*Final Report for:*

# KNEEHILL COUNTY

## HAMLET OF HUXLEY
## WASTEWATER STUDY TM-01


*Prepared by:*
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Date: March 18, 2024
Project #: 4290-021-00

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Kneehill County
1600 – 2 Street NE
Three Hills, AB
T0M 2A0

March 18, 2024
File: N:\4290\021-00\TM01-1.0.R2

**Attention: John McKiernan**
**Manager of Environmental Services**

Dear Mr. McKiernan:

**Re: Kneehill County – Hamlet of Huxley Wastewater Study TM-01**

We are pleased to submit the above-noted final report. We thank you for the opportunity to be of service and to have prepared this report on your behalf. We look forward to assisting you in implementing the recommendations within the report.

If you have any inquiries regarding our report or if clarification is required, please contact the undersigned at 403-219-6307.

Yours truly,

**MPE a division of Englobe**

Kim Schurtz, B.A., P.Tech.(Eng.)
Project Manager

KS/akk
Enclosure

**CORPORATE AUTHORIZATION**

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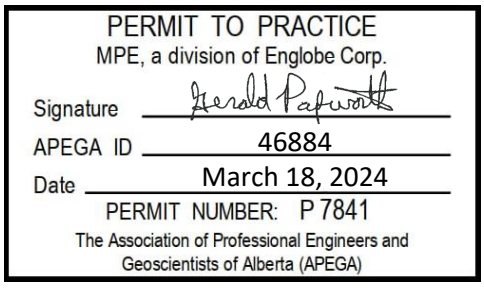
Should any questions arise regarding content of this report, please contact the undersigned.

**MPE a division of Englobe**

Prepared by:


Kim Schurtz, B.A., P.Tech.(Eng.)

Professional Seal

Corporate Permit

## EXECUTIVE SUMMARY

### Project Overview

Kneehill County (County) retained MPE a division of Englobe (MPE) to complete an assessment of the Hamlet of Huxley's (Hamlet) low pressure wastewater collection system. The scope of work and assessment consisted of the following core components:

- Collect data and review of existing record drawings, equipment specifications, equipment manuals, WWTP operational data, laboratory test results, etc.
- Evaluate sizing and capacity of low pressure wastewater collection system.
- Participate in public engagement and consultation of the Hamlet of Huxley residents.
- Develop a model of the existing low pressure wastewater collection system to assess the overall capabilities of the system and restriction any potential growth within the Hamlet.
- Develop upgrades options based on MPE's evaluation and modelling of the Hamlet's existing wastewater collection system.
- Identify alternative wastewater collection and treatment options in addition to reviewing upgrade options for the existing wastewater collection system.
- Develop Technical Memorandum 01 (TM-01) identifying all conceptual upgrade options for the Hamlet's wastewater collection system considered.

### Conclusions

Based on the assessment study completed for the Hamlet of Huxley, the following is a summary of the conclusions identified:

- A maximum of 10 pumps of 0.5 HP and 15 pumps of 0.375 HP should be pumping sewage into the forcemain at the same time for the system to operate without any issues.
- Ensure there is a check valve or backflow preventor installed in every household to prevent sewage backflow from the low pressure forcemain.
- Addition of manholes in the system for flushing the system would be beneficial; manholes installed complete with flushing connections added upstream of the system located at the east end of the system would be sufficient.

**Recommendations**

The following is a summary of the recommended improvements for the Hamlet of Huxley low pressure wastewater collection system:

- Standardize pump design for all lots in the Hamlet. This upgrade consists of standardizing all residential sewage pumps in the Hamlet with the same model. The standardized pump model would be 41 Orenco PF100511-20 pumps with 0.631 L/s and 0.5 HP. The cost to replace all 41 pumps would cost approximately **$351,600** (supply only); assume an additional 25% for installation. Standardized pump design will provide ease in operation and maintenance. Pump quotes and information can be found in ***Appendix C***.
- Kneehill County to obtain a third party to inspect the condition of each pump and septic tank. An inspection of the pumps and septic tanks could determine the problems that need to be addressed and provide information on the data for the existing system.
- Install flushing connections in the following locations:
    - East end of 1 Street N,
    - East end of Main Street,
    - East end of 1 Street S,
    - East end of 2 Street S,
    - South and north end of Queens Avenue.
- Each flushing connection would comprise of a manhole complete with a flush connection at the end of the forcemain. The cost of each flushing connection would be approximately **$14,000**.
- Ensure there is a check valve or backflow preventor installed in every household to prevent sewage backflow from the low pressure forcemain.
- Initiate a flushing regime to remove the blocked sewage inside the forcemain. A flushing mechanism would require adding flushing connections/manholes in the system.
- Upgrading the following section of forcemain to a 75 mm line would improve the flow and ease the system capacity:
    - 50 mm forcemain along Railway Avenue between Main Street and 1 Street N,
    - 50 mm forcemain on 1 Street N between Railway and Queens Avenue.

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# 1.0 INTRODUCTION

## 1.1 Study Background

Kneehill County (County) retained MPE a division of Englobe (MPE) to complete an assessment of the Hamlet of Huxley's (Hamlet) low pressure wastewater collection system. The scope of work and assessment consisted of the following core components:

- Collect data and review of existing record drawings, equipment specifications, equipment manuals, WWTP operational data, laboratory test results, etc.
- Evaluate sizing and capacity of low pressure wastewater collection system.
- Participate in public engagement and consultation of the Hamlet of Huxley residents.
- Develop a model of the existing low pressure wastewater collection system to assess the overall capabilities of the system and restriction any potential growth within the Hamlet.
- Develop upgrades options based on MPE's evaluation and modelling of the Hamlet's existing wastewater collection system.
- Identify alternative wastewater collection and treatment options in addition to reviewing upgrade options for the existing wastewater collection system.
- Develop Technical Memorandum 01 (TM-01) identifying all conceptual upgrade options for the Hamlet's wastewater collection system considered.

This document provides an analysis of the Hamlet of Huxley's low pressure wastewater collection system as well as upgrade options and costs.

# 2.0 GENERAL OVERVIEW

## 2.1 Location

The Hamlet of Huxley is located in Kneehill County and is located 550 m east of Highway 21, 11 km north of Trochu and 160 km northeast of Calgary. ***Figure 2.1*** illustrates the location plan of the Hamlet of Huxley.

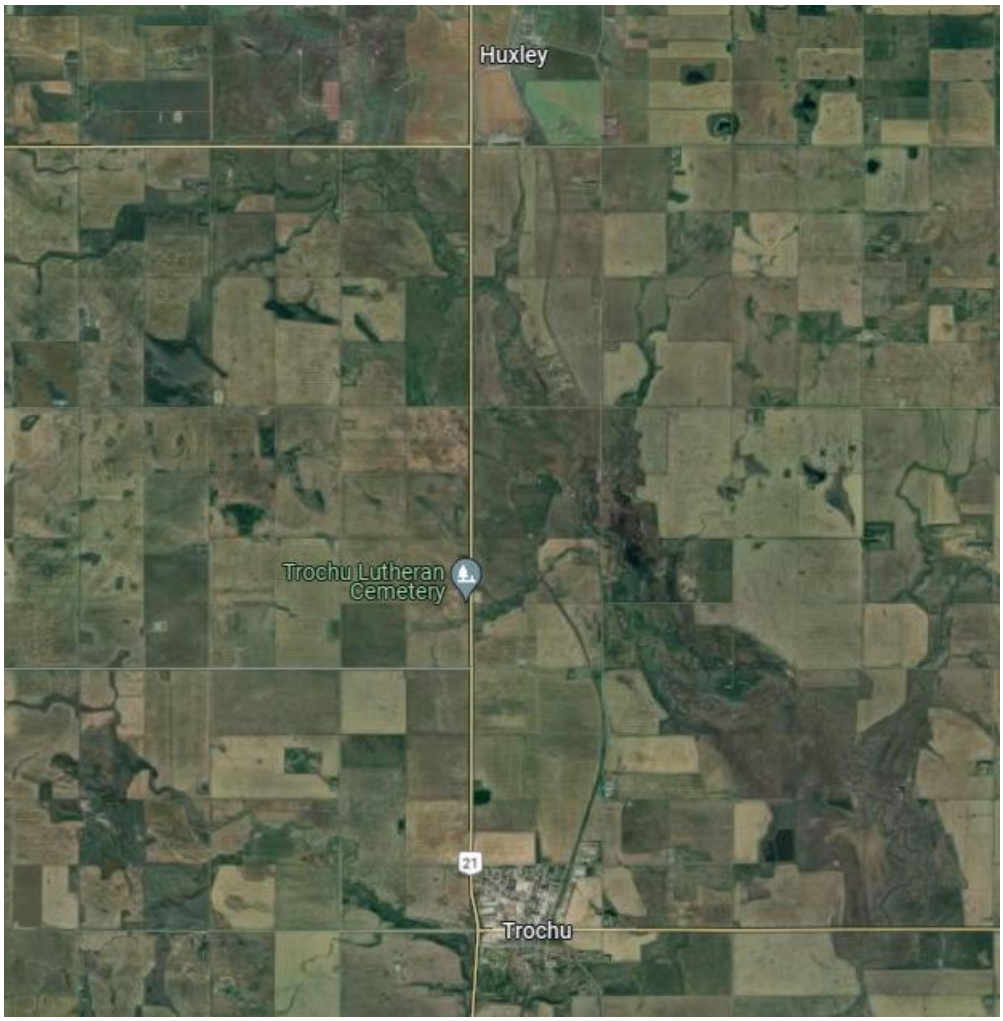


**Figure 2.1: Hamlet of Huxley**

## 2.2 General

The Hamlet's wastewater collection system consists of a low pressure forcemain ranging from 50 mm and 75 mm diameter high-density polyethylene (HDPE) pipe which conveys wastewater to a wastewater stabilization pond to the west of the Hamlet. Each service lot has a septic tank and a submersible effluent pump installed in the septic tank which pumps wastewater into the low pressure wastewater collection system.

# 3.0 REVIEW OF AVAILABLE INFORMATION

## 3.1 Record Drawings, Reports and Manuals

The following data, plans, reports, and manuals were compiled and reviewed for this report:

- Opus Stewart Weir Ltd. 2016. *Huxley Infrastructure Assessment* (Report Excerpt).
- WSP. Date Unknown. *Huxley Lagoon Upgrades* (Report Excerpt).
- EXH Engineering Services Ltd. 2016. *Sanitary Sewer System and Lagoon* – Figure 5.

## 3.2 Missing or Conflicting Data

MPE noted the following missing or conflicting data:

- No documentation, record drawings or specifications were available for the original construction of the low pressure wastewater collection system.
- Operation and maintenance information was not available from the original construction.
- Historical lab testing and flow data has not been made available for any time period.
- Capacity and design information for piping, septic tank submersible pumps and related equipment was not available.

# 4.0 REGULATORY REQUIREMENTS

## 4.1 General

The performance requirements of the existing low pressure sewage collection system are proposed based on regulatory requirements of the provincial government. The following section summarizes the review of regulatory requirements.

## 4.2 Regulatory Review

### *4.2.1 Standards and Guidelines*

The following standards and guidelines will be used to review the Hamlet's low pressure wastewater collection system as a minimum:

- *Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage*, Alberta Environment and Parks, 2013.
- *Wastewater Systems Standards for Performance and Design*, Alberta Environment and Parks, 2013.
- *Wastewater Systems Guidelines for Design, Operating and Monitoring*, Alberta Environment and Parks, 2013.

### *4.2.2 Environmental Protection and Enhancement Act Approval*

The Hamlets wastewater treatment system operates under a Code of Practice registration number 793-02-00 from Alberta Environmental and Protected Areas (APEA, formerly known as Alberta Environment and Parks) for Wastewater Systems Using a Wastewater Lagoon through the EPEA. The code of practice allows for operation of a low pressure wastewater collection system with treatment and discharge from the Hamlet's wastewater lagoon. ***Table 4.2.2*** provides a summary of the facility approval and registration.

**Table 4.2.2: Facility Code of Practice Summary**

| Municipality | Approval No. | Effective Date |
|---|---|---|
| Kneehill County | 793-01-00 (95-MUN-319) | June 15, 2004 |

All EPEA approvals and Codes of Practice contain conditions and requirements pertaining to:

- Construction.
- Management and operation.
- System classification and operator requirements.
- Sampling and monitoring.
- Monitoring and reporting.
- Record keeping.
- Effluent quality limits.

A copy of the AEPA Code of Practice registration number 793-02-00 can be found in ***Appendix A***.

# 5.0 SANITARY INFRASTRUCTURE

## 5.1 General

The sanitary sewer infrastructure in the Hamlet of Huxley consists of a low pressure forcemain which transfers the wastewater to a wastewater stabilization pond located approximately 400 m northwest from the residents. The Hamlet has a septic tank effluent pumping (STEP) system for wastewater collection where each service lot has a submersible pump installed in the septic tank which pumps wastewater into the low pressure wastewater collection system. The collection system was constructed in 1989 and consists of approximately 2.1 km of forcemain ranging in size from 50 mm diameter pipe to 75 mm diameter pipe. The network of pipes consists of HDPE pipe. The collection system has no manholes and does not have any flushing mechanisms installed.

## 5.2 Historical Data Review

### *5.2.1 Data Collection*

The Hamlet has not historically collected data on wastewater flows entering their wastewater collection and treatment system; therefore, wastewater flows have been determined based on a ratio of water usage per capita.

### *5.2.2 Historical Wastewater Flows*

The Hamlet does not record data on the wastewater flows entering the wastewater system. According to the *Huxley Infrastructure Assessment* report by Opus Stewart Weir Ltd., with an assumption of 2% annual growth rate, there would be 126 persons in Huxley by 2035. The wastewater flows have been estimated to be at a rate of 233 lpcd for the estimated population. For reference purposes, the 2021 population for the Hamlet is 75.

## 5.3 Current and Projected Wastewater Flows

Daily wastewater flows were determined using litre per capita day of 233 lpcd. Based on a current population of 75 and a projected 2035 population of 126, the current and projected wastewater flow rates are 17.5 $m^3$/day and 29.4 $m^3$/day, respectively.

### *5.3.1 Wastewater Production*

Future wastewater flows were calculated based on population projections noted previously. To account for the diurnal fluctuations in wastewater flows, maximum daily flows are calculated based on the peaking factor derived from the Harmon equation:

$$\text{Harmon's Peaking Factor} = 1 + 14 / (4 + P^{1/2})$$

Where: P = design contributing population in thousands

Assuming a population of 126 in 2035, the Harmon's Peaking Factor will be equal to 4.21, therefore the current and projected peak flows are 73.7 $m^3$/day and 123.7 $m^3$/day, respectively. Due to the collection system being comprised of a low pressure STEP system, there will be no surface inflow and infiltration into the sanitary collection system from wet weather conditions. Groundwater infiltration will be minimal as the system is comprised predominantly of HDPE pipe. Furthermore, it operates under positive pressure conditions when a resident's effluent pump is active. Therefore, inflow and infiltration has not been included in the current or projected flow and capacity calculations.

## 5.4 Alberta Environment Standards and Guidelines

As noted in **Section 4.2.1**, the Hamlet's low pressure wastewater collection system is governed under the *Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage*, Alberta Environment and Parks, 2013. The following information summarizes the standards and guidelines as they relate to the components of the low pressure wastewater collection system:

- Consideration should be given to the location of forcemains and their accessories to allow for operation and accessibility.
- Forcemains should be installed deep enough to avoid freezing and protection from heavy external loads.
- Piping should be sized to meet peak flows with velocities of 0.6 m/s to 3.0 m/s.
- A sufficient number of air release valves should be installed at appropriate points in the forcemain to prevent hydraulic problems.

## 5.5 Sanitary Infrastructure Assessment

### *5.5.1 Sanitary Collection System*

#### *5.5.1.1 Existing Collection System*

The Hamlet of Huxley uses a STEP system for its wastewater collection system. Wastewater is pumped by individual pumps at each household through low pressure forcemains to the existing lagoon system located 400 m northwest of the community.

The sanitary collection network consists of 2.1 km of forcemain sewer piping ranging from 50 mm to 75 mm diameter pipe. The network of forcemains consists of HDPE. Physical data for the sanitary collection system was obtained from record drawings. In general, the collection system has adequate capacity to carry current Average Dry Weather Flow (ADWF) and Peak Wet Weather Flow (PWWF) only when a maximum of 10 pumps are running at the same time. Additional analysis for the pump modelling can be found in the following sections. A summary of the collection system is presented in ***Table 5.5.1.1***.

**Table 5.5.1.1: Sanitary Main Summary**

| Year | Material | Diameter (mm) | Length (m) |
|---|---|---|---|
| 1989 | HDPE | 50 | 1,720 |
| 1989 | HDPE | 75 | 400 |

The existing wastewater collection system is illustrated in ***Figure 5.1***.

LAGOON DISCHARGE

LAGOON INLET MANHOLE

LOW PRESSURE SEWER LINE TO LAGOON

3" SAN. HDPE

3" SAN. HDPE

SEWAGE LAGOON SITE

NW17 34-23-4

300m DEVELOPMENT SETBACK FROM WASTEWATER LAGOON

CANADIAN NATIONAL RAILWAY

HUXLEY

2 ST N

2" SAN. HDPE

I ST N

2" SAN. HDPE

RAILWAY AVE

2" SAN. HDPE

QUEENS AVE

2" SAN. HDPE

MAIN ST

2" SAN. HDPE

KINGS AVE

2" SAN. HDPE

I ST S

2" SAN. HDPE

2" SAN. HDPE

2" SAN. HDPE

2 ST S

2" SAN. HDPE

2" SAN. HDPE

NE17 34-

NW17 34-23-4

NE17 34

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EXH Engineering Services Ltd.

project
KNEEHILL COUNTY
WATER AND WASTEWATER SYSTEMS STUDY
HAMLET OF HUXLEY
SANITARY SEWER SYSTEM AND LAGOON

| | | | |
|---|---|---|---|
| designed | scale N.T.S | date AUG 2006 | |
| drawn ML. | project no. 1006099 | contract no. | |
| checked JH | drawing no. FIGURE 6 | rev. | |
| approved | | | |

#### *5.5.1.2 Wastewater Collection System Modeling*

After determining the peak design flow, Bentley SewerCAD modelling software was selected for hydraulic analysis. A total of 41 services were modelled. The service lots were identified based on a combination of the Huxley map from Google Earth Pro and the existing sanitary collection system (***Figure 5.1***). Each lot has a wet well and a submersible pump. The pump and wet well for each lot are connected by a 500 mm pressure pipe in the model to simulate that the pump is submerged in the wet well and to ensure there are negligible friction losses during computation. Individual lots, including pumps, tanks, and services, were not explicitly modelled. Each lot has been modelled to attach to a separate junction/node in the sewer system. The design flows, along with a standard 0.631 L/s (10 gpm) pump for each lot were used, assuming Orenco STEP systems would be utilized for on-lot servicing. The County provided GIS data of the elevations and the junctions were updated with the elevations based on interpolated values. A copy of the GIS data and modelling results can be found in ***Appendix B***.

Five different design options were considered in designing the low pressure system:

- 5 connections serviced.
- 10 connections serviced.
- 15 connections serviced.
- 20 connections serviced.
- 25 connections serviced.

The various scenarios mentioned above were created separately and the results of each scenario can be found in ***Appendix B***. A specific number of pumps were switched on for each scenario and computed for results. The pumps that were switched on for the scenarios were chosen at random over the modelled region. Two different pumps were used to run the scenarios, one with a standard 0.5 HP pump and another with a smaller 0.375 HP pump. Each scenario was monitored based on an important junction (J-3) and pressure pipe (P-3) located at the northwest corner of the Hamlet. This junction and pipe were crucial, since all the sewage that is collected from the Hamlet converges at this junction and starts to flow towards the lagoon. Modelled data for each scenario at junction (J-3) and pipe (P-3) are mentioned in ***Table 5.5.1.2a*** and ***Table 5.5.1.2b.***

In scenario 1, five (5) pumps with 0.5 HP were modelled to be running at the same time to pump the sewage into the system. The system performed ideally at this situation with a velocity of 2.53 m/s and a pressure of 21 psi at J-3 and P-3, respectively. The rest of the system works well with a maximum pressure of 31 psi. In scenario 2, 10 pumps with 0.5 HP were switched on to run simultaneously. The model begins to reach its capacity with P-3 having a velocity of 3.64 m/s and J-3 with a moderate pressure of 50 psi. The maximum pressure in the model for 10 pumps switched on is 71 psi. Based on these results, a maximum of 10 pumps should pump sewage into the forcemain for the system to operate without any issues. As the number of active pumps increases, the velocity, flow, and pressure gradually increase in the system. When 25 pumps are running, velocity at P-3 reaches 4.4 m/s and the maximum pressure in the system peaks at 101 psi.

**Table 5.5.1.2a: Flow, Pressure and Velocity at Crucial Junction - 0.5 HP Pump**

| Scenario | Velocity (m/s) Pipe P-3 | Flow (m/s) Pipe P-3 | Pressure (m/s) Junction P-3 |
|---|---|---|---|
| 5 pumps on | 2.53 | 4.71 | 21 |
| 10 pumps on | 3.64 | 6.78 | 50 |
| 15 pumps on | 4.13 | 7.69 | 66 |
| 20 pumps on | 4.27 | 7.95 | 71 |
| 25 pumps on | 4.4 | 8.19 | 75 |

Since only a maximum of 10 pumps with 0.5 HP were recommended to pump sewage into the system, a smaller pump with 0.375 HP could permit an increase the number of active pumps in the system. The model was then updated with a smaller pump. The results summarized in ***Table 5.5.1.2b*** indicate that the system reaches its capacity when 15 pumps are running simultaneously with P-3 having a velocity of 3.57 m/s and J-3 with a pressure of 48 psi. Running 20 or 25 pumps further increases the velocity and pressure, which is not recommended. An additional five pumps can pump sewage into the system when a smaller pump is utilized. However, with a smaller pump the total head (m) decreases as the flow has to be constant to be able to pump sewage and empty the septic tank. The 0.375 HP pump has lesser head compared to a 0.5 HP pump. If the pump cannot overcome the required head elevation (m) then the sewage will not be pumped into the forcemain leading to overflow in the septic tanks.

**Table 5.5.1.2b: Flow, Pressure and Velocity at Crucial Junction - 0.375 HP Pump**

| Scenario | Velocity (m/s) Pipe P-3 | Flow (m/s) Pipe P-3 | Pressure (m/s) Junction P-3 |
|---|---|---|---|
| 5 pumps on | 2.41 | 4.48 | 19 |
| 10 pumps on | 3.19 | 5.95 | 38 |
| 15 pumps on | 3.57 | 6.66 | 48 |
| 20 pumps on | 3.7 | 6.89 | 52 |
| 25 pumps on | 3.83 | 7.13 | 56 |

In conclusion, the modelled sewer system operates within capacity when five 0.5 HP pumps are running, and the system reaches it capacity when 10 0.5 HP pumps are simultaneously pumping into the system. A smaller 0.375 HP pump can operate 15 pumps simultaneously but with a lower head elevation. As the number of active pumps increases, the velocity, flow, and pressure gradually increase in the system. According to standards and guidelines set by AEPA, a small diameter low pressure or vacuum sewer collection system should provide hydraulic calculations and/or supporting information to confirm the ability of the system. The ability of the system to handle a maximum of 10 pumps of 0.5 HP and 15 pumps of 0.375 HP operating at the same time was determined through this model; however, there are more pumps in this system. Increasing the size of the forcemain will possibly increase the number of pumps that can pump sewage into the system at the same time; a larger forcemain can also handle the flows in the case of a torrential rainfall.

### *5.5.1.3 Collection System Analysis*

The average typical design life expectancy for HDPE pipe is 75 years. The collection system was installed entirely in 1989 and is only 35 years old, therefore is projected to serve at an adequate level of service for at least another 40 years.

