



APPROVED

A handwritten signature in blue ink that reads "Chong Woo".

10/02/2025

September 24, 2025

Attention: Chong Woo
Aurora Water | Engineering Department
15151 E Alameda Parkway Suite 3600
Aurora, CO 80012

RE: Dayton Sta on Townhomes – Sanitary Sewer Conformance Letter
Aurora Water Project Number: 1879458

Dear Chong:

Please accept this letter with supporting materials as sufficient documentation of the proposed Dayton Sta on Townhomes (Site) project's sanitary sewer demands on the City of Aurora's infrastructure. The anticipated sanitary sewer peak flows from the Site are not expected to exceed the available downstream capacity of the existing sanitary sewer system.

Description of Property, Proposed Development, & Existing Infrastructure

The 5.77-acre Site is located at Parcel ID 2075-03-3-04-004, and the legal description for the Site is as follows: Lot 4, Block 1, Hampden Town Center Subdivision Filing No. 6, County of Arapahoe, State of Colorado. It is bounded by the existing Townhomes at Dayton Station residences to the north, the Dayton Station light rail parking lot to the south, S Dallas Street to the east, and S Boston Street to the west. This property is a part of the Hampden Town Center Master Development, and the sanitary sewer is to be served by the City of Aurora.

The Site is currently vacant. The proposed development of the Site includes: 9 townhome buildings with a total of 92 multi-family units as well as drive aisles, surface parking, alleys, and sidewalks for vehicle and pedestrian circulation around the Site.

There is an existing 8-inch PVC sanitary sewer main in S Dallas Street that flows north and extends up to the intersection with E Jefferson Place intersection, where it then flows east/northeast within S Dayton Street towards E Hampden Avenue. The sanitary sewer main is upsized to 10-inch PVC downstream of the existing Hampden Town Center commercial developments, before reaching E Hampden Avenue. A map of the Aurora Water sanitary sewer facilities is included with this letter.

Sanitary Sewer Analysis

There are 14 total existing pipe segments between the Site's proposed connection and the existing commercial lots, all located within the Hampden Town Center Master Development, that have been analyzed as a part of this letter. The peak sanitary sewer flow for each pipe segment has been calculated based on the number of cumulative residential units and commercial area being served. The peak flow calculations and a sanitary basin area map showing the number of residential units and commercial areas being served in the Hampden Town Center Master Development are included with this letter.

A Sanitary Sewer Study was previously completed by Paragon Engineering Consultants, Inc. on October 13, 2016, for the entire Hampden Town Center Master Development. This report identified existing 8-inch sanitary sewer mains that would require upsizing if the overall Hampden Town Center constructed as many units as initially anticipated. This report is included with this letter for reference.

Because the Site is the last parcel to be developed in the Hampden Town Center area and the total number of units at 1,117 falls far below the 2,000 units anticipated in the original master plan, none of the existing sanitary sewer main will need to be upsized.

Sanitary Sewer Demands

The Water, Sanitary Sewer, & Storm Drainage Infrastructure Standards & Specifications from Aurora Water (Criteria), specifically Section 5.03, provided design criteria for calculating the sanitary sewer flow of the Site and the overall Hampden Town Center Master Development. Calculations can be found in the supporting materials.

The maximum required sewer pipe capacity for a 12-unit townhome, the largest building proposed within the Site, and the proposed sewer service pipe capacity are shown below in Table 1. A 4-inch sewer service pipe at 2% slope, the minimum service line size and slope per Section 5.03.7 of the Criteria, has adequate capacity to convey the peak sewage flow from each of the 9 buildings.

	Sewer Capacity (cfs)
Required	0.0144
Provided	0.3181

Table 1: Sanitary Sewer Pipe Capacity

The required sewer pipe capacity for all 92 proposed units, and the existing sewer pipe capacity at 75% of the depth of flow, which is the maximum allowed pipe capacity per Section 5.03.6 of the Criteria, for the first pipe segment downstream of the Site are shown below in Table 2. The maximum allowed pipe capacity for all 14 pipe segments downstream of the Site are included with this letter.

	Sewer Capacity (cfs)
Required	0.110
Existing	0.862

Table 2: Downstream Sanitary Sewer Pipe Capacity

The Hydraflow Express Extension was used to determine the hydraulic characteristics for all the existing pipe segments, and the results are included with this letter.

Summary

This Sanitary Sewer Conformance Letter is intended to provide the peak sewage flow as a part of the proposed Dayton Station Townhomes multi-family project and its impact on the existing sanitary sewer infrastructure within the Hampden Town Center Master Development. This letter confirms that no public sanitary sewer improvements are necessary for this project. The figures used for the flow calculations are taken directly from the Aurora Water Sanitary Sewer Standards & Specifications.

Included with this letter are the following supporting materials:

- Sanitary Sewer Basin Map
- Sanitary Sewer Infrastructure Map
- Hampden Town Center Sanitary Sewer Pipe Data Table
- Hampden Town Center Peak Sanitary Sewer Flow Calculations Table
- Sanitary Sewer Service Pipe Calculations
- Existing Pipe Maximum Flow Hydraulic Cross Sections
- Previous Sanitary Sewer Study

References

Water, Sanitary Sewer, & Storm Drainage Infrastructure Standards & Specifications, Aurora Water, Revised January 2025.

Hampden Town Center – GDP Amendment, DA-1202-21, 1998-2004-04; Sanitary Sewer Conformance Letter, Paragon Engineering Consultants, Inc., October 13, 2016.

Please contact me if you have any questions or require additional information at cculligan@craftcivil.com or 650-888-4550.

FACSIMILE

Connor Culligan, P.E.

This electronic plan is a
facsimile of the signed
and sealed PDF set.



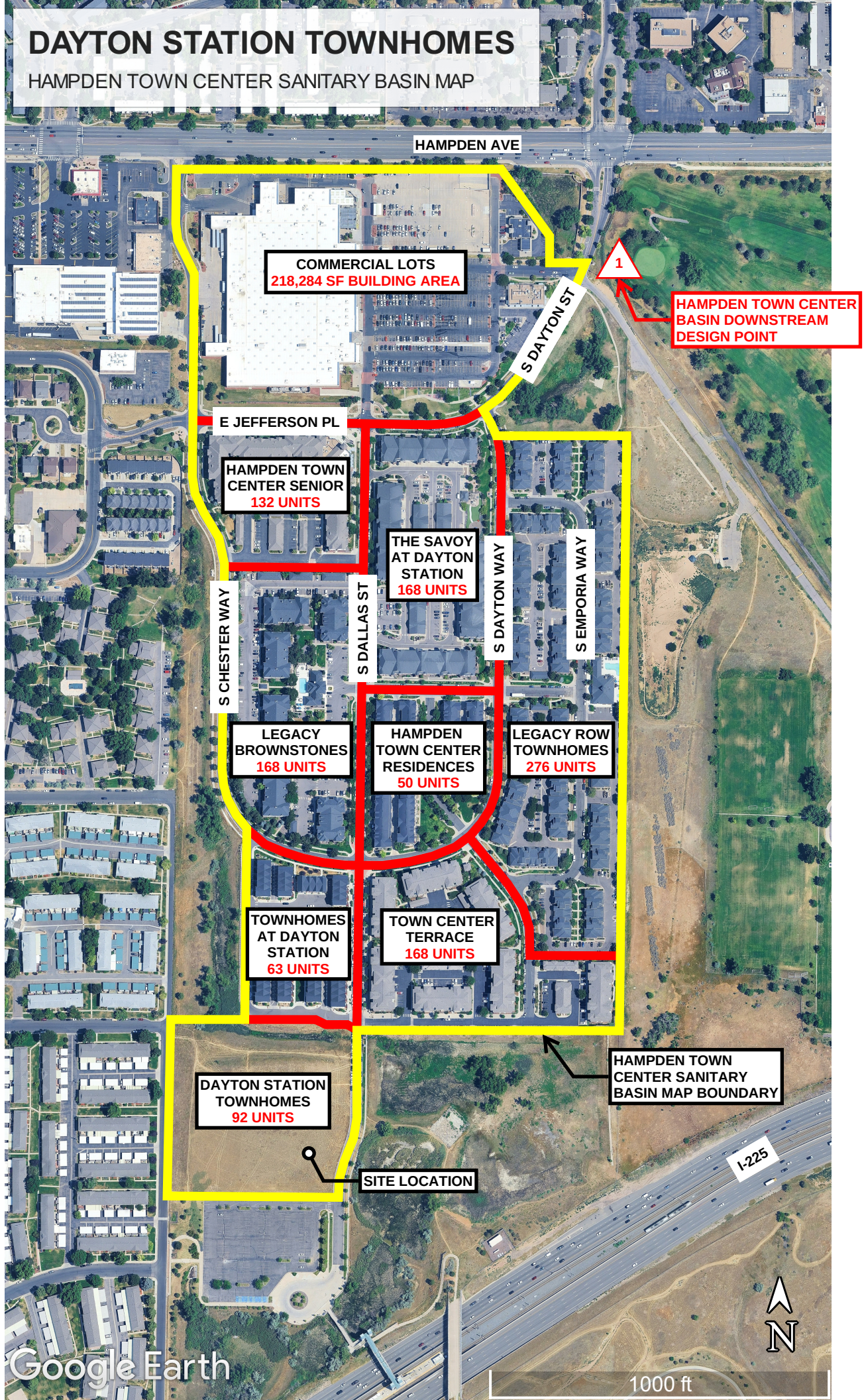
Connor Culligan, PE
09-24-2025



Sanitary Sewer Basin Map

DAYTON STATION TOWNHOMES

HAMPDEN TOWN CENTER SANITARY BASIN MAP

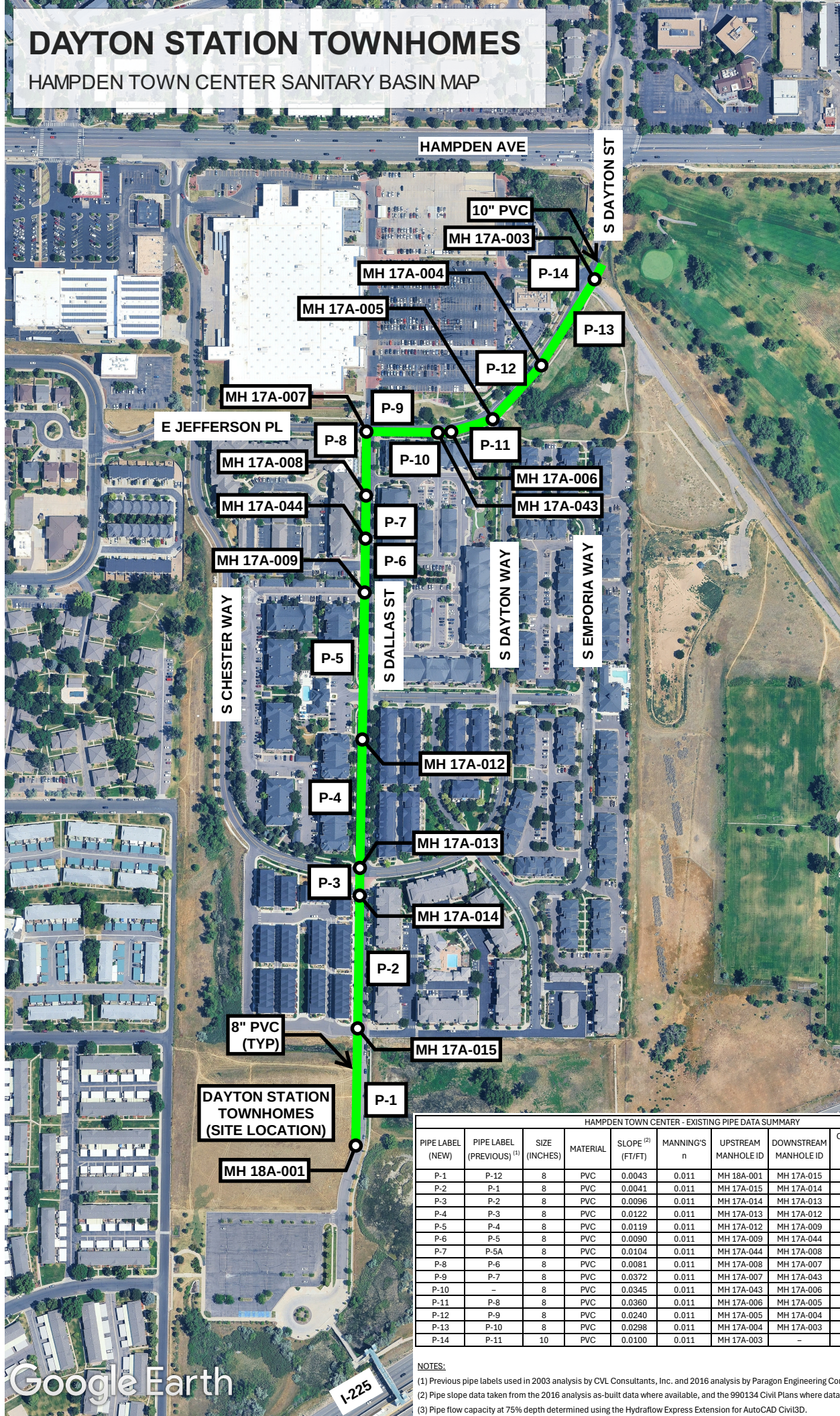




Sanitary Sewer Infrastructure Map

DAYTON STATION TOWNHOMES

HAMPDEN TOWN CENTER SANITARY BASIN MAP



HAMPDEN TOWN CENTER - EXISTING PIPE DATA SUMMARY									
PIPE LABEL (NEW)	PIPE LABEL (PREVIOUS) ⁽¹⁾	SIZE (INCHES)	MATERIAL	SLOPE ⁽²⁾ (FT/FT)	MANNING'S n	UPSTREAM MANHOLE ID	DOWNSTREAM MANHOLE ID	CALCULATED PEAK FLOW (CFS)	75% FLOW DEPTH CAPACITY ⁽³⁾ (CFS)
P-1	P-12	8	PVC	0.0043	0.011	MH 18A-001	MH 17A-015	0.110	0.862
P-2	P-1	8	PVC	0.0041	0.011	MH 17A-015	MH 17A-014	0.387	0.842
P-3	P-2	8	PVC	0.0096	0.011	MH 17A-014	MH 17A-013	0.387	1.289
P-4	P-3	8	PVC	0.0122	0.011	MH 17A-013	MH 17A-012	0.387	1.453
P-5	P-4	8	PVC	0.0119	0.011	MH 17A-012	MH 17A-009	0.387	1.435
P-6	P-5	8	PVC	0.0090	0.011	MH 17A-009	MH 17A-044	0.588	1.248
P-7	P-5A	8	PVC	0.0104	0.011	MH 17A-044	MH 17A-008	0.638	1.341
P-8	P-6	8	PVC	0.0081	0.011	MH 17A-008	MH 17A-007	0.796	1.184
P-9	P-7	8	PVC	0.0372	0.011	MH 17A-007	MH 17A-043	0.796	2.536
P-10	-	8	PVC	0.0345	0.011	MH 17A-043	MH 17A-006	0.846	2.443
P-11	P-8	8	PVC	0.0360	0.011	MH 17A-006	MH 17A-005	0.846	2.495
P-12	P-9	8	PVC	0.0240	0.011	MH 17A-005	MH 17A-004	1.337	2.037
P-13	P-10	8	PVC	0.0298	0.011	MH 17A-004	MH 17A-003	1.337	2.270
P-14	P-11	10	PVC	0.0100	0.011	MH 17A-003	-	1.385	2.351

NOTES:

- (1) Previous pipe labels used in 2003 analysis by CVL Consultants, Inc. and 2016 analysis by Paragon Engineering Consultants, Inc.
- (2) Pipe slope data taken from the 2016 analysis as-built data where available, and the 990134 Civil Plans where data was unavailable.
- (3) Pipe flow capacity at 75% depth determined using the Hydraulflow Express Extension for AutoCAD Civil3D.



Hampden Town Center Sanitary Sewer Pipe Data Table

HAMPDEN TOWN CENTER - EXISTING PIPE DATA SUMMARY									
PIPE LABEL (NEW)	PIPE LABEL (PREVIOUS) ⁽¹⁾	SIZE (INCHES)	MATERIAL	SLOPE ⁽²⁾ (FT/FT)	MANNING'S n	UPSTREAM MANHOLE ID	DOWNSTEAM MANHOLE ID	CALCULATED PEAK FLOW (CFS)	75% FLOW DEPTH CAPACITY ⁽³⁾ (CFS)
P-1	P-12	8	PVC	0.0043	0.011	MH 18A-001	MH 17A-015	0.110	0.862
P-2	P-1	8	PVC	0.0041	0.011	MH 17A-015	MH 17A-014	0.387	0.842
P-3	P-2	8	PVC	0.0096	0.011	MH 17A-014	MH 17A-013	0.387	1.289
P-4	P-3	8	PVC	0.0122	0.011	MH 17A-013	MH 17A-012	0.387	1.453
P-5	P-4	8	PVC	0.0119	0.011	MH 17A-012	MH 17A-009	0.387	1.435
P-6	P-5	8	PVC	0.0090	0.011	MH 17A-009	MH 17A-044	0.588	1.248
P-7	P-5A	8	PVC	0.0104	0.011	MH 17A-044	MH 17A-008	0.638	1.341
P-8	P-6	8	PVC	0.0081	0.011	MH 17A-008	MH 17A-007	0.796	1.184
P-9	P-7	8	PVC	0.0372	0.011	MH 17A-007	MH 17A-043	0.796	2.536
P-10	–	8	PVC	0.0345	0.011	MH 17A-043	MH 17A-006	0.846	2.443
P-11	P-8	8	PVC	0.0360	0.011	MH 17A-006	MH 17A-005	0.846	2.495
P-12	P-9	8	PVC	0.0240	0.011	MH 17A-005	MH 17A-004	1.337	2.037
P-13	P-10	8	PVC	0.0298	0.011	MH 17A-004	MH 17A-003	1.337	2.270
P-14	P-11	10	PVC	0.0100	0.011	MH 17A-003	–	1.385	2.351

NOTES:

(1) Previous pipe labels used in 2003 analysis by CVL Consultants, Inc. and 2016 analysis by Paragon Engineering Consultants, Inc.

(2) Pipe slope data taken from the 2016 analysis as-built data where available, and the 990134 Civil Plans where data was unavailable.

(3) Pipe flow capacity at 75% depth determined using the Hydraflow Express Extension for AutoCAD Civil3D.



Hampden Town Center Peak Sanitary Sewer Flow Calculations Table

HAMPDEN TOWN CENTER - SANITARY SEWER DESIGN FLOW SUMMARY											
PIPE LABEL	TOTAL RESIDENTIAL UNITS	PEOPLE PER UNIT	RESIDENTIAL LOADING RATE (GPCD)	COMMERCIAL BUILDING AREA (ACRES)	COMMERCIAL LOADING RATE (GPD/ACRE)	AVERAGE FLOW (GPD)	INFLOW/ INFILTRATION (GPD)	TOTAL AVERAGE FLOW (GPD)	PEAKING FACTOR	TOTAL PEAK FLOW (GPD)	TOTAL PEAK FLOW (CFS)
P-1	92	2.77	68	0	1,500	17,329	1,733	19,062	4	71,049	0.110
P-2	323	2.77	68	0	1,500	60,840	6,084	66,924	4	249,445	0.387
P-3	323	2.77	68	0	1,500	60,840	6,084	66,924	4	249,445	0.387
P-4	323	2.77	68	0	1,500	60,840	6,084	66,924	4	249,445	0.387
P-5	323	2.77	68	0	1,500	60,840	6,084	66,924	4	249,445	0.387
P-6	491	2.77	68	0	1,500	92,485	9,248	101,733	4	379,188	0.588
P-7	533	2.77	68	0	1,500	100,396	10,040	110,435	4	411,623	0.638
P-8	665	2.77	68	0	1,500	125,259	12,526	137,785	4	513,564	0.796
P-9	665	2.77	68	0	1,500	125,259	12,526	137,785	4	513,564	0.796
P-10	707	2.77	68	0	1,500	133,171	13,317	146,488	4	545,999	0.846
P-11	707	2.77	68	0	1,500	133,171	13,317	146,488	4	545,999	0.846
P-12	1,117	2.77	68	0	1,500	210,398	21,040	231,438	4	862,632	1.337
P-13	1,117	2.77	68	0	1,500	210,398	21,040	231,438	4	862,632	1.337
P-14	1,117	2.77	68	5.01	1,500	217,915	21,791	239,706	4	893,451	1.385



Sanitary Sewer Service Pipe Calculations



SANITARY SEWER PEAK FLOW CALCULATIONS

Project: Dayton Station Townhomes Date: 9/17/2025
Project Number: 25007 By: HDA

Design Criteria: Aurora Water, Sanitary Sewer & Storm Drainage
Infrastructure Standards & Specifications (Rev. January 2025)

Land Use:	Residential	
Residential Units:	12	# of units for the largest townhome building
People Per Unit:	2.77	Per Section 5.03.9; Sewer Loading Rates
Loading Rate:	68 gpd	Per Section 5.03.9; Sewer Loading Rates
Average Flow:	0.0035 cfs	
Infiltration/Inflow:	0.0004 cfs	Per Section 5.03; 10% of Average Flow
Peak Factor:	4.00	Per Section 5.03; Curve "A" Equation
Maximum Daily Demand =	0.0144 cfs	Peak Factor x Average Flow

Proposed Service Pipe Check

Service Pipe Material:	PVC	
Manning's "n" factor:	0.011	Per Section 5.03.3
Minimum Pipe Diameter:	4 inches	
Minimum Pipe Slope:	0.020 ft/ft	
Full Flow Pipe Capacity =	0.3181 cfs	Manning's Equation for Circular Pipes

Pipe Size Is Adequate

Existing Downstream Pipe Capacity Check

Existing Pipe Material:	PVC	Per Aurora GIS
Manning's "n" factor:	0.011	Per Section 5.03.3
Existing Pipe Diameter:	8 inches	Per Aurora GIS
Existing Pipe Slope:	0.0043 ft/ft	Per Aurora Data
Monitored Flow:	0.000 cfs	Upstream pipe; no monitored flows
Maximum Daily Demand =	0.110 cfs	Flow for all 92 units
Existing Pipe 75% Capacity =	0.862 cfs	Per Hydraflow Express Extension

