

# HARMONY – PHASE 5

## MASTER UTILITY STUDY AMENDMENT

### AURORA, COLORADO

Prepared for:

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Prepared by:

APPROVED FOR ONE YEAR FROM THIS DATE \_\_\_\_\_

City Engineer Date

Water Department

Date

Fire Department

Date

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Preparation Date:  
January 13, 2023

#### ENGINEER'S STATEMENT:

This utility study "Harmony – Master Utility Conformance Letter" was prepared under my direct supervision in accordance with the provisions of the City of Aurora Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure. I understand that the City of Aurora does not and will not assume liability for facilities designed by others.



*Brian P. Wilson*

1/20/2023

Date

Brian P. Wilson, P.E. 0050067  
Westwood Professional Services

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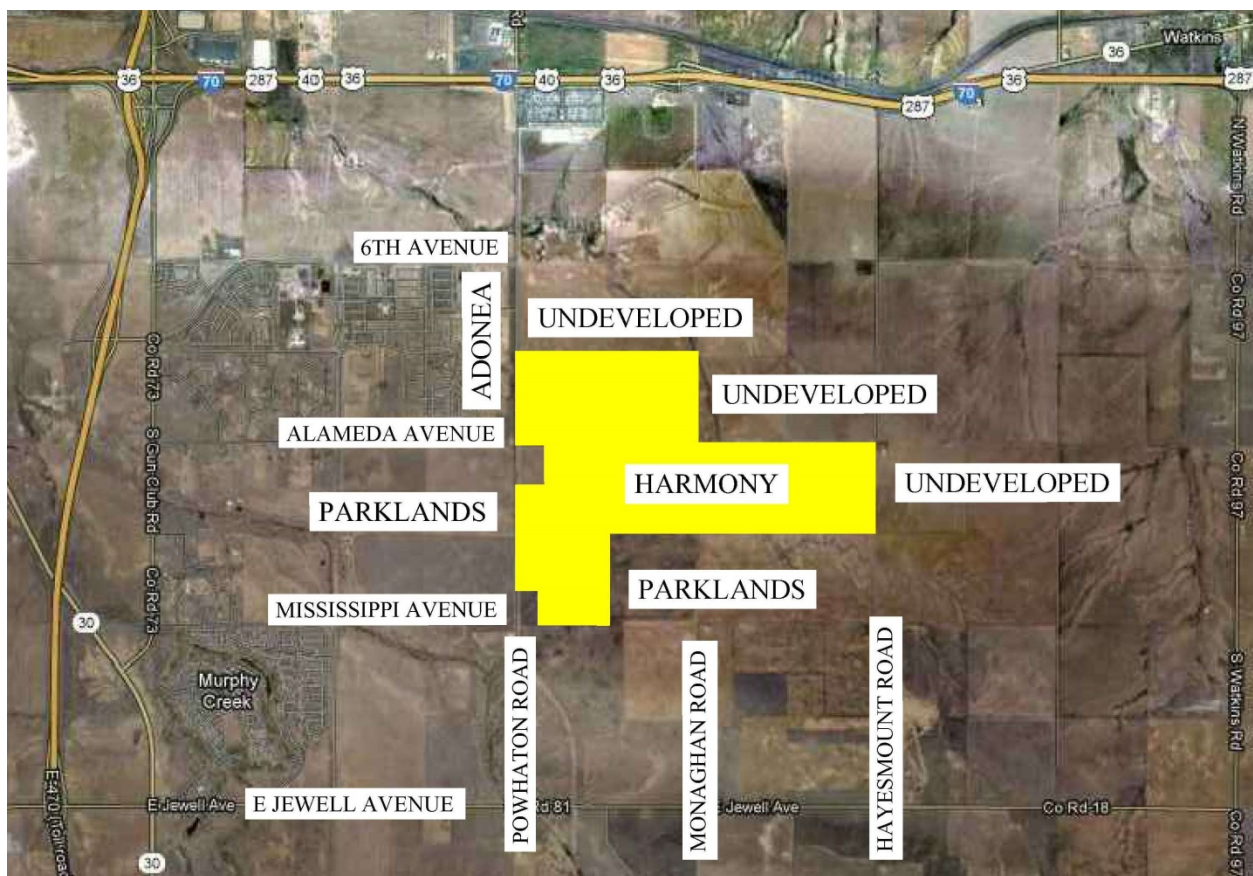
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# INTRODUCTION

## GENERAL DESCRIPTION & LOCATION

Harmony CSP 5 Filing 15 contains a total of approximately 167 acres and is solely residential with development to include 359 detached single-family units (SFD). The Harmony development is located in the southern 1/2 of Section 9, the southwest, northwest, and northeast 1/4 of Section 16, and the northern 1/2 of Section 15, Township 4 South, Range 65 West of the 6<sup>th</sup> Principal Meridian, in the City of Aurora, Colorado. Harmony CSP 5 Filing 15 is bound on the north by Exposition Ave, to the south by future Powhatan Road, to the east by future South Trussville Street, and to the west by existing Powhatan Road. *Parklands (formerly Eastern Hills)* is located east, south, and west of the proposed development, and is currently in the conceptual/preliminary planning stage. Figure-1 clearly depicts the overall Harmony project in context to the surrounding roadways and known developments.



**Figure 1**  
**Location Map**

## SCOPE OF WORK

The purpose of this Master Utility Report Amendment is to amend the approved “Master Utility Report” (Ref. 1) for Harmony prepared by CVL Consultants to the current proposed layout. The calculations in the Master Utility Report assumed a larger population and therefore computed higher peak daily flow and max hour demand values. The report has now been updated for the planned unit count and residence types. The proposed water and sewer system must meet the criteria set forth by the guidelines of the *Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure* (Ref. 2) manual prepared by the City of Aurora (COA). Westwood will work in conjunction with the client and the COA to ensure that the water distribution and sanitary sewer systems are compatible with existing facilities and planned development.

## TOPOGRAPHIC CONDITIONS

Harmony CSP 5 is currently undeveloped land. A small southwestern portion of the site slopes from the southwest to the northwest, while the majority eastern portion generally drains to the center of the site at an existing culvert low point. The total elevation change in the southwestern portion is approximately 35 feet, dropping from 5680 feet above mean sea level (MSL) to 5645 feet above MSL. The total elevation change in the eastern portion is approximately 40 feet, dropping from 5680 feet above MSL at the southern boundary to 5640 feet above MSL at the central point of the development. From the *City of Aurora’s Water Capital Improvement Plan (CIP)*, (Ref. 3) dated February 2009, it is shown that the proposed development is entirely within pressure Zone 4. Table 1 below presents the pressures provided for Zone 4.

**Table 1 – City of Aurora Pressure Zones**

Zone	Static Hydraulic Grade Line, (ft)	Service Elevation Range, (ft)	Static Pressure Range, (psig)
Zone 4	5850	5589-5711	60-113

From the *City of Aurora Wastewater Utility Plan – Volume I: Report* (Ref. 4) the proposed development falls within the service area Subarea 2 – Environs/Eastern Prairie Developing Area and part of the First Creek drainage basin.

## WATER DISTRIBUTION SYSTEM

It is known that the proposed development is entirely within pressure Zone 4.

### DEMANDS

The following is a list of criteria used to develop the water demands for the proposed site:

- Single Family Average Day demand = 0.07 gpm/capita = 101 gpd/capita
- Single Family Max Day Factor + Fire Flow =  $2.8 \times \text{average day demand} + 1500 \text{ gpm (fire flow)}$
- Single Family Peak Hour Factor =  $4.5 \times \text{average day demand}$

Table 1a below displays the typical fire flow demands used in the system modeling.

**Table 1a – IBC 2015 Fire Flow Requirements**

Land Use	Fire Flow Demand (gpm)
Single-Family Res.	1500
Commercial	2500
Industrial	3500

All potable water will be supplied by the City of Aurora's water distribution system. The proposed Harmony CSP 5 water distribution system will connect to the COA's system in four locations, all of which are to be constructed as part of Harmony CSP4. The first location will be at the Filing 14, 12" water stub located along South Trussville Street just south of the roundabout. The second location shall be located at Filing 14, 16" water stub at the intersection of Exposition Avenue and Powhatan Road. The third and fourth locations shall be connected to existing 8" water stubs at the intersection of S Riverwood St and S Scottsburg Ct.

### WATER DEMANDS

The summary of current water demands calculated for the proposed water distribution system for Harmony CSP 5 is presented in Table 2. The summary of previous water demands calculated for the proposed water distribution system for Harmony CSP is presented in Table 3. As stated previously within this report, the demands were determined using assumptions and requirements outlined in the *Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure* (Ref. 2). The residential populations were based on 2.77 persons per single family detached dwelling unit. Average day demands were calculated using the average water demand rate. Maximum day and peak hour demands were calculated using peaking factors shown above.

**Table 2 - New Calculated Water Demand for CSP 5**

Planning Area	Area (ac.)	Residence Type	Residences	Population (Persons/SFd)	Demand (gpm/cap)	Max Population	Average Day Demand (gpm)	Max Day + Fire Flow Demand (gpm)	Max Hour Demand (gpm)
CSP 5	108.15	SFD	359	2.77	0.07	995	69.65	1,695.05	313.43
CSP 5	17.52	School					5.00	1,514.00	22.50
Total	125.67		359			995	74.65	3,209.02	335.93

**Table 3 – Master Utility Report Calculated Water Demand for CSP 5**

Planning Area	Area (ac)	Density (units/ac)	Max units	Population (Persons/SFD)	Demand (gpm/cap)	Max Population	Average Day Demand (gpm)	Max Day Demand (gpm)	Max Hour Demand (gpm)
PA-8	42.0	8.0	336	2.77	0.07	931	65.15	182.42	293.18
PA-9	37.0	8.0	37	2.77	0.07	103	7.17	20.08	32.27
PA-10	22.6	8.0	260	2.77	0.07	721	50.41	141.15	226.85
Total			633			1,755	122.73	343.65	552.30

## SANITARY SYSTEM AND FLOWS

The summary of current sanitary sewer demands calculated for the proposed sanitary sewer system for Harmony CSP 5 is presented in Table 4. The summary of previous sanitary sewer system for Harmony CSP 5 is presented in Table 5. The Harmony CSP 5 Filing 15 has a total of 359 residences, all detached single-family units. The flows from these residences will be carried by PVC pipes to two existing 8” stubs located where Exposition Avenue intersects with S Riverwood St and S Scottsburg Ct. Population estimates are based on 2.77 capita per dwelling unit for single-family units.

## WASTEWATER DESIGN CRITERIA

This section describes the design criteria incorporated in developing the wastewater collection system for Harmony. These design criteria were adopted from the *Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure* (Ref. 2):

- Population – 2.77 people per SFD/SFA/MF.
- Average Daily Flow – 68 gpcd for residential areas, 10 gpcd for schools, 4000 gallons per day/acre for commercial areas, and 5000 gallons per day for community centers, fire stations, and churches.
- Peaking Factor (PF) =  $5 \div p^{0.167}$ , where p = population in thousands and PF is no greater than 4.0 and no less than 1.7.

- The flow velocity shall not exceed ten (10) fps flowing full of ½ full using Manning’s Formula and (n=0.011 for PVC) or (n=0.013 for RCP). Minimum slope shall be 0.4% with a minimum velocity of two (2) fps at least once per day.
- Depth of flow in pipes should not exceed 75% of capacity for pipes 12 inches or smaller and 90% for pipes larger than 12 inches
- Minimum drop through a manhole from inlet to outlet or same diameter pipe shall be:
  1. 0.2 ft. on straight through run
  2. 0.3 ft. on deflected bends greater than 45 degrees
- Minimum of 4 inch diameter pipe for service lines
- Inflow & Infiltration is calculated as 10% of the Peak Daily Flow

**Table 4 - New Calculated Sanitary Sewer Demand for CSP 5**

Residence Type	Demand (gpd/cap)	Residences	Occupancy	Population (Thousands of People)	Average Day Flow (gpd)	Peaking Factor $4 > 5 \div p^{0.167} > 1.7$	Peak Daily Flow (gpd)	Inflow & Infiltration (gpd)	Peak Daily Flow w/ I&I (gpd)
SFD	68	359	2.77	0.995	67,660	4	270,640	27,064	297,704
School	10			0.688	6,880	4	27,520	2,752	30,272
Total		359		1.683	74,540		298,160	29,816	327,976

**Table 5 – Master Utility Report Calculated Sanitary Sewer Demand for CSP 5**

Planning Area	Residence Type	Demand (gpd/cap)	Residences	Occupancy	Population (Thousands of People)	Average Day Flow (gpd)	Peaking Factor $4 > 5 \div p^{0.167} > 1.7$	Peak Daily Flow (gpd)
PA-8	SFD	68	336	2.7	0.482	32,775	4	131,099
PA-9	SFD	68	296	2.7	0.540	36,730	4	146,921
PA-10	SFD	68	181	2.7	1.227	83,443	4	333,774
	Total		813		2.249	152,958		611,794

## CONCLUSION

The proposed Harmony CSP5 water system will have a smaller demand than the previously reviewed “Master Utility Report” (Ref. 1) and conforms to the *Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure* (Ref. 2). The proposed Harmony CSP5 sanitary system will serve 359 residences and will outfall to the existing sanitary sewer stubs located at Exposition Avenue. The flows for the proposed sanitary system are significantly smaller than the previously reviewed “Master Utility Report” (Ref. 1) and conforms to the *Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure* (Ref. 2).

## REFERENCES

1. **Master Utility Report**, CVL Consultants, June 1, 2016.
2. **Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure**, City of Aurora, January 2012.
3. **Treated Water Distribution System 2025 Capital Improvement Plan**, City of Aurora, February 2009.
4. **City of Aurora Wastewater Utility Plan – Volume I: Report**, Camp Dresser & McKee, Inc., January 15, 2003.

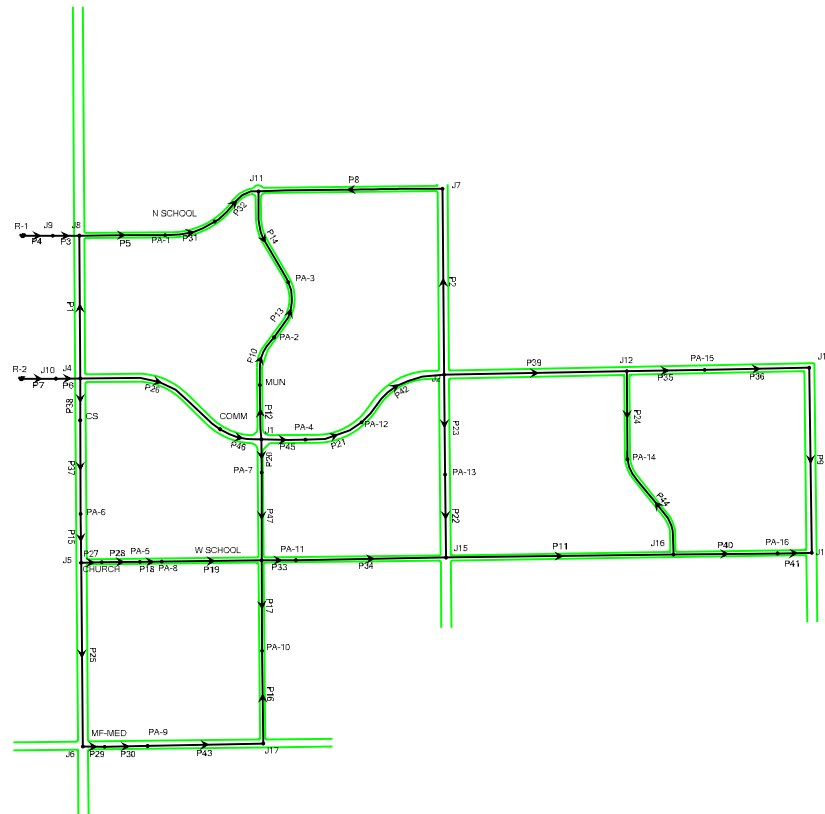
## **Appendix A**

Water Distribution Demands and WaterGEMS Results

# WATER SYSTEM SCHEMATIC



# HARMONY



## WATER DEMANDS

**HARMONY**  
**Master Utility Report**  
**Water Demand Calculations**

Land Use	Avg. Day (gpm/cap)	Max Day (gpm/cap)	Max Hour (gpm/cap)	Occupancy	Density (units/ac)
SINGLE FAMILY	0.11	2.8:1 of Avg	4.5:1 of Avg	3.20	8.0
SINGLE FAMILY-Attach	0.11	2.8:1 of Avg	4.5:1 of Avg	2.10	11.0
Multi Family - MEDIUM	0.11	2.8:1 of Avg	4.5:1 of Avg	1.70	15.0
Multi Family - LARGE	0.11	2.8:1 of Avg	4.5:1 of Avg	1.70	11.0

