

# **EXHIBIT H**

**Preliminary Storm Drainage Report, Map, LTC**

**(3/17/2020)**



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**POULSBO PLACE 2 DIV. 8  
REDEVELOPMENT MASTER PLAN AMENDMENT  
AND SITE PLAN REVIEW  
PRELIMINARY STORM DRAINAGE REPORT**

**For: Phase II, LLC  
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**Preparation Date: 3-17-20  
Job No. 5987.00**

“I hereby state that this Drainage Report has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community of professional engineers. The analysis has been prepared utilizing procedures and practices specified by the City of Poulsbo and within the standard accepted practices of the industry. I understand that the City of Poulsbo does not and will not assume liability for the sufficiency, suitability or performance of drainage facilities prepared by me.

3-23-20



NOTE: THIS DOCUMENT IS INSCRIBED  
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ENGINEER AS PROVIDED BY WAC  
196-23-070(2)

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**POULSBO PLACE 2 DIV. 8**  
**2020 MASTER PLAN AMENDMENT & SITE PLAN REVIEW**  
**PRELIMINARY STORM DRAINAGE REPORT**

**PROJECT OVERVIEW**

Poulsbo Place is the redevelopment of an area of Old Military Housing near downtown Poulsbo. The Poulsbo Place 2 project is the second phase of the overall project, and Divisions 5, 6 & 7 have been completed. The last phase is Division 8, and a Mixed-Use Building and Multi-family building(s) are proposed. The site is located north and east of the Poulsbo Post Office, and is bounded by 3<sup>rd</sup> Avenue and Jensen Way, in Section 14, Township 26 North, Range 1 East, W.M., in Kitsap County, Washington.

**INTRODUCTION**

This Preliminary Storm Drainage Report (PSDR) is being prepared at the request of The City of Poulsbo Engineering Department based upon comments received in a Pre-Application Conference letter dated December 17, 2012 for Division 8, Poulsbo Place Master Plan Amendment, as well as follow-up Pre-Application Meetings held on July 31, 2018, December 18, 2018, and February 18, 2020. The comments found on Page 10 of 24 are as follows:

14. *All temporary and permanent storm system and erosion control measures shall be designed, constructed, maintained, and governed per the following, as adopted by the City of Poulsbo:*
  - a. *The Washington state Department of Ecology (DOE) Stormwater Management Manual for the Puget Sound Basin (1992)*
  - b. *The Kitsap County Stormwater Management Design Manual (1997)*
  - c. *City of Poulsbo standards and ordinances*
  - d. *All conditions of approval associated with any clearing and/or grading permits*
  - e. *Recommendations of the geo-technical engineer*
  
15. *A preliminary storm drainage report (PSDR) and plan was submitted and accepted for Poulsbo Place II in April 2002 and revised in January 2004 with the Master site plan application. A final drainage report shall include an analysis of the current proposed drainage design and how it follows the 2004 accepted design concepts, which satisfies the City Engineer that the design complies with all City requirements and protects downstream properties and the surrounding area from damage and any adverse impacts. Appropriate documentation such as calculations and manufacturer product specifications should accompany the updated drainage report.*
  
16. *There are some downstream pipe capacity and flow concerns that will need to be addressed for this project. Projects that have potential to create downstream flooding cannot be approved without addressing the outstanding issues. The City*

*has no immediate plans to address these issues, so the applicant may need to investigate possible corrections in order to allow use of the street drainage pipes. While the original PSDR supposedly accounted for existing street drain capacity, with the below identified issues the previous PSDR assumptions may not be valid. Record drawings are available for some sections of the Jensen conveyance but field verification would be wise. Joe Walker in the Public Works Department may be able to give some history of repair attempts for the below situations. Pat Fuhrer was provided with storm drainage plan sheets for Jensen Way to assist with flow evaluation.*

- a) The CB on Jensen in front of the Post Office driveway backs up creating minor street “flooding during any sizeable rain events. The Public Works Department has explored this situation and believes there is a compromised pipe downstream of this CB. The fact that some of the drain pipes in this vicinity are a relatively small 12" size likely does not improve matters for adding the increased flow that Div. 8 would be adding.*
- b) Ultimate discharge of this pipe system to Liberty Bay happens at an outfall near the Anderson Parkway gazebo. Formerly a 30" CMP pipe, this has been reduced to an 18" PVC sleeve section when the CMP collapsed. This final outfall diameter might also affect the new ultimate capacity of the Jensen conveyance.*

Previous PSDR’s prepared by MAP, Ltd. which were submitted with prior land use and final construction applications for Poulsbo Place 2, are based upon a vested PSDR entitled “Poulsbo Place II Preliminary Storm Drainage Report” prepared by Triad Associates dated April 5, 2002, with a January 16, 2004 revision date.

In 2015, a pre-application was held and City Engineering Staff requested a revised downstream pipe capacity analysis, as the 2004 Triad PSDR downstream pipe network backwater flow capacity analysis was not calculated with a submerged outlet at a Mean Higher High Water tidal event at the outfall at Anderson Parkway. Over the course of several months, City Staff researched as-built records and performed several dye tests on the downstream pipe network, particularly below Front Street in Anderson Parkway, to identify the existing pipe network. This additional information was inputted into a hydraulic model to determine the existing capacity of the trunk line at a 100-yr., 24 hr. peak stormwater event occurring simultaneously at a MHHW tide event for the Existing Drainage Basin condition and with the Poulsbo Place 2 Division 8 project on-line.

The existing drainage basin condition analysis shows that one catch basin, located on the east side of Jensen Avenue and labeled as “J10”, surcharges 1.43 feet (17”) in the existing condition and 1.81 feet (22”) with the PP@ Div. 8 project on-line.

## **REFERENCES**

Poulsbo Place II – Preliminary Storm Drainage Report, TRIAD Associates (TRIAD), issued April 5, 2002, and revised January 16, 2004.

Anderson Parkway Outfall Capacity – Technical Memorandum, Parametrix (PMX), dated December 15, 2014.

Storm and Sanitary Analysis (SSA) 2014 SP1, Autodesk, Inc., Version 8.1.62.1, July 17, 2014.

Hydraflow Hydrograph Extension for AutoCAD Civil 3D 2015, Version 10.4, Autodesk Inc.

Relation between various datum planes Location 67 Poulsbo, U.S. Army Corps of Engineers, website source.

Front Street Reconstruction Storm Drain Plan “As-Built”, Roats Engineering, February 10, 1989.

Jensen Way N.E. Road, Storm and Sanitary Sewer Plan/Profile, Pac-Tech Engineers, Inc., December 1991.

## **DOWNSTREAM ANALYSIS**

Pre- and Post-Division 8 drainage sub-basins were identified as shown in the Appendices based upon previous basin descriptions in the TRIAD PSDR and PMX Outfall Capacity Analysis TM, and modified based upon LIDAR topographic contour information provided by Kitsap County.

Topographic survey information gathered for the original Poulsbo Place project was used in the TRIAD PSDR for the downstream stormwater trunkline pipe analysis, but was supplemented for this analysis after detailed investigative work was performed by City Engineering Staff. As-built information was found for the Front Street improvements from 1989, which provided additional critical information that provides better predictions of hydrologic and tidal events and impacts for this analysis.

The storm trunkline was found to contain an additional 24” concrete pipe inlet to Junction 1 in Anderson Parkway, that was found to still be “live”. This 24” pipe purportedly goes under the building and a basement at the southwest corner of Front Street and the entrance to Anderson Parkway, however the location of the “videoed” catch basin was never found. This basement floor elevation was measured and found to be essentially the same elevation as a MHHW tide event of 8.7 ft. NAVD 88 datum.

From this 24” terminus at an assumed J-16 defined in the model, a 12” pipe was found by video inspection to exist and connect to J-15 and then to J-5. Based upon this new information J-5 was found to be essentially a “flow-splitter”, and was defined as such in the model. The 18” trunkline reaches its capacity, then excess water spills into the 12” overflow pipe and drains to J-1 via the 24” pipe.

Upstream of J-5 (SDMH-7 on the Basin Map), the system in Jensen Way N.E. is found to be consistent with the Pac-Tech drawings as verified by the ADA topography survey for the Poulsbo Place 2 project.

In this 2020 update to the PDSR, please note the prior reference to ALC (Assisted Living Center) in the report are no longer valid for the project as currently proposed. Additionally, a Technical Memo from the Project Engineer is attached in the Appendices and concludes that an underground concrete detention vault is more suitable for this project due to the invert elevation and covering height limitations. Also, a concrete detention vault is thought to be a more structurally-enhanced feature with it’s proximity to surcharging from adjacent foundations.

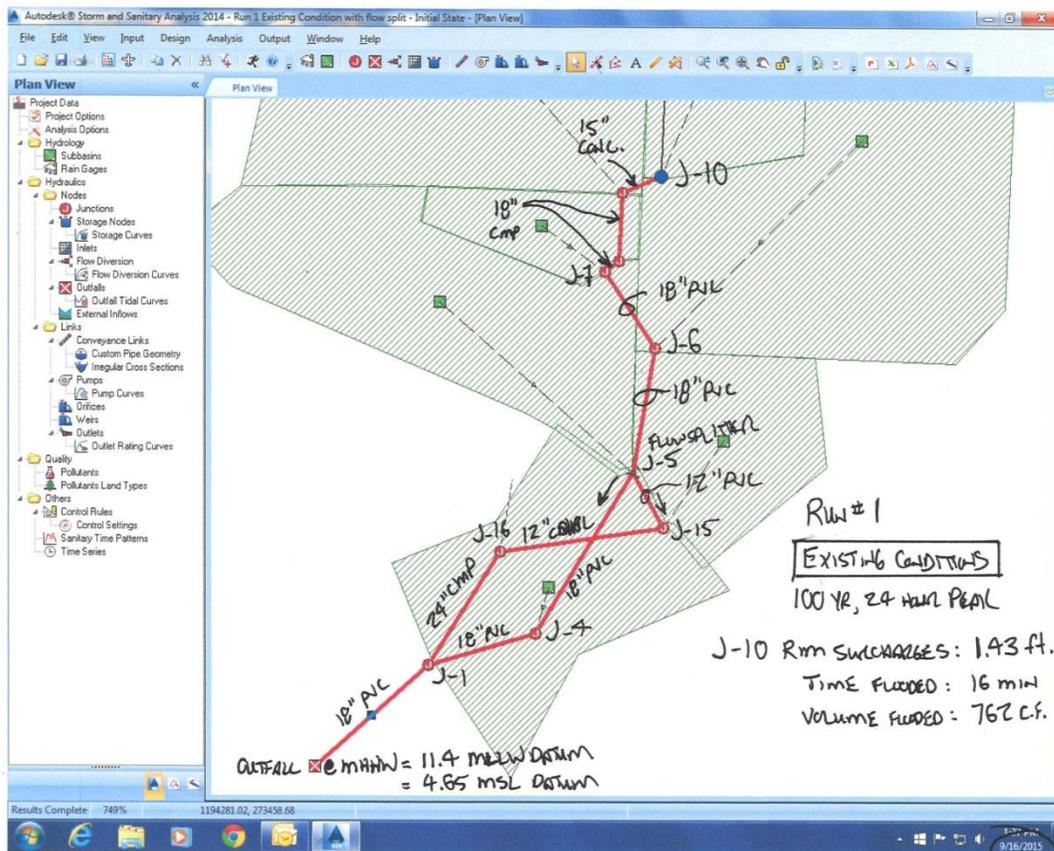
## A. Existing Basin Conditions

SSA Model inputs and output findings are detailed in the appendices, and summarized below as follows:

The existing Basin Analysis performed by the SSA Software yielded the results shown in the appendices, for a 100-yr., 24 hr. peak storm event occurring at a mean higher high tide event of 11.4 MLLW datum (consistent with PMX TM).

Summary:

- All pipes are surcharged below J-10 (SDMH-2 on Basin Maps)
- J-10 is surcharged and would bubble-up 1.43 feet for 16 minutes and flow 5700 gallons of water along the east side of Jensen Avenue.

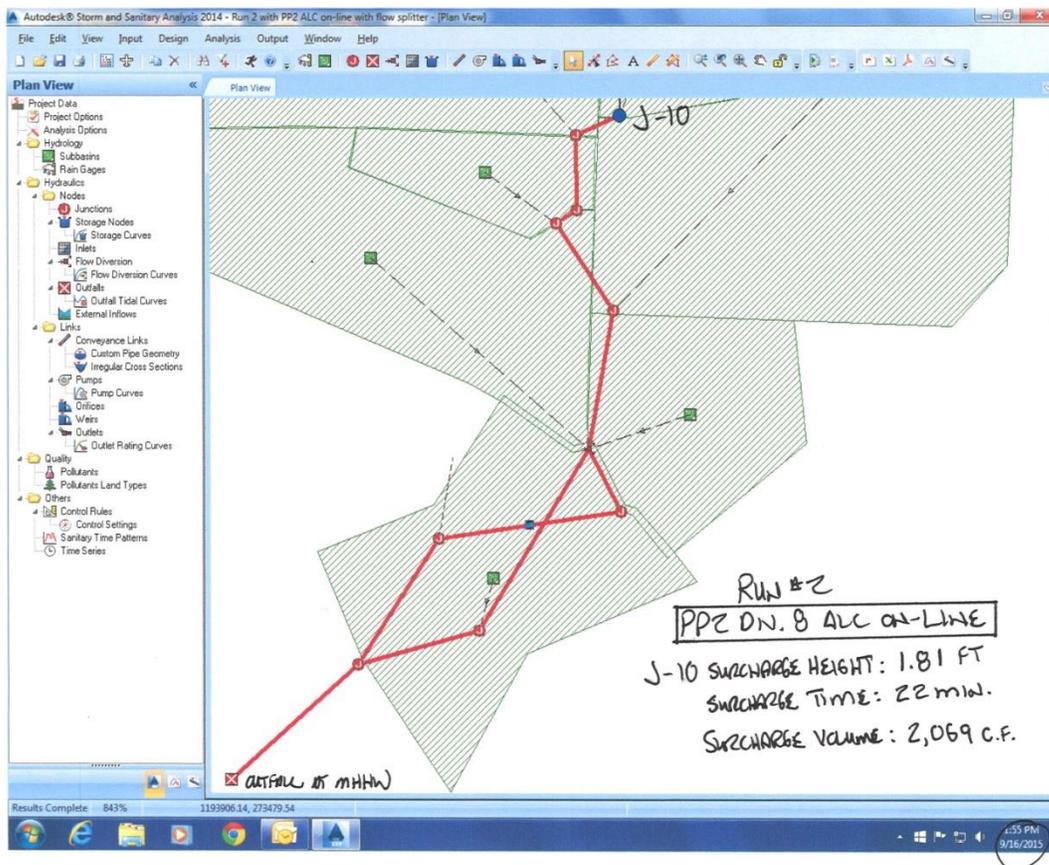


## B. Basin with PP2 Div. 8 Project On-Line

A 95% impervious surface coverage was inputted for the PP2 Division 8 proposed site (Note: the KPAD Fiber Node site developed conditions were also utilized for this analysis).

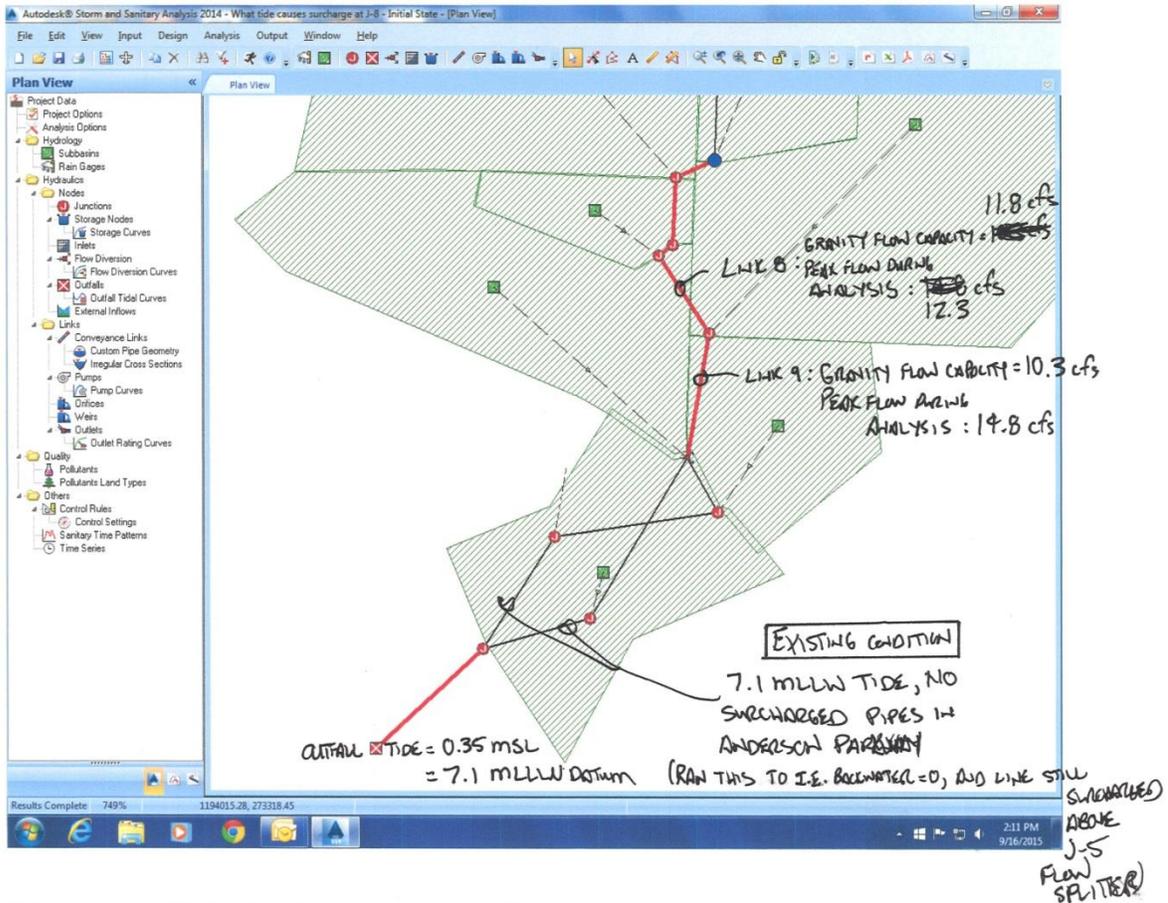
Summary:

- All pipes surcharged below J-10
- J-10 is surcharged and would bubble-up 1.81 feet for 22 minutes and flow approximately 15,500 gallons of stormwater along the east side of Jensen Avenue



### C. Staff Question: Which tide level causes no surcharge in the pipe network?

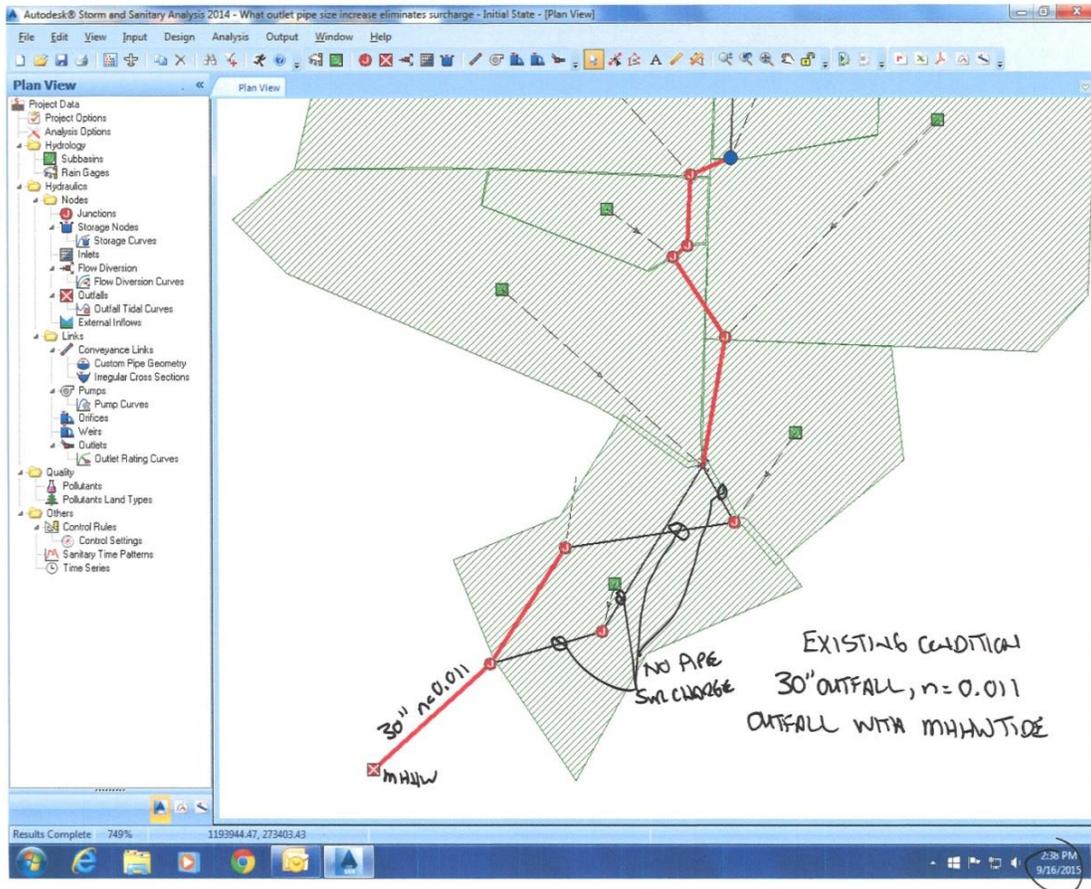
For the existing condition, we iteratively lowered the tailwater tidal elevation to 7.1 MLLW datum, and found this tide event had no backwater effect upon the storm pipe trunkline in Anderson Parkway. However, we found that the storm pipe network above the flowsplitter J-5 remained surcharged up to J-10.

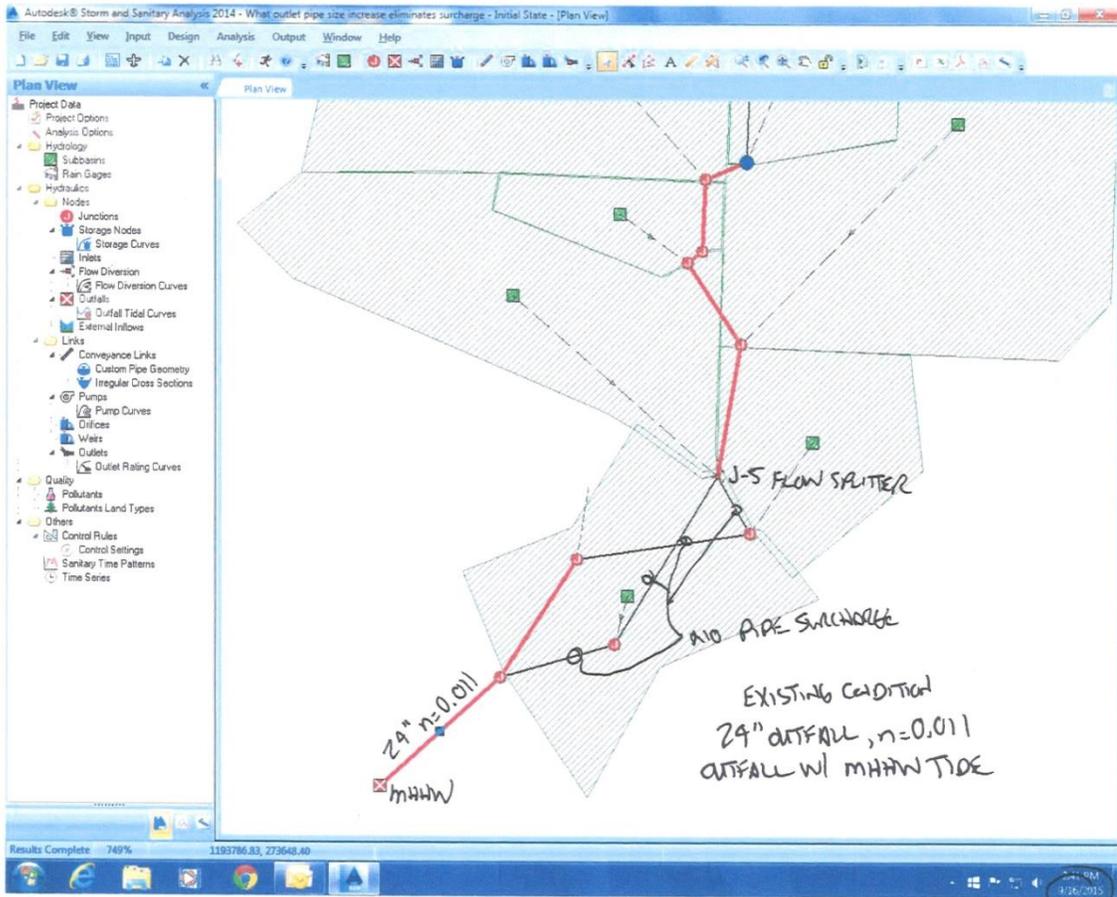


#### D. Staff Question: Would a larger outfall pipe eliminate the surcharge of pipes at a MHHW tidal event?

For this scenario, we upsized the outfall from the current 18" to 24", and then to 30", with the output shown in the appendices and summarized below.

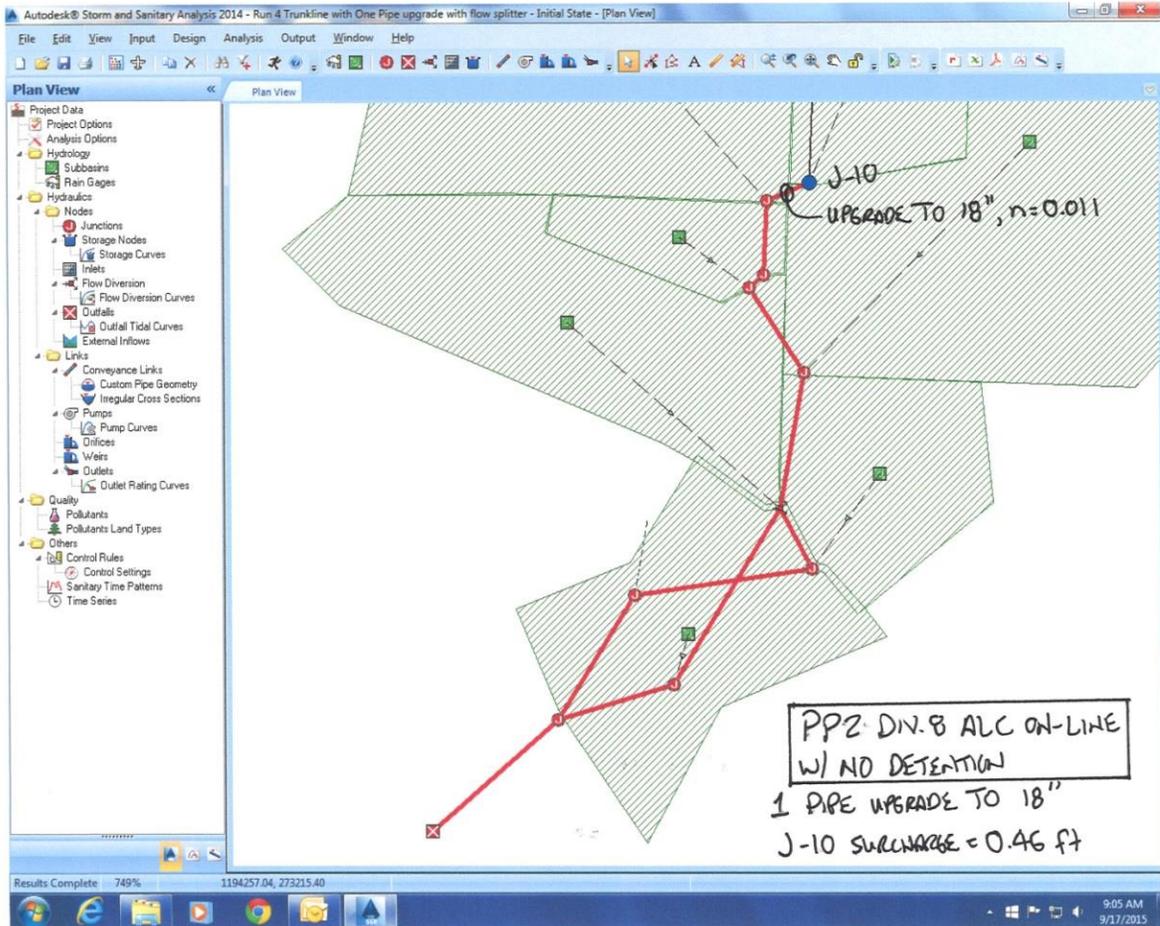
We found that at a MHHW tide event, the 24" pipe under the building remained surcharged, however both the larger outfall pipes relieved the surcharge in the pipe system below J-5 flow-splitter.





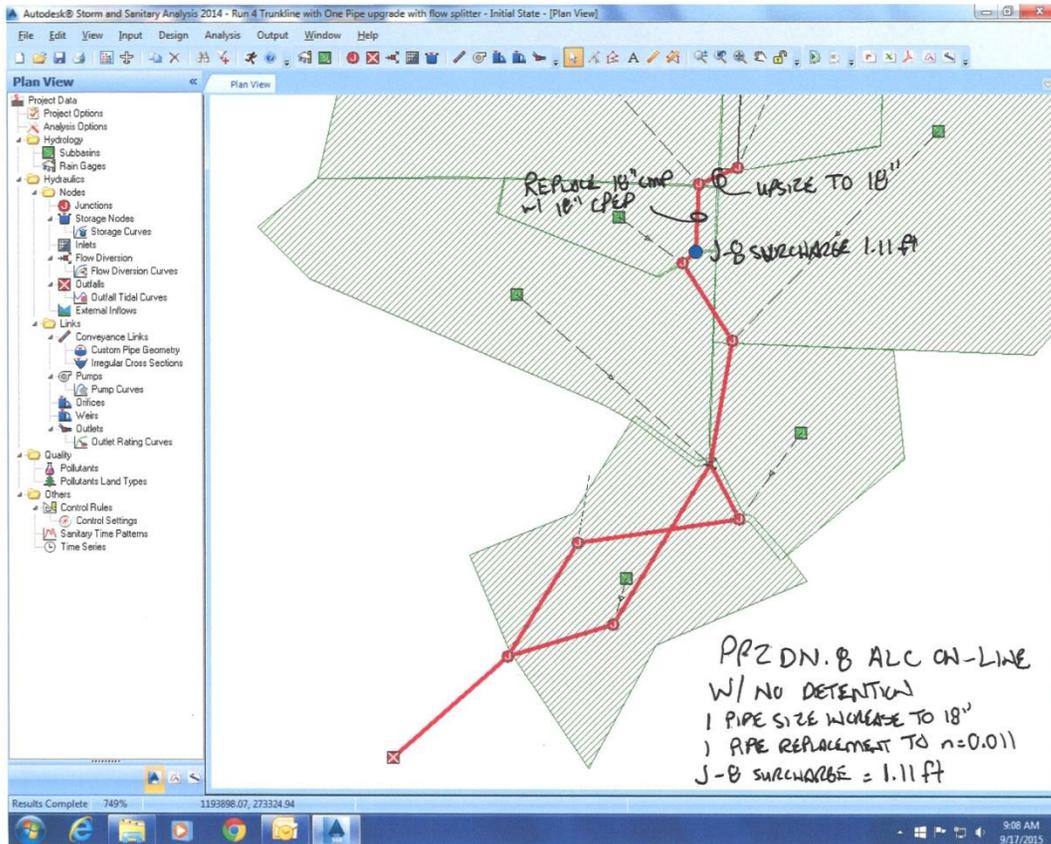
### E. Analysis: One pipe upsized, no detention at PP 2 Div 8

For this possible downstream improvement alternative to eliminate the surcharge at J-10, we upsized the 15" pipe between J-10 and J-9 to 18". The model still showed an approximately 6" surcharge at J-10.



## F. Analysis: One pipe upside, CMP Pipe replaced, no PP@ Div 8 Detention

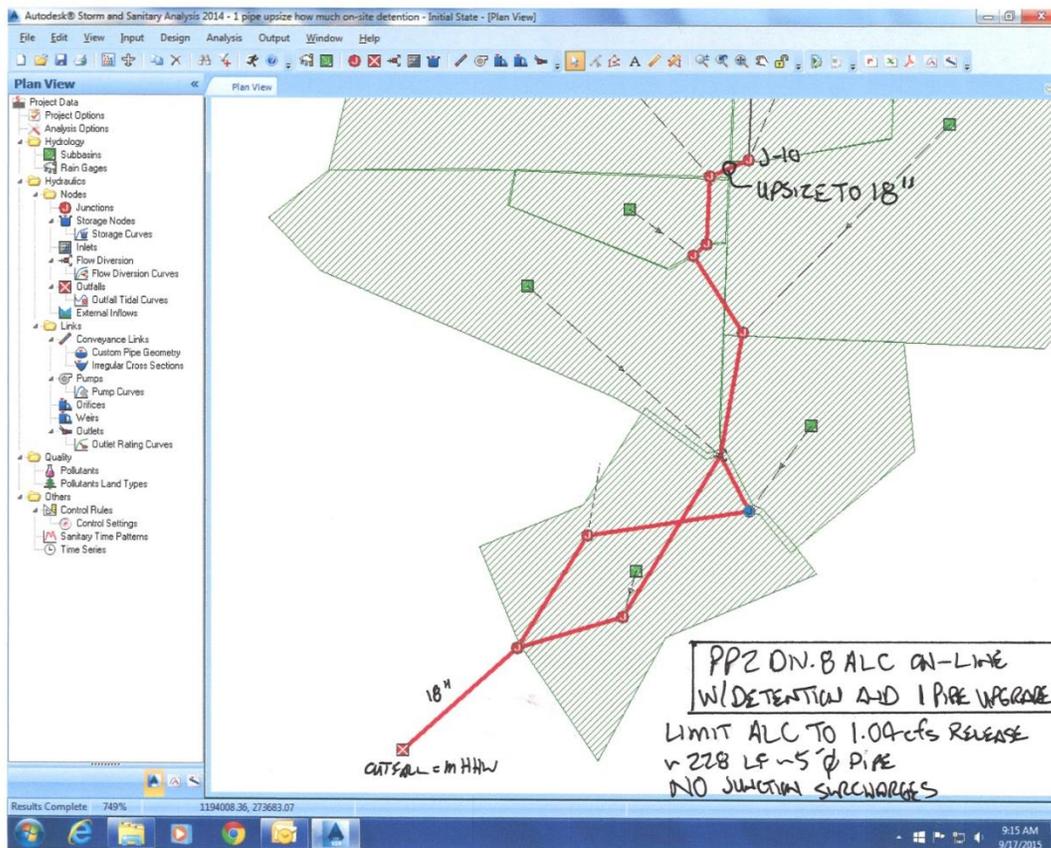
Another potential downstream scenario was analyzed whereby the 18" CMP (n=0.022) between J-9 and J-8 was modeled as an 18" pipe with a smoother friction factor of n=0.011. This improvement, together with the 18" pipe enlargement from J-10 eliminated the surcharge at J-10 but caused a surcharge at J-8 of 1.11 ft., along the curb line in west side of Jensen by the Old City Hall building.



### G. Analysis: One pipe upscale and PP2 Div 8 with detention

This alternative was analyzed to determine how much on-site detention would be required at the PP2 Div 8 site with the one pipe upscale to 18" below J-10. The SSA model showed no surcharge at J-10 when the flow was restricted to 1.04 cfs from the PP2 Div 8 site.

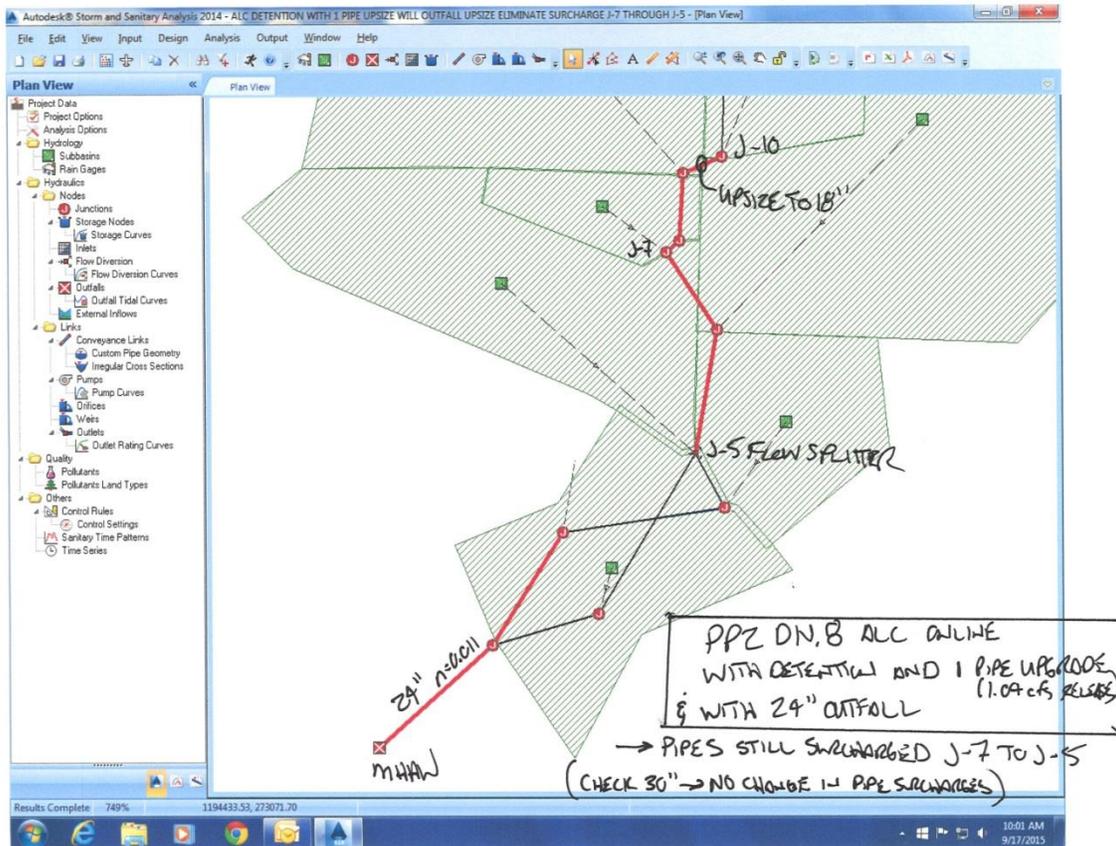
Using the hydraflow hydrograph extension software and performing level-pool routing, we found that 228 lineal feet of 60" diameter underground pipe would be needed to restrict the 100-yr. 24 hr. peak flow from the PP2 Div 8 site to 1.04 cfs.



## H. Analysis: One pipe upgrade, PP@ Div 8 with detention, and 24" outfall improvement

This analysis was performed to verify if a larger diameter outfall pipe, coupled with the one pipe enlargement and on-site detention at the ALC site, would reduce the pipe surcharges downstream of J-10.

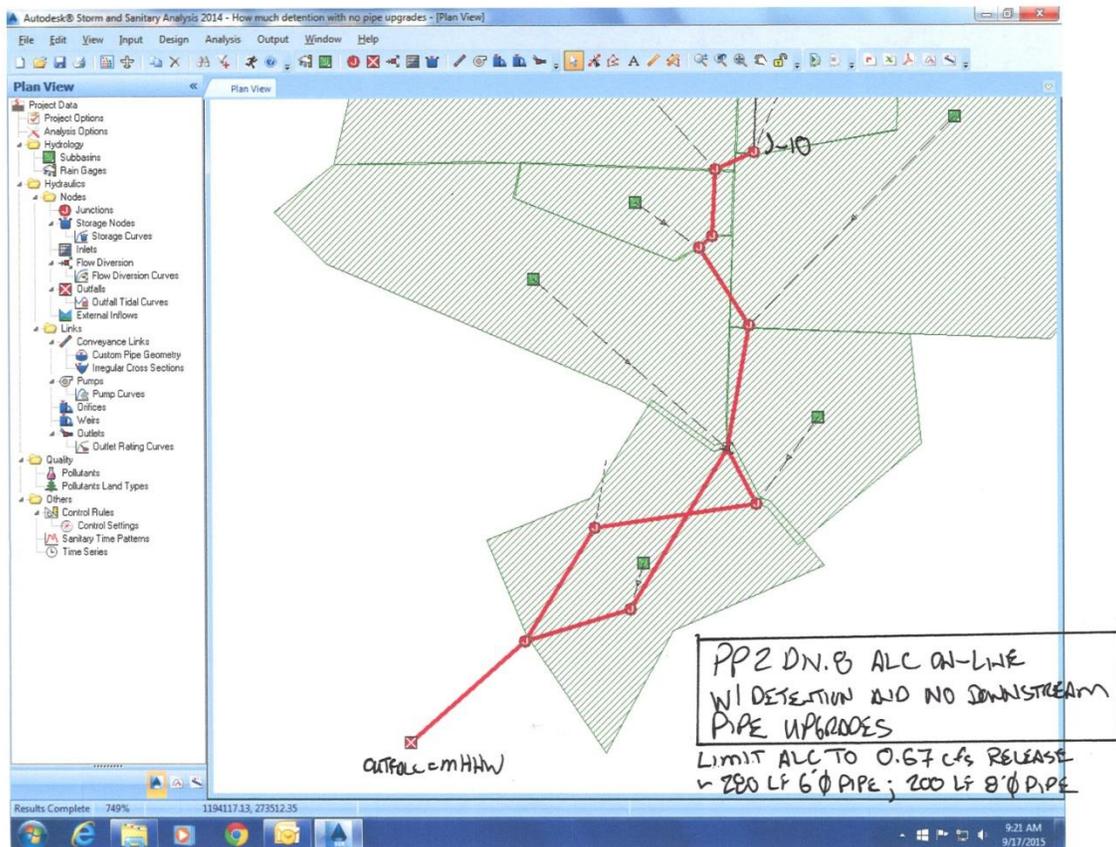
This analysis shows that consistent with the analysis done in Part (D), the pipe surcharges in Anderson Parkway, except for the 24" pipe under the building, are eliminated with the larger outfall pipe installed. However, even with the PP@ Div 8 site restricting its peak flow to 1.04 cfs, the pipe network is surcharged from J-10 to J-5 flow splitter.



## I. Analysis: No downstream pipe improvements, PP2 Div 8 with detention and no junction CB rim surcharges

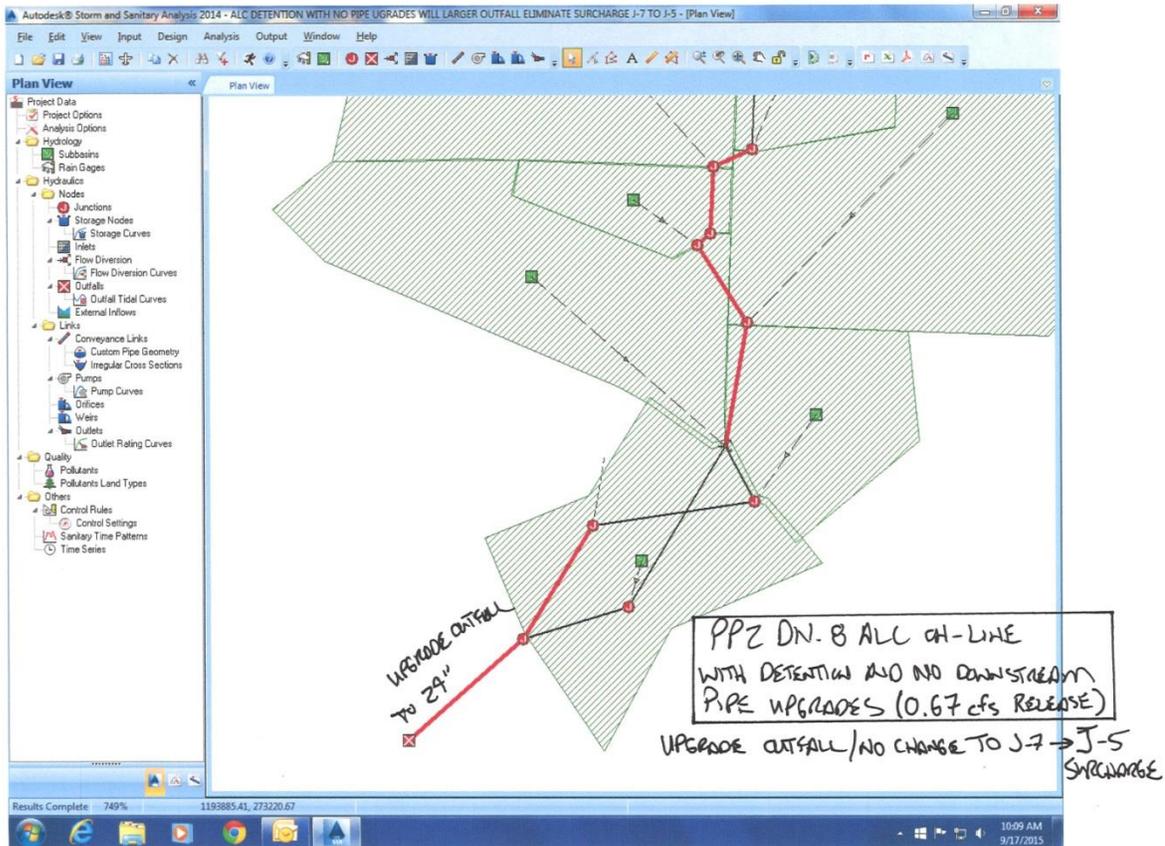
This analysis found that by restricting the flow from the PP2 Division 8 site to 0.67 cfs, no structure surcharges occur.

Using the hydraflow hydrograph extension software, we find that 280 lf of 72" or 200 lf of 98" diameter pipe will provide the necessary detention volume to restrict the peak flow to 0.67 cfs from the PP2 DIV 8 Site. However, based upon nearby structural loading concerns from adjacent foundations, an underground concrete vault 80'x20'x5' deep with 6" of dead storage was found to meet the necessary volume to restrict the peak flow to 0.67 cfs.