Piping should be sized to meet peak flows with velocities of 0.6 m/s to 3.0 m/s, therefore the forcemain is adequately sized for projected peak flows only when less than 10 pumps are pumping into the forcemain. To meet the required peak flows without any limit on the number of active pumps, the forcemain either needs an upgradation in the pipe size or a lift station could be installed.

As shown in the modelling, the flow restrictions occur upstream of junction (J-3) and pipe (P-3). In particular, the 50 mm forcemain along Railway Avenue between Main and 1 Street N and the 50 mm

forcemain on 1 Street N between Railway and Queens Avenue have high flows and velocities. Upgrading the following section of forcemain to a 75 mm line would improve the flow and ease the system capacity:

- 50 mm forcemain along Railway Avenue between Main and 1 Street N.
- 50 mm forcemain on 1 Street N between Railway and Queens Avenue.

Alternatively, installing a lift station/catch basin at the west end of the Hamlet was considered and the following observations were made:

- Installing a lift station at the west end of the Hamlet (where the various lines converge) may help to relieve some of the built-up line pressure but may not solve the problem.
- The main issue is the numbers of 50 mm forcemain lines upstream of the proposed lift station. It will be easy enough for the lift station to pump down the 75 mm forcemain to the lagoon, but it is the upstream 50 mm forcemain that will continue to restrict the flows.
- As shown in the modelling, the flow restrictions occur upstream. In particular the 50 mm forcemain along Railway Ave between Main and 1 Street N and the 50 mm forcemain on 1 Street N between Railway and Queens Avenue have high flows and velocities.
- It would be more cost effective to upsize the mentioned sections of forcemain to increase flow and system capacity rather than installing a lift station.
- In all modelling results, it was these two sections of forcemain that had the most flow and pressure restrictions.

Installing a lift station would not necessarily address the flow restriction issues in the Hamlet; however, upsizing the two noted sections of forcemain would help relieve the flow restriction and increase overall system capacity.

### 5.6 Proposed Upgrades and Improvements

Based on MPE's assessment of the Hamlet's low pressure forcemain, we have developed several proposed upgrades and improvements. These proposed upgrades and improvements are summarized as follows:

- Standardize pump design for all lots in the Hamlet. This upgrade consists of standardizing all residential sewage pumps in the Hamlet with the same model. The standardized pump model would be 41 Orenco PF100511-20 pumps with 0.631 L/s and 0.5 HP. The cost to replace all 41 pumps would cost approximately **$351,600** (supply only); assume an additional 25% for

installation. Standardized pump design will provide ease in operation and maintenance. Pump quotes and information can be found in ***Appendix C***.

- Kneehill County to obtain a third party to inspect the condition of each pump and septic tank. An inspection of the pumps and septic tanks could determine the problems that need to be addressed and provide information on the data for the existing system.
- Install flushing connections in the following locations:
    - East end of 1 Street N,
    - East end of Main Street,
    - East end of 1 Street S,
    - East end of 2 Street S,
    - South and north end of Queens Avenue.
- Each flushing connection would comprise of a manhole complete with a flush connection at the end of the forcemain. The cost of each flushing connection would be approximately **$14,000**.
- Ensure there is a check valve or backflow preventor installed in every household to prevent sewage backflow from the low pressure forcemain,
- Initiate a flushing regime to remove the blocked sewage inside the forcemain. A flushing mechanism would require adding flushing connections/manholes in the system.
- For cost comparison, details on the replacement of the existing low pressure system with a new gravity sewer system can be found in **Section 6.0**.
- Upgrading the following section of forcemain to a 75 mm line would improve the flow and ease the system capacity:
    - 50 mm forcemain along Railway Avenue between Main Street and 1 Street N,
    - 50 mm forcemain on 1 Street N between Railway and Queens Avenue.

# 6.0 COST ESTIMATES

## 6.1 General

Order-of-magnitude estimates for the costs for replacing the existing low pressure wastewater collection system with a gravity collection system were prepared utilizing a Class 4 cost estimate. A Class 4 cost estimate (-30% to + 40%) is a feasibility level cost estimate that was developed utilizing the following cost assumptions:

- Includes total costs for all Immediate, Short-term and Mid-term priority level projects.
- Includes 40% contingency.
- Includes 15% engineering.
- Includes 10% for contractor mobilization/demobilization/bonding/insurance/profit.

## 6.2 Capital Cost

***Table 6.1*** presents the capital cost for upgrading the existing low pressure wastewater collection system with a 200 mm diameter piping gravity collection system. A breakdown of each cost estimate can be found in ***Appendix D***.

**Table 6.1: Cost Estimate**

| Option No. | Project Description | Cost Estimate |
|---|---|---|
| 1 | Gravity Sewer Collection System | $3,790,000 |

# 7.0 CONCLUSIONS AND RECOMMENDATIONS

## 7.1 Conclusions

Based on the assessment study completed for the Hamlet of Huxley, the following is a summary of the conclusions identified:

- A maximum of 10 pumps of 0.5 HP and 15 pumps of 0.375 HP should be pumping sewage into the forcemain at the same time for the system to operate without any issues.
- Ensure there is a check valve or backflow preventor installed in every household to prevent sewage backflow from the low pressure forcemain.
- Addition of manholes in the system for flushing the system would be beneficial; manholes installed complete with flushing connections added upstream of the system located at the east end of the system would be sufficient.

## 7.2 Recommendations

The following is a summary of the recommended improvements for the Hamlet of Huxley low pressure wastewater collection system:

- Standardize pump design for all lots in the Hamlet. This upgrade consists of standardizing all residential sewage pumps in the Hamlet with the same model. The standardized pump model would be 41 Orenco PF100511-20 pumps with 0.631 L/s and 0.5 HP. The cost to replace all 41 pumps would cost approximately **$351,600** (supply only); assume an additional 25% for installation. Standardized pump design will provide ease in operation and maintenance. Pump quotes and information can be found in ***Appendix C***.
- Kneehill County to obtain a third party to inspect the condition of each pump and septic tank. An inspection of the pumps and septic tanks could determine the problems that need to be addressed and provide information on the data for the existing system.
- Install flushing connections in the following locations:
    - East end of 1 Street N,
    - East end of Main Street,
    - East end of 1 Street S,
    - East end of 2 Street S,
    - South and north end of Queens Avenue.

- Each flushing connection would comprise of a manhole complete with a flush connection at the end of the forcemain. The cost of each flushing connection would be approximately **$14,000**.
- Ensure there is a check valve or backflow preventor installed in every household to prevent sewage backflow from the low pressure forcemain.
- Initiate a flushing regime to remove the blocked sewage inside the forcemain. A flushing mechanism would require adding flushing connections/manholes in the system.
- Upgrading the following section of forcemain to a 75 mm line would improve the flow and ease the system capacity:
    - 50 mm forcemain along Railway Avenue between Main Street and 1 Street N,
    - 50 mm forcemain on 1 Street N between Railway and Queens Avenue.

# APPENDIX A

## Code of Practice

Regional Services

Southern Region

Room 203, Deerfoot Square
2938 – 11 Street NE
Calgary, Alberta
Canada T2E 7L7

Telephone: (403) 297-7602

Fax: (403) 297-5944

June 8, 2004

File No. 003-793

Attn. Mr. Gene Kiviaho
Kneehill County
Box 400
Three Hills, AB
T0M 2A0

Dear Mr. Kiviaho,

**RE: Registration No. 793-02-00**
**Huxley Wastewater System, Application No. 003-793**
**Notice – Code of Practice for Wastewater Systems Using a Wastewater Lagoon**

The Huxley wastewater system operated by the Kneehill County is operating under a registration under the *Environmental Protection and Enhancement Act*, and has been required to follow the requirements of the latest approval issued for the system, 793-01-00 (95-MUN-319), as amended, until this notice comes into effect.

In accordance with section 3.2(2) of the *Wastewater and Storm Drainage Regulation*, the Director is providing notice that the Code of Practice for Wastewater Systems Using a Wastewater Lagoon will now be applied to the operation of the Huxley wastewater system.

Pursuant to section 3.2(3) of the *Wastewater and Storm Drainage Regulation*, all of the Code of Practice applies on June 15, 2004.

If you have any questions regarding this Notice, please contact Brock Rush at (403) 297-7884.

Sincerely,

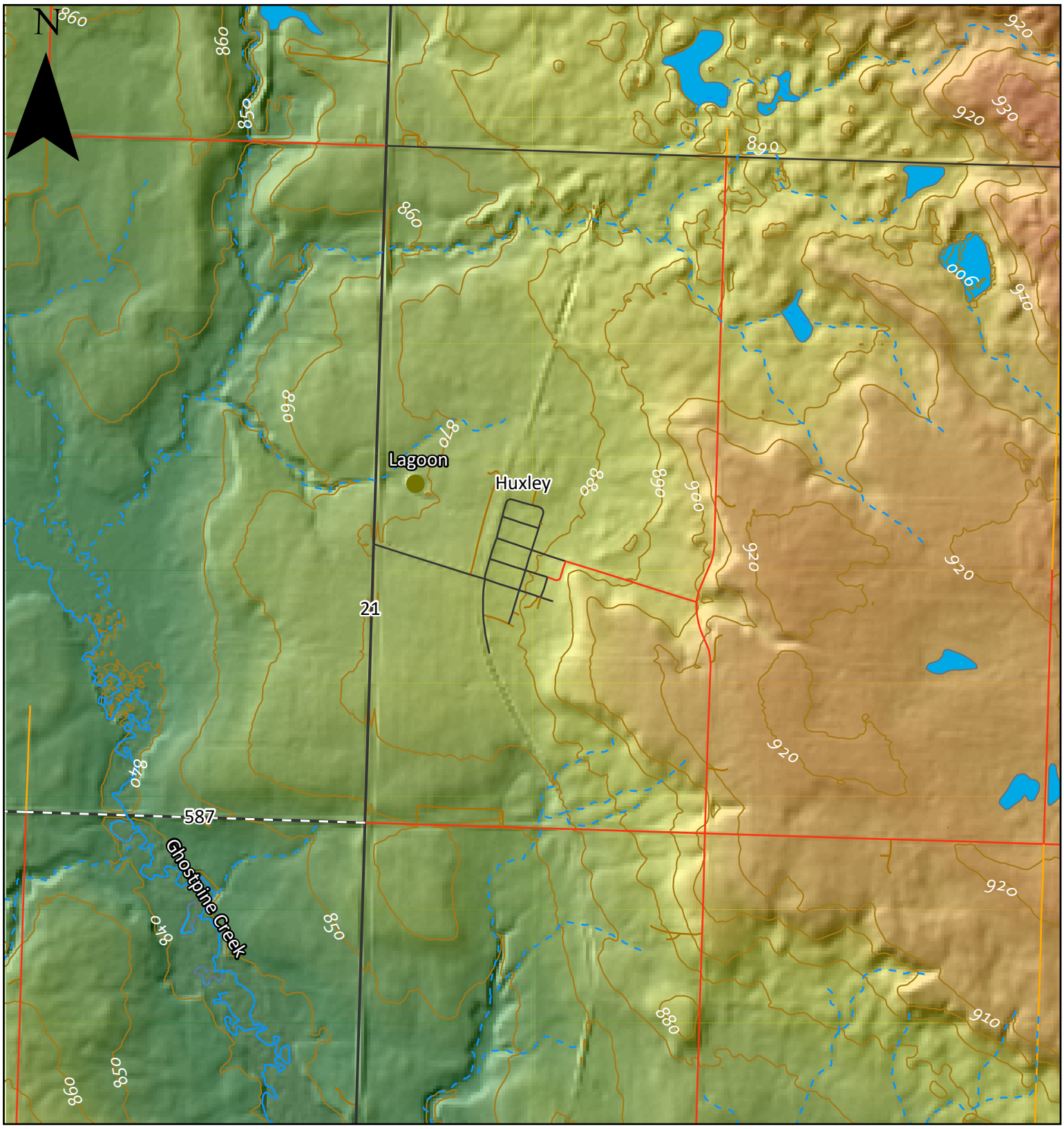
May Mah-Paulson, M.Sc., P.Eng.
District Approvals Manager
Designated Director under the Act

cc: Regulatory Approvals Centre
Pete McRae, Utilities Officer, Kneehill County

# APPENDIX B

## Modelling Data

# Huxley Topography




## Legend

- Provincial Paved Primary
- Provincial Paved Secondary
- Provincial Gravel Secondary
- Gravel Road
- Paved Road
- County Unimproved
- Driveway
- Perennial
- non-Perennial
- Contours 10m
- Hydrology

Digital Elevation Model

950m

832m

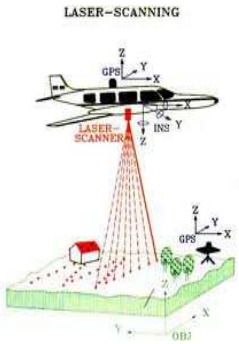
0 0.25 0.5 1 Km

Kneehill COUNTY

## AltaLIS LiDAR15 DEM

The AltaLIS LiDAR15 DEM is a high accuracy and high resolution DEM that has been collected by LiDAR technology and processed into 15 meter post spacing, XYZ ASCII coordinates.

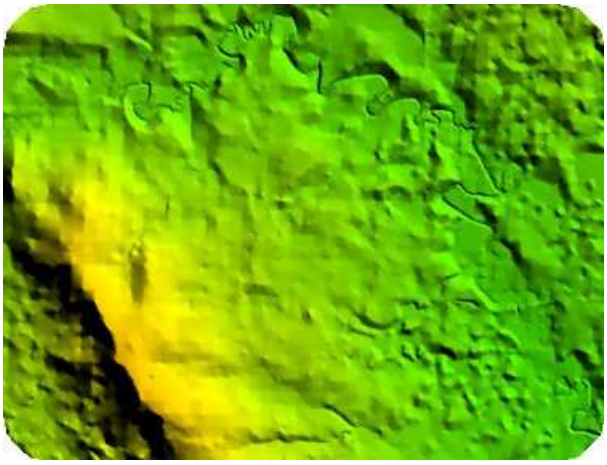
DEM collected with LiDAR (Light Detection and Ranging) technology offers a very high vertical accuracy, which enhances the quality of relief, hydrological features, sub-catchment boundaries (basins and watersheds) and drainage networks.



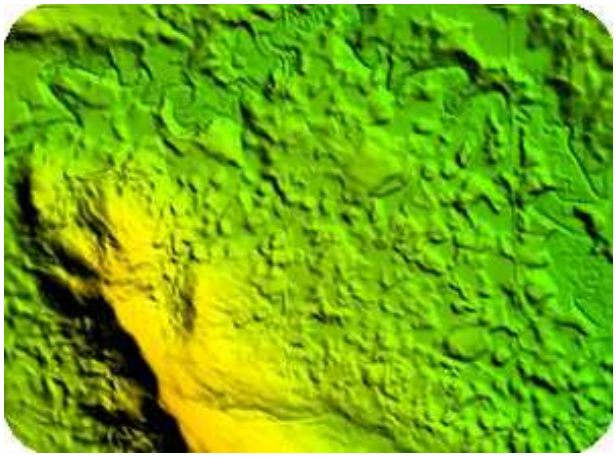

Bare Earth LiDAR DEM includes the returns within the point cloud from the ground, and returns from vegetation and man-made structures have been removed. Laser beams from an aircraft platform scan the ground perpendicular to the line of flight. Laser returns, or reflections from the ground and foliage are processed to determine the ground elevations. As LiDAR penetrates tree cover, it provides the most accurate ground definition possible.

LiDAR15 DEM features **30cm** vertical, **50cm** horizontal accuracy, and is available in two formats: **ESRI Arc Grid ASCII** and **LiDAR15 ASCII**. The AltaLIS DEM product has an accuracy of **5m** and consists of grid points, break lines, and spot heights that have been compiled using 1:60 000 aerial photography.

Compare the detail:



**AltaLIS DEM**



**LiDAR15 DEM**

## LiDAR15 DEM METADATA

15 meter post spacing, Bare Earth
**Ellipsoid:** Nad83
**Projection:** UTM (6TM)
**Vertical Datum:** CGVD28 (HT2)
**Accuracy:** 30cm vertical ( Z ) & 50cm horizontal ( X/Y )

## ESRI ARC GRID ASCII format:

ARC GRID ASCII refers to a specific ESRI interchange format developed for ARC Map raster data in ASCII format. The format consists of a header that specifies the geographic domain and resolution, followed by the actual grid cell values.

**Example:**

```
ncols         1194
nrows         981
xllcorner     654792.500
yllcorner     5735492.500
cellsize      15
nodata_value  -9999
1193.06 1193.836 1194.682 1193.477 1192.764 1192.479 1192.249 1190.09 1190.109 1190.564
1190.654
```

**Records 1-6 Geographic Header:** Coordinates may be in decimal or integer format.

**ncols:** refers to the number of columns in the grid
**nrows:** refers to the number of rows in the grid
**xllcorner:** refers to the western edge of the grid
**yllcorner:** refers to the southern edge of the grid
**cellsize:** refers to the resolution of the grid
**nodata value:** refers to the value that represents missing data. This is optional and your parser should not assume it will be present. Note: The ESRI default is -9999.

**Record 7-End of File:** Data values of the individual cells that represent the elevation of an area.

*val(nox,noy) (f)* = individual grid values, column varying fastest in integer format. Grid values are stored as floating point values.

*xllcorner* and *yllcorner* are given as the lower left edges of the grid, NOT the centers of the edge cells.

## LiDAR15 ASCII format:

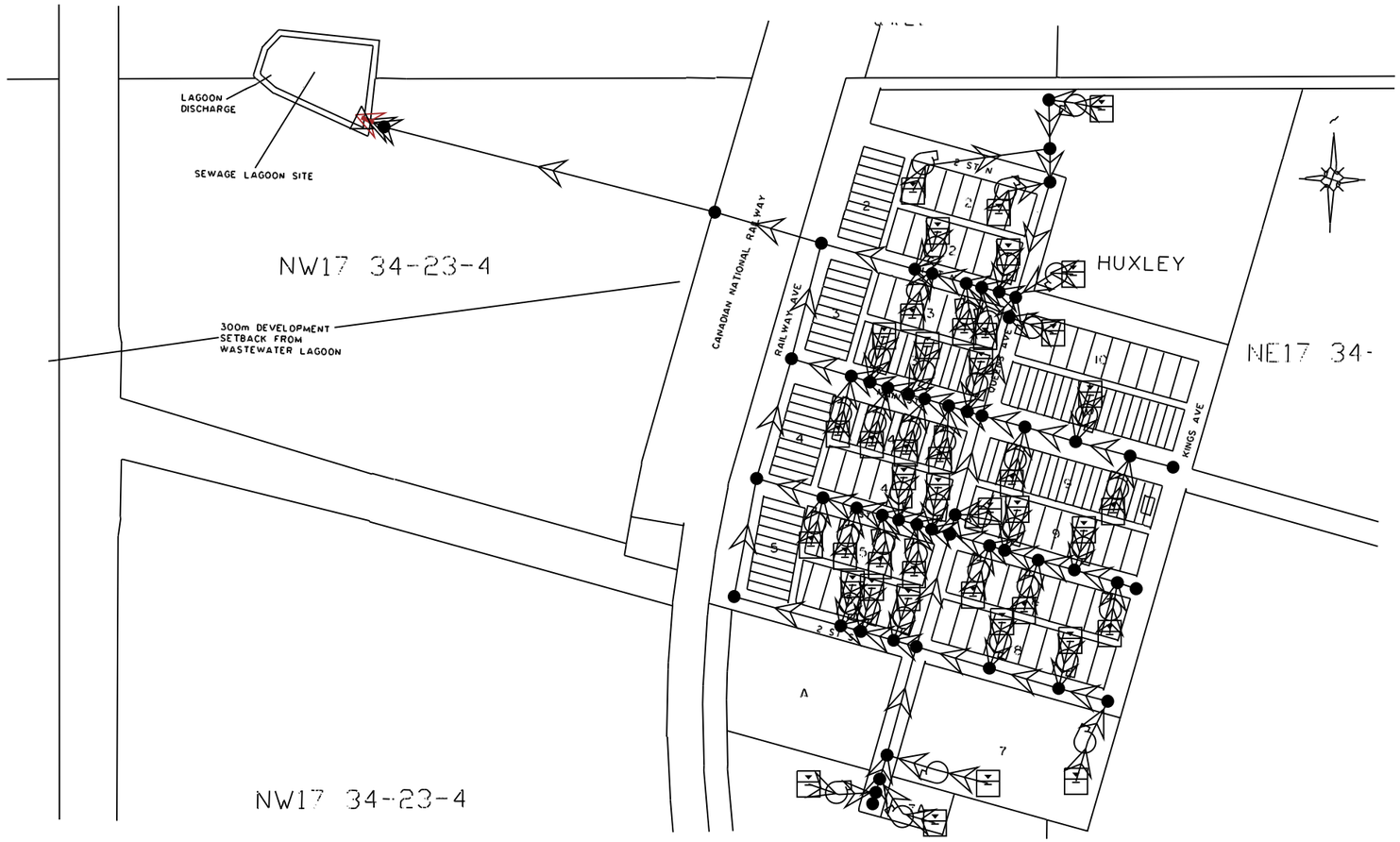
LiDAR15 ASCII DEM refers to a custom 15 meter DEM in a straight ASCII file developed in a generic format. The ASCII file displays coordinates in an XYZ space delimited format, and does not have any header information.

**Example:**

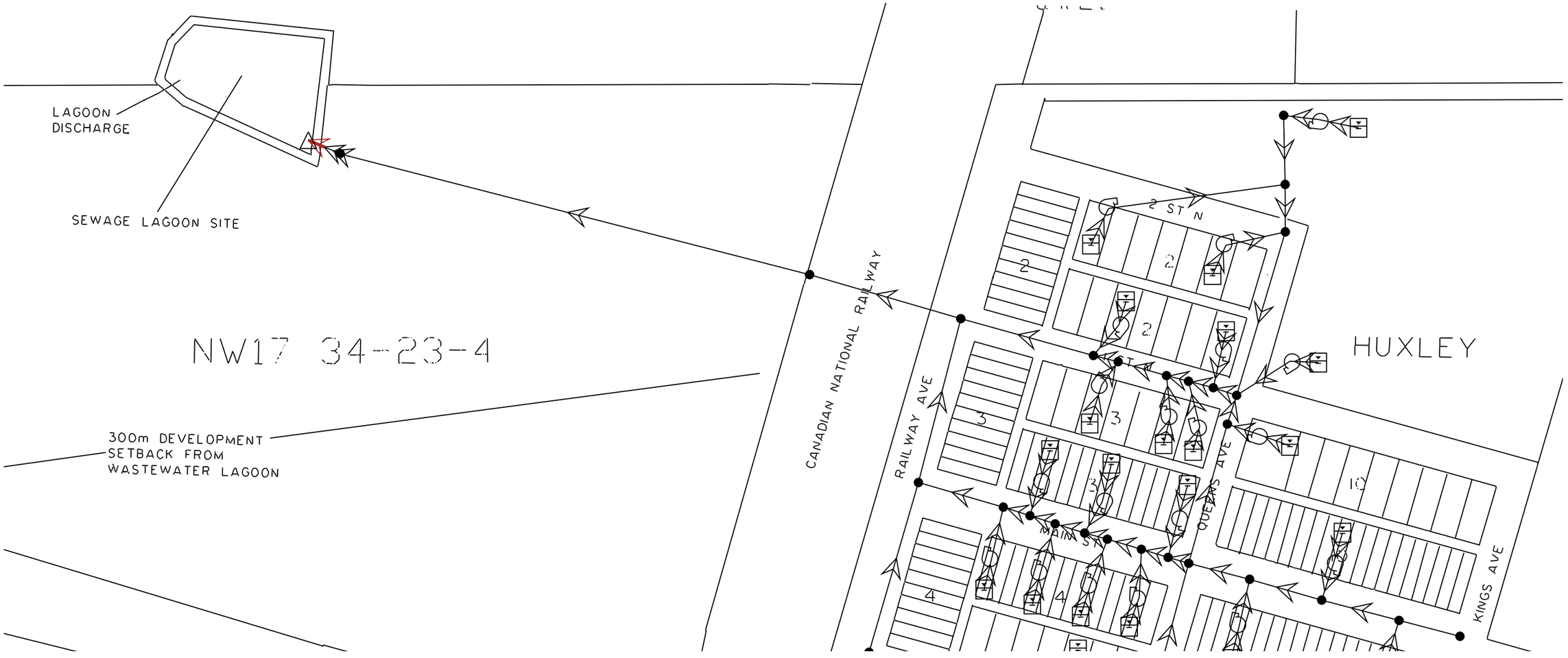
```
654800 5750200 1193.060
654800 5750185 1193.733
654800 5750170 1194.460
654800 5750155 1194.991
654800 5750140 1195.748
654800 5750125 1196.456
654800 5750110 1196.105
```

**Records:** The records are listed in an XYZ space delimited sequence.  X and Y coordinates are listed as integers, and the Z coordinates are listed as decimal values.