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
CHURCH	1.00	4.00	10.00

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
REC. CENTER	5.00	12.60	16.10

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
SCHOOL	5.00	12.60	16.10

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
COMMERCIAL	22.66	72.52	95.19

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
FIRE STATION	5.00	12.60	16.10

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
COMMUNITY CENTER	5.00	12.60	16.10

Label	Description	Area (ac)	Max Units**	Density (units/ac)	Occupancy (persons/unit)	Max Population	Avg. Day Demand (gpm)	Max Day Demand (gpm)	Peak Hour Demand (gpm)	Comments
PA-1	SINGLE FAMILY	12.6	101	8.0	3.20	323	35.55	99.55	159.98	
	<b>Total</b>						<b>35.55</b>	<b>99.55</b>	<b>159.98</b>	
PA-17	NORTH SCHOOL SITE	10.0				688	5.00	12.60	16.10	K-8
	<b>Total</b>						<b>5.00</b>	<b>12.60</b>	<b>16.10</b>	
PA-2	SINGLE FAMILY	107.8	862	8.0	3.20	2758	303.42	849.59	1365.41	
	<b>Total</b>						<b>303.42</b>	<b>849.59</b>	<b>1365.41</b>	
COMM	COMMUNITY CENTER	7.5					5.00	12.60	16.10	
	<b>Total</b>						<b>5.00</b>	<b>12.60</b>	<b>16.10</b>	
PA-3	SINGLE FAMILY	115.2	922	8.0	3.20	2950	324.54	908.72	1460.45	
	<b>Total</b>						<b>324.54</b>	<b>908.72</b>	<b>1460.45</b>	
PA-64	MUNICIPAL	2.8					5.00	12.60	16.10	FIRE STATION
	<b>Total</b>						<b>5.00</b>	<b>12.60</b>	<b>16.10</b>	
PA-4	SINGLE FAMILY- ATTACHED	62.0	496	8.0	2.10	1042	114.58	320.81	515.59	
	<b>Total</b>						<b>114.58</b>	<b>320.81</b>	<b>515.59</b>	
*CS	COMMERCIAL	20.0					22.66	72.52	95.19	GROCERY RELATED
	<b>Total</b>						<b>22.66</b>	<b>72.52</b>	<b>95.19</b>	
PA-5	SINGLE FAMILY	15.5	124	8.0	3.20	397	43.65	122.21	196.42	
	<b>Total</b>						<b>43.65</b>	<b>122.21</b>	<b>196.42</b>	
PA-6	SINGLE FAMILY - ATTACHED	18.4	147	8.0	2.10	309	33.96	95.08	152.81	
	<b>Total</b>						<b>33.96</b>	<b>95.08</b>	<b>152.81</b>	
PA-7	SINGLE FAMILY	51.5	412	8.0	3.20	1318	145.02	406.07	652.61	
	<b>Total</b>						<b>145.02</b>	<b>406.07</b>	<b>652.61</b>	
*CHURCH	CHURCH	11.4					1.00	4.00	10.00	CHURCH SITE
	<b>Total</b>						<b>1.00</b>	<b>4.00</b>	<b>10.00</b>	
*MF-MED	MF-OFFSITE	10.4	208	20.0	1.70	354	38.90	108.91	175.03	
	<b>Total</b>						<b>38.90</b>	<b>108.91</b>	<b>175.03</b>	
PA-8	SINGLE FAMILY	42.0	336	8.0	3.20	1075	118.27	331.16	532.22	
	<b>Total</b>						<b>118.27</b>	<b>331.16</b>	<b>532.22</b>	
PA-9	SINGLE FAMILY	37.0	37	1.0	3.20	118	13.02	36.47	58.61	
	<b>Total</b>						<b>13.02</b>	<b>36.47</b>	<b>58.61</b>	

\* NOT A PART OF THE HARMONY FDP, BUT IS INCLUDED IN THIS WATERCAD ANALYSIS

\*\*MAX UNITS AND MAX POPULATION WILL BE UP TO BUT NOT EXCEEDING THE NUMBER SHOWN.

**HARMONY**  
**Master Utility Report**  
**Water Demand Calculations**

Land Use	Avg. Day (gpm/cap)	Max Day (gpm/cap)	Max Hour (gpm/cap)	Occupancy	Density (units/ac)
SINGLE FAMILY	0.11	2.8:1 of Avg	4.5:1 of Avg	3.20	8.0
SINGLE FAMILY-Attach	0.11	2.8:1 of Avg	4.5:1 of Avg	2.10	11.0
Multi Family - MEDIUM	0.11	2.8:1 of Avg	4.5:1 of Avg	1.70	15.0
Multi Family - LARGE	0.11	2.8:1 of Avg	4.5:1 of Avg	1.70	11.0

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
CHURCH	1.00	4.00	10.00

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
REC. CENTER	5.00	12.60	16.10

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
SCHOOL	5.00	12.60	16.10

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
COMMERCIAL	22.66	72.52	95.19

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
FIRE STATION	5.00	12.60	16.10

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
COMMUNITY CENTER	5.00	12.60	16.10

Label	Description	Area (ac)	Max Units**	Density (units/ac)	Occupancy (persons/unit)	Max Population	Avg. Day Demand (gpm)	Max Day Demand (gpm)	Peak Hour Demand (gpm)	Comments
PA-10	SINGLE FAMILY	22.6	260	11.5	3.20	832	91.52	256.26	411.84	
	<b>Total</b>						<b>91.52</b>	<b>256.26</b>	<b>411.84</b>	
PA-18	WEST SCHOOL SITE	18.1				688	5.00	12.60	16.10	K-8
	<b>Total</b>						<b>5.00</b>	<b>12.60</b>	<b>16.10</b>	
PA-11	SINGLE FAMILY	23.1	66	2.9	3.20	211	23.23	65.05	104.54	
	<b>Total</b>						<b>23.23</b>	<b>65.05</b>	<b>104.54</b>	
PA-12	SINGLE FAMILY	83.4	314	3.8	3.20	1005	110.53	309.48	497.38	
	<b>Total</b>						<b>110.53</b>	<b>309.48</b>	<b>497.38</b>	
PA-13	SINGLE FAMILY	64.5	195	3.0	3.20	624	68.64	192.19	308.88	
	<b>Total</b>						<b>68.64</b>	<b>192.19</b>	<b>308.88</b>	
PA-14	SINGLE FAMILY	64.6	195	3.0	3.20	624	68.64	192.19	308.88	
	<b>Total</b>						<b>68.64</b>	<b>192.19</b>	<b>308.88</b>	
PA-15	SINGLE FAMILY	72.6	345	4.8	3.20	1104	121.44	340.03	546.48	
	<b>Total</b>						<b>121.44</b>	<b>340.03</b>	<b>546.48</b>	
PA-16	SINGLE FAMILY - ATTACHED	47.0	75	1.6	2.10	158	17.33	48.51	77.96	
	<b>Total</b>						<b>17.33</b>	<b>48.51</b>	<b>77.96</b>	

<b>MODEL TOTAL</b>		<b>5,095</b>				<b>16,578</b>	<b>1,555.74</b>	<b>4,360.75</b>	<b>6,973.96</b>	
<b>HARMONY TOTAL</b>		<b>4,887</b>				<b>16,225</b>	<b>1,493.19</b>	<b>4,175.32</b>	<b>6,693.74</b>	<b>On-Site</b>

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**HARMONY**  
**Master Utility Report**  
**Water Demand Calculations**

Land Use	Avg. Day (gpm/cap)	Max Day (gpm/cap)	Max Hour (gpm/cap)	Occupancy	Density (units/ac)
SINGLE FAMILY	0.11	2.8:1 of Avg	4.5:1 of Avg	3.20	8.0
SINGLE FAMILY-Attach	0.11	2.8:1 of Avg	4.5:1 of Avg	2.10	11.0
Multi Family - MEDIUM	0.11	2.8:1 of Avg	4.5:1 of Avg	1.70	15.0
Multi Family - LARGE	0.11	2.8:1 of Avg	4.5:1 of Avg	1.70	11.0

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
CHURCH	1.00	4.00	10.00

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
REC. CENTER	5.00	12.60	16.10

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
SCHOOL	5.00	12.60	16.10

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
COMMERCIAL	22.66	72.52	95.19

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
FIRE STATION	5.00	12.60	16.10

Land Use	Avg. Day (gpm)	Max Day (gpm)	Max Hour (gpm)
COMMUNITY CENTER	5.00	12.60	16.10

OFF-SITE WATER CALCULATIONS*										
Label	Description	Area (ac)	Max Units**	Density (units/ac)	Occupancy (persons/unit)	Max Population	Avg. Day Demand (gpm)	Max Day Demand (gpm)	Peak Hour Demand (gpm)	Comments
J6 Parklands	PARKLANDS CONNECTION	58.0	290	5.0	3.20	928	102.08	285.82	459.36	
J14 Parklands	PARKLANDS CONNECTION	58.0	290	5.0	3.20	928	102.08	285.82	459.36	
J15 Parklands	PARKLANDS CONNECTION	58.0	290	5.0	3.20	928	102.08	285.82	459.36	
J2 Undeveloped	UNDEVELOPED CONNECTION	40.0	200	5.0	3.20	640	70.40	197.12	316.80	
J12 Undeveloped	UNDEVELOPED CONNECTION	40.0	200	5.0	3.20	640	70.40	197.12	316.80	
J7 Sun Meadows	SUN MEADOWS CONNECTION	60.0	300	5.0	3.20	960	105.60	295.68	475.20	
J8 Sun Meadows	SUN MEADOWS CONNECTION	60.0	300	5.0	3.20	960	105.60	295.68	475.20	

AVERAGE DAY

## HARMONY

### Active Scenario: AVERAGE DAY

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/1000ft)
P1	J4	J8	2,046	16	PVC	130.0	0.04	24.82	0.001
P2	J7	J2	2,662	16	PVC	130.0	0.20	-125.86	0.013
P3	J9	J8	10	12	PVC	130.0	1.10	387.35	0.439
P4	J9	R-1	1	12	PVC	130.0	1.10	-387.35	0.488
P5	J8	PA-1	1,232	12	PVC	130.0	0.87	306.58	0.284
P6	J4	J10	10	24	PVC	130.0	1.42	-2,004.45	0.293
P7	J10	R-2	1	24	PVC	130.0	1.42	-2,004.45	0.488
P8	J11	J7	2,642	12	PVC	130.0	0.06	-20.26	0.002
P9	J13	J14	2,650	16	PVC	130.0	0.14	86.02	0.007
P10	MUN	PA-2	742	12	PVC	130.0	0.97	341.67	0.347
P11	J16	J15	3,264	12	PVC	130.0	0.12	-42.30	0.007
P12	J1	MUN	780	12	PVC	130.0	0.98	346.67	0.357
P13	PA-2	PA-3	869	12	PVC	130.0	0.11	38.25	0.006
P14	PA-3	J11	1,409	12	PVC	130.0	0.81	-286.29	0.250
P15	J5	PA-6	700	16	PVC	130.0	0.72	-452.93	0.144
P16	J17	PA-10	1,328	12	PVC	130.0	0.24	83.84	0.026
P17	PA-10	W SCHOOL	1,295	12	PVC	130.0	0.02	-7.68	0.000
P18	PA-5	PA-8	315	12	PVC	130.0	0.48	170.44	0.096
P19	PA-8	W SCHOOL	1,434	12	PVC	130.0	0.15	52.17	0.011
P20	J1	PA-7	475	12	PVC	130.0	0.61	214.62	0.147
P21	PA-4	PA-12	863	24	PVC	130.0	0.55	771.54	0.053
P22	J15	PA-13	1,188	16	PVC	130.0	0.09	-58.52	0.003
P23	PA-13	J2	1,430	16	PVC	130.0	0.20	-127.16	0.014
P24	J12	PA-14	1,262	12	PVC	130.0	0.17	59.73	0.014
P25	J5	J6	2,632	16	PVC	130.0	0.38	237.84	0.044
P26	J4	COMM	2,256	24	PVC	130.0	1.04	1,470.07	0.177
P27	J5	CHURCH	297	12	PVC	130.0	0.61	215.09	0.146
P28	CHURCH	PA-5	548	12	PVC	130.0	0.61	214.09	0.146
P29	J6	MF-MED	313	16	PVC	130.0	0.22	135.76	0.016
P30	MF-MED	PA-9	617	16	PVC	130.0	0.15	96.86	0.008
P31	PA-1	N SCHOOL	751	12	PVC	130.0	0.77	271.03	0.226
P32	N SCHOOL	J11	794	12	PVC	130.0	0.75	266.03	0.218
P33	W SCHOOL	PA-11	491	12	PVC	130.0	0.31	109.09	0.042
P34	PA-11	J15	2,158	12	PVC	130.0	0.24	85.86	0.027
P35	J12	PA-15	1,120	24	PVC	130.0	0.15	207.46	0.005
P36	PA-15	J13	1,502	24	PVC	130.0	0.06	86.02	0.001
P37	PA-6	CS	1,342	16	PVC	130.0	0.78	-486.89	0.164
P38	CS	J4	599	16	PVC	130.0	0.81	-509.55	0.179
P39	J2	J12	2,623	24	PVC	130.0	0.24	337.59	0.012
P40	J16	PA-16	1,494	12	PVC	130.0	0.09	33.39	0.005
P41	PA-16	J14	492	12	PVC	130.0	0.05	16.06	0.001
P42	PA-12	J2	1,436	24	PVC	130.0	0.47	661.01	0.040
P43	PA-9	J17	1,662	16	PVC	130.0	0.13	83.84	0.006
P44	PA-14	J16	1,571	12	PVC	130.0	0.03	-8.91	0.001
P45	J1	PA-4	630	24	PVC	130.0	0.63	886.12	0.070
P46	COMM	J1	621	24	PVC	130.0	1.03	1,447.41	0.171
P47	PA-7	W SCHOOL	1,258	12	PVC	130.0	0.20	69.60	0.018

## HARMONY

### Active Scenario: AVERAGE DAY

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
CHURCH	5,646.55	1.00	87.8	5,849.52
COMM	5,630.53	22.66	94.8	5,849.60
CS	5,628.18	22.66	95.9	5,849.89
J1	5,641.98	0.00	89.8	5,849.49
J2	5,643.16	70.40	89.2	5,849.34
J4	5,629.30	0.00	95.5	5,850.00
J5	5,647.47	0.00	87.4	5,849.57
J6	5,672.32	102.08	76.6	5,849.45
J7	5,618.35	105.60	99.9	5,849.31
J8	5,612.42	105.60	102.8	5,850.00
J9	5,609.31	0.00	104.1	5,850.00
J10	5,624.26	0.00	97.7	5,850.00
J11	5,620.07	0.00	99.2	5,849.30
J12	5,681.12	70.40	72.8	5,849.31
J13	5,711.38	0.00	59.7	5,849.31
J14	5,685.26	102.08	71.0	5,849.29
J15	5,677.09	102.08	74.5	5,849.32
J16	5,660.25	0.00	81.8	5,849.30
J17	5,672.78	0.00	76.4	5,849.43
MF-MED	5,670.87	38.90	77.3	5,849.45
MUN	5,635.82	5.00	92.3	5,849.21
N SCHOOL	5,617.48	5.00	100.4	5,849.48
PA-1	5,620.06	35.55	99.3	5,849.65
PA-2	5,629.95	303.42	94.8	5,848.96
PA-3	5,630.21	324.54	94.6	5,848.95
PA-4	5,651.51	114.58	85.6	5,849.45
PA-5	5,645.18	43.65	88.4	5,849.44
PA-6	5,636.98	33.96	92.0	5,849.67
PA-7	5,641.60	145.02	89.9	5,849.42
PA-8	5,646.41	118.27	87.8	5,849.41
PA-9	5,671.39	13.02	77.0	5,849.44
PA-10	5,656.85	91.52	83.3	5,849.40
PA-11	5,657.56	23.23	83.0	5,849.38
PA-12	5,666.02	110.53	79.3	5,849.40
PA-13	5,669.05	68.64	78.0	5,849.32
PA-14	5,682.61	68.64	72.1	5,849.30
PA-15	5,713.00	121.44	59.0	5,849.31
PA-16	5,680.75	17.33	72.9	5,849.29
W SCHOOL	5,652.03	5.00	85.4	5,849.40