## J. Analysis: PP2 Div 8 with detention, outfall upgrade to 24"

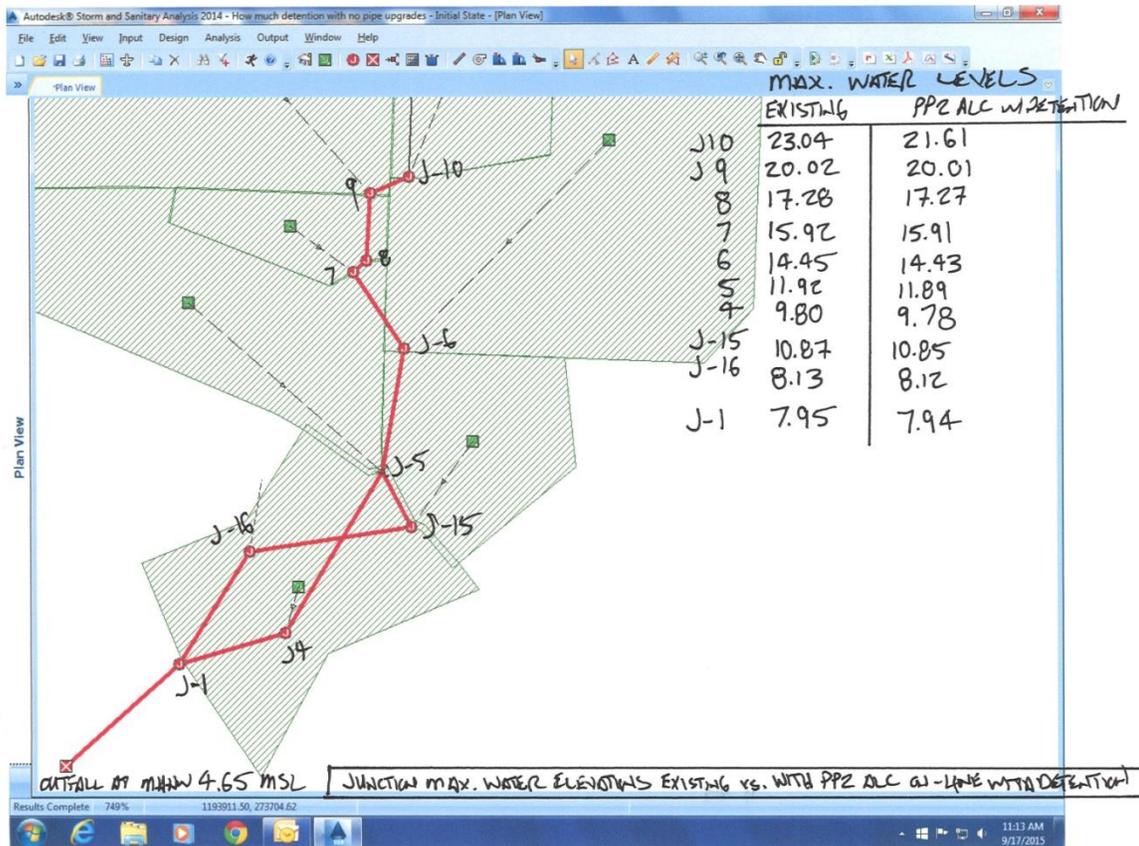
This analysis shows that the pipes are surcharged between J-10 and the flow splitter J-5, even with a larger outfall pipe installed.



### K. Output: Comparison of maximum water surface elevations existing condition versus basin with PP2 Div 8 detention with $Q < 0.67$ cfs

This graphical analysis shows the SSA Model predicted maximum water levels in the structures downstream of J-10 in the existing condition (Part A herein) and with the PP2 Division 8 site with detention and restricting the outflow to 0.67 cfs (Part I herein)

In summary, we find that maximum water levels in all junctions are slightly lower with the flow restriction of 0.67 cfs and detention provided on-site limiting the post-developed peak flow to 0.67 cfs. No existing downstream flooding risk is increased with this flow restriction installed on the PP 2 Div 8 site.



## DETERMINING CONSTRUCTION SITE SEDIMENT DAMAGE POTENTIAL

The following rating system allows objective evaluation of a particular development site's potential to discharge sediment. Permittees may use the rating system below or develop alternative process designed to identify site-specific features, which indicate that the site must be inspected prior to clearing and construction. Any alternative evaluation process must be documented and provide for equivalent environmental review.

Step 1 is to determine if there is a sediment/erosion sensitive feature downstream of the development site. If there is such a site downstream complete step two, assessment of hydraulic nearness. If there is a sediment/erosion sensitive feature and it is hydraulically near the site then go to step three to determine the construction site sediment transport potential.

### STEP 1 - Sediment/Erosion Sensitive Feature Identification

Sediment/erosion sensitive features are areas subject to significant degradation due to the effect of sediment deposition or erosion. Special protection must be provided to protect them. Sediment/erosion sensitive features include but are not limited to:

A. Salmonid bearing fresh water streams and their tributaries or freshwater streams that would be Salmonid bearing if not for anthropogenic barriers;

No

B. Lakes; No

C. Wetlands; No

D. Marine near-shore habitat; Yes

E. Sites containing contaminated soils where erosion could cause dispersal of contaminants; None known

F. Steep slopes (25% or greater) associated with one of the above features. No

Identify any sediment/erosion sensitive features, and proceed to step two. If there are none the assessment is complete.

Marine near-shore environment of Liberty Bay, at the outfall of the City storm system.

### STEP 2 - Hydraulic Nearness Assessment

Sites are hydraulically near a feature if the pollutant load and peak quantity of runoff from the site will not be naturally attenuated before entering the feature. The conditions that render a site hydraulically near to a feature include, but are not limited to, the following:

A. The feature or a buffer to protect the feature is within 200 feet downstream of the site. No

B. Runoff from the site is tight-lined to the feature or flows to the feature through a channel or ditch. Yes

C. A site is not hydraulically near a feature if one of the following takes place to provide attenuation before runoff from the site enters the feature:

1. Sheet flow through a vegetated area with dense ground cover (Western Washington Phase II Municipal Stormwater Permit, January 17,2007 Appendix 7- Determining Sediment Damage Potential, Page 2 of 3) No.

2. Flow through a wetland not included as a sensitive feature No

3. Flow through a significant shallow or adverse slope, not in a conveyance channel, between the site and the sensitive feature. No

Identify any of the sediment/erosion sensitive features from step one that are hydraulically near the site, and proceed to step three. If none of the sediment/erosion sensitive features are hydraulically near the site the assessment is complete.

Site is hydraulically connected to the marine near-shore habitat, therefore on to Step 3

### STEP 3 - Construction Site Sediment Transport Potential

Using the worksheet below, determine the total points for each development site. Assign points based on the most critical condition that affects 10% or more of the site. If soil testing has been performed on site, the results should be used to determine the predominant soil type on the site. Otherwise, soil information should be obtained from the county soil survey to determine Hydrologic Soil Group (Table of Engineering Index Properties for step 1.D) and Erosion Potential (Table of Water Features for step 1.E).

When using the county soil survey, the dominant soil type may be in question, particularly when the site falls on a boundary between two soil types or when one of two soil types may be present on a site. In this case, the soil type resulting in the most points on the rating system will be assumed unless site soil tests indicate that another soil type dominates the site. Use the point score from Step 3 to determine whether the development site has a high potential for sediment transport off of the site.

#### Total Score   Transport Rating

<100      Low

≥100      High

A high transport rating indicates a higher risk that the site will generate sediment contaminated runoff.

### Construction Site Sediment Transport Potential Worksheet

A. Existing slope of site (average, weighted by aerial extent): Points

2% or less.....0

>2-5%..... 5

>5-10%.....15

>10-15%.....**30**

>15%.....50

B. Site Area to be cleared and/or graded:

<5,000 sq. ft..... 0

5,000 sq. ft. – 1 acre.....30

>1 acres.....**50**

Quantity of cut and/or fill on site:

<500 cubic yards.....0

500 - 5,000 cubic yards.....**5**

>5,000 - 10,000 cubic yards.....10  
>10,000- 20,000 cubic yards.....25  
>20,000 cubic yards.....40

Runoff potential of predominant soils(Natural Resources Conservation Service):

Hydrologic soil group A.....0  
Hydrologic soil group B.....10  
Hydrologic soil group C.....**20**  
Hydrologic soil group D.....40

Erosion Potential of predominant soils(Natural Resource Conservation Service):

GW,GP,SW, SP soils.....0  
Dual Classifications(GW-GM,GP-GM,GW-GC, GP-GC,  
SW-SM,SW-SC, SP-SM,SP-SC) .....10  
GM, GC, SM, SC soils.....**20**  
ML, CL, MH, CH soils..... **40**

Surface or Groundwater entering site identified and intercepted:

Yes..... **0**  
No..... 25

G. Depth of cut or height of fill >10 feet:

Yes..... **25**  
No .....**0**

H. Clearing and grading will occur in the wet season (October 1 - May 1):

Yes ..... 50  
No .....**0**

TOTAL POINTS.....**170**

1 If no surface or groundwater enters site, give 0 points.

**Since the rating exceeds 100, this site has a higher degree of risk of sediment transport**

**APPENDIX A**  
**EXISTING BASIN CONDITIONS**





**Poulsbo Place Division 8  
Assisted Living Center**

**Subbasin Summary**

**Downstream Stormwater Backwater Analysis**

SN Subbasin ID	Area (ac)	Impervious Area (%)	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1 Sub-03	5.31	79.00	98.00	86.00	4.69	4.18	22.19	5.47	0 00:06:00
2 Sub-04	2.62	67.00	98.00	86.00	4.69	4.03	10.54	2.60	0 00:06:00
3 Sub-07	2.17	73.00	98.00	86.00	4.69	4.11	8.91	2.19	0 00:06:00
4 Sub-08	0.90	67.00	98.00	86.00	4.69	4.03	3.63	0.90	0 00:06:00
5 Sub-09	2.42	74.00	98.00	86.00	4.69	4.12	9.98	2.46	0 00:06:00
6 Sub-10	0.59	95.00	98.00	86.00	4.69	4.39	2.57	0.83	0 00:06:00
7 Sub-11	0.27	95.00	98.00	86.00	4.69	4.39	1.18	0.29	0 00:06:00
8 Sub-12	1.18	95.00	98.00	86.00	4.69	4.39	5.19	1.28	0 00:06:00
9 Sub-14	0.98	95.00	98.00	86.00	4.69	4.39	4.29	1.05	0 00:06:00
10 sub-2	2.10	21.00	98.00	86.00	4.69	3.42	7.17	1.42	0 00:22:30

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation (ft)	Max Surcharge Depth (ft)	Min Freeboard (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-01	Junction	-3.31	8.68	-3.31	8.68	0.00	21.92	7.95	0.00	0.73	0 00:00	0.00	0.00
2	Jun-04	Junction	6.48	10.97	6.48	10.97	0.00	12.40	9.80	0.00	1.17	0 00:00	0.00	0.00
3	Jun-06	Junction	8.73	17.99	8.73	17.99	0.00	14.09	14.45	0.00	3.54	0 00:00	0.00	0.00
4	Jun-07	Junction	9.82	18.20	9.82	18.20	0.00	11.79	15.92	0.00	2.28	0 00:00	0.00	0.00
5	Jun-08	Junction	11.34	18.22	11.34	18.22	0.00	11.51	17.28	0.00	0.94	0 00:00	0.00	0.00
6	Jun-09	Junction	14.27	21.03	14.27	21.03	0.00	11.51	20.02	0.00	1.01	0 00:00	0.00	0.00
7	Jun-10	Junction	14.34	21.61	14.34	21.61	0.00	10.33	21.61	0.00	0.00	0 08:00	0.21	16.00
8	Jun-11	Junction	27.16	33.84	27.16	33.84	0.00	9.44	28.11	0.00	5.73	0 00:00	0.00	0.00
9	Jun-12	Junction	32.09	44.85	32.09	44.85	0.00	6.85	32.91	0.00	11.94	0 00:00	0.00	0.00
10	Jun-13	Junction	32.55	45.00	32.55	45.00	0.00	1.42	32.97	0.00	12.03	0 00:00	0.00	0.00
11	Jun-14	Junction	38.81	49.11	38.81	49.11	0.00	1.42	40.23	0.00	8.88	0 00:00	0.00	0.00
12	Jun-15	Junction	8.90	15.15	8.90	15.15	0.00	4.74	10.87	0.00	4.28	0 00:00	0.00	0.00
13	Jun-16	Junction	2.04	11.00	2.04	11.00	0.00	9.59	8.13	0.00	2.87	0 00:00	0.00	0.00
14	Out-01	Outfall	-7.10					21.92	4.65					
15	Jun-05	Flow Diversions	7.95	15.30	7.95		0.00	15.36	11.92				0.00	0.00

23.04 AFTER  
ITERATIVELY RAISING  
RIM ELEVATION

**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

**Link Summary**

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (m)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Total Depth Ratio	Total Time Reported (min)	Reported Condition
1	Link-01	Pipe	Jun-14	Jun-13	293.62	39.91	33.55	2.1700	15.000	0.0120	1.42	10.30	0.14	5.78	0.32	0.25	0.00	Calculated
2	Link-02	Pipe	Jun-13	Jun-12	38.02	32.55	32.09	1.2100	15.000	0.0120	1.42	7.70	0.18	2.70	0.62	0.50	0.00	Calculated
3	Link-03	Pipe	Jun-12	Jun-11	258.55	32.09	27.16	1.9100	15.000	0.0120	6.85	9.66	0.71	7.97	0.89	0.71	0.00	Calculated
4	Link-04	Pipe	Jun-11	Jun-10	277.57	27.16	15.13	4.3300	15.000	0.0120	9.44	14.57	0.65	9.78	1.10	0.88	0.00	Calculated
5	Link-05	Pipe	Jun-10	Jun-09	37.89	14.34	14.13	0.5500	15.000	0.0120	9.54	3.01	3.17	7.78	1.25	1.00	30.00	SURCHARGED
6	Link-06	Pipe	Jun-09	Jun-08	61.07	14.27	11.33	4.8100	18.000	0.0220	11.51	13.60	0.85	7.00	1.50	1.00	29.00	SURCHARGED
7	Link-07	Pipe	Jun-08	Jun-07	15.81	11.34	9.89	9.1700	18.000	0.0220	11.53	18.80	0.61	6.53	1.50	1.00	34.00	SURCHARGED
8	link-08	Pipe	Jun-07	Jun-06	82.61	9.82	9.08	0.9000	18.000	0.0110	11.81	11.75	1.01	6.68	1.50	1.00	39.00	SURCHARGED
9	Link-09	Pipe	Jun-06	Jun-05	112.81	8.73	7.95	0.6900	18.000	0.0110	14.09	10.32	1.36	7.97	1.50	1.00	41.00	SURCHARGED
10	Link-10	Pipe	Jun-05	Jun-04	169.20	7.95	6.56	0.8200	18.000	0.0110	11.37	11.25	1.01	6.47	1.50	1.00	32.00	SURCHARGED
11	Link-11	Pipe	Jun-04	Jun-01	100.45	6.48	3.73	2.7400	18.000	0.0110	12.40	20.54	0.60	7.02	1.50	1.00	34.00	SURCHARGED
12	Link-12	Pipe	Jun-01	Out-01	136.85	-3.31	-7.10	2.7700	18.000	0.0110	21.92	20.66	1.06	12.40	1.50	1.00	1440.00	SURCHARGED
13	Link-13	Pipe	Jun-05	Jun-15	57.57	9.43	9.36	0.1200	12.000	0.0110	4.14	1.47	2.82	5.34	1.00	1.00	18.00	SURCHARGED
14	Link-14	Pipe	Jun-15	Jun-16	147.94	8.90	2.04	4.6400	12.000	0.0120	4.64	8.31	0.56	5.91	1.00	1.00	21.00	SURCHARGED
15	Link-15	Pipe	Jun-16	Jun-01	119.81	2.04	-3.05	4.2500	24.000	0.0220	9.59	27.55	0.35	3.56	2.00	1.00	1438.00	SURCHARGED

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

Junction Input

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft <sup>2</sup> )	Minimum Pipe Cover (in)
1 Jun-01	-3.31	8.68	11.99	-3.31	0.00	8.68	0.00	0.00	0.00
2 Jun-04	6.48	10.97	4.49	6.48	0.00	10.97	0.00	0.00	0.00
3 Jun-06	8.73	17.99	9.26	8.73	0.00	17.99	0.00	0.00	0.00
4 Jun-07	9.82	18.20	8.38	9.82	0.00	18.20	0.00	0.00	0.00
5 Jun-08	11.34	18.22	6.88	11.34	0.00	18.22	0.00	0.00	0.00
6 Jun-09	14.27	21.03	6.76	14.27	0.00	21.03	0.00	0.00	0.00
7 Jun-10	14.34	21.61	7.27	14.34	0.00	21.61	0.00	0.00	0.00
8 Jun-11	27.16	33.84	6.68	27.16	0.00	33.84	0.00	0.00	0.00
9 Jun-12	32.09	44.85	12.76	32.09	0.00	44.85	0.00	0.00	0.00
10 Jun-13	32.55	45.00	12.45	32.55	0.00	45.00	0.00	0.00	0.00
11 Jun-14	38.81	49.11	10.30	38.81	0.00	49.11	0.00	0.00	0.00
12 Jun-15	8.90	15.15	6.25	8.90	0.00	15.15	0.00	0.00	0.00
13 Jun-16	2.04	11.00	8.96	2.04	0.00	11.00	0.00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

**Junction Results**

SN Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surchage Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1 Jun-01	21.92	0.00	7.95	11.26	0.00	0.73	4.82	8.13	0 07:55	0 00:00	0.00	0.00
2 Jun-04	12.40	1.05	9.80	3.32	0.00	1.17	6.89	0.41	0 07:55	0 00:00	0.00	0.00
3 Jun-06	14.09	2.46	14.45	5.72	0.00	3.54	9.36	0.63	0 07:55	0 00:00	0.00	0.00
4 Jun-07	11.79	0.29	15.92	6.10	0.00	2.28	10.37	0.55	0 07:55	0 00:00	0.00	0.00
5 Jun-08	11.51	0.00	17.28	5.94	0.00	0.94	11.77	0.43	0 07:55	0 00:00	0.00	0.00
6 Jun-09	11.51	2.19	20.02	5.75	0.00	1.01	14.73	0.46	0 07:55	0 00:00	0.00	0.00
7 Jun-10	10.33	0.90	21.61	7.27	0.00	0.00	15.06	0.72	0 07:49	0 08:00	0.21	16.00
8 Jun-11	9.44	2.60	28.11	0.95	0.00	5.73	27.45	0.29	0 08:00	0 00:00	0.00	0.00
9 Jun-12	6.85	5.46	32.91	0.82	0.00	11.94	32.40	0.31	0 08:00	0 00:00	0.00	0.00
10 Jun-13	1.42	0.00	32.97	0.42	0.00	12.03	32.72	0.17	0 08:00	0 00:00	0.00	0.00
11 Jun-14	1.42	1.42	40.23	1.42	0.00	8.88	40.05	1.24	0 08:06	0 00:00	0.00	0.00
12 Jun-15	4.74	0.63	10.87	1.97	0.00	4.28	8.99	0.09	0 07:55	0 00:00	0.00	0.00
13 Jun-16	9.59	0.00	8.13	6.09	0.00	2.87	4.83	2.79	0 07:55	0 00:00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

**Pipe Input**

SN Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow Gate	Flap	No. of Barrels
1 Link-01	293.62	39.91	1.10	33.55	1.00	6.36	2.1700	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
2 Link-02	38.02	32.55	0.00	32.09	0.00	0.46	1.2100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
3 Link-03	258.55	32.09	0.00	27.16	0.00	4.93	1.9100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
4 Link-04	277.57	27.16	0.00	15.13	0.79	12.03	4.3300	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
5 Link-05	37.89	14.34	0.00	14.13	-0.14	0.21	0.5500	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
6 Link-06	61.07	14.27	0.00	11.33	-0.01	2.94	4.8100	CIRCULAR	18.000	18.000	0.0220	0.5000	0.6000	0.0000	0.00	No	1
7 Link-07	15.81	11.34	0.00	9.89	0.07	1.45	9.1700	CIRCULAR	18.000	18.000	0.0220	0.5000	0.8000	0.0000	0.00	No	1
8 link-08	82.61	9.82	0.00	9.08	0.35	0.74	0.9000	CIRCULAR	18.000	18.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
9 Link-09	112.81	8.73	0.00	7.95	0.00	0.78	0.6900	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
10 Link-10	169.20	7.95	0.00	6.56	0.08	1.39	0.8200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
11 Link-11	100.45	6.48	0.00	3.73	7.04	2.75	2.7400	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
12 Link-12	136.85	-3.31	0.00	-7.10	0.00	3.79	2.7700	CIRCULAR	18.000	18.000	0.0110	0.5000	0.0000	0.0000	0.00	No	1
13 Link-13	57.57	9.43	1.48	9.36	0.46	0.07	0.1200	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
14 Link-14	147.94	8.90	0.00	2.04	0.00	6.86	4.6400	CIRCULAR	12.000	12.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
15 Link-15	119.81	2.04	0.00	-3.05	0.26	5.09	4.2500	CIRCULAR	24.000	24.000	0.0220	0.5000	0.5000	0.0000	0.00	No	1

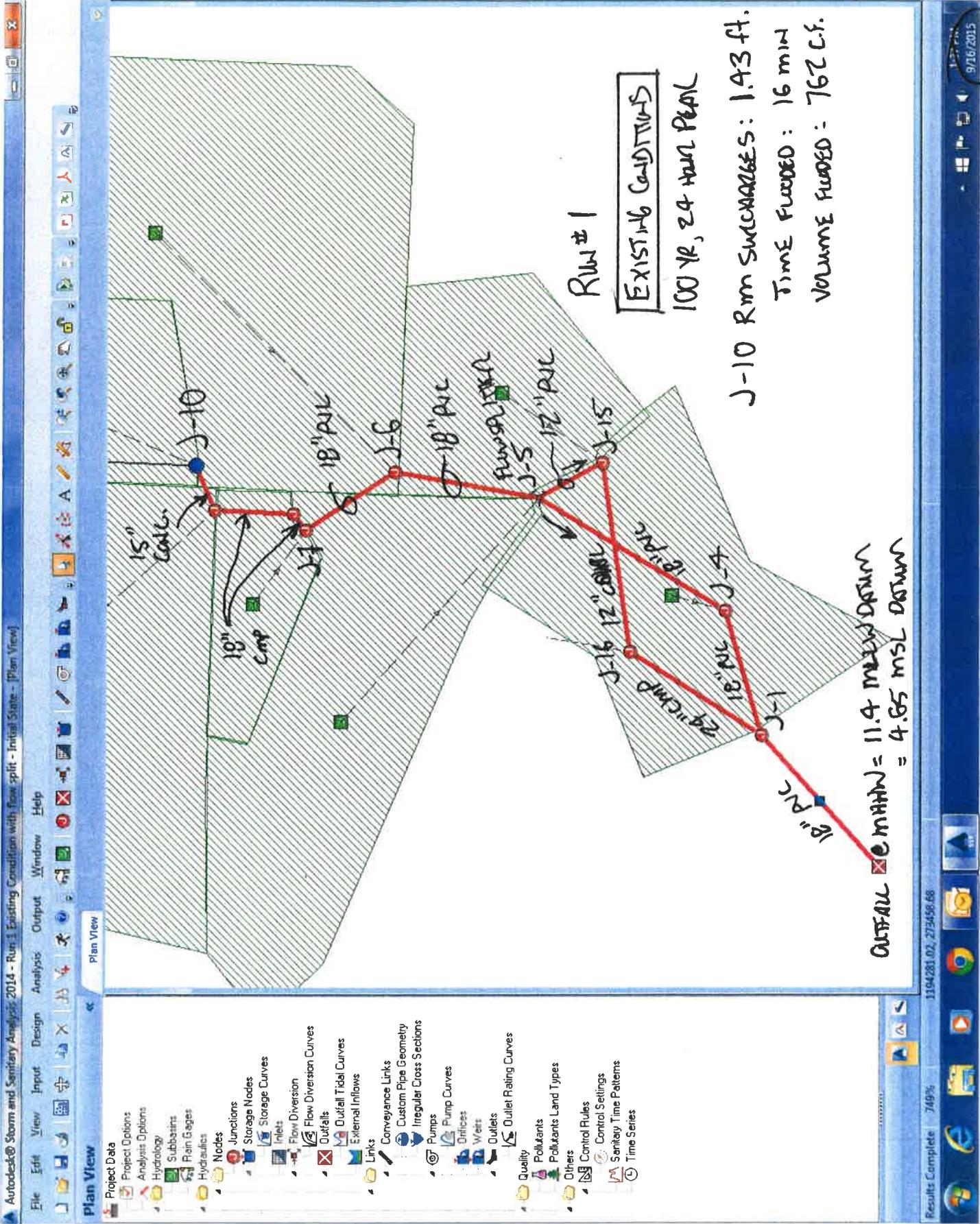
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Pipe Results

Downstream Stormwater Backwater Analysis

SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 Link-01	1.42	0 08:06	10.30	0.14	5.78	0.85	0.32	0.25	0.00		Calculated
2 Link-02	1.42	0 08:06	7.70	0.18	2.70	0.23	0.62	0.50	0.00		Calculated
3 Link-03	6.85	0 08:00	9.66	0.71	7.97	0.54	0.89	0.71	0.00		Calculated
4 Link-04	9.44	0 08:00	14.57	0.65	9.78	0.47	1.10	0.88	0.00		Calculated
5 Link-05	9.54	0 08:04	3.01	3.17	7.78	0.08	1.25	1.00	30.00		SURCHARGED
6 Link-06	11.51	0 08:04	13.60	0.85	7.00	0.15	1.50	1.00	29.00		SURCHARGED
7 Link-07	11.53	0 08:05	18.80	0.61	6.53	0.04	1.50	1.00	34.00		SURCHARGED
8 link-08	11.81	0 08:05	11.75	1.01	6.68	0.21	1.50	1.00	39.00		SURCHARGED
9 Link-09	14.09	0 08:00	10.32	1.36	7.97	0.24	1.50	1.00	41.00		SURCHARGED
10 Link-10	11.37	0 07:41	11.25	1.01	6.47	0.44	1.50	1.00	32.00		SURCHARGED
11 Link-11	12.40	0 07:55	20.54	0.60	7.02	0.24	1.50	1.00	34.00		SURCHARGED
12 Link-12	21.92	0 00:00	20.66	1.06	12.40	0.18	1.50	1.00	1440.00		SURCHARGED
13 Link-13	4.14	0 07:48	1.47	2.82	5.34	0.18	1.00	1.00	18.00		SURCHARGED
14 Link-14	4.64	0 07:55	8.31	0.56	5.91	0.42	1.00	1.00	21.00		SURCHARGED
15 Link-15	9.59	0 00:01	27.55	0.35	3.58	0.56	2.00	1.00	1438.00		SURCHARGED



RUN #1

**EXISTING CONDITIONS**

100 YR, 24 HOUR PEAK

J-10 RIM SURCHARGES: 1.93 FT.

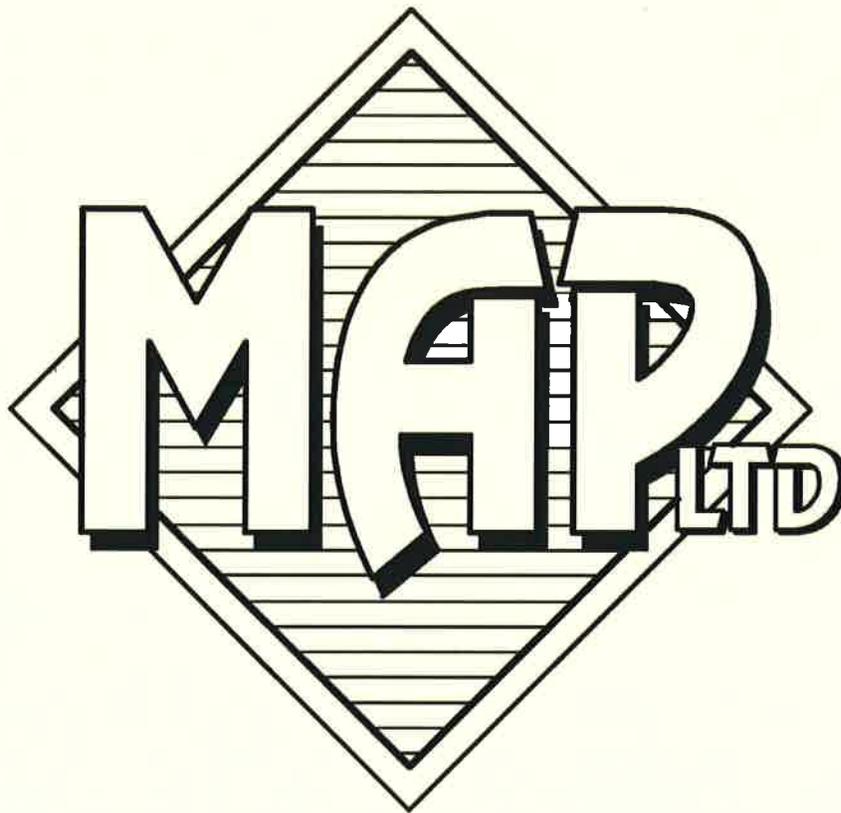
TIME FLOODED: 16 MIN

VOLUME FLOODED: 762 C.F.

OUTFALL @ MATHN = 11.4 MSL DESIGN  
 = 4.65 MSL DESIGN



**APPENDIX B**  
**BASIN WITH PP2 DIV. 8 ALC ON-LINE**



**Poulsbo Place Division 8**

**Assisted Living Center**

**Project Description**

**Downstream Stormwater Backwater Analysis**

File Name ..... Run 2 with PP2 ALC on-line with flow splitter.SPF  
 Description ..... Poulsbo Place 2 Div 8  
 Downstream Existing Conditions

**Project Options**

Flow Units ..... CFS  
 Elevation Type ..... Elevation  
 Hydrology Method ..... Santa Barbara UH  
 Time of Concentration (TOC) Method ..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Enable Overflow Ponding at Nodes ..... NO  
 Skip Steady State Analysis Time Periods ..... NO

**Analysis Options**

Start Analysis On ..... Oct 01, 2013 00:00:00  
 End Analysis On ..... Oct 02, 2013 00:00:00  
 Start Reporting On ..... Oct 01, 2013 00:00:00  
 Antecedent Dry Days ..... 0 days  
 Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss  
 Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss  
 Reporting Time Step ..... 0 00:05:00 days hh:mm:ss  
 Routing Time Step ..... 30 seconds

**Number of Elements**

Qty  
 Rain Gages ..... 1  
 Subbasins ..... 10  
 Nodes ..... 15  
     *Junctions* ..... 13  
     *Outfalls* ..... 1  
     *Flow Diversions* ..... 1  
     *Inlets* ..... 0  
     *Storage Nodes* ..... 0  
 Links ..... 15  
     *Channels* ..... 0  
     *Pipes* ..... 15  
     *Pumps* ..... 0  
     *Orifices* ..... 0  
     *Weirs* ..... 0  
     *Outlets* ..... 0  
 Pollutants ..... 0  
 Land Uses ..... 0

**Rainfall Details**

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (Inches)	Rainfall Distribution
1	Rain Gage-01	Time Series	TS-01	Cumulative	inches	Washington	Kitsap	100	4.70	SCS Type IA 24-hr

Poulsbo Place Division 8

Assisted Living Center

Subbasin Summary

Downstream Stormwater Backwater Analysis

SN Subbasin ID	Area (ac)	Impervious Area (%)	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1 Sub-03	4.78	87.00	98.00	86.00	4.69	4.29	20.48	5.04	0 00:06:00
2 Sub-04	2.62	67.00	98.00	86.00	4.69	4.03	10.54	2.60	0 00:06:00
3 Sub-07	2.17	73.00	98.00	86.00	4.69	4.11	8.91	2.19	0 00:06:00
4 Sub-08	0.90	67.00	98.00	86.00	4.69	4.03	3.63	0.90	0 00:06:00
5 Sub-09	2.42	74.00	98.00	86.00	4.69	4.12	9.98	2.46	0 00:06:00
6 Sub-10	0.59	95.00	98.00	86.00	4.69	4.39	2.57	0.63	0 00:06:00
7 Sub-11	0.27	95.00	98.00	86.00	4.69	4.39	1.18	0.29	0 00:06:00
8 Sub-12	1.18	95.00	98.00	86.00	4.69	4.39	5.19	1.28	0 00:06:00
9 Sub-14	0.98	95.00	98.00	86.00	4.69	4.39	4.29	1.05	0 00:06:00
10 sub-2	2.62	95.00	98.00	86.00	4.69	4.39	11.51	2.83	0 00:06:00

**Poulsbo Place Division 8  
Assisted Living Center**

**Node Summary**

**Downstream Stormwater Backwater Analysis**

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-01	Junction	-3.31	8.68	-3.31	8.68	0.00	21.03	7.95	0.00	0.73	0 00:00	0.00	0.00
2	Jun-04	Junction	6.48	10.97	6.48	10.97	0.00	12.39	9.79	0.00	1.18	0 00:00	0.00	0.00
3	Jun-06	Junction	8.73	17.99	8.73	17.99	0.00	14.10	14.44	0.00	3.55	0 00:00	0.00	0.00
4	Jun-07	Junction	9.82	18.20	9.82	18.20	0.00	11.92	15.91	0.00	2.29	0 00:00	0.00	0.00
5	Jun-08	Junction	11.34	18.22	11.34	18.22	0.00	11.72	17.27	0.00	0.95	0 00:00	0.00	0.00
6	Jun-09	Junction	14.27	21.03	14.27	21.03	0.00	11.76	20.01	0.00	1.02	0 00:00	0.00	0.00
7	Jun-10	Junction	14.34	21.61	14.34	21.61	0.00	11.35	21.61	0.00	0.00	0 07:57	0.55	21.00
8	Jun-11	Junction	27.16	33.84	27.16	33.84	0.00	10.47	26.27	0.00	5.57	0 00:00	0.00	0.00
9	Jun-12	Junction	32.09	44.85	32.09	44.85	0.00	7.88	33.00	0.00	11.85	0 00:00	0.00	0.00
10	Jun-13	Junction	32.55	45.00	32.55	45.00	0.00	2.83	33.26	0.00	11.74	0 00:00	0.00	0.00
11	Jun-14	Junction	38.81	49.11	38.81	49.11	0.00	2.83	40.38	0.00	8.73	0 00:00	0.00	0.00
12	Jun-15	Junction	8.90	15.15	8.90	15.15	0.00	4.75	10.86	0.00	4.29	0 00:00	0.00	0.00
13	Jun-16	Junction	2.04	11.00	2.04	11.00	0.00	9.16	8.13	0.00	2.87	0 00:00	0.00	0.00
14	Out-01	Outfall	-7.10					21.03	4.65					
15	Jun-05	Flow Diversions	7.95	15.30	7.95		0.00	15.36	11.90				0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

**Link Summary**

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Total Depth Ratio	Total Time Reported (min)	Reported Condition
1	Link-01	Pipe	Jun-14	Jun-13	293.62	39.91	33.55	2.1700	15.000	0.0120	2.83	10.30	0.27	6.95	0.46	0.37	0.00	Calculated
2	Link-02	Pipe	Jun-13	Jun-12	38.02	32.55	32.09	1.2100	15.000	0.0120	2.83	7.70	0.37	3.36	0.81	0.65	0.00	Calculated
3	Link-03	Pipe	Jun-12	Jun-11	258.55	32.09	27.16	1.9100	15.000	0.0120	7.87	9.66	0.81	8.22	1.01	0.81	0.00	Calculated
4	Link-04	Pipe	Jun-11	Jun-10	277.57	27.16	15.13	4.3300	15.000	0.0120	10.46	14.57	0.72	9.78	1.18	0.94	0.00	Calculated
5	Link-05	Pipe	Jun-10	Jun-09	37.89	14.34	14.13	0.5500	15.000	0.0120	9.78	3.01	3.25	7.97	1.25	1.00	33.00	SURCHARGED
6	Link-06	Pipe	Jun-09	Jun-08	61.07	14.27	11.35	4.7600	18.000	0.0220	11.72	13.57	0.86	7.05	1.50	1.00	32.00	SURCHARGED
7	Link-07	Pipe	Jun-08	Jun-07	15.81	11.34	9.89	9.1700	18.000	0.0220	11.66	18.80	0.62	6.60	1.50	1.00	37.00	SURCHARGED
8	Link-08	Pipe	Jun-07	Jun-06	82.61	9.82	9.08	0.9000	18.000	0.0110	11.90	11.75	1.01	6.73	1.50	1.00	41.00	SURCHARGED
9	Link-09	Pipe	Jun-06	Jun-05	112.81	8.73	7.95	0.6900	18.000	0.0110	14.09	10.32	1.37	7.97	1.50	1.00	42.00	SURCHARGED
10	Link-10	Pipe	Jun-05	Jun-04	169.20	7.95	6.56	0.8200	18.000	0.0110	11.41	11.25	1.01	6.52	1.50	1.00	35.00	SURCHARGED
11	Link-11	Pipe	Jun-04	Jun-01	100.45	6.48	3.73	2.7400	18.000	0.0110	12.39	20.54	0.60	7.01	1.50	1.00	36.00	SURCHARGED
12	Link-12	Pipe	Jun-01	Out-01	136.85	-3.31	-7.10	2.7700	18.000	0.0110	21.03	20.66	1.02	12.00	1.50	1.00	1440.00	SURCHARGED
13	Link-13	Pipe	Jun-05	Jun-15	56.13	9.43	9.36	0.1200	12.000	0.0110	4.18	1.49	2.81	5.42	1.00	1.00	22.00	SURCHARGED
14	Link-14	Pipe	Jun-15	Jun-16	146.79	8.90	2.04	4.6700	12.000	0.0120	4.65	8.34	0.56	5.92	1.00	1.00	24.00	SURCHARGED
15	Link-15	Pipe	Jun-16	Jun-01	119.84	2.04	-3.05	4.2500	24.000	0.0220	9.16	27.55	0.33	3.57	2.00	1.00	1439.00	SURCHARGED

**Poulsbo Place Division 8  
Assisted Living Center**

**Junction Input**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft <sup>2</sup> )	Minimum Pipe Cover (in)
1 Jun-01	-3.31	8.68	11.99	-3.31	0.00	8.68	0.00	0.00	0.00
2 Jun-04	6.48	10.97	4.49	6.48	0.00	10.97	0.00	0.00	0.00
3 Jun-06	8.73	17.99	9.26	8.73	0.00	17.99	0.00	0.00	0.00
4 Jun-07	9.82	18.20	8.38	9.82	0.00	18.20	0.00	0.00	0.00
5 Jun-08	11.34	18.22	6.88	11.34	0.00	18.22	0.00	0.00	0.00
6 Jun-09	14.27	21.03	6.76	14.27	0.00	21.03	0.00	0.00	0.00
7 Jun-10	14.34	21.61	7.27	14.34	0.00	21.61	0.00	0.00	0.00
8 Jun-11	27.16	33.84	6.68	27.16	0.00	33.84	0.00	0.00	0.00
9 Jun-12	32.09	44.85	12.76	32.09	0.00	44.85	0.00	0.00	0.00
10 Jun-13	32.55	45.00	12.45	32.55	0.00	45.00	0.00	0.00	0.00
11 Jun-14	38.81	49.11	10.30	38.81	0.00	49.11	0.00	0.00	0.00
12 Jun-15	8.90	15.15	6.25	8.90	0.00	15.15	0.00	0.00	0.00
13 Jun-16	2.04	11.00	8.96	2.04	0.00	11.00	0.00	0.00	0.00

Poulsbo Place Division 8

Assisted Living Center

Junction Results

Downstream Stormwater Backwater Analysis

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 Jun-01	21.03	0.00	7.95	11.26	0.00	0.73	4.85	8.16	0 07:58	0 00:00	0.00	0.00
2 Jun-04	12.39	1.05	9.79	3.31	0.00	1.18	6.91	0.43	0 07:58	0 00:00	0.00	0.00
3 Jun-06	14.10	2.46	14.44	5.71	0.00	3.55	9.39	0.66	0 07:59	0 00:00	0.00	0.00
4 Jun-07	11.92	0.29	15.91	6.09	0.00	2.29	10.42	0.60	0 07:59	0 00:00	0.00	0.00
5 Jun-08	11.72	0.00	17.27	5.93	0.00	0.95	11.83	0.49	0 07:59	0 00:00	0.00	0.00
6 Jun-09	11.76	2.19	20.01	5.74	0.00	1.02	14.78	0.51	0 07:59	0 00:00	0.00	0.00
7 Jun-10	11.35	0.90	21.61	7.27	0.00	0.00	15.11	0.77	0 07:46	0 07:57	0.55	21.00
8 Jun-11	10.47	2.60	28.27	1.11	0.00	5.57	27.45	0.29	0 07:57	0 00:00	0.00	0.00
9 Jun-12	7.86	5.04	33.00	0.91	0.00	11.85	32.40	0.31	0 07:54	0 00:00	0.00	0.00
10 Jun-13	2.83	0.00	33.26	0.71	0.00	11.74	32.77	0.22	0 07:55	0 00:00	0.00	0.00
11 Jun-14	2.83	2.83	40.38	1.57	0.00	8.73	40.05	1.24	0 07:55	0 00:00	0.00	0.00
12 Jun-15	4.75	0.63	10.86	1.96	0.00	4.29	9.00	0.10	0 07:58	0 00:00	0.00	0.00
13 Jun-16	9.16	0.00	8.13	6.09	0.00	2.87	4.85	2.81	0 07:59	0 00:00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

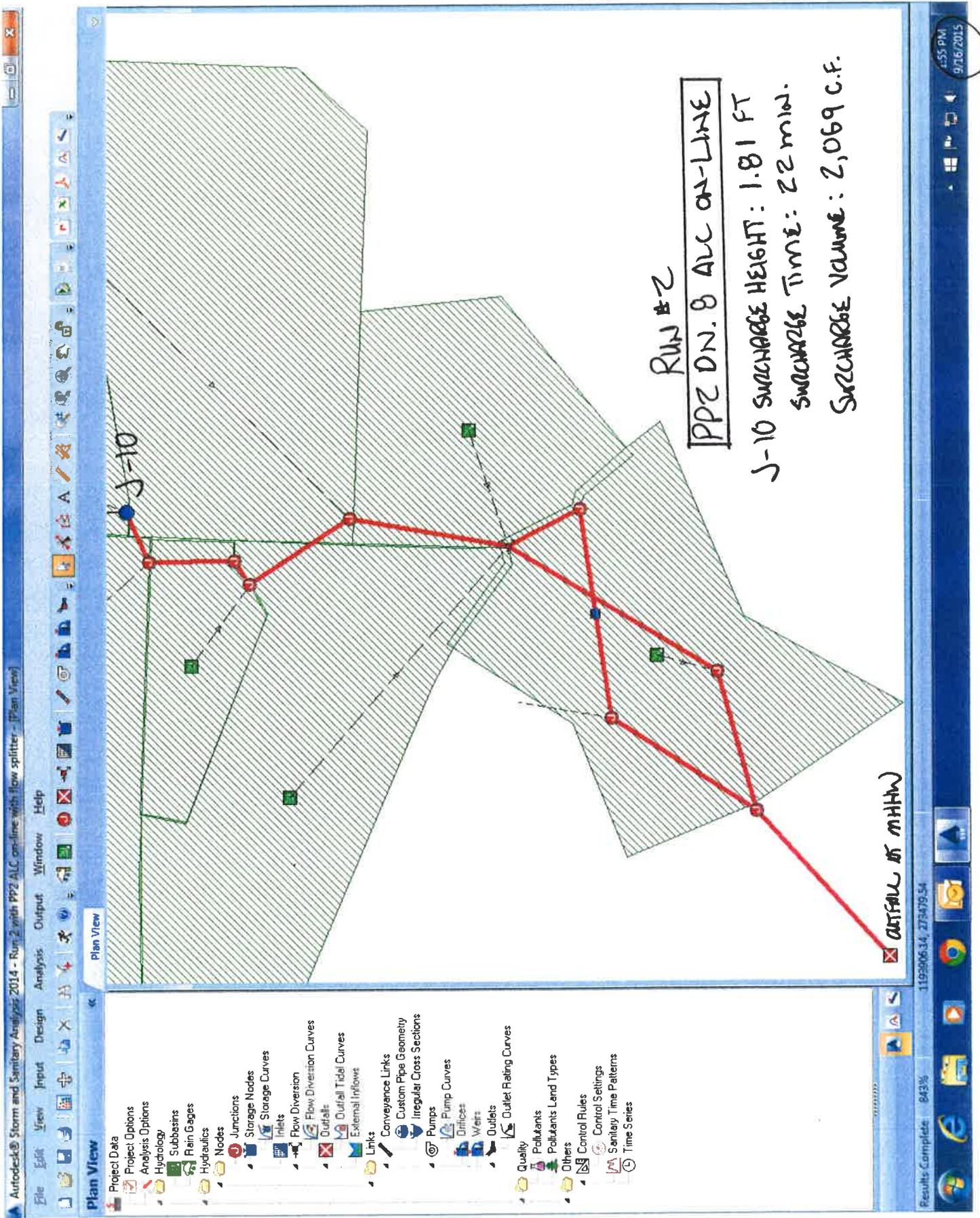
**Pipe Input**

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	Link-01	293.62	39.91	1.10	33.55	1.00	6.36	2.1700	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
2	Link-02	38.02	32.55	0.00	32.09	0.00	0.46	1.2100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
3	Link-03	258.55	32.09	0.00	27.16	0.00	4.93	1.9100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
4	Link-04	277.57	27.16	0.00	15.13	0.79	12.03	4.3300	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
5	Link-05	37.89	14.34	0.00	14.13	-0.14	0.21	0.5500	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
6	Link-06	61.07	14.27	0.00	11.35	0.01	2.92	4.7800	CIRCULAR	18.000	18.000	0.0220	0.5000	0.6000	0.0000	0.00	No	1
7	Link-07	15.81	11.34	0.00	9.89	0.07	1.45	9.1700	CIRCULAR	18.000	18.000	0.0220	0.5000	0.8000	0.0000	0.00	No	1
8	link-08	82.61	9.82	0.00	9.08	0.35	0.74	0.9000	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
9	Link-09	112.81	8.73	0.00	7.95	0.00	0.78	0.6900	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
10	Link-10	169.20	7.95	0.00	6.56	0.08	1.39	0.8200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
11	Link-11	100.45	6.48	0.00	3.73	7.04	2.75	2.7400	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
12	Link-12	136.85	-3.31	0.00	-7.10	0.00	3.79	2.7700	CIRCULAR	18.000	18.000	0.0110	0.5000	0.0000	0.0000	0.00	No	1
13	Link-13	56.13	9.43	1.48	9.36	0.46	0.07	0.1200	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
14	Link-14	146.79	8.90	0.00	2.04	0.00	6.86	4.6700	CIRCULAR	12.000	12.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
15	Link-15	119.84	2.04	0.00	-3.05	0.26	5.09	4.2500	CIRCULAR	24.000	24.000	0.0220	0.5000	0.5000	0.0000	0.00	No	1