Existing Sanitary Sewer has Adequate Downstream Pipe Capacity



Existing Pipe Maximum Flow Hydraulic Cross Sections

Channel Report

HAMPDEN TOWN CENTER - PIPE P-1 @ 75% FLOW DEPTH

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 100.00

Slope (%) = 0.43

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 0.862

Area (sqft) = 0.28

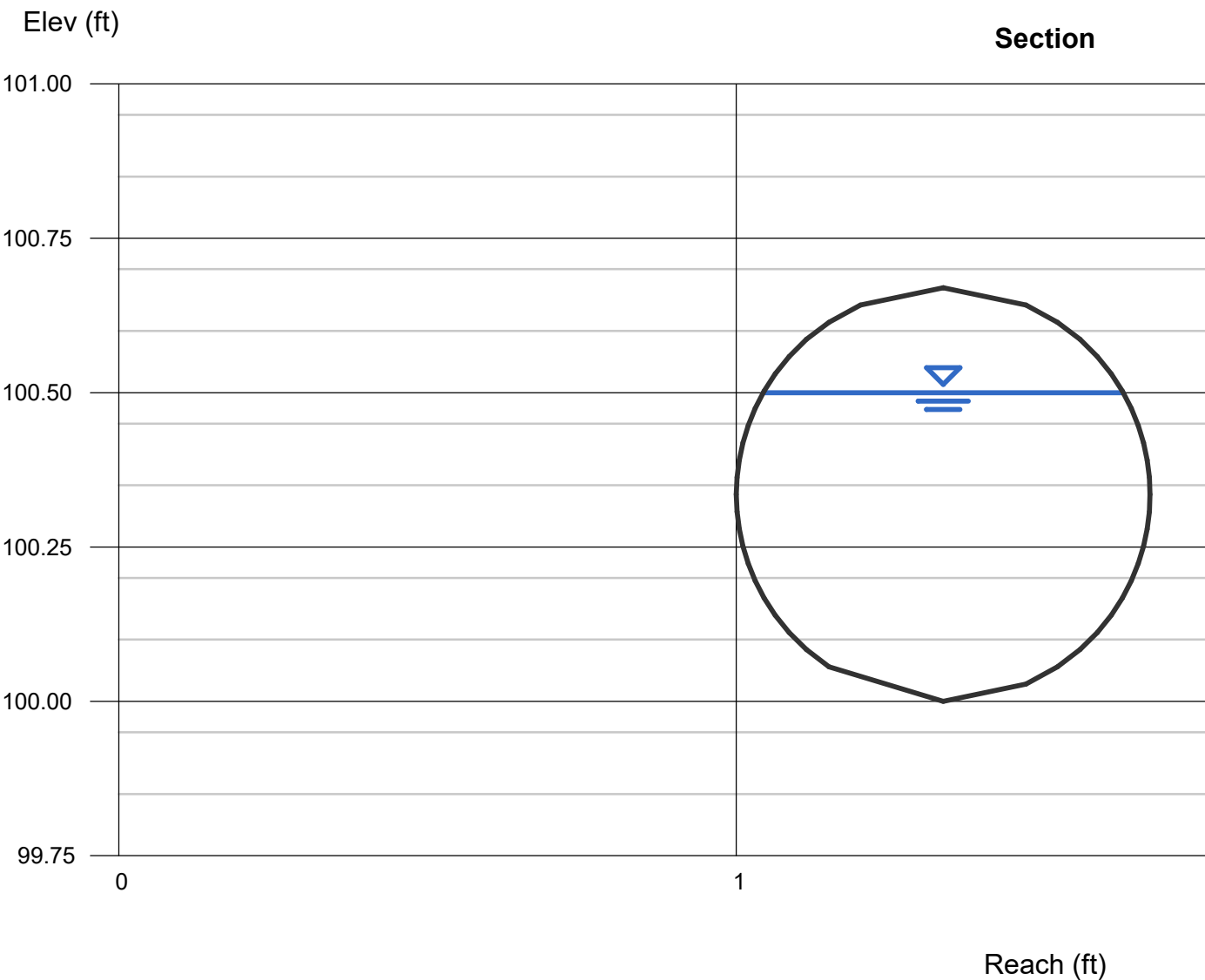
Velocity (ft/s) = 3.05

Wetted Perim (ft) = 1.40

Crit Depth, Yc (ft) = 0.44

Top Width (ft) = 0.58

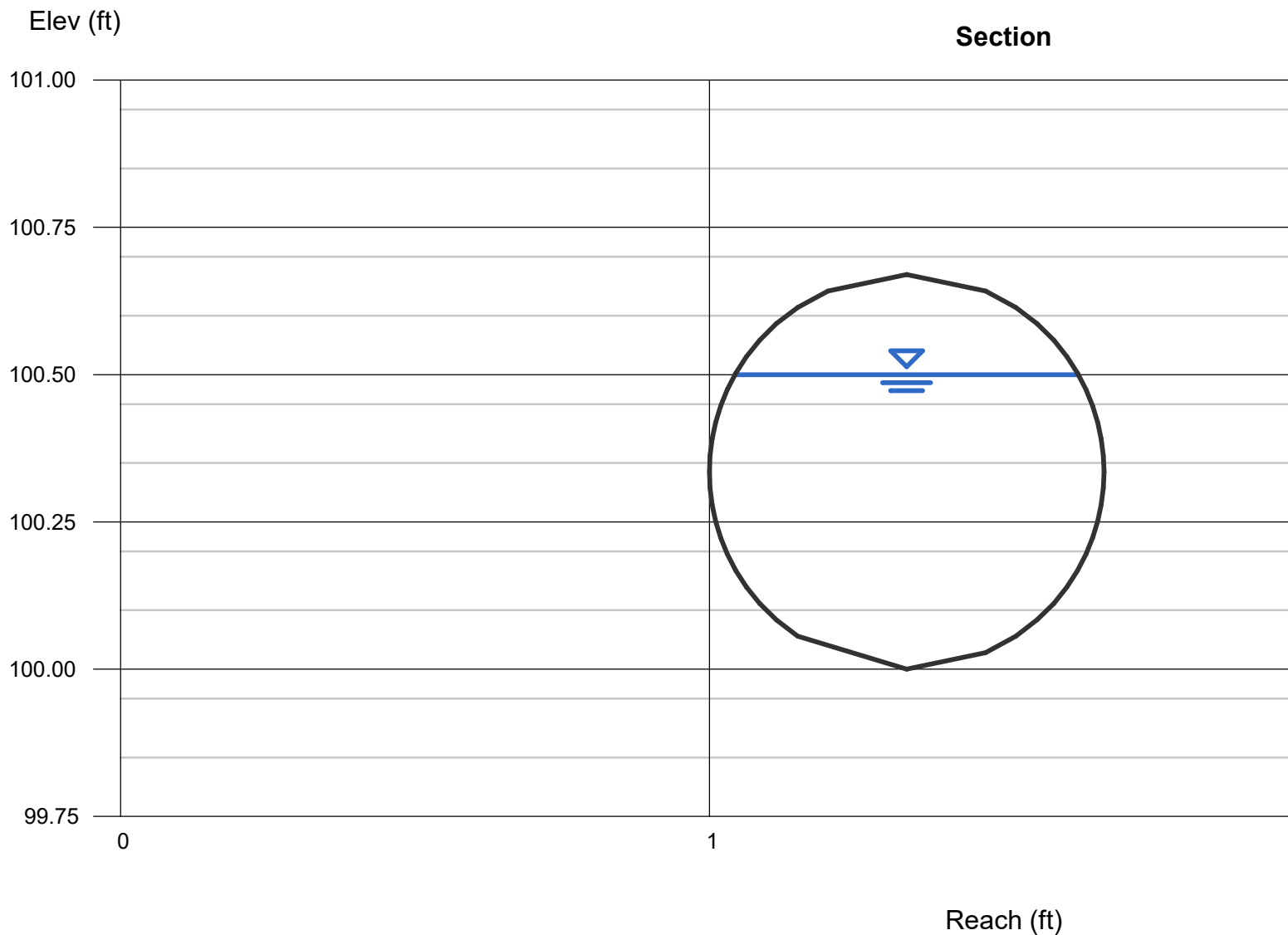
EGL (ft) = 0.64



Channel Report

HAMPDEN TOWN CENTER - PIPE P-2 @ 75% FLOW DEPTH

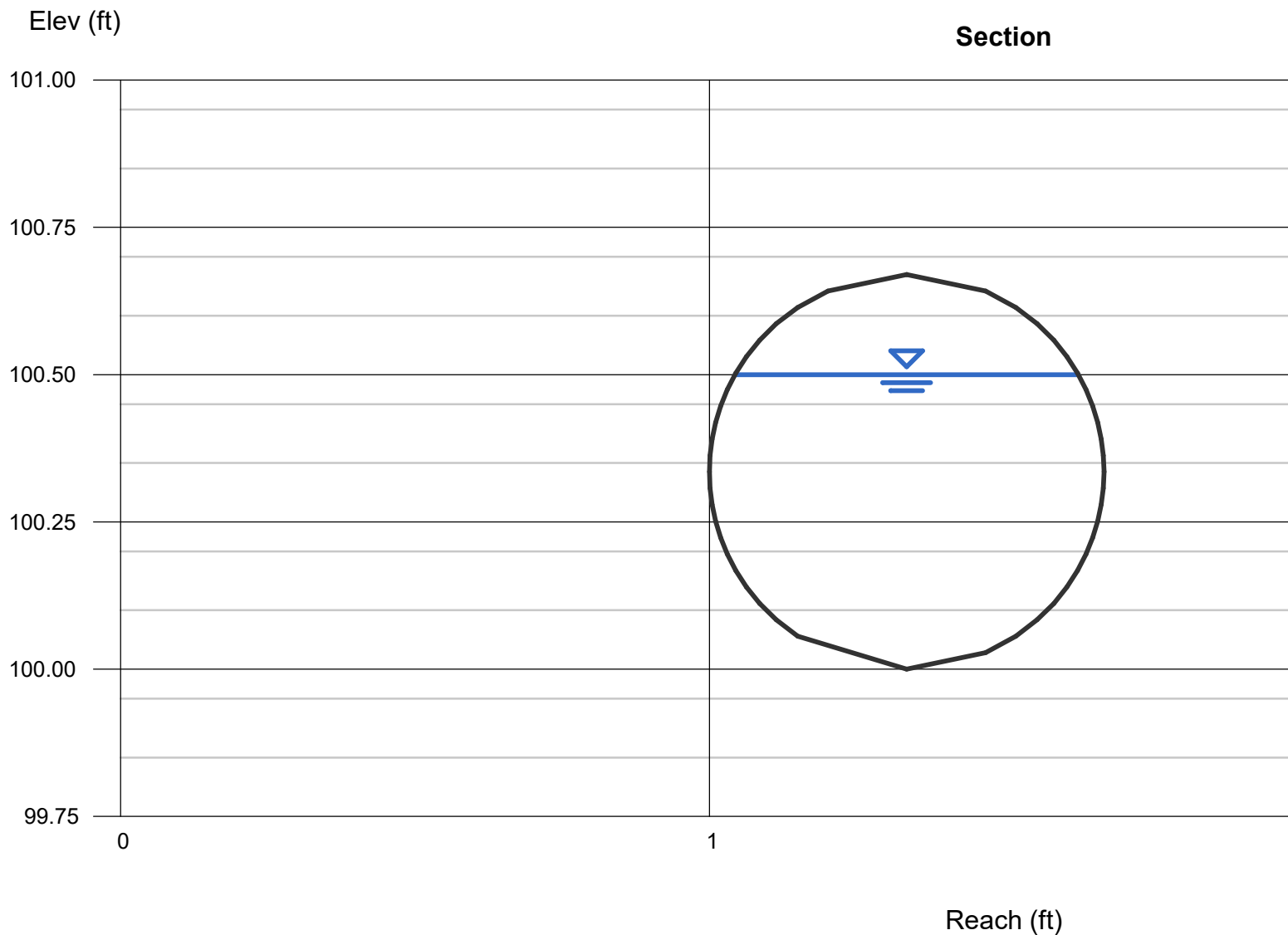
Circular		Highlighted	
Diameter (ft)	= 0.67	Depth (ft)	= 0.50
		Q (cfs)	= 0.842
		Area (sqft)	= 0.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.98
Slope (%)	= 0.41	Wetted Perim (ft)	= 1.40
N-Value	= 0.011	Crit Depth, Yc (ft)	= 0.44
		Top Width (ft)	= 0.58
		EGL (ft)	= 0.64
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.50		



Channel Report

HAMPDEN TOWN CENTER - PIPE P-3 @ 75% FLOW DEPTH

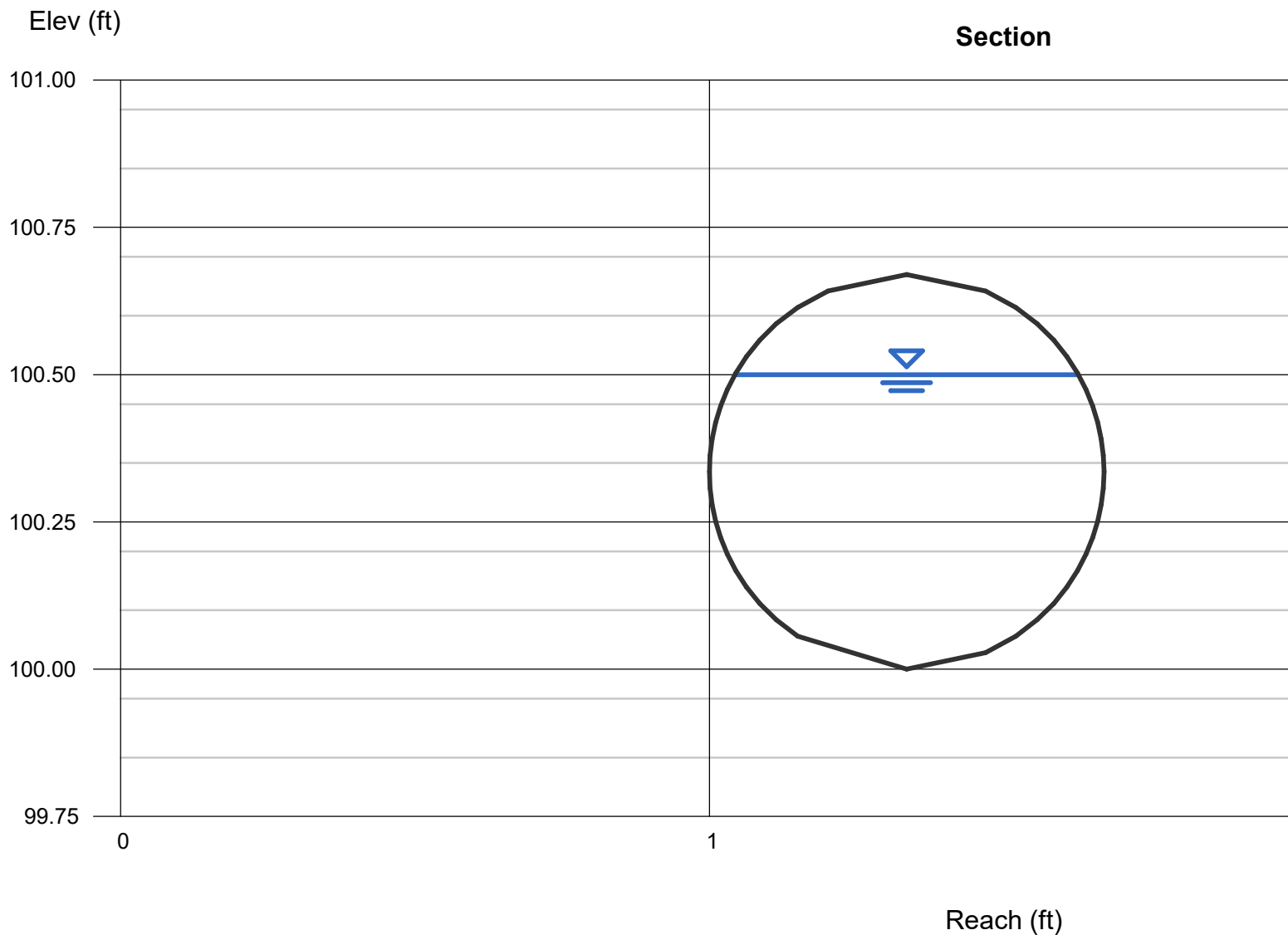
Circular		Highlighted	
Diameter (ft)	= 0.67	Depth (ft)	= 0.50
		Q (cfs)	= 1.289
		Area (sqft)	= 0.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 4.55
Slope (%)	= 0.96	Wetted Perim (ft)	= 1.40
N-Value	= 0.011	Crit Depth, Yc (ft)	= 0.54
		Top Width (ft)	= 0.58
		EGL (ft)	= 0.82
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.50		



Channel Report

HAMPDEN TOWN CENTER - PIPE P-4 @ 75% FLOW DEPTH

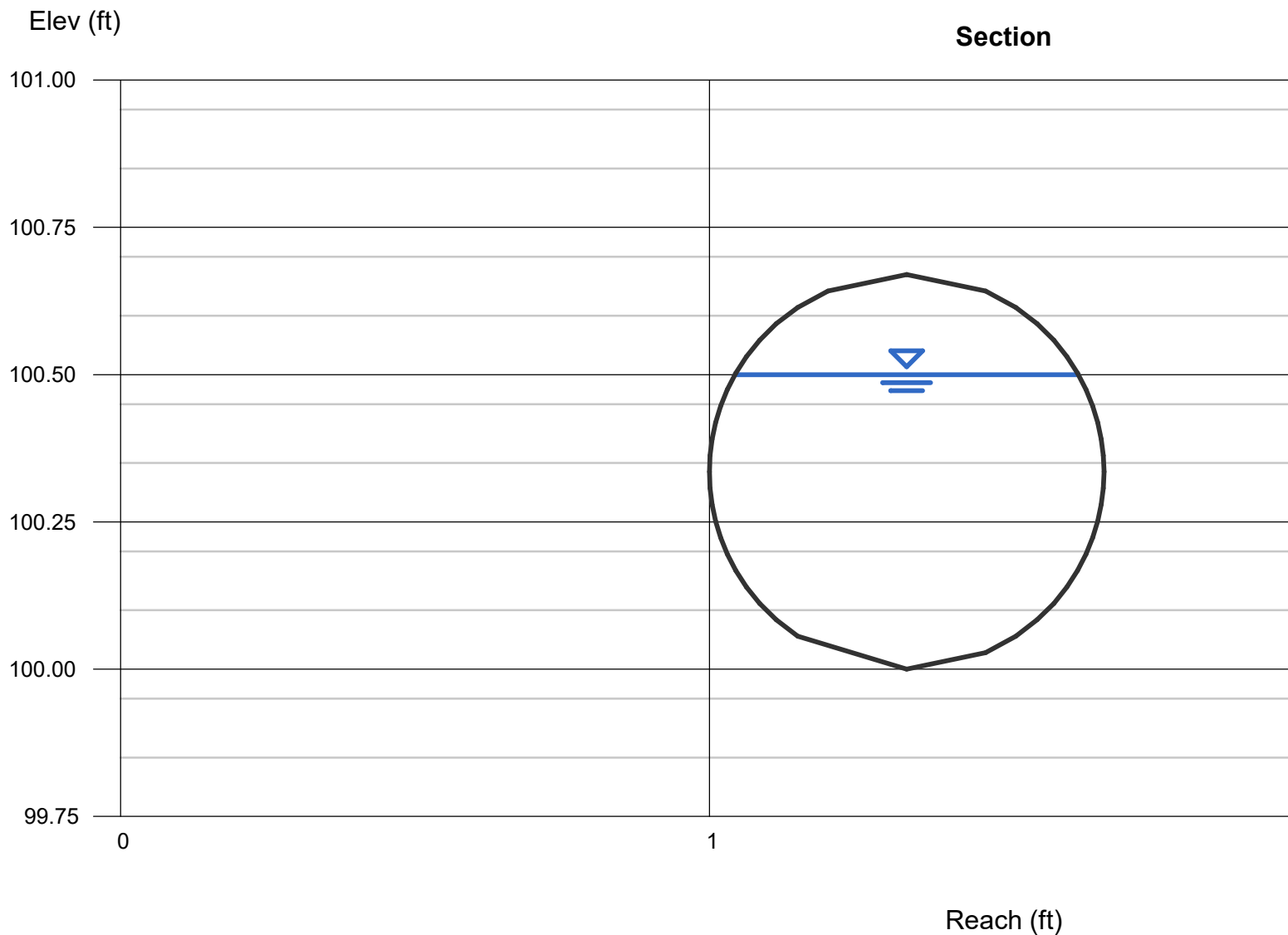
Circular		Highlighted	
Diameter (ft)	= 0.67	Depth (ft)	= 0.50
		Q (cfs)	= 1.453
		Area (sqft)	= 0.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 5.13
Slope (%)	= 1.22	Wetted Perim (ft)	= 1.40
N-Value	= 0.011	Crit Depth, Yc (ft)	= 0.57
		Top Width (ft)	= 0.58
		EGL (ft)	= 0.91
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.50		