## HARMONY

### Active Scenario: AVERAGE DAY

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
473	R-1	5,850.00	387.35	5,850.00
591	R-2	5,850.00	2,004.45	5,850.00

MAX DAY

## HARMONY

### Active Scenario: MAX DAY

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/1000ft)
P1	J4	J8	2,046	16	PVC	130.0	0.11	69.21	0.004
P2	J7	J2	2,662	16	PVC	130.0	0.59	-369.99	0.099
P3	J9	J8	10	12	PVC	130.0	3.03	1,067.98	2.832
P4	J9	R-1	1	12	PVC	130.0	3.03	-1,067.98	2.930
P5	J8	PA-1	1,232	12	PVC	130.0	2.39	841.51	1.841
P6	J4	J10	10	24	PVC	130.0	3.90	-5,502.06	2.051
P7	J10	R-2	1	24	PVC	130.0	3.90	-5,502.06	1.953
P8	J11	J7	2,642	12	PVC	130.0	0.21	-74.31	0.021
P9	J13	J14	2,650	16	PVC	130.0	0.39	247.12	0.047
P10	MUN	PA-2	742	12	PVC	130.0	2.71	954.61	2.326
P11	J16	J15	3,264	12	PVC	130.0	0.29	-103.66	0.038
P12	J1	MUN	780	12	PVC	130.0	2.74	967.21	2.383
P13	PA-2	PA-3	869	12	PVC	130.0	0.30	105.03	0.039
P14	PA-3	J11	1,409	12	PVC	130.0	2.28	-803.68	1.691
P15	J5	PA-6	700	16	PVC	130.0	1.99	-1,245.40	0.938
P16	J17	PA-10	1,328	12	PVC	130.0	0.63	223.52	0.158
P17	PA-10	W SCHOOL	1,295	12	PVC	130.0	0.09	-32.73	0.005
P18	PA-5	PA-8	315	12	PVC	130.0	1.32	464.45	0.612
P19	PA-8	W SCHOOL	1,434	12	PVC	130.0	0.38	133.30	0.061
P20	J1	PA-7	475	12	PVC	130.0	1.71	602.97	0.993
P21	PA-4	PA-12	863	24	PVC	130.0	1.47	2,071.75	0.334
P22	J15	PA-13	1,188	16	PVC	130.0	0.27	-169.65	0.023
P23	PA-13	J2	1,430	16	PVC	130.0	0.58	-361.84	0.095
P24	J12	PA-14	1,262	12	PVC	130.0	0.50	175.76	0.101
P25	J5	J6	2,632	16	PVC	130.0	1.04	654.72	0.285
P26	J4	COMM	2,256	24	PVC	130.0	2.85	4,019.85	1.139
P27	J5	CHURCH	297	12	PVC	130.0	1.68	590.67	0.955
P28	CHURCH	PA-5	548	12	PVC	130.0	1.66	586.67	0.944
P29	J6	MF-MED	313	16	PVC	130.0	0.59	368.90	0.098
P30	MF-MED	PA-9	617	16	PVC	130.0	0.41	259.98	0.051
P31	PA-1	N SCHOOL	751	12	PVC	130.0	2.10	741.97	1.458
P32	N SCHOOL	J11	794	12	PVC	130.0	2.07	729.37	1.413
P33	W SCHOOL	PA-11	491	12	PVC	130.0	0.81	284.88	0.248
P34	PA-11	J15	2,158	12	PVC	130.0	0.62	219.83	0.153
P35	J12	PA-15	1,120	24	PVC	130.0	0.42	587.15	0.032
P36	PA-15	J13	1,502	24	PVC	130.0	0.18	247.12	0.007
P37	PA-6	CS	1,342	16	PVC	130.0	2.14	-1,340.48	1.074
P38	CS	J4	599	16	PVC	130.0	2.25	-1,413.00	1.184
P39	J2	J12	2,623	24	PVC	130.0	0.59	833.31	0.062
P40	J16	PA-16	1,494	12	PVC	130.0	0.25	87.23	0.028
P41	PA-16	J14	492	12	PVC	130.0	0.11	38.70	0.006
P42	PA-12	J2	1,436	24	PVC	130.0	1.25	1,762.27	0.248
P43	PA-9	J17	1,662	16	PVC	130.0	0.36	223.52	0.039
P44	PA-14	J16	1,571	12	PVC	130.0	0.05	-16.43	0.001
P45	J1	PA-4	630	24	PVC	130.0	1.70	2,392.58	0.436
P46	COMM	J1	621	24	PVC	130.0	2.81	3,962.75	1.109
P47	PA-7	W SCHOOL	1,258	12	PVC	130.0	0.56	196.91	0.125

## HARMONY

### Active Scenario: MAX DAY

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
CHURCH	5,646.55	4.00	86.7	5,846.89
COMM	5,630.53	57.10	93.8	5,847.41
CS	5,628.18	72.51	95.7	5,849.27
J1	5,641.98	0.00	88.6	5,846.72
J2	5,643.16	197.12	87.7	5,845.80
J4	5,629.30	0.00	95.5	5,849.98
J5	5,647.47	0.00	86.4	5,847.17
J6	5,672.32	285.82	75.3	5,846.42
J7	5,618.35	295.68	98.3	5,845.54
J8	5,612.42	295.68	102.8	5,849.97
J9	5,609.31	0.00	104.1	5,850.00
J10	5,624.26	0.00	97.7	5,850.00
J11	5,620.07	0.00	97.5	5,845.48
J12	5,681.12	70.40	71.2	5,845.64
J13	5,711.38	0.00	58.1	5,845.59
J14	5,685.26	285.82	69.3	5,845.47
J15	5,677.09	285.82	72.9	5,845.64
J16	5,660.25	0.00	80.2	5,845.51
J17	5,672.78	0.00	75.1	5,846.29
MF-MED	5,670.87	108.92	75.9	5,846.39
MUN	5,635.82	12.60	90.4	5,844.86
N SCHOOL	5,617.48	12.60	99.1	5,846.60
PA-1	5,620.06	99.54	98.5	5,847.70
PA-2	5,629.95	849.58	92.2	5,843.13
PA-3	5,630.21	908.71	92.1	5,843.10
PA-4	5,651.51	320.82	84.3	5,846.44
PA-5	5,645.18	122.22	87.0	5,846.37
PA-6	5,636.98	95.09	91.2	5,847.83
PA-7	5,641.60	406.06	88.5	5,846.25
PA-8	5,646.41	331.16	86.4	5,846.18
PA-9	5,671.39	36.46	75.7	5,846.36
PA-10	5,656.85	256.26	81.9	5,846.08
PA-11	5,657.56	65.04	81.5	5,845.97
PA-12	5,666.02	309.48	77.9	5,846.16
PA-13	5,669.05	192.19	76.4	5,845.67
PA-14	5,682.61	192.19	70.5	5,845.51
PA-15	5,713.00	340.03	57.4	5,845.60
PA-16	5,680.75	48.52	71.3	5,845.47
W SCHOOL	5,652.03	12.60	84.0	5,846.09

## HARMONY

### Active Scenario: MAX DAY

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
473	R-1	5,850.00	1,067.98	5,850.00
591	R-2	5,850.00	5,502.06	5,850.00

MAX DAY WITH  
FIRE FLOW ANALYSIS

## HARMONY

### Active Scenario: MAX DAY + FIRE FLOW

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/1000ft)
P1	J4	J8	2,046	16	PVC	130.0	0.11	69.21	0.004
P2	J7	J2	2,662	16	PVC	130.0	0.59	-369.99	0.099
P3	J9	J8	10	12	PVC	130.0	3.03	1,067.98	2.832
P4	J9	R-1	1	12	PVC	130.0	3.03	-1,067.98	2.930
P5	J8	PA-1	1,232	12	PVC	130.0	2.39	841.51	1.841
P6	J4	J10	10	24	PVC	130.0	3.90	-5,502.06	2.051
P7	J10	R-2	1	24	PVC	130.0	3.90	-5,502.06	1.953
P8	J11	J7	2,642	12	PVC	130.0	0.21	-74.31	0.021
P9	J13	J14	2,650	16	PVC	130.0	0.39	247.12	0.047
P10	MUN	PA-2	742	12	PVC	130.0	2.71	954.61	2.326
P11	J16	J15	3,264	12	PVC	130.0	0.29	-103.66	0.038
P12	J1	MUN	780	12	PVC	130.0	2.74	967.21	2.383
P13	PA-2	PA-3	869	12	PVC	130.0	0.30	105.03	0.039
P14	PA-3	J11	1,409	12	PVC	130.0	2.28	-803.68	1.691
P15	J5	PA-6	700	16	PVC	130.0	1.99	-1,245.40	0.938
P16	J17	PA-10	1,328	12	PVC	130.0	0.63	223.52	0.158
P17	PA-10	W SCHOOL	1,295	12	PVC	130.0	0.09	-32.73	0.005
P18	PA-5	PA-8	315	12	PVC	130.0	1.32	464.45	0.612
P19	PA-8	W SCHOOL	1,434	12	PVC	130.0	0.38	133.30	0.061
P20	J1	PA-7	475	12	PVC	130.0	1.71	602.97	0.993
P21	PA-4	PA-12	863	24	PVC	130.0	1.47	2,071.75	0.334
P22	J15	PA-13	1,188	16	PVC	130.0	0.27	-169.65	0.023
P23	PA-13	J2	1,430	16	PVC	130.0	0.58	-361.84	0.095
P24	J12	PA-14	1,262	12	PVC	130.0	0.50	175.76	0.101
P25	J5	J6	2,632	16	PVC	130.0	1.04	654.72	0.285
P26	J4	COMM	2,256	24	PVC	130.0	2.85	4,019.85	1.139
P27	J5	CHURCH	297	12	PVC	130.0	1.68	590.67	0.955
P28	CHURCH	PA-5	548	12	PVC	130.0	1.66	586.67	0.944
P29	J6	MF-MED	313	16	PVC	130.0	0.59	368.90	0.098
P30	MF-MED	PA-9	617	16	PVC	130.0	0.41	259.98	0.051
P31	PA-1	N SCHOOL	751	12	PVC	130.0	2.10	741.97	1.458
P32	N SCHOOL	J11	794	12	PVC	130.0	2.07	729.37	1.413
P33	W SCHOOL	PA-11	491	12	PVC	130.0	0.81	284.88	0.248
P34	PA-11	J15	2,158	12	PVC	130.0	0.62	219.83	0.153
P35	J12	PA-15	1,120	24	PVC	130.0	0.42	587.15	0.032
P36	PA-15	J13	1,502	24	PVC	130.0	0.18	247.12	0.007
P37	PA-6	CS	1,342	16	PVC	130.0	2.14	-1,340.48	1.074
P38	CS	J4	599	16	PVC	130.0	2.25	-1,413.00	1.184
P39	J2	J12	2,623	24	PVC	130.0	0.59	833.31	0.062
P40	J16	PA-16	1,494	12	PVC	130.0	0.25	87.23	0.028
P41	PA-16	J14	492	12	PVC	130.0	0.11	38.70	0.006
P42	PA-12	J2	1,436	24	PVC	130.0	1.25	1,762.27	0.248
P43	PA-9	J17	1,662	16	PVC	130.0	0.36	223.52	0.039
P44	PA-14	J16	1,571	12	PVC	130.0	0.05	-16.43	0.001
P45	J1	PA-4	630	24	PVC	130.0	1.70	2,392.58	0.436
P46	COMM	J1	621	24	PVC	130.0	2.81	3,962.75	1.109
P47	PA-7	W SCHOOL	1,258	12	PVC	130.0	0.56	196.91	0.125

## HARMONY

### Active Scenario: MAX DAY + FIRE FLOW

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
CHURCH	5,646.55	4.00	86.7	5,846.89
COMM	5,630.53	57.10	93.8	5,847.41
CS	5,628.18	72.51	95.7	5,849.27
J1	5,641.98	0.00	88.6	5,846.72
J2	5,643.16	197.12	87.7	5,845.80
J4	5,629.30	0.00	95.5	5,849.98
J5	5,647.47	0.00	86.4	5,847.17
J6	5,672.32	285.82	75.3	5,846.42
J7	5,618.35	295.68	98.3	5,845.54
J8	5,612.42	295.68	102.8	5,849.97
J9	5,609.31	0.00	104.1	5,850.00
J10	5,624.26	0.00	97.7	5,850.00
J11	5,620.07	0.00	97.5	5,845.48
J12	5,681.12	70.40	71.2	5,845.64
J13	5,711.38	0.00	58.1	5,845.59
J14	5,685.26	285.82	69.3	5,845.47
J15	5,677.09	285.82	72.9	5,845.64
J16	5,660.25	0.00	80.2	5,845.51
J17	5,672.78	0.00	75.1	5,846.29
MF-MED	5,670.87	108.92	75.9	5,846.39
MUN	5,635.82	12.60	90.4	5,844.86
N SCHOOL	5,617.48	12.60	99.1	5,846.60
PA-1	5,620.06	99.54	98.5	5,847.70
PA-2	5,629.95	849.58	92.2	5,843.13
PA-3	5,630.21	908.71	92.1	5,843.10
PA-4	5,651.51	320.82	84.3	5,846.44
PA-5	5,645.18	122.22	87.0	5,846.37
PA-6	5,636.98	95.09	91.2	5,847.83
PA-7	5,641.60	406.06	88.5	5,846.25
PA-8	5,646.41	331.16	86.4	5,846.18
PA-9	5,671.39	36.46	75.7	5,846.36
PA-10	5,656.85	256.26	81.9	5,846.08
PA-11	5,657.56	65.04	81.5	5,845.97
PA-12	5,666.02	309.48	77.9	5,846.16
PA-13	5,669.05	192.19	76.4	5,845.67
PA-14	5,682.61	192.19	70.5	5,845.51
PA-15	5,713.00	340.03	57.4	5,845.60
PA-16	5,680.75	48.52	71.3	5,845.47
W SCHOOL	5,652.03	12.60	84.0	5,846.09



## HARMONY

### Active Scenario: MAX DAY + FIRE FLOW

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
473	R-1	5,850.00	1,067.98	5,850.00
591	R-2	5,850.00	5,502.06	5,850.00