**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

**Pipe Results**

SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 Link-01	2.83	0 07:55	10.30	0.27	6.95	0.70	0.46	0.37	0.00		Calculated
2 Link-02	2.83	0 07:55	7.70	0.37	3.36	0.19	0.81	0.85	0.00		Calculated
3 Link-03	7.87	0 07:55	9.66	0.81	8.22	0.52	1.01	0.81	0.00		Calculated
4 Link-04	10.46	0 07:57	14.57	0.72	9.78	0.47	1.18	0.94	0.00		Calculated
5 Link-05	9.78	0 07:46	3.01	3.25	7.97	0.08	1.25	1.00	33.00		SURCHARGED
6 Link-06	11.72	0 07:46	13.57	0.86	7.05	0.14	1.50	1.00	32.00		SURCHARGED
7 Link-07	11.66	0 07:46	18.80	0.62	6.60	0.04	1.50	1.00	37.00		SURCHARGED
8 Link-08	11.90	0 08:07	11.75	1.01	6.73	0.20	1.50	1.00	41.00		SURCHARGED
9 Link-09	14.09	0 08:00	10.32	1.37	7.97	0.24	1.50	1.00	42.00		SURCHARGED
10 Link-10	11.41	0 07:40	11.25	1.01	6.52	0.43	1.50	1.00	35.00		SURCHARGED
11 Link-11	12.39	0 07:58	20.54	0.60	7.01	0.24	1.50	1.00	36.00		SURCHARGED
12 Link-12	21.03	0 00:00	20.66	1.02	12.00	0.19	1.50	1.00	1440.00		SURCHARGED
13 Link-13	4.18	0 07:46	1.49	2.81	5.42	0.17	1.00	1.00	22.00		SURCHARGED
14 Link-14	4.65	0 07:56	8.34	0.56	5.92	0.41	1.00	1.00	24.00		SURCHARGED
15 Link-15	9.16	0 00:01	27.55	0.33	3.57	0.56	2.00	1.00	1439.00		SURCHARGED



**RUN #2**  
**PPZ DN. 8 ALC ON-LINE**  
**J-10 SURCHARGE HEIGHT: 1.81 FT**  
**SURCHARGE TIME: 22 min.**  
**SURCHARGE VOLUME: 2,069 C.F.**

OUTFALL OF MHHW



**APPENDIX C**  
**STAFF QUESTION: WHICH TIDE LEVEL**  
**CAUSES NO SURCHARGE IN THE PIPE**  
**NETWORK?**





**Poulsbo Place Division 8  
Assisted Living Center**

**Subbasin Summary**

**Downstream Stormwater Backwater Analysis**

SN Subbasin ID	Area (ac)	Impervious Area (%)	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1 Sub-03	5.31	79.00	98.00	86.00	4.69	4.18	22.19	5.47	0 00:06:00
2 Sub-04	2.62	67.00	98.00	86.00	4.69	4.03	10.54	2.60	0 00:06:00
3 Sub-07	2.17	73.00	98.00	86.00	4.69	4.11	8.91	2.19	0 00:06:00
4 Sub-08	0.90	67.00	98.00	86.00	4.69	4.03	3.63	0.90	0 00:06:00
5 Sub-09	2.42	74.00	98.00	86.00	4.69	4.12	9.98	2.46	0 00:06:00
6 Sub-10	0.59	95.00	98.00	86.00	4.69	4.39	2.57	0.63	0 00:06:00
7 Sub-11	0.27	95.00	98.00	86.00	4.69	4.39	1.18	0.29	0 00:06:00
8 Sub-12	1.18	95.00	98.00	86.00	4.69	4.39	5.19	1.28	0 00:06:00
9 Sub-14	0.98	95.00	98.00	86.00	4.69	4.39	4.29	1.05	0 00:06:00
10 sub-2	2.10	21.00	98.00	86.00	4.69	3.42	7.17	1.42	0 00:22:30

**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

**Node Summary**

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-01	Junction	-3.31	8.88	-3.31	8.88	0.00	17.71	3.91	0.00	4.77	0 00:00	0.00	0.00
2	Jun-04	Junction	6.48	10.97	6.48	10.97	0.00	14.22	7.75	0.00	3.22	0 00:00	0.00	0.00
3	Jun-06	Junction	8.73	17.99	8.73	17.99	0.00	14.76	13.54	0.00	4.45	0 00:00	0.00	0.00
4	Jun-07	Junction	9.82	18.20	9.82	18.20	0.00	12.32	15.17	0.00	3.03	0 00:00	0.00	0.00
5	Jun-08	Junction	11.34	18.22	11.34	18.22	0.00	12.03	16.70	0.00	1.52	0 00:00	0.00	0.00
6	Jun-09	Junction	14.27	21.03	14.27	21.03	0.00	12.04	19.77	0.00	1.28	0 00:00	0.00	0.00
7	Jun-10	Junction	14.34	21.61	14.34	21.61	0.00	10.33	21.61	0.00	0.00	0 08:00	0.06	10.00
8	Jun-11	Junction	27.16	33.84	27.16	33.84	0.00	9.44	28.11	0.00	5.73	0 00:00	0.00	0.00
9	Jun-12	Junction	32.09	44.85	32.09	44.85	0.00	6.85	32.88	0.00	11.99	0 00:00	0.00	0.00
10	Jun-13	Junction	32.55	45.00	32.55	45.00	0.00	1.42	32.97	0.00	12.03	0 00:00	0.00	0.00
11	Jun-14	Junction	38.81	49.11	38.81	49.11	0.00	1.42	40.23	0.00	8.88	0 00:00	0.00	0.00
12	Jun-15	Junction	8.90	15.15	8.90	15.15	0.00	3.50	9.35	0.00	5.80	0 00:00	0.00	0.00
13	Jun-16	Junction	2.04	11.00	2.04	11.00	0.00	3.50	4.01	0.00	6.99	0 00:00	0.00	0.00
14	Out-01	Outfall	-7.10					17.71	0.35					
15	Jun-05	Flow Diversions	7.95	15.30	7.95		0.00	16.03	10.75				0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center**

**Link Summary**

**Downstream Stormwater Backwater Analysis**

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Total Depth	Total Time Reported	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)	(ft)	(min)	
1	Link-01	Pipe	Jun-14	Jun-13	293.62	39.91	33.55	2.1700	15.000	0.0120	1.42	10.30	0.14	5.78	0.32	0.25	0.00	Calculated
2	Link-02	Pipe	Jun-13	Jun-12	38.02	32.55	32.09	1.2100	15.000	0.0120	1.42	7.70	0.18	2.79	0.59	0.47	0.00	Calculated
3	Link-03	Pipe	Jun-12	Jun-11	258.55	32.09	27.16	1.9100	15.000	0.0110	6.85	10.54	0.65	8.29	0.86	0.69	0.00	Calculated
4	Link-04	Pipe	Jun-11	Jun-10	277.57	27.16	15.13	4.3300	15.000	0.0120	9.44	14.57	0.65	9.77	1.10	0.88	0.00	Calculated
5	Link-05	Pipe	Jun-10	Jun-09	37.89	14.34	14.13	0.5500	15.000	0.0120	9.97	3.01	3.31	8.12	1.25	1.00	29.00	SURCHARGED
6	Link-06	Pipe	Jun-09	Jun-08	61.07	14.27	11.33	4.8100	18.000	0.0220	12.03	13.60	0.89	7.00	1.50	1.00	28.00	SURCHARGED
7	Link-07	Pipe	Jun-08	Jun-07	15.81	11.34	9.89	9.1700	18.000	0.0220	12.04	18.80	0.64	6.82	1.50	1.00	34.00	SURCHARGED
8	Link-08	Pipe	Jun-07	Jun-06	82.61	9.82	9.08	0.9800	18.000	0.0110	12.32	11.75	1.05	6.97	1.50	1.00	39.00	SURCHARGED
9	Link-09	Pipe	Jun-06	Jun-05	112.81	8.73	7.95	0.8900	18.000	0.0110	14.76	10.32	1.43	8.35	1.50	1.00	41.00	SURCHARGED
10	Link-10	Pipe	Jun-05	Jun-04	169.20	7.95	6.56	0.8200	18.000	0.0110	13.17	11.25	1.17	7.59	1.43	0.95	0.00	> CAPACITY
11	Link-11	Pipe	Jun-04	Jun-01	100.45	6.48	3.73	2.7400	18.000	0.0110	14.22	20.54	0.69	10.30	1.09	0.73	0.00	Calculated
12	Link-12	Pipe	Jun-01	Out-01	136.85	-3.31	-7.10	2.7700	18.000	0.0110	17.71	20.66	0.86	10.02	1.50	1.00	1440.00	SURCHARGED
13	Link-13	Pipe	Jun-05	Jun-15	57.57	9.43	9.36	0.1200	12.000	0.0110	2.86	1.47	1.95	3.98	0.86	0.86	0.00	> CAPACITY
14	Link-14	Pipe	Jun-15	Jun-16	147.94	8.90	2.04	4.6400	12.000	0.0120	3.50	8.31	0.42	7.56	0.73	0.73	0.00	Calculated
15	Link-15	Pipe	Jun-16	Jun-01	119.81	2.04	-3.05	4.2500	24.000	0.0220	3.49	27.55	0.13	1.11	1.99	0.99	0.00	Calculated

**Poulsbo Place Division 8  
Assisted Living Center**

**Junction Input**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft <sup>2</sup> )	Minimum Pipe Cover (in)
1 Jun-01	-3.31	8.68	11.99	-3.31	0.00	8.68	0.00	0.00	0.00
2 Jun-04	6.48	10.97	4.49	6.48	0.00	10.97	0.00	0.00	0.00
3 Jun-06	8.73	17.99	9.26	8.73	0.00	17.99	0.00	0.00	0.00
4 Jun-07	9.82	18.20	8.38	9.82	0.00	18.20	0.00	0.00	0.00
5 Jun-08	11.34	18.22	6.88	11.34	0.00	18.22	0.00	0.00	0.00
6 Jun-09	14.27	21.03	6.76	14.27	0.00	21.03	0.00	0.00	0.00
7 Jun-10	14.34	21.61	7.27	14.34	0.00	21.61	0.00	0.00	0.00
8 Jun-11	27.16	33.84	6.68	27.16	0.00	33.84	0.00	0.00	0.00
9 Jun-12	32.09	44.85	12.76	32.09	0.00	44.85	0.00	0.00	0.00
10 Jun-13	32.55	45.00	12.45	32.55	0.00	45.00	0.00	0.00	0.00
11 Jun-14	38.81	49.11	10.30	38.81	0.00	49.11	0.00	0.00	0.00
12 Jun-15	8.90	15.15	6.25	8.90	0.00	15.15	0.00	0.00	0.00
13 Jun-16	2.04	11.00	8.96	2.04	0.00	11.00	0.00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center**

**Junction Results**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 Jun-01	17.71	0.00	3.91	7.22	0.00	4.77	0.53	3.84	0 07:59	0 00:00	0.00	0.00
2 Jun-04	14.22	1.05	7.75	1.27	0.00	3.22	6.92	0.44	0 07:54	0 00:00	0.00	0.00
3 Jun-06	14.76	2.46	13.54	4.81	0.00	4.45	9.35	0.62	0 07:54	0 00:00	0.00	0.00
4 Jun-07	12.32	0.29	15.17	5.35	0.00	3.03	10.37	0.55	0 07:54	0 00:00	0.00	0.00
5 Jun-08	12.03	0.00	16.70	5.36	0.00	1.52	11.77	0.43	0 07:54	0 00:00	0.00	0.00
6 Jun-09	12.04	2.19	19.77	5.50	0.00	1.26	14.72	0.45	0 07:54	0 00:00	0.00	0.00
7 Jun-10	10.33	0.90	21.61	7.27	0.00	0.00	15.06	0.72	0 07:52	0 08:00	0.06	10.00
8 Jun-11	9.44	2.60	28.11	0.95	0.00	5.73	27.45	0.29	0 08:00	0 00:00	0.00	0.00
9 Jun-12	6.85	5.46	32.86	0.77	0.00	11.99	32.38	0.29	0 08:00	0 00:00	0.00	0.00
10 Jun-13	1.42	0.00	32.97	0.42	0.00	12.03	32.72	0.17	0 08:06	0 00:00	0.00	0.00
11 Jun-14	1.42	1.42	40.23	1.42	0.00	8.88	40.05	1.24	0 08:06	0 00:00	0.00	0.00
12 Jun-15	3.50	0.63	9.35	0.45	0.00	5.80	8.98	0.08	0 07:54	0 00:00	0.00	0.00
13 Jun-16	3.50	0.00	4.01	1.97	0.00	6.99	2.14	0.10	0 07:59	0 00:00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

**Pipe Input**

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	Link-01	293.62	39.91	1.10	33.55	1.00	6.36	2.1700	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
2	Link-02	38.02	32.55	0.00	32.09	0.00	0.46	1.2100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
3	Link-03	258.55	32.09	0.00	27.16	0.00	4.93	1.9100	CIRCULAR	15.000	15.000	0.0110	0.5000	0.5000	0.0000	0.00	No	1
4	Link-04	277.57	27.16	0.00	15.13	0.79	12.03	4.3300	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
5	Link-05	37.89	14.34	0.00	14.13	-0.14	0.21	0.5500	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
6	Link-06	61.07	14.27	0.00	11.33	-0.01	2.94	4.8100	CIRCULAR	18.000	18.000	0.0220	0.5000	0.6000	0.0000	0.00	No	1
7	Link-07	15.81	11.34	0.00	9.89	0.07	1.45	9.1700	CIRCULAR	18.000	18.000	0.0220	0.5000	0.8000	0.0000	0.00	No	1
8	link-08	82.61	9.82	0.00	9.08	0.35	0.74	0.9000	CIRCULAR	18.000	18.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
9	Link-09	112.81	8.73	0.00	7.95	0.00	0.78	0.6900	CIRCULAR	18.000	18.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
10	Link-10	169.20	7.95	0.00	6.56	0.08	1.39	0.8200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
11	Link-11	100.45	6.48	0.00	3.73	7.04	2.75	2.7400	CIRCULAR	18.000	18.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
12	Link-12	136.85	-3.31	0.00	-7.10	0.00	3.79	2.7700	CIRCULAR	18.000	18.000	0.0110	0.5000	0.0000	0.0000	0.00	No	1
13	Link-13	57.57	9.43	1.48	9.36	0.46	0.07	0.1200	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
14	Link-14	147.94	8.90	0.00	2.04	0.00	6.86	4.6400	CIRCULAR	12.000	12.000	0.0120	0.5000	0.8000	0.0000	0.00	No	1
15	Link-15	119.81	2.04	0.00	-3.05	0.26	5.09	4.2500	CIRCULAR	24.000	24.000	0.0220	0.5000	0.5000	0.0000	0.00	No	1

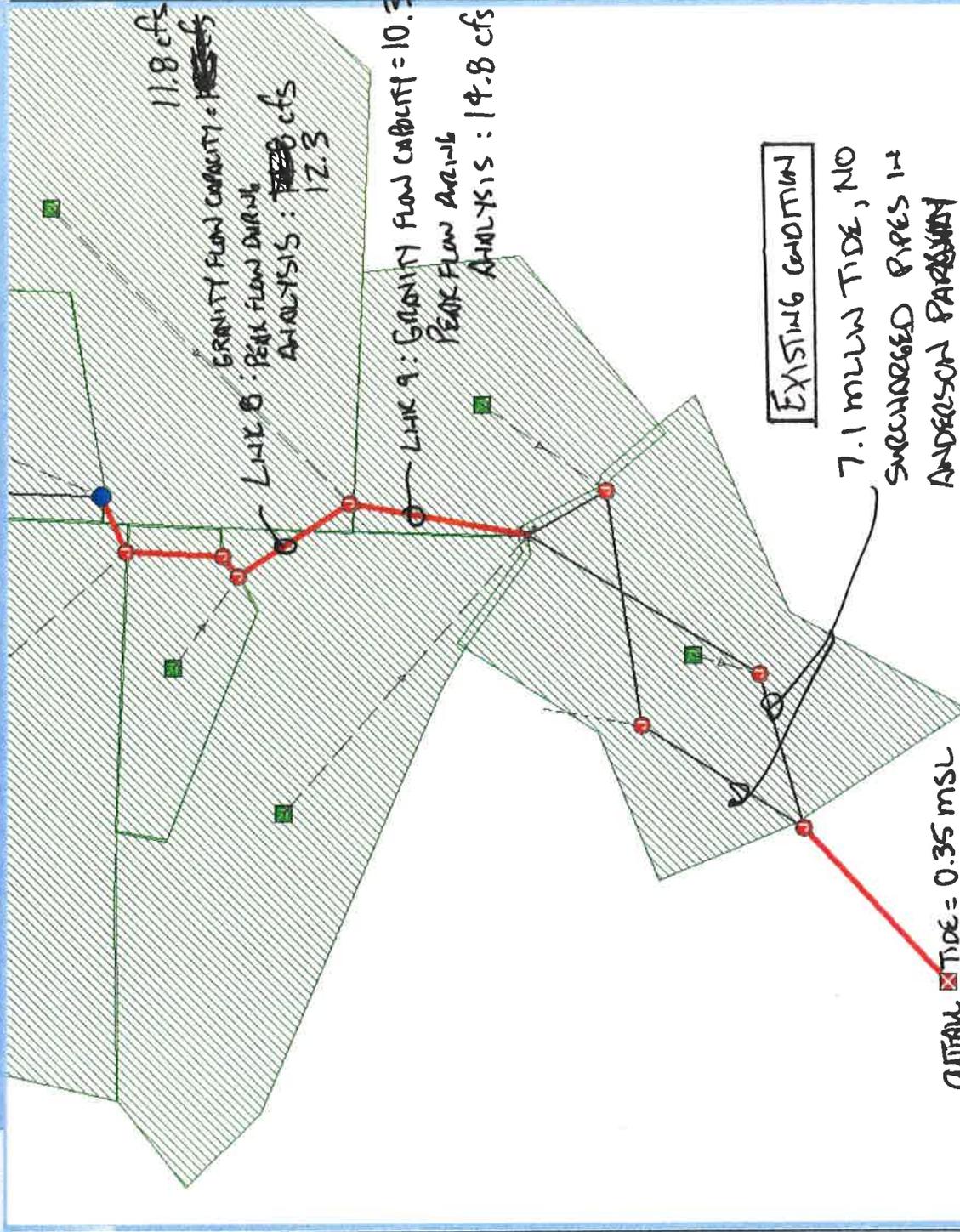
Poulsbo Place Division 8

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Downstream Stormwater Backwater Analysis

Pipe Results

SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 Link-01	1.42	0 08:06	10.30	0.14	5.78	0.85	0.32	0.25	0.00		Calculated
2 Link-02	1.42	0 08:06	7.70	0.18	2.79	0.23	0.59	0.47	0.00		Calculated
3 Link-03	6.85	0 08:00	10.54	0.65	8.29	0.52	0.86	0.69	0.00		Calculated
4 Link-04	9.44	0 08:00	14.57	0.65	9.77	0.47	1.10	0.88	0.00		Calculated
5 Link-05	9.97	0 08:02	3.01	3.31	8.12	0.08	1.25	1.00	29.00		SURCHARGED
6 Link-06	12.03	0 08:02	13.60	0.89	7.00	0.15	1.50	1.00	28.00		SURCHARGED
7 Link-07	12.04	0 08:02	18.80	0.64	6.82	0.04	1.50	1.00	34.00		SURCHARGED
8 link-08	12.32	0 08:02	11.75	1.05	6.97	0.20	1.50	1.00	39.00		SURCHARGED
9 Link-09	14.76	0 07:55	10.32	1.43	8.35	0.23	1.50	1.00	41.00		SURCHARGED
10 Link-10	13.17	0 07:54	11.25	1.17	7.59	0.37	1.43	0.95	0.00		> CAPACITY
11 Link-11	14.22	0 07:54	20.54	0.69	10.30	0.16	1.09	0.73	0.00		Calculated
12 Link-12	17.71	0 07:59	20.66	0.86	10.02	0.23	1.50	1.00	1440.00		SURCHARGED
13 Link-13	2.86	0 07:54	1.47	1.95	3.98	0.24	0.86	0.86	0.00		> CAPACITY
14 Link-14	3.50	0 07:54	8.31	0.42	7.56	0.33	0.73	0.73	0.00		Calculated
15 Link-15	3.49	0 08:00	27.55	0.13	1.11	1.80	1.99	0.99	0.00		Calculated



ABOVE J-5 FLOW SPLITTER

**APPENDIX D**  
**STAFF QUESTION: WOULD A LARGER**  
**OUTFALL PIPE ELIMINATE SURCHARGE OF**  
**PIPES AT A MHHW TIDAL EVENT?**





**Poulsbo Place Division 8  
Assisted Living Center**

**Subbasin Summary**

**Downstream Stormwater Backwater Analysis**

SN Subbasin ID	Area (ac)	Impervious Area (%)	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1 Sub-03	5.31	79.00	98.00	86.00	4.69	4.18	22.19	5.47	0 00:06:00
2 Sub-04	2.62	67.00	98.00	86.00	4.69	4.03	10.54	2.60	0 00:06:00
3 Sub-07	2.17	73.00	98.00	86.00	4.69	4.11	8.91	2.19	0 00:06:00
4 Sub-08	0.90	67.00	98.00	86.00	4.69	4.03	3.63	0.90	0 00:06:00
5 Sub-09	2.42	74.00	98.00	86.00	4.69	4.12	9.98	2.46	0 00:06:00
6 Sub-10	0.59	95.00	98.00	86.00	4.69	4.39	2.57	0.83	0 00:06:00
7 Sub-11	0.27	95.00	98.00	86.00	4.69	4.39	1.18	0.29	0 00:06:00
8 Sub-12	1.18	95.00	98.00	86.00	4.69	4.39	5.19	1.28	0 00:06:00
9 Sub-14	0.98	95.00	98.00	86.00	4.69	4.39	4.29	1.05	0 00:06:00
10 sub-2	2.10	21.00	98.00	86.00	4.69	3.42	7.17	1.42	0 00:22:30

**Poulsbo Place Division 8  
Assisted Living Center**

**Node Summary**

**Downstream Stormwater Backwater Analysis**

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-01	Junction	-3.31	8.68	-3.31	8.68	0.00	59.11	8.60	0.00	0.08	0 00:00	0.00	0.00
2	Jun-04	Junction	6.48	10.97	6.48	10.97	0.00	14.22	7.71	0.00	3.26	0 00:00	0.00	0.00
3	Jun-06	Junction	8.73	17.99	8.73	17.99	0.00	14.76	13.54	0.00	4.45	0 00:00	0.00	0.00
4	Jun-07	Junction	9.82	18.20	9.82	18.20	0.00	12.32	15.17	0.00	3.03	0 00:00	0.00	0.00
5	Jun-08	Junction	11.34	18.22	11.34	18.22	0.00	12.03	16.70	0.00	1.52	0 00:00	0.00	0.00
6	Jun-09	Junction	14.27	21.03	14.27	21.03	0.00	12.04	19.77	0.00	1.26	0 00:00	0.00	0.00
7	Jun-10	Junction	14.34	21.61	14.34	21.61	0.00	10.33	21.61	0.00	0.00	0 08:00	0.06	10.00
8	Jun-11	Junction	27.16	33.84	27.16	33.84	0.00	9.44	28.11	0.00	5.73	0 00:00	0.00	0.00
9	Jun-12	Junction	32.09	44.85	32.09	44.85	0.00	6.85	32.91	0.00	11.94	0 00:00	0.00	0.00
10	Jun-13	Junction	32.55	45.00	32.55	45.00	0.00	1.42	32.97	0.00	12.03	0 00:00	0.00	0.00
11	Jun-14	Junction	36.81	49.11	36.81	49.11	0.00	1.42	40.23	0.00	8.88	0 00:00	0.00	0.00
12	Jun-15	Junction	8.90	15.15	8.90	15.15	0.00	3.50	9.38	0.00	5.77	0 00:00	0.00	0.00
13	Jun-16	Junction	2.04	11.00	2.04	11.00	0.00	15.34	8.11	0.00	2.89	0 00:00	0.00	0.00
14	Out-01	Outfall	-7.10					59.11	4.65					
15	Jun-05	Flow Diversions	7.95	15.30	7.95		0.00	16.03	10.75				0.00	0.00

Poulsbo Place Division 8

Assisted Living Center

Link Summary

Downstream Stormwater Backwater Analysis

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Total Depth Ratio	Total Time Reported	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	Link-01	Pipe	Jun-14	Jun-13	293.62	39.91	33.55	2.1700	15.000	0.0120	1.42	10.30	0.14	5.78	0.32	0.25	0.00	Calculated
2	Link-02	Pipe	Jun-13	Jun-12	38.02	32.55	32.09	1.2100	15.000	0.0120	1.42	7.70	0.18	2.70	0.62	0.50	0.00	Calculated
3	Link-03	Pipe	Jun-12	Jun-11	258.55	32.09	27.16	1.9100	15.000	0.0120	6.85	9.66	0.71	8.00	0.89	0.71	0.00	Calculated
4	Link-04	Pipe	Jun-11	Jun-10	277.57	27.16	15.13	4.3300	15.000	0.0120	9.44	14.57	0.65	9.77	1.10	0.88	0.00	Calculated
5	Link-05	Pipe	Jun-10	Jun-09	37.89	14.34	14.13	0.5500	15.000	0.0120	9.97	3.01	3.31	8.12	1.25	1.00	29.00	SURCHARGED
6	Link-06	Pipe	Jun-09	Jun-08	61.07	14.27	11.33	4.8100	18.000	0.0220	12.03	13.60	0.89	7.00	1.50	1.00	28.00	SURCHARGED
7	Link-07	Pipe	Jun-08	Jun-07	15.81	11.34	9.89	9.1700	18.000	0.0220	12.04	18.80	0.64	6.82	1.50	1.00	34.00	SURCHARGED
8	Link-08	Pipe	Jun-07	Jun-06	82.61	9.82	9.08	0.9000	18.000	0.0110	12.32	11.75	1.05	6.97	1.50	1.00	39.00	SURCHARGED
9	Link-09	Pipe	Jun-06	Jun-05	112.81	8.73	7.95	0.6900	18.000	0.0110	14.76	10.32	1.43	8.35	1.50	1.00	41.00	SURCHARGED
10	Link-10	Pipe	Jun-05	Jun-04	169.20	7.95	6.56	0.8200	18.000	0.0110	13.17	11.25	1.17	7.59	1.43	0.95	0.00	> CAPACITY
11	Link-11	Pipe	Jun-04	Jun-01	100.45	6.48	3.73	2.7400	18.000	0.0110	14.22	20.54	0.69	9.26	1.22	0.81	0.00	Calculated
12	Link-12	Pipe	Jun-01	Out-01	136.85	-3.31	-7.10	2.7700	30.000	0.0110	59.11	80.67	0.73	12.04	2.50	1.00	1440.00	SURCHARGED
13	Link-13	Pipe	Jun-05	Jun-15	57.57	9.43	9.36	0.1200	12.000	0.0110	2.86	1.47	1.95	3.98	0.86	0.86	0.00	> CAPACITY
14	Link-14	Pipe	Jun-15	Jun-16	147.94	8.90	2.04	4.6400	12.000	0.0120	3.50	8.31	0.42	5.60	0.74	0.74	0.00	Calculated
15	Link-15	Pipe	Jun-16	Jun-01	119.81	2.04	-3.05	4.2500	24.000	0.0220	15.34	27.55	0.56	6.27	2.00	1.00	1439.00	SURCHARGED

Poulsbo Place Division 8

Assisted Living Center

Junction Input

Downstream Stormwater Backwater Analysis

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft <sup>2</sup> )	Minimum Pipe Cover (in)
1 Jun-01	-3.31	8.68	11.99	-3.31	0.00	8.68	0.00	0.00	0.00
2 Jun-04	6.48	10.97	4.49	6.48	0.00	10.97	0.00	0.00	0.00
3 Jun-06	8.73	17.99	9.26	8.73	0.00	17.99	0.00	0.00	0.00
4 Jun-07	9.82	18.20	8.38	9.82	0.00	18.20	0.00	0.00	0.00
5 Jun-08	11.34	18.22	6.88	11.34	0.00	18.22	0.00	0.00	0.00
6 Jun-09	14.27	21.03	6.76	14.27	0.00	21.03	0.00	0.00	0.00
7 Jun-10	14.34	21.61	7.27	14.34	0.00	21.61	0.00	0.00	0.00
8 Jun-11	27.16	33.84	6.68	27.16	0.00	33.84	0.00	0.00	0.00
9 Jun-12	32.09	44.85	12.76	32.09	0.00	44.85	0.00	0.00	0.00
10 Jun-13	32.55	45.00	12.45	32.55	0.00	45.00	0.00	0.00	0.00
11 Jun-14	38.81	49.11	10.30	38.81	0.00	49.11	0.00	0.00	0.00
12 Jun-15	8.90	15.15	6.25	8.90	0.00	15.15	0.00	0.00	0.00
13 Jun-16	2.04	11.00	8.96	2.04	0.00	11.00	0.00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center**

**Junction Results**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1 Jun-01	59.11	0.00	8.60	11.91	0.00	0.08	4.66	7.97	0 00:00	0 00:00	0.00	0.00
2 Jun-04	14.22	1.05	7.71	1.23	0.00	3.26	6.88	0.40	0 07:54	0 00:00	0.00	0.00
3 Jun-06	14.76	2.46	13.54	4.81	0.00	4.45	9.35	0.62	0 07:54	0 00:00	0.00	0.00
4 Jun-07	12.32	0.29	15.17	5.35	0.00	3.03	10.37	0.55	0 07:54	0 00:00	0.00	0.00
5 Jun-08	12.03	0.00	16.70	5.36	0.00	1.52	11.77	0.43	0 07:54	0 00:00	0.00	0.00
6 Jun-09	12.04	2.19	19.77	5.50	0.00	1.26	14.72	0.45	0 07:54	0 00:00	0.00	0.00
7 Jun-10	10.33	0.90	21.61	7.27	0.00	0.00	15.06	0.72	0 07:52	0 08:00	0.06	10.00
8 Jun-11	9.44	2.60	28.11	0.95	0.00	5.73	27.45	0.29	0 08:00	0 00:00	0.00	0.00
9 Jun-12	6.85	5.46	32.91	0.82	0.00	11.94	32.40	0.31	0 08:00	0 00:00	0.00	0.00
10 Jun-13	1.42	0.00	32.97	0.42	0.00	12.03	32.72	0.17	0 08:00	0 00:00	0.00	0.00
11 Jun-14	1.42	1.42	40.23	1.42	0.00	8.88	40.05	1.24	0 08:06	0 00:00	0.00	0.00
12 Jun-15	3.50	0.63	9.38	0.48	0.00	5.77	6.98	0.08	0 07:54	0 00:00	0.00	0.00
13 Jun-16	15.34	0.00	8.11	6.07	0.00	2.89	4.66	2.62	0 00:01	0 00:00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

**Pipe Input**

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow Gate	Flap	No. of Barrels
1	Link-01	293.62	39.91	1.10	33.55	1.00	6.36	2.1700	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
2	Link-02	38.02	32.55	0.00	32.09	0.00	0.46	1.2100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
3	Link-03	258.55	32.09	0.00	27.16	0.00	4.93	1.9100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
4	Link-04	277.57	27.16	0.00	15.13	0.79	12.03	4.3300	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
5	Link-05	37.89	14.34	0.00	14.13	-0.14	0.21	0.5500	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
6	Link-06	61.07	14.27	0.00	11.33	-0.01	2.94	4.8100	CIRCULAR	18.000	18.000	0.0220	0.5000	0.6000	0.0000	0.00	No	1
7	Link-07	15.81	11.34	0.00	9.89	0.07	1.45	9.1700	CIRCULAR	18.000	18.000	0.0220	0.5000	0.8000	0.0000	0.00	No	1
8	link-08	82.61	9.82	0.00	9.08	0.35	0.74	0.9000	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
9	Link-09	112.81	8.73	0.00	7.95	0.00	0.78	0.6900	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
10	Link-10	169.20	7.95	0.00	6.56	0.08	1.39	0.8200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
11	Link-11	100.45	6.48	0.00	3.73	7.04	2.75	2.7400	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
12	Link-12	136.85	-3.31	0.00	-7.10	0.00	3.79	2.7700	CIRCULAR	30.000	30.000	0.0110	0.5000	0.0000	0.0000	0.00	No	1
13	Link-13	57.57	9.43	1.48	9.38	0.46	0.07	0.1200	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
14	Link-14	147.94	8.90	0.00	2.04	0.00	6.86	4.6400	CIRCULAR	12.000	12.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
15	Link-15	119.81	2.04	0.00	-3.05	0.26	5.09	4.2500	CIRCULAR	24.000	24.000	0.0220	0.5000	0.5000	0.0000	0.00	No	1

Poulsbo Place Division 8

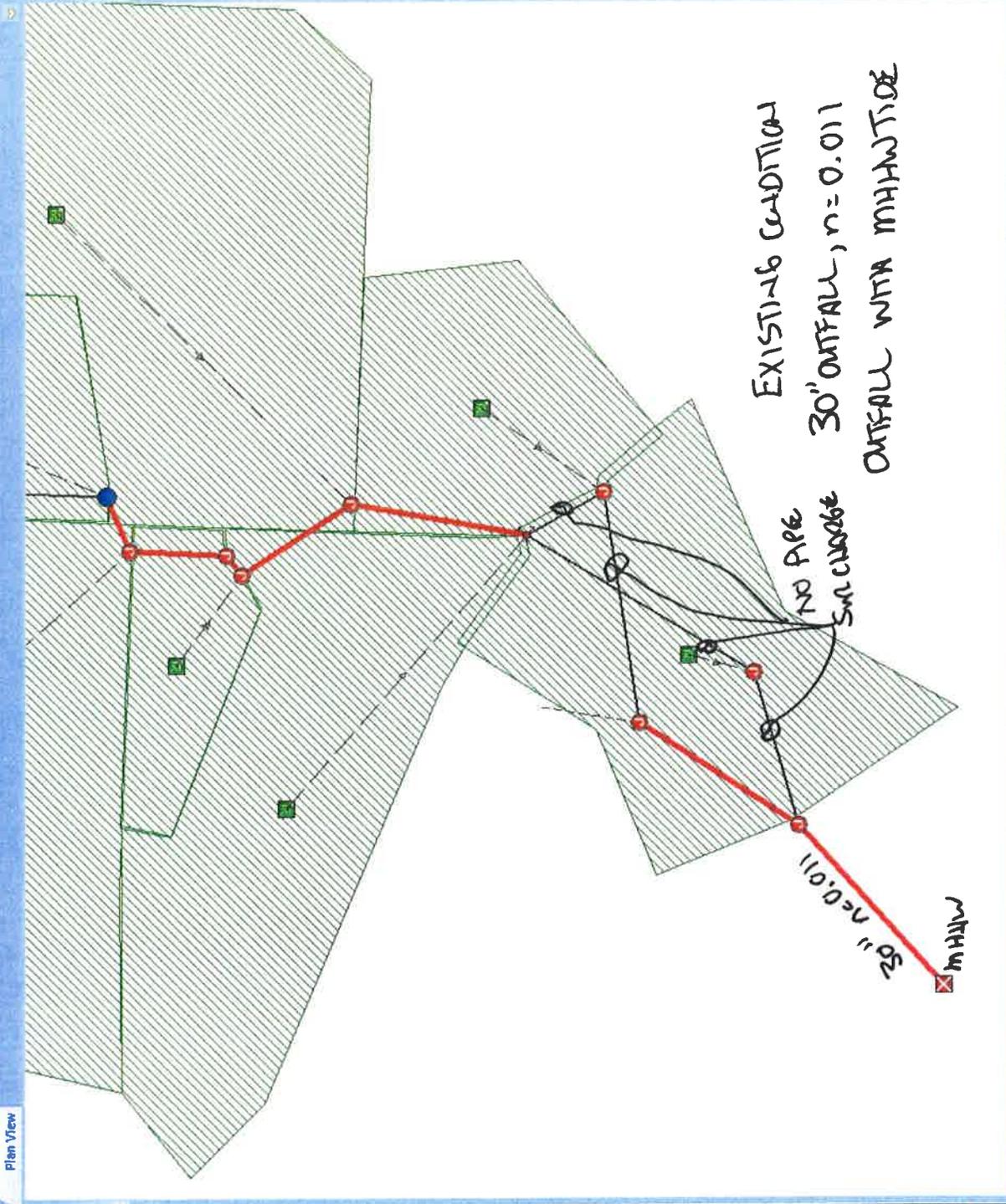
Assisted Living Center

Downstream Stormwater Backwater Analysis

Pipe Results

SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 Link-01	1.42	0 08:06	10.30	0.14	5.78	0.85	0.32	0.25	0.00		Calculated
2 Link-02	1.42	0 08:06	7.70	0.18	2.70	0.23	0.62	0.50	0.00		Calculated
3 Link-03	6.85	0 08:00	9.66	0.71	8.00	0.54	0.89	0.71	0.00		Calculated
4 Link-04	9.44	0 08:00	14.57	0.65	9.77	0.47	1.10	0.88	0.00		Calculated
5 Link-05	9.97	0 08:02	3.01	3.31	8.12	0.08	1.25	1.00	29.00		SURCHARGED
6 Link-06	12.03	0 08:02	13.60	0.89	7.00	0.15	1.50	1.00	28.00		SURCHARGED
7 Link-07	12.04	0 08:02	18.80	0.64	6.82	0.04	1.50	1.00	34.00		SURCHARGED
8 link-08	12.32	0 08:02	11.75	1.05	6.97	0.20	1.50	1.00	39.00		SURCHARGED
9 Link-09	14.76	0 07:55	10.32	1.43	8.35	0.23	1.50	1.00	41.00		SURCHARGED
10 Link-10	13.17	0 07:54	11.25	1.17	7.59	0.37	1.43	0.95	0.00		> CAPACITY
11 Link-11	14.22	0 07:54	20.54	0.69	9.26	0.18	1.22	0.81	0.00		Calculated
12 Link-12	59.11	0 00:00	80.67	0.73	12.04	0.19	2.50	1.00	1440.00		SURCHARGED
13 Link-13	2.88	0 07:54	1.47	1.95	3.98	0.24	0.86	0.86	0.00		> CAPACITY
14 Link-14	3.50	0 07:54	8.31	0.42	5.60	0.44	0.74	0.74	0.00		Calculated
15 Link-15	15.34	0 00:00	27.55	0.56	6.27	0.32	2.00	1.00	1439.00		SURCHARGED

File Edit View Input Design Analysis Output Window Help



Plan View

- Project Data
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  - Flow Diversion Curves
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  - Irregular Cross Sections
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  - Outlets
  - Outlet Rating Curves
- Quality
- Pollutants
- Pollutants Land Types
- Others
  - Control Rules
  - Control Settings
  - Sanitary Time Patterns
  - Time Series

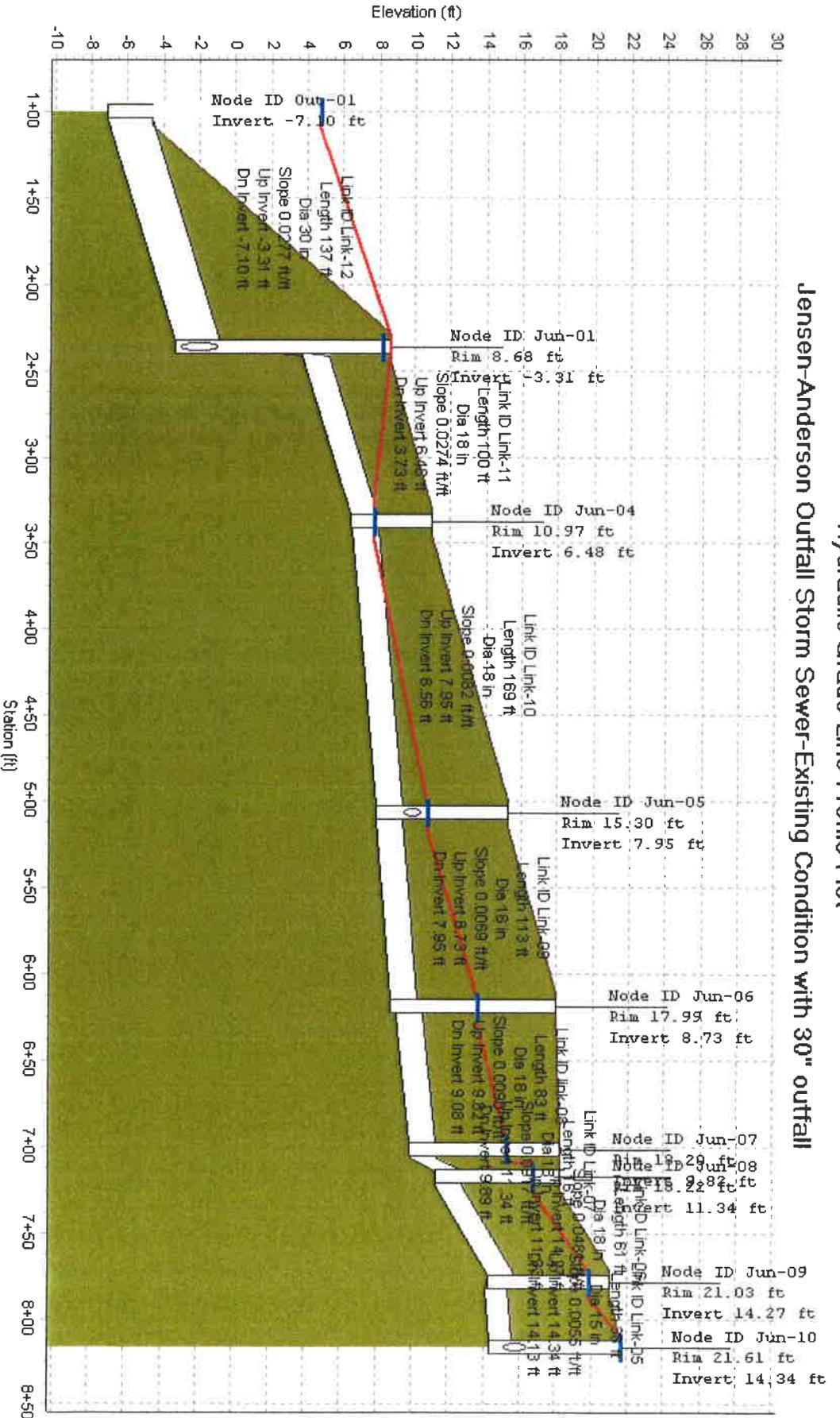
Results Complete 749%

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2:38 PM 9/16/2015

# Hydraulic Grade Line Profile Plot

## Jensen-Anderson Outfall Storm Sewer-Existing Condition with 30" outfall



Node ID:	Jun-01	Jun-04	Jun-05	Jun-06	Jun-07	Jun-08	Jun-09	Jun-10
Rim (ft):	8.68	10.97	15.30	17.99	18.28	18.28	21.03	21.61
Invert (ft):	-3.31	6.48	7.95	8.73	9.82	11.34	14.27	14.34
In Pipe Cover (ft):	3.45	2.91	7.41	7.41	6.85	3.8	5.26	5.23
Max HGL (ft):	8.60	7.71	10.75	13.54	15.76	7.0	19.77	21.61
Link ID:	Link-12	Link-11	Link-10	Link-09	Link-08	Link-07	Link-06	Link-05
Length (ft):	137	100	169	113	83	16	51	38
Dia (in):	30	18	18	18	18	18	18	15
Slope (ft/ft):	0.0277	0.0274	0.0082	0.0069	0.0090	0.0917	0.0481	0.0055
Up Invert (ft):	-3.31	6.48	7.95	8.73	9.82	11.34	14.27	14.34
Dn Invert (ft):	-7.10	3.73	6.56	7.95	14.76	12.04	12.03	14.13
Max Q (cfs):	59.11	14.22	13.17	7.59	8.35	6.97	7.00	8.12
Max Vel (ft/s):	12.04	9.26	7.59	8.35	6.97	8.82	7.00	8.12
Max Depth (ft):	2.50	1.22	1.43	1.50	1.50	1.50	1.50	1.25

Autodesk® Storm and Sanitary Analysis 2014 - What outlet pipe size increase eliminates surcharge - Initial State - [Plan View]

File Edit View Input Design Analysis Output Window Help

Plan View

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 Flow Diversion  
 Flow Diversion Curves  
 Outfalls  
 Outfall Tidal Curves  
 External Inflows  
 Links  
 Conveyance Links  
 Custom Pipe Geometry  
 Irregular Cross Sections  
 Pumps  
 Pump Curves  
 Driftices  
 Weirs  
 Outlets  
 Outlet Rating Curves  
 Quality  
 Pollutants  
 Pollutants Land Types  
 Others  
 Control Rules  
 Control Settings  
 Sanitary Time Patterns  
 Time Series

24" n=0.011 MHHW

J-S FLOW SPALTER

110 PIPE SURCHARGE

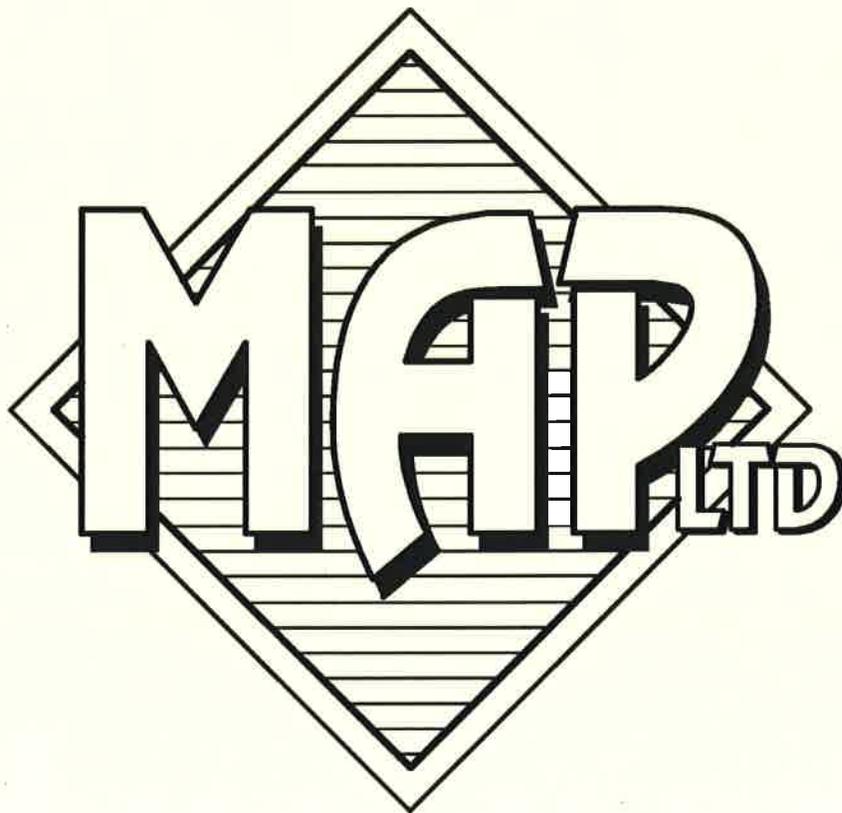
EXISTING CONDITION  
 24" OUTFALL, n=0.011  
 OUTFALL W/ MHHW TIDE