Channel Report

HAMPDEN TOWN CENTER - PIPE P-5 @ 75% FLOW DEPTH

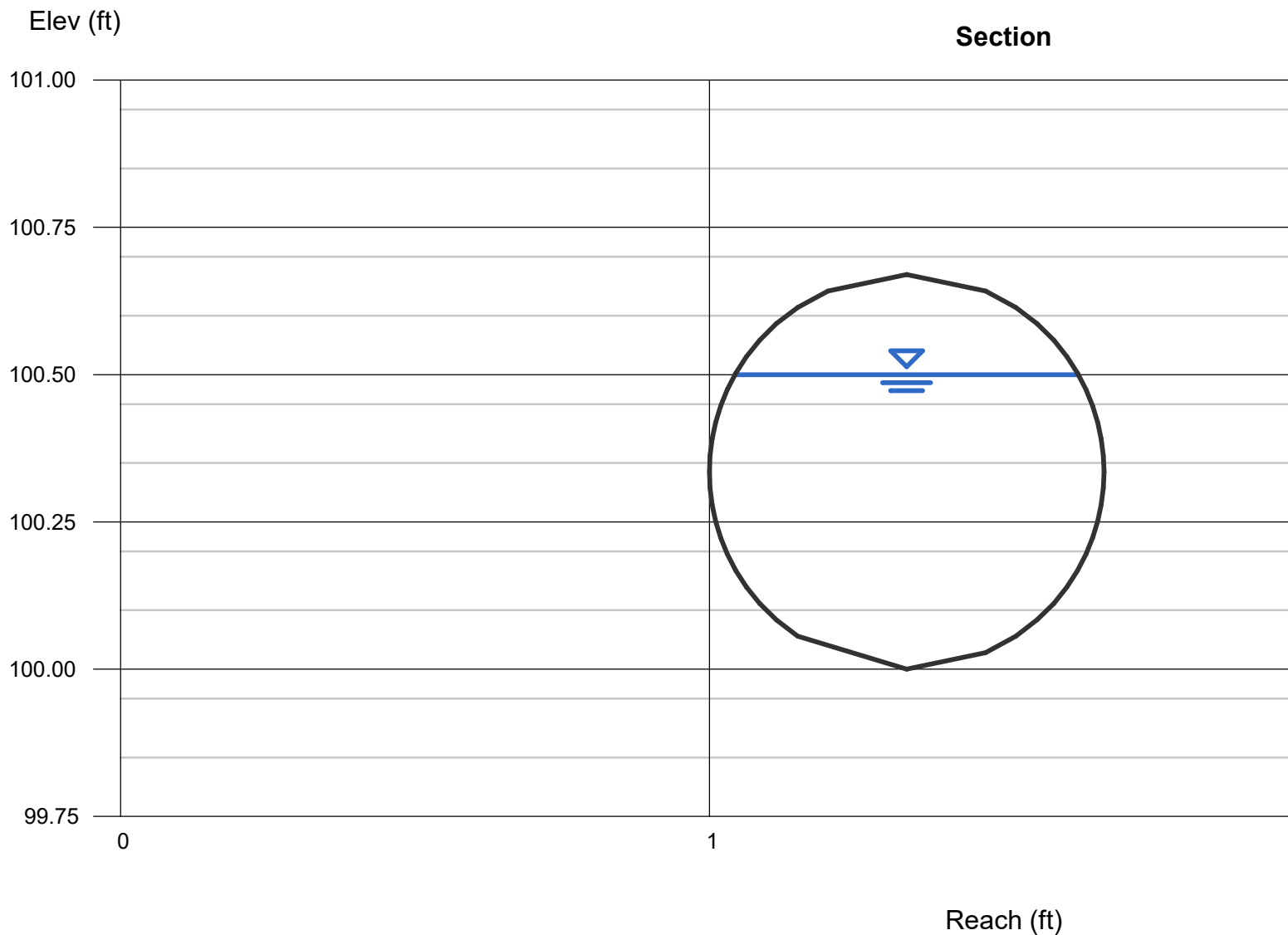
Circular		Highlighted	
Diameter (ft)	= 0.67	Depth (ft)	= 0.50
		Q (cfs)	= 1.435
		Area (sqft)	= 0.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 5.07
Slope (%)	= 1.19	Wetted Perim (ft)	= 1.40
N-Value	= 0.011	Crit Depth, Yc (ft)	= 0.57
		Top Width (ft)	= 0.58
		EGL (ft)	= 0.90
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.50		



Channel Report

HAMPDEN TOWN CENTER - PIPE P-6 @ 75% FLOW DEPTH

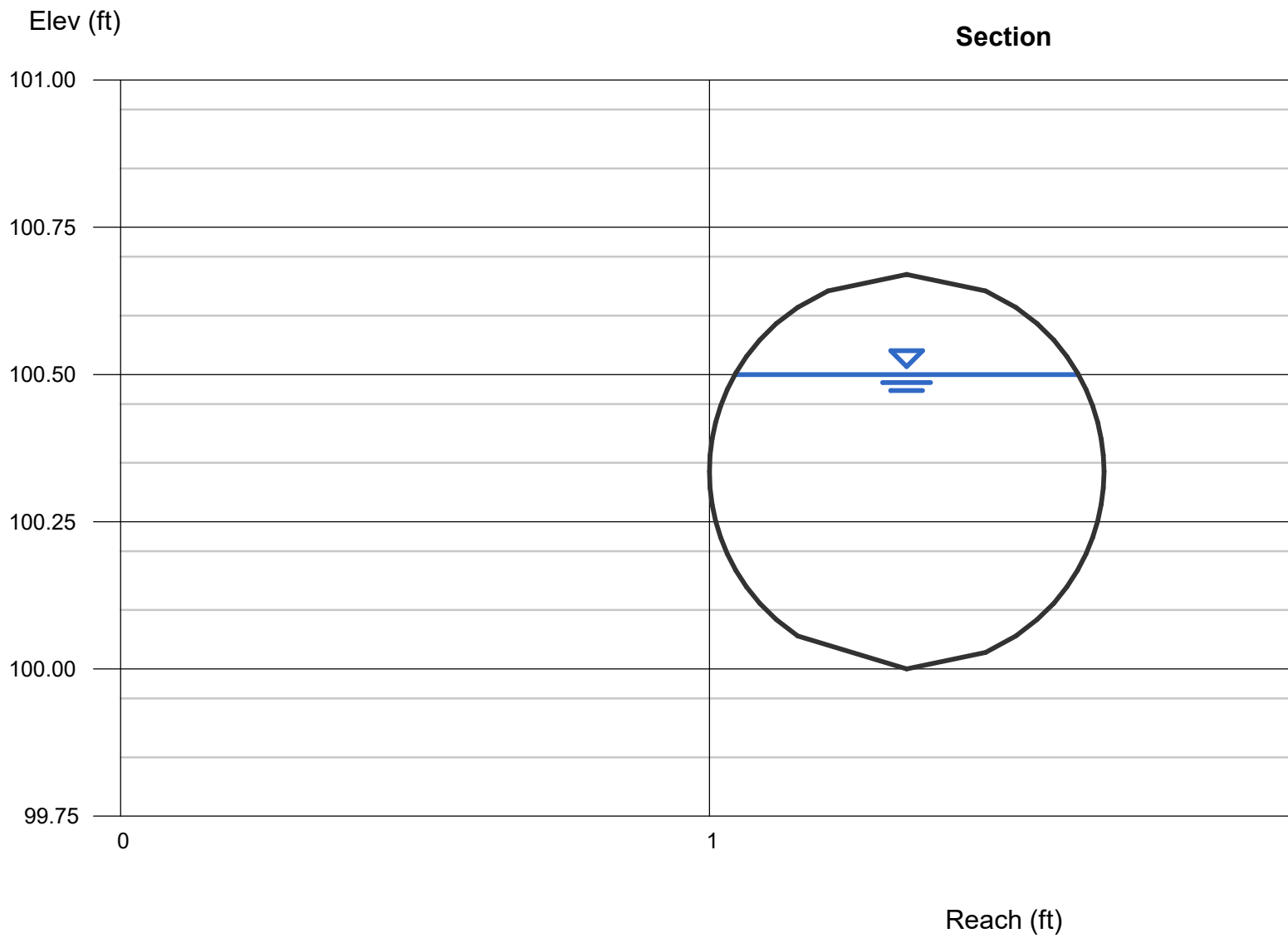
Circular		Highlighted	
Diameter (ft)	= 0.67	Depth (ft)	= 0.50
		Q (cfs)	= 1.248
		Area (sqft)	= 0.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 4.41
Slope (%)	= 0.90	Wetted Perim (ft)	= 1.40
N-Value	= 0.011	Crit Depth, Yc (ft)	= 0.53
		Top Width (ft)	= 0.58
		EGL (ft)	= 0.80
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.50		



Channel Report

HAMPDEN TOWN CENTER - PIPE P-7 @ 75% FLOW DEPTH

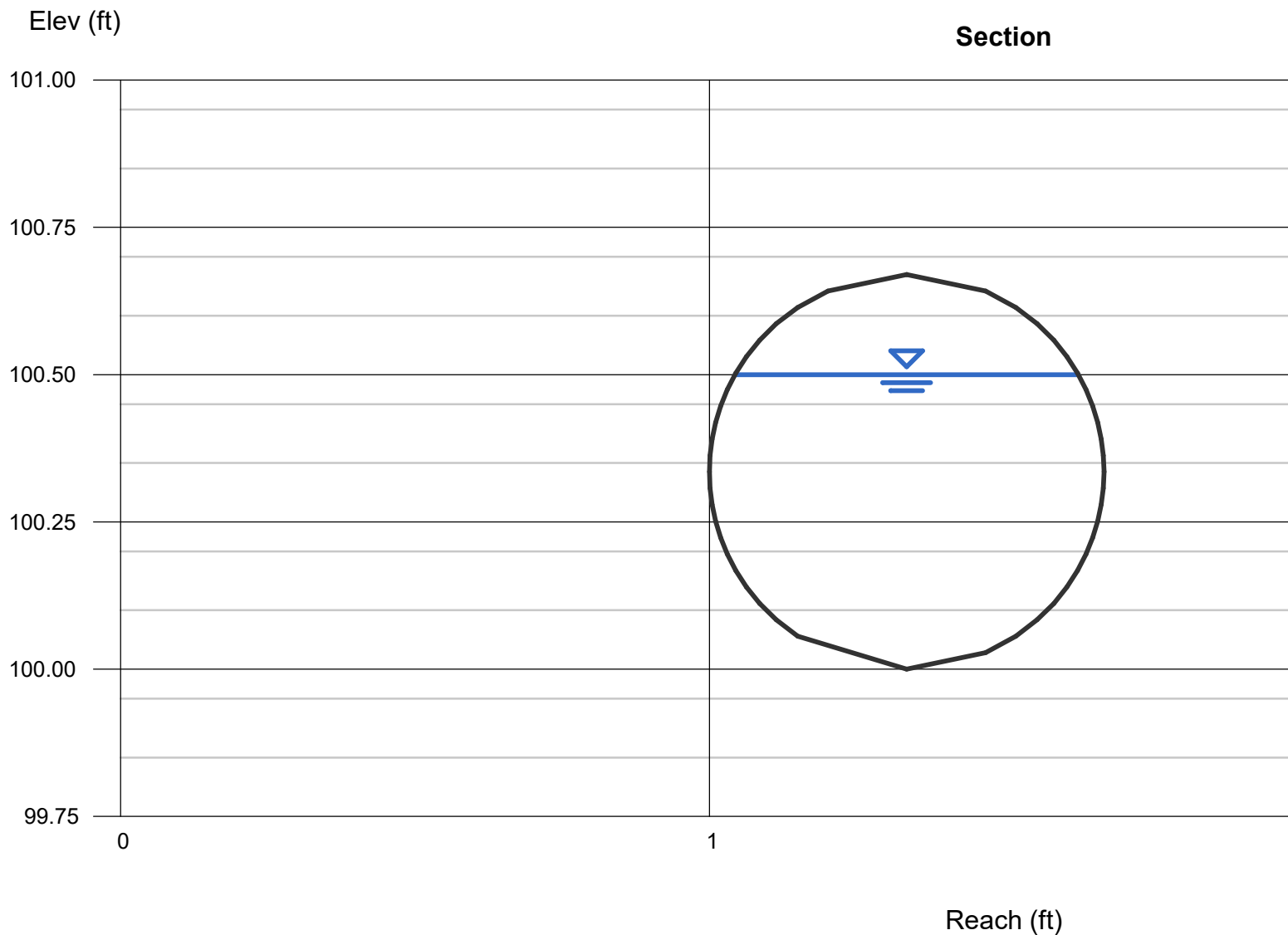
Circular		Highlighted	
Diameter (ft)	= 0.67	Depth (ft)	= 0.50
		Q (cfs)	= 1.341
		Area (sqft)	= 0.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 4.74
Slope (%)	= 1.04	Wetted Perim (ft)	= 1.40
N-Value	= 0.011	Crit Depth, Yc (ft)	= 0.55
		Top Width (ft)	= 0.58
		EGL (ft)	= 0.85
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.50		



Channel Report

HAMPDEN TOWN CENTER - PIPE P-8 @ 75% FLOW DEPTH

Circular		Highlighted	
Diameter (ft)	= 0.67	Depth (ft)	= 0.50
		Q (cfs)	= 1.184
		Area (sqft)	= 0.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 4.18
Slope (%)	= 0.81	Wetted Perim (ft)	= 1.40
N-Value	= 0.011	Crit Depth, Yc (ft)	= 0.52
		Top Width (ft)	= 0.58
		EGL (ft)	= 0.77
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.50		



Channel Report

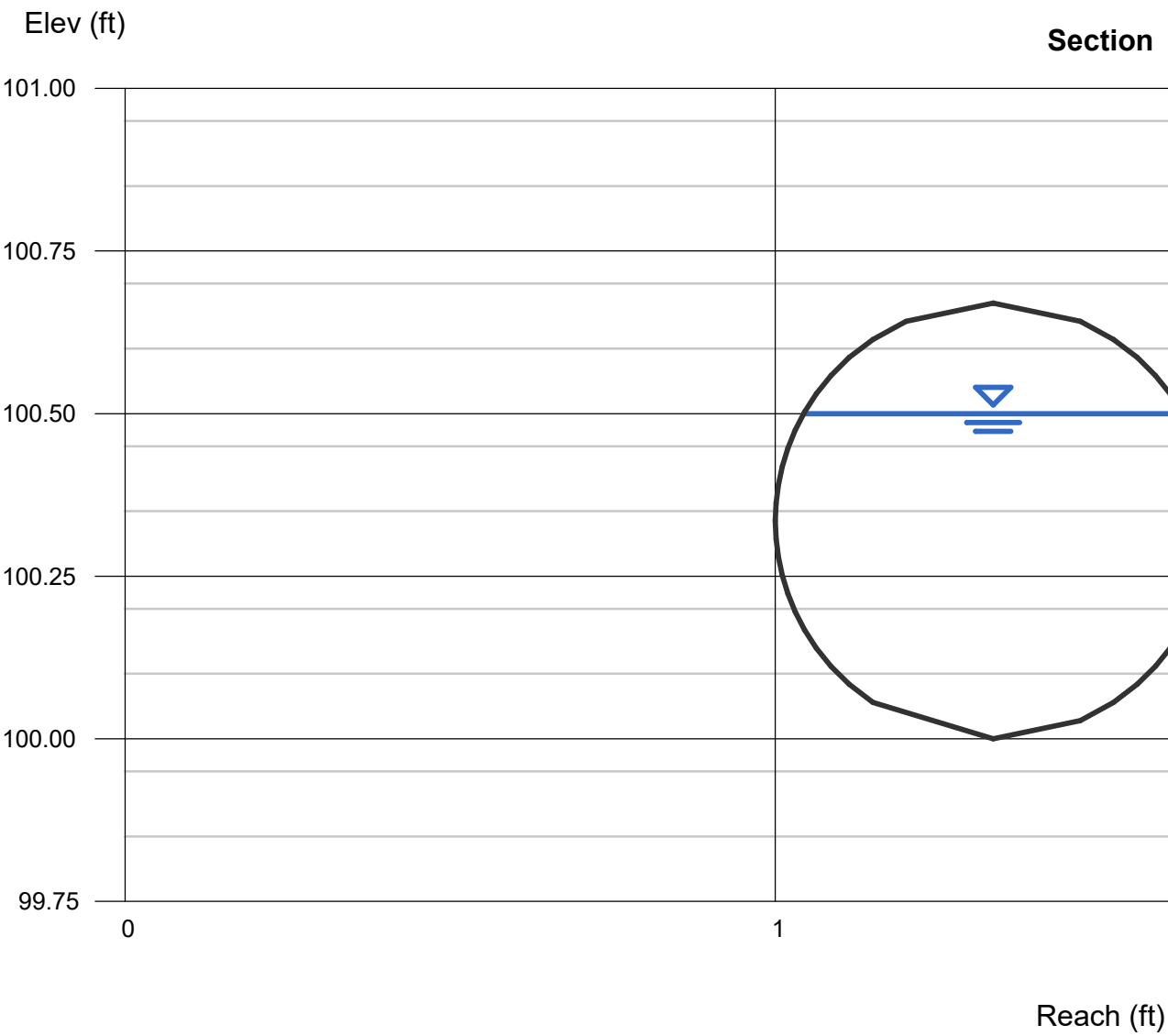
HAMPDEN TOWN CENTER - PIPE P-9 @ 75% FLOW DEPTH

Circular

Diameter (ft)	= 0.67
Invert Elev (ft)	= 100.00
Slope (%)	= 3.72
N-Value	= 0.011
Compute by:	Known Depth
Known Depth (ft)	= 0.50

Highlighted

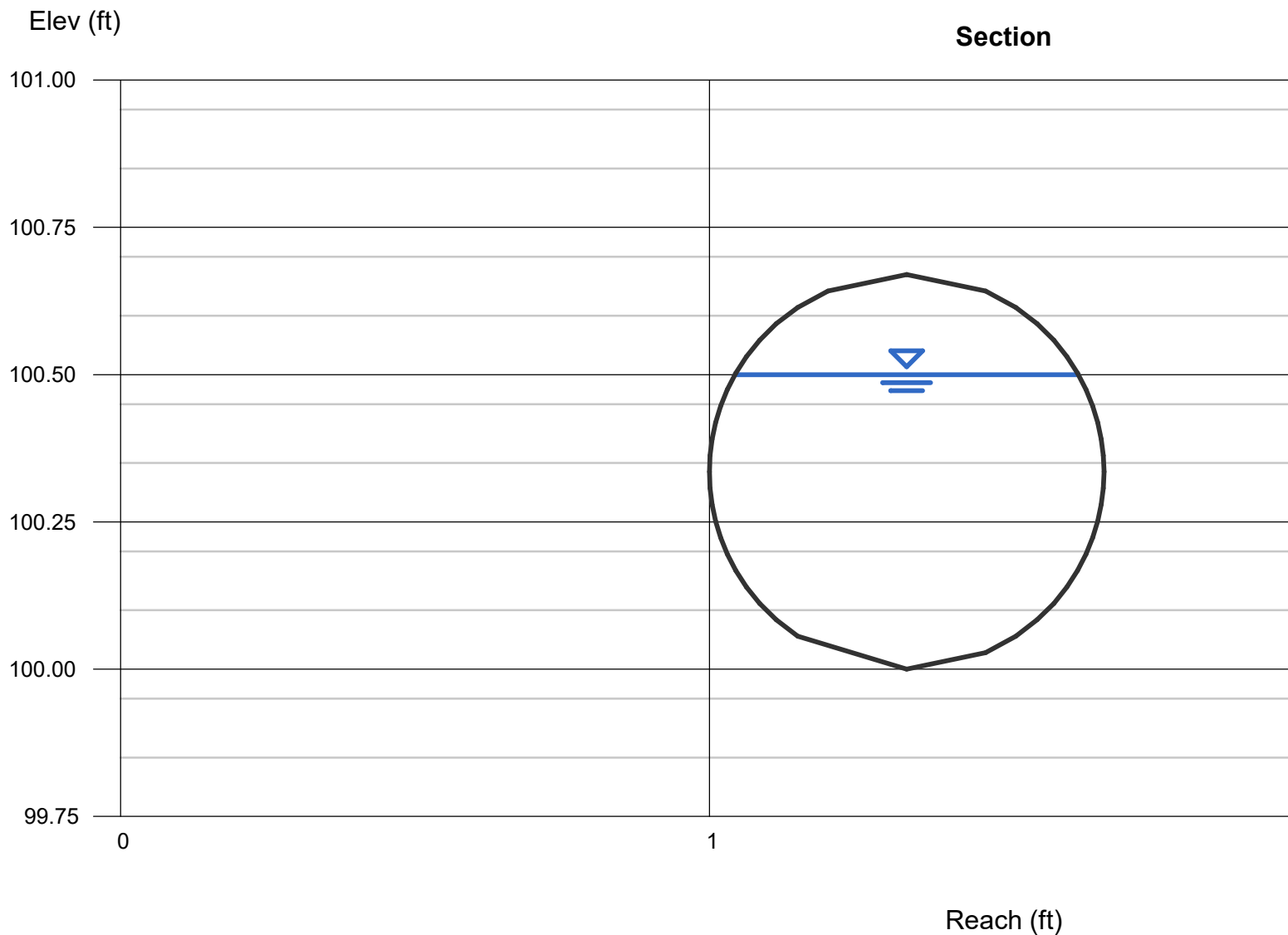
Depth (ft)	= 0.50
Q (cfs)	= 2.536
Area (sqft)	= 0.28
Velocity (ft/s)	= 8.97
Wetted Perim (ft)	= 1.40
Crit Depth, Yc (ft)	= 0.66
Top Width (ft)	= 0.58
EGL (ft)	= 1.75