MAX DAY WITH FF AT PA-15

## HARMONY

### Active Scenario: MAX DAY FF AT PA-15

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/1000ft)
P1	J4	J8	2,046	16	PVC	130.0	0.10	65.05	0.004
P2	J7	J2	2,662	16	PVC	130.0	0.24	-151.56	0.019
P3	J9	J8	10	12	PVC	130.0	3.42	1,204.01	3.613
P4	J9	R-1	1	12	PVC	130.0	3.42	-1,204.01	3.418
P5	J8	PA-1	1,232	12	PVC	130.0	2.76	973.38	2.411
P6	J4	J10	10	24	PVC	130.0	4.67	-6,581.21	2.832
P7	J10	R-2	1	24	PVC	130.0	4.67	-6,581.21	2.930
P8	J11	J7	2,642	12	PVC	130.0	0.41	144.12	0.070
P9	J13	J14	2,650	16	PVC	130.0	0.20	126.59	0.014
P10	MUN	PA-2	742	12	PVC	130.0	2.80	985.98	2.470
P11	J16	J15	3,264	12	PVC	130.0	0.75	-263.63	0.215
P12	J1	MUN	780	12	PVC	130.0	2.83	998.58	2.528
P13	PA-2	PA-3	869	12	PVC	130.0	0.39	136.41	0.063
P14	PA-3	J11	1,409	12	PVC	130.0	2.19	-772.31	1.571
P15	J5	PA-6	700	16	PVC	130.0	2.31	-1,449.35	1.241
P16	J17	PA-10	1,328	12	PVC	130.0	0.91	320.95	0.309
P17	PA-10	W SCHOOL	1,295	12	PVC	130.0	0.18	64.70	0.016
P18	PA-5	PA-8	315	12	PVC	130.0	1.62	570.98	0.898
P19	PA-8	W SCHOOL	1,434	12	PVC	130.0	0.68	239.82	0.180
P20	J1	PA-7	475	12	PVC	130.0	1.66	585.39	0.941
P21	PA-4	PA-12	863	24	PVC	130.0	2.08	2,937.31	0.637
P22	J15	PA-13	1,188	16	PVC	130.0	0.23	-143.24	0.017
P23	PA-13	J2	1,430	16	PVC	130.0	0.54	-335.43	0.083
P24	J12	PA-14	1,262	12	PVC	130.0	0.39	136.33	0.063
P25	J5	J6	2,632	16	PVC	130.0	1.20	752.15	0.368
P26	J4	COMM	2,256	24	PVC	130.0	3.47	4,899.21	1.643
P27	J5	CHURCH	297	12	PVC	130.0	1.98	697.20	1.300
P28	CHURCH	PA-5	548	12	PVC	130.0	1.97	693.20	1.286
P29	J6	MF-MED	313	16	PVC	130.0	0.74	466.33	0.151
P30	MF-MED	PA-9	617	16	PVC	130.0	0.57	357.41	0.093
P31	PA-1	N SCHOOL	751	12	PVC	130.0	2.64	929.03	2.211
P32	N SCHOOL	J11	794	12	PVC	130.0	2.60	916.43	2.157
P33	W SCHOOL	PA-11	491	12	PVC	130.0	1.34	471.25	0.629
P34	PA-11	J15	2,158	12	PVC	130.0	1.15	406.21	0.478
P35	J12	PA-15	1,120	24	PVC	130.0	1.23	1,736.99	0.241
P36	PA-15	J13	1,502	24	PVC	130.0	0.09	126.59	0.002
P37	PA-6	CS	1,342	16	PVC	130.0	2.46	-1,544.44	1.396
P38	CS	J4	599	16	PVC	130.0	2.58	-1,616.95	1.520
P39	J2	J12	2,623	24	PVC	130.0	1.38	1,943.71	0.297
P40	J16	PA-16	1,494	12	PVC	130.0	0.59	207.76	0.138
P41	PA-16	J14	492	12	PVC	130.0	0.45	159.24	0.084
P42	PA-12	J2	1,436	24	PVC	130.0	1.86	2,627.82	0.519
P43	PA-9	J17	1,662	16	PVC	130.0	0.51	320.95	0.076
P44	PA-14	J16	1,571	12	PVC	130.0	0.16	-55.87	0.012
P45	J1	PA-4	630	24	PVC	130.0	2.31	3,258.13	0.772
P46	COMM	J1	621	24	PVC	130.0	3.43	4,842.10	1.608
P47	PA-7	W SCHOOL	1,258	12	PVC	130.0	0.51	179.33	0.105

## HARMONY

### Active Scenario: MAX DAY FF AT PA-15

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
CHURCH	5,646.55	4.00	86.3	5,845.93
COMM	5,630.53	57.10	93.3	5,846.26
CS	5,628.18	72.51	95.6	5,849.06
J1	5,641.98	0.00	88.0	5,845.26
J2	5,643.16	197.12	86.7	5,843.48
J4	5,629.30	0.00	95.5	5,849.97
J5	5,647.47	0.00	86.0	5,846.32
J6	5,672.32	285.82	74.9	5,845.35
J7	5,618.35	295.68	97.4	5,843.43
J8	5,612.42	295.68	102.8	5,849.96
J9	5,609.31	0.00	104.1	5,850.00
J10	5,624.26	0.00	97.7	5,850.00
J11	5,620.07	0.00	96.7	5,843.62
J12	5,681.12	70.40	69.9	5,842.70
J13	5,711.38	0.00	56.7	5,842.43
J14	5,685.26	285.82	68.0	5,842.40
J15	5,677.09	285.82	71.9	5,843.34
J16	5,660.25	0.00	78.9	5,842.64
J17	5,672.78	0.00	74.6	5,845.12
MF-MED	5,670.87	108.92	75.5	5,845.30
MUN	5,635.82	12.60	89.8	5,843.29
N SCHOOL	5,617.48	12.60	98.6	5,845.33
PA-1	5,620.06	44.35	98.2	5,846.99
PA-2	5,629.95	849.58	91.5	5,841.46
PA-3	5,630.21	908.71	91.4	5,841.40
PA-4	5,651.51	320.82	83.6	5,844.78
PA-5	5,645.18	122.22	86.6	5,845.23
PA-6	5,636.98	95.09	90.9	5,847.18
PA-7	5,641.60	406.06	87.9	5,844.82
PA-8	5,646.41	331.16	85.9	5,844.94
PA-9	5,671.39	36.46	75.2	5,845.24
PA-10	5,656.85	256.26	81.3	5,844.71
PA-11	5,657.56	65.04	80.8	5,844.38
PA-12	5,666.02	309.48	77.1	5,844.23
PA-13	5,669.05	192.19	75.4	5,843.36
PA-14	5,682.61	192.19	69.2	5,842.62
PA-15	5,713.00	1,610.40	56.0	5,842.44
PA-16	5,680.75	48.52	70.0	5,842.44
W SCHOOL	5,652.03	12.60	83.4	5,844.68

## HARMONY

### Active Scenario: MAX DAY FF AT PA-15

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
473	R-1	5,850.00	1,204.01	5,850.00
591	R-2	5,850.00	6,581.21	5,850.00

MAX HOUR

## HARMONY

### Active Scenario: MAX HOUR

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/1000ft)
P1	J4	J8	2,046	16	PVC	130.0	0.18	111.65	0.011
P2	J7	J2	2,662	16	PVC	130.0	0.96	-599.64	0.242
P3	J9	J8	10	12	PVC	130.0	4.84	1,706.63	6.836
P4	J9	R-1	1	12	PVC	130.0	4.84	-1,706.63	6.836
P5	J8	PA-1	1,232	12	PVC	130.0	3.81	1,343.08	4.377
P6	J4	J10	10	24	PVC	130.0	6.21	-8,760.57	4.834
P7	J10	R-2	1	24	PVC	130.0	6.21	-8,760.57	4.883
P8	J11	J7	2,642	12	PVC	130.0	0.35	-124.44	0.053
P9	J13	J14	2,650	16	PVC	130.0	0.64	399.24	0.114
P10	MUN	PA-2	742	12	PVC	130.0	4.35	1,534.37	5.601
P11	J16	J15	3,264	12	PVC	130.0	0.46	-161.64	0.087
P12	J1	MUN	780	12	PVC	130.0	4.40	1,550.47	5.710
P13	PA-2	PA-3	869	12	PVC	130.0	0.48	168.98	0.094
P14	PA-3	J11	1,409	12	PVC	130.0	3.66	-1,291.45	4.071
P15	J5	PA-6	700	16	PVC	130.0	3.18	-1,993.97	2.241
P16	J17	PA-10	1,328	12	PVC	130.0	1.01	354.36	0.371
P17	PA-10	W SCHOOL	1,295	12	PVC	130.0	0.16	-57.48	0.013
P18	PA-5	PA-8	315	12	PVC	130.0	2.10	740.19	1.452
P19	PA-8	W SCHOOL	1,434	12	PVC	130.0	0.59	207.97	0.138
P20	J1	PA-7	475	12	PVC	130.0	2.75	969.17	2.392
P21	PA-4	PA-12	863	24	PVC	130.0	2.34	3,298.73	0.790
P22	J15	PA-13	1,188	16	PVC	130.0	0.44	-274.56	0.057
P23	PA-13	J2	1,430	16	PVC	130.0	0.93	-583.44	0.230
P24	J12	PA-14	1,262	12	PVC	130.0	0.81	285.34	0.248
P25	J5	J6	2,632	16	PVC	130.0	1.67	1,047.36	0.680
P26	J4	COMM	2,256	24	PVC	130.0	4.54	6,406.95	2.701
P27	J5	CHURCH	297	12	PVC	130.0	2.69	946.61	2.290
P28	CHURCH	PA-5	548	12	PVC	130.0	2.66	936.61	2.244
P29	J6	MF-MED	313	16	PVC	130.0	0.94	588.00	0.232
P30	MF-MED	PA-9	617	16	PVC	130.0	0.66	412.95	0.122
P31	PA-1	N SCHOOL	751	12	PVC	130.0	3.36	1,183.10	3.460
P32	N SCHOOL	J11	794	12	PVC	130.0	3.31	1,167.00	3.374
P33	W SCHOOL	PA-11	491	12	PVC	130.0	1.28	450.97	0.580
P34	PA-11	J15	2,158	12	PVC	130.0	0.98	346.44	0.356
P35	J12	PA-15	1,120	24	PVC	130.0	0.67	945.72	0.078
P36	PA-15	J13	1,502	24	PVC	130.0	0.28	399.24	0.016
P37	PA-6	CS	1,342	16	PVC	130.0	3.43	-2,146.79	2.569
P38	CS	J4	599	16	PVC	130.0	3.58	-2,241.96	2.784
P39	J2	J12	2,623	24	PVC	130.0	0.92	1,301.46	0.141
P40	J16	PA-16	1,494	12	PVC	130.0	0.39	138.10	0.065
P41	PA-16	J14	492	12	PVC	130.0	0.17	60.12	0.014
P42	PA-12	J2	1,436	24	PVC	130.0	1.99	2,801.35	0.583
P43	PA-9	J17	1,662	16	PVC	130.0	0.57	354.36	0.091
P44	PA-14	J16	1,571	12	PVC	130.0	0.07	-23.54	0.002
P45	J1	PA-4	630	24	PVC	130.0	2.71	3,814.34	1.034
P46	COMM	J1	621	24	PVC	130.0	4.49	6,333.99	2.644
P47	PA-7	W SCHOOL	1,258	12	PVC	130.0	0.90	316.58	0.301

## HARMONY

### Active Scenario: MAX HOUR

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
CHURCH	5,646.55	10.00	84.8	5,842.58
COMM	5,630.53	72.97	92.3	5,843.85
CS	5,628.18	95.17	95.2	5,848.28
J1	5,641.98	0.00	86.6	5,842.21
J2	5,643.16	316.80	85.2	5,840.04
J4	5,629.30	0.00	95.5	5,849.95
J5	5,647.47	0.00	84.7	5,843.26
J6	5,672.32	459.36	73.2	5,841.47
J7	5,618.35	475.20	95.6	5,839.40
J8	5,612.42	475.20	102.8	5,849.92
J9	5,609.31	0.00	104.1	5,849.99
J10	5,624.26	0.00	97.7	5,850.00
J11	5,620.07	0.00	94.8	5,839.26
J12	5,681.12	70.40	68.6	5,839.67
J13	5,711.38	0.00	55.5	5,839.56
J14	5,685.26	459.36	66.6	5,839.26
J15	5,677.09	459.36	70.3	5,839.64
J16	5,660.25	0.00	77.5	5,839.36
J17	5,672.78	0.00	72.9	5,841.17
MF-MED	5,670.87	175.05	73.8	5,841.40
MUN	5,635.82	16.10	87.4	5,837.76
N SCHOOL	5,617.48	16.10	97.1	5,841.93
PA-1	5,620.06	159.98	97.1	5,844.53
PA-2	5,629.95	1,365.39	88.1	5,833.60
PA-3	5,630.21	1,460.43	88.0	5,833.52
PA-4	5,651.51	515.61	82.2	5,841.56
PA-5	5,645.18	196.43	84.9	5,841.35
PA-6	5,636.98	152.82	89.9	5,844.83
PA-7	5,641.60	652.59	86.3	5,841.08
PA-8	5,646.41	532.21	84.1	5,840.90
PA-9	5,671.39	58.59	73.5	5,841.32
PA-10	5,656.85	411.84	79.5	5,840.68
PA-11	5,657.56	104.54	79.1	5,840.41
PA-12	5,666.02	497.38	75.7	5,840.88
PA-13	5,669.05	308.88	73.8	5,839.71
PA-14	5,682.61	308.88	67.8	5,839.36
PA-15	5,713.00	546.48	54.8	5,839.58
PA-16	5,680.75	77.99	68.6	5,839.26
W SCHOOL	5,652.03	16.10	81.6	5,840.70

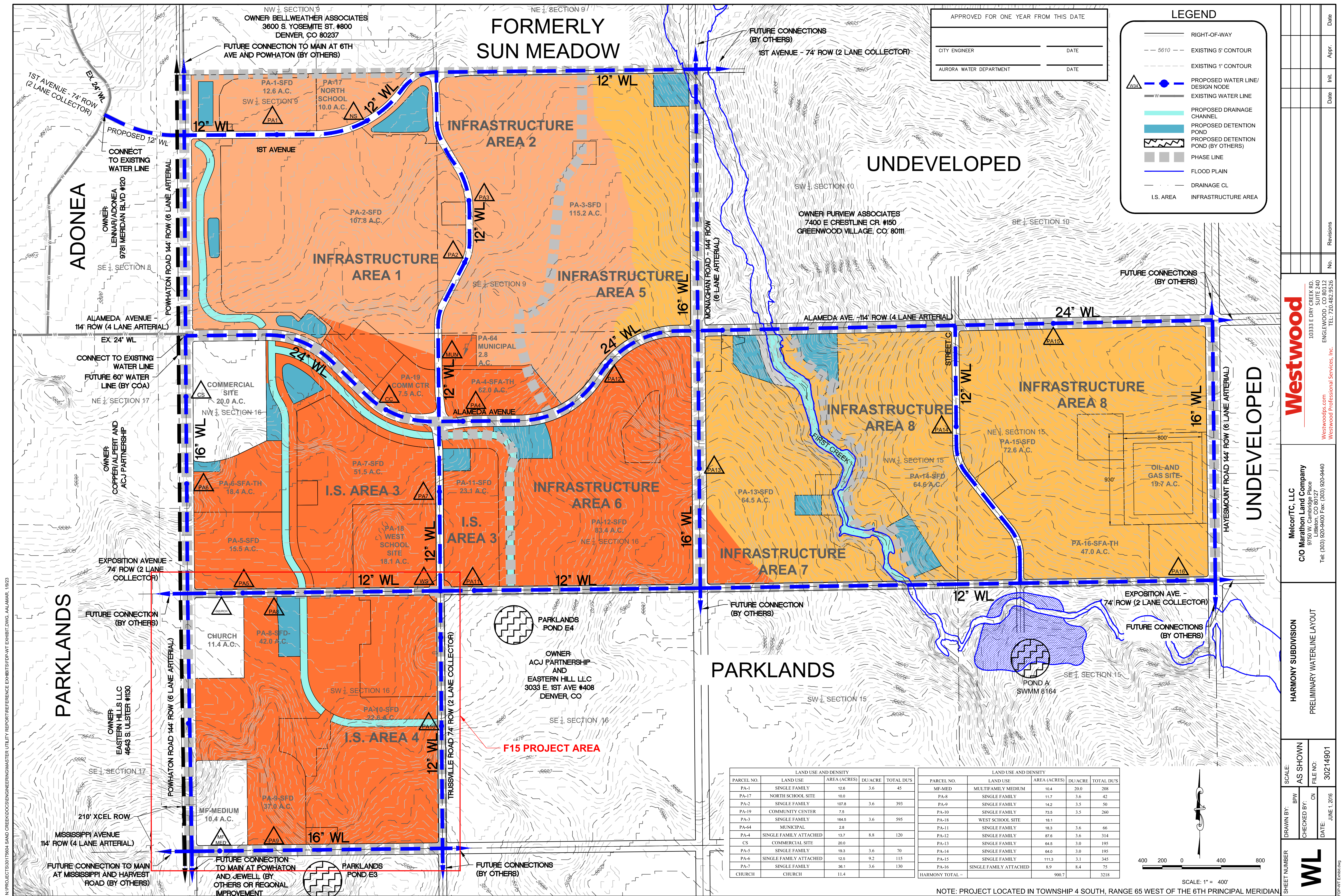


## HARMONY

### Active Scenario: MAX HOUR

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
473	R-1	5,850.00	1,706.63	5,850.00
591	R-2	5,850.00	8,760.57	5,850.00