1193786.63, 273640.40

Results Complete 749%

9/16/2015

**APPENDIX E**  
**ANALYSIS: ONE PIPE UPSIZED, NO**  
**DETENTION AT ALC**



**Poulsbo Place Division 8  
Assisted Living Center**

**Project Description**

**Downstream Stormwater Backwater Analysis**

File Name ..... Run 4 Trunkline with One Pipe upgrade with flow splitter.SPF  
 Description ..... Poulsbo Place 2 Div 8  
 Downstream Existing Conditions

**Project Options**

Flow Units ..... CFS  
 Elevation Type ..... Elevation  
 Hydrology Method ..... Santa Barbara UH  
 Time of Concentration (TOC) Method ..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Enable Overflow Ponding at Nodes ..... NO  
 Skip Steady State Analysis Time Periods ..... NO

**Analysis Options**

Start Analysis On ..... Oct 01, 2013 00:00:00  
 End Analysis On ..... Oct 02, 2013 00:00:00  
 Start Reporting On ..... Oct 01, 2013 00:00:00  
 Antecedent Dry Days ..... 0 days  
 Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss  
 Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss  
 Reporting Time Step ..... 0 00:05:00 days hh:mm:ss  
 Routing Time Step ..... 30 seconds

**Number of Elements**

	Qty
Rain Gages .....	1
Subbasins.....	10
Nodes.....	15
<i>Junctions</i> .....	13
<i>Outfalls</i> .....	1
<i>Flow Diversions</i> .....	1
<i>Inlets</i> .....	0
<i>Storage Nodes</i> .....	0
Links.....	15
<i>Channels</i> .....	0
<i>Pipes</i> .....	15
<i>Pumps</i> .....	0
<i>Orifices</i> .....	0
<i>Weirs</i> .....	0
<i>Outlets</i> .....	0
Pollutants .....	0
Land Uses .....	0

**Rainfall Details**

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	Rain Gage-01	Time Series	TS-01	Cumulative	inches	Washington	Kitsap	100	4.70	SCS Type IA 24-hr

**Poulsbo Place Division 8  
Assisted Living Center**

**Subbasin Summary**

**Downstream Stormwater Backwater Analysis**

SN Subbasin ID	Area (ac)	Impervious Area (%)	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1 Sub-03	4.78	87.00	98.00	86.00	4.69	4.29	20.48	5.04	0 00:06:00
2 Sub-04	2.62	67.00	98.00	86.00	4.69	4.03	10.54	2.60	0 00:06:00
3 Sub-07	2.17	73.00	98.00	86.00	4.69	4.11	8.91	2.19	0 00:06:00
4 Sub-08	0.90	78.00	98.00	86.00	4.69	4.17	3.76	0.93	0 00:06:00
5 Sub-09	2.42	74.00	98.00	86.00	4.69	4.12	9.98	2.46	0 00:06:00
6 Sub-10	0.59	95.00	98.00	86.00	4.69	4.39	2.57	0.63	0 00:06:00
7 Sub-11	0.27	95.00	98.00	86.00	4.69	4.39	1.18	0.29	0 00:06:00
8 Sub-12	1.18	95.00	98.00	86.00	4.69	4.39	5.19	1.28	0 00:06:00
9 Sub-14	0.98	95.00	98.00	86.00	4.69	4.39	4.29	1.05	0 00:06:00
10 sub-2	2.62	95.00	98.00	86.00	4.69	4.39	11.51	2.83	0 00:06:00

**Poulsbo Place Division 8  
Assisted Living Center**

**Node Summary**

**Downstream Stormwater Backwater Analysis**

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-01	Junction	-3.31	8.68	-3.31	8.68	0.00	21.92	8.10	0.00	0.58	0 00:00	0.00	0.00
2	Jun-04	Junction	6.48	10.97	6.48	10.97	0.00	12.67	10.03	0.00	0.94	0 00:00	0.00	0.00
3	Jun-06	Junction	8.73	17.99	8.73	17.99	0.00	14.48	14.93	0.00	3.06	0 00:00	0.00	0.00
4	Jun-07	Junction	9.82	18.20	9.82	18.20	0.00	12.26	16.51	0.00	1.69	0 00:00	0.00	0.00
5	Jun-08	Junction	11.34	18.22	11.34	18.22	0.00	12.00	17.96	0.00	0.26	0 00:00	0.00	0.00
6	Jun-09	Junction	14.27	21.03	14.27	21.03	0.00	12.00	20.89	0.00	0.14	0 00:00	0.00	0.00
7	Jun-10	Junction	14.34	21.61	14.34	21.61	0.00	11.38	21.61	0.00	0.00	0 07:56	0.43	19.00
8	Jun-11	Junction	27.16	33.84	27.16	33.84	0.00	10.47	28.27	0.00	5.57	0 00:00	0.00	0.00
9	Jun-12	Junction	32.09	44.85	32.09	44.85	0.00	7.86	33.00	0.00	11.85	0 00:00	0.00	0.00
10	Jun-13	Junction	32.55	45.00	32.55	45.00	0.00	2.83	33.26	0.00	11.74	0 00:00	0.00	0.00
11	Jun-14	Junction	38.81	49.11	38.81	49.11	0.00	2.83	40.38	0.00	8.73	0 00:00	0.00	0.00
12	Jun-15	Junction	8.90	15.15	8.90	15.15	0.00	4.77	11.16	0.00	3.99	0 00:00	0.00	0.00
13	Jun-16	Junction	2.04	11.00	2.04	11.00	0.00	9.58	8.29	0.00	2.71	0 00:00	0.00	0.00
14	Out-01	Outfall	-7.10					21.92	4.65					
15	Jun-05	Flow Diversion	7.95	15.30	7.95		0.00	15.75	12.25				0.00	0.00

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Reported (min)	Reported Condition
1	Link-01	Pipe	Jun-14	Jun-13	293.62	39.91	33.55	2.1700	15.000	0.0120	2.83	10.30	0.27	6.95	0.46	0.37	0.00	Calculated
2	Link-02	Pipe	Jun-13	Jun-12	38.02	32.55	32.09	1.2100	15.000	0.0120	2.83	7.70	0.37	3.36	0.81	0.65	0.00	Calculated
3	Link-03	Pipe	Jun-12	Jun-11	258.55	32.09	27.16	1.9100	15.000	0.0120	7.87	9.66	0.81	8.25	1.01	0.81	0.00	Calculated
4	Link-04	Pipe	Jun-11	Jun-10	277.57	27.16	15.13	4.3300	15.000	0.0120	10.46	14.57	0.72	10.63	1.18	0.94	0.00	Calculated
5	Link-05	Pipe	Jun-10	Jun-09	37.89	14.34	14.13	0.5500	18.000	0.0110	10.09	5.34	1.89	5.71	1.50	1.00	32.00	SURCHARGED
6	Link-06	Pipe	Jun-09	Jun-08	61.07	14.27	11.35	4.7800	18.000	0.0220	12.00	13.57	0.88	7.13	1.50	1.00	32.00	SURCHARGED
7	Link-07	Pipe	Jun-08	Jun-07	15.81	11.34	9.82	9.6100	18.000	0.0220	12.01	19.25	0.62	6.80	1.50	1.00	37.00	SURCHARGED
8	Link-08	Pipe	Jun-07	Jun-06	82.61	9.82	9.06	0.9200	18.000	0.0111	12.28	11.80	1.04	6.95	1.50	1.00	40.00	SURCHARGED
9	Link-09	Pipe	Jun-06	Jun-05	112.81	8.73	7.95	0.6900	18.000	0.0110	14.48	10.32	1.40	8.19	1.50	1.00	42.00	SURCHARGED
10	Link-10	Pipe	Jun-05	Jun-04	169.20	7.95	6.56	0.8200	18.000	0.0110	11.62	11.25	1.03	6.58	1.50	1.00	35.00	SURCHARGED
11	Link-11	Pipe	Jun-04	Jun-01	100.45	6.48	3.73	2.7400	18.000	0.0110	12.67	20.54	0.62	7.17	1.50	1.00	36.00	SURCHARGED
12	Link-12	Pipe	Jun-01	Out-01	136.85	-3.31	-7.10	2.7700	18.000	0.0110	21.92	20.66	1.06	12.40	1.50	1.00	1440.00	SURCHARGED
13	Link-13	Pipe	Jun-05	Jun-15	55.92	9.43	9.36	0.1300	12.000	0.0110	4.21	1.49	2.83	5.43	1.00	1.00	22.00	SURCHARGED
14	Link-14	Pipe	Jun-15	Jun-16	146.92	8.90	2.04	4.6700	12.000	0.0120	4.76	8.34	0.57	6.06	1.00	1.00	25.00	SURCHARGED
15	Link-15	Pipe	Jun-16	Jun-01	120.02	2.04	-3.05	4.2400	24.000	0.0220	9.58	27.53	0.35	3.56	2.00	1.00	1438.00	SURCHARGED

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

Junction Input

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft <sup>2</sup> )	Minimum Pipe Cover (in)
1 Jun-01	-3.31	8.68	11.99	-3.31	0.00	8.68	0.00	0.00	0.00
2 Jun-04	6.48	10.97	4.49	6.48	0.00	10.97	0.00	0.00	0.00
3 Jun-06	8.73	17.99	9.26	8.73	0.00	17.99	0.00	0.00	0.00
4 Jun-07	9.82	18.20	8.38	9.82	0.00	18.20	0.00	0.00	0.00
5 Jun-08	11.34	18.22	6.88	11.34	0.00	18.22	0.00	0.00	0.00
6 Jun-09	14.27	21.03	6.76	14.27	0.00	21.03	0.00	0.00	0.00
7 Jun-10	14.34	21.61	7.27	14.34	0.00	21.61	0.00	0.00	0.00
8 Jun-11	27.16	33.84	6.68	27.16	0.00	33.84	0.00	0.00	0.00
9 Jun-12	32.09	44.85	12.76	32.09	0.00	44.85	0.00	0.00	0.00
10 Jun-13	32.55	45.00	12.45	32.55	0.00	45.00	0.00	0.00	0.00
11 Jun-14	38.81	49.11	10.30	38.81	0.00	49.11	0.00	0.00	0.00
12 Jun-15	8.90	15.15	6.25	8.90	0.00	15.15	0.00	0.00	0.00
13 Jun-16	2.04	11.00	8.96	2.04	0.00	11.00	0.00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center**

**Junction Results**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 Jun-01	21.92	0.00	8.10	11.41	0.00	0.58	4.84	8.15	0 07:54	0 00:00	0.00	0.00
2 Jun-04	12.67	1.05	10.03	3.55	0.00	0.94	6.91	0.43	0 07:54	0 00:00	0.00	0.00
3 Jun-06	14.48	2.46	14.93	6.20	0.00	3.06	9.38	0.65	0 07:54	0 00:00	0.00	0.00
4 Jun-07	12.26	0.29	16.51	6.69	0.00	1.69	10.40	0.58	0 07:54	0 00:00	0.00	0.00
5 Jun-08	12.00	0.00	17.96	6.62	0.00	0.26	11.79	0.45	0 07:54	0 00:00	0.00	0.00
6 Jun-09	12.00	2.19	20.89	6.62	0.00	0.14	14.75	0.48	0 07:54	0 00:00	0.00	0.00
7 Jun-10	11.38	0.92	21.61	7.27	0.00	0.00	15.03	0.69	0 07:46	0 07:56	0.43	19.00
8 Jun-11	10.47	2.60	28.27	1.11	0.00	5.57	27.46	0.30	0 07:57	0 00:00	0.00	0.00
9 Jun-12	7.86	5.04	33.00	0.91	0.00	11.85	32.41	0.32	0 07:54	0 00:00	0.00	0.00
10 Jun-13	2.83	0.00	33.26	0.71	0.00	11.74	32.78	0.23	0 07:55	0 00:00	0.00	0.00
11 Jun-14	2.83	2.83	40.38	1.57	0.00	8.73	40.09	1.28	0 07:55	0 00:00	0.00	0.00
12 Jun-15	4.77	0.63	11.16	2.26	0.00	3.99	8.99	0.09	0 07:54	0 00:00	0.00	0.00
13 Jun-16	9.58	0.00	8.29	6.25	0.00	2.71	4.84	2.80	0 07:54	0 00:00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

**Pipe Input**

SN Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1 Link-01	293.62	39.91	1.10	33.55	1.00	6.36	2.1700	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
2 Link-02	38.02	32.55	0.00	32.09	0.00	0.46	1.2100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
3 Link-03	258.55	32.09	0.00	27.16	0.00	4.93	1.9100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
4 Link-04	277.57	27.16	0.00	15.13	0.79	12.03	4.3300	CIRCULAR	15.000	15.000	0.0120	0.5000	0.8000	0.0000	0.00	No	1
5 Link-05	37.89	14.34	0.00	14.13	-0.14	0.21	0.5500	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
6 Link-06	61.07	14.27	0.00	11.35	0.01	2.92	4.7800	CIRCULAR	18.000	18.000	0.0220	0.5000	0.6000	0.0000	0.00	No	1
7 Link-07	15.81	11.34	0.00	9.82	0.00	1.52	9.6100	CIRCULAR	18.000	18.000	0.0220	0.5000	0.8000	0.0000	0.00	No	1
8 link-08	82.61	9.82	0.00	9.06	0.33	0.78	0.9200	CIRCULAR	18.000	18.000	0.0111	0.5000	0.8000	0.0000	0.00	No	1
9 Link-09	112.81	8.73	0.00	7.95	0.00	0.78	0.6900	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
10 Link-10	169.20	7.95	0.00	6.56	0.08	1.39	0.8200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
11 Link-11	100.45	6.48	0.00	3.73	7.04	2.75	2.7400	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
12 Link-12	136.85	-3.31	0.00	-7.10	0.00	3.79	2.7700	CIRCULAR	18.000	18.000	0.0110	0.5000	0.0000	0.0000	0.00	No	1
13 Link-13	55.92	9.43	1.48	9.36	0.46	0.07	0.1300	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
14 Link-14	146.92	8.90	0.00	2.04	0.00	6.86	4.6700	CIRCULAR	12.000	12.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
15 Link-15	120.02	2.04	0.00	-3.05	0.28	5.09	4.2400	CIRCULAR	24.000	24.000	0.0220	0.5000	0.5000	0.0000	0.00	No	1

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

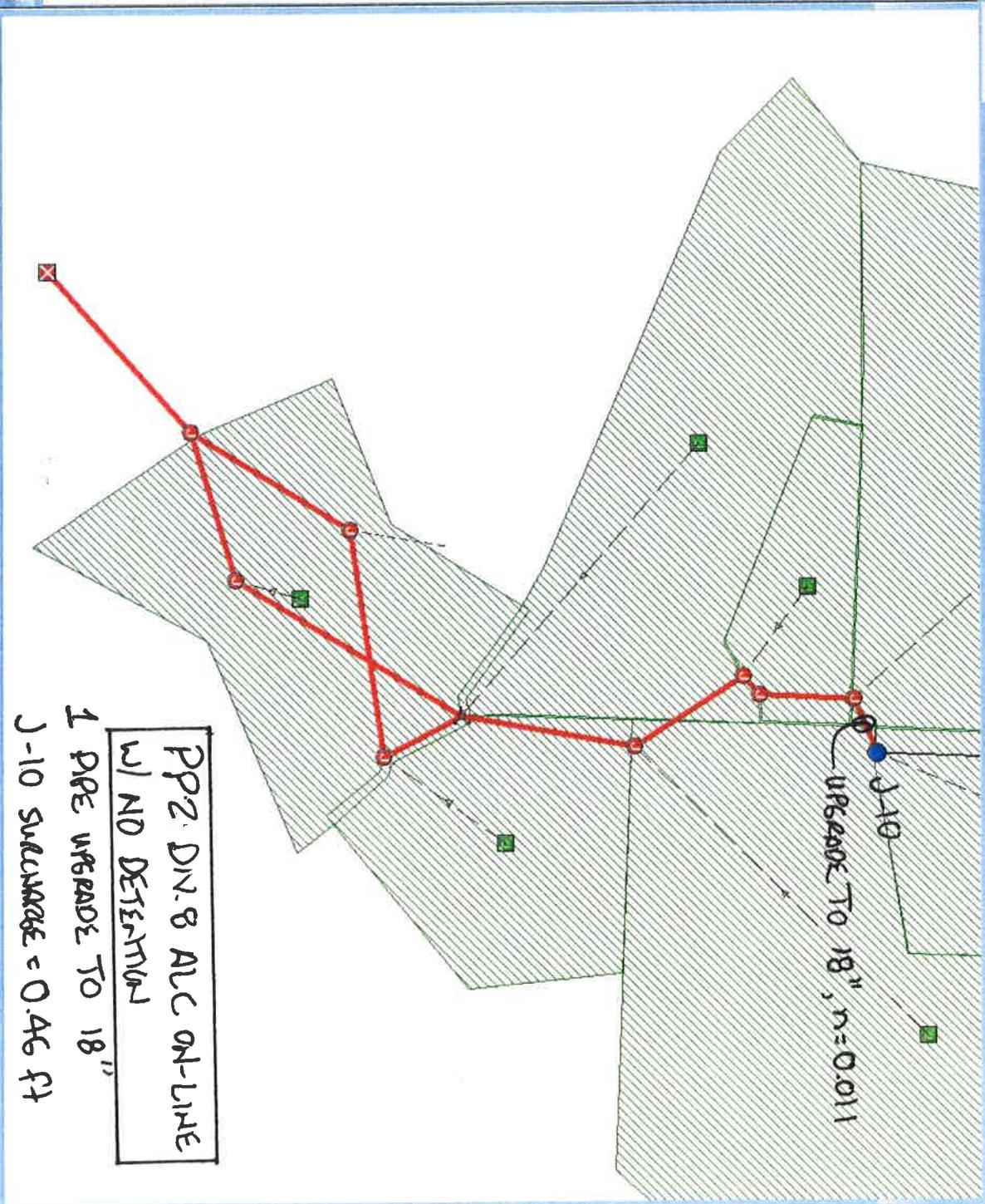
Pipe Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1 Link-01	2.83	0 07:55	10.30	0.27	6.95	0.70	0.46	0.37	0.00		Calculated
2 Link-02	2.83	0 07:55	7.70	0.37	3.36	0.19	0.81	0.65	0.00		Calculated
3 Link-03	7.87	0 07:55	9.68	0.81	8.25	0.52	1.01	0.81	0.00		Calculated
4 Link-04	10.46	0 07:57	14.57	0.72	10.63	0.44	1.18	0.94	0.00		Calculated
5 Link-05	10.09	0 08:06	5.34	1.89	5.71	0.11	1.50	1.00	32.00		SURCHARGED
6 Link-06	12.00	0 08:06	13.57	0.88	7.13	0.14	1.50	1.00	32.00		SURCHARGED
7 Link-07	12.01	0 08:06	19.25	0.62	6.80	0.04	1.50	1.00	37.00		SURCHARGED
8 Link-08	12.28	0 08:06	11.80	1.04	6.95	0.20	1.50	1.00	40.00		SURCHARGED
9 Link-09	14.48	0 08:00	10.32	1.40	8.19	0.23	1.50	1.00	42.00		SURCHARGED
10 Link-10	11.62	0 07:54	11.25	1.03	6.58	0.43	1.50	1.00	35.00		SURCHARGED
11 Link-11	12.67	0 07:54	20.54	0.62	7.17	0.23	1.50	1.00	36.00		SURCHARGED
12 Link-12	21.92	0 00:00	20.66	1.06	12.40	0.18	1.50	1.00	1440.00		SURCHARGED
13 Link-13	4.21	0 07:45	1.49	2.83	5.43	0.17	1.00	1.00	22.00		SURCHARGED
14 Link-14	4.76	0 07:54	8.34	0.57	6.06	0.40	1.00	1.00	25.00		SURCHARGED
15 Link-15	9.58	0 00:01	27.53	0.35	3.56	0.58	2.00	1.00	1438.00		SURCHARGED

File Edit View Input Design Analysis Output Window Help

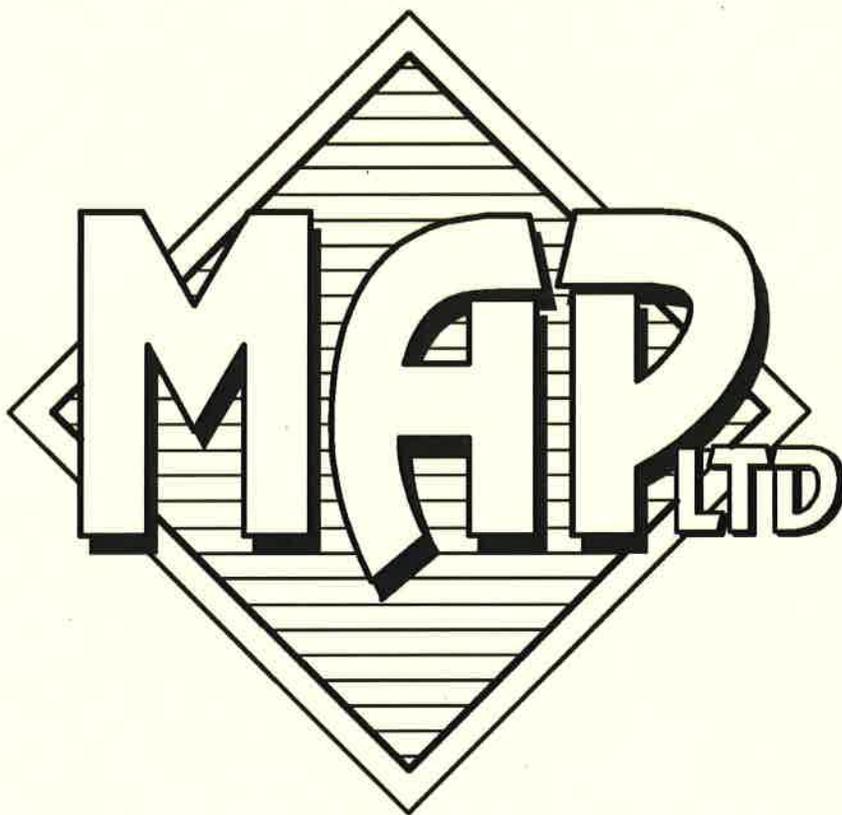
Plan View

- Project Data
- Project Options
- Analytic Options
- Hydrology
- Subbasins
- Rain Gages
- Hydraulics
- Nodes
- Junctions
- Storage Nodes
- Storage Curves
- Inlets
- Flow Diversion
- Flow Diversion Curves
- Outfalls
- Outfall Tidal Curves
- External Inflows
- Links
- Conveyance Links
- Custom Pipe Geometry
- Irregular Cross Sections
- Pumps
- Pump Curves
- Orifices
- Weirs
- Outlet
- Outlet Rating Curves
- Quality
- Pollutants
- Pollutants Land Types
- Others
- Control Rules
- Sanitary Time Patterns
- Time Series



PP2. DN. 8 ALC ON-LINE  
w/ NO DETENTION  
1 PIPE UPGRADE TO 18"  
J-10 SW UPGRADE = 0.46 FT

**APPENDIX F**  
**ANALYSIS: ONE PIPE UPSIZE, CMP PIPE**  
**REPLACED, NO ALC DETENTION**



**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

**Project Description**

File Name ..... Run 4 Trunkline with One Pipe upgrade with flow splitter.SPF  
 Description ..... Poulsbo Place 2 Div 8  
 Downstream Existing Conditions

**Project Options**

Flow Units ..... CFS  
 Elevation Type ..... Elevation  
 Hydrology Method ..... Santa Barbara UH  
 Time of Concentration (TOC) Method ..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Enable Overflow Ponding at Nodes ..... NO  
 Skip Steady State Analysis Time Periods ..... NO

**Analysis Options**

Start Analysis On ..... Oct 01, 2013 00:00:00  
 End Analysis On ..... Oct 02, 2013 00:00:00  
 Start Reporting On ..... Oct 01, 2013 00:00:00  
 Antecedent Dry Days ..... 0 days  
 Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss  
 Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss  
 Reporting Time Step ..... 0 00:05:00 days hh:mm:ss  
 Routing Time Step ..... 30 seconds

**Number of Elements**

Qty

Rain Gages ..... 1  
 Subbasins ..... 10  
 Nodes ..... 15  
 Junctions ..... 13  
 Outfalls ..... 1  
 Flow Diversions ..... 1  
 Inlets ..... 0  
 Storage Nodes ..... 0  
 Links ..... 15  
 Channels ..... 0  
 Pipes ..... 15  
 Pumps ..... 0  
 Orifices ..... 0  
 Weirs ..... 0  
 Outlets ..... 0  
 Pollutants ..... 0  
 Land Uses ..... 0

**Rainfall Details**

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	Rain Gage-01	Time Series	TS-01	Cumulative	inches	Washington	Kitsap	100	4.70	SCS Type IA 24-hr

**Poulsbo Place Division 8  
Assisted Living Center**

**Subbasin Summary**

**Downstream Stormwater Backwater Analysis**

SN Subbasin ID	Area Impervious Area (ac)	Impervious Area Curve Number (%)	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)	
1 Sub-03	4.78	87.00	98.00	86.00	4.69	4.29	20.48	5.04	0 00:06:00
2 Sub-04	2.62	67.00	98.00	86.00	4.69	4.03	10.54	2.60	0 00:06:00
3 Sub-07	2.17	73.00	98.00	86.00	4.69	4.11	8.91	2.19	0 00:06:00
4 Sub-08	0.90	78.00	98.00	86.00	4.69	4.17	3.76	0.93	0 00:06:00
5 Sub-09	2.42	74.00	98.00	86.00	4.69	4.12	9.98	2.46	0 00:06:00
6 Sub-10	0.59	95.00	98.00	86.00	4.69	4.39	2.57	0.63	0 00:06:00
7 Sub-11	0.27	95.00	98.00	86.00	4.69	4.39	1.18	0.29	0 00:06:00
8 Sub-12	1.18	95.00	98.00	86.00	4.69	4.39	5.19	1.28	0 00:06:00
9 Sub-14	0.98	95.00	98.00	86.00	4.69	4.39	4.29	1.05	0 00:06:00
10 sub-2	2.62	95.00	98.00	86.00	4.69	4.39	11.51	2.83	0 00:06:00

**Poulsbo Place Division 8  
Assisted Living Center**

**Node Summary**

**Downstream Stormwater Backwater Analysis**

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-01	Junction	-3.31	8.68	-3.31	8.68	0.00	21.92	8.16	0.00	0.52	0 00:00	0.00	0.00
2	Jun-04	Junction	6.48	10.97	6.48	10.97	0.00	12.78	10.12	0.00	0.85	0 00:00	0.00	0.00
3	Jun-06	Junction	8.73	17.99	8.73	17.99	0.00	14.68	15.12	0.00	2.87	0 00:00	0.00	0.00
4	Jun-07	Junction	9.82	18.20	9.82	18.20	0.00	12.50	16.73	0.00	1.47	0 00:00	0.00	0.00
5	Jun-08	Junction	11.34	18.22	11.34	18.22	0.00	13.58	18.22	0.00	0.00	0 07:56	0.37	18.00
6	Jun-09	Junction	14.27	21.03	14.27	21.03	0.00	13.58	19.96	0.00	1.07	0 00:00	0.00	0.00
7	Jun-10	Junction	14.34	21.61	14.34	21.61	0.00	11.38	20.99	0.00	0.62	0 00:00	0.00	0.00
8	Jun-11	Junction	27.16	33.84	27.16	33.84	0.00	10.47	28.18	0.00	5.66	0 00:00	0.00	0.00
9	Jun-12	Junction	32.09	44.85	32.09	44.85	0.00	7.86	33.01	0.00	11.84	0 00:00	0.00	0.00
10	Jun-13	Junction	32.55	45.00	32.55	45.00	0.00	2.83	33.27	0.00	11.73	0 00:00	0.00	0.00
11	Jun-14	Junction	38.81	49.11	38.81	49.11	0.00	2.83	40.38	0.00	8.73	0 00:00	0.00	0.00
12	Jun-15	Junction	8.90	15.15	8.90	15.15	0.00	4.80	11.27	0.00	3.88	0 00:00	0.00	0.00
13	Jun-16	Junction	2.04	11.00	2.04	11.00	0.00	9.58	8.35	0.00	2.65	0 00:00	0.00	0.00
14	Out-01	Outfall	-7.10					21.92	4.65					
15	Jun-05	Flow Diversions	7.95	15.30	7.95		0.00	15.90	12.38				0.00	0.00

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-01	Pipe	Jun-14	Jun-13	293.62	39.91	33.55	2.1700	15.000	0.0120	2.83	10.30	0.27	6.95	0.46	0.37	0.00	Calculated
2	Link-02	Pipe	Jun-13	Jun-12	38.02	32.55	32.09	1.2100	15.000	0.0120	2.83	7.70	0.37	3.33	0.82	0.66	0.00	Calculated
3	Link-03	Pipe	Jun-12	Jun-11	258.55	32.09	27.16	1.9100	15.000	0.0120	7.87	9.66	0.81	8.32	0.97	0.78	0.00	Calculated
4	Link-04	Pipe	Jun-11	Jun-10	277.57	27.16	15.13	4.3300	15.000	0.0120	10.46	14.57	0.72	11.28	1.14	0.91	0.00	Calculated
5	Link-05	Pipe	Jun-10	Jun-09	37.89	14.34	14.13	0.5500	18.000	0.0110	11.38	5.34	2.13	6.44	1.50	1.00	28.00	SURCHARGED
6	Link-06	Pipe	Jun-09	Jun-08	61.07	14.27	11.35	4.7800	18.000	0.0110	13.58	27.15	0.50	8.58	1.50	1.00	28.00	SURCHARGED
7	Link-07	Pipe	Jun-08	Jun-07	15.81	11.34	9.82	9.6100	18.000	0.0220	12.24	19.25	0.64	6.93	1.50	1.00	36.00	SURCHARGED
8	Link-08	Pipe	Jun-07	Jun-06	82.61	9.82	9.06	0.9200	18.000	0.0111	12.51	11.80	1.06	7.08	1.50	1.00	40.00	SURCHARGED
9	Link-09	Pipe	Jun-06	Jun-05	112.81	8.73	7.95	0.6900	18.000	0.0110	14.68	10.32	1.42	8.31	1.50	1.00	42.00	SURCHARGED
10	Link-10	Pipe	Jun-05	Jun-04	169.20	7.95	6.56	0.8200	18.000	0.0110	11.73	11.25	1.04	6.64	1.50	1.00	35.00	SURCHARGED
11	Link-11	Pipe	Jun-04	Jun-01	100.45	6.48	3.73	2.7400	18.000	0.0110	12.78	20.54	0.62	7.23	1.50	1.00	36.00	SURCHARGED
12	Link-12	Pipe	Jun-01	Out-01	136.85	-3.31	-7.10	2.7700	18.000	0.0110	21.92	20.66	1.06	12.40	1.50	1.00	1440.00	SURCHARGED
13	Link-13	Pipe	Jun-05	Jun-15	55.92	9.43	9.36	0.1300	12.000	0.0110	4.21	1.49	2.83	5.43	1.00	1.00	22.00	SURCHARGED
14	Link-14	Pipe	Jun-15	Jun-16	146.92	8.90	2.04	4.6700	12.000	0.0120	4.80	8.34	0.58	6.11	1.00	1.00	25.00	SURCHARGED
15	Link-15	Pipe	Jun-16	Jun-01	120.02	2.04	-3.05	4.2400	24.000	0.0220	9.58	27.53	0.35	3.56	2.00	1.00	1438.00	SURCHARGED

Poulsbo Place Division 8

Assisted Living Center

Junction Input

Downstream Stormwater Backwater Analysis

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft <sup>2</sup> )	Minimum Pipe Cover (in)
1 Jun-01	-3.31	8.68	11.99	-3.31	0.00	8.68	0.00	0.00	0.00
2 Jun-04	6.48	10.97	4.49	6.48	0.00	10.97	0.00	0.00	0.00
3 Jun-06	8.73	17.99	9.26	8.73	0.00	17.99	0.00	0.00	0.00
4 Jun-07	9.82	18.20	8.38	9.82	0.00	18.20	0.00	0.00	0.00
5 Jun-08	11.34	18.22	6.88	11.34	0.00	18.22	0.00	0.00	0.00
6 Jun-09	14.27	21.03	6.76	14.27	0.00	21.03	0.00	0.00	0.00
7 Jun-10	14.34	21.61	7.27	14.34	0.00	21.61	0.00	0.00	0.00
8 Jun-11	27.16	33.84	6.68	27.16	0.00	33.84	0.00	0.00	0.00
9 Jun-12	32.09	44.85	12.76	32.09	0.00	44.85	0.00	0.00	0.00
10 Jun-13	32.55	45.00	12.45	32.55	0.00	45.00	0.00	0.00	0.00
11 Jun-14	38.81	49.11	10.30	38.81	0.00	49.11	0.00	0.00	0.00
12 Jun-15	8.90	15.15	6.25	8.90	0.00	15.15	0.00	0.00	0.00
13 Jun-16	2.04	11.00	8.96	2.04	0.00	11.00	0.00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center**

**Junction Results**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surchage Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 Jun-01	21.92	0.00	8.16	11.47	0.00	0.52	4.84	8.15	0 07:54	0 00:00	0.00	0.00
2 Jun-04	12.78	1.05	10.12	3.64	0.00	0.85	6.91	0.43	0 07:54	0 00:00	0.00	0.00
3 Jun-06	14.68	2.46	15.12	6.39	0.00	2.87	9.39	0.66	0 07:54	0 00:00	0.00	0.00
4 Jun-07	12.50	0.29	16.73	6.91	0.00	1.47	10.40	0.58	0 07:54	0 00:00	0.00	0.00
5 Jun-08	13.58	0.00	18.22	6.88	0.00	0.00	11.79	0.45	0 07:47	0 07:56	0.37	18.00
6 Jun-09	13.58	2.19	19.96	5.69	0.00	1.07	14.63	0.36	0 07:56	0 00:00	0.00	0.00
7 Jun-10	11.38	0.92	20.99	6.65	0.00	0.62	14.98	0.64	0 07:56	0 00:00	0.00	0.00
8 Jun-11	10.47	2.60	28.18	1.02	0.00	5.66	27.46	0.30	0 07:56	0 00:00	0.00	0.00
9 Jun-12	7.86	5.04	33.01	0.92	0.00	11.84	32.41	0.32	0 07:54	0 00:00	0.00	0.00
10 Jun-13	2.83	0.00	33.27	0.72	0.00	11.73	32.78	0.23	0 07:55	0 00:00	0.00	0.00
11 Jun-14	2.83	2.83	40.38	1.57	0.00	8.73	40.09	1.28	0 07:55	0 00:00	0.00	0.00
12 Jun-15	4.80	0.63	11.27	2.37	0.00	3.88	8.99	0.09	0 07:54	0 00:00	0.00	0.00
13 Jun-16	9.58	0.00	8.35	6.31	0.00	2.65	4.84	2.80	0 07:54	0 00:00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center**

**Downstream Stormwater Backwater Analysis**

**Pipe Input**

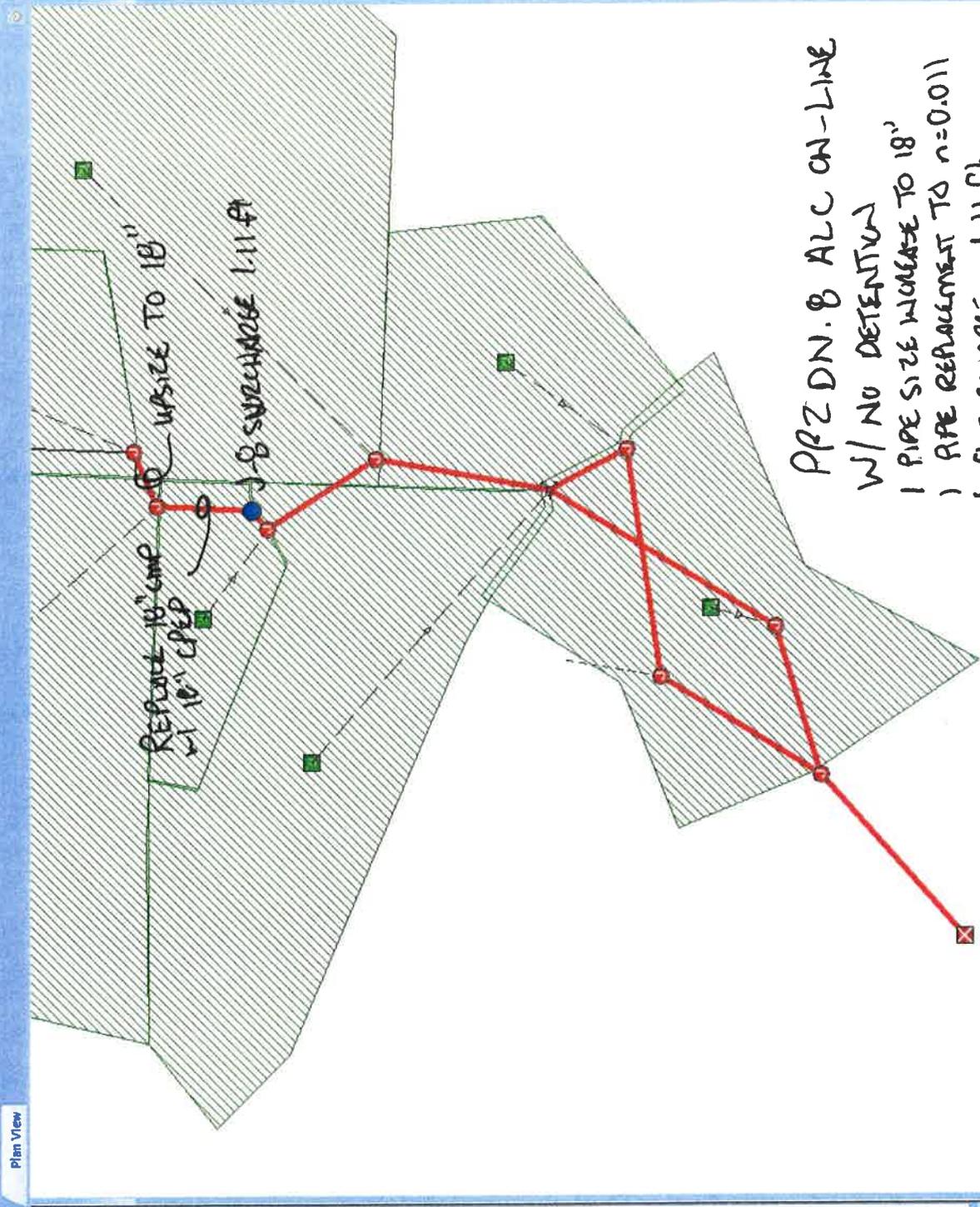
SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	Link-01	293.62	39.91	1.10	33.55	1.00	6.36	2.1700	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
2	Link-02	38.02	32.55	0.00	32.09	0.00	0.46	1.2100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
3	Link-03	258.55	32.09	0.00	27.16	0.00	4.93	1.9100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
4	Link-04	277.57	27.16	0.00	15.13	0.79	12.03	4.3300	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
5	Link-05	37.89	14.34	0.00	14.13	-0.14	0.21	0.5500	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
6	Link-06	61.07	14.27	0.00	11.35	0.01	2.92	4.7800	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
7	Link-07	15.81	11.34	0.00	9.82	0.00	1.52	9.6100	CIRCULAR	18.000	18.000	0.0220	0.5000	0.8000	0.0000	0.00	No	1
8	link-08	82.61	9.82	0.00	9.06	0.33	0.76	0.9200	CIRCULAR	18.000	18.000	0.0111	0.5000	0.6000	0.0000	0.00	No	1
9	Link-09	112.81	8.73	0.00	7.95	0.00	0.78	0.6900	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
10	Link-10	169.20	7.95	0.00	6.56	0.08	1.39	0.8200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
11	Link-11	100.45	6.48	0.00	3.73	7.04	2.75	2.7400	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
12	Link-12	136.85	-3.31	0.00	-7.10	0.00	3.79	2.7700	CIRCULAR	18.000	18.000	0.0110	0.5000	0.0000	0.0000	0.00	No	1
13	Link-13	55.92	9.43	1.48	9.36	0.46	0.07	0.1300	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
14	Link-14	146.92	8.90	0.00	2.04	0.00	6.86	4.6700	CIRCULAR	12.000	12.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
15	Link-15	120.02	2.04	0.00	-3.05	0.26	5.09	4.2400	CIRCULAR	24.000	24.000	0.0220	0.5000	0.5000	0.0000	0.00	No	1

**Poulsbo Place Division 8  
Assisted Living Center**

**Pipe Results**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 Link-01	2.83	0 07:55	10.30	0.27	6.95	0.70	0.46	0.37	0.00		Calculated
2 Link-02	2.83	0 07:55	7.70	0.37	3.33	0.19	0.82	0.66	0.00		Calculated
3 Link-03	7.87	0 07:55	9.66	0.81	8.32	0.52	0.97	0.78	0.00		Calculated
4 Link-04	10.46	0 07:56	14.57	0.72	11.28	0.41	1.14	0.91	0.00		Calculated
5 Link-05	11.38	0 07:56	5.34	2.13	6.44	0.10	1.50	1.00	28.00		SURCHARGED
6 Link-06	13.58	0 07:56	27.15	0.50	8.58	0.12	1.50	1.00	28.00		SURCHARGED
7 Link-07	12.24	0 08:05	19.25	0.64	6.93	0.04	1.50	1.00	36.00		SURCHARGED
8 link-08	12.51	0 08:05	11.80	1.06	7.08	0.19	1.50	1.00	40.00		SURCHARGED
9 Link-09	14.68	0 08:05	10.32	1.42	8.31	0.23	1.50	1.00	42.00		SURCHARGED
10 Link-10	11.73	0 07:54	11.25	1.04	6.64	0.42	1.50	1.00	35.00		SURCHARGED
11 Link-11	12.78	0 07:54	20.54	0.62	7.23	0.23	1.50	1.00	36.00		SURCHARGED
12 Link-12	21.92	0 00:00	20.86	1.06	12.40	0.18	1.50	1.00	1440.00		SURCHARGED
13 Link-13	4.21	0 07:45	1.49	2.83	5.43	0.17	1.00	1.00	22.00		SURCHARGED
14 Link-14	4.80	0 07:54	8.34	0.58	6.11	0.40	1.00	1.00	25.00		SURCHARGED
15 Link-15	9.58	0 00:01	27.53	0.35	3.56	0.56	2.00	1.00	1438.00		SURCHARGED



PRZDN. 8 ALC ON-LINE  
W/ NO DETENTION  
1 PIPE SIZE INCREASE TO 18"  
1 APE REPLACEMENT TO n=0.011  
J-B SURCHARGE = 1.11 ft

- Project Data
- Project Options
- Analysis Options
- Hydrology
- Subbasins
- Rain Gages
- Hydraulics
- Nodes
  - Junctions
  - Storage Nodes
  - Storage Curves
  - Inlets
  - Flow Diversion
  - Flow Diversion Curves
  - Dutfalls
  - Outlet Tidal Curves
  - External Inflows
- Links
  - Conveyance Links
  - Custom Pipe Geometry
  - Irregular Cross Sections
  - Pumps
  - Pump Curves
  - Driftices
  - Weirs
  - Outlets
  - Outlet Rating Curves
- Quality
- Pollutants
- Pollutants Land Types
- Others
  - Control Rules
  - Control Settings
  - Sanitary Time Patterns
  - Time Series

**APPENDIX G**  
**ANALYSIS: ONE PIPE UPSIZE AND ALC WITH**  
**DETENTION**



**Poulsbo Place Division 8**

**Assisted Living Center**

**Project Description**

**Downstream Stormwater Backwater Analysis**

File Name ..... 1 pipe upsize how much on-site detention.SPF  
 Description .....  
 Poulsbo Place 2 Div 8  
 Downstream Existing Conditions

**Project Options**

Flow Units ..... CFS  
 Elevation Type ..... Elevation  
 Hydrology Method ..... Santa Barbara UH  
 Time of Concentration (TOC) Method ..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Enable Overflow Ponding at Nodes ..... NO  
 Skip Steady State Analysis Time Periods ..... NO

**Analysis Options**

Start Analysis On ..... Oct 01, 2013 00:00:00  
 End Analysis On ..... Oct 02, 2013 00:00:00  
 Start Reporting On ..... Oct 01, 2013 00:00:00  
 Antecedent Dry Days ..... 0 days  
 Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss  
 Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss  
 Reporting Time Step ..... 0 00:05:00 days hh:mm:ss  
 Routing Time Step ..... 30 seconds

**Number of Elements**

Qty  
 Rain Gages ..... 1  
 Subbasins ..... 10  
 Nodes ..... 15  
     *Junctions* ..... 13  
     *Outfalls* ..... 1  
     *Flow Diversions* ..... 1  
     *Inlets* ..... 0  
     *Storage Nodes* ..... 0  
 Links ..... 15  
     *Channels* ..... 0  
     *Pipes* ..... 15  
     *Pumps* ..... 0  
     *Orifices* ..... 0  
     *Weirs* ..... 0  
     *Outlets* ..... 0  
 Pollutants ..... 0  
 Land Uses ..... 0

**Rainfall Details**

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	Rain Gage-01	Time Series	TS-01	Cumulative	inches	Washington	Kitsap	100	4.70	SCS Type IA 24-hr