Channel Report

HAMPDEN TOWN CENTER - PIPE P-10 @ 75% FLOW DEPTH

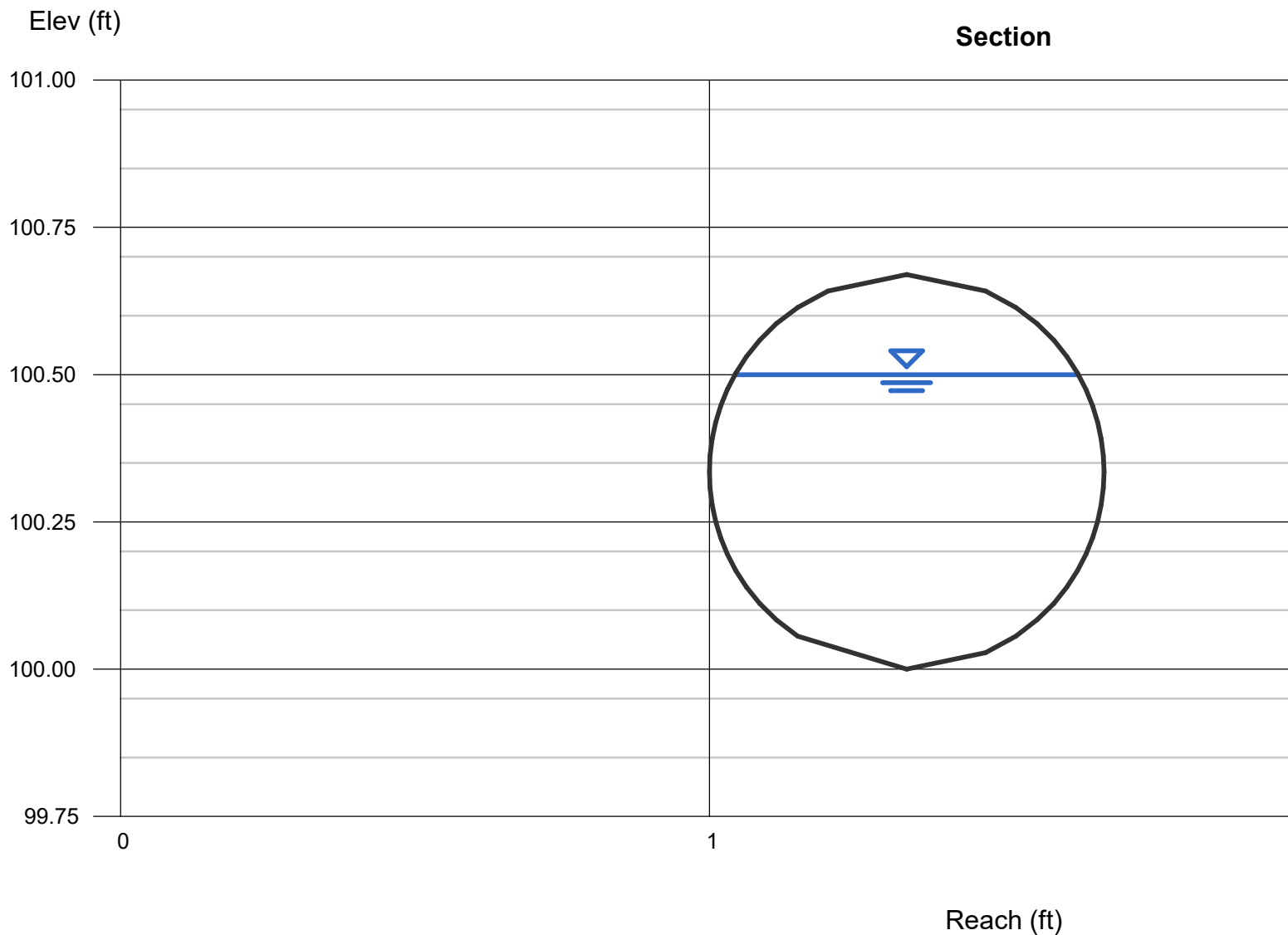
Circular		Highlighted	
Diameter (ft)	= 0.67	Depth (ft)	= 0.50
		Q (cfs)	= 2.443
		Area (sqft)	= 0.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 8.63
Slope (%)	= 3.45	Wetted Perim (ft)	= 1.40
N-Value	= 0.011	Crit Depth, Yc (ft)	= 0.65
		Top Width (ft)	= 0.58
		EGL (ft)	= 1.66
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.50		



Channel Report

HAMPDEN TOWN CENTER - PIPE P-11 @ 75% FLOW DEPTH

Circular		Highlighted	
Diameter (ft)	= 0.67	Depth (ft)	= 0.50
		Q (cfs)	= 2.495
		Area (sqft)	= 0.28
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 8.82
Slope (%)	= 3.60	Wetted Perim (ft)	= 1.40
N-Value	= 0.011	Crit Depth, Yc (ft)	= 0.66
		Top Width (ft)	= 0.58
		EGL (ft)	= 1.71
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.50		



Channel Report

HAMPDEN TOWN CENTER - PIPE P-12 @ 75% FLOW DEPTH

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 100.00

Slope (%) = 2.40

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 2.037

Area (sqft) = 0.28

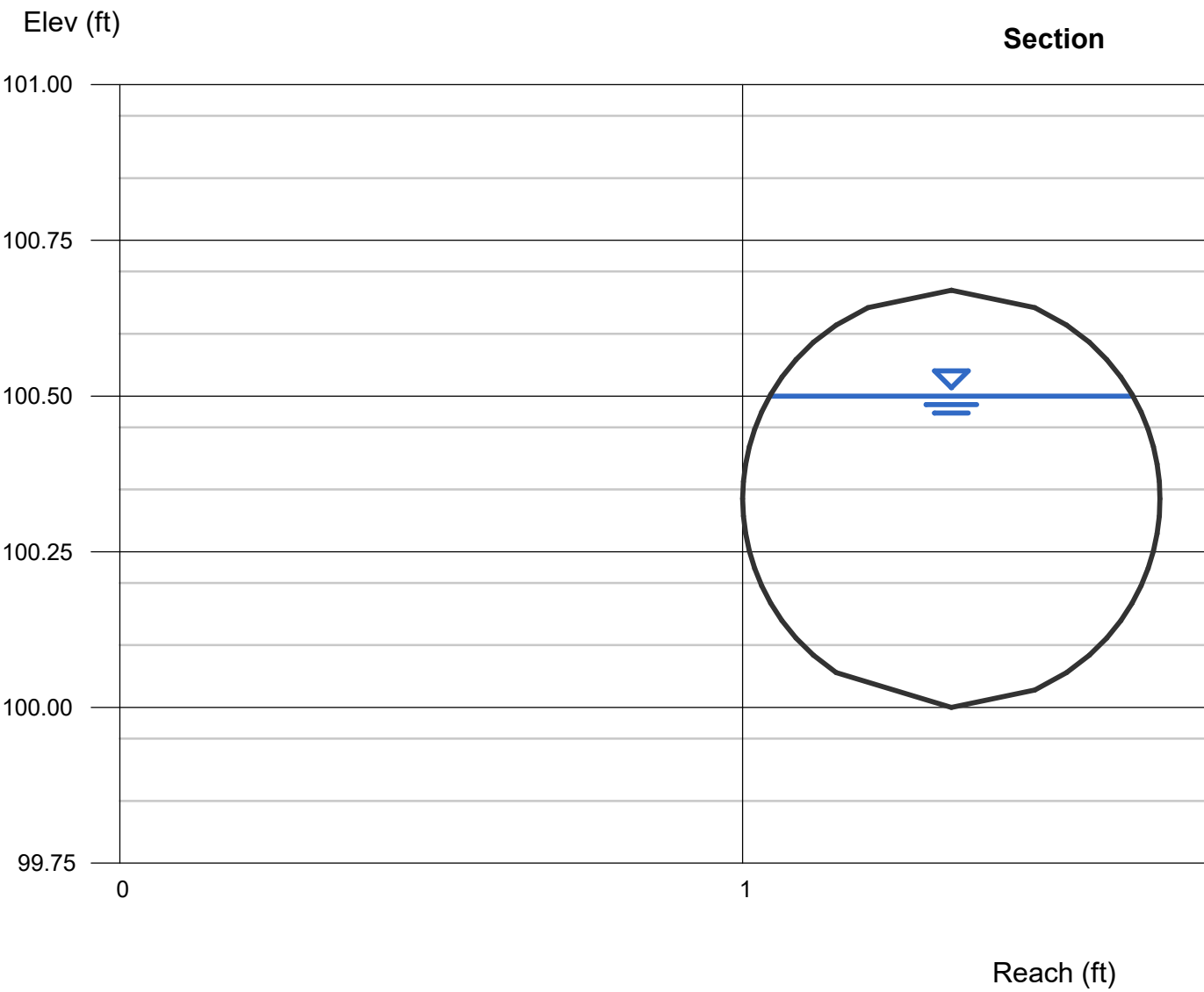
Velocity (ft/s) = 7.20

Wetted Perim (ft) = 1.40

Crit Depth, Yc (ft) = 0.64

Top Width (ft) = 0.58

EGL (ft) = 1.31



Channel Report

HAMPDEN TOWN CENTER - PIPE P-13 @ 75% FLOW DEPTH

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 100.00

Slope (%) = 2.98

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 2.270

Area (sqft) = 0.28

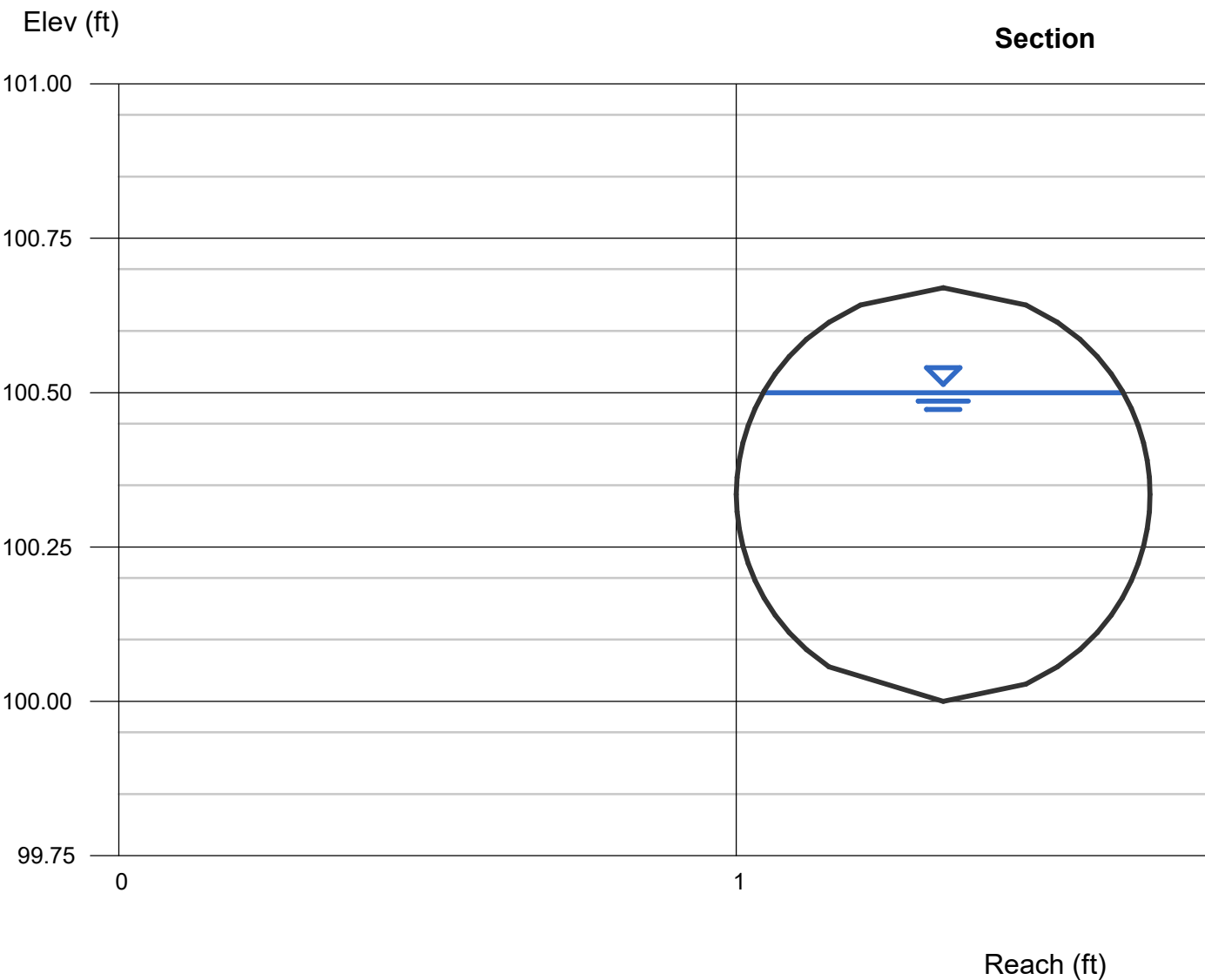
Velocity (ft/s) = 8.02

Wetted Perim (ft) = 1.40

Crit Depth, Yc (ft) = 0.65

Top Width (ft) = 0.58

EGL (ft) = 1.50



Channel Report

HAMPDEN TOWN CENTER - PIPE P-14 @ 75% FLOW DEPTH

Circular

Diameter (ft) = 0.83

Invert Elev (ft) = 100.00

Slope (%) = 1.00

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.63

Highlighted

Depth (ft) = 0.63

Q (cfs) = 2.351

Area (sqft) = 0.44

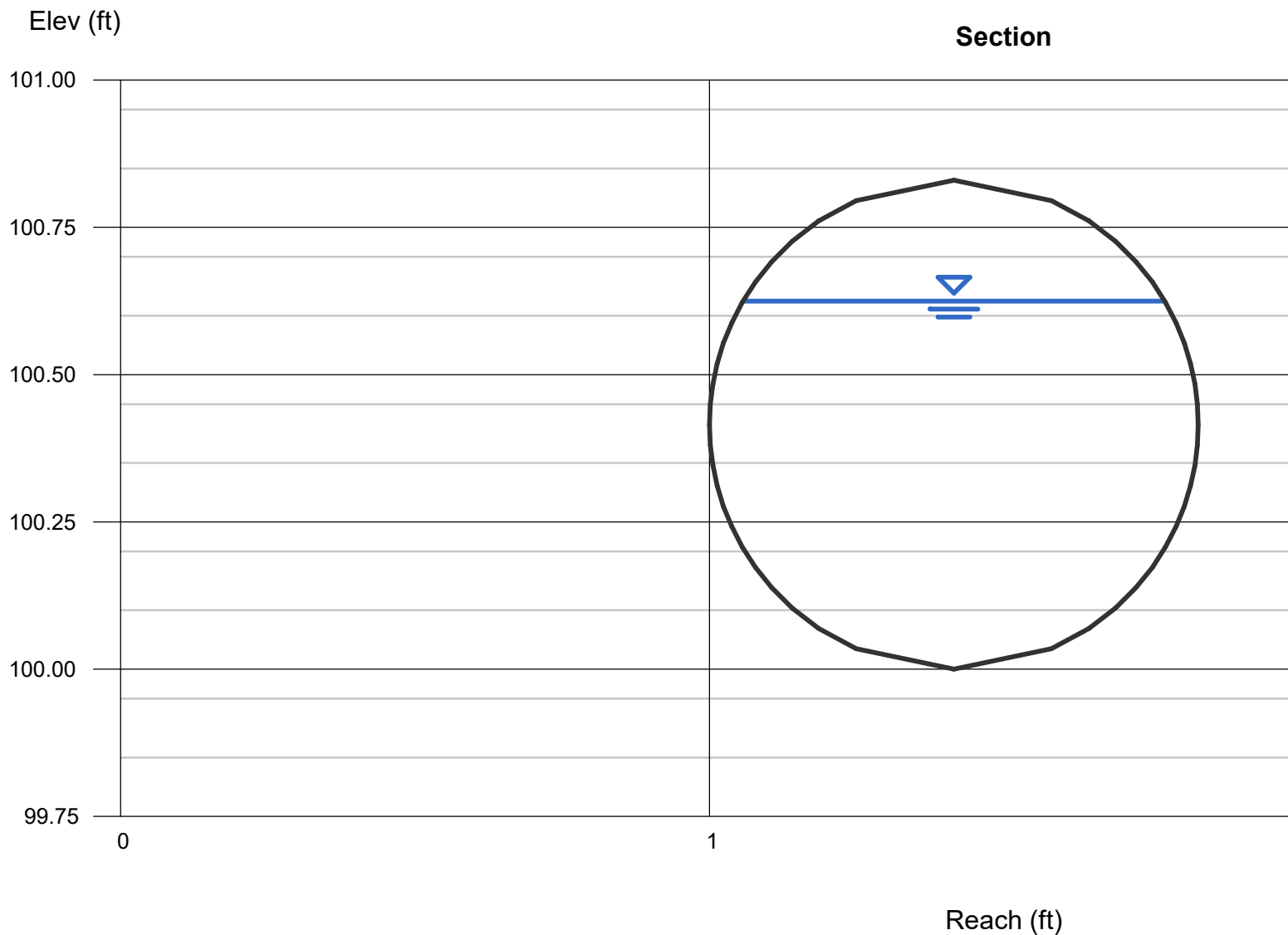
Velocity (ft/s) = 5.37

Wetted Perim (ft) = 1.75

Crit Depth, Yc (ft) = 0.69

Top Width (ft) = 0.71

EGL (ft) = 1.07





Previous Sanitary Sewer Study



PARAGON ENGINEERING CONSULTANTS, INC.

October 13, 2016

James DeHerrera
City of Aurora
Utilities Department
15151 E. Alameda Parkway, Ste. 2300
Aurora, CO 80012

RE: Hampden Town Center – GDP Amendment, DA-1202-21, 1998-2004-04

Dear Mr. Herrera,

The purpose of this letter is to respond to your query regarding whether there is enough capacity in the existing sanitary sewer main to serve the proposed Dayton Town Center project; Item 14 in the City's May 12, 2016 letter/initial submission review. This is in response to a request to amend the existing 3rd Amendment to the GDP.

CVL Consultants, Inc. (CVL) prepared a sanitary sewer analysis on the system serving Hampden Town Center Use Areas 1 through 8 in 2003, based on existing and proposed development. The CVL report serves as a basis for this updated analysis.

The Hampden Town Center GDP consists of eleven Use Areas. The CVL study analyzed flow from Use Area 1 through Use Area 8. With the exception of Use Area 5, the Use Areas are built out. Of the 246 units planned for Use Area 5, only 156 have been constructed. The remaining 90-multifamily units were planned for the portion of Use Area 5 on the west side of S. Dallas Street but were not constructed.

An As-built survey of the existing sanitary sewer system was completed by Red Rock Land Surveys on 08/02/2016. This survey includes rim and invert elevations of the existing sanitary sewer manholes from S. Dallas Street south of Chester Way to East Hampden Ave. This as-built information was used to analyze the existing sanitary sewer system and determine the remaining pipe capacity based on the pipes being three quarters full during peak flow with 10% infiltration.

Per the CVL Study and current City of Aurora Design Criteria, the peak sanitary sewer flow rate with 10% infiltration and a peaking factor of four from one multifamily unit is 557.6 gallons per day (GPD). This peak flow rate was used to analyze the remaining capacity of the existing sanitary sewer system. For ease of reference, the CVL Pipe Labels have been added to Sheet 17A of the City of Aurora Atlas map dated July 20, 2014 in the Appendix.

The flow capacity for pipes P-1 through P17 have been calculated based on the As-Built invert data. Table 1 below shows the original capacity analysis compared to the as-built capacity in gallons per day.

Table 1

Pipe Label	CVL Design Pipe Capacity (GPD)	As-built Pipe Capacity (GPD)
P-12	583,738	582,978
P-1	640,439	544,199
P-2	587,345	833,103
P-3	1,019,916	939,098
P-4	1,003,664	927,465
P-5	920,193	806,604
P5-A	N/A	849,907
P-6	863,360	765,239
P-7	1,781,944	1,650,047
P-8	1,794,534	1,578,952
P-9	1,432,234	1,612,561
P-10	1,593,355	1,327,535
P-11	1,661,150	2,349,362
P-16	5,509,633	4,719,406
P-17	N/A	5,602,921

Analysis shows additional 80 units would exceed as-built capacity: $853,365 + 504,296 = 1,357,661$ gpd

Provide circular flow worksheet to show wastewater depth of flow in existing pipe.

Note: P-5A and P-17 were not analyzed in the CVL Study.

The difference in capacity is due to the difference between the constructed pipe slope and the designed pipe slope. For detailed hydraulic calculations, see Table 1 in the Appendix.

Excess capacity is calculated by subtracting known peak flows from the total as-built pipe capacity. The known flow rates for pipes P-1, P-2 and P-3 have been reduced to account for the partial building out of Use Area 5. The known flow rates have been reduced by 50,184 GPD which is the amount of flow that would have been generated by the 90-units that were not constructed.

Table 2 in the Appendix is a side by side comparison of the CVL excess capacity analysis and the As-built capacity analysis. For the As-Built condition Table 2 shows the excess capacity in gallons per day and in the number of multifamily units that can be served. Table 2 is summarized below.

Table 2 As-Built Summary

Pipe Label	CVL Report - Excess Design Capacity (GPD)	As-built - Excess Design Capacity (GPD)	As-built - Excess Number of Multifamily Units Available (557.6 GPD/Unit) (GPD)
P-12	583,738	582,978	1,046
P-1	503,269	457,213	820
P-2	450,175	746,117	1,338
P-3	882,746	852,112	1,528
P-4	819,656	793,640	1,423
P-5	689,347	625,941	1,123
P-5A	N/A	669,244	1,200
P-6	558,910	510,973	916
P-7	1,477,494	1,395,781	2,503
P-8	1,490,084	1,324,686	2,376
P-9	613,456	843,966	1,514
P-10	774,577	558,940	1,002
P-11	825,398	1,563,793	2,805
P-16	4,673,880	3,933,837	7,055
P-17	N/A	4,817,353	8,639

Note: P-5A and P-17 were not analyzed in the CVL Study.

The Third Amendment to the GDP allows for a total of 2,000 units to be constructed in this area. To date, 703 of these units have been constructed which leaves 1,297 units available based on the GDP. The current sanitary sewer system limits the maximum number of units to 820 which is the excess capacity of Pipe P-1. In order to increase the capacity of the existing sanitary sewer system to 1,297 units, pipes P-1, P-5, P-5A, P-6 and P-10 would have to be increased in diameter to 10-inches. Table 3 below, summarizes the increased capacity available by increasing the diameter of these pipe from 8-inches to 10-inches.

Table 3

Pipe To Be Upsized	Proposed Pipe Size (Inches)	Proposed Capacity (GPD)	Total Existing Design Flow (GPD)	Excess Existing Design Capacity (GPD)	Excess Number of Multifamily Units (557.6 GPD/Unit) (GPD)
P-1	10	973,353	86,986	886,367	1,590
P-5	10	1,441,933	180,663	1,261,270	2,262
P-5A	10	1,534,356	180,663	1,353,694	2,428
P-6	10	1,367,607	254,266	1,113,341	1,997
P-10	10	2,373,922	768,595	1,605,327	2,879

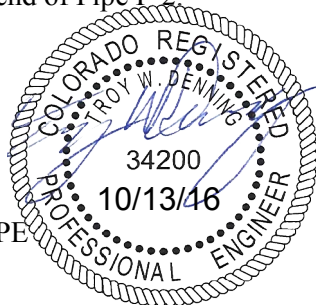
One alternative to upsizing Pipe P-1 is to connect to the manhole upstream of Pipe P-2 (MH-2) since Pipe P-2 has an excess capacity of 1,338 Units. If the future sewer service line to the north portion of the site cannot connect to MH-2, a second alternative to upsizing Pipe P-1 is to install a new pipe in Chester Way and connecting it to SS MH-14. Flow in excess of 820 units ($1297-820=477$) would then be directed through the site to the new pipe in Chester Way rather than out to Pipes P-1 and P-12 in S. Dallas Street.

As shown in Table 2, the next limiting pipe is Pipe P-6 which has an excess capacity of 916 units. Upsizing Pipe P-6 to 10-inches increases its excess capacity to 1,997 units. After Pipe P-6, the next limiting pipe is Pipe P-10 which has an excess capacity of 1,002 units. Upsizing Pipe P-10 to 10-inches increases its excess capacity to 2,879 units. Pipes P-5 and P-5A are the remaining limiting pipes in the system with excess capacity of 1,123 and 1,200 units, respectively. Increasing the diameter of Pipes P-5 and P-5A increases their excess capacity to 2,262 and 2,428 units, respectively.