## **Appendix B**

### **Wastewater Demands and Routing Calculations**

**HARMONY DEVELOPMENT**  
**CITY OF AURORA**  
**ON-SITE SANITARY SEWER PEAK ROUTING CALCULATIONS**

PLANNING AREA	TYPE OF DEVELOPMENT	AREA (AC)	MAX. UNITS***	MAXIMUM DENSITY (DU/AC)	OCCUPANCY (PERSONS/DU)	AVG DAY FLOW (GPD/CAP)	AVG DAY FLOW (GPD)	MAX POPULATION*** (THOUSANDS)	PEAKING FACTOR (PF)	PEAK DAILY FLOW (GPD)	PEAK DAILY FLOW (CFS)	INFILTRATION 10% OF AVG DAY FLOW (GPD)	PEAK DAY FLOW WITH INFILTRATION (GPD)
PA-1	SFD	12.6	101	8.0	2.77	68	19,024	0.280	4.0	76,097	0.12	1,902	78,000
PA-17-NORTH SCHOOL	SCHOOL	19.0			(Equivalent Pop./Acre) 18	(GPD/Acre) 1200	22,800	0.342	4.0	91,200	0.14	2,280	93,480
PA-2	SFD	107.8	862	8.0	2.77	68	162,366	2.388	4.0	649,465	1.01	16,237	665,702
PA-19-COMMUNITY CENTER	COMM	7.4	1		(Equivalent Pop./Acre) 18	(GPD/Acre) 1200	8,880	0.133	4.0	35,520	0.05	888	36,408
PA-3	SFD	115.2	922	8.0	2.77	68	173,668	2.554	4.0	694,672	1.07	17,367	712,038
PA-4	SFD	62.0	247	4.0	2.77	68	46,525	0.684	4.0	186,100	0.29	4,652	190,752
CS	COMMERCIAL SITE	20.0	1		(Equivalent Pop./Acre) 22	(GPD/Acre) 1,500	30,000	0.440	4.0	120,000	0.19	3,000	123,000
PA-5	SFD	15.5	63	4.1	2.77	68	11,867	0.175	4.0	47,467	0.07	1,187	48,653
PA-6	SFD	18.4	54	2.9	2.77	68	10,171	0.150	4.0	40,686	0.06	1,017	41,703
PA-7	SFD	51.5	193	3.7	2.77	68	36,353	0.535	4.0	145,414	0.23	3,635	149,049
CHURCH	CHURCH	11.4	1		(Equivalent Pop./Acre) 18	(GPD/Acre) 1,200	13,680	0.205	4.0	54,720	0.08	1,368	56,088
MF-MED	MF-MEDIUM	10.4	208	20.0	2.77	68	39,179	0.576	4.0	156,716	0.24	3,918	160,633
PA-8	SFD	42.0	139	3.3	2.77	68	26,182	0.385	4.0	104,728	0.16	2,618	107,346
PA-9	SFD	37.0	166	4.5	2.77	68	31,268	0.460	4.0	125,071	0.19	3,127	128,198
PA-10	SFD	22.6	54	2.4	2.77	68	10,171	0.150	4.0	40,686	0.06	1,017	41,703

\*\*\*MAX UNITS AND MAX POPULATION WILL BE UP TO BUT NOT EXCEEDING THE NUMBER SHOWN.

## HARMONY DEVELOPMENT

### CITY OF AURORA

PLANNING AREA	TYPE OF DEVELOPMENT	AREA (AC)	MAX. UNITS	MAXIMUM DENSITY (DU/AC)	OCCUPANCY (PERSONS/DU)	AVG DAY FLOW (GPD/CAP)	AVG DAY FLOW (GPD)	POPULATION (THOUSANDS)	PEAKING FACTOR (PF)	PEAK DAILY FLOW (GPD)	PEAK DAILY FLOW (CFS)	INFILTRATION 10% OF AVG DAY FLOW (GPD)	PEAK DAY FLOW WITH INFILTRATION (GPD)
PA-18- WEST SCHOOL	SCHOOL	18.1	1		(Equivalent Popul.) 18	(GPD/Acre) 1,200	21,720	0.326	4.0	86,880	0.13	2,172	89,052
PA-11	SFD	23.1	81	3.5	2.77	68	15,257	0.224	4.0	61,029	0.09	1,526	62,554
PA-12	SFD	83.4	269	3.2	2.77	68	50,669	0.745	4.0	202,675	0.31	5,067	207,742
PA-64- MUNICIPAL	FIRE STATION	2.8	1		(Equivalent Pop./Acre) 18	(GPD/Acre) 1,200	3,360	0.050	4.0	13,440	0.02	336	13,776
PA-13	SFD	64.5	206	3.2	2.77	68	38,802	0.571	4.0	155,209	0.24	3,880	159,089
PA-14	SFD	59.3	219	3.7	2.77	68	41,251	0.607	4.0	165,003	0.26	4,125	169,128
PA-15	SFD	60.4	260	4.3	2.77	68	48,974	0.720	4.0	195,894	0.30	4,897	200,792
PA-16	SFA-TH	35.9	233	6.5	2.77	68	43,888	0.645	4.0	175,552	0.27	4,389	179,940
PA-86	SFD	23.2	123	5.3	2.77	68	23,168	0.341	4.0	92,673	0.14	2,317	94,990
PA-87	SFD	24.0	156	6.5	2.77	68	29,384	0.432	4.0	117,537	0.18	2,938	120,475
PA-88	SFD	32.4	162	5.0	2.77	68	30,514	0.449	4.0	122,057	0.19	3,051	125,109
PA-89	SFD	30.0	168	5.6	2.77	68	31,644	0.465	4.0	126,578	0.20	3,164	129,742
PA-90	SFD	40.0	204	5.1	2.77	68	38,425	0.565	4.0	153,702	0.24	3,843	157,544
PA-91	SFD	12.1	39	3.2	2.77	68	7,346	0.108	4.0	29,384	0.05	735	30,119
PA-92	SFA-TH	24.1	419	17.4	2.77	68	78,923	1.161	4.0	315,691	0.49	7,892	323,584
PA-93	CAC-Shopping Ctr	16.3			(Equivalent Pop./Acre) 22	(GPD/Acre) 1,500	24,450	0.359	4.0	97,800	0.15	2,445	100,245

#### OFF-SITE SANITARY SEWER PEAK FLOW CALCULATIONS\*

PLANNING AREA	TYPE OF DEVELOPMENT	AREA (AC)	MAX. UNITS	MAXIMUM DENSITY (DU/AC)	OCCUPANCY (PERSONS/DU)	AVG DAY FLOW (GPD/CAP)	AVG DAY FLOW (GPD)	POPULATION (THOUSANDS)	PEAKING FACTOR (PF)	PEAK DAILY FLOW (GPD)	PEAK DAILY FLOW (CFS)	INFILTRATION 10% OF AVG DAY FLOW (GPD)	PEAK DAY FLOW WITH INFILTRATION (GPD)
Parklands F-13*	NAC & SFD	43.0	225				57,600	0.720	4.0	230,400	0.36	5,760	236,160
Parklands F-12*	SFD	24.0	145				37,018	0.464	4.0	148,072	0.23	3,702	151,774
Parklands F-7*	CP, CAC, SFA, SFD	282.0	1896				485,366	6.067	2.78	1,349,317	2.09	48,537	1,397,854
Parklands F-1*	CP, NP, NAC SFD	466.0	2334				596,788	7.469	2.57	1,533,745	2.37	59,679	1,593,424
Sun Meadows** SM Offsite 2	SFD/MF COMM/RETAIL	60.0	320			80	60,638	0.758	4.0	242,552	0.38	6,064	248,616
Undeveloped SM Offsite 1	SFD/MF COMM/RETAIL	160.5	857			80	162,208	2.028	4.0	648,832	1.00	16,221	665,053

\* Source: Sanitary Sewer Analysis calculations/exhibits by Meurer & Associates dated 7/5/2005 for Parklands (formerly Eastern Hills)

\*\* Source: Master Utilities Report for Sun Meadow, CVL Consultants of Colorado, Inc., Oct. 5, 2005

\*\*\*MAX UNITS AND MAX POPULATION WILL BE UP TO BUT NOT EXCEEDING THE NUMBER SHOWN.

**HARMONY DEVELOPMENT**  
**CITY OF AURORA**  
**ON-SITE SANITARY SEWER PEAK ROUTING CALCULATIONS - (PERMANENT GRAVITY SYSTEM)**

DESIGN POINT	PLANNING AREA	DESCRIPTION	AREA (AC)	UNITS	MAXIMUM DENSITY (DU/AC)	OCCUPANCY (PERSONS/DU)	AVG DAY FLOW (GPD/CAP)	PERCENTAGE OF PLANNING AREA	AVG DAY FLOW (GPD)	POPULATION (THOUSANDS)	PEAKING FACTOR (PF)	PEAK DAILY FLOW (GPD)	INFILTRATION 10% OF AVG DAY FLOW (GPD)	PEAK DAY FLOW WITH INFILTRATION (GPD)	PEAK DAY FLOW WITH INFILTRATION (CFS)	COMMENTS
<b>SS2</b>	<b>PA-1, 2, 3</b>		<b>297.7</b>	<b>2,231</b>					<b>442,805</b>	<b>6.519</b>	<b>3.7</b>	<b>1,618,898</b>	<b>44,281</b>	<b>1,663,178</b>	<b>2.57</b>	<b>to DP SS1, 12"</b>
SS2	PA-1	SFD	12.6	101	8.0	2.77	68	100%	19,024	0.280	4.0	76,097	1,902	78,000	0.12	
SS2	PA-2 (40%)	SFD	107.8	862	8.0	2.77	68	40%	64,947	0.955	4.0	259,786	6,495	266,281	0.41	
<b>SS3</b>	<b>PA-2, 3</b>		<b>242.0</b>	<b>1,785</b>					<b>358,834</b>	<b>5.284</b>	<b>3.8</b>	<b>1,358,731</b>	<b>35,883</b>	<b>1,394,614</b>	<b>2.16</b>	<b>to DP SS2 - 12"</b>
SS3	PA-2 (35%)	SFD	107.8	862	8.0	2.77	68	100%	162,366	2.388	4.0	649,465	16,237	665,702	1.03	
SS3	PA-17	SCHOOL	19.0	1		(Equivalent Pop./Acre) 18.0	(GPD/Acre) 1,200	100%	22,800	0.342	4.0	91,200	2,280	93,480	0.14	
<b>SS4</b>	<b>PA-3</b>		<b>115.2</b>	<b>922</b>					<b>173,668</b>	<b>2.554</b>	<b>4.0</b>	<b>694,672</b>	<b>17,367</b>	<b>712,038</b>	<b>1.10</b>	<b>to DP SS3 - 12"</b>
SS4	PA-3 (80%)	SFD	115.2	922	8.0	2.77	68	80%	138,934	2.043	4.0	555,737	13,893	569,631	0.88	
<b>SS5</b>	<b>PA-3</b>		<b>23.0</b>	<b>184</b>					<b>34,734</b>	<b>0.511</b>	<b>4.0</b>	<b>138,934</b>	<b>3,473</b>	<b>142,408</b>	<b>0.22</b>	<b>to DP SS4 - 8"</b>
SS5	PA-3 (20%)	SFD	115.2	922	8.0	2.77	68	20%	34,734	0.511	4.0	138,934	3,473	142,408	0.22	

DESIGN POINT	PLANNING AREA	DESCRIPTION	AREA (AC)	UNITS	MAXIMUM DENSITY (DU/AC)	OCCUPANCY (PERSONS/DU)	AVG DAY FLOW (GPD/CAP)	PERCENTAGE OF PLANNING AREA	AVG DAY FLOW (GPD)	POPULATION (THOUSANDS)	PEAKING FACTOR (PF)	PEAK DAILY FLOW (GPD)	INFILTRATION 10% OF AVG DAY FLOW (GPD)	PEAK DAY FLOW WITH INFILTRATION (GPD)	PEAK DAY FLOW WITH INFILTRATION (CFS)	COMMENTS
<b>SS8</b>	<b>PA-2, 5, 6, 7, 8, 9, 10, 11, 12, SOUTH SCHOOL, CS, CHURCH, MF-MED, F-12,13, COMM, MUNICIPAL</b>		<b>437.3</b>	<b>1,811</b>					<b>404,129</b>	<b>5.748</b>	<b>3.7</b>	<b>1,508,846</b>	<b>40,413</b>	<b>1,549,259</b>	<b>2.40</b>	<b>to DP SS7, 15"</b>
SS8	COMMERCIAL SITE	CS	20.0			(Equivalent Pop./Acre) 22.0	(GPD/Acre) 1,500	100%	30,000	0.440	4.0	120,000	3,000	123,000	0.19	
<b>SS9</b>	<b>PA-7, 9, 10, 11, 12, SOUTH SCHOOL, F-12,13, COMM, MUNICIPAL</b>		<b>319.6</b>	<b>1,811</b>					<b>273,050</b>	<b>5.308</b>	<b>3.8</b>	<b>1,033,100</b>	<b>27,305</b>	<b>1,060,405</b>	<b>1.64</b>	<b>to DP SS8 - 12"</b>
SS9	PA-2 (16 HOMES)	SFD	26.95	16	8.0	2.77	68	25%	753	0.011	4.0	3,014	75	3,089	0.00	
<b>SS10</b>	<b>PA-11,12, COMM, MUNICIPAL</b>		<b>116.7</b>	<b>351.0</b>					<b>78,166</b>	<b>1.153</b>	<b>4.0</b>	<b>312,664</b>	<b>7,817</b>	<b>320,481</b>	<b>0.50</b>	<b>to DP SS9 - 8"</b>
SS10	COMMUNITY CENTER		7.4			(Equivalent Pop./Acre) 18.0	(GPD/Acre) 1,200	100%	8,880	0.133	4.0	35,520	888	36,408	0.06	
<b>SS19</b>	<b>PA-64 - MUNICIPAL</b>		<b>2.8</b>	<b>1</b>					<b>3,360</b>	<b>0.050</b>	<b>4.0</b>	<b>13,440</b>	<b>336</b>	<b>13,776</b>	<b>0.02</b>	<b>to DP SS10 - 8"</b>
SS19	PA-64 - MUNICIPAL	SFD	2.8	1		(Equivalent Pop./Acre) 18.0	(GPD/Acre) 1200	100%	3,360	0.050	4.0	13,440	336	13,776	0.02	
<b>SS11</b>	<b>PA-12</b>		<b>83.4</b>	<b>269</b>					<b>50,669</b>	<b>0.745</b>	<b>4.0</b>	<b>202,675</b>	<b>5,067</b>	<b>207,742</b>	<b>0.32</b>	<b>to DP SS10 - 8"</b>
SS11	PA-12	SFD	83.4	269	3.2	2.77	68	100%	50,669	0.745	4.0	202,675	5,067	207,742	0.32	
<b>SS12</b>	<b>PA-11</b>		<b>23.1</b>	<b>81</b>					<b>15,257</b>	<b>0.224</b>	<b>4.0</b>	<b>61,029</b>	<b>1,526</b>	<b>62,554</b>	<b>0.10</b>	<b>to DP SS10 - 8"</b>
SS12	PA-11	SFD	23.1	81	3.5	2.77	68	100%	15,257	0.224	4.0	61,029	1,526	62,554	0.10	
<b>SS13</b>	<b>PA-7, 9, 10, SOUTH SCHOOL, F-12,13</b>		<b>196.2</b>	<b>1,456</b>					<b>194,131</b>	<b>4.144</b>	<b>3.9</b>	<b>765,508</b>	<b>19,413</b>	<b>784,922</b>	<b>1.21</b>	<b>to DP SS9 - 12"</b>
SS13	PA-7	SFD	51.5	193	3.7	2.77	68	100%	36,353	0.535	4.0	145,414	3,635	149,049	0.23	