## Scenario: Base



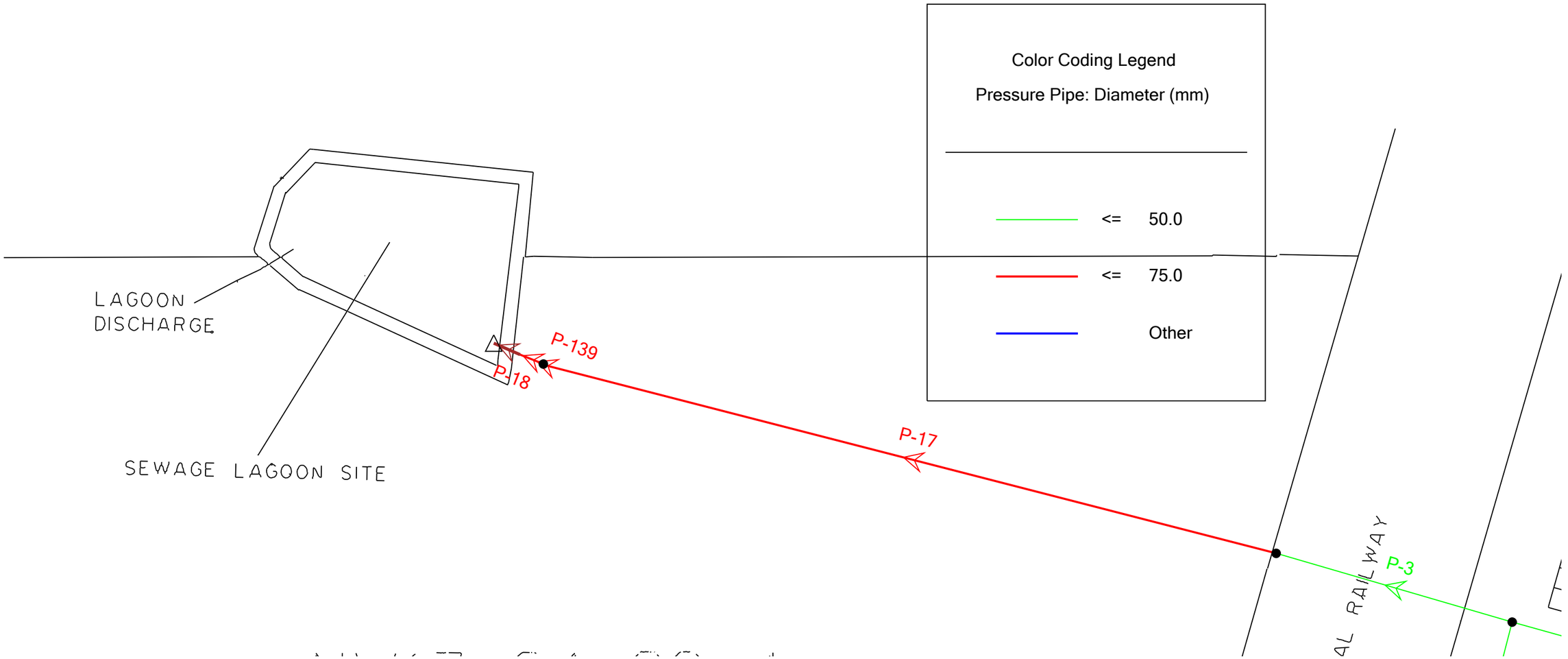
**Scenario: Base**



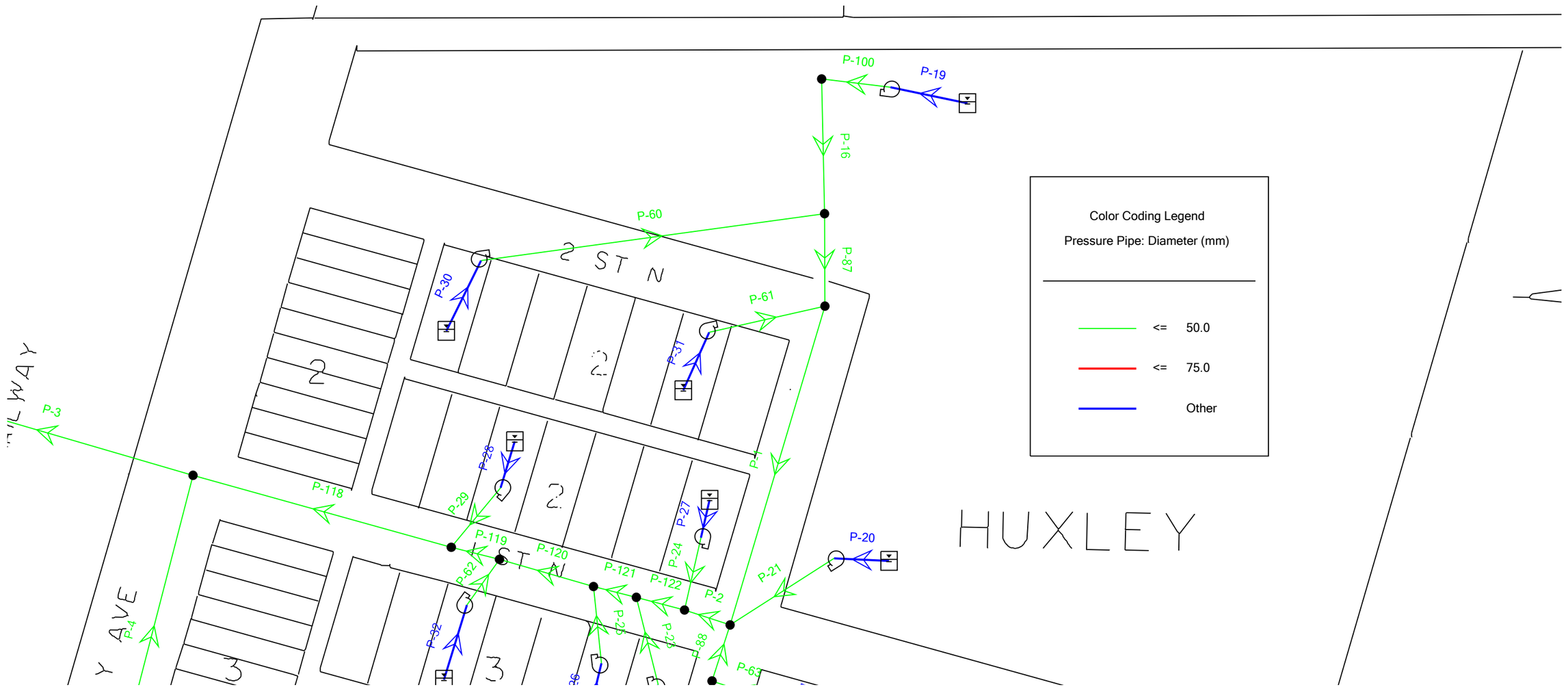
**Scenario: Base**


23-4

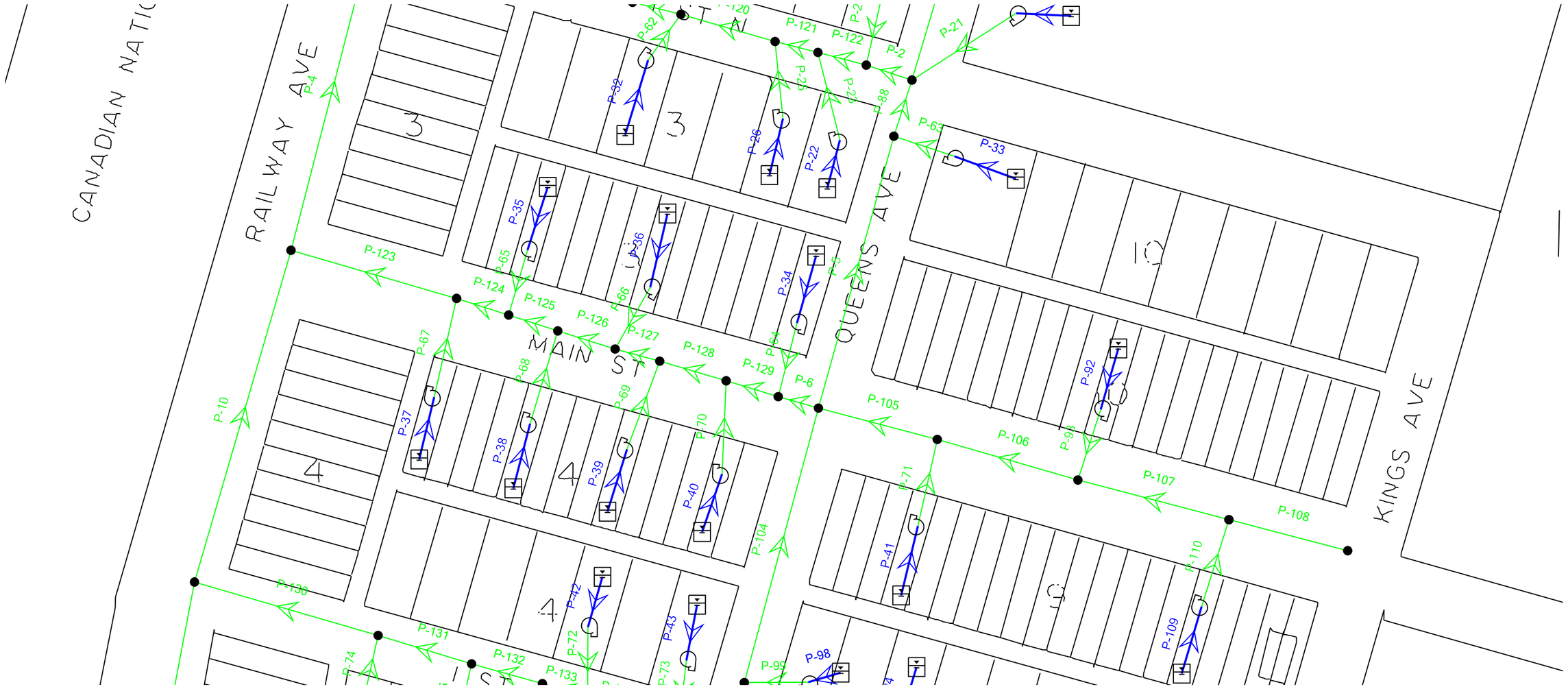
**Scenario: Base**



# Scenario: Base

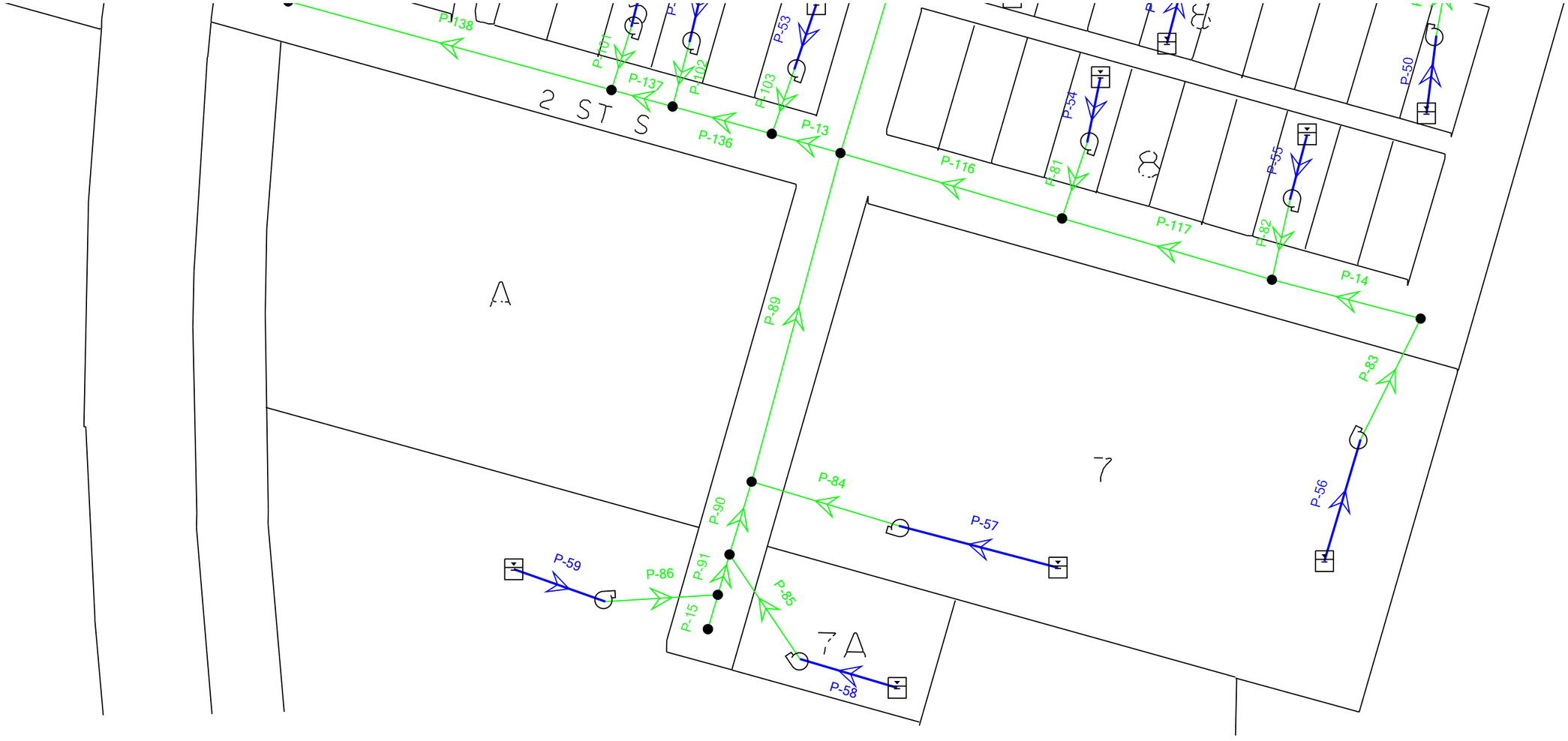


**Scenario: Base**

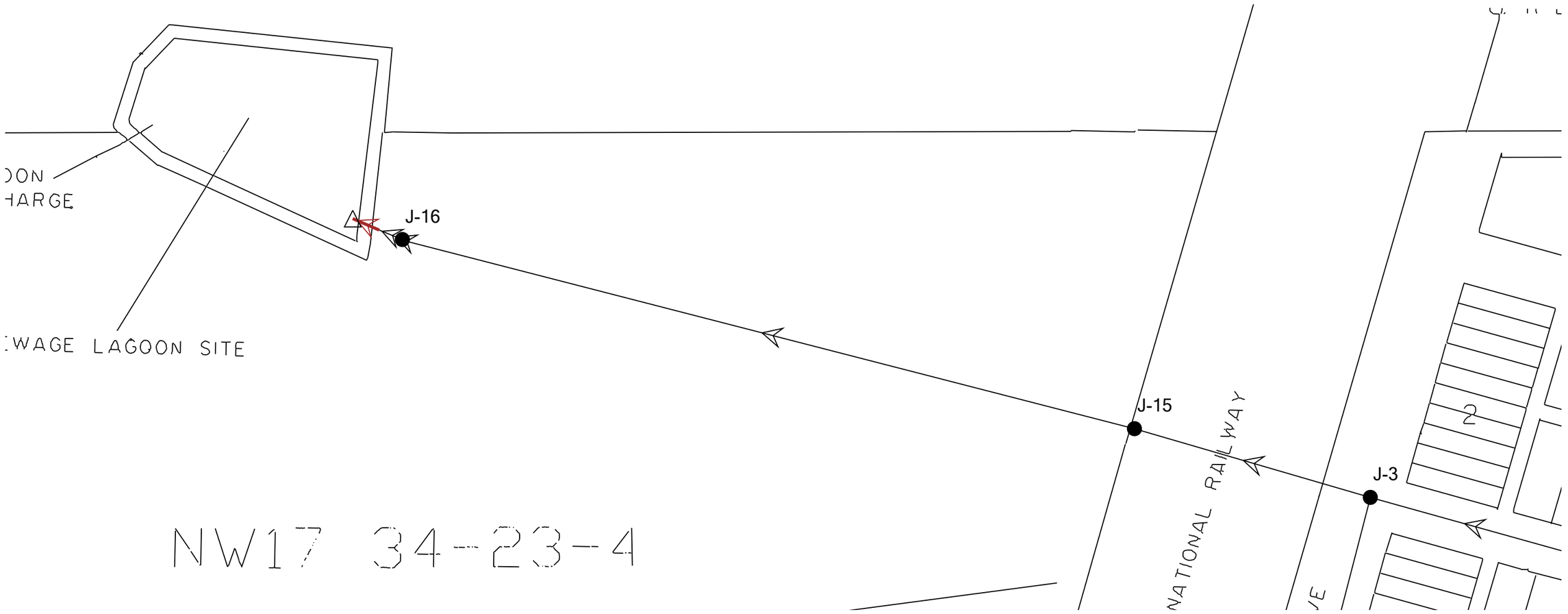


**Scenario: Base**

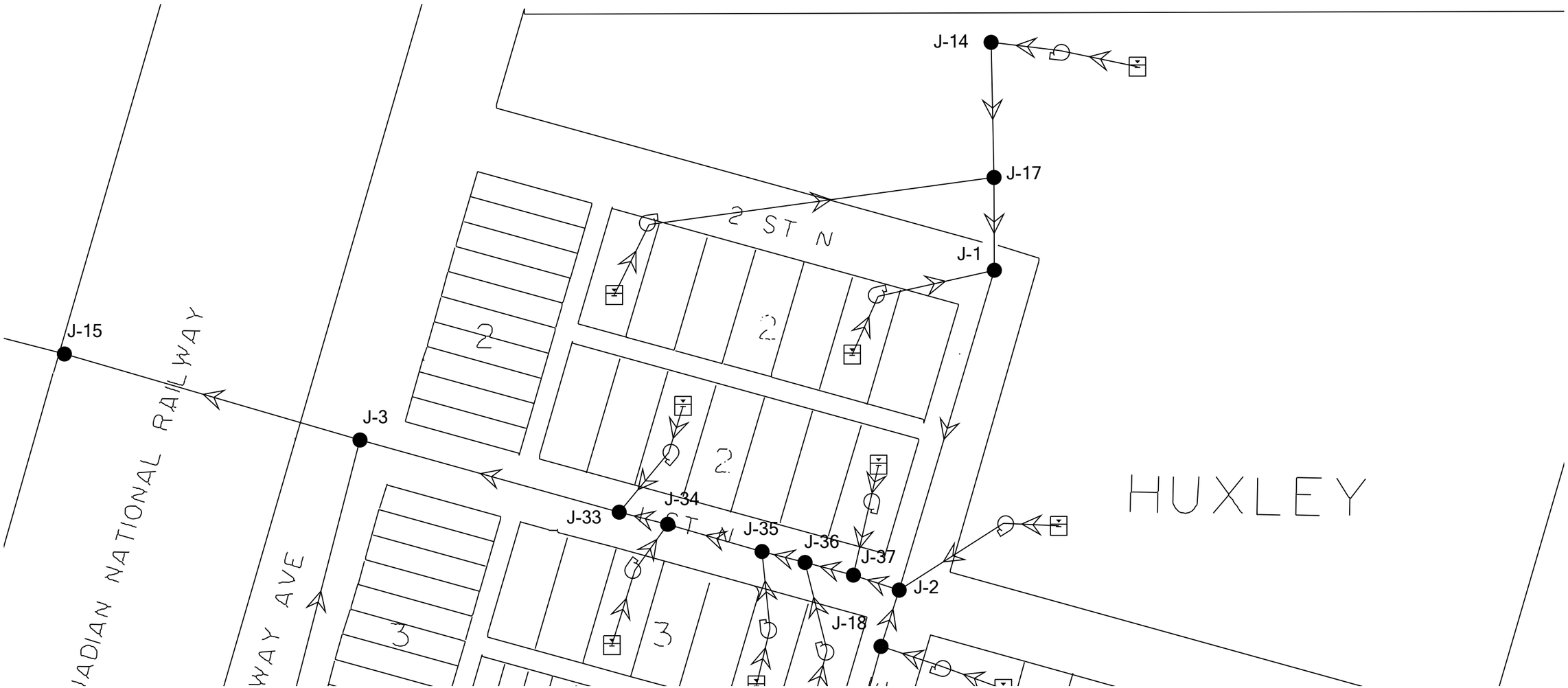
**Scenario: Base**



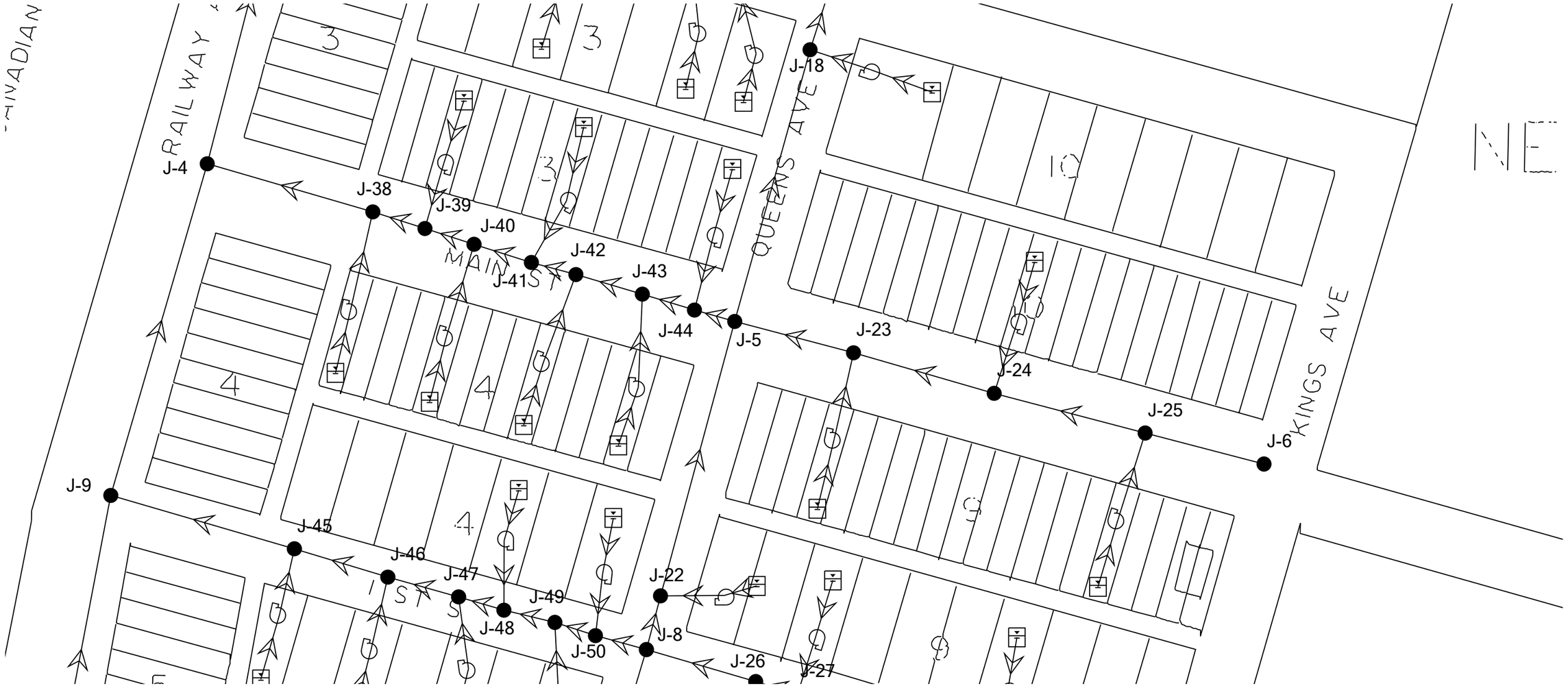
**Scenario: Base**



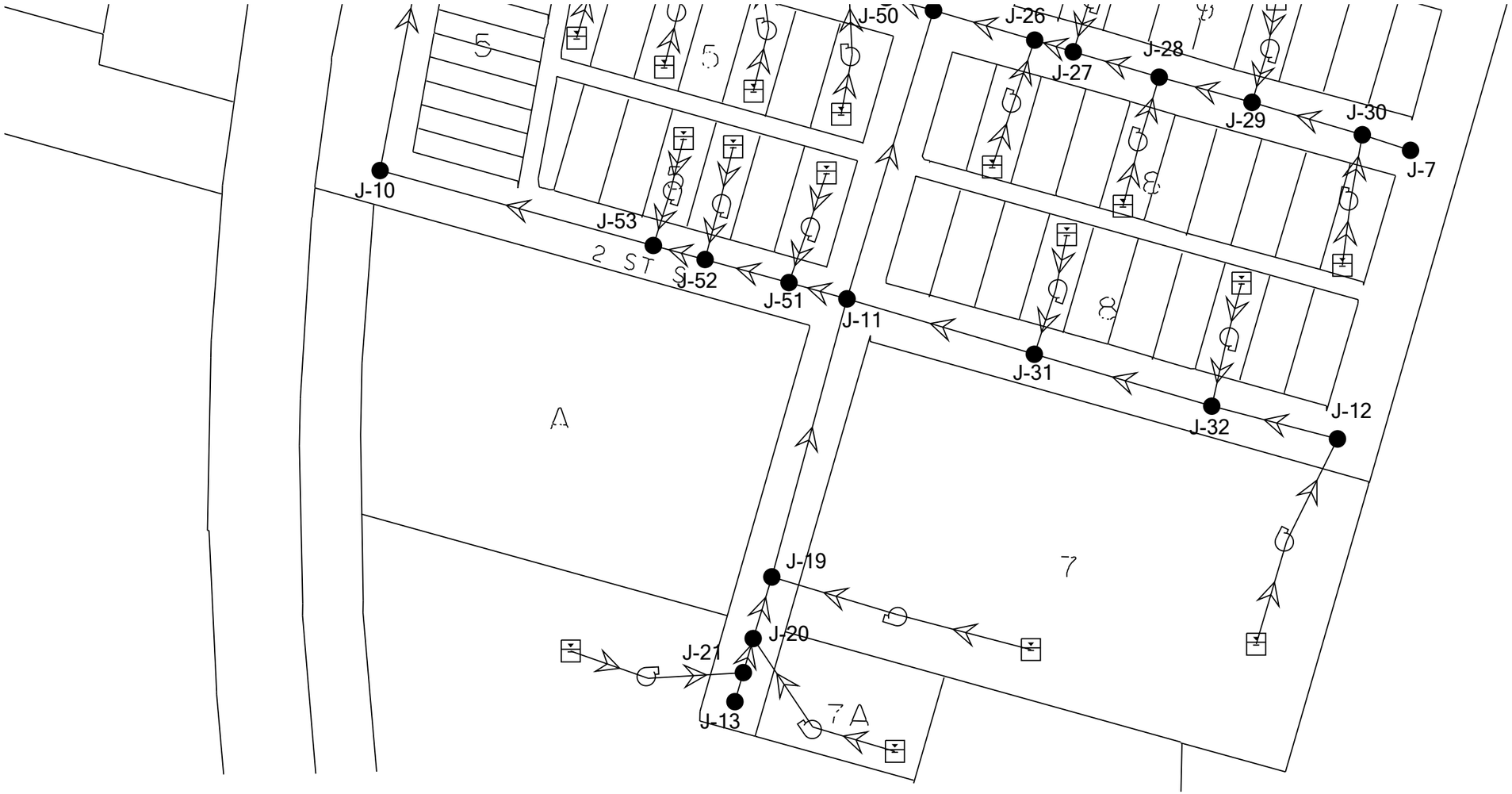
**Scenario: Base**



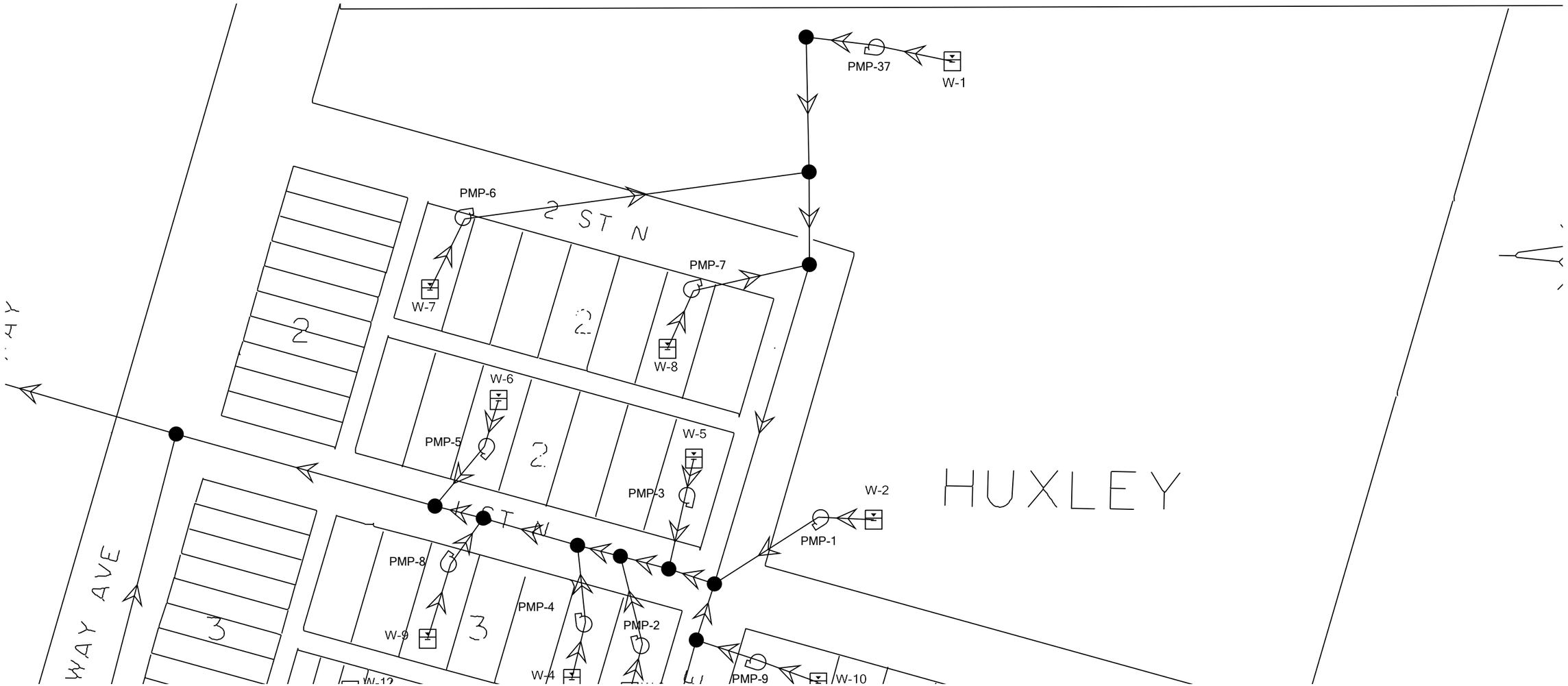
**Scenario: Base**



**Scenario: Base**

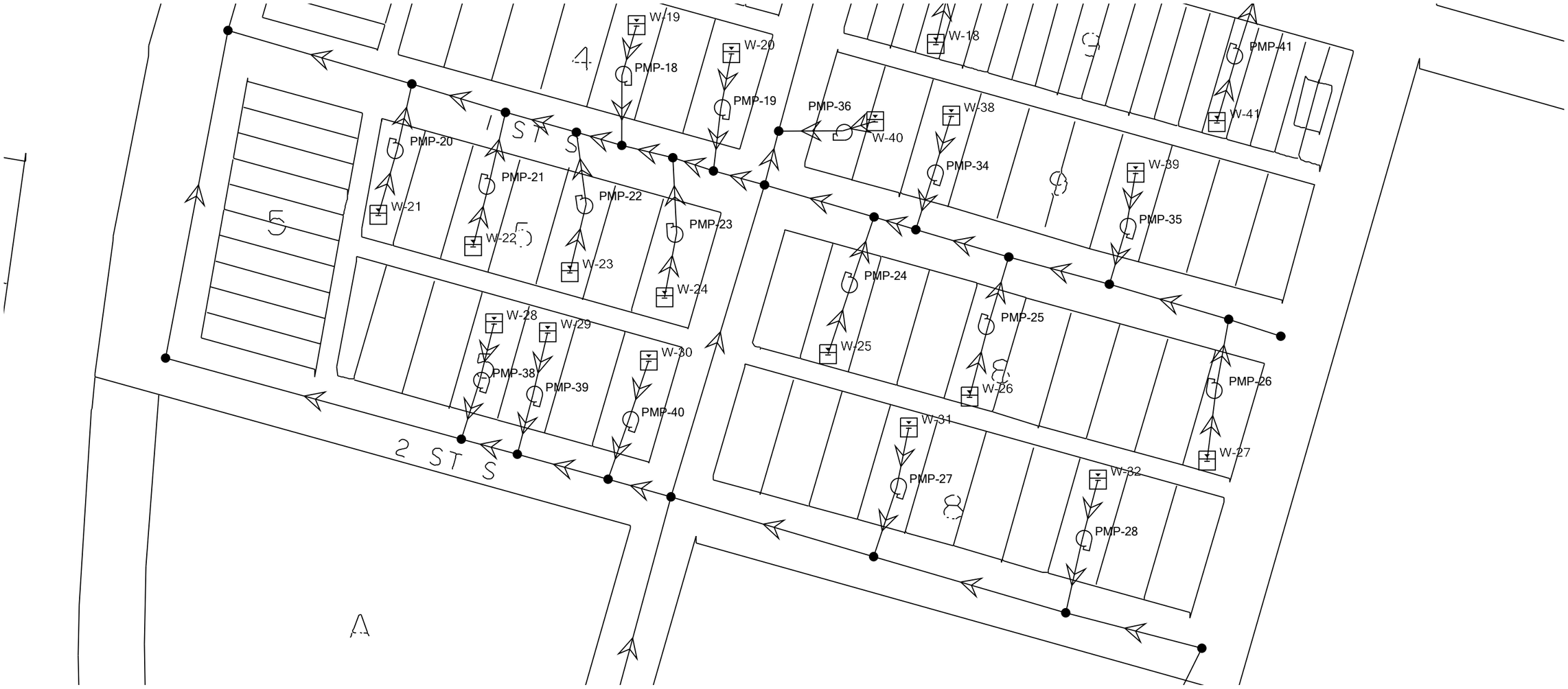


**Scenario: Base**

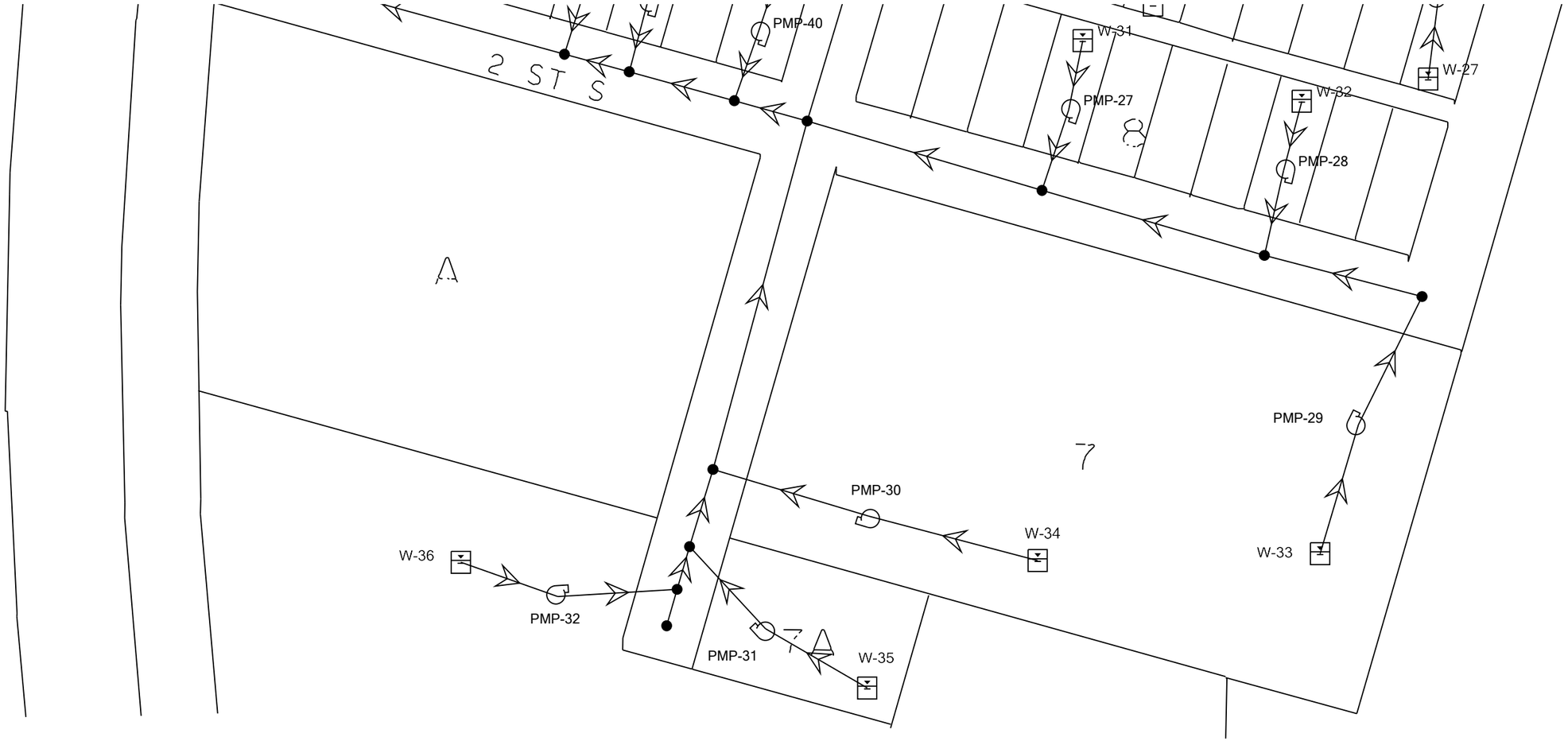


**Scenario: Base**

**Scenario: Base**

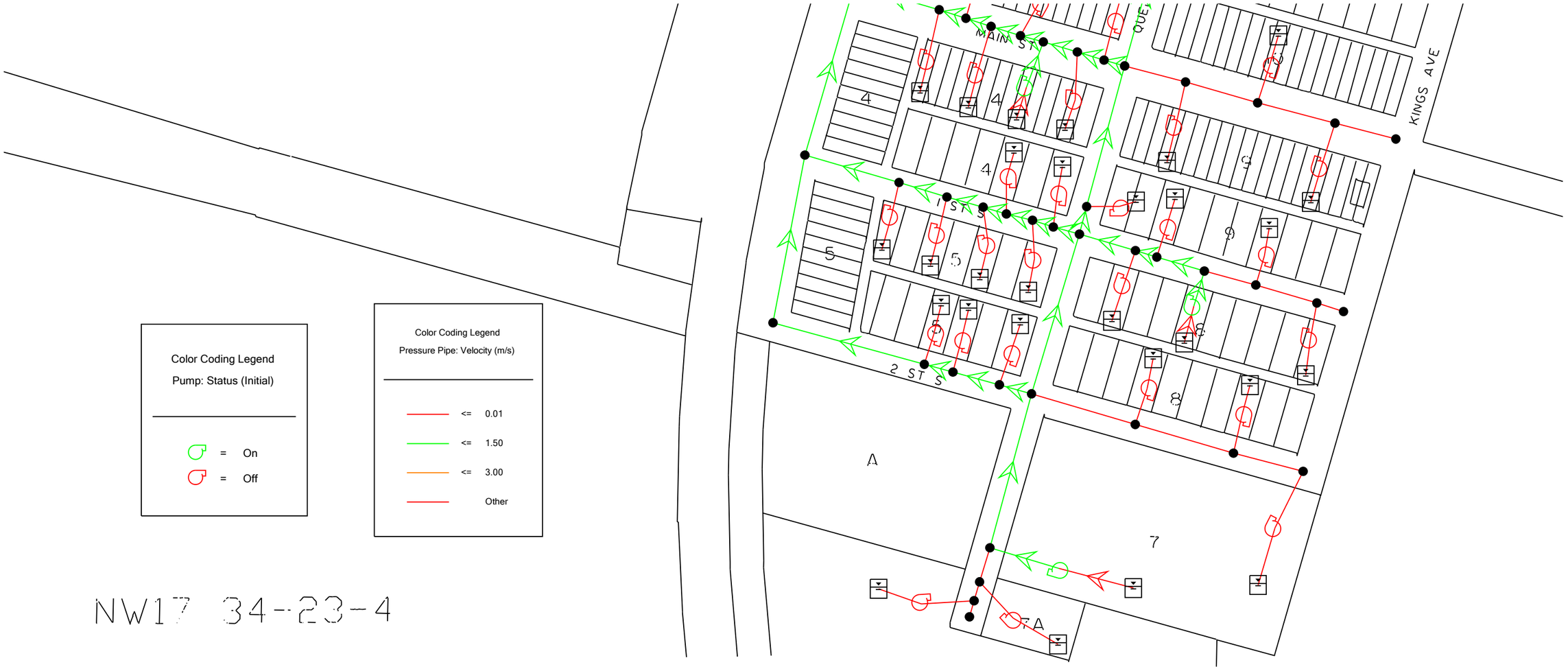


**Scenario: Base**



**Scenario: 5 Pumps On**

# Scenario: 5 Pumps On



# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On)

## Executive Summary

| Scenario | |
|---|---|
| Label | 5 Pumps On |

| Computation Results | |
|---|---|
| Subnetwork Results | Number of Gravity Subnetworks: 1<br>Number of Pressure Subnetworks: 1<br><br>>>>> Info: Pressure subnetwork flowing to: MH-1<br>>>>> Info: Pressure analysis iterations: 11<br>>>>> Info: Convergence was achieved.<br><br>>>>> Info: Gravity subnetwork draining to: O-8<br>>>>> Info: Convergence was achieved. |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On)

## Calculation Options

| <General> | | | |
|---|---|---|---|
| Label | Base Calculation Options | Calculation Type | Analysis |
| Time Analysis Type | Steady State | | |

| Gravity Hydraulics | | | |
|---|---|---|---|
| Maximum Network Traversals | 5 | Governing Upstream Pipe Selection Method | Pipe with Maximum QV |
| Flow Convergence Test | 0.001 | Structure Loss Mode | Hydraulic Grade |
| Tractive Stress (Global Minimum) | 0.000 Pascals | Report Hydrologic Time Step? | True |
| Flow Profile Method | Backwater Analysis | Save Detailed Headloss Data? | False |
| Number of Flow Profile Steps | 5 | Gravity Friction Method | Manning's |
| Hydraulic Grade Convergence Test | 0.00 m | Liquid Label | Water at 20C (68F) |
| Average Velocity Method | Actual Uniform Flow Velocity | Use Explicit Depth and Slope Equations? | False |
| Minimum Structure Headloss | 0.00 m | | |

| Pressure | | | |
|---|---|---|---|
| Peak Flow Ratio | 75.0 % | Pattern Setup | <None> |
| Extreme Flow Setup | <None> | Steady State Hydrograph Equivalent | Peak |