In summary, every pipe in the existing system has some excess capacity. Of the remaining 1,297 units allowed by the GDP, 820 units can be served by the existing sanitary sewer system. By upsizing the pipes listed in Table 3, the remaining 477 units allowed by the GDP can be served. As an alternative to upsizing Pipe P-1, flow from 477 units could be directed to a new pipe in Chester Way that would be connected to the existing manhole SS-MH-14 at the downstream end of Pipe P-2.

Sincerely,

Troy W. Denning, PE



APPENDIX



LEGEND:

- Manhole**
- Denver_ECCV, Metro
 - Aurora MH
 - Aurora Division Box
 - Aurora Drop MH
 - Aurora Vault MH
- Private Assets**
- UNITTYPE
- Manhole
 - Acid Trap
 - Grease Trap
 - Sand Trap
- Wastewater_Fitting**
- UNITTYPE
- Cleanout
 - Joint
 - Other
 - Tee
 - Wastewater_Valve
- Wastewater_Misc**
- UNITTYPE
- LS
 - NA
 - VAULT
 - Fire_Hydrants
 - Aurora Main
- UNIT_FUNCTION**
- Creek Crossing
 - Encasement
 - Forced Main
 - Arapco,Denver,ECCV,Metro
- OWNER**
- Private
 - Lined Pipe
 - Abandoned
 - Sewer_Security_Areas
 - Address Points
 - Street Name Geocoded Line
- Aurora**
- City Limits
 - Section Corners Point
 - Parcel Lines
 - Easement Line
 - Plats Poly
 - Mapbook Plat Page Poly
 - Section Line Poly

*** RESTRICTED AREA ***

AURORA WATER SECURITY AREA

THIS INFORMATION HAS BEEN BLOCKED FOR SECURITY PURPOSES. CONTACT AURORA WATER, ENGINEERING DIVISION FOR DETAILS AT (303)-738-7378

NOTES:

THE CITY OF AURORA WATER DEPARTMENT ASSUMES NO RESPONSIBILITY OR LIABILITY OF ANY KIND TO ANY USER OF THIS MAP

LOCATIONS ON THIS MAP ARE APPROXIMATE AND ARE INTENDED TO SERVE AS AN AID IN GRAPHIC REPRESENTATION ONLY

BEFORE EXCAVATION CALL THE CITY OF AURORA WATER OPERATIONS AT (303)-326-8645 TO SCHEDULE FIELD LOCATIONS OF WATER, STORM AND SANITARY LINES.

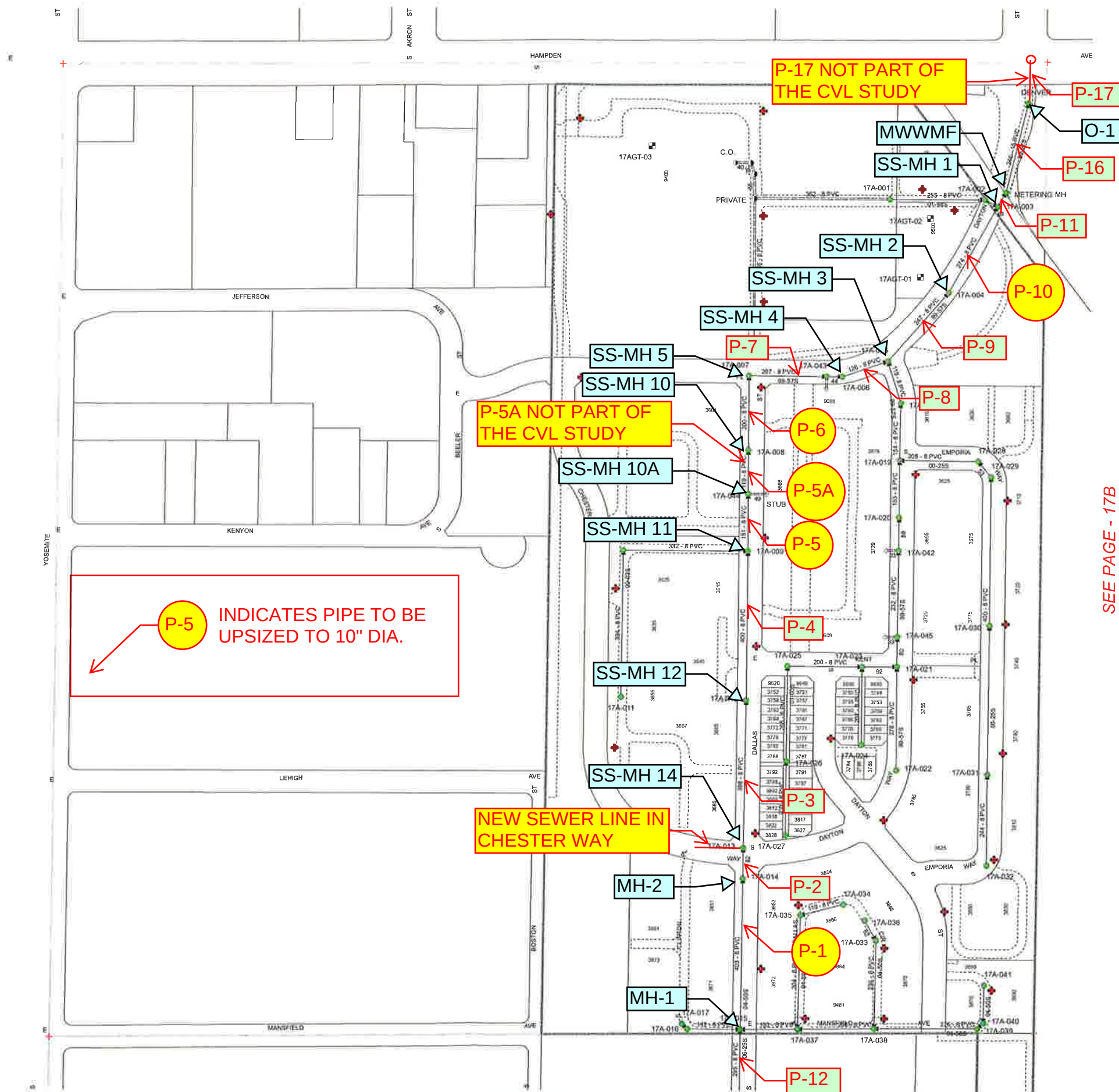
PLEASE REPORT ANY ERRORS OR OMISSIONS ON THIS MAP TO THE CITY OF AURORA, AURORA WATER, ENGINEERING DIVISION, GIS SECTION.

PLOT DATE:

July 20, 2014

SEE PAGE - 16A

SEE PAGE - 17ZZ



SEE PAGE - 17B

2014

City of Aurora, Colorado - Aurora Water

15151 East Alameda Parkway, Aurora, Colorado 80012
website: www.auroragov.org phone: 303.739.7370 fax: 303.739.7491

TRS: NW1/4 SEC03 T5S R67W



SEWER RESTRICTED

17A

SEE PAGE - 18A



SEE PAGE - 19A

TABLE 1

Source: Paragon Engineering Consultants Sewer Capacity Study, 2016. Pipe, rim and invert elevations are based on an As-built survey by Red Rock Land Surveys dated 08/02/2016.

Pipe Label	Material	Pipe Diameter (inches)	Upstream Manhole	Upstream Invert Out Elevation (ft)	Downstream Manhole	Downstream Invert In Elevation (ft)	As-Built Pipe Length (feet)	As-built Slope (ft/ft)	Q (cfs)	As-Built Capacity (gpd)	Mannings n	Velocity (ft/s)
P-12	PVC	8	MH-13	46.7	MH-1	45.3	295	0.47%	0.902	582,977.87	0.011	
P-1	PVC	8	MH-1	45.1	MH-2	43.5	389	0.41%	0.842	544,198.85	0.011	
P-2	PVC	8	MH-2	43.19	SS-MH 14	42.41	81.28	0.96%	1.289	833,102.52	0.011	
P-3	PVC	8	SS-MH 14	42.29	SS-MH 12	37.41	399.82	1.22%	1.453	939,098.50	0.011	
P-4	PVC	8	SS-MH 12	37.06	SS-MH 11	32.29	400.4	1.19%	1.435	927,464.79	0.011	
P-5	PVC	8	SS-MH 11	32.06	SS-MH 11A	30.7	150.32	0.90%	1.248	806,603.53	0.011	
P-5A	PVC	8	SS-MH 11A	30.63	SS-MH 10	29.4	118.65	1.04%	1.315	849,906.76	0.011	
P-6	PVC	8	SS-MH 10	29.25	SS-MH 5	27.63	199.69	0.81%	1.184	765,239.24	0.011	
P-7	PVC	8	SS-MH 5	27.38	SS-MH 4	19.62	205.92	3.77%	2.553	1,650,047.12	0.011	
P-8	PVC	8	SS-MH 4	19.52	SS-MH 3	18.02	43.47	3.45%	2.443	1,578,952.26	0.011	
P-9	PVC	8	SS-MH 3	17.8	SS-MH 2	13.19	127.94	3.60%	2.495	1,612,560.74	0.011	
P-10	PVC	8	SS-MH 2	13.03	SS-MH 1	7.03	245.87	2.44%	2.054	1,327,534.97	0.011	
P-11	PVC	10	SS-MH 1	6.83	MWWMF	0.29	273.27	2.39%	3.635	2,349,362.03	0.011	
P-16	PVC	15	MWWMF	98.57	O-1	95.47	282.11	1.10%	7.302	4,719,406.21	0.011	
P-17	PVC	15	O-1	94.78		90.23	295.22	1.54%	8.669	5,602,921.45	0.011	

Table 1A

Proposed Pipe Label	Material	Pipe Diameter (inches)	Upstream Manhole	Upstream Invert Out Elevation (ft)	Downstream Manhole	Downstream Invert In Elevation (ft)	As-Built Pipe Length (feet)	As-built Slope (ft/ft)	Q (cfs)	As-Built Capacity (gpd)	Mannings n
P-1 Proposed	PVC	11	MH-1	45.1	MH-2	43.5	389	0.41%	1.506	973,353.29	0.011
P-5 Proposed	PVC	10	SS-MH 11	32.06	SS-MH 11A	30.7	150.32	0.90%	2.231	1,441,933.07	0.011
P-5A Proposed	PVC	10	SS-MH 11A	30.63	SS-MH 10	29.4	118.65	1.04%	2.374	1,534,356.39	0.011
P-6 Proposed	PVC	10	SS-MH 10	29.25	SS-MH 5	27.63	199.69	0.81%	2.116	1,367,606.62	0.011
P-10 Proposed	PVC	10	SS-MH 2	13.03	SS-MH 1	7.03	245.87	2.44%	3.673	2,373,922.08	0.011

TABLE 2

Source: Hampden Town Center Sanitary Sewer Capacity Analysis by CVL Consultants, Inc., 2003				Source: Paragon Engineering Consultants Sewer Capacity Study, 2016. Pipe, rim and invert elevations are based on an As-built survey by Red Rock Land Surveys dated 08/02/2016				
Pipe Label	Pipe Capacity (GPD)	Total Design Flow (GPD)	Excess Design Capacity (GPD)	As-Built Pipe Capacity (GPD)	Total Existing Design Flow (GPD)	Excess Existing Design Capacity (GPD)	Excess Number of Multifamily Units (557.6 GPD/Unit) (GPD)	Comments
P-12	583,738	-	583,738	582,978	0	582,978	1,046	As-Built
P-1	640,439	137,170	503,269	544,199	86,986	457,213	820	As-Built
P-2	587,345	137,170	450,175	833,103	86,986	746,117	1,338	As-Built
P-3	1,019,916	137,170	882,746	939,098	86,986	852,112	1,528	As-Built
P-4	1,003,664	184,008	819,656	927,465	133,824	793,640	1,423	As-Built
P-5	920,193	230,847	689,347	806,604	180,663	625,941	1,123	As-Built
P5-A	N/A	N/A	N/A	849,907	180,663	669,244	1,200	As-Built
P-6	863,360	304,450	558,910	765,239	254,266	510,973	916	As-Built
P-7	1,781,944	304,450	1,477,494	1,650,047	254,266	1,395,781	2,503	As-Built
P-8	1,794,534	304,450	1,490,084	1,578,952	254,266	1,324,686	2,376	As-Built
P-9	1,432,234	818,779	613,456	1,612,561	768,595	843,966	1,514	As-Built
P-10	1,593,355	818,779	774,577	1,327,535	768,595	558,940	1,002	As-Built
P-11	1,661,150	835,753	825,398	2,349,362	785,569	1,563,793	2,805	As-Built
P-16	5,509,633	835,753	4,673,880	4,719,406	785,569	3,933,837	7,055	As-Built
P-17	5,509,633	835,753	4,673,880	5,602,921	785,569	4,817,353	8,639	As-Built
P-1 Proposed				973,353	86,986	886,367	1,590	
P-5 Proposed				1,441,933	180,663	1,261,270	2,262	
P-5A Proposed				1,534,356	180,663	1,353,694	2,428	
P-6 Proposed				1,367,607	254,266	1,113,341	1,997	
P-10 Proposed				2,373,922	768,595	1,605,327	2,879	

Channel Report

Hampden Town Center Pipe P-1

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 45.10

Slope (%) = 0.41

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 0.842

Area (sqft) = 0.28

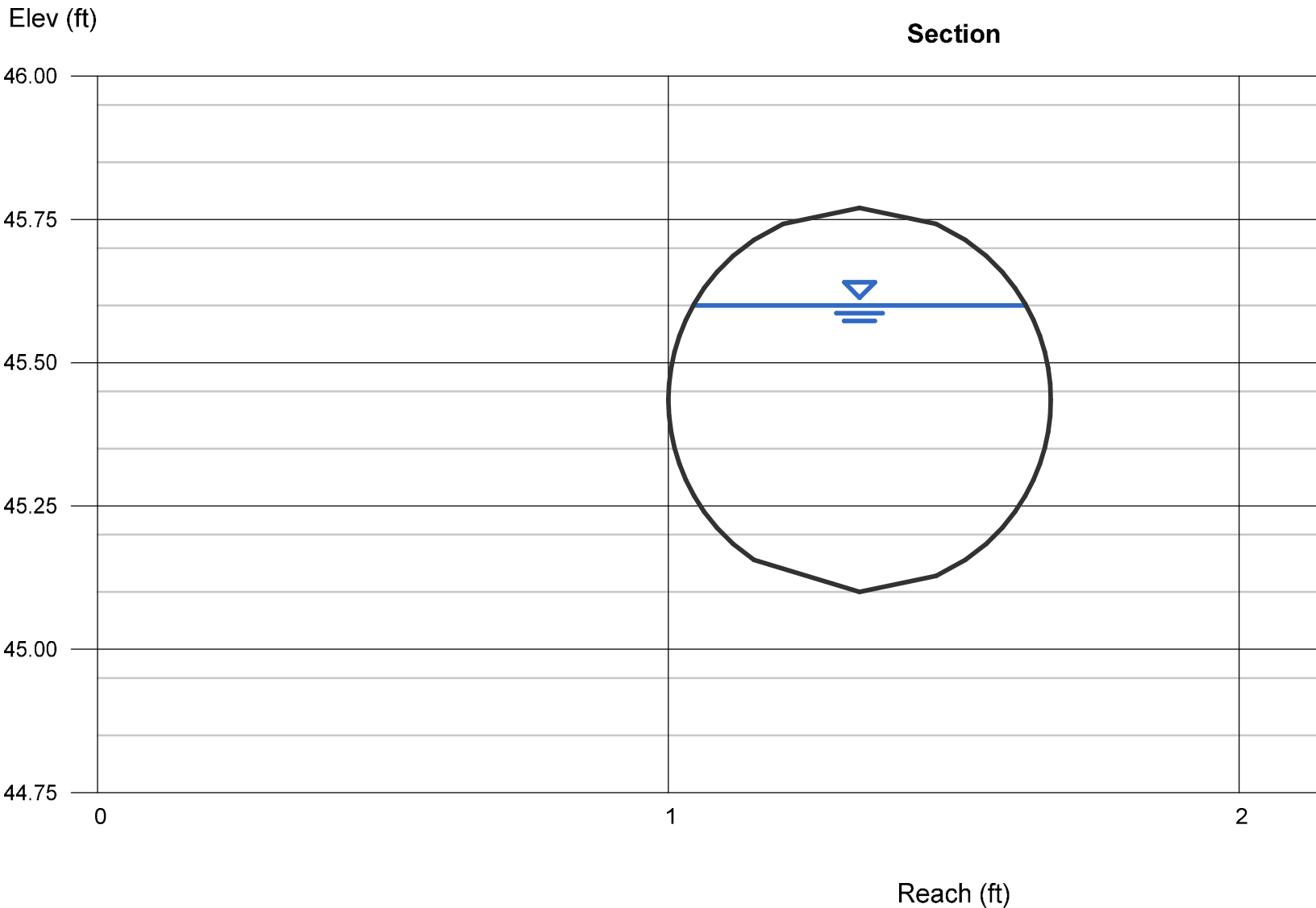
Velocity (ft/s) = 2.98

Wetted Perim (ft) = 1.40

Crit Depth, Yc (ft) = 0.44

Top Width (ft) = 0.58

EGL (ft) = 0.64



Channel Report

Hampden Town Center Pipe P-1 Proposed

Circular

Diameter (ft) = 0.83

Invert Elev (ft) = 45.10

Slope (%) = 0.41

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.63

Highlighted

Depth (ft) = 0.63

Q (cfs) = 1.520

Area (sqft) = 0.44

Velocity (ft/s) = 3.44

Wetted Perim (ft) = 1.76

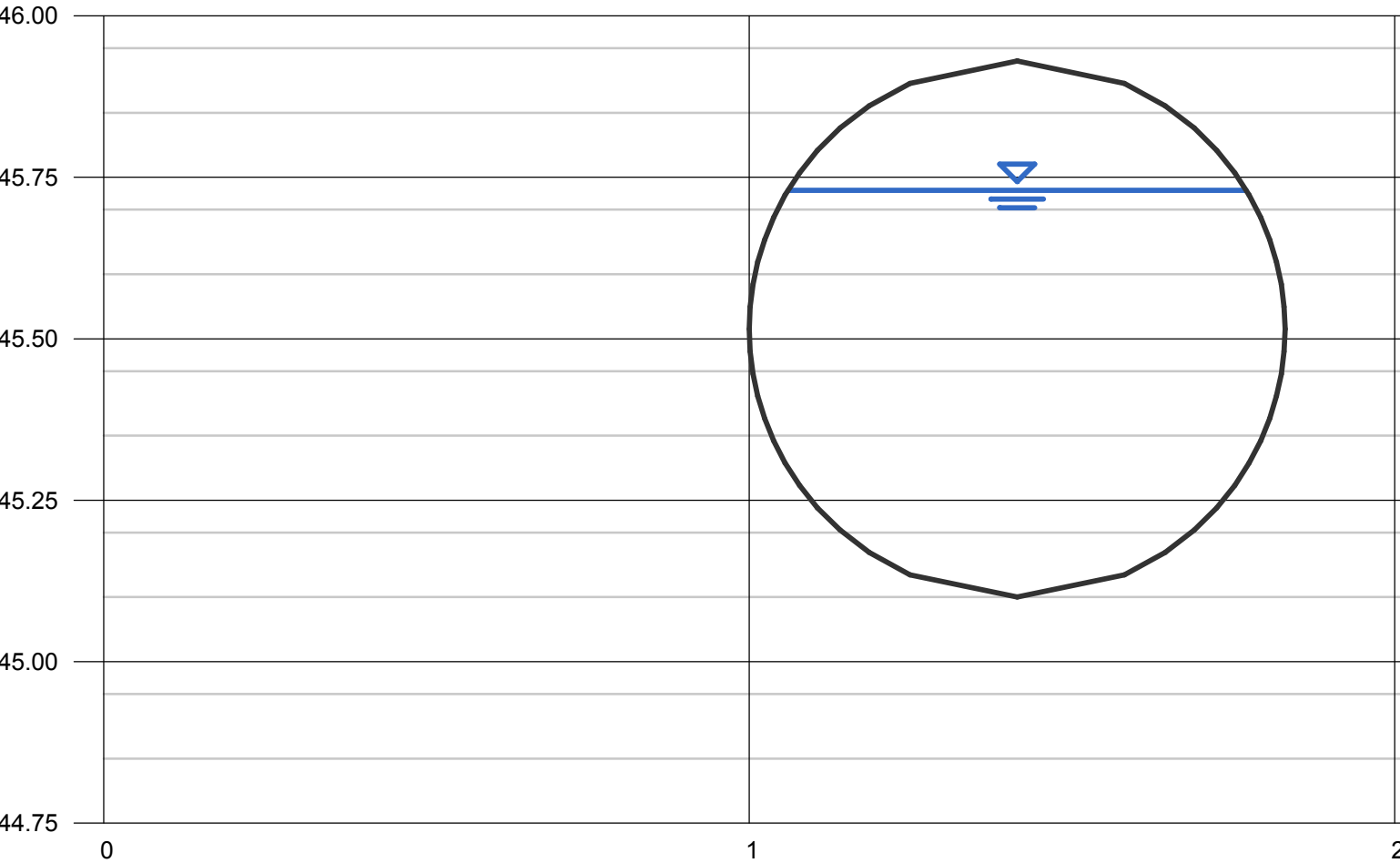
Crit Depth, Yc (ft) = 0.56

Top Width (ft) = 0.71

EGL (ft) = 0.81

Elev (ft)

Section



Reach (ft)