**HARMONY DEVELOPMENT**  
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DESIGN POINT	PLANNING AREA	DESCRIPTION	AREA (AC)	UNITS	MAXIMUM DENSITY (DU/AC)	OCCUPANCY (PERSONS/DU)	AVG DAY FLOW (GPD/CAP)	PERCENTAGE OF PLANNING AREA	AVG DAY FLOW (GPD)	POPULATION (THOUSANDS)	PEAKING FACTOR (PF)	PEAK DAILY FLOW (GPD)	INFILTRATION 10% OF AVG DAY FLOW (GPD)	PEAK DAY FLOW WITH INFILTRATION (GPD)	PEAK DAY FLOW WITH INFILTRATION (CFS)	COMMENTS
SS14	PA-8, CHURCH, MF-MED, PA-5, 6		97.7	464					101,079	0.914	4.0	404,316	10,108	414,424	0.64	to DP SS8 - 8"
SS14	PA-6	SFD	18.4	54	2.9	2.77	68	100%	10,171	0.150	4.0	40,686	1,017	41,703	0.06	
SS15	PA-8, CHURCH, MF-MED, PA-5		79.3	410					90,908	0.765	4.0	363,630	9,091	372,721	0.58	to DP SS14 - 8"
SS15	PA-5	SFD	15.5	63	4.1	2.77	68	100%	11,867	0.175	4.0	47,467	1,187	48,653	0.08	
SS16	PA-9, 10, SOUTH SCHOOL F-12,13		144.7	799					157,777	2.695	4.0	631,109	15,778	646,887	1.00	to DP SS13 - 12"
SS16	PA-10	SFD	22.6	54	2.4	2.77	68	100%	10,171	0.150	4.0	40,686	1,017	41,703	0.06	
SS17	PA-8, CHURCH, MF-MED		63.8	347					79,041	0.590	4.0	316,164	7,904	324,068	0.50	to DP SS15 - 8"
SS17	PA-8	SFD	42.0	139	3.3	2.77	68	100%	26,182	0.385	4.0	104,728	2,618	107,346	0.17	
SS18	CHURCH		11.4	1					13,680	0.205	4.0	54,720	1,368	56,088	0.09	to DP SS17 - 8"
SS18	CHURCH	SFD	11.4	1		(Equivalent Pop./Acre) 18.0	(GPD/Acre) 1200	100%	13,680	0.205	4.0	54,720	1,368	56,088	0.09	
SS20	PA-9		37.0	374					31,268	1.036	4.0	125,071	3,127	128,198	0.20	to DP SS16 - 8"
SS20	PA-9	SFD	37.0	166	4.5	2.77	68	100%	31,268	0.460	4.0	125,071	3,127	128,198	0.20	
SS21	MF-MED		10.4	208					39,179	0.576	4.0	156,716	3,918	160,633	0.25	to DP SS17 - 8"
SS21	MF-MEDIUM	MF-MEDIUM	10.4	208	20.0	2.77	68	100%	39,179	0.576	4.0	156,716	3,918	160,633	0.25	
SS22	SOUTH SCHOOL, PARK F-12 PARK F-13		85.1	371					116,338	1.510	4.0	465,352	11,634	476,986	0.74	to DP SS16 - 8"
SS22	PA-18- SOUTH SCHOOL	SCHOOL	18.1	1		(Equivalent Pop./Acre) 18.0	(GPD/Acre) 1200	100%	21,720	0.326	4.0	86,880	2,172	89,052	0.14	
SS22	PARKLAND F-12	OFFSITE	24.0	145				100%	37,018	0.464	4.0	148,072	3,702	151,774	0.23	
SS23	PARK F-13		43.0	225					57,600	0.720	4.0	230,400	5,760	236,160	0.37	to DP SS22 - 8"
SS23	PARKLAND F-13	OFFSITE	43.0	225				100%	57,600	0.720	4.0	230,400	5,760	236,160	0.37	
SS40	PA-4,13,14,15,16,91,90,89,92,93,87,86 PARK F-1,7, SM OFF-1, SM OFF-2		1389.5	7,503					1,723,701	22.612	3.0	5,119,847	172,370	5,292,217	8.19	Tie to 18" SS Line at 6th Ave/Pow
SS40	SM OFF-2	SFD	30.0	168.0				100%	31,644	0.465	4.0	126,578	3,164	129,742	0.20	
SS40	PA-86	SFD	23.2	123.0	5.3	2.77	68	100%	23,168	0.341	4.0	92,673	2,317	94,990	0.15	
SS39	PA-4,13,14,15,16,91,90,89,92,93,87 PARK F-1,7, SM OFF-1		1336.3	7,212					1,668,889	21.806	3.0	4,987,178	166,889	5,154,067	7.98	to SS40 - 18"
SS39	PA-87	SFD	24.0	156.0	6.5	2.77	68	100%	29,384	0.432	4.0	117,537	2,938	120,475	0.19	
SS38	PA-4,13,14,15,16,91,90,89,92,93 PARK F-1,7, SM OFF-1		1312.3	7,056					1,639,504	21.374	3.0	4,915,773	163,950	5,079,723	7.86	to SS39 - 18"
SS37	PA-93, PA-92		64.1	420					103,373	1.519	4.0	413,491	10,337	423,829	0.66	to SS38 - 8"
SS37	PA-92	SFA-TH	24.1	419.0	17.4	2.77	68	100%	78,923	1.161	4.0	315,691	7,892	323,584	0.50	
SS36	PA-93		40.0	1					24,450	0.359	4.0	97,800	2,445	100,245	0.16	to SS37 - 8"
SS36	PA-93-CAC	SFD	40.0	1.0		(Equivalent Pop./Acre) 22.0	(GPD/Acre) 1500	100%	24,450	0.359	4.0	97,800	2,445	100,245	0.16	

**HARMONY DEVELOPMENT**  
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DESIGN POINT	PLANNING AREA	DESCRIPTION	AREA (AC)	UNITS	MAXIMUM DENSITY (DU/AC)	OCCUPANCY (PERSONS/DU)	AVG DAY FLOW (GPD/CAP)	PERCENTAGE OF PLANNING AREA	AVG DAY FLOW (GPD)	POPULATION (THOUSANDS)	PEAKING FACTOR (PF)	PEAK DAILY FLOW (GPD)	INFILTRATION 10% OF AVG DAY FLOW (GPD)	PEAK DAY FLOW WITH INFILTRATION (GPD)	PEAK DAY FLOW WITH INFILTRATION (CFS)	COMMENTS
<b>SS35</b>	<b>PA-4,13,14,15,16,91,90,89 PARK F-1,7, SM OFF-1</b>		<b>1248.2</b>	<b>6,636</b>					<b>1,536,132</b>	<b>19.855</b>	<b>3.0</b>	<b>4,662,890</b>	<b>153,613</b>	<b>4,816,503</b>	<b>7.45</b>	<b>to SS36 - 18"</b>
SS35	PA-89	SFD	30.0	168.0	5.6	2.77	68	100%	31,644	0.465	4.0	126,578	3,164	129,742	0.20	
<b>SS34</b>	<b>PA-13,14,15,16,91,90 PARK F-1,7 SM OFF-1</b>		<b>1218.2</b>	<b>6,468</b>					<b>1,504,487</b>	<b>19.389</b>	<b>3.0</b>	<b>4,584,958</b>	<b>150,449</b>	<b>4,735,407</b>	<b>7.33</b>	<b>to SS36 - 18"</b>
SS34	PA-90	SFD	40.0	204.0	5.1	2.77	68	100%	38,425	0.565	4.0	153,702	3,843	157,544	0.24	
<b>SS33</b>	<b>PA-4,13,14,15,16,91 PARK F-1,7 SM OFF-1</b>		<b>1178.2</b>	<b>6,264</b>					<b>1,466,062</b>	<b>18.824</b>	<b>3.1</b>	<b>4,489,978</b>	<b>146,606</b>	<b>4,636,585</b>	<b>7.17</b>	<b>to SS34 - 18"</b>
SM DP 2/SS33	PA-91	SFD	12.1	39	3.2	2.77	68	100%	7,346	0.108	4.0	29,384	735	30,119	0.05	
<b>SS25</b>	<b>PA-4,13,14,15,16, PARK F-1,7, SM OFF-1</b>		<b>1166.1</b>	<b>6,225</b>					<b>1,458,716</b>	<b>18.716</b>	<b>3.1</b>	<b>4,471,776</b>	<b>145,872</b>	<b>4,617,648</b>	<b>7.15</b>	<b>to SS33 - 18"</b>
SM DP 1/ SS 25	SM OFF-1	SFD/MF COMM/RETAIL	160.5	857.0				100%	162,208	2.028	4.0	648,832	16,221	665,053	1.03	
SS25	PA-4	SFD	62.0	247	4.0	2.77	68	100%	46,525	0.684	4.0	186,100	4,652	190,752	0.30	
<b>SS26</b>	<b>PA-13,14,15,16 PARK F-1,7</b>		<b>943.6</b>	<b>5,121</b>					<b>1,249,983</b>	<b>16.004</b>	<b>3.1</b>	<b>3,933,395</b>	<b>124,998</b>	<b>4,058,393</b>	<b>6.28</b>	<b>to SS25 - 18"</b>
SS 26	PA-13	SFD	64.5	206	3.2	2.77	68	100%	38,802	0.571	4.0	155,209	3,880	159,089	0.25	
<b>SS27</b>	<b>PARK F-7</b>		<b>282.0</b>	<b>1,896</b>					<b>485,366</b>	<b>6.067</b>	<b>2.8</b>	<b>1,349,317</b>	<b>48,537</b>	<b>1,397,854</b>	<b>2.16</b>	<b>to DP SS27 -15"</b>
SS27	PARKLAND F-7	OFFSITE	282.0	1,896				100%	485,366	6.067	2.8	1,349,317	48,537	1,397,854	2.16	
<b>SS28</b>	<b>PA-14,15,16, PARK F-1</b>		<b>597.1</b>	<b>3,019</b>					<b>725,815</b>	<b>9.366</b>	<b>3.4</b>	<b>2,497,714</b>	<b>72,581</b>	<b>2,570,295</b>	<b>3.98</b>	<b>to DP SS26 - 15"</b>
SS28	PA-14 (60)	SFD	59.3	219	3.7	2.77	68	60%	24,751	0.364	4.0	99,002	2,475	101,477	0.16	
<b>SS29</b>	<b>PA-15 (60%)</b>		<b>35.9</b>	<b>233</b>					<b>43,888</b>	<b>0.645</b>	<b>4.0</b>	<b>175,552</b>	<b>4,389</b>	<b>179,940</b>	<b>0.28</b>	<b>to DP SS28 - 8"</b>
SS30	PA-15	SFD	35.9	233	6.5	2.77	68	100%	43,888	0.645	4.0	175,552	4,389	179,940	0.28	
<b>SS30</b>	<b>PA-14, 15, 16, PARKLAND F-1</b>		<b>525.6</b>	<b>2,655</b>					<b>657,176</b>	<b>8.357</b>	<b>3.5</b>	<b>2,304,989</b>	<b>65,718</b>	<b>2,370,707</b>	<b>3.67</b>	<b>to DP SS29 - 15"</b>
SS30	PA-14 (40%)	SFD	59.3	219	3.7	2.77	68	40%	16,500	0.243	4.0	66,001	1,650	67,651	0.10	
<b>SS31</b>	<b>PA-16, Park-F1</b>		<b>501.9</b>	<b>2,567</b>					<b>640,676</b>	<b>8.114</b>	<b>3.5</b>	<b>2,258,200</b>	<b>64,068</b>	<b>2,322,268</b>	<b>3.59</b>	<b>to DP SS30 - 15"</b>
SS31	PA-16	SFD	35.9	233	6.5	2.77	68	100%	43,888	0.645	4.0	175,552	4,389	179,940	0.28	
SS31	Parklands-F1	Offsite	466.0	2,334				100%	596,788	7.469	2.6	1,533,745	59,679	1,593,424	2.47	
<b>SS41</b>	<b>PA-88</b>		<b>32.4</b>	<b>162</b>					<b>30,514</b>	<b>0.449</b>	<b>4.0</b>	<b>122,057</b>	<b>3,051</b>	<b>125,109</b>	<b>0.19</b>	<b>Tie into existing 10" ss</b>
SS41	PA-88	SFD	32.4	162.0	5.0	2.77	68	100%	30,514	0.449	4.0	122,057	3,051	125,109	0.19	

## NOTES:

Peaking Factor =  $5/p^{0.167}$ , p = population in thousands, where  $1.7 < PF < 4$ Sanitary Sewer loading rates, factors, and calculations based on City of Aurora Public Utility Improvements Standards and Specifications Chapter 4

(p) - in Planning Area and Description columns represent portion of the total Planning Area described