Poulsbo Place Division 8

Assisted Living Center

Subbasin Summary

Downstream Stormwater Backwater Analysis

SN Subbasin ID	Area (ac)	Impervious Area (%)	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1 Sub-03	4.78	87.00	98.00	86.00	4.69	4.29	20.48	5.04	0 00:06:00
2 Sub-04	2.62	67.00	98.00	86.00	4.69	4.03	10.54	2.60	0 00:06:00
3 Sub-07	2.17	73.00	98.00	86.00	4.69	4.11	8.91	2.19	0 00:06:00
4 Sub-08	0.90	78.00	98.00	86.00	4.69	4.17	3.76	0.93	0 00:06:00
5 Sub-09	2.42	74.00	98.00	86.00	4.69	4.12	9.98	2.46	0 00:06:00
6 Sub-10	0.59	95.00	98.00	86.00	4.69	4.39	2.57	0.63	0 00:06:00
7 Sub-11	0.27	95.00	98.00	86.00	4.69	4.39	1.18	0.29	0 00:06:00
8 Sub-12	1.18	95.00	98.00	86.00	4.69	4.39	5.19	1.28	0 00:06:00
9 Sub-14	0.98	95.00	98.00	86.00	4.69	4.39	4.29	1.05	0 00:06:00
10 sub-2	2.62	0.00	98.00	71.00	4.69	1.88	4.94	1.04	0 00:06:00

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-01	Junction	-3.31	8.68	-3.31	8.68	0.00	21.92	8.09	0.00	0.59	0 00:00	0.00	0.00
2	Jun-04	Junction	6.48	10.97	6.48	10.97	0.00	12.64	10.00	0.00	0.97	0 00:00	0.00	0.00
3	Jun-06	Junction	8.73	17.99	8.73	17.99	0.00	14.45	14.88	0.00	3.11	0 00:00	0.00	0.00
4	Jun-07	Junction	9.82	18.20	9.82	18.20	0.00	12.01	16.46	0.00	1.74	0 00:00	0.00	0.00
5	Jun-08	Junction	11.34	18.22	11.34	18.22	0.00	11.72	17.91	0.00	0.31	0 00:00	0.00	0.00
6	Jun-09	Junction	14.27	21.03	14.27	21.03	0.00	11.73	20.84	0.00	0.19	0 00:00	0.00	0.00
7	Jun-10	Junction	14.34	21.61	14.34	21.61	0.00	9.55	21.56	0.00	0.05	0 00:00	0.00	0.00
8	Jun-11	Junction	27.16	33.84	27.16	33.84	0.00	8.65	28.02	0.00	5.82	0 00:00	0.00	0.00
9	Jun-12	Junction	32.09	44.85	32.09	44.85	0.00	6.05	32.84	0.00	12.01	0 00:00	0.00	0.00
10	Jun-13	Junction	32.55	45.00	32.55	45.00	0.00	1.03	32.88	0.00	12.12	0 00:00	0.00	0.00
11	Jun-14	Junction	38.81	49.11	38.81	49.11	0.00	1.03	40.18	0.00	8.93	0 00:00	0.00	0.00
12	Jun-15	Junction	8.90	15.15	8.90	15.15	0.00	4.75	11.12	0.00	4.03	0 00:00	0.00	0.00
13	Jun-16	Junction	2.04	11.00	2.04	11.00	0.00	9.58	8.27	0.00	2.73	0 00:00	0.00	0.00
14	Out-01	Outfall	-7.10					21.92	4.65					
15	Jun-05	Flow Diversions	7.95	15.30	7.95		0.00	15.72	12.21				0.00	0.00

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Total Depth Ratio	Total Time Reported (min)	Reported Condition
1	Link-01	Pipe	Jun-14 Jun-13	293.62	39.91	33.55	2.1700	15.000	0.0120	1.03	10.30	0.10	5.28	0.27	0.22	0.00	Calculated
2	Link-02	Pipe	Jun-13 Jun-12	38.02	32.55	32.09	1.2100	15.000	0.0120	1.03	7.70	0.13	2.08	0.54	0.43	0.00	Calculated
3	Link-03	Pipe	Jun-12 Jun-11	258.55	32.09	27.16	1.9100	15.000	0.0120	6.05	9.66	0.63	7.82	0.81	0.64	0.00	Calculated
4	Link-04	Pipe	Jun-11 Jun-10	277.57	27.16	15.13	4.3300	15.000	0.0120	8.63	14.57	0.59	10.51	1.06	0.84	0.00	Calculated
5	Link-05	Pipe	Jun-10 Jun-09	37.89	14.34	14.13	0.5500	18.000	0.0110	9.55	5.34	1.79	5.40	1.50	1.00	26.00	SURCHARGED
6	Link-06	Pipe	Jun-09 Jun-08	61.07	14.27	11.35	4.7800	18.000	0.0220	11.72	13.57	0.86	7.13	1.50	1.00	26.00	SURCHARGED
7	Link-07	Pipe	Jun-08 Jun-07	15.81	11.34	9.82	9.6100	18.000	0.0220	11.73	19.25	0.61	6.64	1.50	1.00	31.00	SURCHARGED
8	Link-08	Pipe	Jun-07 Jun-06	82.61	9.82	9.06	0.9200	18.000	0.0111	12.04	11.80	1.02	6.81	1.50	1.00	35.00	SURCHARGED
9	Link-09	Pipe	Jun-06 Jun-05	112.81	8.73	7.95	0.6900	18.000	0.0110	14.45	10.32	1.40	8.18	1.50	1.00	37.00	SURCHARGED
10	Link-10	Pipe	Jun-05 Jun-04	169.20	7.95	6.56	0.8200	18.000	0.0110	11.59	11.25	1.03	6.56	1.50	1.00	30.00	SURCHARGED
11	Link-11	Pipe	Jun-04 Jun-01	100.45	6.48	3.73	2.7400	18.000	0.0110	12.64	20.54	0.62	7.15	1.50	1.00	32.00	SURCHARGED
12	Link-12	Pipe	Jun-01 Out-01	136.85	-3.31	-7.10	2.7700	18.000	0.0110	21.92	20.66	1.06	12.40	1.50	1.00	1440.00	SURCHARGED
13	Link-13	Pipe	Jun-05 Jun-15	55.92	9.43	9.36	0.1300	12.000	0.0110	4.12	1.49	2.77	5.25	1.00	1.00	14.00	SURCHARGED
14	Link-14	Pipe	Jun-15 Jun-16	146.92	8.90	2.04	4.6700	12.000	0.0120	4.75	8.34	0.57	6.05	1.00	1.00	17.00	SURCHARGED
15	Link-15	Pipe	Jun-16 Jun-01	120.02	2.04	-3.05	4.2400	24.000	0.0220	9.58	27.53	0.35	3.56	2.00	1.00	1438.00	SURCHARGED

**Poulsbo Place Division 8  
Assisted Living Center**

**Junction Input**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft <sup>2</sup> )	Minimum Pipe Cover (in)
1 Jun-01	-3.31	8.68	11.99	-3.31	0.00	8.68	0.00	0.00	0.00
2 Jun-04	6.48	10.97	4.49	6.48	0.00	10.97	0.00	0.00	0.00
3 Jun-06	8.73	17.99	9.26	8.73	0.00	17.99	0.00	0.00	0.00
4 Jun-07	9.82	18.20	8.38	9.82	0.00	18.20	0.00	0.00	0.00
5 Jun-08	11.34	18.22	6.88	11.34	0.00	18.22	0.00	0.00	0.00
6 Jun-09	14.27	21.03	6.76	14.27	0.00	21.03	0.00	0.00	0.00
7 Jun-10	14.34	21.61	7.27	14.34	0.00	21.61	0.00	0.00	0.00
8 Jun-11	27.16	33.84	6.68	27.16	0.00	33.84	0.00	0.00	0.00
9 Jun-12	32.09	44.85	12.76	32.09	0.00	44.85	0.00	0.00	0.00
10 Jun-13	32.55	45.00	12.45	32.55	0.00	45.00	0.00	0.00	0.00
11 Jun-14	38.81	49.11	10.30	38.81	0.00	49.11	0.00	0.00	0.00
12 Jun-15	8.90	15.15	6.25	8.90	0.00	15.15	0.00	0.00	0.00
13 Jun-16	2.04	11.00	8.96	2.04	0.00	11.00	0.00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center**

**Junction Results**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surchage Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 Jun-01	21.92	0.00	8.09	11.40	0.00	0.59	4.81	8.12	0 08:00	0 00:00	0.00	0.00
2 Jun-04	12.64	1.05	10.00	3.52	0.00	0.97	6.88	0.40	0 08:00	0 00:00	0.00	0.00
3 Jun-06	14.45	2.46	14.88	6.15	0.00	3.11	9.34	0.61	0 08:00	0 00:00	0.00	0.00
4 Jun-07	12.01	0.29	16.48	6.64	0.00	1.74	10.35	0.53	0 08:00	0 00:00	0.00	0.00
5 Jun-08	11.72	0.00	17.91	6.57	0.00	0.31	11.74	0.40	0 08:00	0 00:00	0.00	0.00
6 Jun-09	11.73	2.19	20.84	6.57	0.00	0.19	14.71	0.44	0 08:00	0 00:00	0.00	0.00
7 Jun-10	9.55	0.92	21.56	7.22	0.00	0.05	14.97	0.63	0 08:00	0 00:00	0.00	0.00
8 Jun-11	8.65	2.60	28.02	0.86	0.00	5.82	27.44	0.28	0 08:00	0 00:00	0.00	0.00
9 Jun-12	6.05	5.04	32.84	0.75	0.00	12.01	32.38	0.29	0 07:54	0 00:00	0.00	0.00
10 Jun-13	1.03	0.00	32.88	0.33	0.00	12.12	32.68	0.13	0 08:00	0 00:00	0.00	0.00
11 Jun-14	1.03	1.03	40.18	1.37	0.00	8.93	39.84	1.03	0 08:00	0 00:00	0.00	0.00
12 Jun-15	4.75	0.63	11.12	2.22	0.00	4.03	8.99	0.09	0 08:00	0 00:00	0.00	0.00
13 Jun-16	9.58	0.00	8.27	8.23	0.00	2.73	4.81	2.77	0 08:00	0 00:00	0.00	0.00

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

Pipe Input

SN Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1 Link-01	293.62	39.91	1.10	33.55	1.00	6.36	2.1700	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
2 Link-02	38.02	32.55	0.00	32.09	0.00	0.46	1.2100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
3 Link-03	258.55	32.09	0.00	27.16	0.00	4.93	1.9100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
4 Link-04	277.57	27.16	0.00	15.13	0.79	12.03	4.3300	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
5 Link-05	37.89	14.34	0.00	14.13	-0.14	0.21	0.5500	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
6 Link-06	61.07	14.27	0.00	11.35	0.01	2.92	4.7800	CIRCULAR	18.000	18.000	0.0220	0.5000	0.6000	0.0000	0.00	No	1
7 Link-07	15.81	11.34	0.00	9.82	0.00	1.52	9.6100	CIRCULAR	18.000	18.000	0.0220	0.5000	0.8000	0.0000	0.00	No	1
8 link-08	82.61	9.82	0.00	9.06	0.33	0.76	0.9200	CIRCULAR	18.000	18.000	0.0111	0.5000	0.6000	0.0000	0.00	No	1
9 Link-09	112.81	8.73	0.00	7.95	0.00	0.78	0.6900	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
10 Link-10	169.20	7.95	0.00	6.56	0.08	1.39	0.8200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
11 Link-11	100.45	6.48	0.00	3.73	7.04	2.75	2.7400	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
12 Link-12	136.85	-3.31	0.00	-7.10	0.00	3.79	2.7700	CIRCULAR	18.000	18.000	0.0110	0.5000	0.0000	0.0000	0.00	No	1
13 Link-13	55.92	9.43	1.48	9.36	0.46	0.07	0.1300	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
14 Link-14	146.92	8.90	0.00	2.04	0.00	6.86	4.6700	CIRCULAR	12.000	12.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
15 Link-15	120.02	2.04	0.00	-3.05	0.26	5.09	4.2400	CIRCULAR	24.000	24.000	0.0220	0.5000	0.5000	0.0000	0.00	No	1

**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

**Pipe Results**

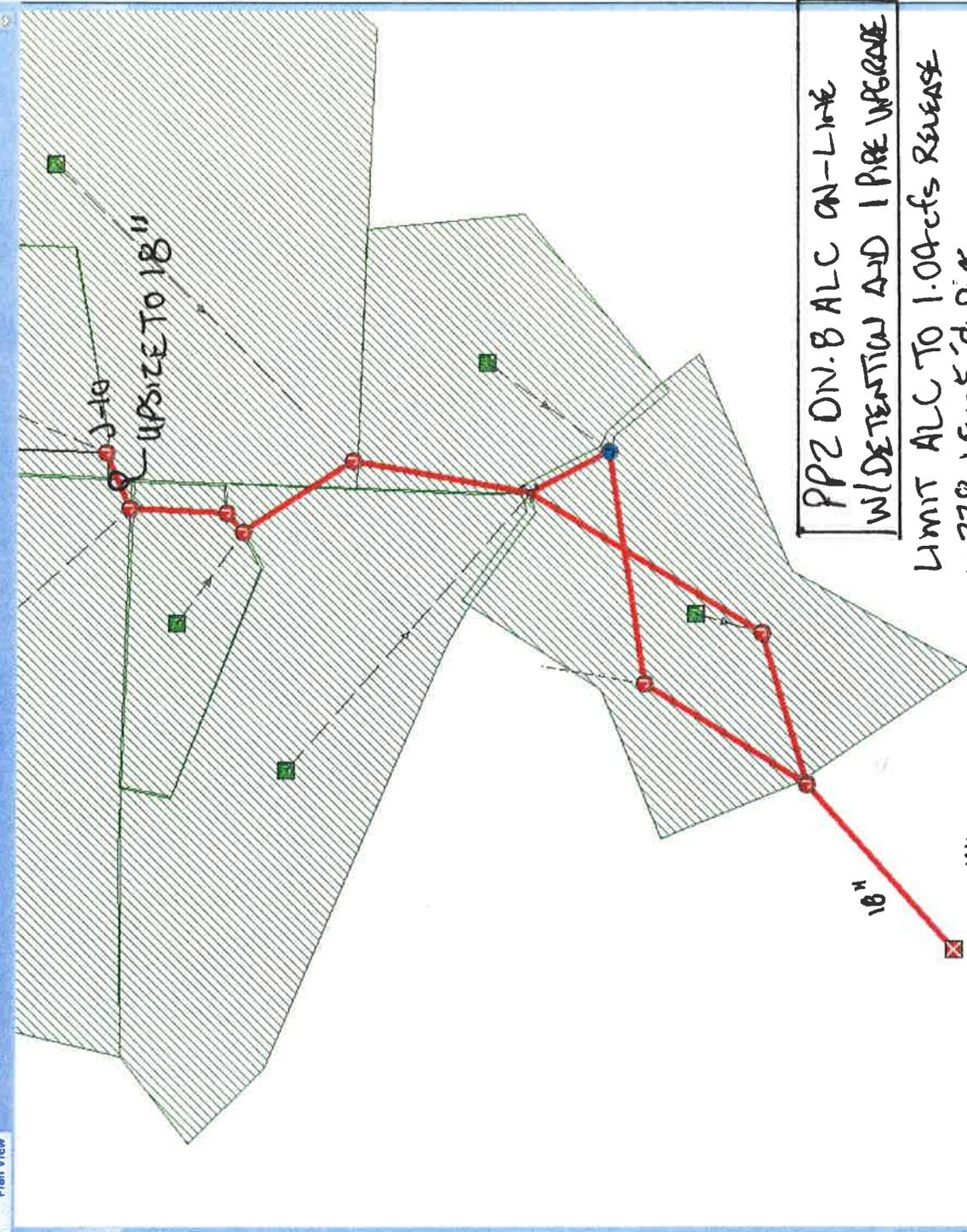
SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 Link-01	1.03	0 08:00	10.30	0.10	5.28	0.93	0.27	0.22	0.00		Calculated
2 Link-02	1.03	0 08:00	7.70	0.13	2.08	0.30	0.54	0.43	0.00		Calculated
3 Link-03	6.05	0 08:00	9.66	0.63	7.82	0.55	0.81	0.84	0.00		Calculated
4 Link-04	8.63	0 08:00	14.57	0.59	10.51	0.44	1.06	0.84	0.00		Calculated
5 Link-05	9.55	0 08:00	5.34	1.79	5.40	0.12	1.50	1.00	26.00		SURCHARGED
6 Link-06	11.72	0 08:00	13.57	0.86	7.13	0.14	1.50	1.00	26.00		SURCHARGED
7 Link-07	11.73	0 08:01	19.25	0.61	6.64	0.04	1.50	1.00	31.00		SURCHARGED
8 link-08	12.04	0 08:01	11.80	1.02	8.81	0.20	1.50	1.00	35.00		SURCHARGED
9 Link-09	14.45	0 08:00	10.32	1.40	8.18	0.23	1.50	1.00	37.00		SURCHARGED
10 Link-10	11.59	0 08:00	11.25	1.03	6.56	0.43	1.50	1.00	30.00		SURCHARGED
11 Link-11	12.64	0 08:00	20.54	0.62	7.15	0.23	1.50	1.00	32.00		SURCHARGED
12 Link-12	21.92	0 00:00	20.66	1.06	12.40	0.18	1.50	1.00	1440.00		SURCHARGED
13 Link-13	4.12	0 08:00	1.49	2.77	5.25	0.18	1.00	1.00	14.00		SURCHARGED
14 Link-14	4.75	0 08:00	8.34	0.57	6.05	0.40	1.00	1.00	17.00		SURCHARGED
15 Link-15	9.58	0 00:01	27.53	0.35	3.56	0.56	2.00	1.00	1438.00		SURCHARGED

Plan View

- File
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Project Data

- Project Options
- Analysis Options
- Hydrology
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  - Rain Gages
- Hydraulics
  - Nodes
    - Junctions
    - Storage Nodes
    - Storage Curves
  - Inlets
  - Flow Diversion
    - Flow Diversion Curves
  - Outfalls
    - Outfall Tidal Curves
    - External Inflows
  - Links
    - Conveyance Links
    - Custom Pipe Geometry
    - Irregular Cross Sections
  - Pumps
  - Orifices
  - Wells
  - Outlets
    - Outlet Rating Curves
- Quality
  - Pollutants
  - Pollutants Land Types
- Others
  - Control Rules
  - Control Settings
  - Sanitary Time Patterns
  - Time Series



PPZ ON-8 ALC ON-LINE  
W/ DETENTION AND 1 PIPE UPGRADE  
LIMIT ALC TO 1.04 cfs RELEASE  
v 228 LF ~ 5'  $\phi$  PIPE  
NO JUNCTION SURCHARGES

**APPENDIX H**  
**ANALYSIS: ONE PIPE UPGRADE, ALC WITH**  
**DETENTION, AND 24" OUTFALL**  
**IMPROVEMENT**





Poulsbo Place Division 8

Assisted Living Center

Subbasin Summary

Downstream Stormwater Backwater Analysis

SN	Subbasin ID	Area (ac)	Impervious Area (%)	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-03	4.78	87.00	98.00	86.00	4.69	4.29	20.48	5.04	0 00:06:00
2	Sub-04	2.62	67.00	98.00	86.00	4.69	4.03	10.54	2.60	0 00:06:00
3	Sub-07	2.17	73.00	98.00	86.00	4.69	4.11	8.91	2.19	0 00:06:00
4	Sub-08	0.90	78.00	98.00	86.00	4.69	4.17	3.76	0.93	0 00:06:00
5	Sub-09	2.42	74.00	98.00	86.00	4.69	4.12	9.98	2.46	0 00:06:00
6	Sub-10	0.59	95.00	98.00	86.00	4.69	4.39	2.57	0.63	0 00:06:00
7	Sub-11	0.27	95.00	98.00	86.00	4.69	4.39	1.18	0.29	0 00:06:00
8	Sub-12	1.18	95.00	98.00	86.00	4.69	4.39	5.19	1.28	0 00:06:00
9	Sub-14	0.98	95.00	98.00	86.00	4.69	4.39	4.29	1.05	0 00:06:00
10	sub-2	2.62	0.00	98.00	71.00	4.69	1.88	4.94	1.04	0 00:06:00

**Poulsbo Place Division 8**

**Assisted Living Center**

**Downstream Stormwater Backwater Analysis**

**Node Summary**

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-01	Junction	-3.31	8.68	-3.31	8.88	0.00	37.96	6.04	0.00	2.64	0 00:00	0.00	0.00
2	Jun-04	Junction	6.48	10.97	6.48	10.97	0.00	14.07	7.78	0.00	3.19	0 00:00	0.00	0.00
3	Jun-06	Junction	8.73	17.99	8.73	17.99	0.00	14.49	13.37	0.00	4.62	0 00:00	0.00	0.00
4	Jun-07	Junction	9.82	18.20	9.82	18.20	0.00	12.04	14.96	0.00	3.24	0 00:00	0.00	0.00
5	Jun-08	Junction	11.34	18.22	11.34	18.22	0.00	11.75	16.41	0.00	1.81	0 00:00	0.00	0.00
6	Jun-09	Junction	14.27	21.03	14.27	21.03	0.00	11.75	19.36	0.00	1.67	0 00:00	0.00	0.00
7	Jun-10	Junction	14.34	21.61	14.34	21.61	0.00	9.56	20.08	0.00	1.53	0 00:00	0.00	0.00
8	Jun-11	Junction	27.16	33.84	27.16	33.84	0.00	8.65	27.94	0.00	5.90	0 00:00	0.00	0.00
9	Jun-12	Junction	32.09	44.85	32.09	44.85	0.00	8.05	32.85	0.00	12.00	0 00:00	0.00	0.00
10	Jun-13	Junction	32.55	45.00	32.55	45.00	0.00	1.03	32.88	0.00	12.12	0 00:00	0.00	0.00
11	Jun-14	Junction	38.81	49.11	38.81	49.11	0.00	1.03	40.18	0.00	8.93	0 00:00	0.00	0.00
12	Jun-15	Junction	8.90	15.15	8.90	15.15	0.00	3.36	9.39	0.00	5.76	0 00:00	0.00	0.00
13	Jun-16	Junction	2.04	11.00	2.04	11.00	0.00	13.63	8.10	0.00	2.90	0 00:00	0.00	0.00
14	Out-01	Outfall	-7.10					37.96	4.65					
15	Jun-05	Flow Diversions	7.95	15.30	7.95		0.00	15.76	10.69				0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center**

**Link Summary**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-01	Pipe	Jun-14 Jun-13	293.62	39.91	33.55	2.1700	15.000	0.0120	1.03	10.30	0.10	5.28	0.27	0.22	0.00	Calculated
2	Link-02	Pipe	Jun-13 Jun-12	38.02	32.55	32.09	1.2100	15.000	0.0120	1.03	7.70	0.13	2.07	0.55	0.44	0.00	Calculated
3	Link-03	Pipe	Jun-12 Jun-11	258.55	32.09	27.16	1.9100	15.000	0.0120	6.05	9.66	0.63	7.86	0.77	0.62	0.00	Calculated
4	Link-04	Pipe	Jun-11 Jun-10	277.57	27.16	15.13	4.3300	15.000	0.0120	8.64	14.57	0.59	10.51	1.02	0.81	0.00	Calculated
5	Link-05	Pipe	Jun-10 Jun-09	37.89	14.34	14.13	0.5500	18.000	0.0110	9.56	5.34	1.79	5.41	1.50	1.00	25.00	SURCHARGED
6	Link-06	Pipe	Jun-09 Jun-08	61.07	14.27	11.35	4.7800	18.000	0.0220	11.75	13.57	0.87	7.13	1.50	1.00	25.00	SURCHARGED
7	Link-07	Pipe	Jun-08 Jun-07	15.81	11.34	9.82	9.6100	18.000	0.0220	11.75	19.25	0.61	6.65	1.50	1.00	31.00	SURCHARGED
8	Link-08	Pipe	Jun-07 Jun-06	82.61	9.82	9.06	0.9200	18.000	0.0111	12.04	11.80	1.02	6.82	1.50	1.00	35.00	SURCHARGED
9	Link-09	Pipe	Jun-06 Jun-05	112.81	8.73	7.95	0.6900	18.000	0.0110	14.49	10.32	1.40	8.20	1.50	1.00	37.00	SURCHARGED
10	Link-10	Pipe	Jun-05 Jun-04	169.20	7.95	6.56	0.8200	18.000	0.0110	13.02	11.25	1.16	7.51	1.42	0.95	0.00	> CAPACITY
11	Link-11	Pipe	Jun-04 Jun-01	100.45	6.48	3.73	2.7400	18.000	0.0110	14.07	20.54	0.69	8.19	1.40	0.93	0.00	Calculated
12	Link-12	Pipe	Jun-01 Out-01	136.85	-3.31	-7.10	2.7700	24.000	0.0110	37.96	44.49	0.85	12.08	2.00	1.00	1440.00	SURCHARGED
13	Link-13	Pipe	Jun-05 Jun-15	55.92	9.43	9.36	0.1300	12.000	0.0110	2.73	1.49	1.83	3.83	0.85	0.85	0.00	> CAPACITY
14	Link-14	Pipe	Jun-15 Jun-16	146.92	8.90	2.04	4.6700	12.000	0.0120	3.36	8.34	0.40	5.35	0.75	0.75	0.00	Calculated
15	Link-15	Pipe	Jun-16 Jun-01	120.02	2.04	-3.05	4.2400	24.000	0.0220	13.63	27.53	0.50	4.67	2.00	1.00	1439.00	SURCHARGED

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

Junction Input

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft <sup>2</sup> )	Minimum Pipe Cover (in)
1 Jun-01	-3.31	8.68	11.99	-3.31	0.00	8.68	0.00	0.00	0.00
2 Jun-04	6.48	10.97	4.49	6.48	0.00	10.97	0.00	0.00	0.00
3 Jun-06	8.73	17.99	9.26	8.73	0.00	17.99	0.00	0.00	0.00
4 Jun-07	9.82	18.20	8.38	9.82	0.00	18.20	0.00	0.00	0.00
5 Jun-08	11.34	18.22	6.88	11.34	0.00	18.22	0.00	0.00	0.00
6 Jun-09	14.27	21.03	6.76	14.27	0.00	21.03	0.00	0.00	0.00
7 Jun-10	14.34	21.61	7.27	14.34	0.00	21.61	0.00	0.00	0.00
8 Jun-11	27.16	33.84	6.68	27.16	0.00	33.84	0.00	0.00	0.00
9 Jun-12	32.09	44.85	12.76	32.09	0.00	44.85	0.00	0.00	0.00
10 Jun-13	32.55	45.00	12.45	32.55	0.00	45.00	0.00	0.00	0.00
11 Jun-14	38.81	49.11	10.30	38.81	0.00	49.11	0.00	0.00	0.00
12 Jun-15	8.90	15.15	6.25	8.90	0.00	15.15	0.00	0.00	0.00
13 Jun-16	2.04	11.00	8.96	2.04	0.00	11.00	0.00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center**

**Junction Results**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surchage Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 Jun-01	37.96	0.00	6.04	9.35	0.00	2.64	4.69	8.00	0 00:01	0 00:00	0.00	0.00
2 Jun-04	14.07	1.05	7.78	1.30	0.00	3.19	6.87	0.39	0 08:00	0 00:00	0.00	0.00
3 Jun-06	14.49	2.46	13.37	4.64	0.00	4.62	9.33	0.60	0 08:00	0 00:00	0.00	0.00
4 Jun-07	12.04	0.29	14.96	5.14	0.00	3.24	10.34	0.52	0 08:00	0 00:00	0.00	0.00
5 Jun-08	11.75	0.00	16.41	5.07	0.00	1.81	11.74	0.40	0 08:00	0 00:00	0.00	0.00
6 Jun-09	11.75	2.19	19.36	5.09	0.00	1.67	14.70	0.43	0 08:00	0 00:00	0.00	0.00
7 Jun-10	9.56	0.92	20.08	5.74	0.00	1.53	14.96	0.62	0 08:00	0 00:00	0.00	0.00
8 Jun-11	8.65	2.60	27.94	0.78	0.00	5.90	27.44	0.28	0 08:00	0 00:00	0.00	0.00
9 Jun-12	6.05	5.04	32.85	0.76	0.00	12.00	32.38	0.29	0 08:00	0 00:00	0.00	0.00
10 Jun-13	1.03	0.00	32.88	0.33	0.00	12.12	32.68	0.13	0 08:00	0 00:00	0.00	0.00
11 Jun-14	1.03	1.03	40.18	1.37	0.00	8.93	39.84	1.03	0 08:00	0 00:00	0.00	0.00
12 Jun-15	3.36	0.63	9.39	0.49	0.00	5.76	8.98	0.08	0 08:00	0 00:00	0.00	0.00
13 Jun-16	13.63	0.00	8.10	6.06	0.00	2.90	4.69	2.65	0 00:01	0 00:00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center  
Downstream Stormwater Backwater Analysis**

**Pipe Input**

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	Link-01	293.62	39.91	1.10	33.55	1.00	6.36	2.1700	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
2	Link-02	38.02	32.55	0.00	32.09	0.00	0.46	1.2100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
3	Link-03	258.55	32.09	0.00	27.16	0.00	4.93	1.9100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
4	Link-04	277.57	27.16	0.00	15.13	0.79	12.03	4.3300	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
5	Link-05	37.89	14.34	0.00	14.13	-0.14	0.21	0.5500	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
6	Link-06	61.07	14.27	0.00	11.35	0.01	2.92	4.7800	CIRCULAR	18.000	18.000	0.0220	0.5000	0.6000	0.0000	0.00	No	1
7	Link-07	15.81	11.34	0.00	9.82	0.00	1.52	9.6100	CIRCULAR	18.000	18.000	0.0220	0.5000	0.8000	0.0000	0.00	No	1
8	link-08	82.61	9.82	0.00	9.06	0.33	0.76	0.9200	CIRCULAR	18.000	18.000	0.0111	0.5000	0.6000	0.0000	0.00	No	1
9	Link-09	112.81	8.73	0.00	7.95	0.00	0.78	0.6900	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
10	Link-10	169.20	7.95	0.00	6.56	0.08	1.39	0.8200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
11	Link-11	100.45	6.48	0.00	3.73	7.04	2.75	2.7400	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
12	Link-12	136.85	-3.31	0.00	-7.10	0.00	3.79	2.7700	CIRCULAR	24.000	24.000	0.0110	0.5000	0.0000	0.0000	0.00	No	1
13	Link-13	55.92	9.43	1.48	9.36	0.46	0.07	0.1300	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
14	Link-14	146.92	8.90	0.00	2.04	0.00	6.86	4.6700	CIRCULAR	12.000	12.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
15	Link-15	120.02	2.04	0.00	-3.05	0.26	5.09	4.2400	CIRCULAR	24.000	24.000	0.0220	0.5000	0.5000	0.0000	0.00	No	1

Poulsbo Place Division 8

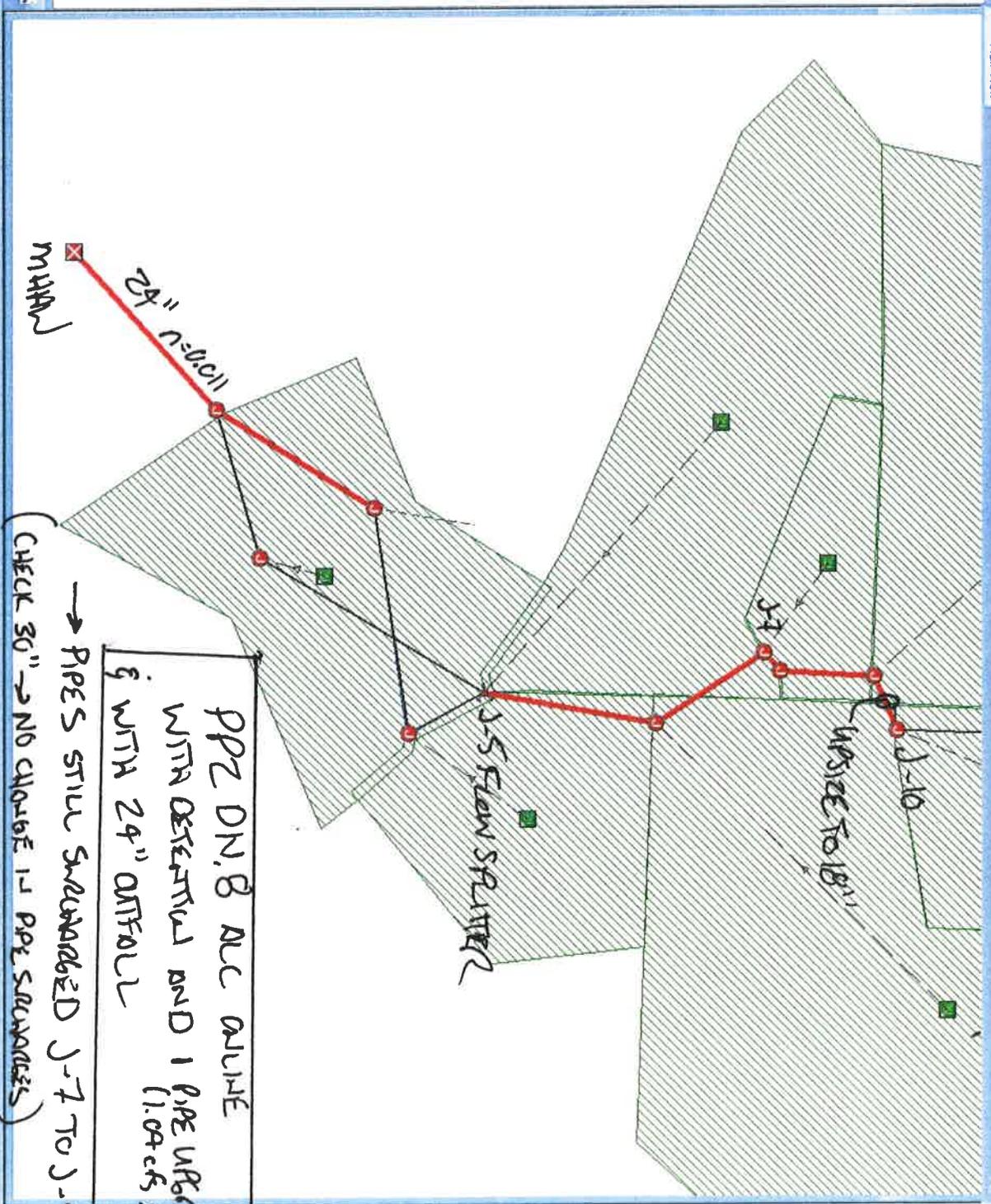
Assisted Living Center

Downstream Stormwater Backwater Analysis

Pipe Results

SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 Link-01	1.03	0 08:00	10.30	0.10	5.28	0.93	0.27	0.22	0.00		Calculated
2 Link-02	1.03	0 08:00	7.70	0.13	2.07	0.31	0.55	0.44	0.00		Calculated
3 Link-03	6.05	0 08:00	9.66	0.63	7.86	0.55	0.77	0.82	0.00		Calculated
4 Link-04	8.64	0 08:00	14.57	0.59	10.51	0.44	1.02	0.81	0.00		Calculated
5 Link-05	9.56	0 08:00	5.34	1.79	5.41	0.12	1.50	1.00	25.00		SURCHARGED
6 Link-06	11.75	0 08:00	13.57	0.87	7.13	0.14	1.50	1.00	25.00		SURCHARGED
7 Link-07	11.75	0 08:00	19.25	0.61	6.65	0.04	1.50	1.00	31.00		SURCHARGED
8 Link-08	12.04	0 08:00	11.80	1.02	6.82	0.20	1.50	1.00	35.00		SURCHARGED
9 Link-09	14.49	0 08:00	10.32	1.40	8.20	0.23	1.50	1.00	37.00		SURCHARGED
10 Link-10	13.02	0 08:00	11.25	1.16	7.51	0.38	1.42	0.95	0.00		> CAPACITY
11 Link-11	14.07	0 08:00	20.54	0.69	8.19	0.20	1.40	0.93	0.00		Calculated
12 Link-12	37.96	0 00:00	44.49	0.85	12.08	0.19	2.00	1.00	1440.00		SURCHARGED
13 Link-13	2.73	0 08:00	1.49	1.83	3.83	0.24	0.85	0.85	0.00		> CAPACITY
14 Link-14	3.36	0 08:00	8.34	0.40	5.35	0.46	0.75	0.75	0.00		Calculated
15 Link-15	13.63	0 00:01	27.53	0.50	4.67	0.43	2.00	1.00	1439.00		SURCHARGED

- Project Data
- Project Options
- Analysis Options
- Hydrology
- Subbasins
- Rain G apps
- Hydraulics
- Nodes
- Junctions
- Storage Nodes
- Storage Curves
- Inlets
- Flow Diversion
- Flow Diversion Curves
- Outfalls
- Outfall Tidal Curves
- External Inflows
- Links
- Conveyance Links
- Custom Pipe Geometry
- Irregular Cross Sections
- Pumps
- Pump Curves
- Drifts
- Weirs
- Outlets
- Outlet Rating Curves
- Quality
- Pollutants
- Pollutants Land Types
- Others
- Control Rules
- Sanitary Time Patterns
- Time Series



PPZ DN.8 ALL ONLINE  
WITH DETENTION AND 1 PIPE WRKROCK  
(1.09 cfs PERSEC)  
& WITH 24" OUTFALL  
→ PIPES STILL SURCHARGED J-7 TO J-5  
(CHECK 30" → NO CHANGE IN PPE SURCHARGES)

# Hydrograph Report

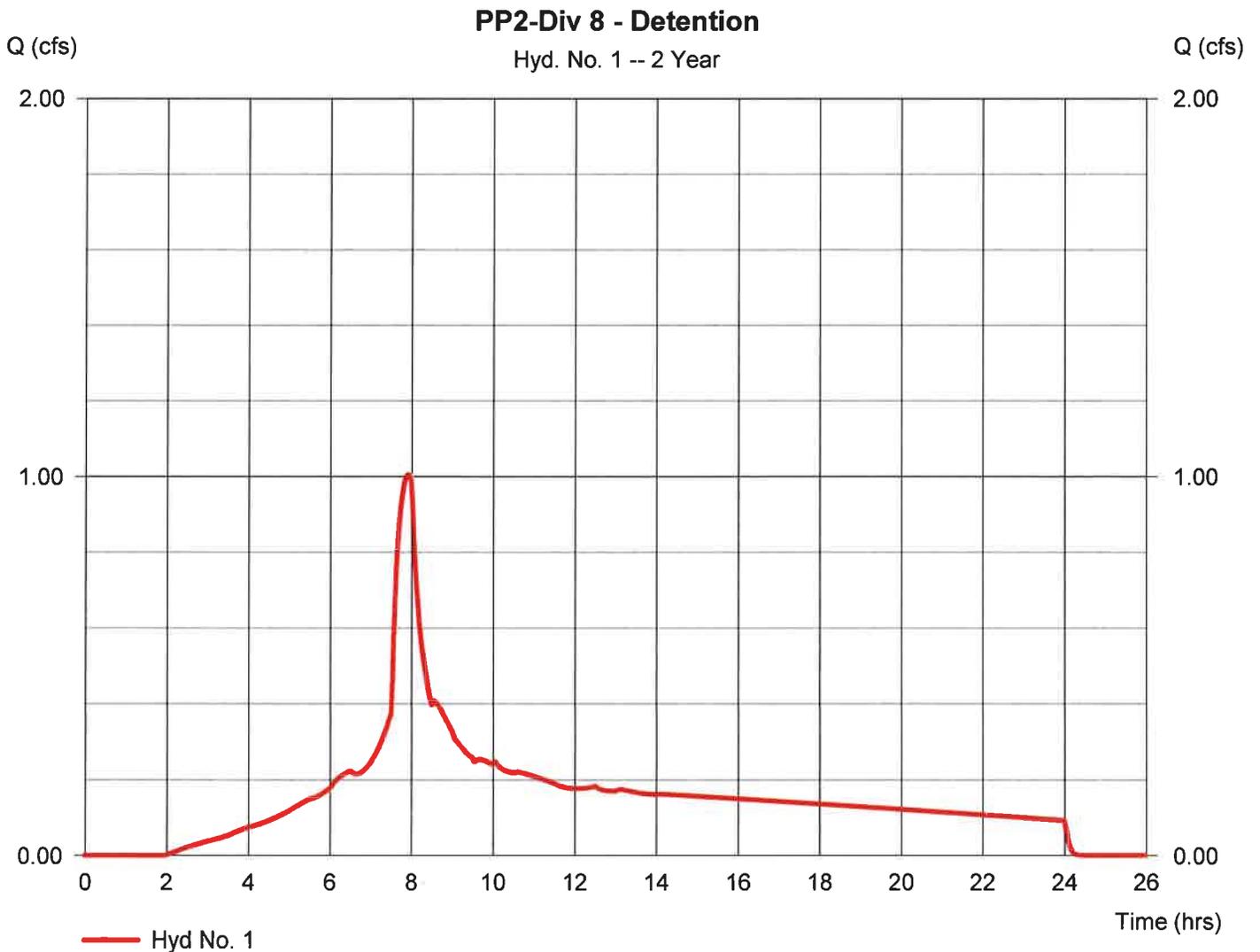
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Thursday, 10 / 1 / 2015

## Hyd. No. 1

### PP2-Div 8 - Detention

Hydrograph type	= SBUH Runoff	Peak discharge	= 1.005 cfs
Storm frequency	= 2 yrs	Time to peak	= 7.90 hrs
Time interval	= 2 min	Hyd. volume	= 14,115 cuft
Drainage area	= 2.197 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

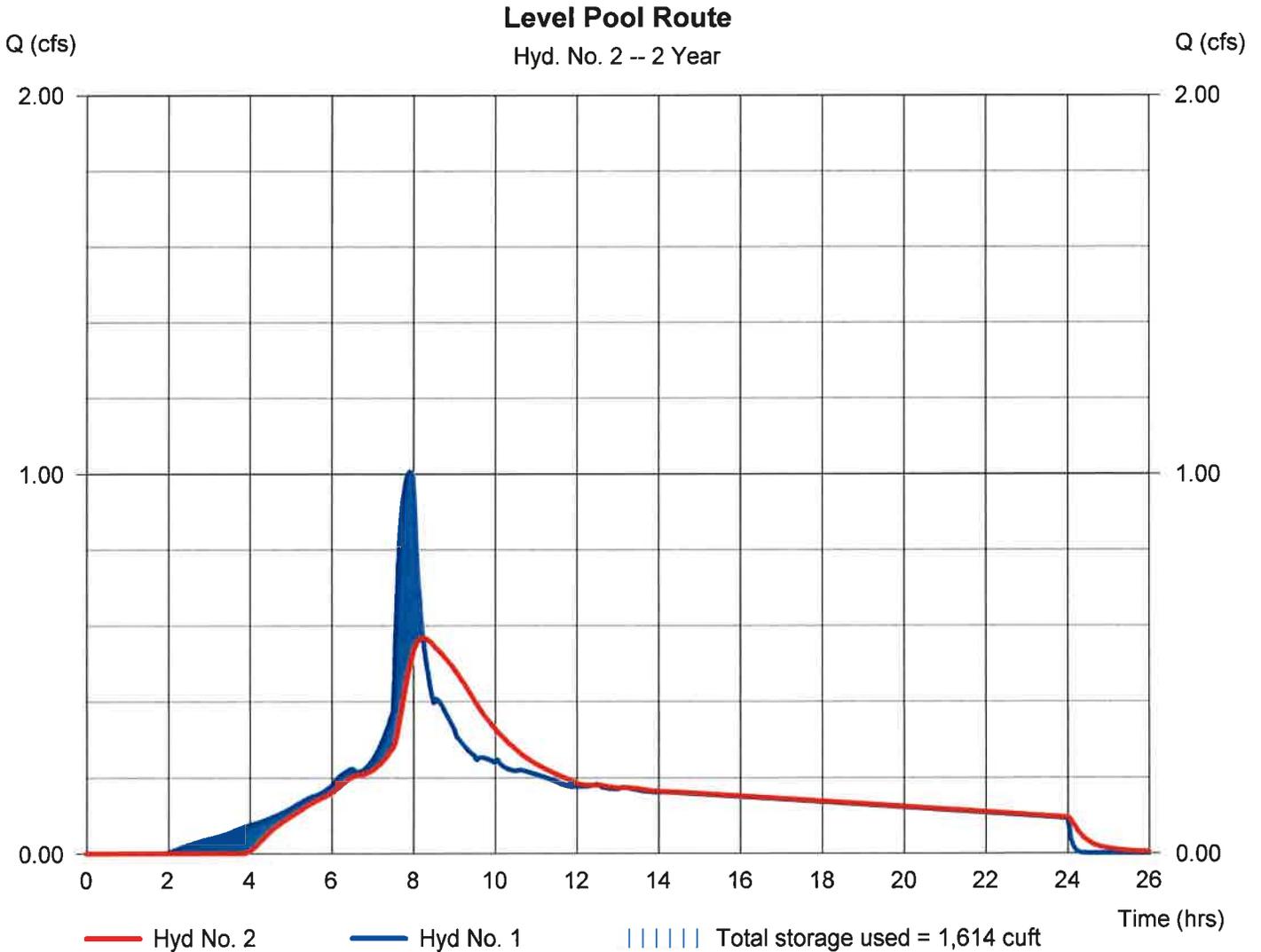
Thursday, 10 / 1 / 2015

## Hyd. No. 2

Level Pool Route

Hydrograph type	= Reservoir	Peak discharge	= 0.568 cfs
Storm frequency	= 2 yrs	Time to peak	= 8.23 hrs
Time interval	= 2 min	Hyd. volume	= 13,874 cuft
Inflow hyd. No.	= 1 - PP2-Div 8 - Detention	Max. Elevation	= 46.95 ft
Reservoir name	= Underground Detention	Max. Storage	= 1,614 cuft

Storage Indication method used.