| Pressure Hydraulics | | | |
|---|---|---|---|
| Use Controls During Steady State? | True | Use Linear Interpolation For Multipoint Pumps? | False |
| Wet Well Convergence Increment | 0.2 m | Use Controls During Steady State? | True |
| Use Pumped Flows? | True | Liquid Specific Gravity | 0.998 |
| Pressure Subnetwork Accuracy | 0.001 | Pressure Subnetwork Minimum Possible Pressure | -14 psi |
| Pressure Subnetwork Trials | 40 | Pressure Friction Method | Hazen-Williams |

| SWMM Hydrology | | | |
|---|---|---|---|
| Default Infiltration Method | Horton | SWMM Hydrologic Increment | 0.250 hours |

| Headloss (AASHTO) | | | |
|---|---|---|---|
| Expansion, Ke | 0.350 | Shaping Adjustment, Cs | 0.500 |
| Contraction, Kc | 0.250 | Non-Piped Flow Adjustment, Cn | 1.300 |

### Bend Angle vs. Bend Loss Curve

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On)

## Bend Angle vs. Bend Loss Curve

| Bend Angle (degrees) | Bend Loss Coefficient, Kb |
|---|---|
| 0.00 | 0.000 |
| 15.00 | 0.190 |
| 30.00 | 0.350 |
| 45.00 | 0.470 |
| 60.00 | 0.560 |
| 75.00 | 0.640 |
| 90.00 | 0.700 |

| HEC-22 Energy Losses | |
|---|---|
| Consider Non-Piped Plunging Flow? | True |

| HEC-22 Energy Losses (Second Edition) | | | |
|---|---|---|---|
| Elevations Considered Equal Within | 0.15 m | Half Bench Submerged Factor | 0.950 |
| Flat Unsubmerged Factor | 1.000 | Full Bench Unsubmerged Factor | 0.070 |
| Flat Submerged Factor | 1.000 | Full Bench Submerged Factor | 0.750 |
| Depressed Unsubmerged Factor | 1.000 | Improved Bench Unsubmerged Factor | 0.035 |
| Depressed Submerged Factor | 1.000 | Improved Bench Submerged Factor | 0.375 |
| Half Bench Unsubmerged Factor | 0.150 | | |

| HEC-22 Energy Losses (Third Edition) | | | |
|---|---|---|---|
| Flat Submerged Coefficient | -0.050 | Half Bench Unsubmerged Coefficient | -0.850 |
| Flat Unsubmerged Coefficient | -0.050 | Full Bench Submerged Coefficient | -0.250 |
| Depressed Submerged Coefficient | 0.000 | Full Bench Unsubmerged Coefficient | -0.930 |
| Depressed Unsubmerged Coefficient | 0.000 | Improved Submerged Coefficient | -0.600 |
| Half Bench Submerged Coefficient | -0.050 | Improved Unsubmerged Coefficient | -0.980 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On)

## Calculation Summary (498: 5 Pumps On)

| Time (hours) | Balanced? | Trials | Relative Flow Change |
|---|---|---|---|
| All Time Steps (0) | True | 11 | 0.0000753 |
| 0.00 | True | 11 | 0.0000753 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On)