# Channel Report

## SS8

### Circular

Diameter (ft) = 1.25

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 2.42

### Highlighted

Depth (ft) = 0.70

Q (cfs) = 2.420

Area (sqft) = 0.71

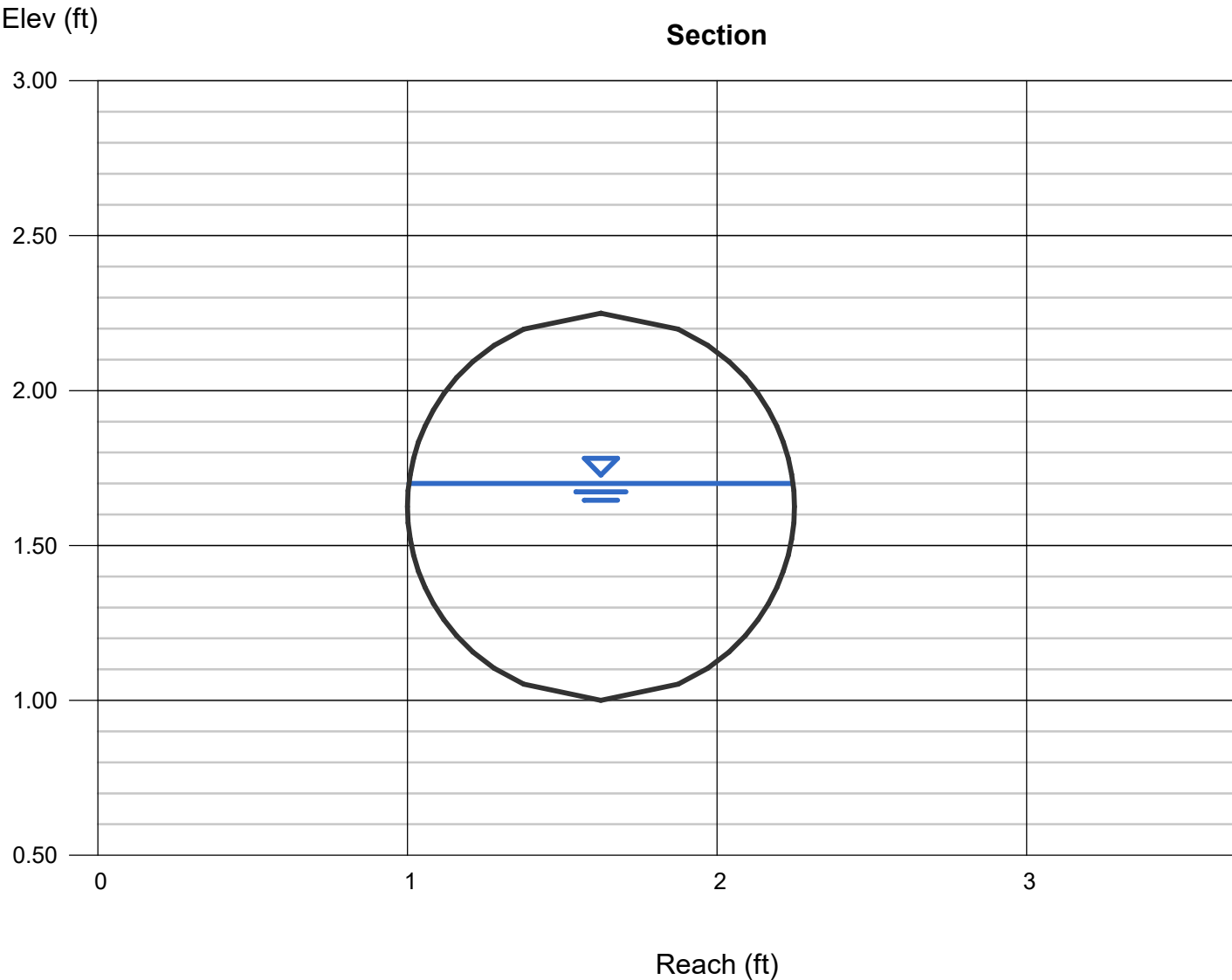
Velocity (ft/s) = 3.41

Wetted Perim (ft) = 2.12

Crit Depth, Yc (ft) = 0.63

Top Width (ft) = 1.24

EGL (ft) = 0.88



# Channel Report

## SS9

### Circular

Diameter (ft) = 1.00

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 1.64

### Highlighted

Depth (ft) = 0.64

Q (cfs) = 1.640

Area (sqft) = 0.53

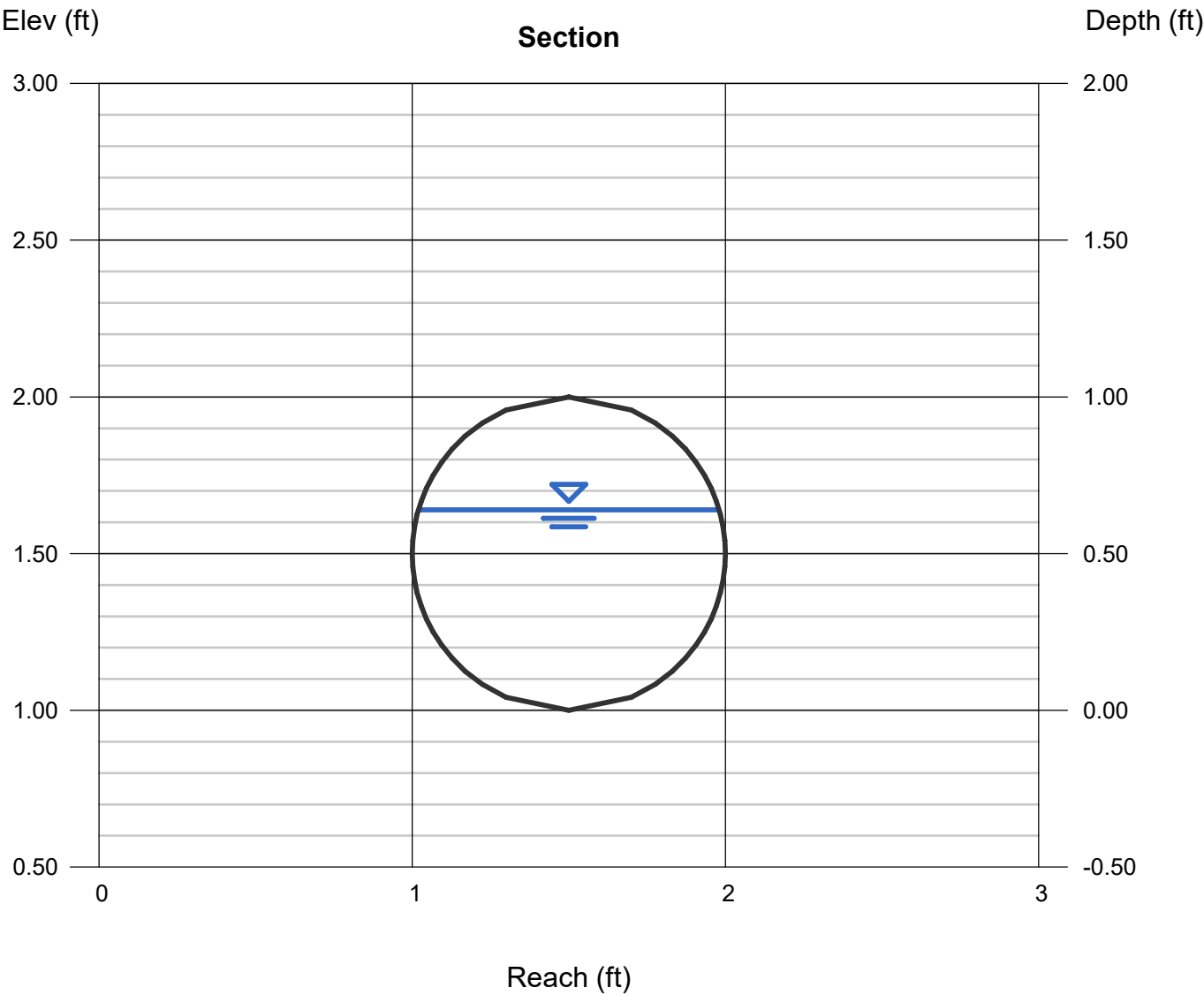
Velocity (ft/s) = 3.09

Wetted Perim (ft) = 1.85

Crit Depth, Yc (ft) = 0.55

Top Width (ft) = 0.96

EGL (ft) = 0.79



# Channel Report

## SS13

### Circular

Diameter (ft) = 1.00

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 1.21

### Highlighted

Depth (ft) = 0.52

Q (cfs) = 1.210

Area (sqft) = 0.41

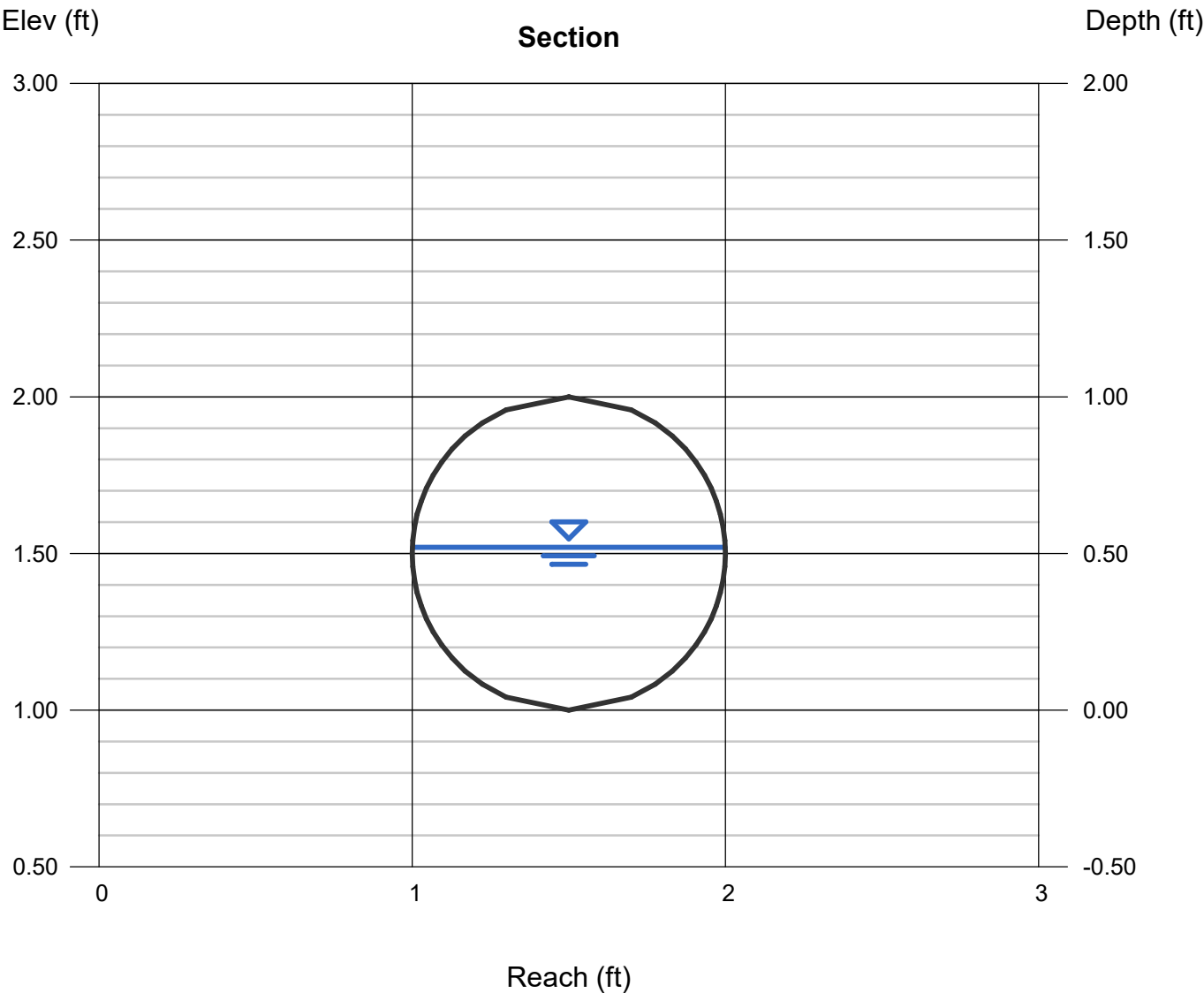
Velocity (ft/s) = 2.92

Wetted Perim (ft) = 1.61

Crit Depth, Yc (ft) = 0.47

Top Width (ft) = 1.00

EGL (ft) = 0.65



# Channel Report

## SS14

### Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 0.67

### Highlighted

Depth (ft) = 0.49

Q (cfs) = 0.670

Area (sqft) = 0.28

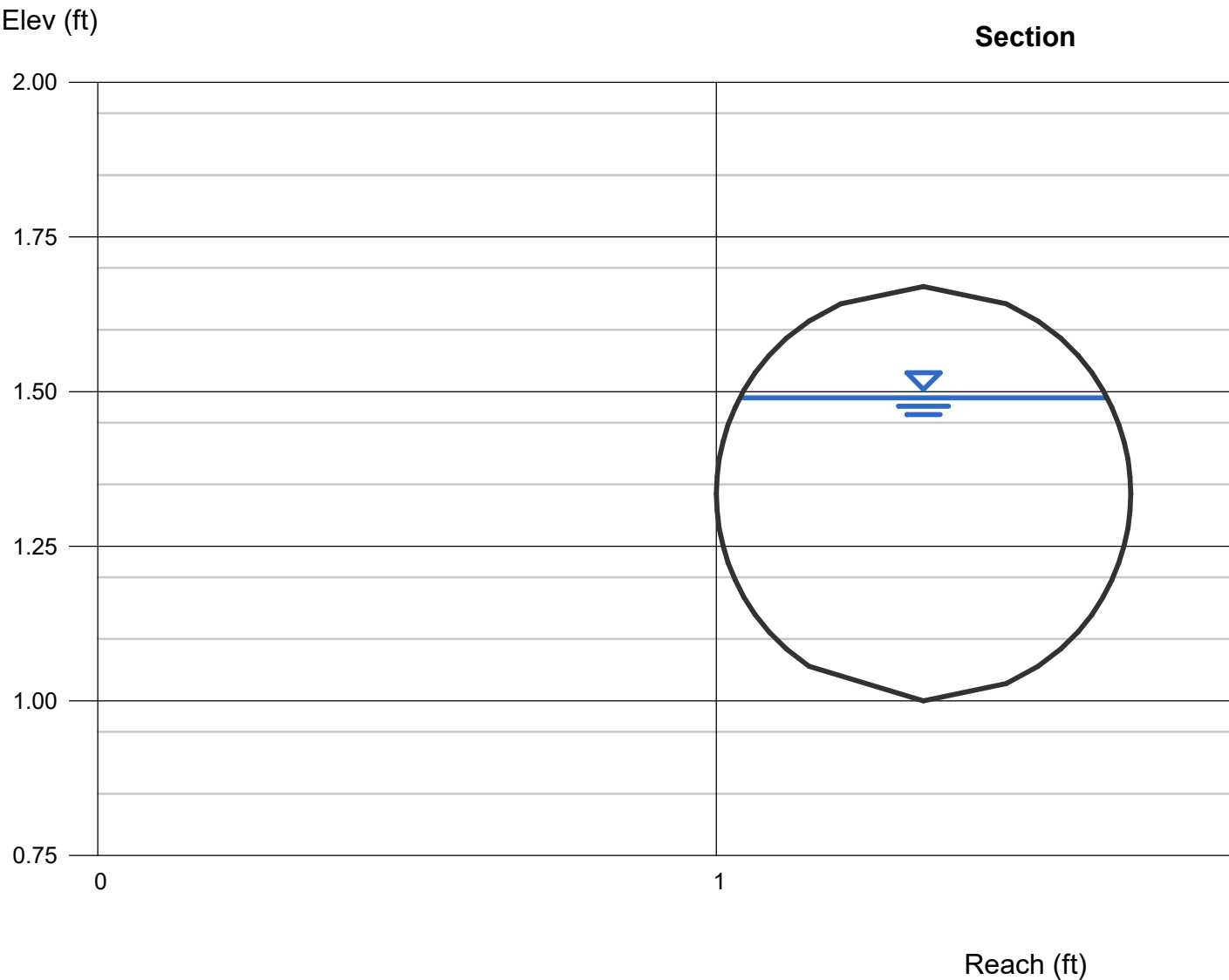
Velocity (ft/s) = 2.42

Wetted Perim (ft) = 1.38

Crit Depth, Yc (ft) = 0.39

Top Width (ft) = 0.59

EGL (ft) = 0.58



# Channel Report

## SS15

### Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 0.60

### Highlighted

Depth (ft) = 0.45

Q (cfs) = 0.600

Area (sqft) = 0.25

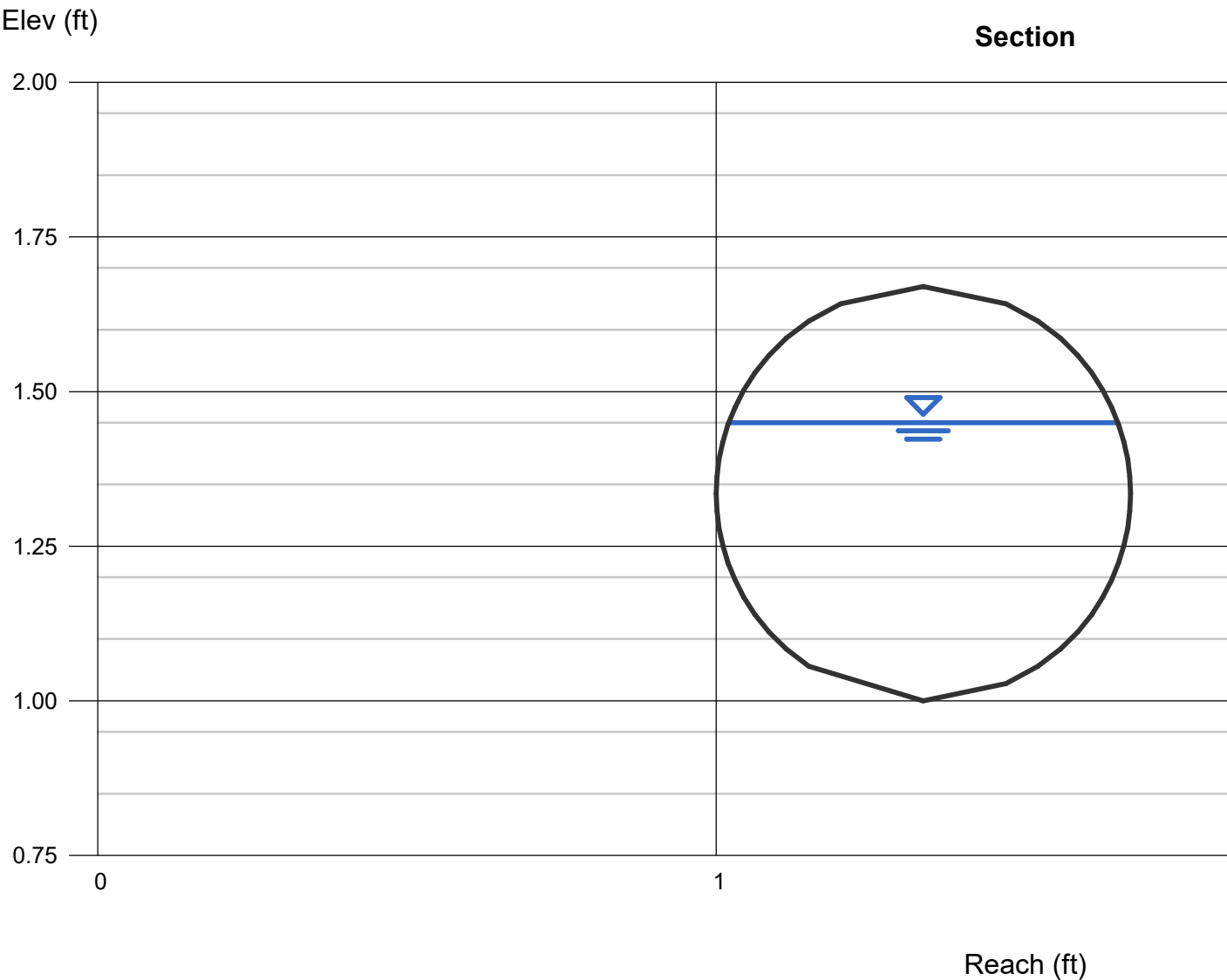
Velocity (ft/s) = 2.38

Wetted Perim (ft) = 1.29

Crit Depth, Yc (ft) = 0.37