Channel Report

Hampden Town Center Pipe P-2

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 43.19

Slope (%) = 0.96

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 1.289

Area (sqft) = 0.28

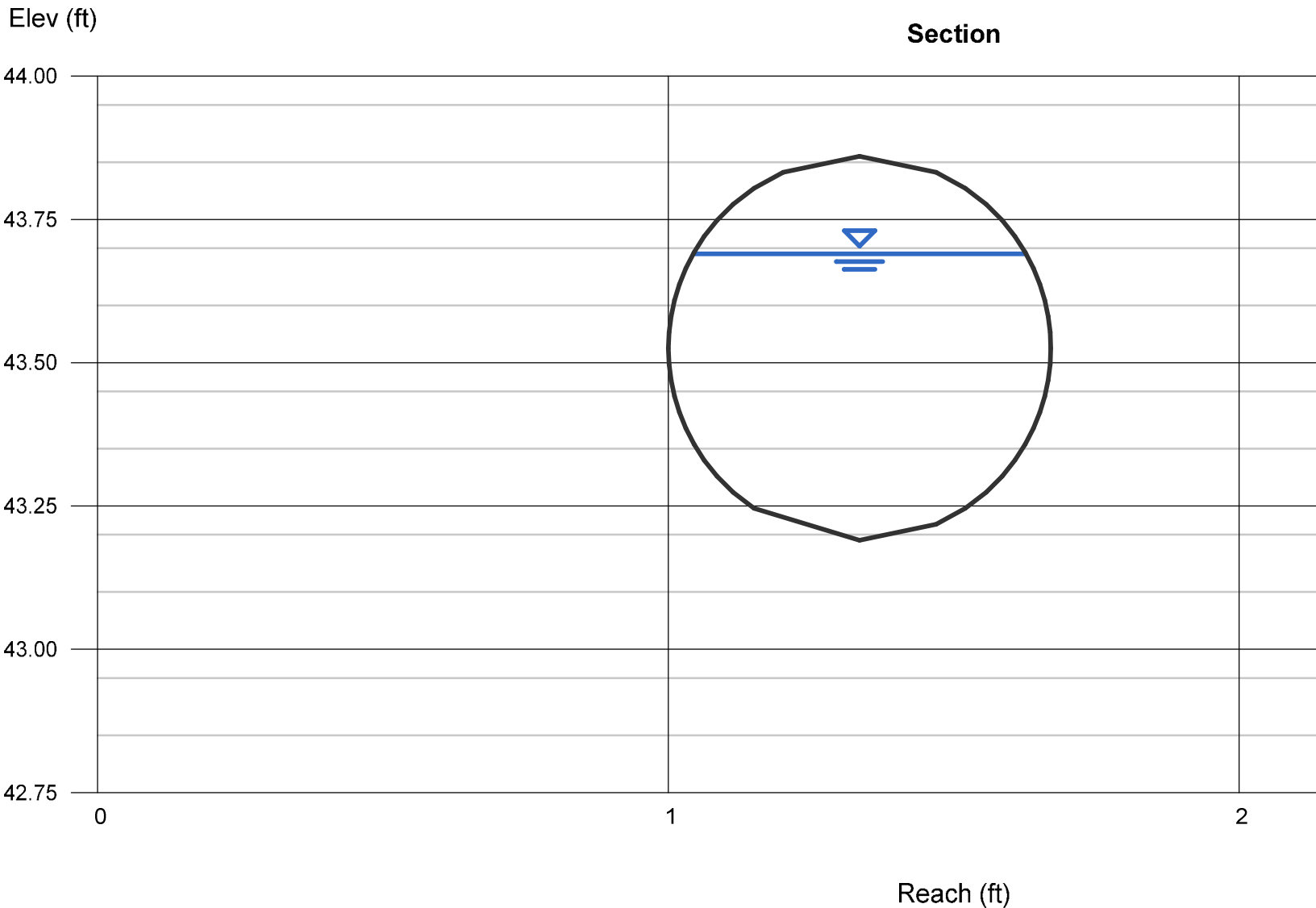
Velocity (ft/s) = 4.55

Wetted Perim (ft) = 1.40

Crit Depth, Yc (ft) = 0.54

Top Width (ft) = 0.58

EGL (ft) = 0.82



Channel Report

Hampden Town Center Pipe P-3

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 42.29

Slope (%) = 1.22

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 1.453

Area (sqft) = 0.28

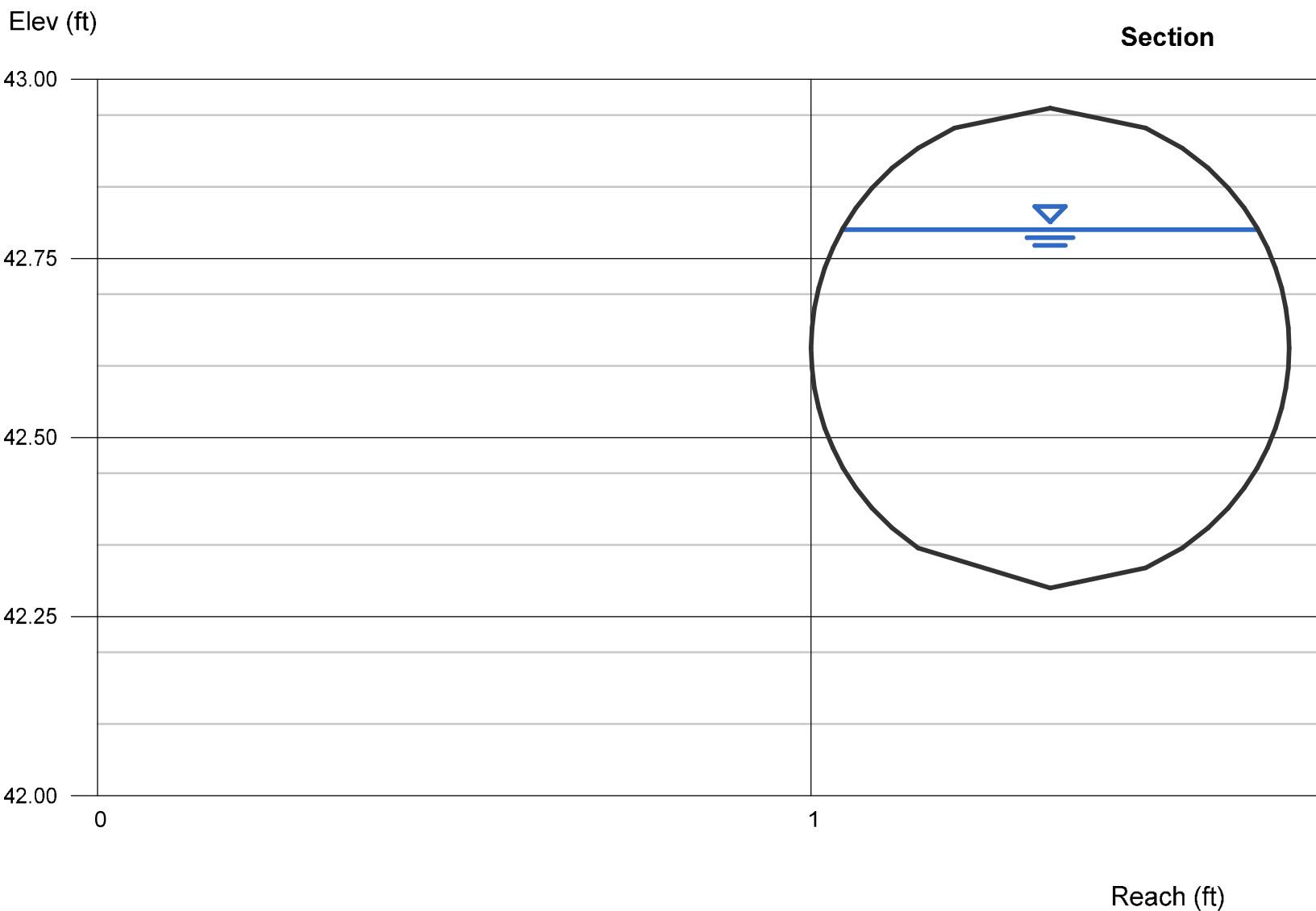
Velocity (ft/s) = 5.13

Wetted Perim (ft) = 1.40

Crit Depth, Yc (ft) = 0.57

Top Width (ft) = 0.58

EGL (ft) = 0.91



Channel Report

Hampden Town Center Pipe P-4

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 39.06

Slope (%) = 1.19

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 1.435

Area (sqft) = 0.28

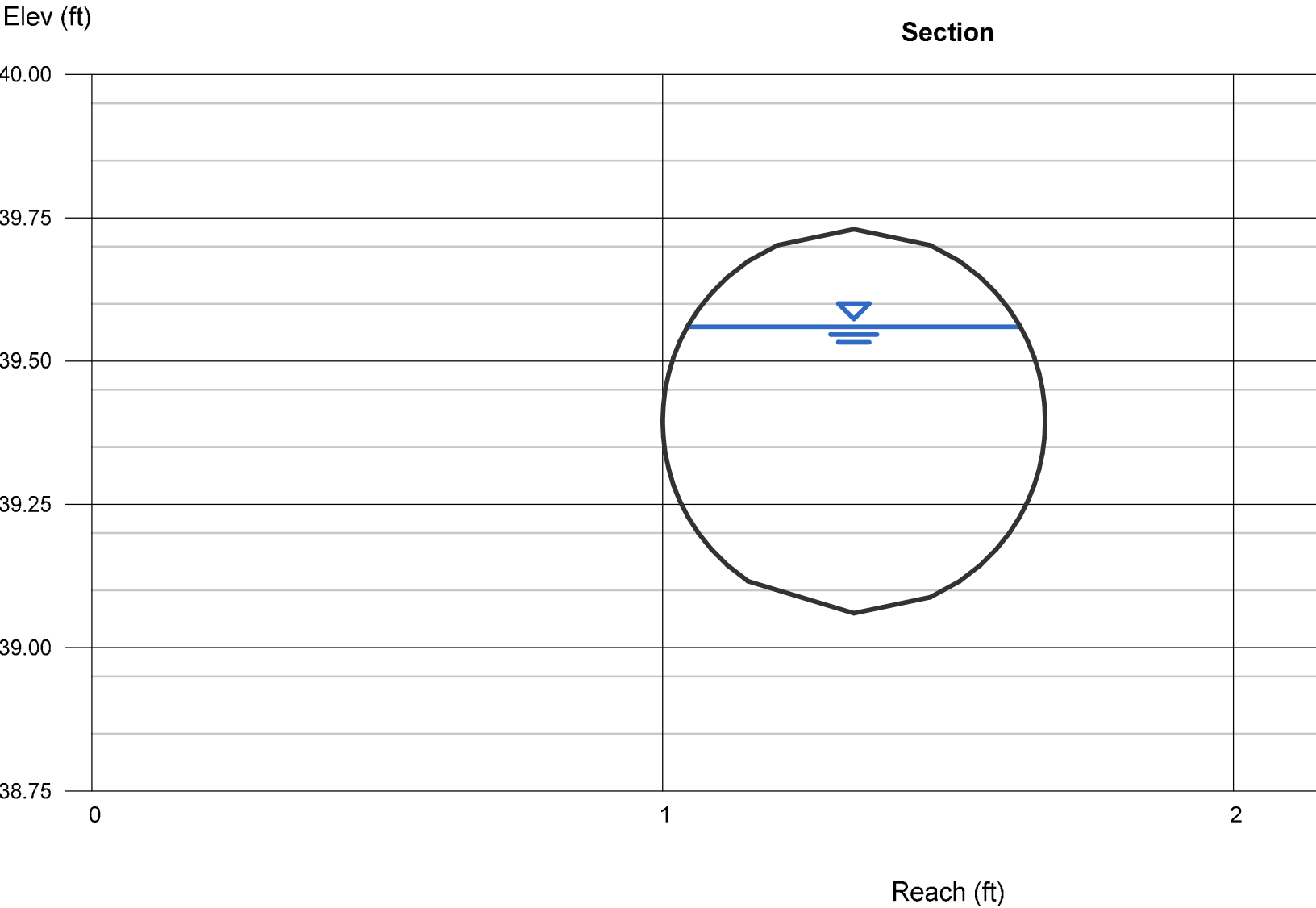
Velocity (ft/s) = 5.07

Wetted Perim (ft) = 1.40

Crit Depth, Yc (ft) = 0.57

Top Width (ft) = 0.58

EGL (ft) = 0.90



Channel Report

Hampden Town Center Pipe P-5

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 32.06

Slope (%) = 0.90

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 1.248

Area (sqft) = 0.28

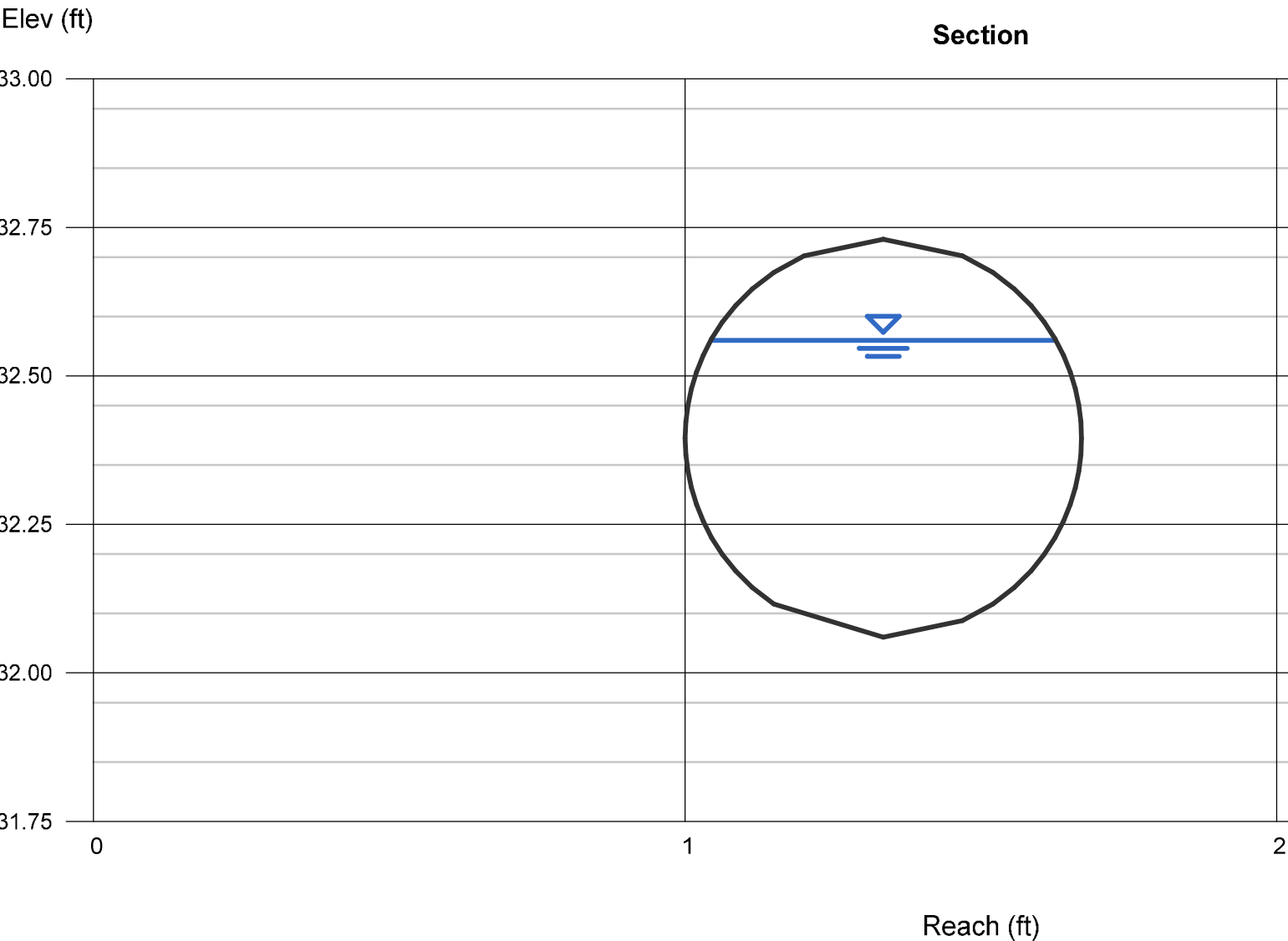
Velocity (ft/s) = 4.41

Wetted Perim (ft) = 1.40

Crit Depth, Yc (ft) = 0.53

Top Width (ft) = 0.58

EGL (ft) = 0.80



Channel Report

Hampden Town Center Pipe P-5 Proposed

Circular

Diameter (ft) = 0.83

Invert Elev (ft) = 32.06

Slope (%) = 0.90

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.63

Highlighted

Depth (ft) = 0.63

Q (cfs) = 2.252

Area (sqft) = 0.44

Velocity (ft/s) = 5.10

Wetted Perim (ft) = 1.76

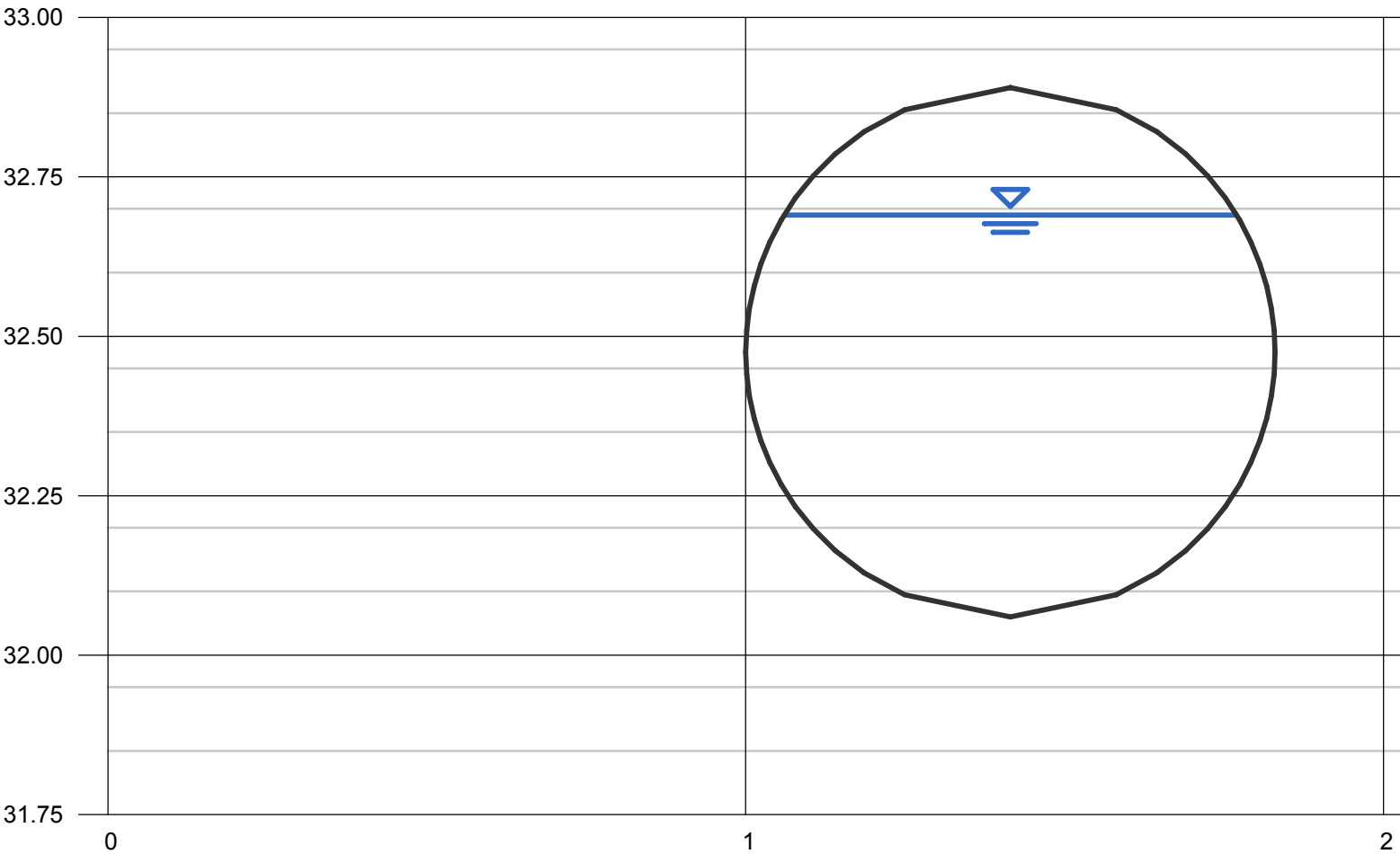
Crit Depth, Yc (ft) = 0.68

Top Width (ft) = 0.71

EGL (ft) = 1.03

Elev (ft)

Section



Reach (ft)

Channel Report

Hampden Town Center Pipe P-5A Proposed

Circular

Diameter (ft) = 0.83

Invert Elev (ft) = 30.63

Slope (%) = 1.00

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.63

Highlighted

Depth (ft) = 0.63

Q (cfs) = 2.351

Area (sqft) = 0.44

Velocity (ft/s) = 5.37

Wetted Perim (ft) = 1.75

Crit Depth, Yc (ft) = 0.69

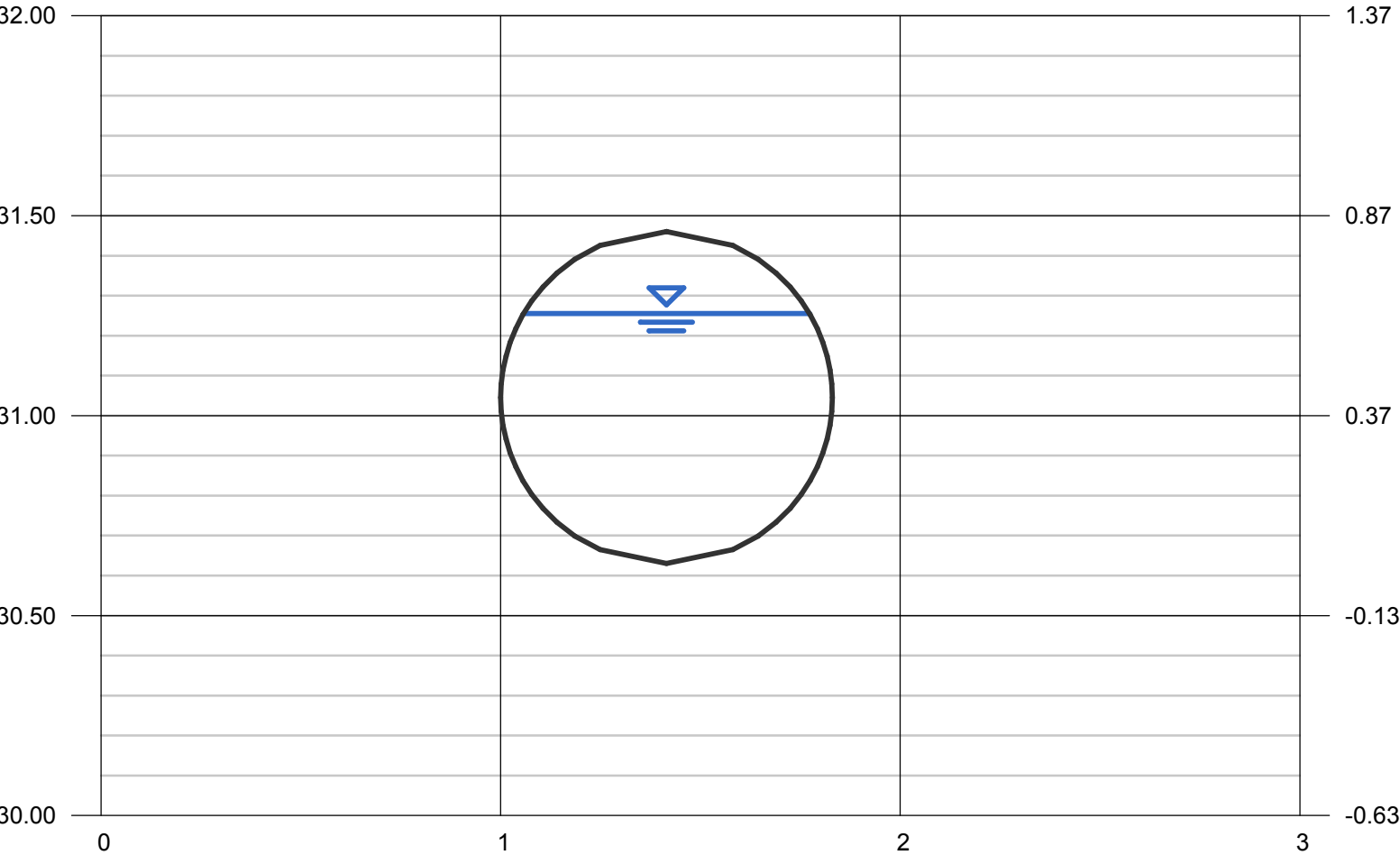
Top Width (ft) = 0.71

EGL (ft) = 1.07

Elev (ft)