## Pipe Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Gravity Subnetwork |

### Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-3 | 0.000 | 4.71 | 2.53 | (N/A) |
| P-4 | 0.000 | 2.55 | 1.37 | (N/A) |
| P-18 | 0.000 | 4.71 | 1.16 | (N/A) |
| P-139 | 0.000 | 4.71 | 1.16 | (N/A) |
| P-17 | 0.000 | 4.71 | 1.16 | (N/A) |
| P-2 | 0.000 | 2.16 | 1.16 | (N/A) |
| P-122 | 0.000 | 2.16 | 1.16 | (N/A) |
| P-121 | 0.000 | 2.16 | 1.16 | (N/A) |
| P-120 | 0.000 | 2.16 | 1.16 | (N/A) |
| P-119 | 0.000 | 2.16 | 1.16 | (N/A) |
| P-118 | 0.000 | 2.16 | 1.16 | (N/A) |
| P-127 | 0.000 | 1.29 | 0.69 | (N/A) |
| P-126 | 0.000 | 1.29 | 0.69 | (N/A) |
| P-125 | 0.000 | 1.29 | 0.69 | (N/A) |
| P-124 | 0.000 | 1.29 | 0.69 | (N/A) |
| P-123 | 0.000 | 1.29 | 0.69 | (N/A) |
| P-10 | 0.000 | 1.26 | 0.68 | (N/A) |
| P-88 | 0.000 | 1.22 | 0.65 | (N/A) |
| P-79 | 0.000 | 0.95 | 0.51 | (N/A) |
| P-113 | 0.000 | 0.95 | 0.51 | (N/A) |
| P-112 | 0.000 | 0.95 | 0.51 | (N/A) |
| P-111 | 0.000 | 0.95 | 0.51 | (N/A) |
| P-63 | 0.000 | 0.94 | 0.51 | (N/A) |
| P-69 | 0.000 | 0.94 | 0.50 | (N/A) |
| P-61 | 0.000 | 0.94 | 0.50 | (N/A) |
| P-1 | 0.000 | 0.94 | 0.50 | (N/A) |
| P-84 | 0.000 | 0.93 | 0.50 | (N/A) |
| P-89 | 0.000 | 0.93 | 0.50 | (N/A) |
| P-9 | 0.000 | 0.67 | 0.36 | (N/A) |
| P-135 | 0.000 | 0.67 | 0.36 | (N/A) |
| P-134 | 0.000 | 0.67 | 0.36 | (N/A) |
| P-133 | 0.000 | 0.67 | 0.36 | (N/A) |
| P-132 | 0.000 | 0.67 | 0.36 | (N/A) |
| P-131 | 0.000 | 0.67 | 0.36 | (N/A) |
| P-130 | 0.000 | 0.67 | 0.36 | (N/A) |
| P-8 | 0.000 | 0.62 | 0.33 | (N/A) |
| P-104 | 0.000 | 0.62 | 0.33 | (N/A) |
| P-13 | 0.000 | 0.59 | 0.32 | (N/A) |
| P-136 | 0.000 | 0.59 | 0.32 | (N/A) |
| P-137 | 0.000 | 0.59 | 0.32 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-11 | 0.000 | 0.59 | 0.32 | (N/A) |
| P-138 | 0.000 | 0.59 | 0.32 | (N/A) |
| P-6 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-129 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-128 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-12 | 0.000 | 0.34 | 0.18 | (N/A) |
| P-5 | 0.000 | 0.27 | 0.15 | (N/A) |
| P-49 | 0.000 | 0.95 | 0.00 | (N/A) |
| P-33 | 0.000 | 0.94 | 0.00 | (N/A) |
| P-39 | 0.000 | 0.94 | 0.00 | (N/A) |
| P-31 | 0.000 | 0.94 | 0.00 | (N/A) |
| P-57 | 0.000 | 0.93 | 0.00 | (N/A) |
| P-90 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-114 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-91 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-115 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-105 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-116 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-87 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-106 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-117 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-86 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-85 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-101 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-74 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-102 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-75 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-76 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-103 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-72 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-77 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-16 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-60 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-100 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-73 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-99 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-66 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-70 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-68 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-64 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-65 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-67 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-78 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-96 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-21 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-24 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-71 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-81 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-23 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-97 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-25 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-93 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-82 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-80 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-62 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-110 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-107 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-83 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-29 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-14 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-58 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-59 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-53 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-19 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-98 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-30 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-94 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-20 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-54 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-95 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-43 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-34 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-37 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-41 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-32 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-26 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-22 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-35 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-38 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-46 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-48 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-40 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-42 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-44 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-47 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-27 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-51 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-45 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-92 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-50 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-108 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-15 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-109 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-56 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-55 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-28 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-36 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-52 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-7 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On)

## Node Report

Subnetwork Summary

| Subnetwork | Gravity Subnetwork |
|---|---|

### Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-10 | 0.000 | 894.82 | (N/A) | 31 |
| J-13 | 0.000 | 896.08 | (N/A) | 31 |
| J-19 | 0.000 | 896.08 | (N/A) | 31 |
| J-20 | 0.000 | 896.08 | (N/A) | 31 |
| J-21 | 0.000 | 896.08 | (N/A) | 31 |
| J-9 | 0.000 | 894.49 | (N/A) | 31 |
| J-53 | 0.000 | 895.13 | (N/A) | 30 |
| J-45 | 0.000 | 894.74 | (N/A) | 30 |
| J-52 | 0.000 | 895.19 | (N/A) | 30 |
| J-46 | 0.000 | 894.87 | (N/A) | 30 |
| J-47 | 0.000 | 894.96 | (N/A) | 30 |
| J-51 | 0.000 | 895.29 | (N/A) | 30 |
| J-48 | 0.000 | 895.03 | (N/A) | 30 |
| J-49 | 0.000 | 895.10 | (N/A) | 30 |
| J-11 | 0.000 | 895.36 | (N/A) | 30 |
| J-1 | 0.000 | 895.34 | (N/A) | 30 |
| J-14 | 0.000 | 895.34 | (N/A) | 30 |
| J-17 | 0.000 | 895.34 | (N/A) | 30 |
| J-50 | 0.000 | 895.16 | (N/A) | 30 |
| J-42 | 0.000 | 894.80 | (N/A) | 29 |
| J-8 | 0.000 | 895.24 | (N/A) | 29 |
| J-22 | 0.000 | 895.17 | (N/A) | 29 |
| J-41 | 0.000 | 894.58 | (N/A) | 29 |
| J-43 | 0.000 | 894.82 | (N/A) | 29 |
| J-40 | 0.000 | 894.31 | (N/A) | 29 |
| J-44 | 0.000 | 894.85 | (N/A) | 29 |
| J-39 | 0.000 | 894.07 | (N/A) | 29 |
| J-5 | 0.000 | 894.86 | (N/A) | 29 |
| J-38 | 0.000 | 893.81 | (N/A) | 29 |
| J-18 | 0.000 | 894.80 | (N/A) | 29 |
| J-26 | 0.000 | 895.52 | (N/A) | 29 |
| J-27 | 0.000 | 895.64 | (N/A) | 29 |
| J-4 | 0.000 | 893.07 | (N/A) | 28 |
| J-2 | 0.000 | 894.55 | (N/A) | 28 |
| J-28 | 0.000 | 895.88 | (N/A) | 28 |
| J-37 | 0.000 | 893.96 | (N/A) | 28 |
| J-23 | 0.000 | 894.86 | (N/A) | 28 |
| J-31 | 0.000 | 895.36 | (N/A) | 28 |
| J-36 | 0.000 | 893.35 | (N/A) | 27 |
| J-29 | 0.000 | 895.88 | (N/A) | 27 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-35 | 0.000 | 892.80 | (N/A) | 27 |
| J-24 | 0.000 | 894.86 | (N/A) | 26 |
| J-32 | 0.000 | 895.36 | (N/A) | 26 |
| J-30 | 0.000 | 895.88 | (N/A) | 26 |
| J-7 | 0.000 | 895.88 | (N/A) | 25 |
| J-34 | 0.000 | 891.67 | (N/A) | 25 |
| J-25 | 0.000 | 894.86 | (N/A) | 25 |
| J-12 | 0.000 | 895.36 | (N/A) | 25 |
| J-33 | 0.000 | 891.07 | (N/A) | 25 |
| J-6 | 0.000 | 894.86 | (N/A) | 24 |
| J-3 | 0.000 | 888.08 | (N/A) | 21 |
| J-15 | 0.000 | 873.61 | (N/A) | 2 |
| W-11 | 0.000 | 874.39 | (N/A) | 1 |
| W-13 | 0.000 | 873.92 | (N/A) | 1 |
| W-14 | 0.000 | 873.47 | (N/A) | 1 |
| W-15 | 0.000 | 873.76 | (N/A) | 1 |
| W-16 | 0.000 | 874.05 | (N/A) | 1 |
| W-19 | 0.000 | 874.10 | (N/A) | 1 |
| W-20 | 0.000 | 874.36 | (N/A) | 1 |
| W-26 | 0.000 | 876.16 | (N/A) | 1 |
| W-27 | 0.000 | 877.65 | (N/A) | 1 |
| W-30 | 0.000 | 874.31 | (N/A) | 1 |
| W-1 | 0.000 | 874.50 | (N/A) | 1 |
| W-2 | 0.000 | 874.50 | (N/A) | 1 |
| W-3 | 0.000 | 874.24 | (N/A) | 1 |
| W-4 | 0.000 | 874.12 | (N/A) | 1 |
| W-5 | 0.000 | 874.37 | (N/A) | 1 |
| W-6 | 0.000 | 873.72 | (N/A) | 1 |
| W-7 | 0.000 | 874.50 | (N/A) | 1 |
| W-8 | 0.000 | 874.50 | (N/A) | 1 |
| W-9 | 0.000 | 873.85 | (N/A) | 1 |
| W-10 | 0.000 | 874.50 | (N/A) | 1 |
| W-12 | 0.000 | 873.62 | (N/A) | 1 |
| W-17 | 0.000 | 874.24 | (N/A) | 1 |
| W-18 | 0.000 | 875.28 | (N/A) | 1 |
| W-21 | 0.000 | 873.51 | (N/A) | 1 |
| W-22 | 0.000 | 873.78 | (N/A) | 1 |
| W-23 | 0.000 | 873.98 | (N/A) | 1 |
| W-24 | 0.000 | 874.24 | (N/A) | 1 |
| W-25 | 0.000 | 875.24 | (N/A) | 1 |
| W-28 | 0.000 | 873.87 | (N/A) | 1 |
| W-29 | 0.000 | 874.03 | (N/A) | 1 |
| W-31 | 0.000 | 875.84 | (N/A) | 1 |
| W-32 | 0.000 | 877.11 | (N/A) | 1 |
| W-33 | 0.000 | 878.00 | (N/A) | 1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| W-34 | 0.000 | 874.50 | (N/A) | 1 |
| W-35 | 0.000 | 874.50 | (N/A) | 1 |
| W-36 | 0.000 | 874.50 | (N/A) | 1 |
| W-37 | 0.000 | 876.22 | (N/A) | 1 |
| W-38 | 0.000 | 875.53 | (N/A) | 1 |
| W-39 | 0.000 | 876.85 | (N/A) | 1 |
| W-40 | 0.000 | 874.50 | (N/A) | 1 |
| W-41 | 0.000 | 877.22 | (N/A) | 1 |
| MH-1 | 0.000 | (N/A) | (N/A) | 0 |
| AV-3 | 0.000 | 867.02 | (N/A) | 0 |
| J-16 | 0.000 | 866.36 | (N/A) | -1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On)

## Pond Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Gravity Subnetwork |

### Pond Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) |
|---|---|---|

**Scenario: 10 Pumps On**

# Scenario: 10 Pumps On

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On)

## Executive Summary

| Scenario | |
|---|---|
| Label | 10 Pumps On |

| Computation Results | |
|---|---|
| Subnetwork Results | Number of Gravity Subnetworks: 1<br>Number of Pressure Subnetworks: 1<br><br>>>>> Info: Pressure subnetwork flowing to: MH-1<br>>>>> Info: Pressure analysis iterations: 11<br>>>>> Info: Convergence was achieved.<br><br>>>>> Info: Gravity subnetwork draining to: O-8<br>>>>> Info: Convergence was achieved. |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On)

## Calculation Options

### <General>

| | | | |
|---|---|---|---|
| Label | Base Calculation Options | Calculation Type | Analysis |
| Time Analysis Type | Steady State | | |

### Gravity Hydraulics

| | | | |
|---|---|---|---|
| Maximum Network Traversals | 5 | Governing Upstream Pipe Selection Method | Pipe with Maximum QV |
| Flow Convergence Test | 0.001 | Structure Loss Mode | Hydraulic Grade |
| Tractive Stress (Global Minimum) | 0.000 Pascals | Report Hydrologic Time Step? | True |
| Flow Profile Method | Backwater Analysis | Save Detailed Headloss Data? | False |
| Number of Flow Profile Steps | 5 | Gravity Friction Method | Manning's |
| Hydraulic Grade Convergence Test | 0.00 m | Liquid Label | Water at 20C (68F) |
| Average Velocity Method | Actual Uniform Flow Velocity | Use Explicit Depth and Slope Equations? | False |
| Minimum Structure Headloss | 0.00 m | | |

### Pressure

| | | | |
|---|---|---|---|
| Peak Flow Ratio | 75.0 % | Pattern Setup | <None> |
| Extreme Flow Setup | <None> | Steady State Hydrograph Equivalent | Peak |

### Pressure Hydraulics

| | | | |
|---|---|---|---|
| Use Controls During Steady State? | True | Use Linear Interpolation For Multipoint Pumps? | False |
| Wet Well Convergence Increment | 0.2 m | Use Controls During Steady State? | True |
| Use Pumped Flows? | True | Liquid Specific Gravity | 0.998 |
| Pressure Subnetwork Accuracy | 0.001 | Pressure Subnetwork Minimum Possible Pressure | -14 psi |
| Pressure Subnetwork Trials | 40 | Pressure Friction Method | Hazen-Williams |

### SWMM Hydrology

| | | | |
|---|---|---|---|
| Default Infiltration Method | Horton | SWMM Hydrologic Increment | 0.250 hours |

### Headloss (AASHTO)

| | | | |
|---|---|---|---|
| Expansion, Ke | 0.350 | Shaping Adjustment, Cs | 0.500 |
| Contraction, Kc | 0.250 | Non-Piped Flow Adjustment, Cn | 1.300 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On)

### Bend Angle vs. Bend Loss Curve

| Bend Angle (degrees) | Bend Loss Coefficient, Kb |
|---|---|
| 0.00 | 0.000 |
| 15.00 | 0.190 |
| 30.00 | 0.350 |
| 45.00 | 0.470 |
| 60.00 | 0.560 |
| 75.00 | 0.640 |
| 90.00 | 0.700 |

| HEC-22 Energy Losses | |
|---|---|
| Consider Non-Piped Plunging Flow? | True |

| HEC-22 Energy Losses (Second Edition) | | | |
|---|---|---|---|
| Elevations Considered Equal Within | 0.15 m | Half Bench Submerged Factor | 0.950 |
| Flat Unsubmerged Factor | 1.000 | Full Bench Unsubmerged Factor | 0.070 |
| Flat Submerged Factor | 1.000 | Full Bench Submerged Factor | 0.750 |
| Depressed Unsubmerged Factor | 1.000 | Improved Bench Unsubmerged Factor | 0.035 |
| Depressed Submerged Factor | 1.000 | Improved Bench Submerged Factor | 0.375 |
| Half Bench Unsubmerged Factor | 0.150 | | |

| HEC-22 Energy Losses (Third Edition) | | | |
|---|---|---|---|
| Flat Submerged Coefficient | -0.050 | Half Bench Unsubmerged Coefficient | -0.850 |
| Flat Unsubmerged Coefficient | -0.050 | Full Bench Submerged Coefficient | -0.250 |
| Depressed Submerged Coefficient | 0.000 | Full Bench Unsubmerged Coefficient | -0.930 |
| Depressed Unsubmerged Coefficient | 0.000 | Improved Submerged Coefficient | -0.600 |
| Half Bench Submerged Coefficient | -0.050 | Improved Unsubmerged Coefficient | -0.980 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On)

## Calculation Summary (499: 10 Pumps On)

| Time (hours) | Balanced? | Trials | Relative Flow Change |
|---|---|---|---|
| All Time Steps (0) | True | 0 | (N/A) |
| 0.00 | True | (N/A) | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On)

## Pipe Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Gravity Subnetwork |

### Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-3 | 0.000 | 6.78 | 3.64 | (N/A) |
| P-4 | 0.000 | 3.78 | 2.03 | (N/A) |
| P-17 | 0.000 | 6.78 | 1.67 | (N/A) |
| P-18 | 0.000 | 6.78 | 1.67 | (N/A) |
| P-139 | 0.000 | 6.78 | 1.67 | (N/A) |
| P-122 | 0.000 | 3.00 | 1.61 | (N/A) |
| P-121 | 0.000 | 3.00 | 1.61 | (N/A) |
| P-120 | 0.000 | 3.00 | 1.61 | (N/A) |
| P-119 | 0.000 | 3.00 | 1.61 | (N/A) |
| P-118 | 0.000 | 3.00 | 1.61 | (N/A) |
| P-2 | 0.000 | 2.29 | 1.23 | (N/A) |
| P-10 | 0.000 | 2.03 | 1.09 | (N/A) |
| P-126 | 0.000 | 1.75 | 0.94 | (N/A) |
| P-125 | 0.000 | 1.75 | 0.94 | (N/A) |
| P-124 | 0.000 | 1.75 | 0.94 | (N/A) |
| P-123 | 0.000 | 1.75 | 0.94 | (N/A) |
| P-5 | 0.000 | 1.59 | 0.86 | (N/A) |
| P-88 | 0.000 | 1.59 | 0.86 | (N/A) |
| P-105 | 0.000 | 1.37 | 0.73 | (N/A) |
| P-111 | 0.000 | 1.34 | 0.72 | (N/A) |
| P-8 | 0.000 | 1.30 | 0.70 | (N/A) |
| P-104 | 0.000 | 1.30 | 0.70 | (N/A) |
| P-133 | 0.000 | 1.11 | 0.59 | (N/A) |
| P-132 | 0.000 | 1.11 | 0.59 | (N/A) |
| P-131 | 0.000 | 1.11 | 0.59 | (N/A) |
| P-130 | 0.000 | 1.11 | 0.59 | (N/A) |
| P-6 | 0.000 | 1.07 | 0.58 | (N/A) |
| P-129 | 0.000 | 1.07 | 0.58 | (N/A) |
| P-128 | 0.000 | 1.07 | 0.58 | (N/A) |
| P-127 | 0.000 | 1.07 | 0.58 | (N/A) |
| P-137 | 0.000 | 0.92 | 0.49 | (N/A) |
| P-11 | 0.000 | 0.92 | 0.49 | (N/A) |
| P-138 | 0.000 | 0.92 | 0.49 | (N/A) |
| P-24 | 0.000 | 0.71 | 0.38 | (N/A) |
| P-61 | 0.000 | 0.70 | 0.37 | (N/A) |
| P-1 | 0.000 | 0.70 | 0.37 | (N/A) |
| P-93 | 0.000 | 0.69 | 0.37 | (N/A) |
| P-106 | 0.000 | 0.69 | 0.37 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-82 | 0.000 | 0.68 | 0.37 | (N/A) |
| P-117 | 0.000 | 0.68 | 0.37 | (N/A) |
| P-116 | 0.000 | 0.68 | 0.37 | (N/A) |
| P-71 | 0.000 | 0.68 | 0.36 | (N/A) |
| P-66 | 0.000 | 0.68 | 0.36 | (N/A) |
| P-97 | 0.000 | 0.68 | 0.36 | (N/A) |
| P-114 | 0.000 | 0.68 | 0.36 | (N/A) |
| P-113 | 0.000 | 0.68 | 0.36 | (N/A) |
| P-112 | 0.000 | 0.68 | 0.36 | (N/A) |
| P-78 | 0.000 | 0.66 | 0.36 | (N/A) |
| P-72 | 0.000 | 0.66 | 0.35 | (N/A) |
| P-102 | 0.000 | 0.65 | 0.35 | (N/A) |
| P-9 | 0.000 | 0.45 | 0.24 | (N/A) |
| P-135 | 0.000 | 0.45 | 0.24 | (N/A) |
| P-134 | 0.000 | 0.45 | 0.24 | (N/A) |
| P-12 | 0.000 | 0.41 | 0.22 | (N/A) |
| P-13 | 0.000 | 0.27 | 0.14 | (N/A) |
| P-136 | 0.000 | 0.27 | 0.14 | (N/A) |
| P-27 | 0.000 | 0.71 | 0.00 | (N/A) |
| P-31 | 0.000 | 0.70 | 0.00 | (N/A) |
| P-92 | 0.000 | 0.69 | 0.00 | (N/A) |
| P-55 | 0.000 | 0.68 | 0.00 | (N/A) |
| P-41 | 0.000 | 0.68 | 0.00 | (N/A) |
| P-36 | 0.000 | 0.68 | 0.00 | (N/A) |
| P-95 | 0.000 | 0.68 | 0.00 | (N/A) |
| P-48 | 0.000 | 0.66 | 0.00 | (N/A) |
| P-42 | 0.000 | 0.66 | 0.00 | (N/A) |
| P-52 | 0.000 | 0.65 | 0.00 | (N/A) |
| P-89 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-90 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-87 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-101 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-103 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-76 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-75 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-77 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-91 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-85 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-86 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-84 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-74 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-73 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-99 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-96 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-81 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-79 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-64 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-70 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-69 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-68 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-65 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-115 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-80 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-67 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-14 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-83 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-100 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-16 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-60 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-63 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-107 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-110 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-21 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-23 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-25 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-62 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-29 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-39 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-53 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-57 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-58 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-59 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-94 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-98 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-54 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-30 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-19 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-33 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-20 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-32 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-37 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-34 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-43 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-22 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-35 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-40 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-44 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-47 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-51 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-28 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-26 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-49 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-56 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-46 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-45 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-50 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-109 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-38 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-15 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-7 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-108 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On)