Top Width (ft) = 0.63

EGL (ft) = 0.54



# Channel Report

## SS16

### Circular

Diameter (ft) = 1.00

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 1.00

### Highlighted

Depth (ft) = 0.47

Q (cfs) = 1.000

Area (sqft) = 0.36

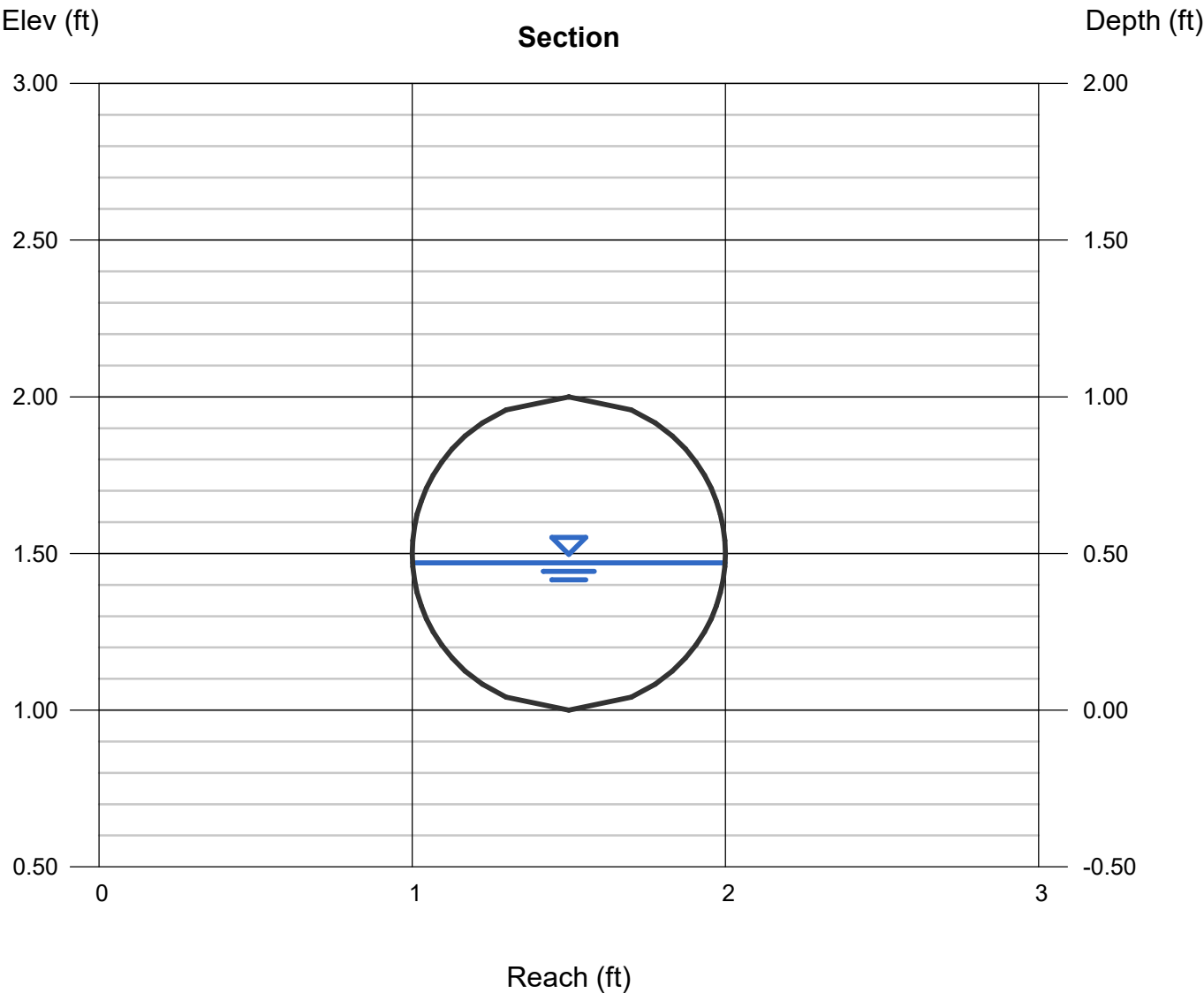
Velocity (ft/s) = 2.74

Wetted Perim (ft) = 1.51

Crit Depth, Yc (ft) = 0.42

Top Width (ft) = 1.00

EGL (ft) = 0.59



# Channel Report

## SS17

### Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 0.53

### Highlighted

Depth (ft) = 0.41

Q (cfs) = 0.530

Area (sqft) = 0.23

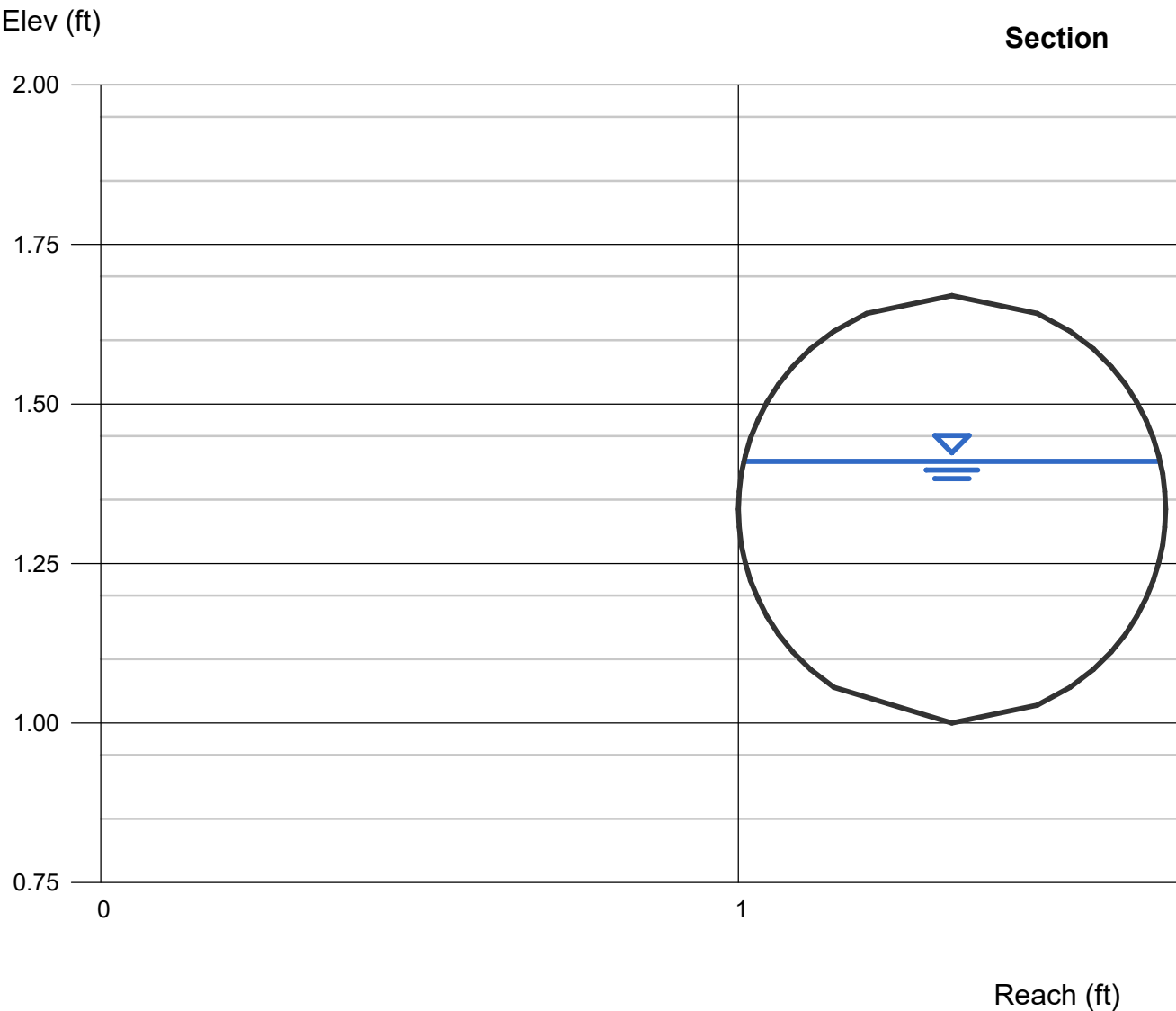
Velocity (ft/s) = 2.34

Wetted Perim (ft) = 1.21

Crit Depth, Yc (ft) = 0.34

Top Width (ft) = 0.65

EGL (ft) = 0.49





# Channel Report

## SS18

### Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 0.08

### Highlighted

Depth (ft) = 0.15

Q (cfs) = 0.080

Area (sqft) = 0.06

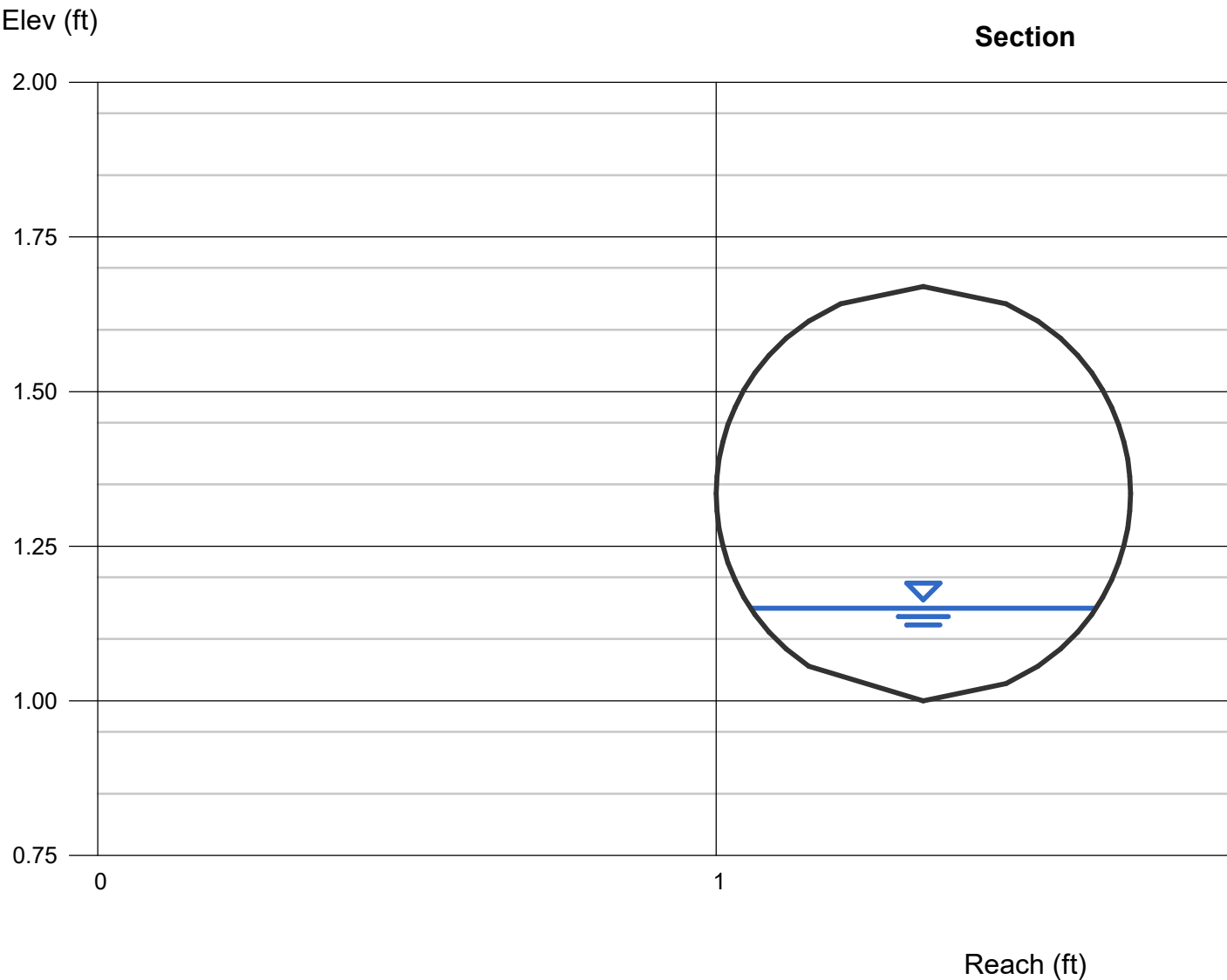
Velocity (ft/s) = 1.34

Wetted Perim (ft) = 0.66

Crit Depth, Yc (ft) = 0.13

Top Width (ft) = 0.56

EGL (ft) = 0.18



# Channel Report

## SS20

### Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 0.20

### Highlighted

Depth (ft) = 0.24

Q (cfs) = 0.200

Area (sqft) = 0.11

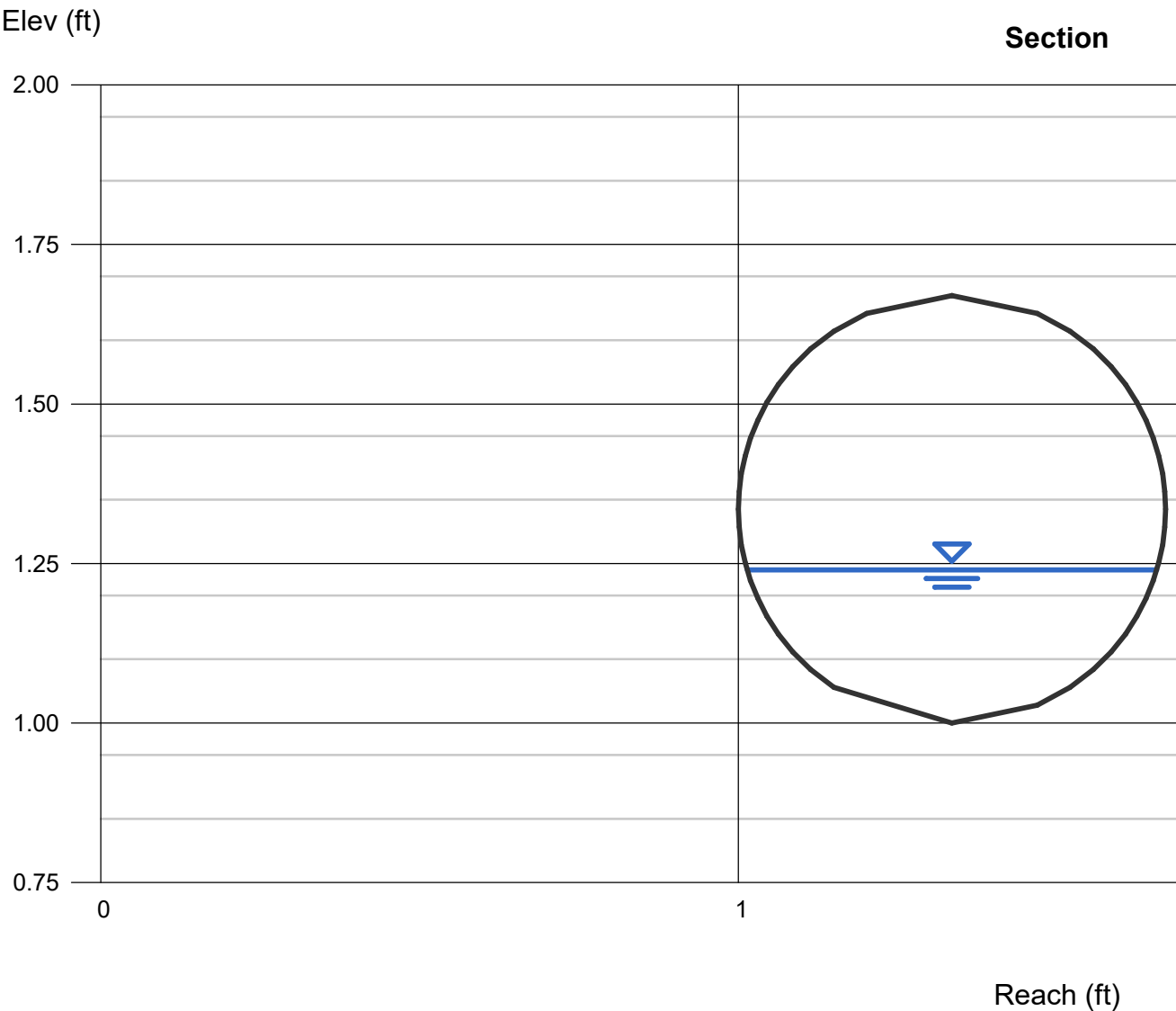
Velocity (ft/s) = 1.76

Wetted Perim (ft) = 0.86

Crit Depth, Yc (ft) = 0.21

Top Width (ft) = 0.64

EGL (ft) = 0.29



# Channel Report

## SS21

### Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 0.25

### Highlighted

Depth (ft) = 0.27

Q (cfs) = 0.250

Area (sqft) = 0.13

Velocity (ft/s) = 1.87

Wetted Perim (ft) = 0.92

Crit Depth, Yc (ft) = 0.23

Top Width (ft) = 0.66

EGL (ft) = 0.32