# Pond Report

## Pond No. 1 - Underground Detention

### Pond Data

UG Chambers -Invert elev. = 45.00 ft, Rise x Span = 5.00 x 5.00 ft, Barrel Len = 228.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	45.00	n/a	0	0
0.50	45.50	n/a	233	233
1.00	46.00	n/a	405	638
1.50	46.50	n/a	492	1,130
2.00	47.00	n/a	542	1,673
2.50	47.50	n/a	567	2,239
3.00	48.00	n/a	567	2,806
3.50	48.50	n/a	542	3,348
4.00	49.00	n/a	492	3,840
4.50	49.50	n/a	405	4,245
5.00	50.00	n/a	233	4,478

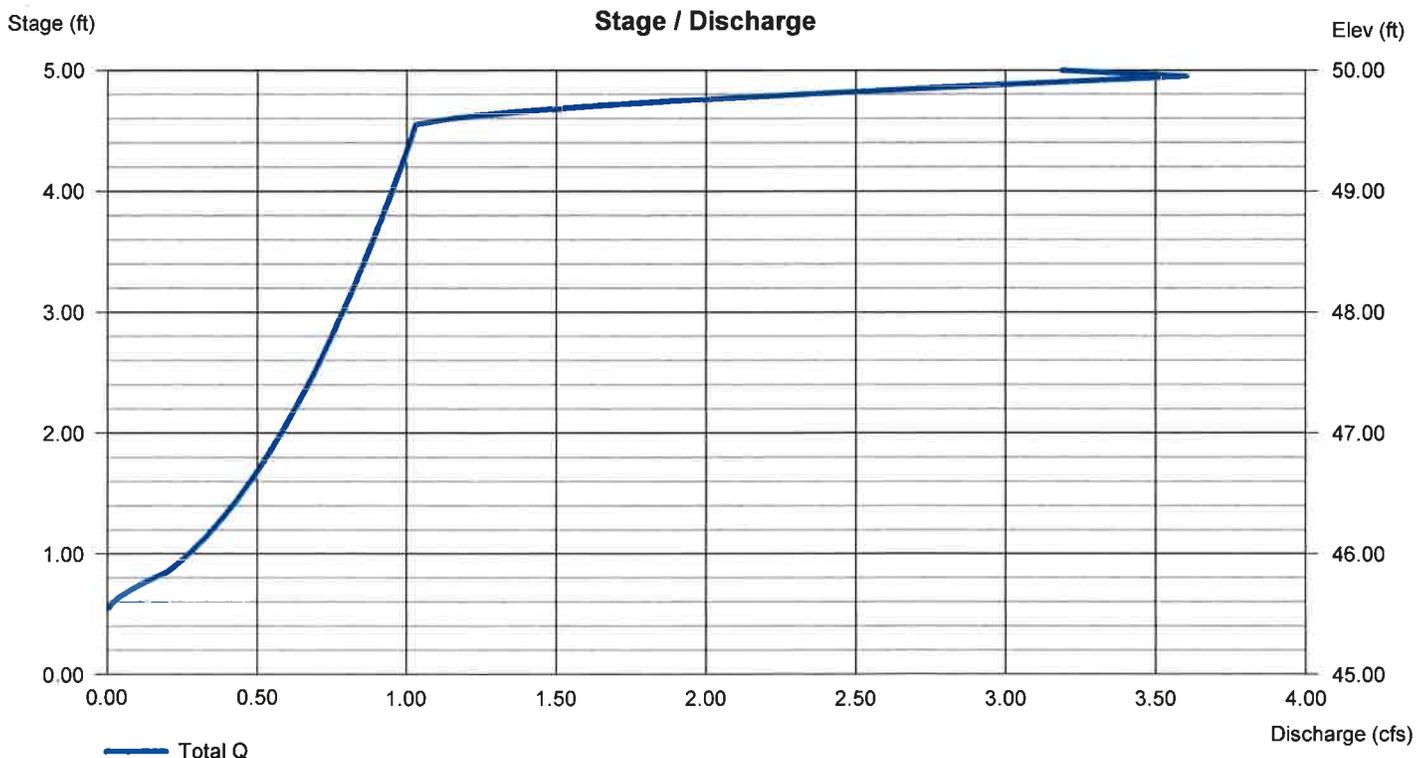
### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	4.50	Inactive	Inactive
Span (in)	= 12.00	4.50	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 45.50	45.50	0.00	0.00
Length (ft)	= 20.00	0.00	0.00	0.00
Slope (%)	= 2.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.62	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.14	Inactive	Inactive	Inactive
Crest El. (ft)	= 49.55	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 45.10			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



# Hydrograph Report

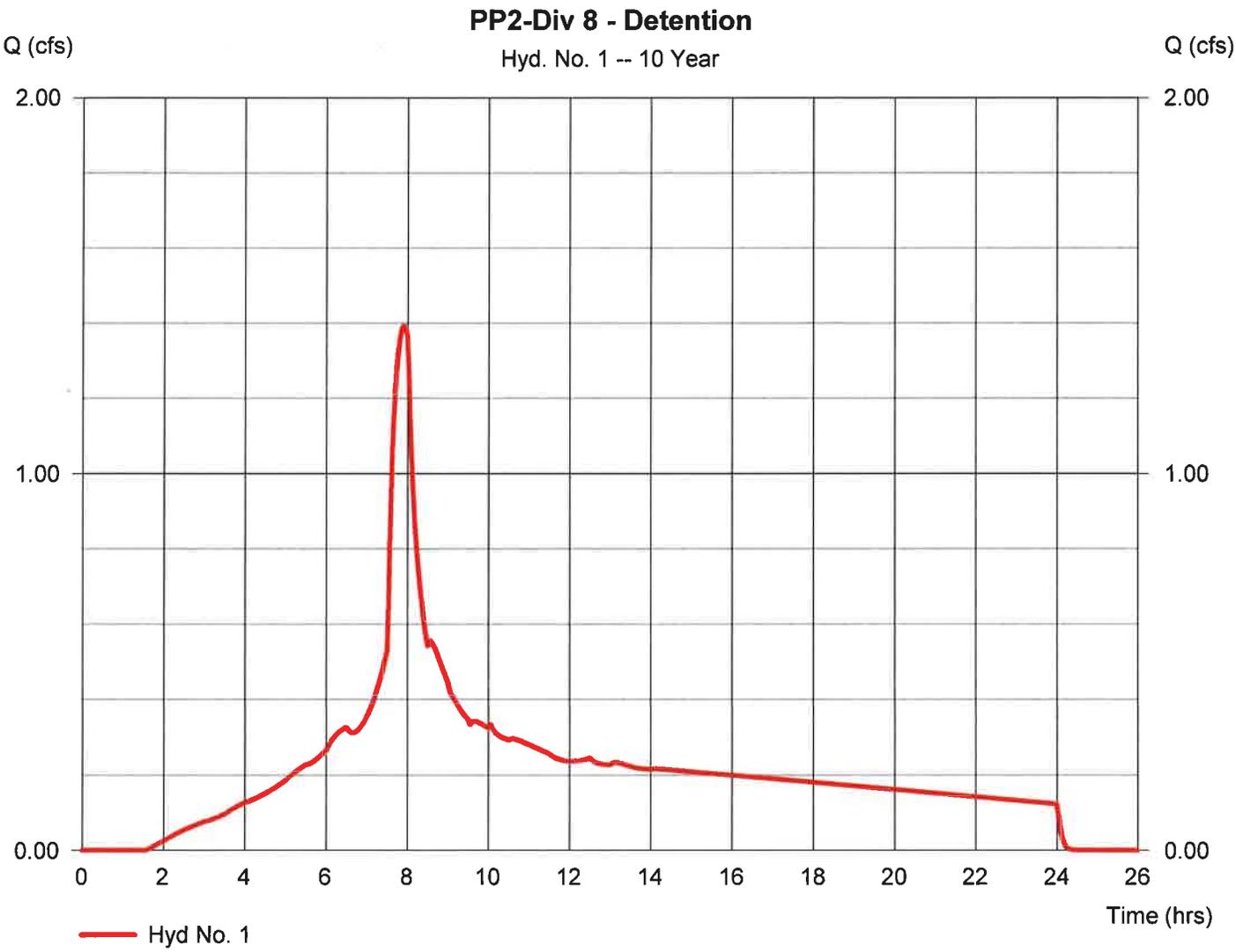
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Thursday, 10 / 1 / 2015

## Hyd. No. 1

### PP2-Div 8 - Detention

Hydrograph type	= SBUH Runoff	Peak discharge	= 1.392 cfs
Storm frequency	= 10 yrs	Time to peak	= 7.90 hrs
Time interval	= 2 min	Hyd. volume	= 19,530 cuft
Drainage area	= 2.197 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

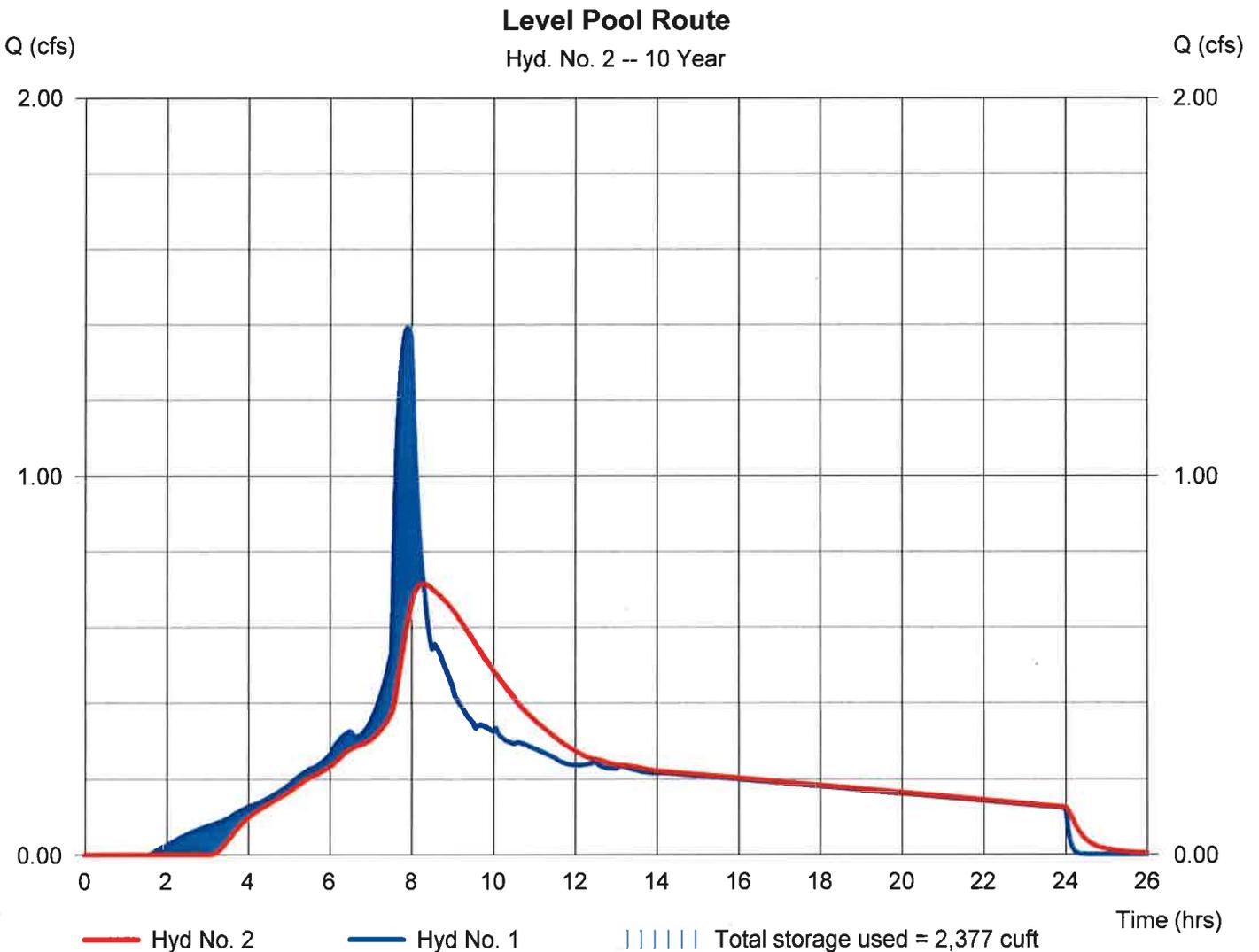
Thursday, 10 / 1 / 2015

## Hyd. No. 2

Level Pool Route

Hydrograph type	= Reservoir	Peak discharge	= 0.716 cfs
Storm frequency	= 10 yrs	Time to peak	= 8.30 hrs
Time interval	= 2 min	Hyd. volume	= 19,289 cuft
Inflow hyd. No.	= 1 - PP2-Div 8 - Detention	Max. Elevation	= 47.62 ft
Reservoir name	= Underground Detention	Max. Storage	= 2,377 cuft

Storage Indication method used.



# Hydrograph Report

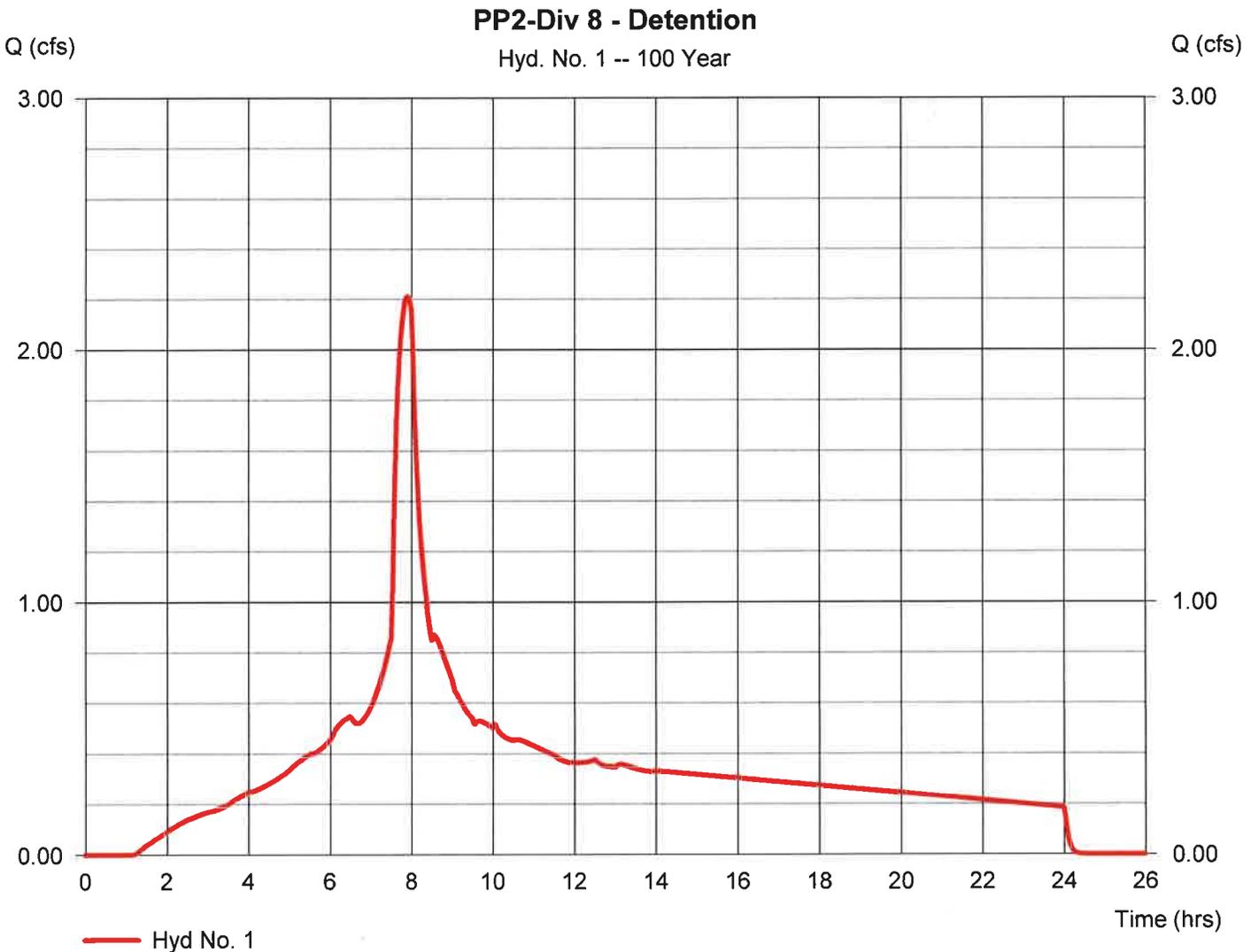
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Thursday, 10 / 1 / 2015

## Hyd. No. 1

### PP2-Div 8 - Detention

Hydrograph type	=	SBUH Runoff	Peak discharge	=	2.213 cfs
Storm frequency	=	100 yrs	Time to peak	=	7.90 hrs
Time interval	=	2 min	Hyd. volume	=	31,293 cuft
Drainage area	=	2.197 ac	Curve number	=	95
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.50 in	Distribution	=	Type IA
Storm duration	=	24 hrs	Shape factor	=	n/a



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Thursday, 10 / 1 / 2015

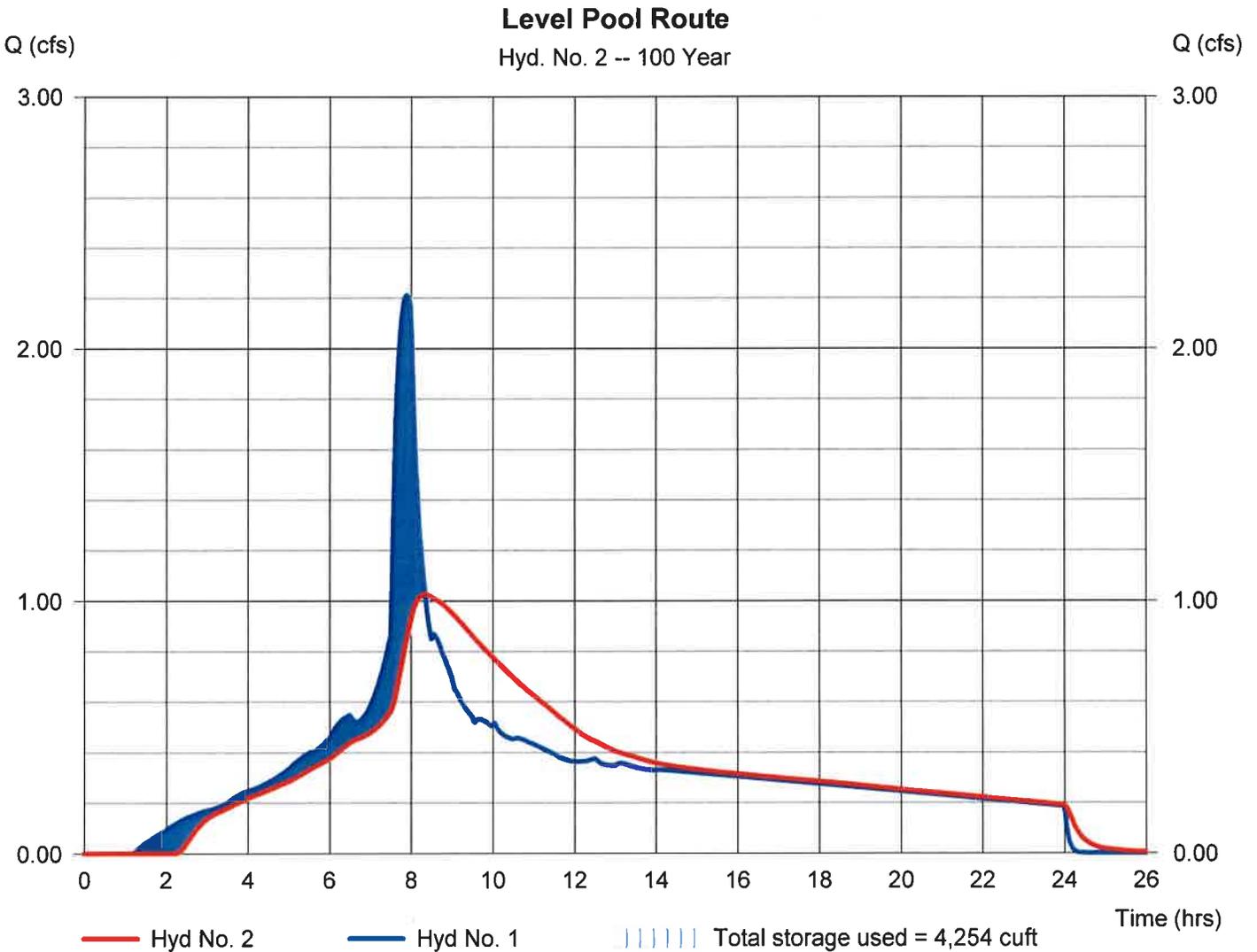
## Hyd. No. 2

Level Pool Route

Hydrograph type	= Reservoir	Peak discharge	= 1.028 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.37 hrs
Time interval	= 2 min	Hyd. volume	= 31,053 cuft
Inflow hyd. No.	= 1 - PP2-Div 8 - Detention	Max. Elevation	= 49.52 ft
Reservoir name	= Underground Detention	Max. Storage	= 4,254 cuft



Storage Indication method used.



**APPENDIX I**  
**ANALYSIS: NO DOWNSTREAM PIPE**  
**IMPROVEMENTS, ALC WITH DETENTION, NO**  
**JUNCTION CB RIM SURCHARGES**





**Poulsbo Place Division 8  
Assisted Living Center**

**Subbasin Summary**

**Downstream Stormwater Backwater Analysis**

SN Subbasin ID	Area (ac)	Impervious Area (%)	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1 Sub-03	4.78	97.00	98.00	86.00	4.69	4.29	20.48	5.04	0 00:06:00
2 Sub-04	2.62	67.00	98.00	86.00	4.69	4.03	10.54	2.60	0 00:06:00
3 Sub-07	2.17	73.00	98.00	86.00	4.69	4.11	8.91	2.19	0 00:06:00
4 Sub-08	0.90	78.00	98.00	86.00	4.69	4.17	3.76	0.93	0 00:06:00
5 Sub-09	2.42	74.00	98.00	86.00	4.69	4.12	9.98	2.46	0 00:06:00
6 Sub-10	0.59	95.00	98.00	86.00	4.69	4.39	2.57	0.63	0 00:06:00
7 Sub-11	0.27	95.00	98.00	86.00	4.69	4.39	1.18	0.29	0 00:06:00
8 Sub-12	1.18	95.00	98.00	86.00	4.69	4.39	5.19	1.28	0 00:06:00
9 Sub-14	0.98	95.00	98.00	86.00	4.69	4.39	4.29	1.05	0 00:06:00
10 sub-2	2.62	0.00	98.00	65.00	4.69	1.45	3.80	0.87	0 00:06:00

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

Node Summary

SN	Element ID	Element Type	Invert Elevation	Ground/Rim (Max) Elevation	Initial Water Elevation	Surcharge Elevation	Ponded Area	Peak Inflow	Max HGL Elevation Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
			(ft)	(ft)	(ft)	(ft)	(ft <sup>2</sup> )	(cfs)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-in)	(min)
1	Jun-01	Junction	-3.31	8.68	-3.31	8.68	0.00	21.92	7.94	0.00	0.74	0 00:00	0.00	0.00
2	Jun-04	Junction	6.48	10.97	6.48	10.97	0.00	12.38	9.78	0.00	1.19	0 00:00	0.00	0.00
3	Jun-06	Junction	8.73	17.99	8.73	17.99	0.00	14.08	14.43	0.00	3.56	0 00:00	0.00	0.00
4	Jun-07	Junction	9.82	18.20	9.82	18.20	0.00	11.64	15.91	0.00	2.29	0 00:00	0.00	0.00
5	Jun-08	Junction	11.34	18.22	11.34	18.22	0.00	11.36	17.27	0.00	0.95	0 00:00	0.00	0.00
6	Jun-09	Junction	14.27	21.03	14.27	21.03	0.00	11.37	20.01	0.00	1.02	0 00:00	0.00	0.00
7	Jun-10	Junction	14.34	21.61	14.34	21.61	0.00	9.19	21.61	0.00	0.00	0 08:00	0.00	1.00
8	Jun-11	Junction	27.16	33.84	27.16	33.84	0.00	8.28	27.99	0.00	5.85	0 00:00	0.00	0.00
9	Jun-12	Junction	32.09	44.85	32.09	44.85	0.00	5.68	32.81	0.00	12.04	0 00:00	0.00	0.00
10	Jun-13	Junction	32.55	45.00	32.55	45.00	0.00	0.66	32.81	0.00	12.19	0 00:00	0.00	0.00
11	Jun-14	Junction	38.81	49.11	38.81	49.11	0.00	0.67	40.13	0.00	8.98	0 00:00	0.00	0.00
12	Jun-15	Junction	8.90	15.15	8.90	15.15	0.00	4.65	10.85	0.00	4.30	0 00:00	0.00	0.00
13	Jun-16	Junction	2.04	11.00	2.04	11.00	0.00	9.58	8.12	0.00	2.88	0 00:00	0.00	0.00
14	Out-01	Outfall	-7.10					21.92	4.65					
15	Jun-05	Flow Diversions	7.95	15.30	7.95		0.00	15.35	11.89				0.00	0.00

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Total Depth Ratio	Total Time Reported Surcharged (min)	Reported Condition
1	Link-01	Pipe	Jun-14 Jun-13	293.62	39.91	33.55	2.1700	15.000	0.0120	0.66	10.30	0.06	4.64	0.22	0.17	0.00	Calculated
2	Link-02	Pipe	Jun-13 Jun-12	38.02	32.55	32.09	1.2100	15.000	0.0120	0.67	7.70	0.09	1.64	0.49	0.39	0.00	Calculated
3	Link-03	Pipe	Jun-12 Jun-11	258.55	32.09	27.16	1.9100	15.000	0.0120	5.68	9.66	0.59	7.67	0.77	0.62	0.00	Calculated
4	Link-04	Pipe	Jun-11 Jun-10	277.57	27.16	15.13	4.3300	15.000	0.0120	8.27	14.57	0.57	9.70	1.04	0.83	0.00	Calculated
5	Link-05	Pipe	Jun-10 Jun-09	37.89	14.34	14.13	0.5500	15.000	0.0120	9.17	3.01	3.05	7.47	1.25	1.00	25.00	SURCHARGED
6	Link-06	Pipe	Jun-09 Jun-08	61.07	14.27	11.35	4.7800	18.000	0.0220	11.36	13.57	0.84	7.14	1.50	1.00	24.00	SURCHARGED
7	Link-07	Pipe	Jun-08 Jun-07	15.81	11.34	9.82	9.6100	18.000	0.0220	11.36	19.25	0.59	6.43	1.50	1.00	30.00	SURCHARGED
8	Link-08	Pipe	Jun-07 Jun-06	82.61	9.82	9.06	0.9200	18.000	0.0111	11.66	11.80	0.99	6.60	1.50	1.00	34.00	SURCHARGED
9	Link-09	Pipe	Jun-06 Jun-05	112.81	8.73	7.95	0.6900	18.000	0.0110	14.08	10.32	1.36	7.97	1.50	1.00	36.00	SURCHARGED
10	Link-10	Pipe	Jun-05 Jun-04	169.20	7.95	6.56	0.8200	18.000	0.0110	11.33	11.25	1.01	6.42	1.50	1.00	29.00	SURCHARGED
11	Link-11	Pipe	Jun-04 Jun-01	100.45	6.48	3.73	2.7400	18.000	0.0110	12.37	20.54	0.60	7.00	1.50	1.00	31.00	SURCHARGED
12	Link-12	Pipe	Jun-01 Out-01	136.85	-3.31	-7.10	2.7700	18.000	0.0110	21.92	20.66	1.06	12.40	1.50	1.00	1440.00	SURCHARGED
13	Link-13	Pipe	Jun-05 Jun-15	55.92	9.43	9.36	0.1300	12.000	0.0110	4.02	1.49	2.70	5.19	1.00	1.00	11.00	SURCHARGED
14	Link-14	Pipe	Jun-15 Jun-16	146.92	8.90	2.04	4.6700	12.000	0.0120	4.65	8.34	0.56	5.92	1.00	1.00	15.00	SURCHARGED
15	Link-15	Pipe	Jun-16 Jun-01	120.02	2.04	-3.05	4.2400	24.000	0.0220	9.58	27.53	0.35	3.56	2.00	1.00	1438.00	SURCHARGED

Poulsbo Place Division 8

Assisted Living Center

Downstream Stormwater Backwater Analysis

Junction Input

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft <sup>2</sup> )	Minimum Pipe Cover (in)
1 Jun-01	-3.31	8.68	11.99	-3.31	0.00	8.68	0.00	0.00	0.00
2 Jun-04	6.48	10.97	4.49	6.48	0.00	10.97	0.00	0.00	0.00
3 Jun-06	8.73	17.99	9.26	8.73	0.00	17.99	0.00	0.00	0.00
4 Jun-07	9.82	18.20	8.38	9.82	0.00	18.20	0.00	0.00	0.00
5 Jun-08	11.34	18.22	6.88	11.34	0.00	18.22	0.00	0.00	0.00
6 Jun-09	14.27	21.03	6.76	14.27	0.00	21.03	0.00	0.00	0.00
7 Jun-10	14.34	21.61	7.27	14.34	0.00	21.61	0.00	0.00	0.00
8 Jun-11	27.16	33.84	6.68	27.16	0.00	33.84	0.00	0.00	0.00
9 Jun-12	32.09	44.85	12.76	32.09	0.00	44.85	0.00	0.00	0.00
10 Jun-13	32.55	45.00	12.45	32.55	0.00	45.00	0.00	0.00	0.00
11 Jun-14	38.81	49.11	10.30	38.81	0.00	49.11	0.00	0.00	0.00
12 Jun-15	8.90	15.15	6.25	8.90	0.00	15.15	0.00	0.00	0.00
13 Jun-16	2.04	11.00	8.96	2.04	0.00	11.00	0.00	0.00	0.00

Poulsbo Place Division 8

Assisted Living Center

Junction Results

Downstream Stormwater Backwater Analysis

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 Jun-01	21.92	0.00	7.94	11.25	0.00	0.74	4.81	8.12	0 08:00	0 00:00	0.00	0.00
2 Jun-04	12.38	1.05	9.78	3.30	0.00	1.19	6.88	0.40	0 08:00	0 00:00	0.00	0.00
3 Jun-06	14.08	2.46	14.43	5.70	0.00	3.56	9.33	0.60	0 08:00	0 00:00	0.00	0.00
4 Jun-07	11.64	0.29	15.91	6.09	0.00	2.29	10.34	0.52	0 08:00	0 00:00	0.00	0.00
5 Jun-08	11.36	0.00	17.27	5.93	0.00	0.95	11.73	0.39	0 08:00	0 00:00	0.00	0.00
6 Jun-09	11.37	2.19	20.01	5.74	0.00	1.02	14.70	0.43	0 08:00	0 00:00	0.00	0.00
7 Jun-10	9.19	0.92	21.61	7.27	0.00	0.00	15.01	0.67	0 07:59	0 08:00	0.00	1.00
8 Jun-11	8.28	2.60	27.99	0.83	0.00	5.85	27.43	0.27	0 08:00	0 00:00	0.00	0.00
9 Jun-12	5.68	5.04	32.81	0.72	0.00	12.04	32.37	0.28	0 07:54	0 00:00	0.00	0.00
10 Jun-13	0.66	0.00	32.81	0.26	0.00	12.19	32.66	0.11	0 07:54	0 00:00	0.00	0.00
11 Jun-14	0.67	0.67	40.13	1.32	0.00	8.98	39.77	0.96	0 08:00	0 00:00	0.00	0.00
12 Jun-15	4.65	0.63	10.85	1.95	0.00	4.30	8.99	0.09	0 08:00	0 00:00	0.00	0.00
13 Jun-16	9.58	0.00	8.12	6.08	0.00	2.88	4.81	2.77	0 08:00	0 00:00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center**

**Pipe Input**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Total Drop	Average Slope	Pipe Shape	Pipe Diameter or Height	Pipe Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate	No. of Barrels
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(in)	(in)					(cfs)		
1 Link-01	293.62	39.91	1.10	33.55	1.00	6.36	2.1700	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
2 Link-02	38.02	32.55	0.00	32.09	0.00	0.46	1.2100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
3 Link-03	258.55	32.09	0.00	27.16	0.00	4.93	1.9100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
4 Link-04	277.57	27.16	0.00	15.13	0.79	12.03	4.3300	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
5 Link-05	37.89	14.34	0.00	14.13	-0.14	0.21	0.5500	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
6 Link-06	61.07	14.27	0.00	11.35	0.01	2.92	4.7800	CIRCULAR	18.000	18.000	0.0220	0.5000	0.6000	0.0000	0.00	No	1
7 Link-07	15.81	11.34	0.00	9.82	0.00	1.52	9.6100	CIRCULAR	18.000	18.000	0.0220	0.5000	0.8000	0.0000	0.00	No	1
8 link-08	82.61	9.82	0.00	9.06	0.33	0.76	0.9200	CIRCULAR	18.000	18.000	0.0111	0.5000	0.6000	0.0000	0.00	No	1
9 Link-09	112.81	8.73	0.00	7.95	0.00	0.78	0.6900	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
10 Link-10	169.20	7.95	0.00	6.56	0.08	1.39	0.8200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
11 Link-11	100.45	6.48	0.00	3.73	7.04	2.75	2.7400	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
12 Link-12	136.85	-3.31	0.00	-7.10	0.00	3.79	2.7700	CIRCULAR	18.000	18.000	0.0110	0.5000	0.0000	0.0000	0.00	No	1
13 Link-13	55.92	9.43	1.48	9.36	0.46	0.07	0.1300	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
14 Link-14	146.92	8.90	0.00	2.04	0.00	6.86	4.6700	CIRCULAR	12.000	12.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
15 Link-15	120.02	2.04	0.00	-3.05	0.26	5.09	4.2400	CIRCULAR	24.000	24.000	0.0220	0.5000	0.5000	0.0000	0.00	No	1

Poulsbo Place Division 8

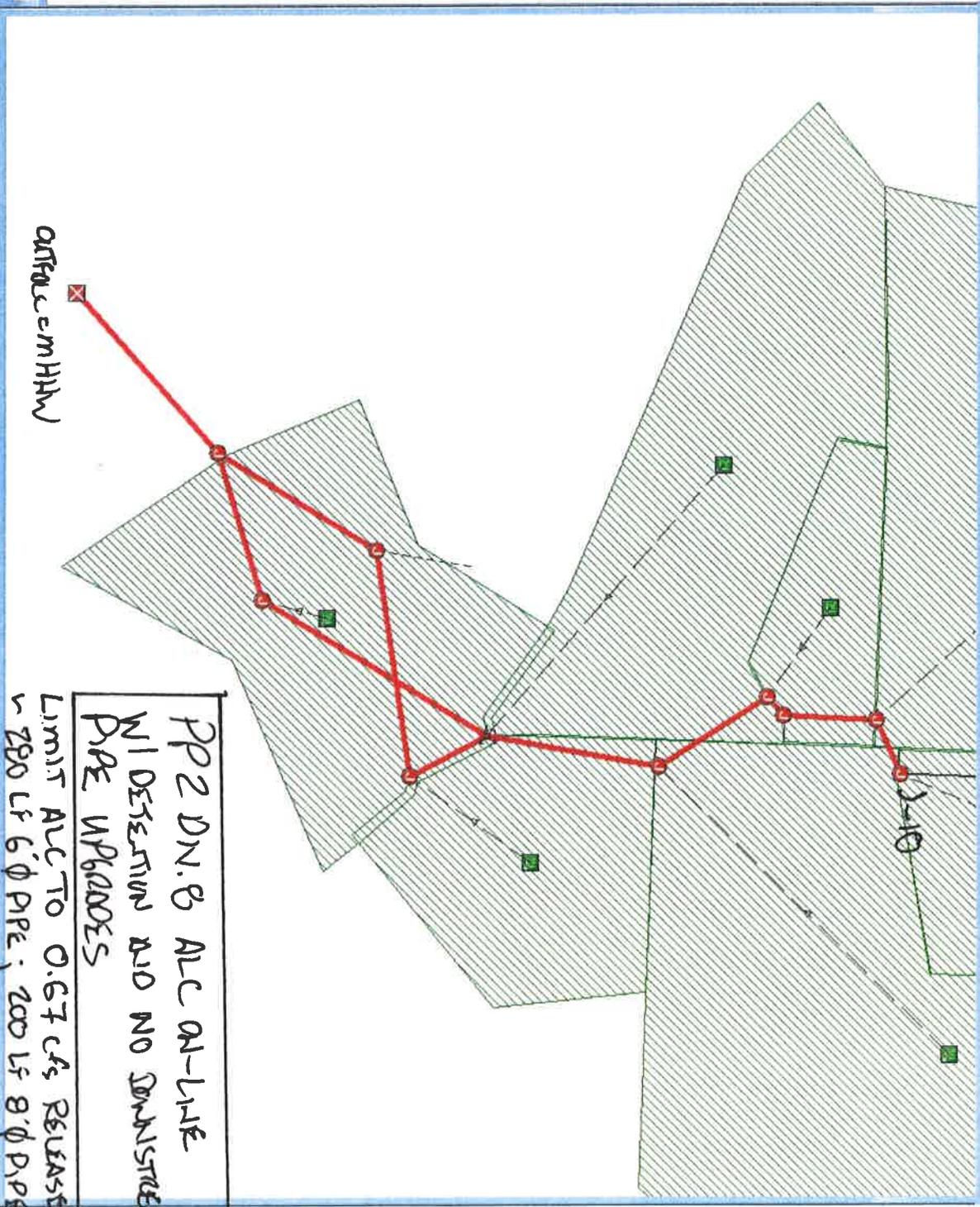
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Downstream Stormwater Backwater Analysis

Pipe Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1 Link-01	0.66	0 08:01	10.30	0.06	4.64	1.05	0.22	0.17	0.00		Calculated
2 Link-02	0.67	0 08:00	7.70	0.09	1.64	0.39	0.49	0.39	0.00		Calculated
3 Link-03	5.68	0 08:00	9.66	0.59	7.67	0.56	0.77	0.62	0.00		Calculated
4 Link-04	8.27	0 08:00	14.57	0.57	9.70	0.48	1.04	0.83	0.00		Calculated
5 Link-05	9.17	0 08:00	3.01	3.05	7.47	0.08	1.25	1.00	25.00		SURCHARGED
6 Link-06	11.36	0 07:59	13.57	0.84	7.14	0.14	1.50	1.00	24.00		SURCHARGED
7 Link-07	11.36	0 08:01	19.25	0.59	6.43	0.04	1.50	1.00	30.00		SURCHARGED
8 link-08	11.66	0 08:01	11.80	0.99	6.80	0.21	1.50	1.00	34.00		SURCHARGED
9 Link-09	14.08	0 08:00	10.32	1.36	7.97	0.24	1.50	1.00	36.00		SURCHARGED
10 Link-10	11.33	0 08:00	11.25	1.01	6.42	0.44	1.50	1.00	29.00		SURCHARGED
11 Link-11	12.37	0 08:00	20.54	0.60	7.00	0.24	1.50	1.00	31.00		SURCHARGED
12 Link-12	21.92	0 00:00	20.66	1.06	12.40	0.18	1.50	1.00	1440.00		SURCHARGED
13 Link-13	4.02	0 08:00	1.49	2.70	5.19	0.18	1.00	1.00	11.00		SURCHARGED
14 Link-14	4.65	0 08:00	8.34	0.56	5.92	0.41	1.00	1.00	15.00		SURCHARGED
15 Link-15	9.58	0 00:01	27.53	0.35	3.56	0.56	2.00	1.00	1438.00		SURCHARGED

- Project Data
- Analysis Options
- Hydrology
- Subbasins
- Rain Gages
- Hydraulics
- Nodes
- Junctions
- Storage Nodes
- Storage Curves
- Inlets
- Flow Diversion
- Flow Diversion Curves
- Outfalls
- Outfall Tidal Curves
- External Inflows
- Links
- Conveyance Links
- Custom Pipe Geometry
- Irregular Cross Sections
- Pumps
- Pump Curves
- Orifices
- Wells
- Outlets
- Outlet Rating Curves
- Quality
- Pollutants
- Pollutants Land Types
- Others
- Control Rules
- Control Settings
- Sanitary Time Patterns
- Time Series



PP2 DN.8 ALC ON-LINE  
 W/ DETENTION AND NO DOWNSTREAM  
 PIPE UPGRADES  
 LIMIT ALC TO 0.67 CFS RELEASE  
 ~ 280 LF 6" Ø PIPE; 200 LF 8" Ø PIPE

# Hydrograph Report

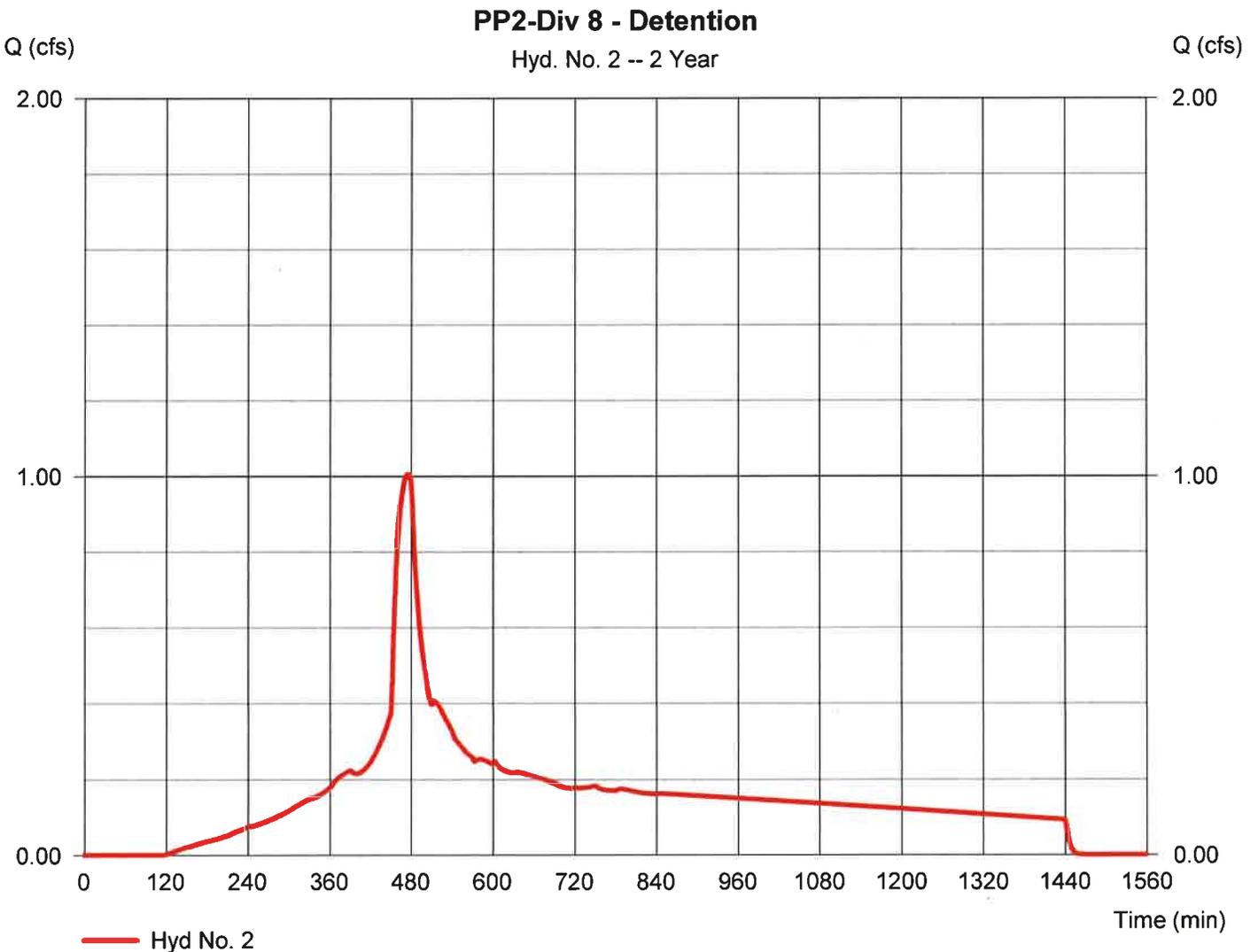
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 09 / 30 / 2015

## Hyd. No. 2

### PP2-Div 8 - Detention

Hydrograph type	= SBUH Runoff	Peak discharge	= 1.005 cfs
Storm frequency	= 2 yrs	Time to peak	= 474 min
Time interval	= 2 min	Hyd. volume	= 14,115 cuft
Drainage area	= 2.197 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

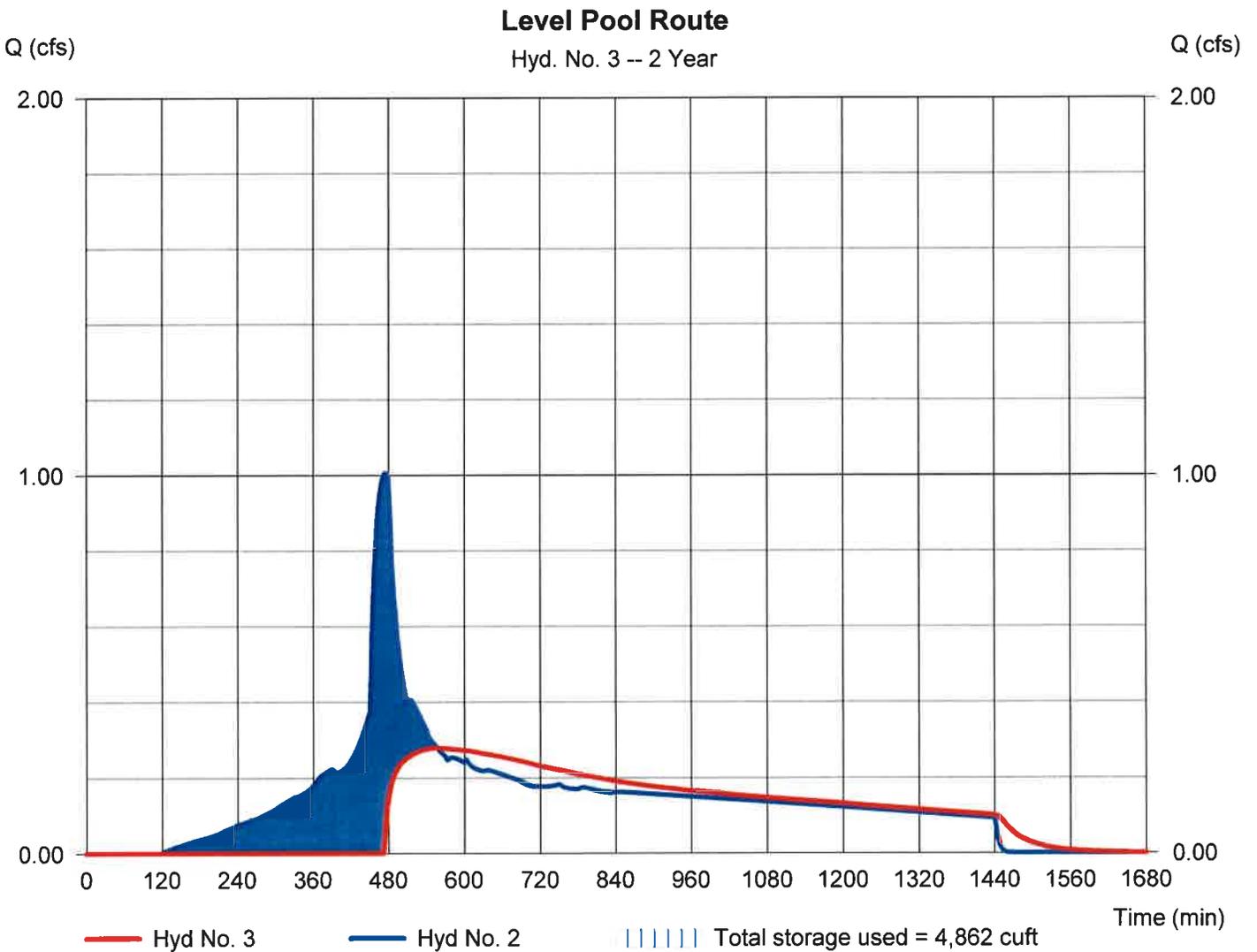
Wednesday, 09 / 30 / 2015

## Hyd. No. 3

### Level Pool Route

Hydrograph type	= Reservoir	Peak discharge	= 0.279 cfs
Storm frequency	= 2 yrs	Time to peak	= 558 min
Time interval	= 2 min	Hyd. volume	= 10,599 cuft
Inflow hyd. No.	= 2 - PP2-Div 8 - Detention	Max. Elevation	= 45.90 ft
Reservoir name	= Underground Detention	Max. Storage	= 4,862 cuft

Storage Indication method used.