## Node Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Gravity Subnetwork |

### Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-10 | 0.000 | 922.94 | (N/A) | 71 |
| J-53 | 0.000 | 923.63 | (N/A) | 71 |
| J-52 | 0.000 | 923.77 | (N/A) | 71 |
| J-51 | 0.000 | 923.80 | (N/A) | 70 |
| J-48 | 0.000 | 923.55 | (N/A) | 70 |
| J-47 | 0.000 | 923.38 | (N/A) | 70 |
| J-46 | 0.000 | 923.13 | (N/A) | 70 |
| J-49 | 0.000 | 923.58 | (N/A) | 70 |
| J-11 | 0.000 | 923.81 | (N/A) | 70 |
| J-13 | 0.000 | 923.81 | (N/A) | 70 |
| J-19 | 0.000 | 923.81 | (N/A) | 70 |
| J-20 | 0.000 | 923.81 | (N/A) | 70 |
| J-21 | 0.000 | 923.81 | (N/A) | 70 |
| J-45 | 0.000 | 922.80 | (N/A) | 70 |
| J-50 | 0.000 | 923.61 | (N/A) | 70 |
| J-9 | 0.000 | 922.18 | (N/A) | 70 |
| J-8 | 0.000 | 923.64 | (N/A) | 70 |
| J-26 | 0.000 | 924.18 | (N/A) | 69 |
| J-22 | 0.000 | 923.38 | (N/A) | 69 |
| J-27 | 0.000 | 924.24 | (N/A) | 69 |
| J-31 | 0.000 | 924.09 | (N/A) | 68 |
| J-28 | 0.000 | 924.37 | (N/A) | 68 |
| J-29 | 0.000 | 924.51 | (N/A) | 68 |
| J-5 | 0.000 | 922.15 | (N/A) | 68 |
| J-44 | 0.000 | 922.01 | (N/A) | 68 |
| J-43 | 0.000 | 921.83 | (N/A) | 68 |
| J-42 | 0.000 | 921.61 | (N/A) | 68 |
| J-41 | 0.000 | 921.46 | (N/A) | 67 |
| J-23 | 0.000 | 922.75 | (N/A) | 67 |
| J-32 | 0.000 | 924.36 | (N/A) | 67 |
| J-40 | 0.000 | 920.97 | (N/A) | 67 |
| J-39 | 0.000 | 920.54 | (N/A) | 67 |
| J-30 | 0.000 | 924.51 | (N/A) | 67 |
| J-24 | 0.000 | 922.95 | (N/A) | 66 |
| J-38 | 0.000 | 920.09 | (N/A) | 66 |
| J-7 | 0.000 | 924.51 | (N/A) | 66 |
| J-12 | 0.000 | 924.36 | (N/A) | 66 |
| J-1 | 0.000 | 920.42 | (N/A) | 65 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-14 | 0.000 | 920.42 | (N/A) | 65 |
| J-17 | 0.000 | 920.42 | (N/A) | 65 |
| J-18 | 0.000 | 920.37 | (N/A) | 65 |
| J-4 | 0.000 | 918.78 | (N/A) | 65 |
| J-25 | 0.000 | 922.95 | (N/A) | 65 |
| J-2 | 0.000 | 919.97 | (N/A) | 65 |
| J-6 | 0.000 | 922.95 | (N/A) | 64 |
| J-37 | 0.000 | 919.31 | (N/A) | 64 |
| J-36 | 0.000 | 918.18 | (N/A) | 62 |
| J-35 | 0.000 | 917.16 | (N/A) | 61 |
| J-34 | 0.000 | 915.07 | (N/A) | 59 |
| J-33 | 0.000 | 913.94 | (N/A) | 57 |
| J-3 | 0.000 | 908.44 | (N/A) | 50 |
| J-15 | 0.000 | 879.97 | (N/A) | 11 |
| W-11 | 0.000 | 874.39 | (N/A) | 1 |
| W-13 | 0.000 | 873.92 | (N/A) | 1 |
| W-14 | 0.000 | 873.47 | (N/A) | 1 |
| W-15 | 0.000 | 873.76 | (N/A) | 1 |
| W-16 | 0.000 | 874.05 | (N/A) | 1 |
| W-19 | 0.000 | 874.10 | (N/A) | 1 |
| W-20 | 0.000 | 874.36 | (N/A) | 1 |
| W-26 | 0.000 | 876.16 | (N/A) | 1 |
| W-27 | 0.000 | 877.65 | (N/A) | 1 |
| W-30 | 0.000 | 874.31 | (N/A) | 1 |
| W-1 | 0.000 | 874.50 | (N/A) | 1 |
| W-2 | 0.000 | 874.50 | (N/A) | 1 |
| W-3 | 0.000 | 874.24 | (N/A) | 1 |
| W-4 | 0.000 | 874.12 | (N/A) | 1 |
| W-5 | 0.000 | 874.37 | (N/A) | 1 |
| W-6 | 0.000 | 873.72 | (N/A) | 1 |
| W-7 | 0.000 | 874.50 | (N/A) | 1 |
| W-8 | 0.000 | 874.50 | (N/A) | 1 |
| W-9 | 0.000 | 873.85 | (N/A) | 1 |
| W-10 | 0.000 | 874.50 | (N/A) | 1 |
| W-12 | 0.000 | 873.62 | (N/A) | 1 |
| W-17 | 0.000 | 874.24 | (N/A) | 1 |
| W-18 | 0.000 | 875.28 | (N/A) | 1 |
| W-21 | 0.000 | 873.51 | (N/A) | 1 |
| W-22 | 0.000 | 873.78 | (N/A) | 1 |
| W-23 | 0.000 | 873.98 | (N/A) | 1 |
| W-24 | 0.000 | 874.24 | (N/A) | 1 |
| W-25 | 0.000 | 875.24 | (N/A) | 1 |
| W-28 | 0.000 | 873.87 | (N/A) | 1 |
| W-29 | 0.000 | 874.03 | (N/A) | 1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| W-31 | 0.000 | 875.84 | (N/A) | 1 |
| W-32 | 0.000 | 877.11 | (N/A) | 1 |
| W-33 | 0.000 | 878.00 | (N/A) | 1 |
| W-34 | 0.000 | 874.50 | (N/A) | 1 |
| W-35 | 0.000 | 874.50 | (N/A) | 1 |
| W-36 | 0.000 | 874.50 | (N/A) | 1 |
| W-37 | 0.000 | 876.22 | (N/A) | 1 |
| W-38 | 0.000 | 875.53 | (N/A) | 1 |
| W-39 | 0.000 | 876.85 | (N/A) | 1 |
| W-40 | 0.000 | 874.50 | (N/A) | 1 |
| W-41 | 0.000 | 877.22 | (N/A) | 1 |
| MH-1 | 0.000 | (N/A) | (N/A) | 0 |
| AV-3 | 0.000 | 867.02 | (N/A) | 0 |
| J-16 | 0.000 | 866.64 | (N/A) | -1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On)

## Pond Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Gravity Subnetwork |

### Pond Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) |
|---|---|---|

**Scenario: 15 Pumps On**

# Scenario: 15 Pumps On

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On)

## Executive Summary

| Scenario | |
|---|---|
| Label | 15 Pumps On |

| Computation Results | |
|---|---|
| Subnetwork Results | Number of Gravity Subnetworks: 1<br>Number of Pressure Subnetworks: 1<br><br>>>>> Info: Pressure subnetwork flowing to: MH-1<br>>>>> Info: Pressure analysis iterations: 11<br>>>>> Info: Convergence was achieved.<br><br>>>>> Info: Gravity subnetwork draining to: O-8<br>>>>> Info: Convergence was achieved. |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On)

## Calculation Options

| <General> | | | |
|---|---|---|---|
| Label | Base Calculation Options | Calculation Type | Analysis |
| Time Analysis Type | Steady State | | |

| Gravity Hydraulics | | | |
|---|---|---|---|
| Maximum Network Traversals | 5 | Governing Upstream Pipe Selection Method | Pipe with Maximum QV |
| Flow Convergence Test | 0.001 | Structure Loss Mode | Hydraulic Grade |
| Tractive Stress (Global Minimum) | 0.000 Pascals | Report Hydrologic Time Step? | True |
| Flow Profile Method | Backwater Analysis | Save Detailed Headloss Data? | False |
| Number of Flow Profile Steps | 5 | Gravity Friction Method | Manning's |
| Hydraulic Grade Convergence Test | 0.00 m | Liquid Label | Water at 20C (68F) |
| Average Velocity Method | Actual Uniform Flow Velocity | Use Explicit Depth and Slope Equations? | False |
| Minimum Structure Headloss | 0.00 m | | |

| Pressure | | | |
|---|---|---|---|
| Peak Flow Ratio | 75.0 % | Pattern Setup | <None> |
| Extreme Flow Setup | <None> | Steady State Hydrograph Equivalent | Peak |

| Pressure Hydraulics | | | |
|---|---|---|---|
| Use Controls During Steady State? | True | Use Linear Interpolation For Multipoint Pumps? | False |
| Wet Well Convergence Increment | 0.2 m | Use Controls During Steady State? | True |
| Use Pumped Flows? | True | Liquid Specific Gravity | 0.998 |
| Pressure Subnetwork Accuracy | 0.001 | Pressure Subnetwork Minimum Possible Pressure | -14 psi |
| Pressure Subnetwork Trials | 40 | Pressure Friction Method | Hazen-Williams |

| SWMM Hydrology | | | |
|---|---|---|---|
| Default Infiltration Method | Horton | SWMM Hydrologic Increment | 0.250 hours |

| Headloss (AASHTO) | | | |
|---|---|---|---|
| Expansion, Ke | 0.350 | Shaping Adjustment, Cs | 0.500 |
| Contraction, Kc | 0.250 | Non-Piped Flow Adjustment, Cn | 1.300 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On)

### Bend Angle vs. Bend Loss Curve

| Bend Angle (degrees) | Bend Loss Coefficient, Kb |
|---|---|
| 0.00 | 0.000 |
| 15.00 | 0.190 |
| 30.00 | 0.350 |
| 45.00 | 0.470 |
| 60.00 | 0.560 |
| 75.00 | 0.640 |
| 90.00 | 0.700 |

| HEC-22 Energy Losses | |
|---|---|
| Consider Non-Piped Plunging Flow? | True |

| HEC-22 Energy Losses (Second Edition) | | | |
|---|---|---|---|
| Elevations Considered Equal Within | 0.15 m | Half Bench Submerged Factor | 0.950 |
| Flat Unsubmerged Factor | 1.000 | Full Bench Unsubmerged Factor | 0.070 |
| Flat Submerged Factor | 1.000 | Full Bench Submerged Factor | 0.750 |
| Depressed Unsubmerged Factor | 1.000 | Improved Bench Unsubmerged Factor | 0.035 |
| Depressed Submerged Factor | 1.000 | Improved Bench Submerged Factor | 0.375 |
| Half Bench Unsubmerged Factor | 0.150 | | |

| HEC-22 Energy Losses (Third Edition) | | | |
|---|---|---|---|
| Flat Submerged Coefficient | -0.050 | Half Bench Unsubmerged Coefficient | -0.850 |
| Flat Unsubmerged Coefficient | -0.050 | Full Bench Submerged Coefficient | -0.250 |
| Depressed Submerged Coefficient | 0.000 | Full Bench Unsubmerged Coefficient | -0.930 |
| Depressed Unsubmerged Coefficient | 0.000 | Improved Submerged Coefficient | -0.600 |
| Half Bench Submerged Coefficient | -0.050 | Improved Unsubmerged Coefficient | -0.980 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On)

## Calculation Summary (501: 15 Pumps On)

| Time (hours) | Balanced? | Trials | Relative Flow Change |
|---|---|---|---|
| All Time Steps (1) | True | 11 | 0.0000465 |
| 0.00 | True | 11 | 0.0000465 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On)

## Pipe Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Gravity Subnetwork |

### Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-3 | 0.000 | 7.69 | 4.13 | (N/A) |
| P-4 | 0.000 | 4.02 | 2.16 | (N/A) |
| P-118 | 0.000 | 3.66 | 1.97 | (N/A) |
| P-18 | 0.000 | 7.69 | 1.90 | (N/A) |
| P-139 | 0.000 | 7.69 | 1.90 | (N/A) |
| P-17 | 0.000 | 7.69 | 1.90 | (N/A) |
| P-119 | 0.000 | 3.06 | 1.64 | (N/A) |
| P-2 | 0.000 | 2.48 | 1.33 | (N/A) |
| P-122 | 0.000 | 2.48 | 1.33 | (N/A) |
| P-121 | 0.000 | 2.48 | 1.33 | (N/A) |
| P-120 | 0.000 | 2.48 | 1.33 | (N/A) |
| P-10 | 0.000 | 2.07 | 1.11 | (N/A) |
| P-125 | 0.000 | 1.96 | 1.05 | (N/A) |
| P-124 | 0.000 | 1.96 | 1.05 | (N/A) |
| P-123 | 0.000 | 1.96 | 1.05 | (N/A) |
| P-88 | 0.000 | 1.94 | 1.04 | (N/A) |
| P-126 | 0.000 | 1.45 | 0.78 | (N/A) |
| P-5 | 0.000 | 1.41 | 0.76 | (N/A) |
| P-8 | 0.000 | 1.32 | 0.71 | (N/A) |
| P-104 | 0.000 | 1.32 | 0.71 | (N/A) |
| P-132 | 0.000 | 1.05 | 0.56 | (N/A) |
| P-131 | 0.000 | 1.04 | 0.56 | (N/A) |
| P-130 | 0.000 | 1.04 | 0.56 | (N/A) |
| P-11 | 0.000 | 1.02 | 0.55 | (N/A) |
| P-138 | 0.000 | 1.02 | 0.55 | (N/A) |
| P-116 | 0.000 | 1.00 | 0.53 | (N/A) |
| P-112 | 0.000 | 0.99 | 0.53 | (N/A) |
| P-111 | 0.000 | 0.99 | 0.53 | (N/A) |
| P-127 | 0.000 | 0.95 | 0.51 | (N/A) |
| P-12 | 0.000 | 0.90 | 0.48 | (N/A) |
| P-29 | 0.000 | 0.60 | 0.32 | (N/A) |
| P-62 | 0.000 | 0.59 | 0.31 | (N/A) |
| P-9 | 0.000 | 0.57 | 0.31 | (N/A) |
| P-135 | 0.000 | 0.57 | 0.31 | (N/A) |
| P-134 | 0.000 | 0.57 | 0.31 | (N/A) |
| P-133 | 0.000 | 0.57 | 0.31 | (N/A) |
| P-13 | 0.000 | 0.56 | 0.30 | (N/A) |
| P-136 | 0.000 | 0.56 | 0.30 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-137 | 0.000 | 0.56 | 0.30 | (N/A) |
| P-110 | 0.000 | 0.54 | 0.29 | (N/A) |
| P-107 | 0.000 | 0.54 | 0.29 | (N/A) |
| P-106 | 0.000 | 0.54 | 0.29 | (N/A) |
| P-105 | 0.000 | 0.54 | 0.29 | (N/A) |
| P-61 | 0.000 | 0.53 | 0.29 | (N/A) |
| P-1 | 0.000 | 0.53 | 0.29 | (N/A) |
| P-63 | 0.000 | 0.53 | 0.28 | (N/A) |
| P-14 | 0.000 | 0.51 | 0.28 | (N/A) |
| P-83 | 0.000 | 0.51 | 0.28 | (N/A) |
| P-117 | 0.000 | 0.51 | 0.28 | (N/A) |
| P-68 | 0.000 | 0.50 | 0.27 | (N/A) |
| P-66 | 0.000 | 0.50 | 0.27 | (N/A) |
| P-69 | 0.000 | 0.50 | 0.27 | (N/A) |
| P-79 | 0.000 | 0.50 | 0.27 | (N/A) |
| P-113 | 0.000 | 0.50 | 0.27 | (N/A) |
| P-96 | 0.000 | 0.49 | 0.26 | (N/A) |
| P-81 | 0.000 | 0.48 | 0.26 | (N/A) |
| P-76 | 0.000 | 0.48 | 0.26 | (N/A) |
| P-84 | 0.000 | 0.46 | 0.25 | (N/A) |
| P-89 | 0.000 | 0.46 | 0.25 | (N/A) |
| P-101 | 0.000 | 0.46 | 0.25 | (N/A) |
| P-6 | 0.000 | 0.45 | 0.24 | (N/A) |
| P-129 | 0.000 | 0.45 | 0.24 | (N/A) |
| P-128 | 0.000 | 0.45 | 0.24 | (N/A) |
| P-28 | 0.000 | 0.60 | 0.00 | (N/A) |
| P-32 | 0.000 | 0.59 | 0.00 | (N/A) |
| P-109 | 0.000 | 0.54 | 0.00 | (N/A) |
| P-31 | 0.000 | 0.53 | 0.00 | (N/A) |
| P-33 | 0.000 | 0.53 | 0.00 | (N/A) |
| P-56 | 0.000 | 0.51 | 0.00 | (N/A) |
| P-38 | 0.000 | 0.50 | 0.00 | (N/A) |
| P-36 | 0.000 | 0.50 | 0.00 | (N/A) |
| P-39 | 0.000 | 0.50 | 0.00 | (N/A) |
| P-49 | 0.000 | 0.50 | 0.00 | (N/A) |
| P-94 | 0.000 | 0.49 | 0.00 | (N/A) |
| P-54 | 0.000 | 0.48 | 0.00 | (N/A) |
| P-46 | 0.000 | 0.48 | 0.00 | (N/A) |
| P-57 | 0.000 | 0.46 | 0.00 | (N/A) |
| P-51 | 0.000 | 0.46 | 0.00 | (N/A) |
| P-108 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-90 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-114 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-87 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-102 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-86 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-85 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-91 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-103 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-75 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-74 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-72 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-77 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-73 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-99 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-78 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-82 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-70 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-64 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-65 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-97 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-67 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-71 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-80 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-115 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-93 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-60 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-16 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-100 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-21 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-24 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-23 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-25 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-58 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-59 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-53 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-95 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-30 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-19 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-20 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-98 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-37 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-41 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-34 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-43 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-26 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-22 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-27 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-52 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-55 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-92 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-35 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-40 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-50 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-44 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-45 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-42 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-48 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-47 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-15 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-7 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On)

## Node Report

Subnetwork Summary

| Subnetwork | Gravity Subnetwork |
|---|---|

### Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-10 | 0.000 | 935.52 | (N/A) | 89 |
| J-53 | 0.000 | 936.37 | (N/A) | 89 |
| J-52 | 0.000 | 936.43 | (N/A) | 89 |
| J-13 | 0.000 | 936.78 | (N/A) | 88 |
| J-19 | 0.000 | 936.78 | (N/A) | 88 |
| J-20 | 0.000 | 936.78 | (N/A) | 88 |
| J-21 | 0.000 | 936.78 | (N/A) | 88 |
| J-51 | 0.000 | 936.52 | (N/A) | 88 |
| J-11 | 0.000 | 936.58 | (N/A) | 88 |
| J-47 | 0.000 | 935.68 | (N/A) | 88 |
| J-46 | 0.000 | 935.45 | (N/A) | 88 |
| J-45 | 0.000 | 935.16 | (N/A) | 88 |
| J-48 | 0.000 | 935.73 | (N/A) | 87 |
| J-9 | 0.000 | 934.60 | (N/A) | 87 |
| J-49 | 0.000 | 935.78 | (N/A) | 87 |
| J-50 | 0.000 | 935.82 | (N/A) | 87 |
| J-8 | 0.000 | 935.88 | (N/A) | 87 |
| J-31 | 0.000 | 937.15 | (N/A) | 87 |
| J-22 | 0.000 | 935.61 | (N/A) | 87 |
| J-26 | 0.000 | 936.18 | (N/A) | 87 |
| J-27 | 0.000 | 936.31 | (N/A) | 86 |
| J-28 | 0.000 | 936.38 | (N/A) | 85 |
| J-32 | 0.000 | 937.30 | (N/A) | 85 |
| J-41 | 0.000 | 934.11 | (N/A) | 85 |
| J-42 | 0.000 | 934.23 | (N/A) | 85 |
| J-43 | 0.000 | 934.28 | (N/A) | 85 |
| J-40 | 0.000 | 933.77 | (N/A) | 85 |
| J-44 | 0.000 | 934.31 | (N/A) | 85 |
| J-5 | 0.000 | 934.34 | (N/A) | 85 |
| J-39 | 0.000 | 933.24 | (N/A) | 85 |
| J-29 | 0.000 | 936.38 | (N/A) | 85 |
| J-12 | 0.000 | 937.41 | (N/A) | 84 |
| J-38 | 0.000 | 932.69 | (N/A) | 84 |
| J-23 | 0.000 | 934.45 | (N/A) | 84 |
| J-30 | 0.000 | 936.38 | (N/A) | 83 |
| J-18 | 0.000 | 932.91 | (N/A) | 83 |
| J-7 | 0.000 | 936.38 | (N/A) | 83 |
| J-24 | 0.000 | 934.58 | (N/A) | 83 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-1 | 0.000 | 932.61 | (N/A) | 82 |
| J-14 | 0.000 | 932.61 | (N/A) | 82 |
| J-17 | 0.000 | 932.61 | (N/A) | 82 |
| J-4 | 0.000 | 931.07 | (N/A) | 82 |
| J-2 | 0.000 | 932.33 | (N/A) | 82 |
| J-25 | 0.000 | 934.71 | (N/A) | 82 |
| J-37 | 0.000 | 931.56 | (N/A) | 81 |
| J-6 | 0.000 | 934.71 | (N/A) | 81 |
| J-36 | 0.000 | 930.77 | (N/A) | 80 |
| J-35 | 0.000 | 930.06 | (N/A) | 79 |
| J-34 | 0.000 | 928.59 | (N/A) | 78 |
| J-33 | 0.000 | 927.42 | (N/A) | 76 |
| J-3 | 0.000 | 919.45 | (N/A) | 66 |
| J-15 | 0.000 | 883.47 | (N/A) | 16 |
| W-11 | 0.000 | 874.39 | (N/A) | 1 |
| W-13 | 0.000 | 873.92 | (N/A) | 1 |
| W-14 | 0.000 | 873.47 | (N/A) | 1 |
| W-15 | 0.000 | 873.76 | (N/A) | 1 |
| W-16 | 0.000 | 874.05 | (N/A) | 1 |
| W-19 | 0.000 | 874.10 | (N/A) | 1 |
| W-20 | 0.000 | 874.36 | (N/A) | 1 |
| W-26 | 0.000 | 876.16 | (N/A) | 1 |
| W-27 | 0.000 | 877.65 | (N/A) | 1 |
| W-30 | 0.000 | 874.31 | (N/A) | 1 |
| W-1 | 0.000 | 874.50 | (N/A) | 1 |
| W-2 | 0.000 | 874.50 | (N/A) | 1 |
| W-3 | 0.000 | 874.24 | (N/A) | 1 |
| W-4 | 0.000 | 874.12 | (N/A) | 1 |
| W-5 | 0.000 | 874.37 | (N/A) | 1 |
| W-6 | 0.000 | 873.72 | (N/A) | 1 |
| W-7 | 0.000 | 874.50 | (N/A) | 1 |
| W-8 | 0.000 | 874.50 | (N/A) | 1 |
| W-9 | 0.000 | 873.85 | (N/A) | 1 |
| W-10 | 0.000 | 874.50 | (N/A) | 1 |
| W-12 | 0.000 | 873.62 | (N/A) | 1 |
| W-17 | 0.000 | 874.24 | (N/A) | 1 |
| W-18 | 0.000 | 875.28 | (N/A) | 1 |
| W-21 | 0.000 | 873.51 | (N/A) | 1 |
| W-22 | 0.000 | 873.78 | (N/A) | 1 |
| W-23 | 0.000 | 873.98 | (N/A) | 1 |
| W-24 | 0.000 | 874.24 | (N/A) | 1 |
| W-25 | 0.000 | 875.24 | (N/A) | 1 |
| W-28 | 0.000 | 873.87 | (N/A) | 1 |
| W-29 | 0.000 | 874.03 | (N/A) | 1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| W-31 | 0.000 | 875.84 | (N/A) | 1 |
| W-32 | 0.000 | 877.11 | (N/A) | 1 |
| W-33 | 0.000 | 878.00 | (N/A) | 1 |
| W-34 | 0.000 | 874.50 | (N/A) | 1 |
| W-35 | 0.000 | 874.50 | (N/A) | 1 |
| W-36 | 0.000 | 874.50 | (N/A) | 1 |
| W-37 | 0.000 | 876.22 | (N/A) | 1 |
| W-38 | 0.000 | 875.53 | (N/A) | 1 |
| W-39 | 0.000 | 876.85 | (N/A) | 1 |
| W-40 | 0.000 | 874.50 | (N/A) | 1 |
| W-41 | 0.000 | 877.22 | (N/A) | 1 |
| AV-3 | 0.000 | 867.11 | (N/A) | 0 |
| MH-1 | 0.000 | (N/A) | (N/A) | 0 |
| J-16 | 0.000 | 866.80 | (N/A) | 0 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On)