Section

Depth (ft)



Reach (ft)

Channel Report

Hampden Town Center Pipe P-6

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 29.25

Slope (%) = 0.81

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 1.184

Area (sqft) = 0.28

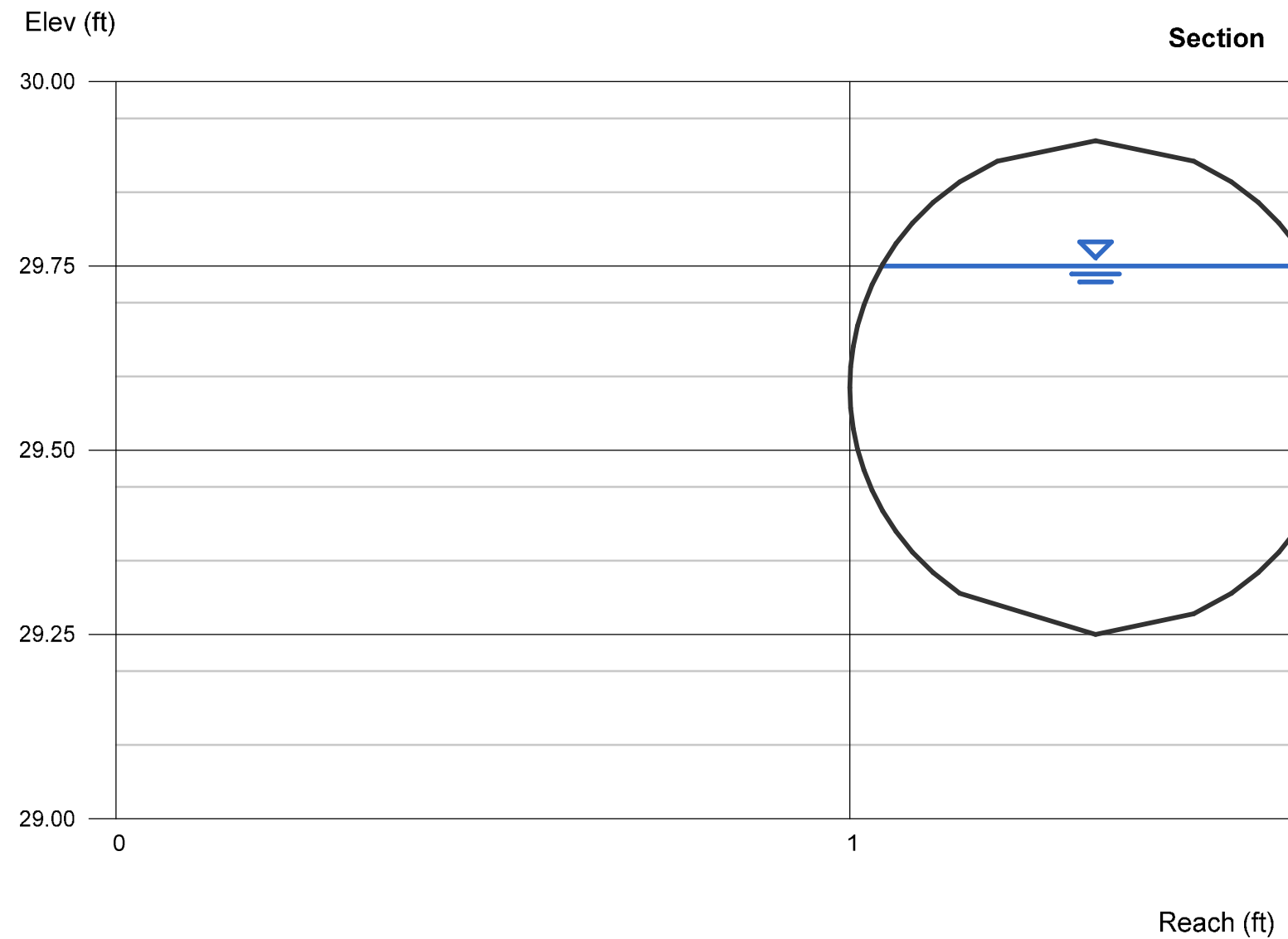
Velocity (ft/s) = 4.18

Wetted Perim (ft) = 1.40

Crit Depth, Yc (ft) = 0.52

Top Width (ft) = 0.58

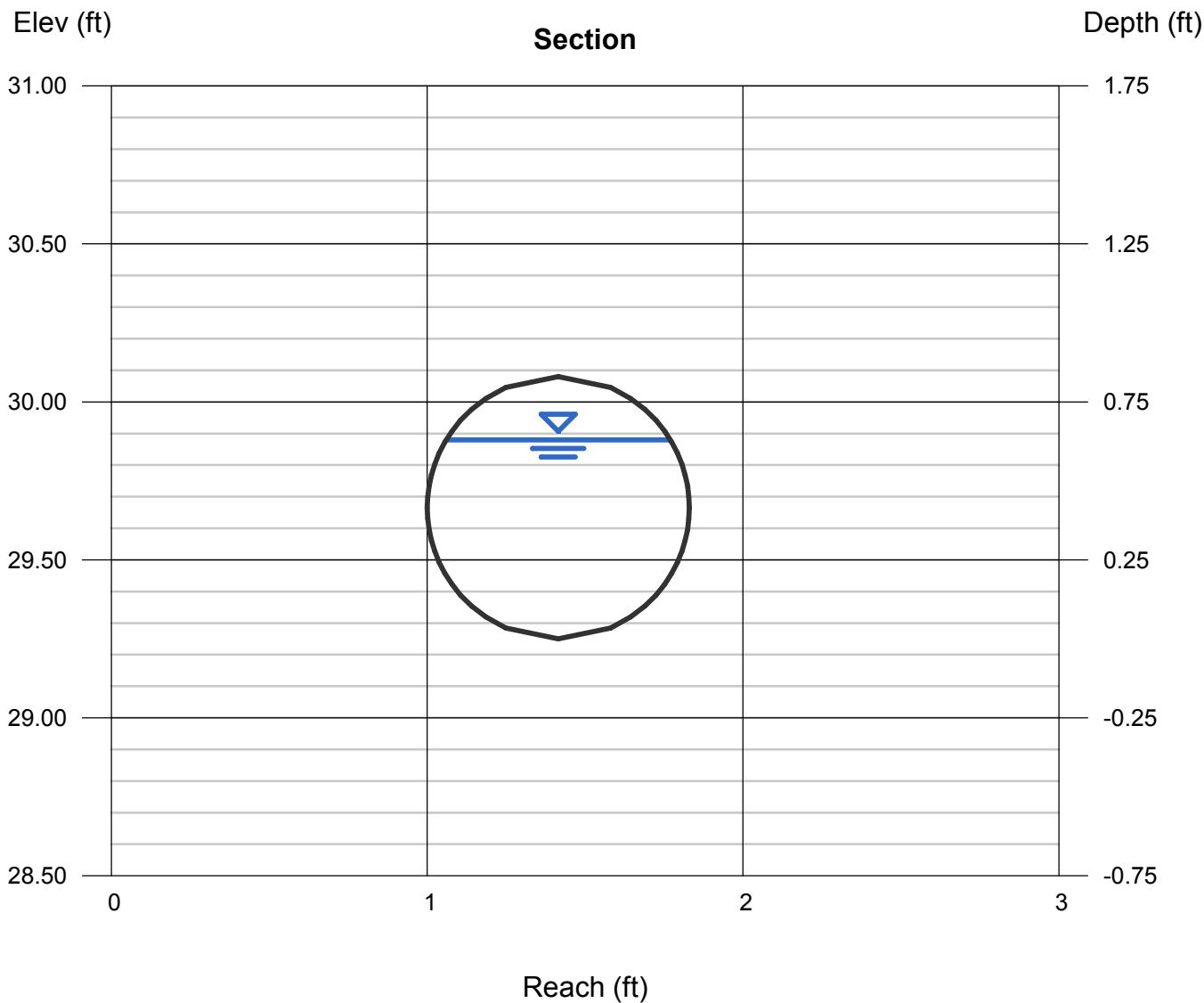
EGL (ft) = 0.77



Channel Report

Hampden Town Center Pipe P-6 Proposed

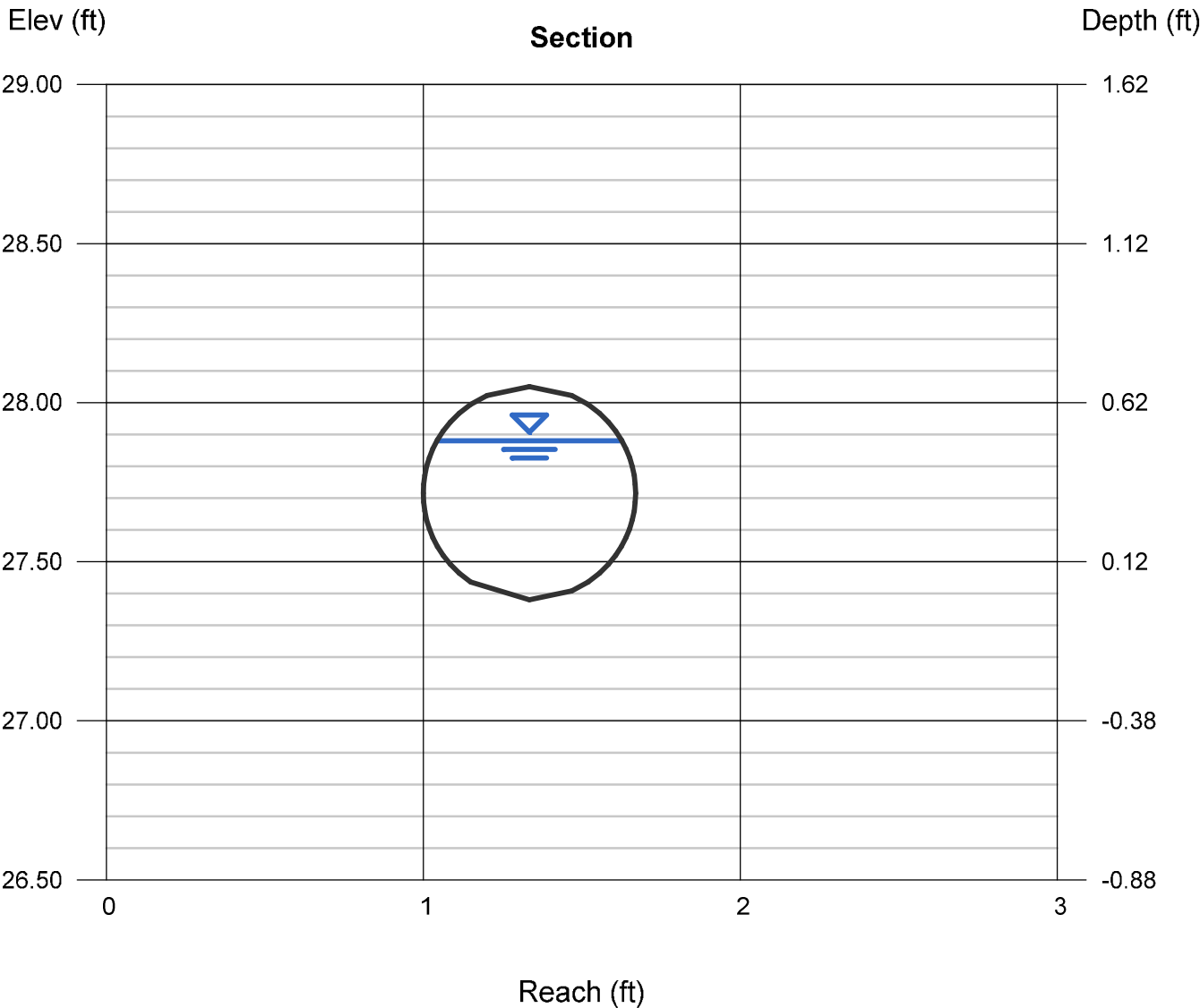
Circular		Highlighted	
Diameter (ft)	= 0.83	Depth (ft)	= 0.63
		Q (cfs)	= 2.137
		Area (sqft)	= 0.44
Invert Elev (ft)	= 29.25	Velocity (ft/s)	= 4.84
Slope (%)	= 0.81	Wetted Perim (ft)	= 1.76
N-Value	= 0.011	Crit Depth, Yc (ft)	= 0.66
		Top Width (ft)	= 0.71
		EGL (ft)	= 0.99
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.63		



Channel Report

Hampden Town Center Pipe P-7

Circular		Highlighted	
Diameter (ft)	= 0.67	Depth (ft)	= 0.50
		Q (cfs)	= 2.553
		Area (sqft)	= 0.28
Invert Elev (ft)	= 27.38	Velocity (ft/s)	= 9.03
Slope (%)	= 3.77	Wetted Perim (ft)	= 1.40
N-Value	= 0.011	Crit Depth, Yc (ft)	= 0.66
		Top Width (ft)	= 0.58
		EGL (ft)	= 1.77
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.50		



