Traffic Access	23.0
Other Indices	—
Hardship	75.2
Other Decision Support	—
2016 Voting	11.0

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	93.0
Healthy Places Index Score for Project Location (b)	19.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	Yes
Project Located in a Low-Income Community (Assembly Bill 1550)	Yes
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification

Operations: Emergency Generators and Fire Pumps	CARE Comment Letter