## Pond Report

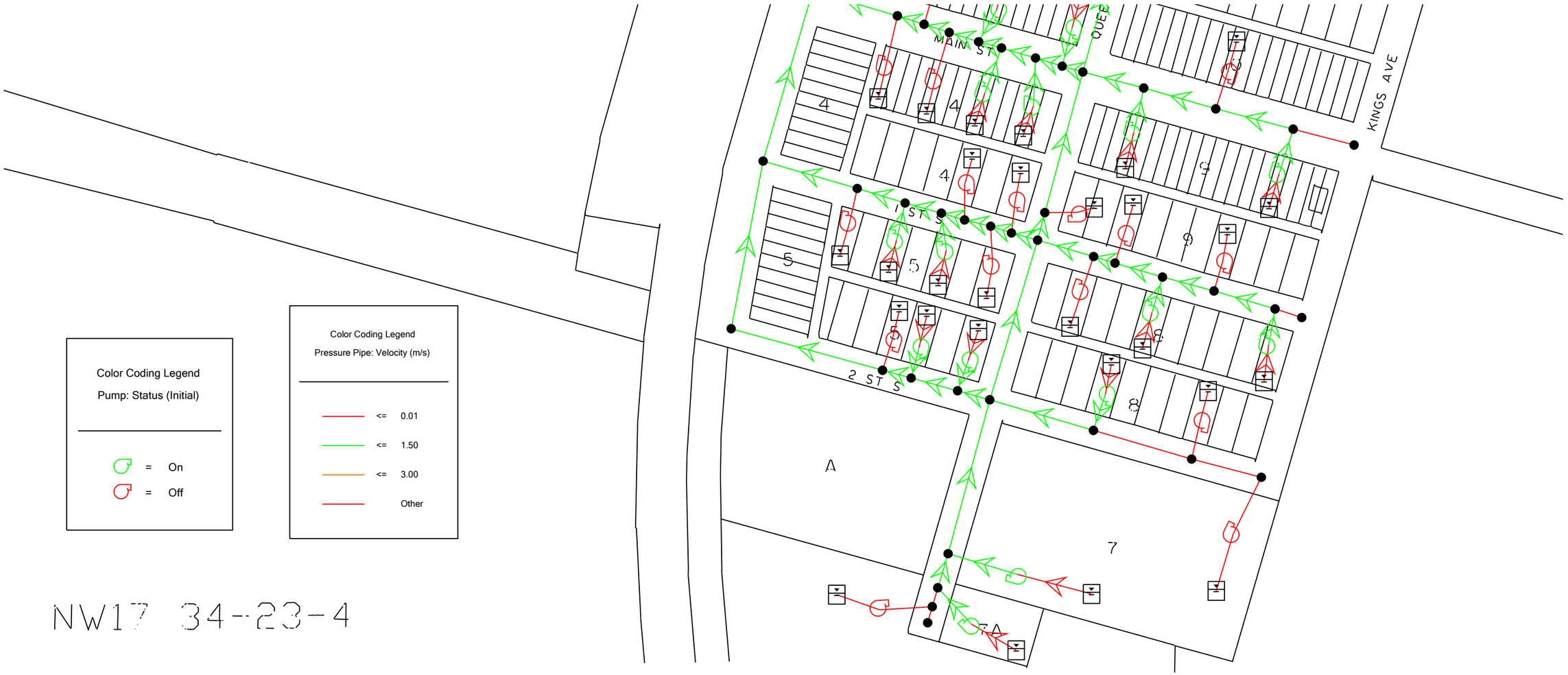
| Subnetwork Summary | |
|---|---|
| Subnetwork | Gravity Subnetwork |

### Pond Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) |
|---|---|---|

**Scenario: 20 Pumps On**

# Scenario: 20 Pumps On



# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On)

## Executive Summary

| Scenario | |
|---|---|
| Label | 20 Pumps On |

| Computation Results | |
|---|---|
| Subnetwork Results | Number of Gravity Subnetworks: 1<br>Number of Pressure Subnetworks: 1<br><br>>>>> Info: Pressure subnetwork flowing to: MH-1<br>>>>> Info: Pressure analysis iterations: 12<br>>>>> Info: Convergence was achieved.<br><br>>>>> Info: Gravity subnetwork draining to: O-8<br>>>>> Info: Convergence was achieved. |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On)

## Calculation Options

### <General>

| | | | |
|---|---|---|---|
| Label | Base Calculation Options | Calculation Type | Analysis |
| Time Analysis Type | Steady State | | |

### Gravity Hydraulics

| | | | |
|---|---|---|---|
| Maximum Network Traversals | 5 | Governing Upstream Pipe Selection Method | Pipe with Maximum QV |
| Flow Convergence Test | 0.001 | Structure Loss Mode | Hydraulic Grade |
| Tractive Stress (Global Minimum) | 0.000 Pascals | Report Hydrologic Time Step? | True |
| Flow Profile Method | Backwater Analysis | Save Detailed Headloss Data? | False |
| Number of Flow Profile Steps | 5 | Gravity Friction Method | Manning's |
| Hydraulic Grade Convergence Test | 0.00 m | Liquid Label | Water at 20C (68F) |
| Average Velocity Method | Actual Uniform Flow Velocity | Use Explicit Depth and Slope Equations? | False |
| Minimum Structure Headloss | 0.00 m | | |

### Pressure

| | | | |
|---|---|---|---|
| Peak Flow Ratio | 75.0 % | Pattern Setup | <None> |
| Extreme Flow Setup | <None> | Steady State Hydrograph Equivalent | Peak |

### Pressure Hydraulics

| | | | |
|---|---|---|---|
| Use Controls During Steady State? | True | Use Linear Interpolation For Multipoint Pumps? | False |
| Wet Well Convergence Increment | 0.2 m | Use Controls During Steady State? | True |
| Use Pumped Flows? | True | Liquid Specific Gravity | 0.998 |
| Pressure Subnetwork Accuracy | 0.001 | Pressure Subnetwork Minimum Possible Pressure | -14 psi |
| Pressure Subnetwork Trials | 40 | Pressure Friction Method | Hazen-Williams |

### SWMM Hydrology

| | | | |
|---|---|---|---|
| Default Infiltration Method | Horton | SWMM Hydrologic Increment | 0.250 hours |

### Headloss (AASHTO)

| | | | |
|---|---|---|---|
| Expansion, Ke | 0.350 | Shaping Adjustment, Cs | 0.500 |
| Contraction, Kc | 0.250 | Non-Piped Flow Adjustment, Cn | 1.300 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On)

### Bend Angle vs. Bend Loss Curve

| Bend Angle (degrees) | Bend Loss Coefficient, Kb |
|---|---|
| 0.00 | 0.000 |
| 15.00 | 0.190 |
| 30.00 | 0.350 |
| 45.00 | 0.470 |
| 60.00 | 0.560 |
| 75.00 | 0.640 |
| 90.00 | 0.700 |

| HEC-22 Energy Losses | |
|---|---|
| Consider Non-Piped Plunging Flow? | True |

| HEC-22 Energy Losses (Second Edition) | | | |
|---|---|---|---|
| Elevations Considered Equal Within | 0.15 m | Half Bench Submerged Factor | 0.950 |
| Flat Unsubmerged Factor | 1.000 | Full Bench Unsubmerged Factor | 0.070 |
| Flat Submerged Factor | 1.000 | Full Bench Submerged Factor | 0.750 |
| Depressed Unsubmerged Factor | 1.000 | Improved Bench Unsubmerged Factor | 0.035 |
| Depressed Submerged Factor | 1.000 | Improved Bench Submerged Factor | 0.375 |
| Half Bench Unsubmerged Factor | 0.150 | | |

| HEC-22 Energy Losses (Third Edition) | | | |
|---|---|---|---|
| Flat Submerged Coefficient | -0.050 | Half Bench Unsubmerged Coefficient | -0.850 |
| Flat Unsubmerged Coefficient | -0.050 | Full Bench Submerged Coefficient | -0.250 |
| Depressed Submerged Coefficient | 0.000 | Full Bench Unsubmerged Coefficient | -0.930 |
| Depressed Unsubmerged Coefficient | 0.000 | Improved Submerged Coefficient | -0.600 |
| Half Bench Submerged Coefficient | -0.050 | Improved Unsubmerged Coefficient | -0.980 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On)

## Calculation Summary (502: 20 Pumps On)

| Time (hours) | Balanced? | Trials | Relative Flow Change |
|---|---|---|---|
| All Time Steps (0) | True | 0 | (N/A) |
| 0.00 | True | (N/A) | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On)

## Pipe Report

Subnetwork Summary

| | |
|---|---|
| Subnetwork | Pressure Subnetwork - 1 |

### Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-3 | 0.000 | 7.95 | 4.27 | (N/A) |
| P-4 | 0.000 | 4.28 | 2.30 | (N/A) |
| P-120 | 0.000 | 3.66 | 1.97 | (N/A) |
| P-119 | 0.000 | 3.66 | 1.97 | (N/A) |
| P-118 | 0.000 | 3.66 | 1.97 | (N/A) |
| P-18 | 0.000 | 7.95 | 1.96 | (N/A) |
| P-139 | 0.000 | 7.95 | 1.96 | (N/A) |
| P-17 | 0.000 | 7.95 | 1.96 | (N/A) |
| P-121 | 0.000 | 3.18 | 1.71 | (N/A) |
| P-2 | 0.000 | 2.72 | 1.46 | (N/A) |
| P-122 | 0.000 | 2.72 | 1.46 | (N/A) |
| P-10 | 0.000 | 2.23 | 1.19 | (N/A) |
| P-126 | 0.000 | 2.06 | 1.11 | (N/A) |
| P-125 | 0.000 | 2.06 | 1.11 | (N/A) |
| P-124 | 0.000 | 2.06 | 1.11 | (N/A) |
| P-123 | 0.000 | 2.06 | 1.11 | (N/A) |
| P-127 | 0.000 | 1.66 | 0.89 | (N/A) |
| P-5 | 0.000 | 1.45 | 0.78 | (N/A) |
| P-88 | 0.000 | 1.45 | 0.78 | (N/A) |
| P-128 | 0.000 | 1.27 | 0.68 | (N/A) |
| P-131 | 0.000 | 1.23 | 0.66 | (N/A) |
| P-130 | 0.000 | 1.23 | 0.66 | (N/A) |
| P-8 | 0.000 | 1.09 | 0.59 | (N/A) |
| P-104 | 0.000 | 1.09 | 0.59 | (N/A) |
| P-137 | 0.000 | 1.00 | 0.54 | (N/A) |
| P-11 | 0.000 | 1.00 | 0.54 | (N/A) |
| P-138 | 0.000 | 1.00 | 0.54 | (N/A) |
| P-129 | 0.000 | 0.87 | 0.47 | (N/A) |
| P-132 | 0.000 | 0.87 | 0.46 | (N/A) |
| P-105 | 0.000 | 0.85 | 0.45 | (N/A) |
| P-1 | 0.000 | 0.84 | 0.45 | (N/A) |
| P-113 | 0.000 | 0.82 | 0.44 | (N/A) |
| P-112 | 0.000 | 0.82 | 0.44 | (N/A) |
| P-111 | 0.000 | 0.82 | 0.44 | (N/A) |
| P-12 | 0.000 | 0.78 | 0.42 | (N/A) |
| P-89 | 0.000 | 0.69 | 0.37 | (N/A) |
| P-136 | 0.000 | 0.65 | 0.35 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-9 | 0.000 | 0.51 | 0.27 | (N/A) |
| P-135 | 0.000 | 0.51 | 0.27 | (N/A) |
| P-134 | 0.000 | 0.51 | 0.27 | (N/A) |
| P-133 | 0.000 | 0.51 | 0.27 | (N/A) |
| P-6 | 0.000 | 0.48 | 0.26 | (N/A) |
| P-25 | 0.000 | 0.48 | 0.26 | (N/A) |
| P-23 | 0.000 | 0.46 | 0.25 | (N/A) |
| P-107 | 0.000 | 0.44 | 0.24 | (N/A) |
| P-110 | 0.000 | 0.44 | 0.24 | (N/A) |
| P-106 | 0.000 | 0.44 | 0.24 | (N/A) |
| P-21 | 0.000 | 0.43 | 0.23 | (N/A) |
| P-115 | 0.000 | 0.42 | 0.23 | (N/A) |
| P-80 | 0.000 | 0.42 | 0.23 | (N/A) |
| P-114 | 0.000 | 0.42 | 0.23 | (N/A) |
| P-61 | 0.000 | 0.42 | 0.22 | (N/A) |
| P-16 | 0.000 | 0.42 | 0.22 | (N/A) |
| P-100 | 0.000 | 0.42 | 0.22 | (N/A) |
| P-87 | 0.000 | 0.42 | 0.22 | (N/A) |
| P-71 | 0.000 | 0.41 | 0.22 | (N/A) |
| P-66 | 0.000 | 0.40 | 0.21 | (N/A) |
| P-79 | 0.000 | 0.40 | 0.21 | (N/A) |
| P-69 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-64 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-70 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-81 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-116 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-76 | 0.000 | 0.36 | 0.19 | (N/A) |
| P-75 | 0.000 | 0.36 | 0.19 | (N/A) |
| P-103 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-102 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-84 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-85 | 0.000 | 0.34 | 0.19 | (N/A) |
| P-90 | 0.000 | 0.34 | 0.19 | (N/A) |
| P-13 | 0.000 | 0.30 | 0.16 | (N/A) |
| P-26 | 0.000 | 0.48 | 0.00 | (N/A) |
| P-22 | 0.000 | 0.46 | 0.00 | (N/A) |
| P-109 | 0.000 | 0.44 | 0.00 | (N/A) |
| P-20 | 0.000 | 0.43 | 0.00 | (N/A) |
| P-50 | 0.000 | 0.42 | 0.00 | (N/A) |
| P-31 | 0.000 | 0.42 | 0.00 | (N/A) |
| P-19 | 0.000 | 0.42 | 0.00 | (N/A) |
| P-41 | 0.000 | 0.41 | 0.00 | (N/A) |
| P-36 | 0.000 | 0.40 | 0.00 | (N/A) |
| P-49 | 0.000 | 0.40 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-39 | 0.000 | 0.39 | 0.00 | (N/A) |
| P-34 | 0.000 | 0.39 | 0.00 | (N/A) |
| P-40 | 0.000 | 0.39 | 0.00 | (N/A) |
| P-54 | 0.000 | 0.39 | 0.00 | (N/A) |
| P-46 | 0.000 | 0.36 | 0.00 | (N/A) |
| P-45 | 0.000 | 0.36 | 0.00 | (N/A) |
| P-53 | 0.000 | 0.35 | 0.00 | (N/A) |
| P-52 | 0.000 | 0.35 | 0.00 | (N/A) |
| P-57 | 0.000 | 0.35 | 0.00 | (N/A) |
| P-58 | 0.000 | 0.34 | 0.00 | (N/A) |
| P-117 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-86 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-91 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-101 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-72 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-74 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-77 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-73 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-99 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-78 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-96 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-97 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-68 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-82 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-60 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-65 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-93 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-63 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-67 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-14 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-83 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-24 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-62 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-29 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-37 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-32 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-59 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-94 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-98 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-95 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-30 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-33 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-43 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-35 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-44 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-27 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-38 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-48 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-42 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-47 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-108 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-28 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-15 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-7 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-51 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-55 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-56 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-92 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On)

## Node Report

Subnetwork Summary

| Subnetwork | Pressure Subnetwork - 1 |
|---|---|

### Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-13 | 0.000 | 942.39 | (N/A) | 96 |
| J-20 | 0.000 | 942.39 | (N/A) | 96 |
| J-21 | 0.000 | 942.39 | (N/A) | 96 |
| J-19 | 0.000 | 942.36 | (N/A) | 96 |
| J-10 | 0.000 | 940.83 | (N/A) | 96 |
| J-52 | 0.000 | 941.81 | (N/A) | 96 |
| J-53 | 0.000 | 941.64 | (N/A) | 96 |
| J-51 | 0.000 | 941.93 | (N/A) | 96 |
| J-11 | 0.000 | 941.95 | (N/A) | 96 |
| J-46 | 0.000 | 941.09 | (N/A) | 96 |
| J-47 | 0.000 | 941.25 | (N/A) | 95 |
| J-48 | 0.000 | 941.29 | (N/A) | 95 |
| J-45 | 0.000 | 940.69 | (N/A) | 95 |
| J-49 | 0.000 | 941.33 | (N/A) | 95 |
| J-50 | 0.000 | 941.36 | (N/A) | 95 |
| J-9 | 0.000 | 939.94 | (N/A) | 95 |
| J-8 | 0.000 | 941.41 | (N/A) | 95 |
| J-22 | 0.000 | 941.22 | (N/A) | 95 |
| J-26 | 0.000 | 941.62 | (N/A) | 94 |
| J-31 | 0.000 | 942.04 | (N/A) | 94 |
| J-27 | 0.000 | 941.71 | (N/A) | 94 |
| J-43 | 0.000 | 940.18 | (N/A) | 94 |
| J-44 | 0.000 | 940.30 | (N/A) | 94 |
| J-5 | 0.000 | 940.33 | (N/A) | 93 |
| J-42 | 0.000 | 939.87 | (N/A) | 93 |
| J-28 | 0.000 | 941.90 | (N/A) | 93 |
| J-41 | 0.000 | 939.52 | (N/A) | 93 |
| J-23 | 0.000 | 940.58 | (N/A) | 93 |
| J-29 | 0.000 | 941.95 | (N/A) | 92 |
| J-40 | 0.000 | 938.86 | (N/A) | 92 |
| J-32 | 0.000 | 942.04 | (N/A) | 92 |
| J-14 | 0.000 | 939.25 | (N/A) | 92 |
| J-17 | 0.000 | 939.17 | (N/A) | 92 |
| J-39 | 0.000 | 938.29 | (N/A) | 92 |
| J-1 | 0.000 | 939.12 | (N/A) | 92 |
| J-24 | 0.000 | 940.66 | (N/A) | 91 |
| J-30 | 0.000 | 942.02 | (N/A) | 91 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-18 | 0.000 | 938.83 | (N/A) | 91 |
| J-38 | 0.000 | 937.68 | (N/A) | 91 |
| J-12 | 0.000 | 942.04 | (N/A) | 91 |
| J-7 | 0.000 | 942.02 | (N/A) | 91 |
| J-2 | 0.000 | 938.49 | (N/A) | 91 |
| J-25 | 0.000 | 940.76 | (N/A) | 90 |
| J-37 | 0.000 | 937.58 | (N/A) | 90 |
| J-4 | 0.000 | 935.90 | (N/A) | 89 |
| J-6 | 0.000 | 940.76 | (N/A) | 89 |
| J-36 | 0.000 | 936.64 | (N/A) | 89 |
| J-35 | 0.000 | 935.50 | (N/A) | 87 |
| J-34 | 0.000 | 932.46 | (N/A) | 83 |
| J-33 | 0.000 | 930.82 | (N/A) | 81 |
| J-3 | 0.000 | 922.85 | (N/A) | 71 |
| J-15 | 0.000 | 884.58 | (N/A) | 18 |
| W-11 | 0.000 | 874.39 | (N/A) | 1 |
| W-13 | 0.000 | 873.92 | (N/A) | 1 |
| W-14 | 0.000 | 873.47 | (N/A) | 1 |
| W-15 | 0.000 | 873.76 | (N/A) | 1 |
| W-16 | 0.000 | 874.05 | (N/A) | 1 |
| W-19 | 0.000 | 874.10 | (N/A) | 1 |
| W-20 | 0.000 | 874.36 | (N/A) | 1 |
| W-26 | 0.000 | 876.16 | (N/A) | 1 |
| W-27 | 0.000 | 877.65 | (N/A) | 1 |
| W-30 | 0.000 | 874.31 | (N/A) | 1 |
| W-1 | 0.000 | 874.50 | (N/A) | 1 |
| W-2 | 0.000 | 874.50 | (N/A) | 1 |
| W-3 | 0.000 | 874.24 | (N/A) | 1 |
| W-4 | 0.000 | 874.12 | (N/A) | 1 |
| W-5 | 0.000 | 874.37 | (N/A) | 1 |
| W-6 | 0.000 | 873.72 | (N/A) | 1 |
| W-7 | 0.000 | 874.50 | (N/A) | 1 |
| W-8 | 0.000 | 874.50 | (N/A) | 1 |
| W-9 | 0.000 | 873.85 | (N/A) | 1 |
| W-10 | 0.000 | 874.50 | (N/A) | 1 |
| W-12 | 0.000 | 873.62 | (N/A) | 1 |
| W-17 | 0.000 | 874.24 | (N/A) | 1 |
| W-18 | 0.000 | 875.28 | (N/A) | 1 |
| W-21 | 0.000 | 873.51 | (N/A) | 1 |
| W-22 | 0.000 | 873.78 | (N/A) | 1 |
| W-23 | 0.000 | 873.98 | (N/A) | 1 |
| W-24 | 0.000 | 874.24 | (N/A) | 1 |
| W-25 | 0.000 | 875.24 | (N/A) | 1 |
| W-28 | 0.000 | 873.87 | (N/A) | 1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| W-29 | 0.000 | 874.03 | (N/A) | 1 |
| W-31 | 0.000 | 875.84 | (N/A) | 1 |
| W-32 | 0.000 | 877.11 | (N/A) | 1 |
| W-33 | 0.000 | 878.00 | (N/A) | 1 |
| W-34 | 0.000 | 874.50 | (N/A) | 1 |
| W-35 | 0.000 | 874.50 | (N/A) | 1 |
| W-36 | 0.000 | 874.50 | (N/A) | 1 |
| W-37 | 0.000 | 876.22 | (N/A) | 1 |
| W-38 | 0.000 | 875.53 | (N/A) | 1 |
| W-39 | 0.000 | 876.85 | (N/A) | 1 |
| W-40 | 0.000 | 874.50 | (N/A) | 1 |
| W-41 | 0.000 | 877.22 | (N/A) | 1 |
| AV-3 | 0.000 | 867.18 | (N/A) | 0 |
| MH-1 | 0.000 | (N/A) | (N/A) | 0 |
| J-16 | 0.000 | 866.84 | (N/A) | 0 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On)

## Pond Report

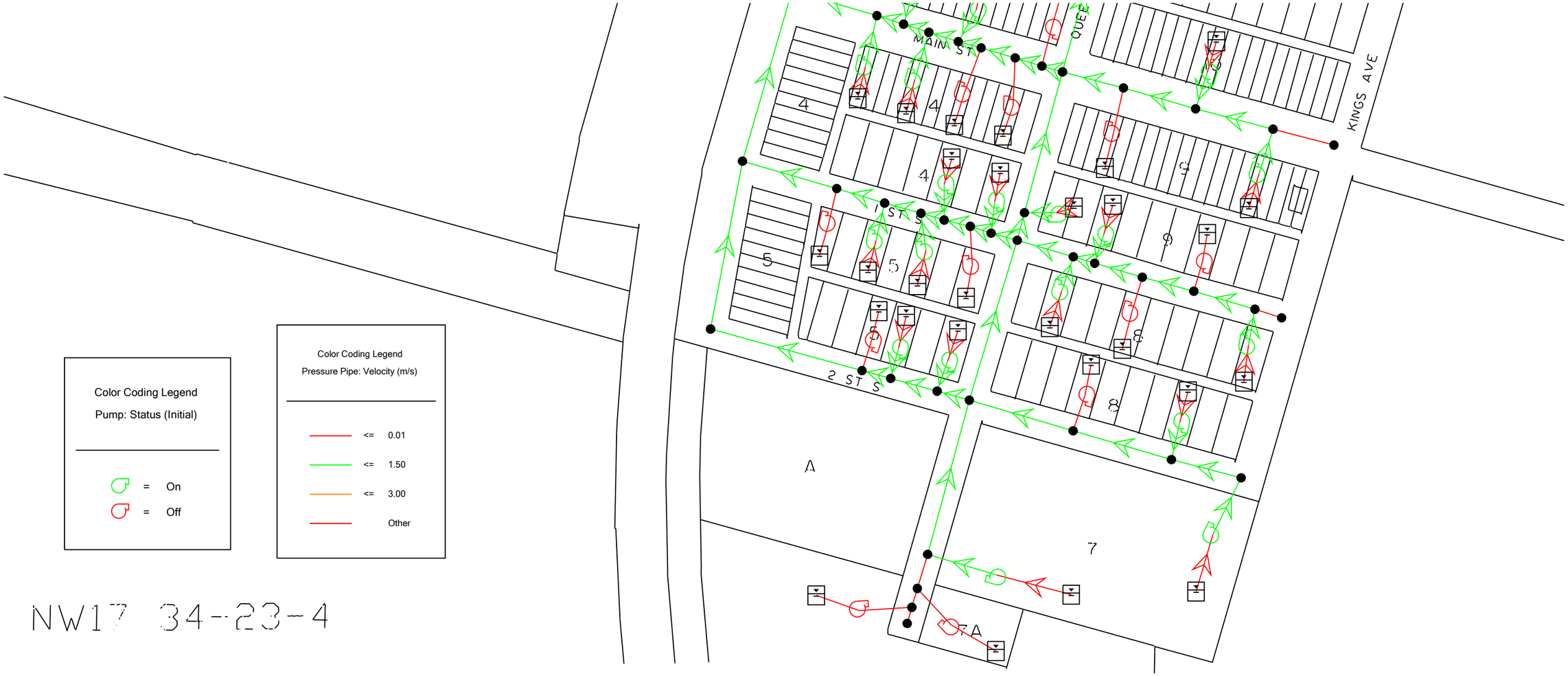
| Subnetwork Summary | |
|---|---|
| Subnetwork | Pressure Subnetwork - 1 |