Channel Report

Hampden Town Center Pipe P-8

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 19.52

Slope (%) = 3.45

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 2.443

Area (sqft) = 0.28

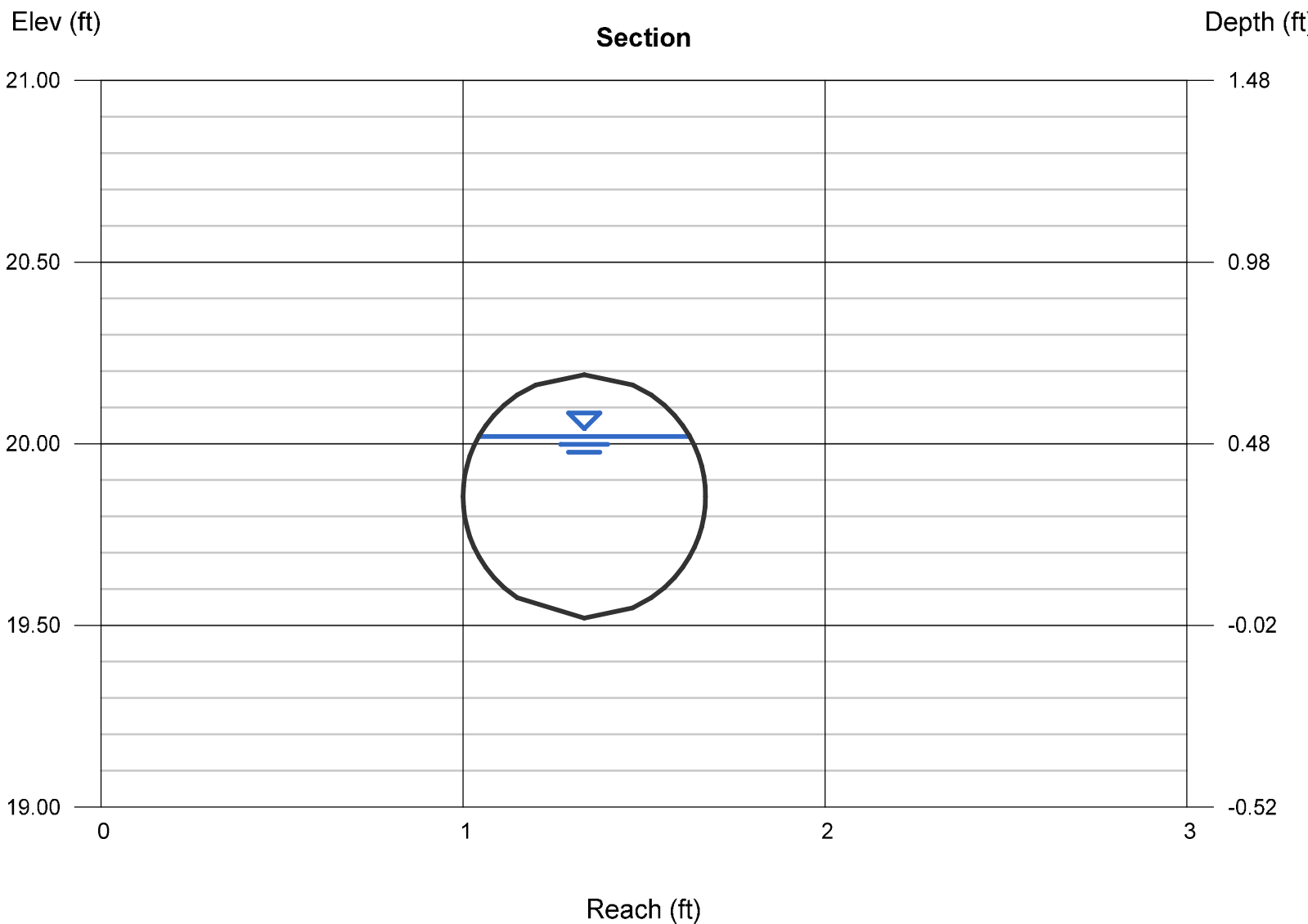
Velocity (ft/s) = 8.63

Wetted Perim (ft) = 1.40

Crit Depth, Yc (ft) = 0.65

Top Width (ft) = 0.58

EGL (ft) = 1.66



Channel Report

Hampden Town Center Pipe P-9

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 17.80

Slope (%) = 3.60

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 2.495

Area (sqft) = 0.28

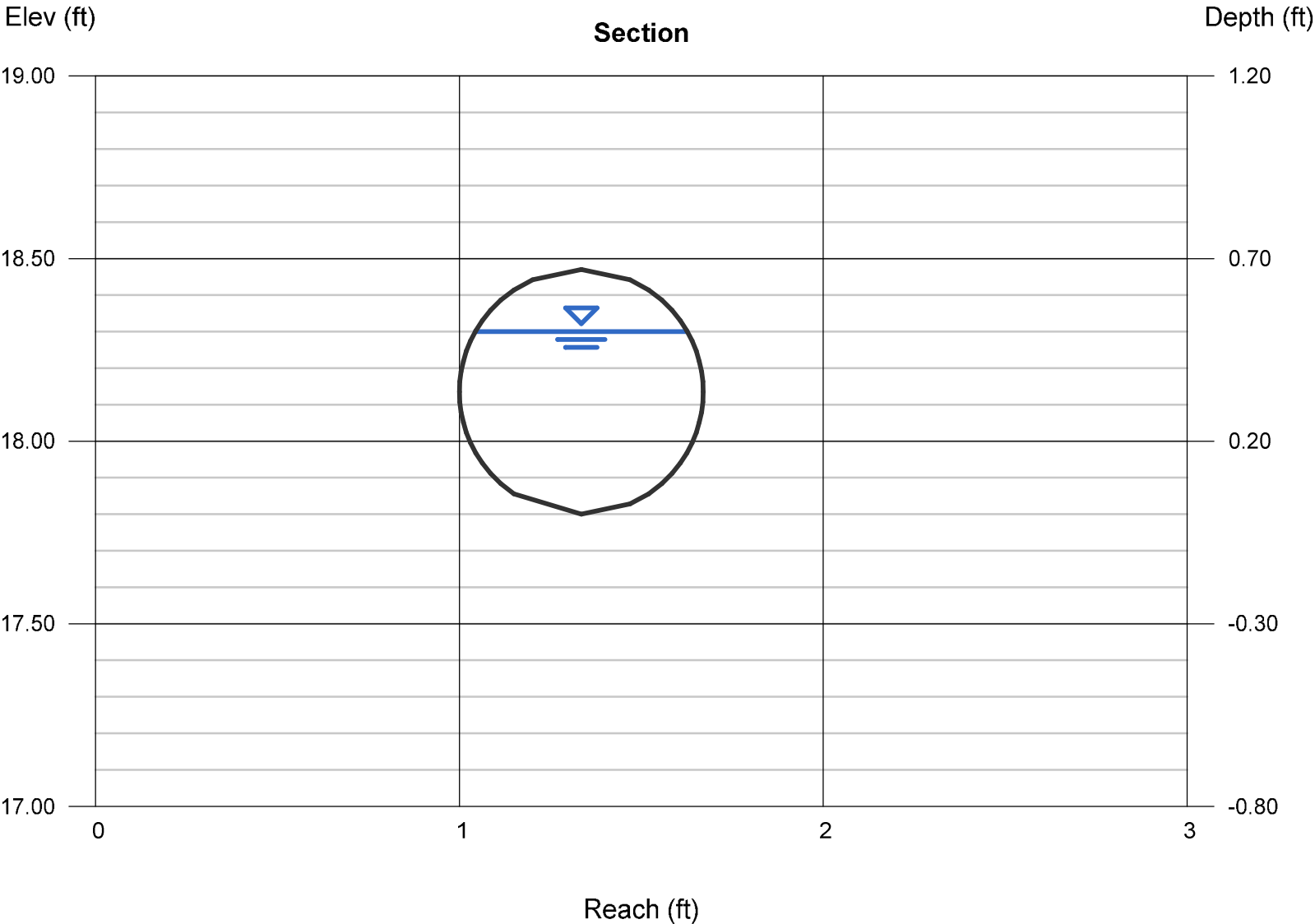
Velocity (ft/s) = 8.82

Wetted Perim (ft) = 1.40

Crit Depth, Yc (ft) = 0.66

Top Width (ft) = 0.58

EGL (ft) = 1.71



Channel Report

Hampden Town Center Pipe P-10

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 13.03

Slope (%) = 2.44

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 2.054

Area (sqft) = 0.28

Velocity (ft/s) = 7.26

Wetted Perim (ft) = 1.40

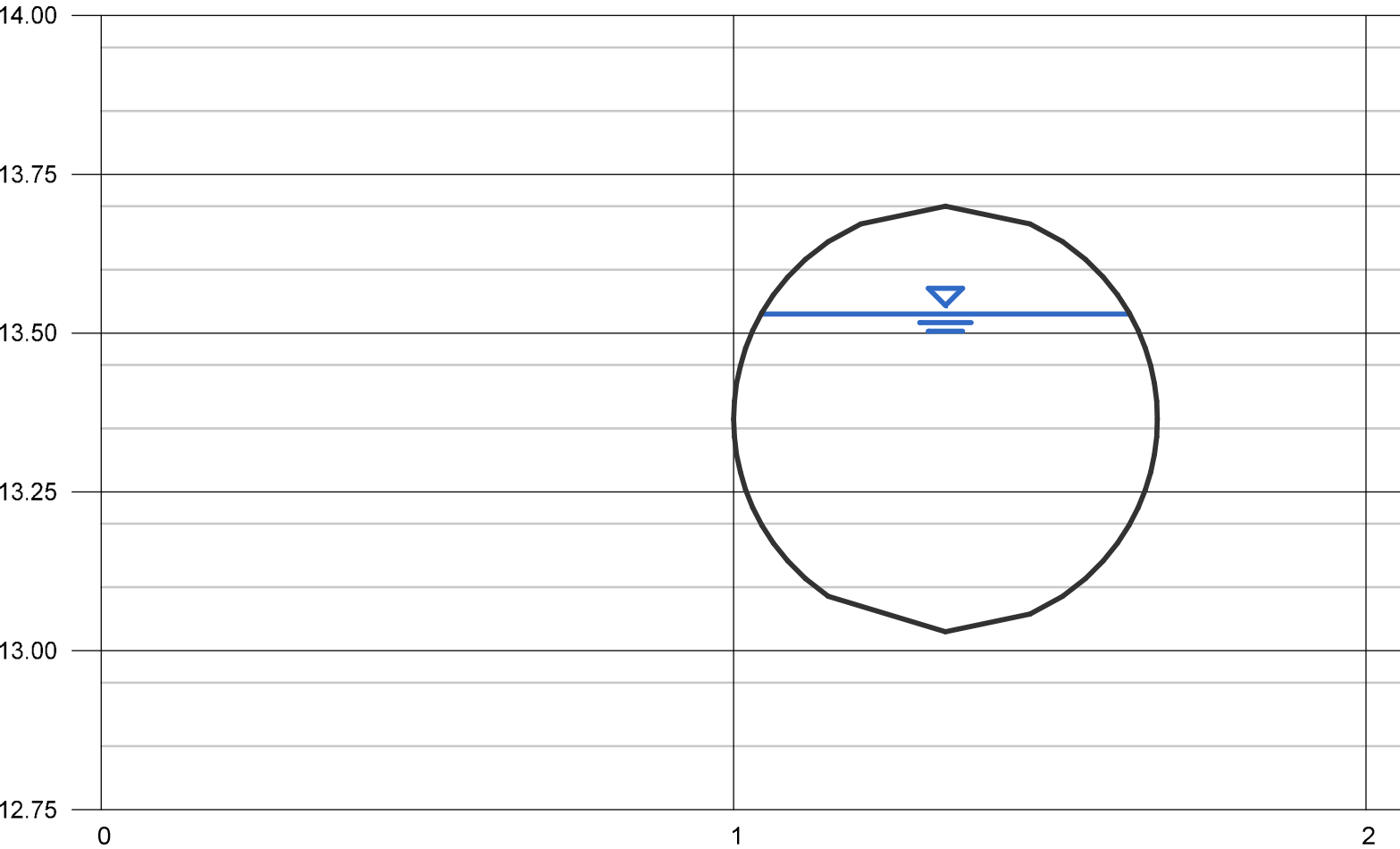
Crit Depth, Yc (ft) = 0.64

Top Width (ft) = 0.58

EGL (ft) = 1.32

Elev (ft)

Section



Reach (ft)

Channel Report

Hampden Town Center Pipe P-10 Proposed

Circular

Diameter (ft) = 0.83

Invert Elev (ft) = 13.03

Slope (%) = 2.44

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.63

Highlighted

Depth (ft) = 0.63

Q (cfs) = 3.709

Area (sqft) = 0.44

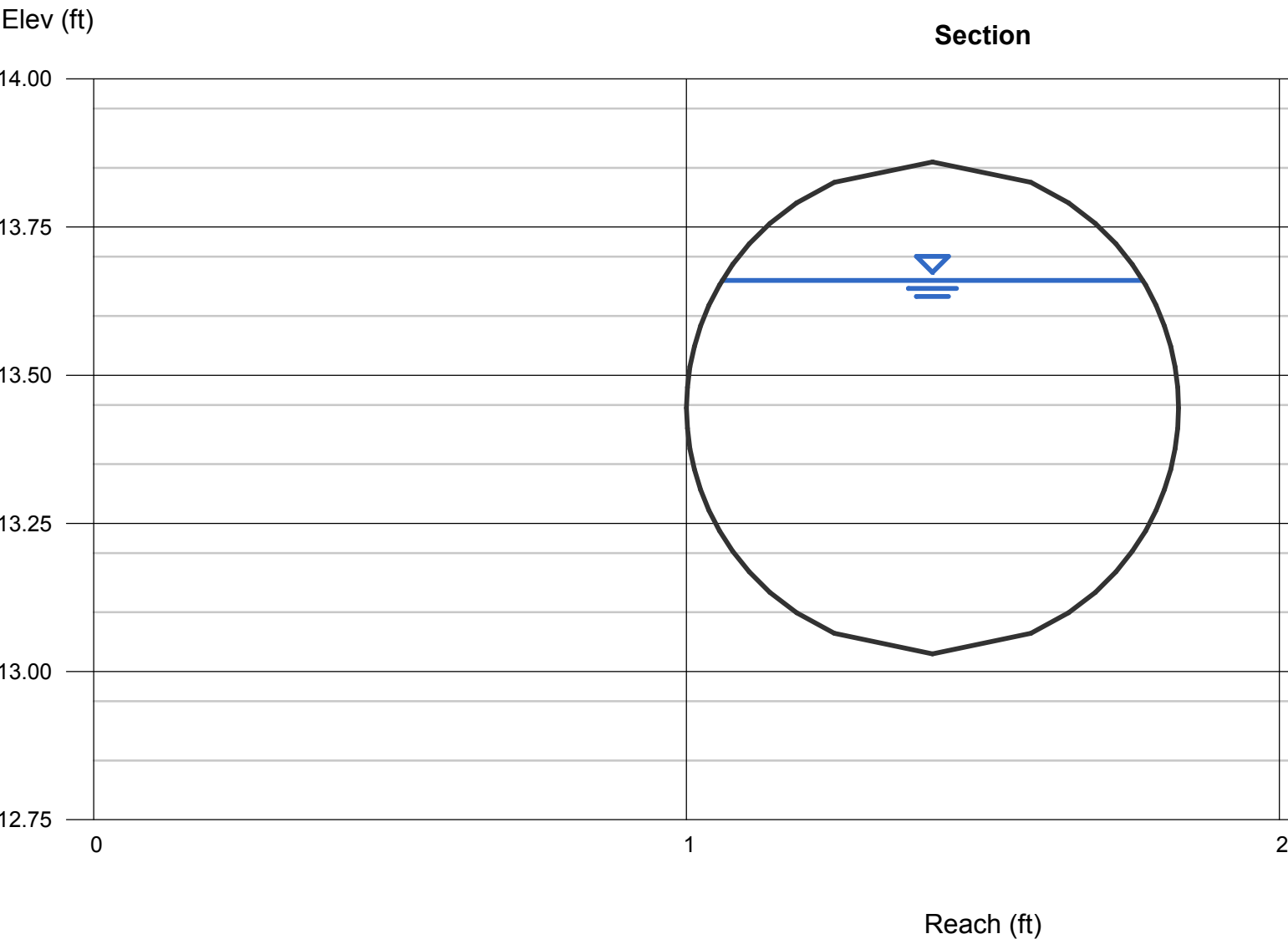
Velocity (ft/s) = 8.39

Wetted Perim (ft) = 1.76

Crit Depth, Yc (ft) = 0.80

Top Width (ft) = 0.71

EGL (ft) = 1.73



Channel Report

Hampden Town Center Pipe P-11

Circular

Diameter (ft) = 0.83

Invert Elev (ft) = 6.83

Slope (%) = 2.39

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.63

Highlighted

Depth (ft) = 0.63

Q (cfs) = 3.670

Area (sqft) = 0.44

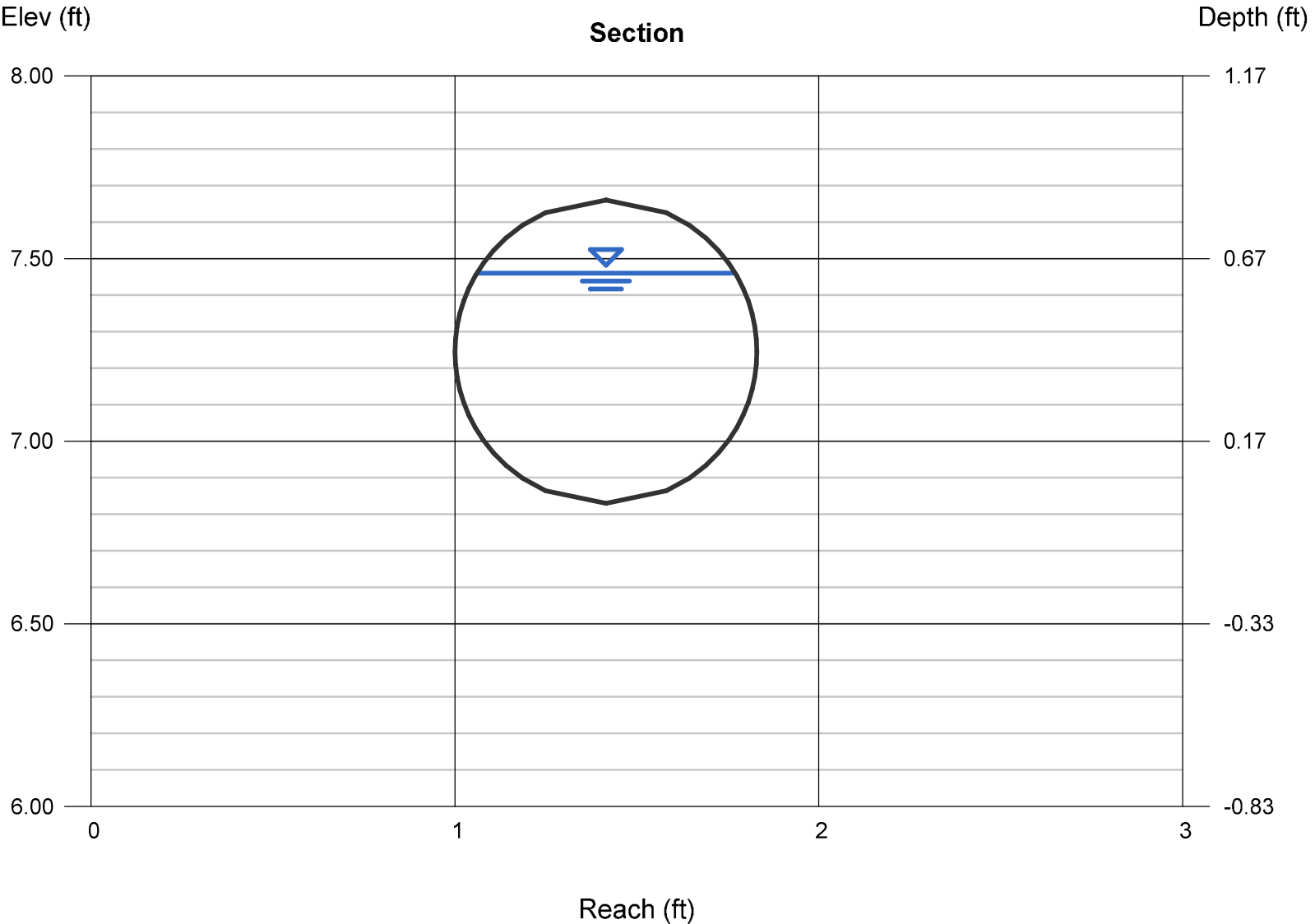
Velocity (ft/s) = 8.31

Wetted Perim (ft) = 1.76

Crit Depth, Yc (ft) = 0.79

Top Width (ft) = 0.71

EGL (ft) = 1.70



Channel Report

Hampden Town Center Pipe P-12

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 46.70

Slope (%) = 0.47

N-Value = 0.011

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 0.902

Area (sqft) = 0.28

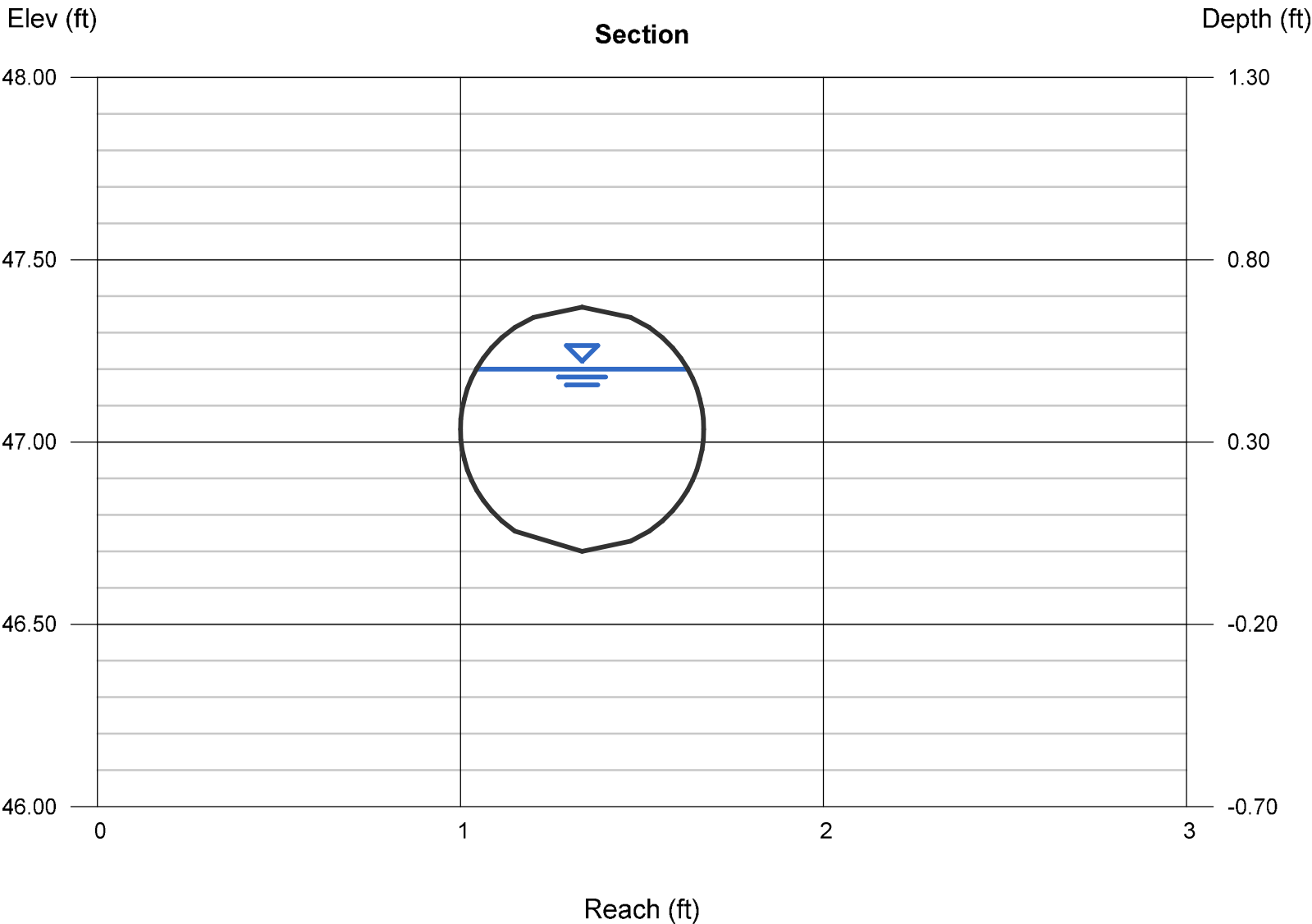
Velocity (ft/s) = 3.19

Wetted Perim (ft) = 1.40

Crit Depth, Yc (ft) = 0.45

Top Width (ft) = 0.58

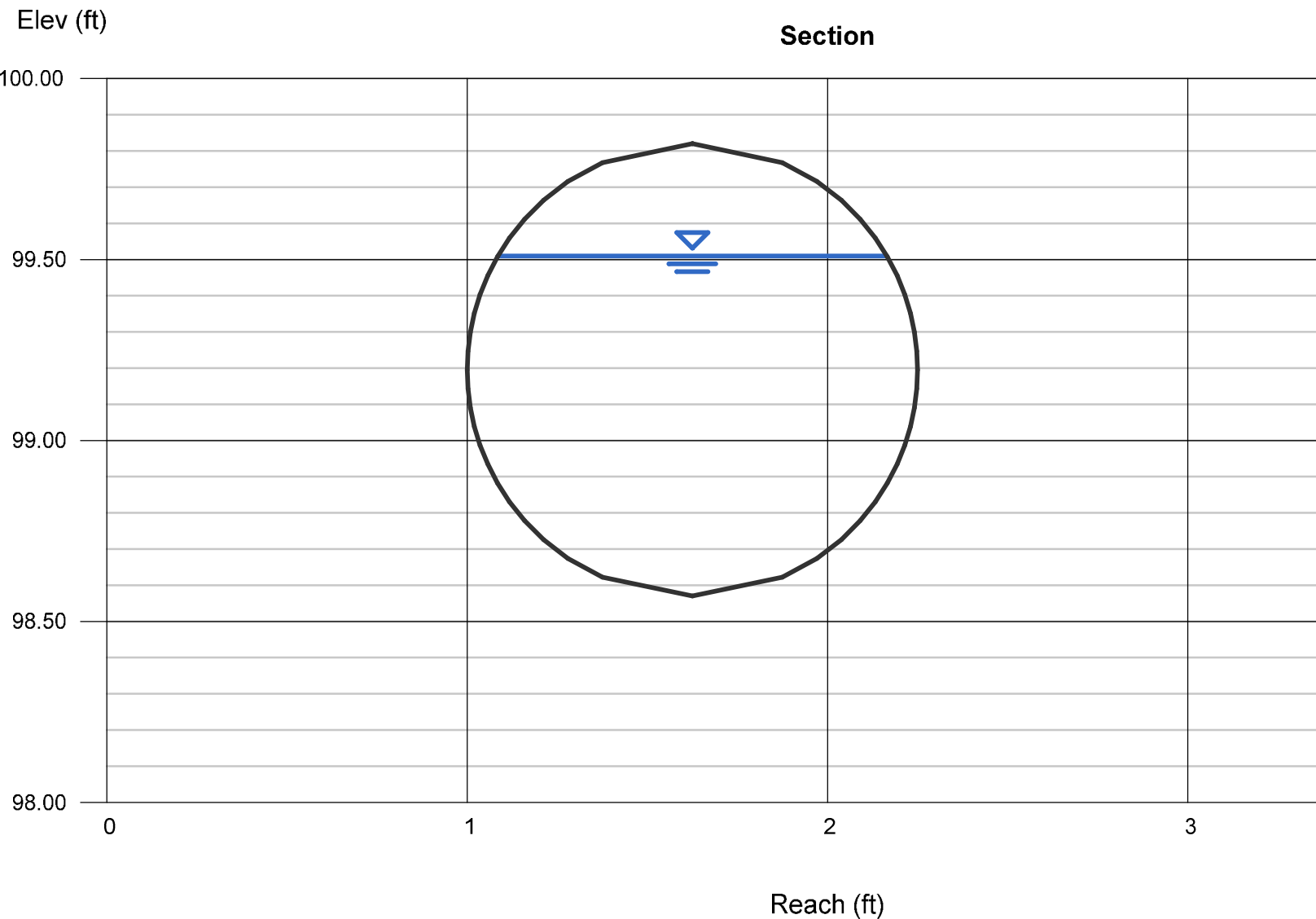
EGL (ft) = 0.66



Channel Report

Hampden Town Center Pipe P-16

Circular		Highlighted	
Diameter (ft)	= 1.25	Depth (ft)	= 0.94
		Q (cfs)	= 7.326
		Area (sqft)	= 0.99
Invert Elev (ft)	= 98.57	Velocity (ft/s)	= 7.40
Slope (%)	= 1.10	Wetted Perim (ft)	= 2.63
N-Value	= 0.011	Crit Depth, Yc (ft)	= 1.08
		Top Width (ft)	= 1.08
		EGL (ft)	= 1.79
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.94		



Channel Report

Hampden Town Center Pipe P-17

Circular		Highlighted	
Diameter (ft)	= 1.25	Depth (ft)	= 0.94
		Q (cfs)	= 8.669
		Area (sqft)	= 0.99
Invert Elev (ft)	= 90.23	Velocity (ft/s)	= 8.75
Slope (%)	= 1.54	Wetted Perim (ft)	= 2.63
N-Value	= 0.011	Crit Depth, Yc (ft)	= 1.15
		Top Width (ft)	= 1.08
		EGL (ft)	= 2.13
Calculations			
Compute by:	Known Depth		
Known Depth (ft)	= 0.94		