# Pond Report

## Pond No. 1 - Underground Detention

### Pond Data

UG Chambers -Invert elev. = 42.00 ft, Rise x Span = 8.00 x 8.00 ft, Barrel Len = 200.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	42.00	n/a	0	0
0.80	42.80	n/a	523	523
1.60	43.60	n/a	909	1,433
2.40	44.40	n/a	1,106	2,538
3.20	45.20	n/a	1,218	3,756
4.00	46.00	n/a	1,272	5,029
4.80	46.80	n/a	1,272	6,301
5.60	47.60	n/a	1,218	7,519
6.40	48.40	n/a	1,105	8,624
7.20	49.20	n/a	909	9,533
8.00	50.00	n/a	523	10,055

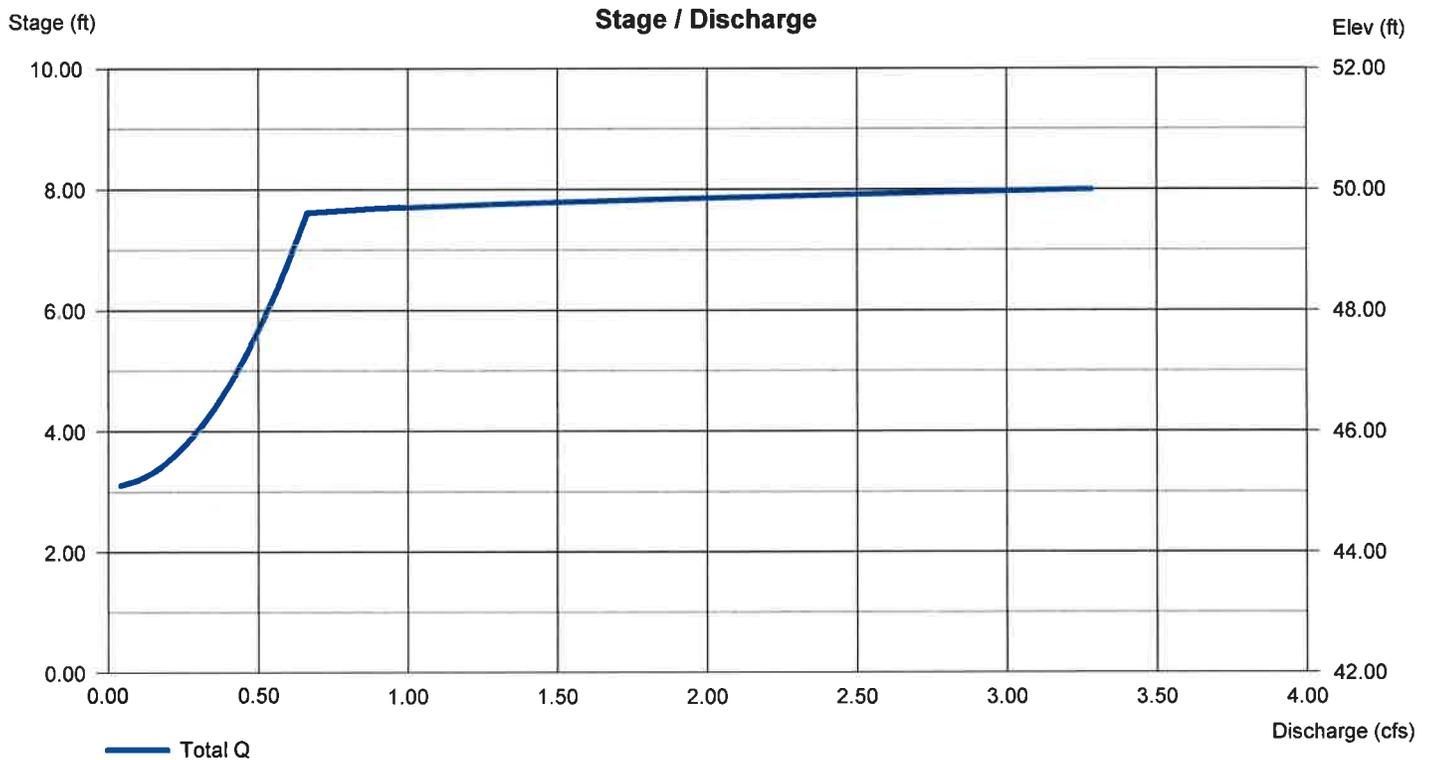
### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	3.40	Inactive	Inactive
Span (in)	= 12.00	3.40	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 42.50	42.50	0.00	0.00
Length (ft)	= 20.00	0.00	0.00	0.00
Slope (%)	= 2.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.62	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.14	Inactive	Inactive	Inactive
Crest El. (ft)	= 49.60	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 45.10			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



# Hydrograph Report

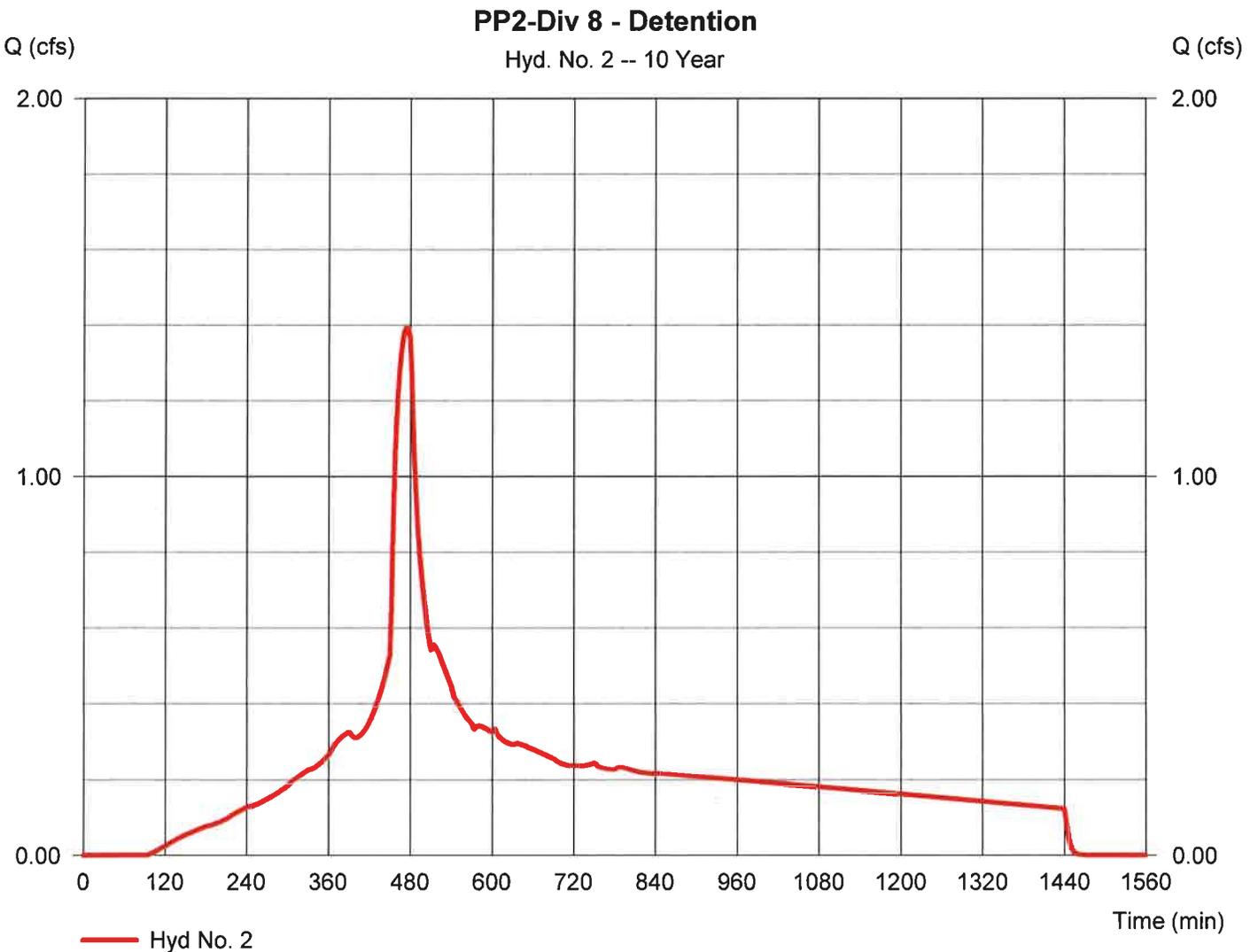
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 09 / 30 / 2015

## Hyd. No. 2

### PP2-Div 8 - Detention

Hydrograph type	= SBUH Runoff	Peak discharge	= 1.392 cfs
Storm frequency	= 10 yrs	Time to peak	= 474 min
Time interval	= 2 min	Hyd. volume	= 19,530 cuft
Drainage area	= 2.197 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

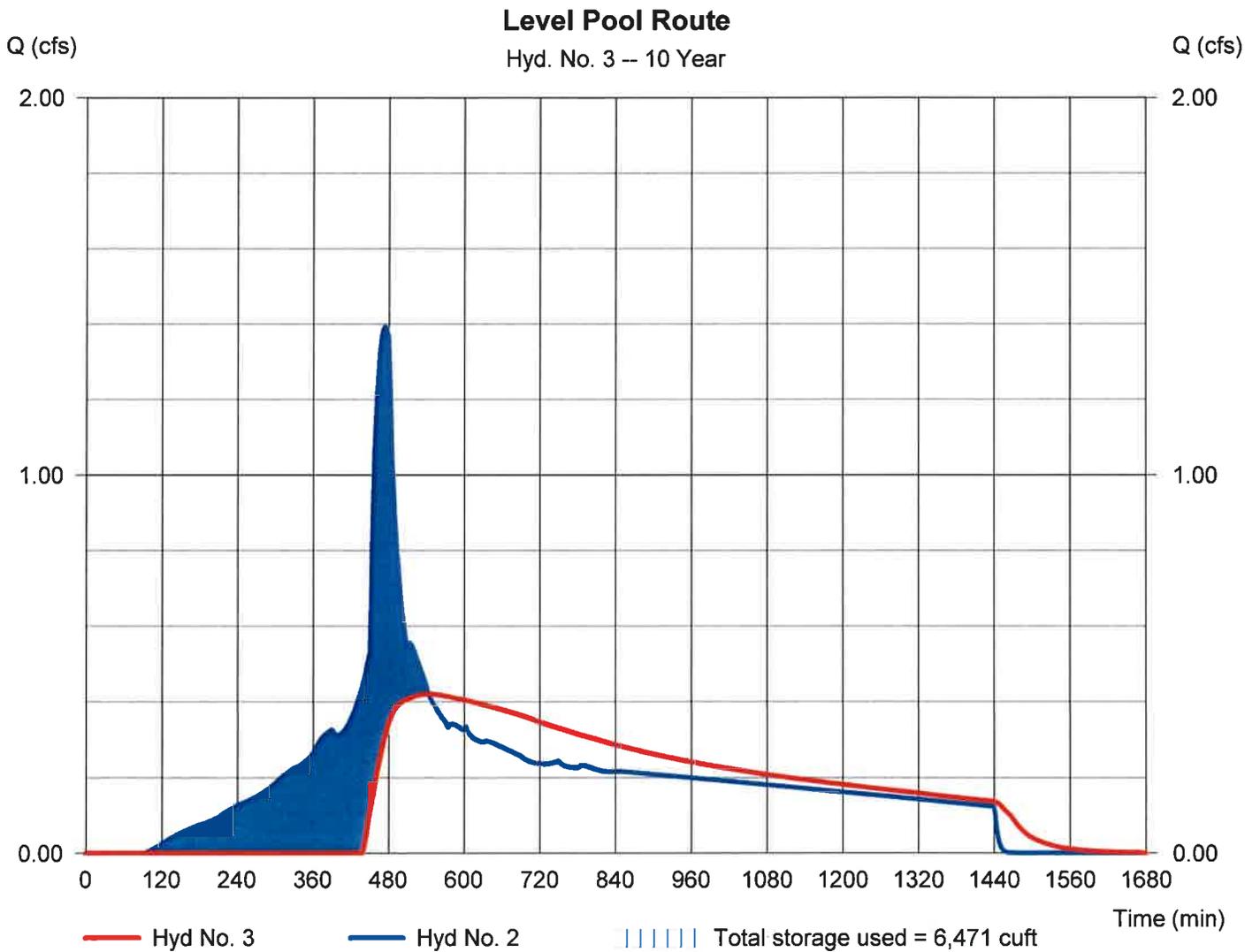
Wednesday, 09 / 30 / 2015

## Hyd. No. 3

### Level Pool Route

Hydrograph type	= Reservoir	Peak discharge	= 0.421 cfs
Storm frequency	= 10 yrs	Time to peak	= 544 min
Time interval	= 2 min	Hyd. volume	= 16,014 cuft
Inflow hyd. No.	= 2 - PP2-Div 8 - Detention	Max. Elevation	= 46.91 ft
Reservoir name	= Underground Detention	Max. Storage	= 6,471 cuft

Storage Indication method used.



# Hydrograph Report

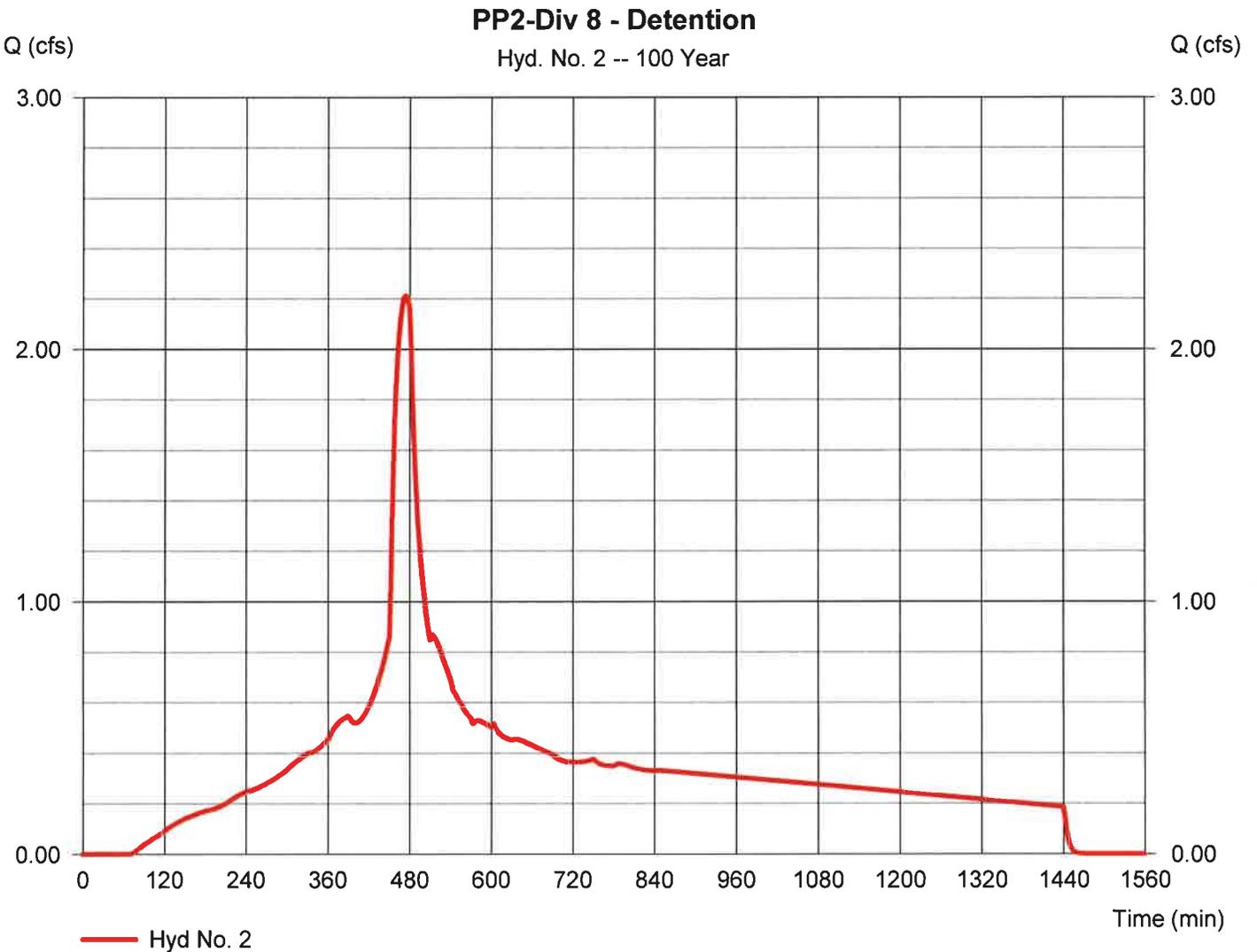
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Wednesday, 09 / 30 / 2015

## Hyd. No. 2

PP2-Div 8 - Detention

Hydrograph type	= SBUH Runoff	Peak discharge	= 2.213 cfs
Storm frequency	= 100 yrs	Time to peak	= 474 min
Time interval	= 2 min	Hyd. volume	= 31,293 cuft
Drainage area	= 2.197 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

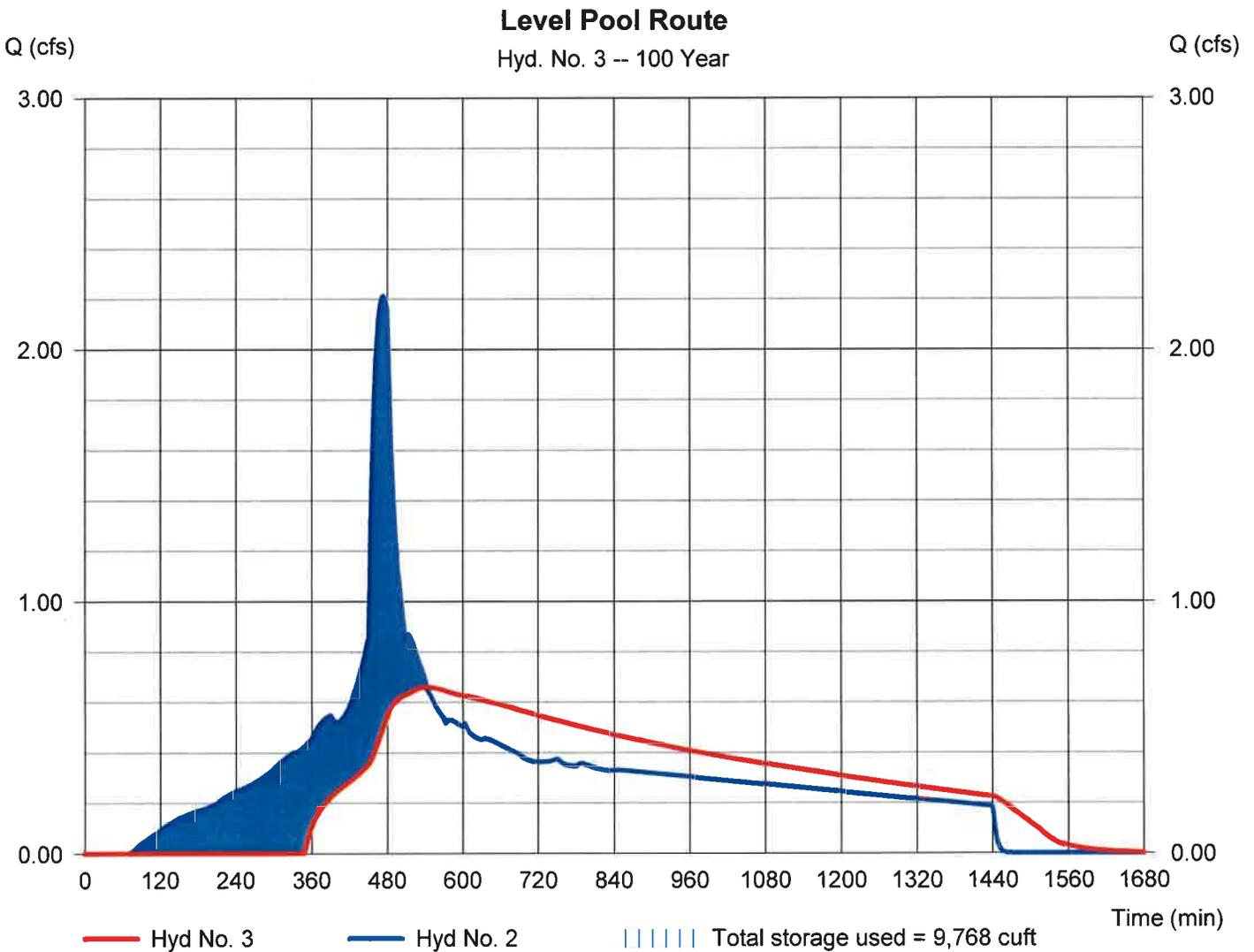
Wednesday, 09 / 30 / 2015

## Hyd. No. 3

### Level Pool Route

Hydrograph type	= Reservoir	Peak discharge	= <u>0.660 cfs</u>
Storm frequency	= 100 yrs	Time to peak	= 544 min
Time interval	= 2 min	Hyd. volume	= 27,778 cuft
Inflow hyd. No.	= 2 - PP2-Div 8 - Detention	Max. Elevation	= 49.56 ft
Reservoir name	= Underground Detention	Max. Storage	= 9,768 cuft

Storage Indication method used.



**APPENDIX J**  
**ANALYSIS: ALC WITH DETENTION, OUTFALL**  
**UPGRADE TO 24"**





**Poulsbo Place Division 8**

**Assisted Living Center**

**Subbasin Summary**

**Downstream Stormwater Backwater Analysis**

SN Subbasin ID	Area (ac)	Impervious Area (%)	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1 Sub-03	4.78	87.00	98.00	86.00	4.69	4.29	20.48	5.04	0 00:06:00
2 Sub-04	2.62	67.00	98.00	86.00	4.69	4.03	10.54	2.60	0 00:06:00
3 Sub-07	2.17	73.00	98.00	86.00	4.69	4.11	8.91	2.19	0 00:06:00
4 Sub-08	0.90	78.00	98.00	86.00	4.69	4.17	3.76	0.93	0 00:06:00
5 Sub-09	2.42	74.00	98.00	86.00	4.69	4.12	9.98	2.46	0 00:06:00
6 Sub-10	0.59	95.00	98.00	86.00	4.69	4.39	2.57	0.63	0 00:06:00
7 Sub-11	0.27	95.00	98.00	86.00	4.69	4.39	1.18	0.29	0 00:06:00
8 Sub-12	1.18	95.00	98.00	86.00	4.69	4.39	5.19	1.28	0 00:06:00
9 Sub-14	0.98	95.00	98.00	86.00	4.69	4.39	4.29	1.05	0 00:06:00
10 sub-2	2.62	0.00	98.00	65.00	4.69	1.45	3.80	0.67	0 00:06:00

**Poulsbo Place Division 8  
Assisted Living Center**

**Node Summary**

**Downstream Stormwater Backwater Analysis**

SN	Element ID	Element Type	Invert Elevation	Ground/Rim (Max) Elevation	Initial Water Elevation	Surcharge Elevation	Ponded Area	Peak Inflow	Max HGL Elevation Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
			(ft)	(ft)	(ft)	(ft)	(ft <sup>2</sup> )	(cfs)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-in)	(min)
1	Jun-01	Junction	-3.31	8.68	-3.31	8.68	0.00	37.96	6.04	0.00	2.64	0 00:00	0.00	0.00
2	Jun-04	Junction	6.48	10.97	6.48	10.97	0.00	13.90	7.75	0.00	3.22	0 00:00	0.00	0.00
3	Jun-06	Junction	8.73	17.99	8.73	17.99	0.00	14.12	13.16	0.00	4.83	0 00:00	0.00	0.00
4	Jun-07	Junction	9.82	18.20	9.82	18.20	0.00	11.67	14.65	0.00	3.55	0 00:00	0.00	0.00
5	Jun-08	Junction	11.34	18.22	11.34	18.22	0.00	11.38	16.02	0.00	2.20	0 00:00	0.00	0.00
6	Jun-09	Junction	14.27	21.03	14.27	21.03	0.00	11.38	18.78	0.00	2.25	0 00:00	0.00	0.00
7	Jun-10	Junction	14.34	21.61	14.34	21.61	0.00	9.19	20.39	0.00	1.22	0 00:00	0.00	0.00
8	Jun-11	Junction	27.16	33.84	27.16	33.84	0.00	8.28	27.92	0.00	5.92	0 00:00	0.00	0.00
9	Jun-12	Junction	32.09	44.85	32.09	44.85	0.00	5.68	32.82	0.00	12.03	0 00:00	0.00	0.00
10	Jun-13	Junction	32.55	45.00	32.55	45.00	0.00	0.66	32.82	0.00	12.18	0 00:00	0.00	0.00
11	Jun-14	Junction	38.81	49.11	38.81	49.11	0.00	0.67	40.13	0.00	8.98	0 00:00	0.00	0.00
12	Jun-15	Junction	8.90	15.15	8.90	15.15	0.00	3.17	9.37	0.00	5.78	0 00:00	0.00	0.00
13	Jun-16	Junction	2.04	11.00	2.04	11.00	0.00	13.63	8.10	0.00	2.90	0 00:00	0.00	0.00
14	Out-01	Outfall	-7.10					37.96	4.65					
15	Jun-05	Flow Diversions	7.95	15.30	7.95		0.00	15.39	10.61				0.00	0.00

Pouisbo Place Division 8

Assisted Living Center

Link Summary

Downstream Stormwater Backwater Analysis

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-01	Pipe	Jun-14	Jun-13	293.62	39.91	33.55	2.1700	15.000	0.0120	0.66	10.30	0.06	4.64	0.22	0.17	0.00	Calculated
2	Link-02	Pipe	Jun-13	Jun-12	38.02	32.55	32.09	1.2100	15.000	0.0120	0.67	7.70	0.09	1.64	0.50	0.40	0.00	Calculated
3	Link-03	Pipe	Jun-12	Jun-11	258.55	32.09	27.16	1.9100	15.000	0.0120	5.68	9.66	0.59	7.71	0.75	0.60	0.00	Calculated
4	Link-04	Pipe	Jun-11	Jun-10	277.57	27.16	15.13	4.3300	15.000	0.0120	8.27	14.57	0.57	9.69	1.01	0.81	0.00	Calculated
5	Link-05	Pipe	Jun-10	Jun-09	37.89	14.34	14.13	0.5500	15.000	0.0120	9.19	3.01	3.06	7.49	1.25	1.00	24.00	SURCHARGED
6	Link-06	Pipe	Jun-09	Jun-08	61.07	14.27	11.35	4.7800	18.000	0.0220	11.38	13.57	0.84	7.14	1.50	1.00	23.00	SURCHARGED
7	Link-07	Pipe	Jun-08	Jun-07	15.81	11.34	9.82	9.6100	18.000	0.0220	11.38	19.25	0.59	6.44	1.50	1.00	29.00	SURCHARGED
8	Link-08	Pipe	Jun-07	Jun-06	82.61	9.82	9.06	0.9200	18.000	0.0111	11.68	11.80	0.99	6.61	1.50	1.00	34.00	SURCHARGED
9	Link-09	Pipe	Jun-06	Jun-05	112.81	8.73	7.95	0.6900	18.000	0.0110	14.12	10.32	1.37	7.99	1.50	1.00	36.00	SURCHARGED
10	Link-10	Pipe	Jun-05	Jun-04	169.20	7.95	6.56	0.8200	18.000	0.0110	12.85	11.25	1.14	7.42	1.42	0.95	0.00	> CAPACITY
11	Link-11	Pipe	Jun-04	Jun-01	100.45	6.48	3.73	2.7400	18.000	0.0110	13.90	20.54	0.68	8.14	1.39	0.92	0.00	Calculated
12	Link-12	Pipe	Jun-01	Out-01	136.85	-3.31	-7.10	2.7700	24.000	0.0110	37.96	44.49	0.85	12.08	2.00	1.00	1440.00	SURCHARGED
13	Link-13	Pipe	Jun-05	Jun-15	55.92	9.43	9.36	0.1300	12.000	0.0110	2.54	1.49	1.71	3.61	0.84	0.84	0.00	> CAPACITY
14	Link-14	Pipe	Jun-15	Jun-16	146.92	8.90	2.04	4.6700	12.000	0.0120	3.17	8.34	0.38	5.14	0.73	0.73	0.00	Calculated
15	Link-15	Pipe	Jun-16	Jun-01	120.02	2.04	-3.05	4.2400	24.000	0.0220	13.63	27.53	0.50	4.67	2.00	1.00	1439.00	SURCHARGED

**Poulsbo Place Division 8  
Assisted Living Center**

**Junction Input**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft <sup>2</sup> )	Minimum Pipe Cover (in)
1 Jun-01	-3.31	8.68	11.99	-3.31	0.00	8.68	0.00	0.00	0.00
2 Jun-04	6.48	10.97	4.49	6.48	0.00	10.97	0.00	0.00	0.00
3 Jun-06	8.73	17.99	9.26	8.73	0.00	17.99	0.00	0.00	0.00
4 Jun-07	9.82	18.20	8.38	9.82	0.00	18.20	0.00	0.00	0.00
5 Jun-08	11.34	18.22	6.88	11.34	0.00	18.22	0.00	0.00	0.00
6 Jun-09	14.27	21.03	6.76	14.27	0.00	21.03	0.00	0.00	0.00
7 Jun-10	14.34	21.61	7.27	14.34	0.00	21.61	0.00	0.00	0.00
8 Jun-11	27.16	33.84	6.68	27.16	0.00	33.84	0.00	0.00	0.00
9 Jun-12	32.09	44.85	12.76	32.09	0.00	44.85	0.00	0.00	0.00
10 Jun-13	32.55	45.00	12.45	32.55	0.00	45.00	0.00	0.00	0.00
11 Jun-14	38.81	49.11	10.30	38.81	0.00	49.11	0.00	0.00	0.00
12 Jun-15	8.90	15.15	6.25	8.90	0.00	15.15	0.00	0.00	0.00
13 Jun-16	2.04	11.00	8.96	2.04	0.00	11.00	0.00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center**

**Junction Results**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 Jun-01	37.96	0.00	6.04	9.35	0.00	2.64	4.69	8.00	0 00:01	0 00:00	0.00	0.00
2 Jun-04	13.90	1.05	7.75	1.27	0.00	3.22	6.87	0.39	0 08:00	0 00:00	0.00	0.00
3 Jun-06	14.12	2.46	13.16	4.43	0.00	4.83	9.33	0.60	0 08:00	0 00:00	0.00	0.00
4 Jun-07	11.67	0.29	14.65	4.83	0.00	3.55	10.34	0.52	0 08:00	0 00:00	0.00	0.00
5 Jun-08	11.38	0.00	16.02	4.68	0.00	2.20	11.73	0.39	0 08:00	0 00:00	0.00	0.00
6 Jun-09	11.38	2.19	18.78	4.51	0.00	2.25	14.69	0.42	0 08:00	0 00:00	0.00	0.00
7 Jun-10	9.19	0.92	20.39	6.05	0.00	1.22	15.01	0.67	0 08:00	0 00:00	0.00	0.00
8 Jun-11	8.28	2.60	27.92	0.76	0.00	5.92	27.43	0.27	0 08:00	0 00:00	0.00	0.00
9 Jun-12	5.68	5.04	32.82	0.73	0.00	12.03	32.37	0.28	0 08:00	0 00:00	0.00	0.00
10 Jun-13	0.66	0.00	32.62	0.27	0.00	12.18	32.66	0.11	0 08:00	0 00:00	0.00	0.00
11 Jun-14	0.67	0.67	40.13	1.32	0.00	8.98	39.77	0.96	0 08:00	0 00:00	0.00	0.00
12 Jun-15	3.17	0.63	9.37	0.47	0.00	5.78	8.98	0.08	0 08:00	0 00:00	0.00	0.00
13 Jun-16	13.63	0.00	8.10	6.06	0.00	2.90	4.69	2.65	0 00:01	0 00:00	0.00	0.00

**Poulsbo Place Division 8  
Assisted Living Center**

**Pipe Input**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Pipe Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1 Link-01	293.62	39.91	1.10	33.55	1.00	6.36	2.1700	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
2 Link-02	38.02	32.55	0.00	32.09	0.00	0.46	1.2100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
3 Link-03	258.55	32.09	0.00	27.16	0.00	4.93	1.9100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
4 Link-04	277.57	27.16	0.00	15.13	0.79	12.03	4.3300	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
5 Link-05	37.89	14.34	0.00	14.13	-0.14	0.21	0.5500	CIRCULAR	15.000	15.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
6 Link-06	61.07	14.27	0.00	11.35	0.01	2.92	4.7800	CIRCULAR	18.000	18.000	0.0220	0.5000	0.6000	0.0000	0.00	No	1
7 Link-07	15.81	11.34	0.00	9.82	0.00	1.52	9.6100	CIRCULAR	18.000	18.000	0.0220	0.5000	0.8000	0.0000	0.00	No	1
8 link-08	82.61	9.82	0.00	9.06	0.33	0.76	0.9200	CIRCULAR	18.000	18.000	0.0111	0.5000	0.6000	0.0000	0.00	No	1
9 Link-09	112.81	8.73	0.00	7.95	0.00	0.78	0.6900	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
10 Link-10	169.20	7.95	0.00	6.56	0.08	1.39	0.8200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
11 Link-11	100.45	6.48	0.00	3.73	7.04	2.75	2.7400	CIRCULAR	18.000	18.000	0.0110	0.5000	0.6000	0.0000	0.00	No	1
12 Link-12	136.85	-3.31	0.00	-7.10	0.00	3.79	2.7700	CIRCULAR	24.000	24.000	0.0110	0.5000	0.0000	0.0000	0.00	No	1
13 Link-13	55.92	9.43	1.48	9.36	0.46	0.07	0.1300	CIRCULAR	12.000	12.000	0.0110	0.5000	0.8000	0.0000	0.00	No	1
14 Link-14	146.92	8.90	0.00	2.04	0.00	6.86	4.6700	CIRCULAR	12.000	12.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
15 Link-15	120.02	2.04	0.00	-3.05	0.26	5.09	4.2400	CIRCULAR	24.000	24.000	0.0220	0.5000	0.5000	0.0000	0.00	No	1

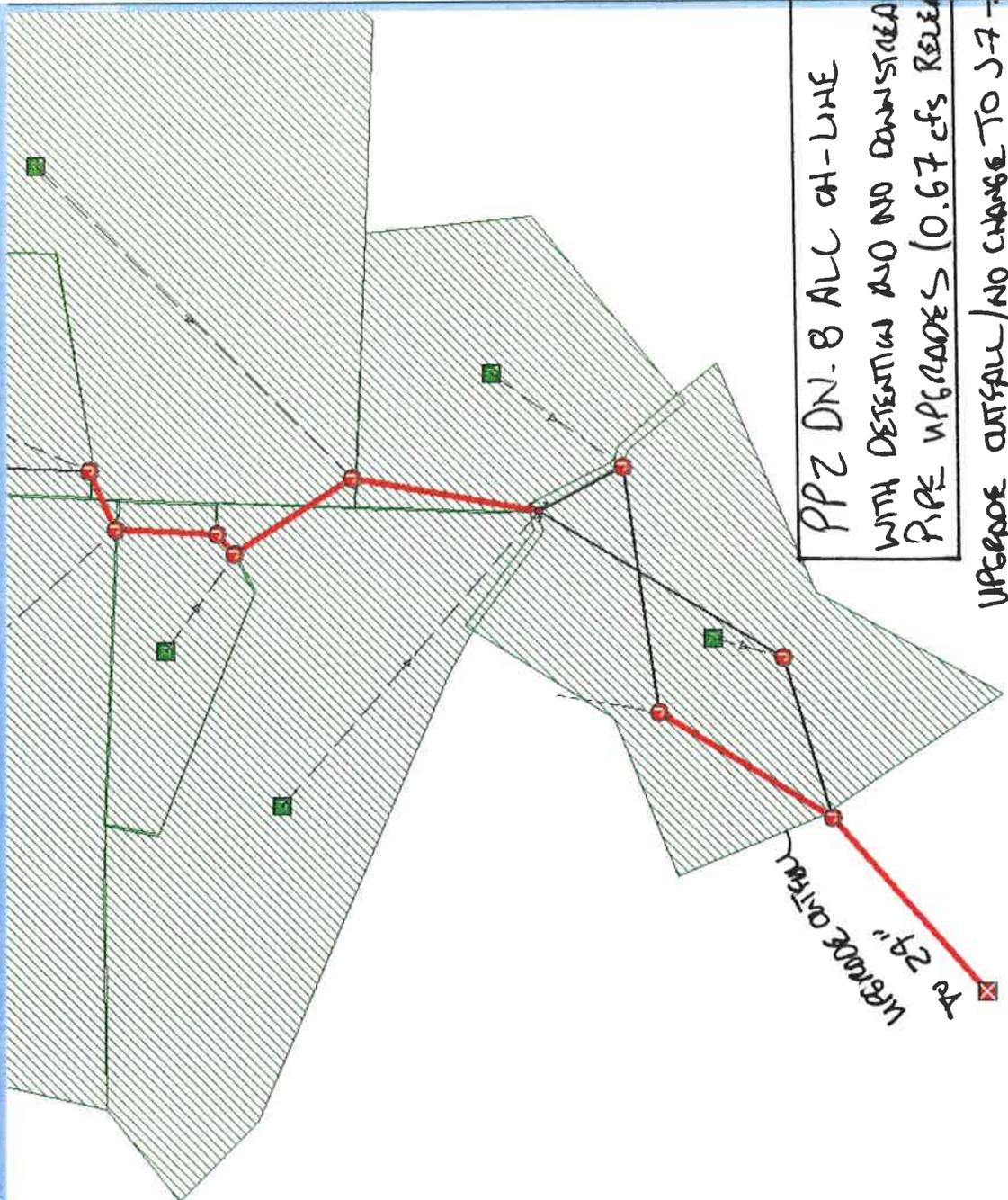
**Poulsbo Place Division 8  
Assisted Living Center**

**Pipe Results**

**Downstream Stormwater Backwater Analysis**

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1 Link-01	0.66	0 08:01	10.30	0.06	4.64	1.05	0.22	0.17	0.00		Calculated
2 Link-02	0.67	0 08:00	7.70	0.09	1.64	0.39	0.50	0.40	0.00		Calculated
3 Link-03	5.68	0 08:00	9.66	0.59	7.71	0.56	0.75	0.60	0.00		Calculated
4 Link-04	8.27	0 08:00	14.57	0.57	9.69	0.48	1.01	0.81	0.00		Calculated
5 Link-05	9.19	0 08:00	3.01	3.06	7.49	0.08	1.25	1.00	24.00		SURCHARGED
6 Link-06	11.38	0 08:00	13.57	0.84	7.14	0.14	1.50	1.00	23.00		SURCHARGED
7 Link-07	11.38	0 08:00	19.25	0.59	6.44	0.04	1.50	1.00	29.00		SURCHARGED
8 Link-08	11.68	0 08:00	11.80	0.99	6.61	0.21	1.50	1.00	34.00		SURCHARGED
9 Link-09	14.12	0 08:00	10.32	1.37	7.99	0.24	1.50	1.00	36.00		SURCHARGED
10 Link-10	12.85	0 08:00	11.25	1.14	7.42	0.38	1.42	0.95	0.00		> CAPACITY
11 Link-11	13.90	0 08:00	20.54	0.68	8.14	0.21	1.39	0.92	0.00		Calculated
12 Link-12	37.96	0 00:00	44.49	0.85	12.08	0.19	2.00	1.00	1440.00		SURCHARGED
13 Link-13	2.54	0 08:00	1.49	1.71	3.61	0.26	0.84	0.84	0.00		> CAPACITY
14 Link-14	3.17	0 08:00	8.34	0.38	5.14	0.48	0.73	0.73	0.00		Calculated
15 Link-15	13.63	0 00:01	27.53	0.50	4.67	0.43	2.00	1.00	1439.00		SURCHARGED

- Project Data
- Project Options
- Analysis Options
- Hydrology
- Substrata
- Rain Gages
- Hydraulics
- Nodes
  - Junctions
  - Storage Nodes
  - Storage Curves
  - Inlets
  - Flow Diversion
  - Flow Diversion Curves
  - Outfalls
  - Outfall Tidal Curves
  - External Inflows
- Links
  - Conveyance Links
  - Custom Pipe Geometry
  - Irregular Cross Sections
  - Pumps
  - Pump Curves
  - Drifts
  - Wells
  - Outlets
  - Outlet Rating Curves
- Quality
- Pollutants
- Pollutants Land Types
- Others
  - Control Rules
  - Control Settings
  - Sanitary Time Patterns
  - Time Series



PPZ DN. 8 ALL CH-LINE  
WITH DETENTION AND NO CONVEYANCE  
PIPE UPGRADES (0.67 cfs RELEASE)

UPGRADE OUTFALL/NO CHANGE TO J-7 → J-5  
SURCHARGE

UPGRADE OUTFALL  
To 24"

**APPENDIX K**  
**OUTPUT: COMPARISON OF MAXIMUM WATER**  
**SURFACE ELEVATIONS IN THE EXISTING**  
**CONDITION VERSUS BASIN WITH ALC ON-LINE**  
**WITH  $Q < 0.67$  CFS**



EXISTING GDOTW (SEE APPENDIX A)

Poulsbo Place Division 8  
Assisted Living Center

Node Summary

Downstream Stormwater Backwater Analysis

SN Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1 Jun-01	Junction	-3.31	8.68	-3.31	8.68	0.00	21.92	7.95	0.00	0.73	0 00:00	0.00	0.00
2 Jun-04	Junction	6.48	10.97	6.48	10.97	0.00	12.40	9.80	0.00	1.17	0 00:00	0.00	0.00
3 Jun-06	Junction	8.73	17.99	8.73	17.99	0.00	14.09	14.45	0.00	3.54	0 00:00	0.00	0.00
4 Jun-07	Junction	9.82	18.20	9.82	18.20	0.00	11.79	15.92	0.00	2.28	0 00:00	0.00	0.00
5 Jun-08	Junction	11.34	18.22	11.34	18.22	0.00	11.51	17.28	0.00	0.94	0 00:00	0.00	0.00
6 Jun-09	Junction	14.27	21.03	14.27	21.03	0.00	11.51	20.02	0.00	1.01	0 00:00	0.00	0.00
7 Jun-10	Junction	14.34	21.61	14.34	21.61	0.00	10.33	21.61	0.00	1.01	0 08:00	0.21	16.00
8 Jun-11	Junction	27.16	33.84	27.16	33.84	0.00	9.44	28.11	0.00	5.73	0 00:00	0.00	0.00
9 Jun-12	Junction	32.09	44.85	32.09	44.85	0.00	6.85	32.91	0.00	11.94	0 00:00	0.00	0.00
10 Jun-13	Junction	32.55	45.00	32.55	45.00	0.00	1.42	32.97	0.00	12.03	0 00:00	0.00	0.00
11 Jun-14	Junction	38.81	49.11	38.81	49.11	0.00	1.42	40.23	0.00	8.88	0 00:00	0.00	0.00
12 Jun-15	Junction	8.90	15.15	8.90	15.15	0.00	4.74	10.87	0.00	4.28	0 00:00	0.00	0.00
13 Jun-16	Junction	2.04	11.00	2.04	11.00	0.00	9.59	8.13	0.00	2.87	0 00:00	0.00	0.00
14 Out-01	Outfall	-7.10					21.92	4.65					
15 Jun-05	Flow Diversions	7.95	15.30	7.95		0.00	15.36	11.92				0.00	0.00

23.04 AFTER  
ITERATIVELY RAISING  
RIM ELEVATION

BOSW w/ ALC INTO DETENTION AND Q ≤ 0.67 CFS (APPROX I)

Poulsbo Place Division 8

Assisted Living Center

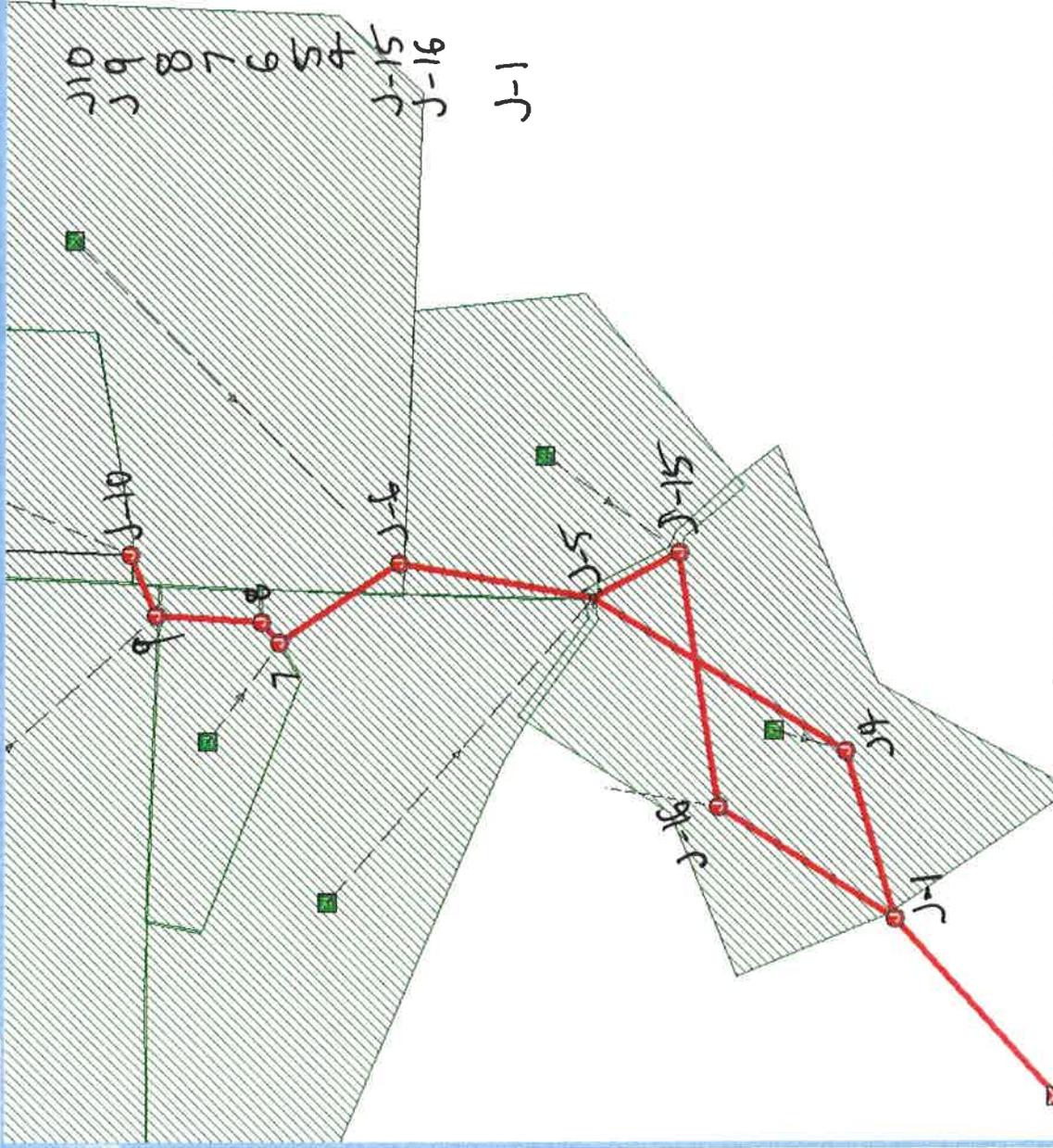
Downstream Stormwater Backwater Analysis

Node Summary

SN Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-01 Junction	-3.31	8.68	-3.31	8.68	0.00	21.92	7.94	0.00	0.74	0 00:00	0.00	0.00
2	Jun-04 Junction	6.48	10.97	6.48	10.97	0.00	12.38	9.78	0.00	1.19	0 00:00	0.00	0.00
3	Jun-06 Junction	8.73	17.99	8.73	17.99	0.00	14.08	14.43	0.00	3.56	0 00:00	0.00	0.00
4	Jun-07 Junction	9.82	18.20	9.82	18.20	0.00	11.64	15.91	0.00	2.29	0 00:00	0.00	0.00
5	Jun-08 Junction	11.34	18.22	11.34	18.22	0.00	11.36	17.27	0.00	0.95	0 00:00	0.00	0.00
6	Jun-09 Junction	14.27	21.03	14.27	21.03	0.00	11.37	20.01	0.00	1.02	0 00:00	0.00	0.00
7	Jun-10 Junction	14.34	21.61	14.34	21.61	0.00	9.19	21.61	0.00	0.00	0 08:00	0.00	1.00
8	Jun-11 Junction	27.16	33.84	27.16	33.84	0.00	8.28	27.99	0.00	5.85	0 00:00	0.00	0.00
9	Jun-12 Junction	32.09	44.85	32.09	44.85	0.00	5.68	32.81	0.00	12.04	0 00:00	0.00	0.00
10	Jun-13 Junction	32.55	45.00	32.55	45.00	0.00	0.68	32.81	0.00	12.19	0 00:00	0.00	0.00
11	Jun-14 Junction	38.81	49.11	38.81	49.11	0.00	0.67	40.13	0.00	8.98	0 00:00	0.00	0.00
12	Jun-15 Junction	8.90	15.15	8.90	15.15	0.00	4.65	10.85	0.00	4.30	0 00:00	0.00	0.00
13	Jun-16 Junction	2.04	11.00	2.04	11.00	0.00	9.58	8.12	0.00	2.88	0 00:00	0.00	0.00
14	Out-01 Outfall	-7.10					21.92	4.65					
15	Jun-05 Flow Diversions	7.95	15.30	7.95		0.00	15.35	11.89				0.00	0.00

MAX. WATER LEVELS

EXISTING	PPZ ALL W/ DETENTION
23.04	21.61
20.02	20.01
17.28	17.27
15.92	15.91
14.45	14.43
11.92	11.89
9.80	9.78
10.87	10.85
8.13	8.12
7.95	7.94

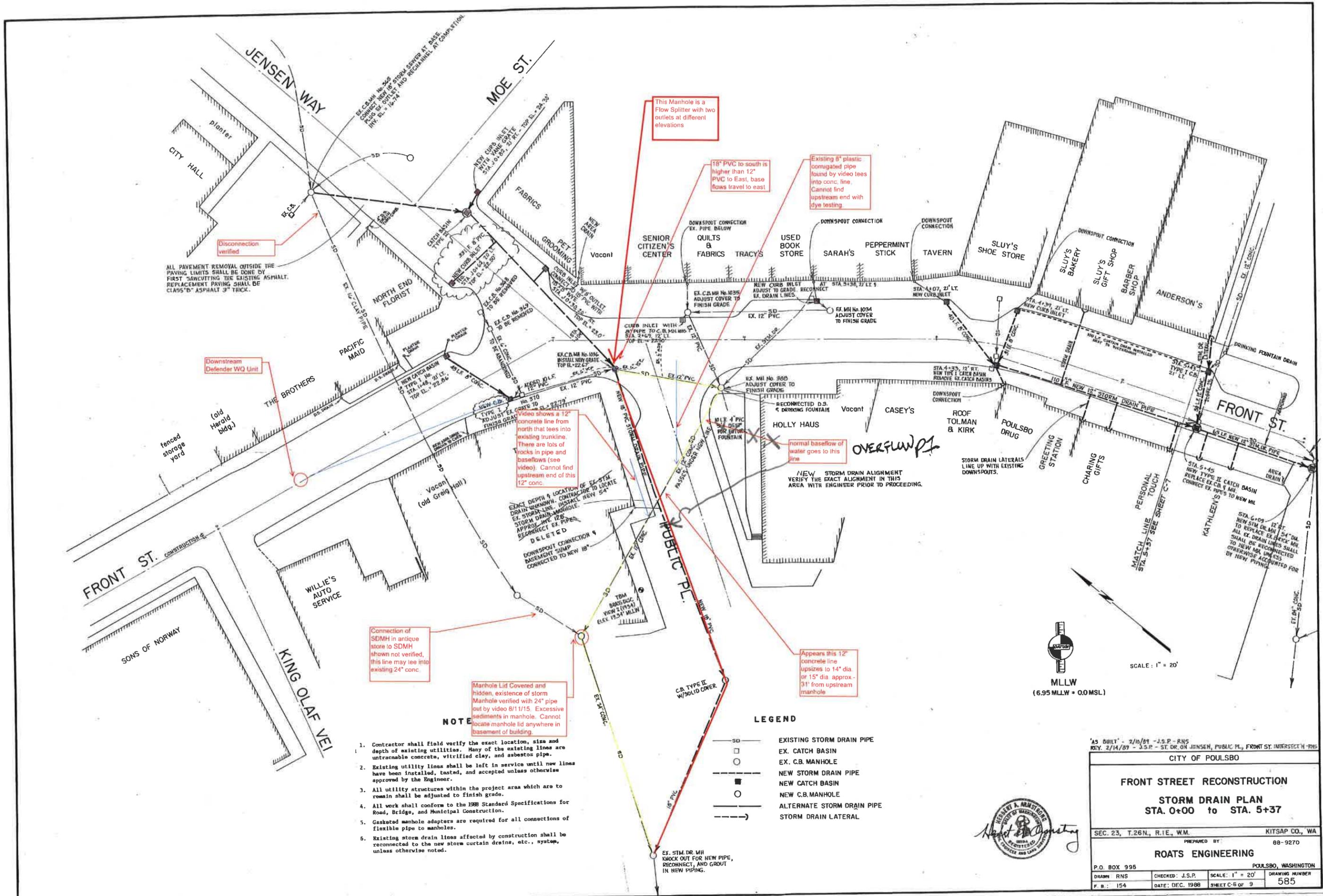


CUTFALL AT MAXIMUM 4.65 MSL

JUNCTION MAX. WATER ELEVATIONS EXISTING VS. WITH PPZ ALL W/ DETENTION

**APPENDIX L**  
**AS-BUILT INFORMATION/OTHER REFERENCE**  
**INFORMATION**





ALL PAVEMENT REMOVAL OUTSIDE THE PAVING LIMITS SHALL BE DONE BY FIRST SAWCUTTING THE EXISTING ASPHALT. REPLACEMENT PAVING SHALL BE CLASS "B" ASPHALT 3" THICK.

Disconnection verified

Downstream Defender WQ Unit

Video shows a 12" concrete line from north that tees into existing trunkline. There are lots of rocks in pipe and baseflows (see video). Cannot find upstream end of this 12" conc.

Connection of SDMH in antique store to SDMH shown not verified, this line may tee into existing 24" conc.

Manhole Lid Covered and hidden, existence of storm Manhole verified with 24" pipe out by video 8/11/15. Excessive sediments in manhole. Cannot locate manhole lid anywhere in basement of building.

This Manhole is a Flow Splitter with two outlets at different elevations

18" PVC to south is higher than 12" PVC to East, base flows travel to east

Existing 6" plastic corrugated pipe found by video tees into conc. line. Cannot find upstream end with dye testing

normal baseflow of water goes to this line

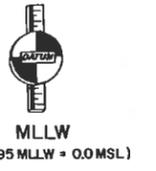
Appears this 12" concrete line upsizes to 14" dia. or 15" dia. approx. 31' from upstream manhole

NEW STORM DRAIN ALIGNMENT VERIFY THE EXACT ALIGNMENT IN THIS AREA WITH ENGINEER PRIOR TO PROCEEDING.

OVERFLOW PT

- NOTE**
- Contractor shall field verify the exact location, size and depth of existing utilities. Many of the existing lines are untraceable concrete, vitrified clay, and asbestos pipe.
  - Existing utility lines shall be left in service until new lines have been installed, tested, and accepted unless otherwise approved by the Engineer.
  - All utility structures within the project area which are to remain shall be adjusted to finish grade.
  - All work shall conform to the 1988 Standard Specifications for Road, Bridge, and Municipal Construction.
  - Gasketed manhole adapters are required for all connections of flexible pipe to manholes.
  - Existing storm drain lines affected by construction shall be reconnected to the new storm curtain drains, etc., system, unless otherwise noted.

- LEGEND**
- SD — EXISTING STORM DRAIN PIPE
  - — EX. CATCH BASIN
  - — EX. C.B. MANHOLE
  - — — — NEW STORM DRAIN PIPE
  - — NEW CATCH BASIN
  - — NEW C.B. MANHOLE
  - — — — ALTERNATE STORM DRAIN PIPE
  - — — — STORM DRAIN LATERAL



'AS BUILT' - 2/18/81 - J.S.P. - RNS  
 REV. 2/14/89 - J.S.P. - ST. DR. ON JENSEN, PUBLIC PL., FRONT ST. INTERSECT'N PHS

CITY OF POULSBORO

**FRONT STREET RECONSTRUCTION**  
**STORM DRAIN PLAN**  
**STA. 0+00 to STA. 5+37**

SEC. 23, T.26N., R.1E., W.M. KITSAP CO., WA  
 PREPARED BY: 88-9270

**ROATS ENGINEERING**

P.O. BOX 995 POULSBORO, WASHINGTON  
 DRAWN: RNS CHECKED: J.S.P. SCALE: 1" = 20' DRAWING NUMBER  
 F. B.: 154 DATE: DEC. 1988 SHEET C-6 OF 9 585





# JENSEN WAY N.E.

A PORTION OF SECTION 23, TOWNSHIP 26 NORTH, RANGE 1 EAST, W.M.  
POULSBORO, WASHINGTON

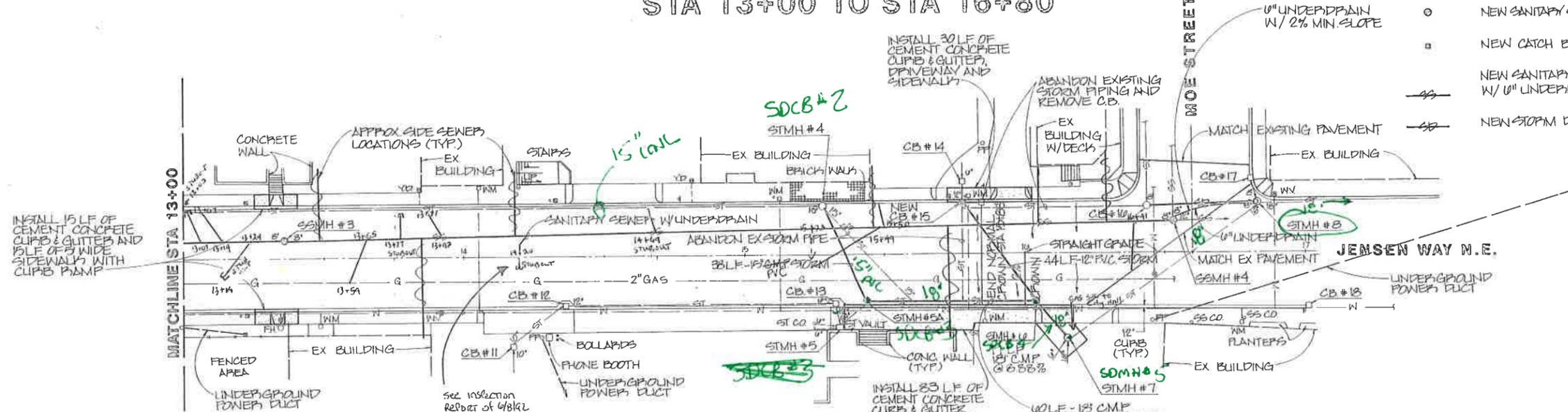
## IVERSON STREET N.E. TO MOE STREET N.E.

### ROAD, STORM AND SANITARY SEWER PLAN/PROFILE

#### STA 13+00 TO STA 16+80

### LEGEND

- ASPHALT CONCRETE PAVEMENT CLASS 1B WITH SURFACING
- MANULITHIC CURBS AND GUTTER W/ SIDEWALK OR DRIVEWAY
- NEW SANITARY SEWER MANHOLE
- NEW CATCH BASIN
- NEW SANITARY SEWER MAIN W/ 6" UNDERDRAIN
- NEW STORM DRAINAGE PIPE



INSTALL 15 LF OF CEMENT CONCRETE CURBS & GUTTER AND 15 LF OF 3' WIDE SIDEWALK WITH CURB PAMP

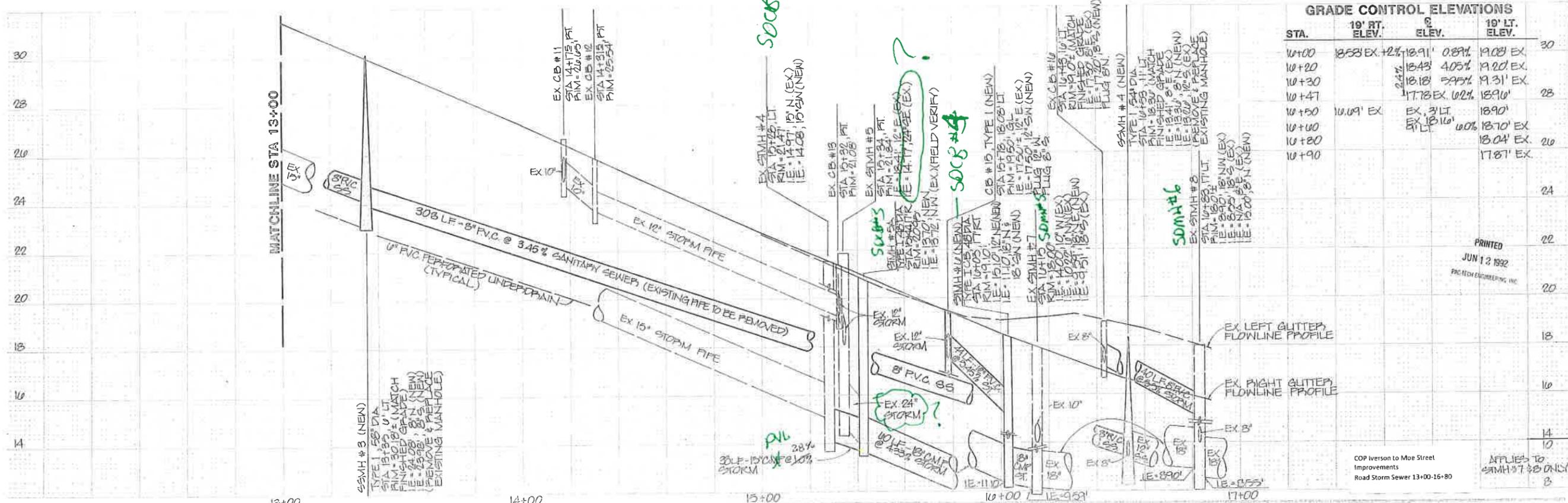
INSTALL 30 LF OF CEMENT CONCRETE CURBS & GUTTER, DRIVEWAY AND SIDEWALK

ABANDON EXISTING STORM PIPING AND REMOVE C.B.

6" UNDERDRAIN W/ 2% MIN. SLOPE

JENSEN WAY N.E.

THE LOCATION OF APPROX 13 EXISTING SIDE SEWER CONNECTIONS IS UNKNOWN. THE CONTRACTOR SHALL IDENTIFY ALL SIDE SEWER LOCATIONS BY DISTANCE FROM DOWNSTREAM MANHOLE TO NEAREST OS AND SHALL PROVIDE DIAMETER AND DIRECTION OF PIPE.



GRADE CONTROL ELEVATIONS				
STA.	19' RT. ELEV.	6' ELEV.	19' LT. ELEV.	
13+00	1858' EX. +2%	1891'	0.89%	1908' EX. 30
13+20		1843'	4.05%	1920' EX.
13+30		1818'	5.95%	1931' EX.
13+47		1778' EX. 0.2%		1890'
13+50	16.09' EX.	EX. 3' LT.		1890'
13+60		EX. 18' 10' 4' LT.	0.0%	1870' EX.
13+80				1804' EX. 210
13+90				1787' EX.



TITLE: JENSEN WAY N.E. IVERSON STREET N.E. TO MOE STREET N.E. ROAD, STORM AND SANITARY SEWER PLAN/PROFILE STA 13+00 TO STA 16+80

CLIENT: CITY OF POULSBORO  
POULSBORO WA 98370  
200-714-4078

PAC-TECH ENGINEERING, INC.  
Engineers / Planners / Surveyors

PRINTED JUN 12 1992  
PAC-TECH ENGINEERING, INC.



COP Iverson to Moe Street Improvements  
Road Storm Sewer 13+00-16+80

APPLIED TO SMH #7 & 8 ONLY

SHEET 5 OF 7  
JUN 20 1992

**APPENDIX M**  
**TECHNICAL MEMORANDUM**  
**SIZING UNDERGROUND**  
**CONCRETE VAULT**





P.O. Box 720 • 11309 Clear Creek Road N.W.  
Silverdale, Washington 98383  
Silverdale (360) 692-5525 • Seattle (206) 682-5574  
Fax (360) 698-0546

Engineering • Surveying • Planning

## TECHNICAL MEMORANDUM APRIL 27, 2016

FROM: Pat Fuhrer, P.E.

RE: Poulsbo Place 2, Division 8  
Assisted Living Facility Master Plan Amendment

The current revision to the Site Plan proposes a lower parking garage access, which will require lower final grade elevations in the parking area off of Jensen Way NE. A 96" diameter detention pipe manifold was previously proposed and calculations included in the PDSR submitted with the Master Plan Amendment.

With the lower parking area finish grades, there is about 54" of working detention volume height available above the 6" of dead storage. As such, an underground concrete vault would likely prove to be more cost-effective than a smaller-diameter pipe manifold.

Attached please find the stage-storage-discharge calculations for an 80'x20'x4.5' live storage vault volume, over 6" of dead storage. The release rate is fixed at less than 0.67 cfs to mitigate downstream capacity limitations as discussed in the PDSR submitted for this project.

Final dimensioning of the tank will occur at the time of final construction design and permitting.

Enclosures  
KPF:lrs  
#5987.00



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 04 / 25 / 2016

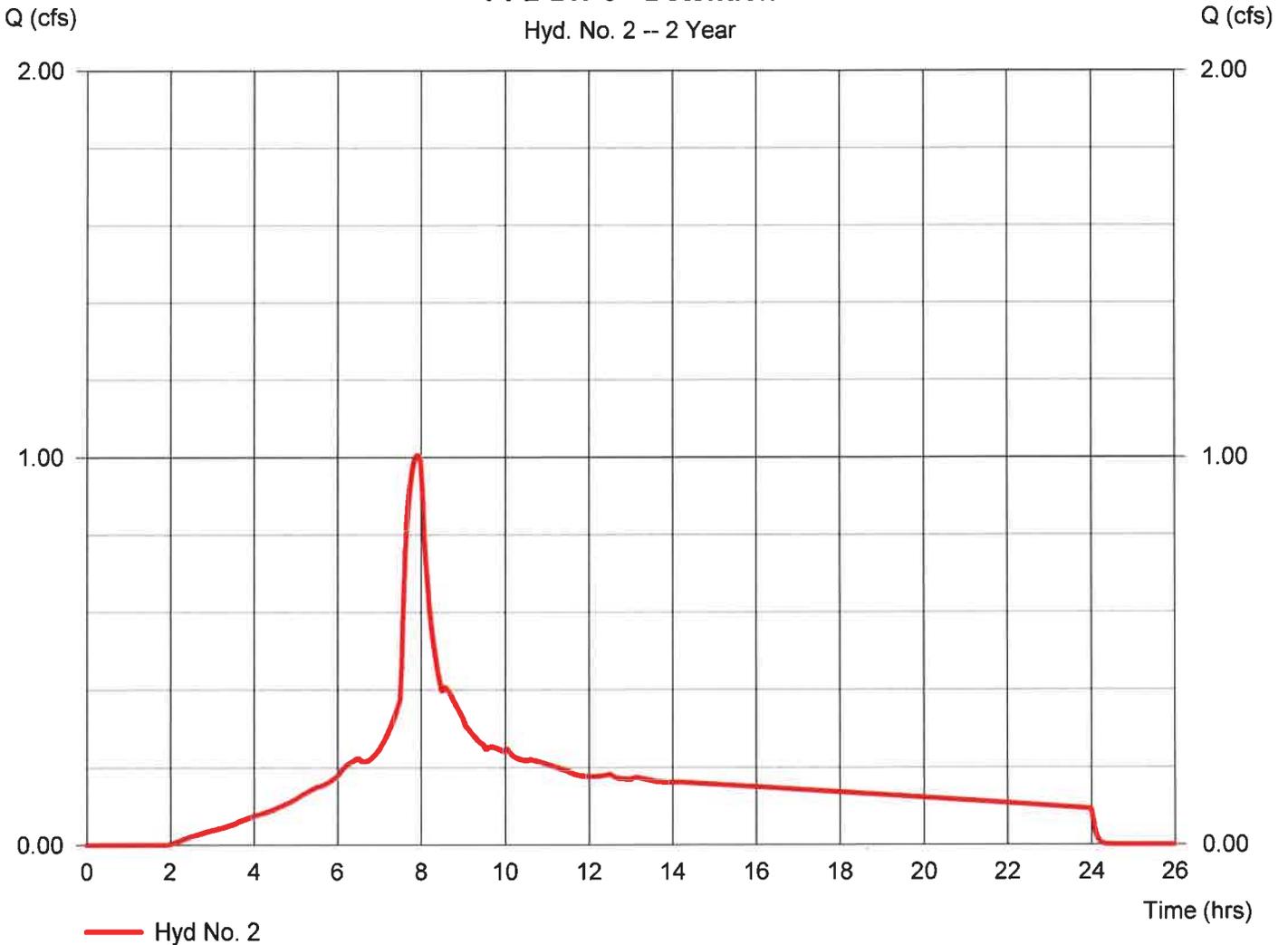
## Hyd. No. 2

PP2-Div 8 - Detention

Hydrograph type	= SBUH Runoff	Peak discharge	= 1.005 cfs
Storm frequency	= 2 yrs	Time to peak	= 7.90 hrs
Time interval	= 2 min	Hyd. volume	= 14,115 cuft
Drainage area	= 2.197 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

### PP2-Div 8 - Detention

Hyd. No. 2 -- 2 Year



# Hydrograph Report

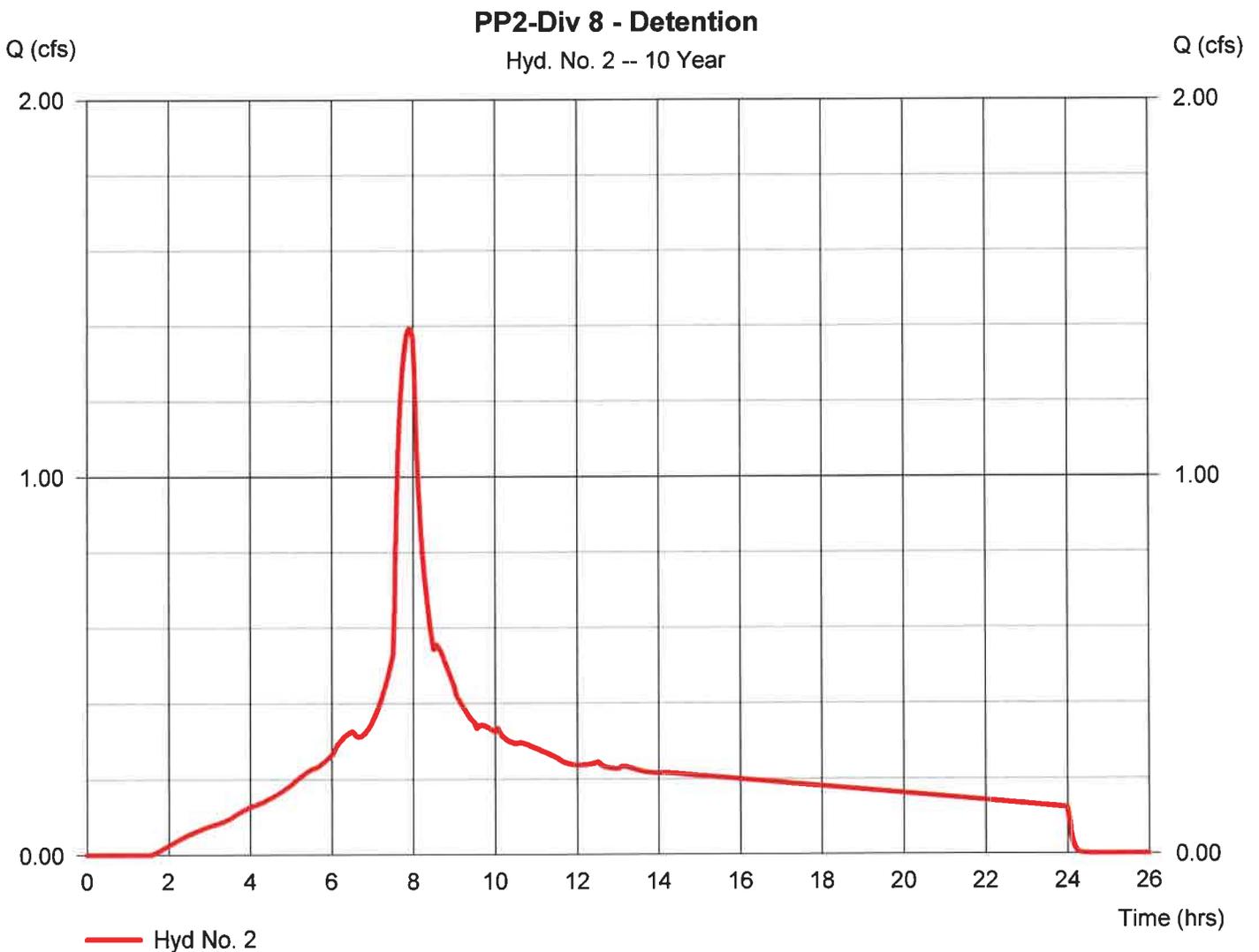
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 04 / 25 / 2016

## Hyd. No. 2

### PP2-Div 8 - Detention

Hydrograph type	= SBUH Runoff	Peak discharge	= 1.392 cfs
Storm frequency	= 10 yrs	Time to peak	= 7.90 hrs
Time interval	= 2 min	Hyd. volume	= 19,530 cuft
Drainage area	= 2.197 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



# Hydrograph Report

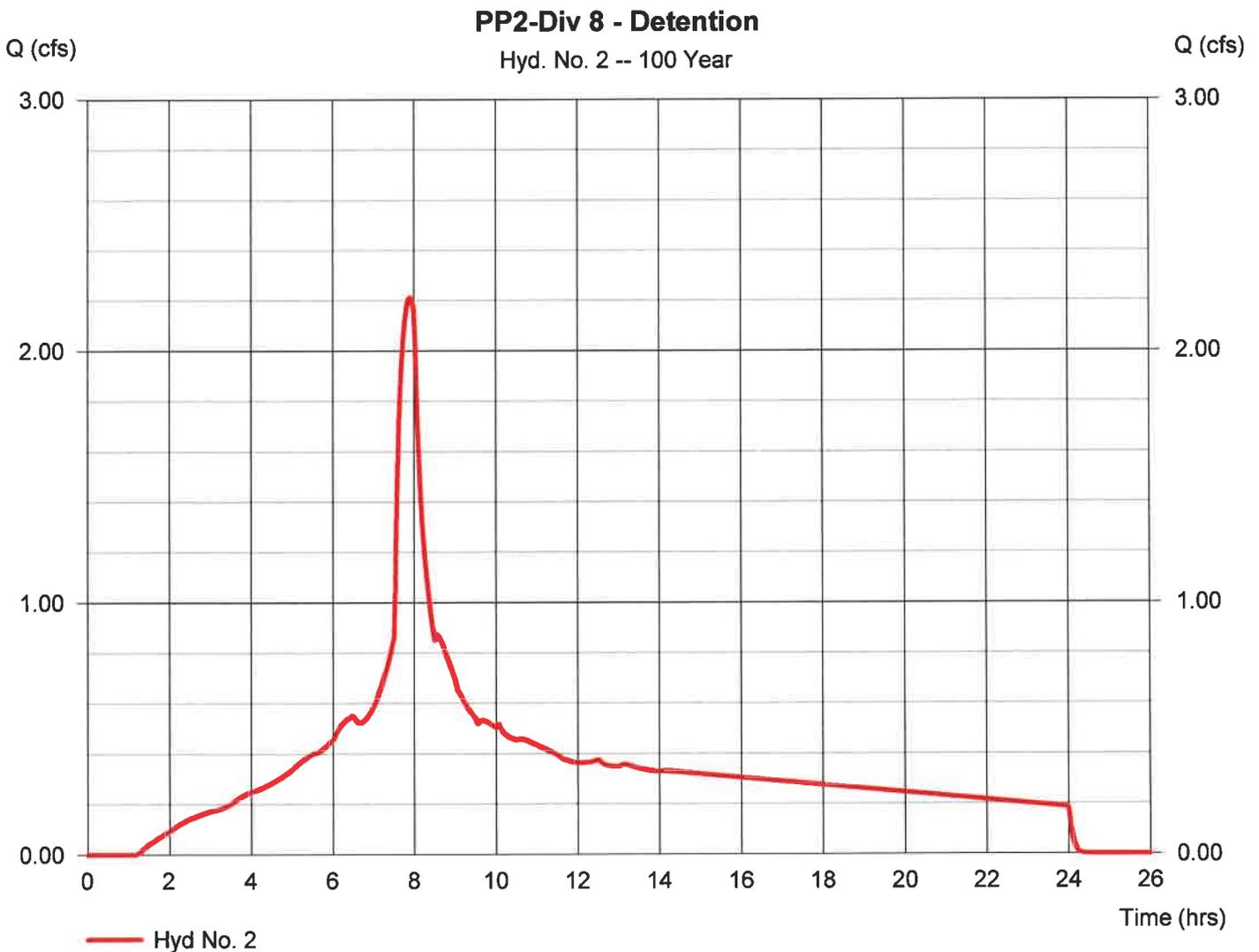
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 04 / 25 / 2016

## Hyd. No. 2

### PP2-Div 8 - Detention

Hydrograph type	= SBUH Runoff	Peak discharge	= 2.213 cfs
Storm frequency	= 100 yrs	Time to peak	= 7.90 hrs
Time interval	= 2 min	Hyd. volume	= 31,293 cuft
Drainage area	= 2.197 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



# Pond Report

## Pond No. 2 - VAULT

### Pond Data

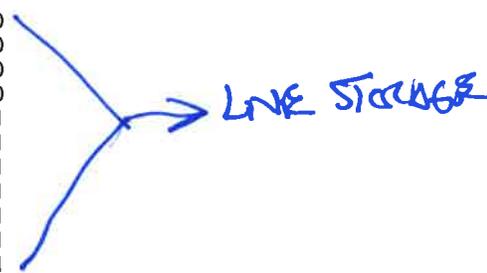
UG Chambers -Invert elev. = 43.50 ft, Rise x Span = 4.50 x 20.00 ft, Barrel Len = 80.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

### Stage / Storage Table

*IR AT STREET = +/- 42.0*

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	43.50	n/a	0	0
0.45	43.95	n/a	720	720
0.90	44.40	n/a	720	1,440
1.35	44.85	n/a	720	2,160
1.80	45.30	n/a	720	2,881
2.25	45.75	n/a	720	3,601
2.70	46.20	n/a	720	4,321
3.15	46.65	n/a	720	5,041
3.60	47.10	n/a	720	5,761
4.05	47.55	n/a	720	6,481
4.50	48.00	n/a	720	7,201

*4.3 - DEAD STORAGE, BOTTOM OF VAULT*



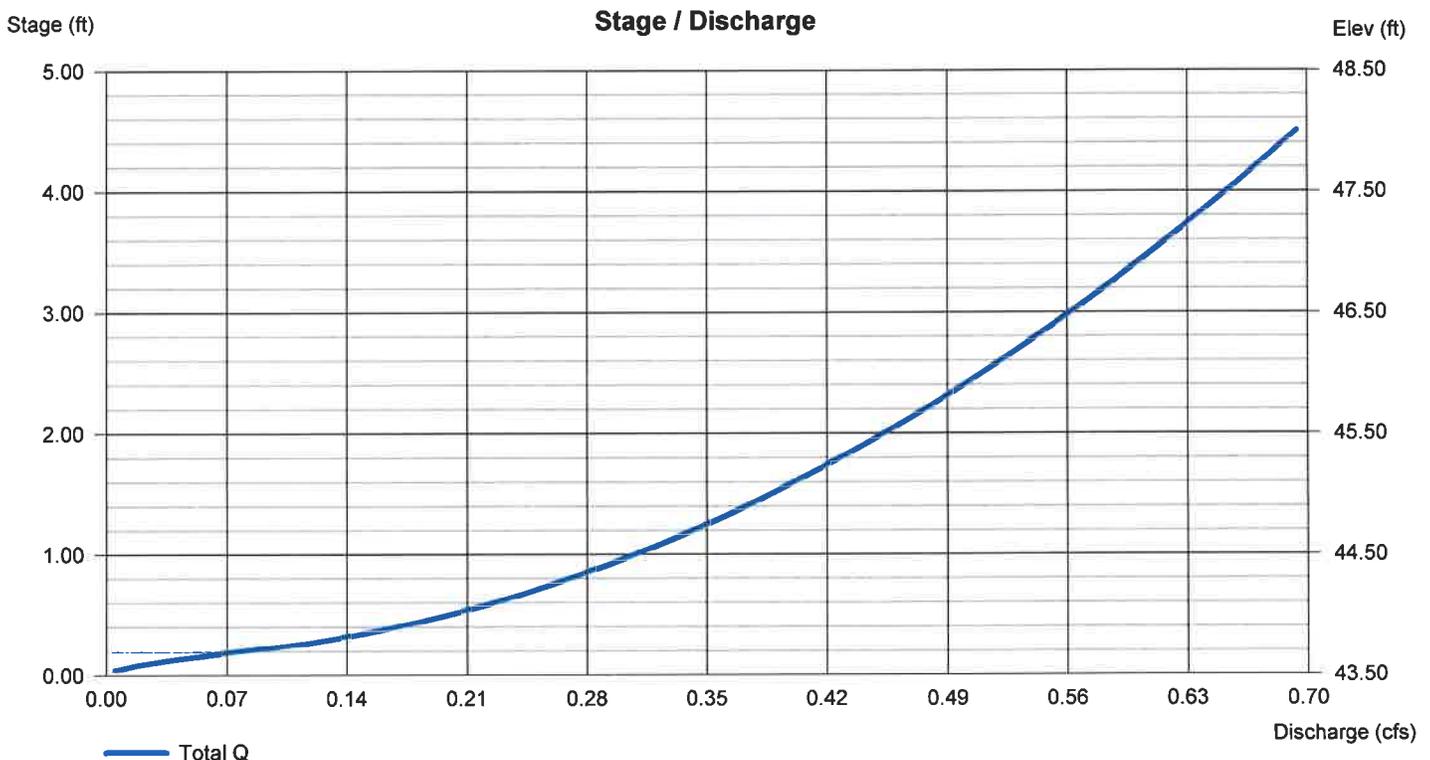
### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	3.50	Inactive	Inactive
Span (in)	= 0.00	3.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 0.00	43.50	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.62	0.60	0.60
Multi-Stage	= n/a	No	No	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	Inactive	Inactive	Inactive	Inactive
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s)



# Hydrograph Report

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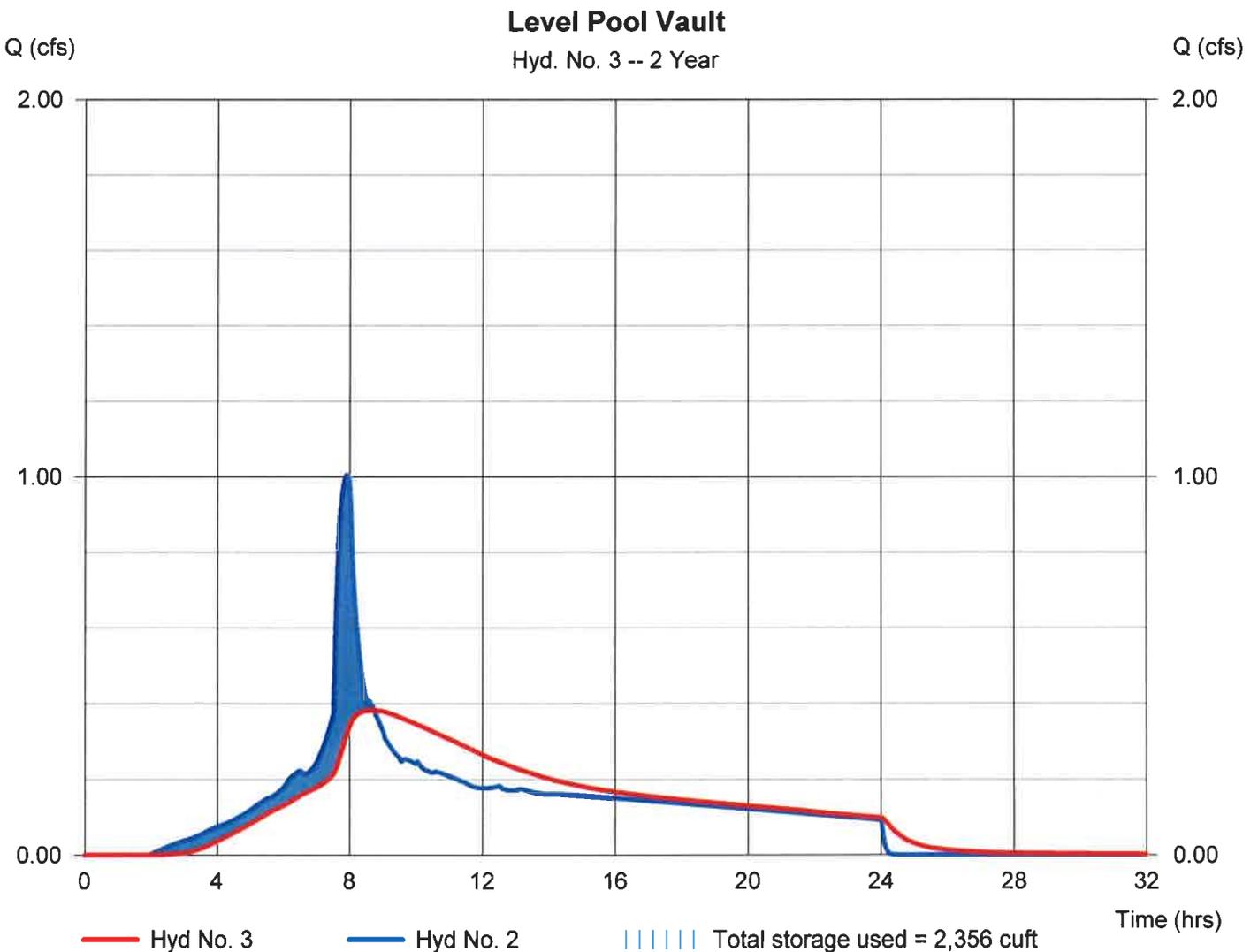
Monday, 04 / 25 / 2016

## Hyd. No. 3

### Level Pool Vault

Hydrograph type	= Reservoir	Peak discharge	= 0.383 cfs ✓
Storm frequency	= 2 yrs ←	Time to peak	= 8.73 hrs
Time interval	= 2 min	Hyd. volume	= 14,100 cuft
Inflow hyd. No.	= 2 - PP2-Div 8 - Detention	Max. Elevation	= 44.97 ft
Reservoir name	= VAULT	Max. Storage	= 2,356 cuft

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

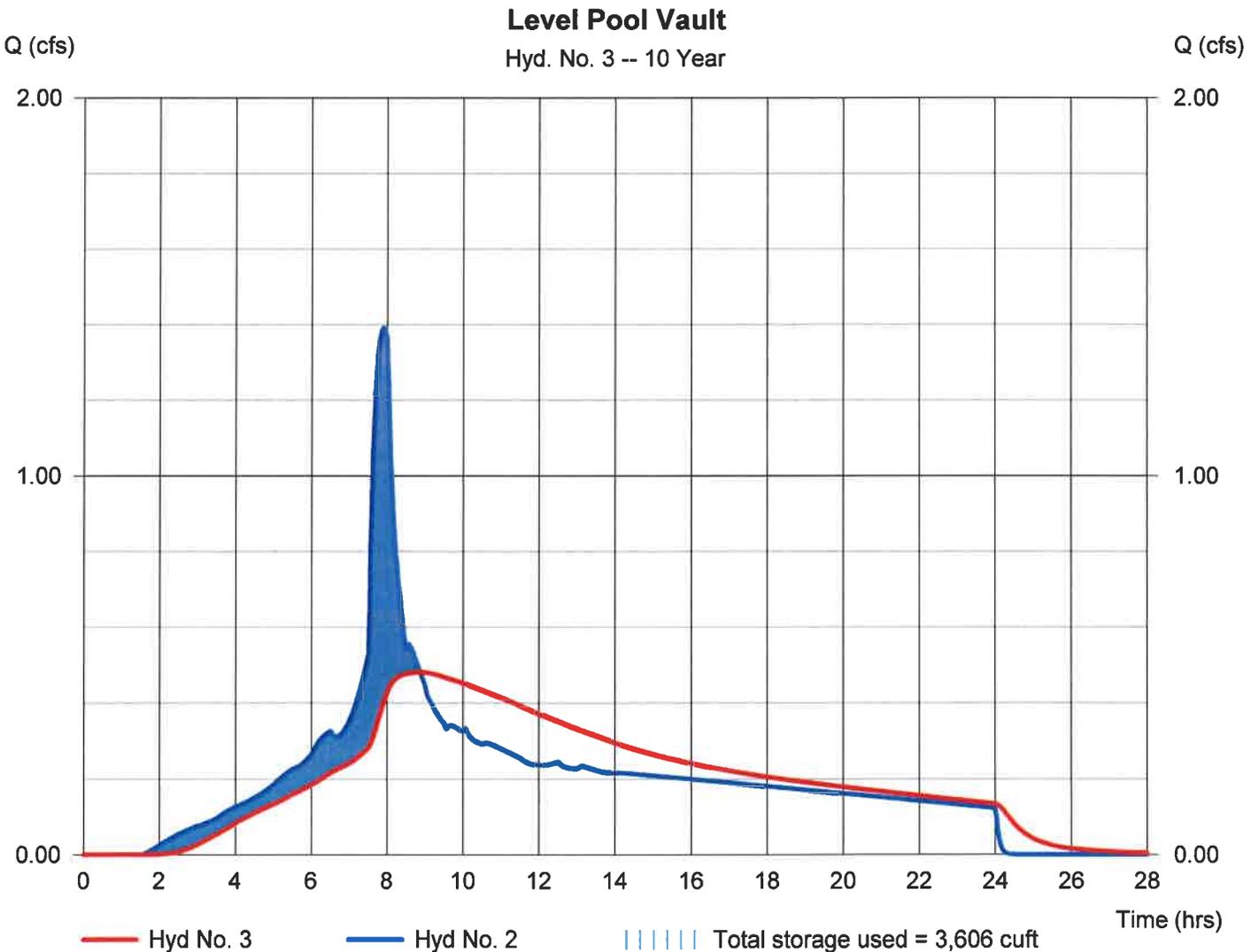
Monday, 04 / 25 / 2016

## Hyd. No. 3

Level Pool Vault

Hydrograph type	= Reservoir	Peak discharge	= 0.483 cfs ✓
Storm frequency	= 10 yrs ←	Time to peak	= 8.87 hrs
Time interval	= 2 min	Hyd. volume	= 19,515 cuft
Inflow hyd. No.	= 2 - PP2-Div 8 - Detention	Max. Elevation	= 45.75 ft
Reservoir name	= VAULT	Max. Storage	= 3,606 cuft

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 04 / 25 / 2016

## Hyd. No. 3

### Level Pool Vault

Hydrograph type	= Reservoir	Peak discharge	= 0.668 cfs ✓
Storm frequency	= 100 yrs ←	Time to peak	= 9.03 hrs
Time interval	= 2 min	Hyd. volume	= 31,278 cuft
Inflow hyd. No.	= 2 - PP2-Div 8 - Detention	Max. Elevation	= 47.69 ft (2" of cover 2 min) ✓
Reservoir name	= VAULT	Max. Storage	= 6,701 cuft

Storage Indication method used.