### Pond Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) |
|---|---|---|

**Scenario: 25 Pumps On**

# Scenario: 25 Pumps On



# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On)

## Executive Summary

| Scenario | |
|---|---|
| Label | 25 Pumps On |

| Computation Results | |
|---|---|
| Subnetwork Results | Number of Gravity Subnetworks: 1<br>Number of Pressure Subnetworks: 1<br><br>>>>> Info: Pressure subnetwork flowing to: MH-1<br>>>>> Info: Pressure analysis iterations: 12<br>>>>> Info: Convergence was achieved.<br><br>>>>> Info: Gravity subnetwork draining to: O-8<br>>>>> Info: Convergence was achieved. |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On)

## Calculation Options

### <General>

| | | | |
|---|---|---|---|
| Label | Base Calculation Options | Calculation Type | Analysis |
| Time Analysis Type | Steady State | | |

### Gravity Hydraulics

| | | | |
|---|---|---|---|
| Maximum Network Traversals | 5 | Governing Upstream Pipe Selection Method | Pipe with Maximum QV |
| Flow Convergence Test | 0.001 | Structure Loss Mode | Hydraulic Grade |
| Tractive Stress (Global Minimum) | 0.000 Pascals | Report Hydrologic Time Step? | True |
| Flow Profile Method | Backwater Analysis | Save Detailed Headloss Data? | False |
| Number of Flow Profile Steps | 5 | Gravity Friction Method | Manning's |
| Hydraulic Grade Convergence Test | 0.00 m | Liquid Label | Water at 20C (68F) |
| Average Velocity Method | Actual Uniform Flow Velocity | Use Explicit Depth and Slope Equations? | False |
| Minimum Structure Headloss | 0.00 m | | |

### Pressure

| | | | |
|---|---|---|---|
| Peak Flow Ratio | 75.0 % | Pattern Setup | <None> |
| Extreme Flow Setup | <None> | Steady State Hydrograph Equivalent | Peak |

### Pressure Hydraulics

| | | | |
|---|---|---|---|
| Use Controls During Steady State? | True | Use Linear Interpolation For Multipoint Pumps? | False |
| Wet Well Convergence Increment | 0.2 m | Use Controls During Steady State? | True |
| Use Pumped Flows? | True | Liquid Specific Gravity | 0.998 |
| Pressure Subnetwork Accuracy | 0.001 | Pressure Subnetwork Minimum Possible Pressure | -14 psi |
| Pressure Subnetwork Trials | 40 | Pressure Friction Method | Hazen-Williams |

### SWMM Hydrology

| | | | |
|---|---|---|---|
| Default Infiltration Method | Horton | SWMM Hydrologic Increment | 0.250 hours |

### Headloss (AASHTO)

| | | | |
|---|---|---|---|
| Expansion, Ke | 0.350 | Shaping Adjustment, Cs | 0.500 |
| Contraction, Kc | 0.250 | Non-Piped Flow Adjustment, Cn | 1.300 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On)

### Bend Angle vs. Bend Loss Curve

| Bend Angle (degrees) | Bend Loss Coefficient, Kb |
|---|---|
| 0.00 | 0.000 |
| 15.00 | 0.190 |
| 30.00 | 0.350 |
| 45.00 | 0.470 |
| 60.00 | 0.560 |
| 75.00 | 0.640 |
| 90.00 | 0.700 |

| HEC-22 Energy Losses | |
|---|---|
| Consider Non-Piped Plunging Flow? | True |

| HEC-22 Energy Losses (Second Edition) | | | |
|---|---|---|---|
| Elevations Considered Equal Within | 0.15 m | Half Bench Submerged Factor | 0.950 |
| Flat Unsubmerged Factor | 1.000 | Full Bench Unsubmerged Factor | 0.070 |
| Flat Submerged Factor | 1.000 | Full Bench Submerged Factor | 0.750 |
| Depressed Unsubmerged Factor | 1.000 | Improved Bench Unsubmerged Factor | 0.035 |
| Depressed Submerged Factor | 1.000 | Improved Bench Submerged Factor | 0.375 |
| Half Bench Unsubmerged Factor | 0.150 | | |

| HEC-22 Energy Losses (Third Edition) | | | |
|---|---|---|---|
| Flat Submerged Coefficient | -0.050 | Half Bench Unsubmerged Coefficient | -0.850 |
| Flat Unsubmerged Coefficient | -0.050 | Full Bench Submerged Coefficient | -0.250 |
| Depressed Submerged Coefficient | 0.000 | Full Bench Unsubmerged Coefficient | -0.930 |
| Depressed Unsubmerged Coefficient | 0.000 | Improved Submerged Coefficient | -0.600 |
| Half Bench Submerged Coefficient | -0.050 | Improved Unsubmerged Coefficient | -0.980 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On)

## Calculation Summary (503: 25 Pumps On)

| Time (hours) | Balanced? | Trials | Relative Flow Change |
|---|---|---|---|
| All Time Steps (1) | True | 12 | 0.0001179 |
| 0.00 | True | 12 | 0.0001179 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On)

## Pipe Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Gravity Subnetwork |

### Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-3 | 0.000 | 8.19 | 4.40 | (N/A) |
| P-4 | 0.000 | 4.35 | 2.33 | (N/A) |
| P-118 | 0.000 | 3.84 | 2.06 | (N/A) |
| P-18 | 0.000 | 8.19 | 2.02 | (N/A) |
| P-139 | 0.000 | 8.19 | 2.02 | (N/A) |
| P-17 | 0.000 | 8.19 | 2.02 | (N/A) |
| P-120 | 0.000 | 3.36 | 1.80 | (N/A) |
| P-119 | 0.000 | 3.36 | 1.80 | (N/A) |
| P-121 | 0.000 | 2.94 | 1.58 | (N/A) |
| P-122 | 0.000 | 2.54 | 1.36 | (N/A) |
| P-123 | 0.000 | 2.18 | 1.17 | (N/A) |
| P-10 | 0.000 | 2.17 | 1.17 | (N/A) |
| P-2 | 0.000 | 2.15 | 1.16 | (N/A) |
| P-124 | 0.000 | 1.83 | 0.98 | (N/A) |
| P-104 | 0.000 | 1.54 | 0.82 | (N/A) |
| P-125 | 0.000 | 1.50 | 0.81 | (N/A) |
| P-5 | 0.000 | 1.44 | 0.77 | (N/A) |
| P-88 | 0.000 | 1.44 | 0.77 | (N/A) |
| P-8 | 0.000 | 1.26 | 0.67 | (N/A) |
| P-131 | 0.000 | 1.24 | 0.67 | (N/A) |
| P-130 | 0.000 | 1.24 | 0.67 | (N/A) |
| P-126 | 0.000 | 1.17 | 0.63 | (N/A) |
| P-132 | 0.000 | 0.98 | 0.53 | (N/A) |
| P-111 | 0.000 | 0.93 | 0.50 | (N/A) |
| P-137 | 0.000 | 0.93 | 0.50 | (N/A) |
| P-11 | 0.000 | 0.93 | 0.50 | (N/A) |
| P-138 | 0.000 | 0.93 | 0.50 | (N/A) |
| P-6 | 0.000 | 0.85 | 0.46 | (N/A) |
| P-129 | 0.000 | 0.85 | 0.46 | (N/A) |
| P-128 | 0.000 | 0.85 | 0.46 | (N/A) |
| P-127 | 0.000 | 0.85 | 0.45 | (N/A) |
| P-106 | 0.000 | 0.75 | 0.40 | (N/A) |
| P-105 | 0.000 | 0.75 | 0.40 | (N/A) |
| P-133 | 0.000 | 0.72 | 0.39 | (N/A) |
| P-87 | 0.000 | 0.72 | 0.38 | (N/A) |
| P-1 | 0.000 | 0.72 | 0.38 | (N/A) |
| P-117 | 0.000 | 0.68 | 0.36 | (N/A) |
| P-116 | 0.000 | 0.68 | 0.36 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-136 | 0.000 | 0.67 | 0.36 | (N/A) |
| P-112 | 0.000 | 0.64 | 0.35 | (N/A) |
| P-12 | 0.000 | 0.52 | 0.28 | (N/A) |
| P-29 | 0.000 | 0.49 | 0.26 | (N/A) |
| P-135 | 0.000 | 0.46 | 0.25 | (N/A) |
| P-134 | 0.000 | 0.46 | 0.25 | (N/A) |
| P-25 | 0.000 | 0.42 | 0.22 | (N/A) |
| P-13 | 0.000 | 0.42 | 0.22 | (N/A) |
| P-23 | 0.000 | 0.40 | 0.21 | (N/A) |
| P-24 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-107 | 0.000 | 0.38 | 0.21 | (N/A) |
| P-110 | 0.000 | 0.38 | 0.21 | (N/A) |
| P-93 | 0.000 | 0.36 | 0.19 | (N/A) |
| P-16 | 0.000 | 0.36 | 0.19 | (N/A) |
| P-100 | 0.000 | 0.36 | 0.19 | (N/A) |
| P-60 | 0.000 | 0.36 | 0.19 | (N/A) |
| P-115 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-80 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-114 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-113 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-14 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-83 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-67 | 0.000 | 0.34 | 0.18 | (N/A) |
| P-65 | 0.000 | 0.33 | 0.18 | (N/A) |
| P-68 | 0.000 | 0.33 | 0.18 | (N/A) |
| P-82 | 0.000 | 0.33 | 0.18 | (N/A) |
| P-66 | 0.000 | 0.33 | 0.18 | (N/A) |
| P-96 | 0.000 | 0.29 | 0.16 | (N/A) |
| P-78 | 0.000 | 0.29 | 0.15 | (N/A) |
| P-99 | 0.000 | 0.28 | 0.15 | (N/A) |
| P-73 | 0.000 | 0.27 | 0.14 | (N/A) |
| P-72 | 0.000 | 0.26 | 0.14 | (N/A) |
| P-84 | 0.000 | 0.26 | 0.14 | (N/A) |
| P-89 | 0.000 | 0.26 | 0.14 | (N/A) |
| P-75 | 0.000 | 0.26 | 0.14 | (N/A) |
| P-76 | 0.000 | 0.26 | 0.14 | (N/A) |
| P-103 | 0.000 | 0.26 | 0.14 | (N/A) |
| P-102 | 0.000 | 0.25 | 0.14 | (N/A) |
| P-9 | 0.000 | 0.20 | 0.10 | (N/A) |
| P-28 | 0.000 | 0.49 | 0.00 | (N/A) |
| P-26 | 0.000 | 0.42 | 0.00 | (N/A) |
| P-22 | 0.000 | 0.40 | 0.00 | (N/A) |
| P-27 | 0.000 | 0.39 | 0.00 | (N/A) |
| P-109 | 0.000 | 0.38 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-92 | 0.000 | 0.36 | 0.00 | (N/A) |
| P-19 | 0.000 | 0.36 | 0.00 | (N/A) |
| P-30 | 0.000 | 0.36 | 0.00 | (N/A) |
| P-50 | 0.000 | 0.35 | 0.00 | (N/A) |
| P-56 | 0.000 | 0.35 | 0.00 | (N/A) |
| P-37 | 0.000 | 0.34 | 0.00 | (N/A) |
| P-35 | 0.000 | 0.33 | 0.00 | (N/A) |
| P-38 | 0.000 | 0.33 | 0.00 | (N/A) |
| P-55 | 0.000 | 0.33 | 0.00 | (N/A) |
| P-36 | 0.000 | 0.33 | 0.00 | (N/A) |
| P-94 | 0.000 | 0.29 | 0.00 | (N/A) |
| P-48 | 0.000 | 0.29 | 0.00 | (N/A) |
| P-98 | 0.000 | 0.28 | 0.00 | (N/A) |
| P-43 | 0.000 | 0.27 | 0.00 | (N/A) |
| P-42 | 0.000 | 0.26 | 0.00 | (N/A) |
| P-57 | 0.000 | 0.26 | 0.00 | (N/A) |
| P-45 | 0.000 | 0.26 | 0.00 | (N/A) |
| P-46 | 0.000 | 0.26 | 0.00 | (N/A) |
| P-53 | 0.000 | 0.26 | 0.00 | (N/A) |
| P-52 | 0.000 | 0.25 | 0.00 | (N/A) |
| P-90 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-91 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-15 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-101 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-85 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-86 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-74 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-77 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-81 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-79 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-69 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-70 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-64 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-97 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-71 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-61 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-63 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-21 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-62 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-32 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-31 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-33 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-20 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-58 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-59 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-54 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-95 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-39 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-41 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-34 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-40 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-44 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-47 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-7 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-51 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-49 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-108 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On)

## Node Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Gravity Subnetwork |

### Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-10 | 0.000 | 944.14 | (N/A) | 101 |
| J-53 | 0.000 | 944.85 | (N/A) | 101 |
| J-52 | 0.000 | 944.99 | (N/A) | 101 |
| J-51 | 0.000 | 945.12 | (N/A) | 101 |
| J-47 | 0.000 | 944.75 | (N/A) | 100 |
| J-46 | 0.000 | 944.55 | (N/A) | 100 |
| J-48 | 0.000 | 944.83 | (N/A) | 100 |
| J-13 | 0.000 | 945.22 | (N/A) | 100 |
| J-19 | 0.000 | 945.22 | (N/A) | 100 |
| J-20 | 0.000 | 945.22 | (N/A) | 100 |
| J-21 | 0.000 | 945.22 | (N/A) | 100 |
| J-11 | 0.000 | 945.16 | (N/A) | 100 |
| J-45 | 0.000 | 944.14 | (N/A) | 100 |
| J-49 | 0.000 | 944.86 | (N/A) | 100 |
| J-50 | 0.000 | 944.89 | (N/A) | 100 |
| J-8 | 0.000 | 944.90 | (N/A) | 100 |
| J-9 | 0.000 | 943.37 | (N/A) | 100 |
| J-22 | 0.000 | 944.65 | (N/A) | 100 |
| J-26 | 0.000 | 945.17 | (N/A) | 99 |
| J-27 | 0.000 | 945.23 | (N/A) | 99 |
| J-31 | 0.000 | 945.43 | (N/A) | 99 |
| J-28 | 0.000 | 945.27 | (N/A) | 98 |
| J-41 | 0.000 | 942.52 | (N/A) | 97 |
| J-32 | 0.000 | 945.69 | (N/A) | 97 |
| J-42 | 0.000 | 942.62 | (N/A) | 97 |
| J-40 | 0.000 | 942.29 | (N/A) | 97 |
| J-43 | 0.000 | 942.77 | (N/A) | 97 |
| J-44 | 0.000 | 942.88 | (N/A) | 97 |
| J-5 | 0.000 | 942.97 | (N/A) | 97 |
| J-29 | 0.000 | 945.31 | (N/A) | 97 |
| J-39 | 0.000 | 941.97 | (N/A) | 97 |
| J-38 | 0.000 | 941.48 | (N/A) | 97 |
| J-23 | 0.000 | 943.17 | (N/A) | 96 |
| J-12 | 0.000 | 945.74 | (N/A) | 96 |
| J-30 | 0.000 | 945.36 | (N/A) | 96 |
| J-7 | 0.000 | 945.36 | (N/A) | 96 |
| J-14 | 0.000 | 941.84 | (N/A) | 96 |
| J-17 | 0.000 | 941.79 | (N/A) | 96 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-24 | 0.000 | 943.40 | (N/A) | 95 |
| J-1 | 0.000 | 941.65 | (N/A) | 95 |
| J-18 | 0.000 | 941.50 | (N/A) | 95 |
| J-2 | 0.000 | 941.17 | (N/A) | 95 |
| J-4 | 0.000 | 939.51 | (N/A) | 94 |
| J-25 | 0.000 | 943.47 | (N/A) | 94 |
| J-37 | 0.000 | 940.58 | (N/A) | 94 |
| J-36 | 0.000 | 939.76 | (N/A) | 93 |
| J-6 | 0.000 | 943.47 | (N/A) | 93 |
| J-35 | 0.000 | 938.78 | (N/A) | 92 |
| J-34 | 0.000 | 936.20 | (N/A) | 89 |
| J-33 | 0.000 | 934.81 | (N/A) | 87 |
| J-3 | 0.000 | 926.10 | (N/A) | 75 |
| J-15 | 0.000 | 885.64 | (N/A) | 19 |
| W-11 | 0.000 | 874.39 | (N/A) | 1 |
| W-13 | 0.000 | 873.92 | (N/A) | 1 |
| W-14 | 0.000 | 873.47 | (N/A) | 1 |
| W-15 | 0.000 | 873.76 | (N/A) | 1 |
| W-16 | 0.000 | 874.05 | (N/A) | 1 |
| W-19 | 0.000 | 874.10 | (N/A) | 1 |
| W-20 | 0.000 | 874.36 | (N/A) | 1 |
| W-26 | 0.000 | 876.16 | (N/A) | 1 |
| W-27 | 0.000 | 877.65 | (N/A) | 1 |
| W-30 | 0.000 | 874.31 | (N/A) | 1 |
| W-1 | 0.000 | 874.50 | (N/A) | 1 |
| W-2 | 0.000 | 874.50 | (N/A) | 1 |
| W-3 | 0.000 | 874.24 | (N/A) | 1 |
| W-4 | 0.000 | 874.12 | (N/A) | 1 |
| W-5 | 0.000 | 874.37 | (N/A) | 1 |
| W-6 | 0.000 | 873.72 | (N/A) | 1 |
| W-7 | 0.000 | 874.50 | (N/A) | 1 |
| W-8 | 0.000 | 874.50 | (N/A) | 1 |
| W-9 | 0.000 | 873.85 | (N/A) | 1 |
| W-10 | 0.000 | 874.50 | (N/A) | 1 |
| W-12 | 0.000 | 873.62 | (N/A) | 1 |
| W-17 | 0.000 | 874.24 | (N/A) | 1 |
| W-18 | 0.000 | 875.28 | (N/A) | 1 |
| W-21 | 0.000 | 873.51 | (N/A) | 1 |
| W-22 | 0.000 | 873.78 | (N/A) | 1 |
| W-23 | 0.000 | 873.98 | (N/A) | 1 |
| W-24 | 0.000 | 874.24 | (N/A) | 1 |
| W-25 | 0.000 | 875.24 | (N/A) | 1 |
| W-28 | 0.000 | 873.87 | (N/A) | 1 |
| W-29 | 0.000 | 874.03 | (N/A) | 1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| W-31 | 0.000 | 875.84 | (N/A) | 1 |
| W-32 | 0.000 | 877.11 | (N/A) | 1 |
| W-33 | 0.000 | 878.00 | (N/A) | 1 |
| W-34 | 0.000 | 874.50 | (N/A) | 1 |
| W-35 | 0.000 | 874.50 | (N/A) | 1 |
| W-36 | 0.000 | 874.50 | (N/A) | 1 |
| W-37 | 0.000 | 876.22 | (N/A) | 1 |
| W-38 | 0.000 | 875.53 | (N/A) | 1 |
| W-39 | 0.000 | 876.85 | (N/A) | 1 |
| W-40 | 0.000 | 874.50 | (N/A) | 1 |
| W-41 | 0.000 | 877.22 | (N/A) | 1 |
| AV-3 | 0.000 | 867.24 | (N/A) | 0 |
| MH-1 | 0.000 | (N/A) | (N/A) | 0 |
| J-16 | 0.000 | 866.89 | (N/A) | 0 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On)

## Pond Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Gravity Subnetwork |

### Pond Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) |
|---|---|---|

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On - 3/8 HP)

## Executive Summary

| Scenario | |
|---|---|
| Label | 5 Pumps On - 3/8 HP |

| Computation Results | |
|---|---|
| Subnetwork Results | Number of Gravity Subnetworks: 1<br>Number of Pressure Subnetworks: 1<br><br>>>>> Info: Pressure subnetwork flowing to: MH-1<br>>>>> Info: Pressure analysis iterations: 11<br>>>>> Info: Convergence was achieved.<br><br>>>>> Info: Gravity subnetwork draining to: O-8<br>>>>> Info: Convergence was achieved. |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On - 3/8 HP)

## Calculation Options

### <General>

| | | | |
|---|---|---|---|
| Label | Base Calculation Options | Calculation Type | Analysis |
| Time Analysis Type | Steady State | | |

### Gravity Hydraulics

| | | | |
|---|---|---|---|
| Maximum Network Traversals | 5 | Governing Upstream Pipe Selection Method | Pipe with Maximum QV |
| Flow Convergence Test | 0.001 | Structure Loss Mode | Hydraulic Grade |
| Tractive Stress (Global Minimum) | 0.000 Pascals | Report Hydrologic Time Step? | True |
| Flow Profile Method | Backwater Analysis | Save Detailed Headloss Data? | False |
| Number of Flow Profile Steps | 5 | Gravity Friction Method | Manning's |
| Hydraulic Grade Convergence Test | 0.00 m | Liquid Label | Water at 20C (68F) |
| Average Velocity Method | Actual Uniform Flow Velocity | Use Explicit Depth and Slope Equations? | False |
| Minimum Structure Headloss | 0.00 m | | |

### Pressure

| | | | |
|---|---|---|---|
| Peak Flow Ratio | 75.0 % | Pattern Setup | <None> |
| Extreme Flow Setup | <None> | Steady State Hydrograph Equivalent | Peak |

### Pressure Hydraulics

| | | | |
|---|---|---|---|
| Use Controls During Steady State? | True | Use Linear Interpolation For Multipoint Pumps? | False |
| Wet Well Convergence Increment | 0.2 m | Use Controls During Steady State? | True |
| Use Pumped Flows? | True | Liquid Specific Gravity | 0.998 |
| Pressure Subnetwork Accuracy | 0.001 | Pressure Subnetwork Minimum Possible Pressure | -14 psi |
| Pressure Subnetwork Trials | 40 | Pressure Friction Method | Hazen-Williams |

### SWMM Hydrology

| | | | |
|---|---|---|---|
| Default Infiltration Method | Horton | SWMM Hydrologic Increment | 0.250 hours |

### Headloss (AASHTO)

| | | | |
|---|---|---|---|
| Expansion, Ke | 0.350 | Shaping Adjustment, Cs | 0.500 |
| Contraction, Kc | 0.250 | Non-Piped Flow Adjustment, Cn | 1.300 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On - 3/8 HP)

## Bend Angle vs. Bend Loss Curve

| Bend Angle (degrees) | Bend Loss Coefficient, Kb |
|---|---|
| 0.00 | 0.000 |
| 15.00 | 0.190 |
| 30.00 | 0.350 |
| 45.00 | 0.470 |
| 60.00 | 0.560 |
| 75.00 | 0.640 |
| 90.00 | 0.700 |

| HEC-22 Energy Losses | |
|---|---|
| Consider Non-Piped Plunging Flow? | True |

| HEC-22 Energy Losses (Second Edition) | | | |
|---|---|---|---|
| Elevations Considered Equal Within | 0.15 m | Half Bench Submerged Factor | 0.950 |
| Flat Unsubmerged Factor | 1.000 | Full Bench Unsubmerged Factor | 0.070 |
| Flat Submerged Factor | 1.000 | Full Bench Submerged Factor | 0.750 |
| Depressed Unsubmerged Factor | 1.000 | Improved Bench Unsubmerged Factor | 0.035 |
| Depressed Submerged Factor | 1.000 | Improved Bench Submerged Factor | 0.375 |
| Half Bench Unsubmerged Factor | 0.150 | | |

| HEC-22 Energy Losses (Third Edition) | | | |
|---|---|---|---|
| Flat Submerged Coefficient | -0.050 | Half Bench Unsubmerged Coefficient | -0.850 |
| Flat Unsubmerged Coefficient | -0.050 | Full Bench Submerged Coefficient | -0.250 |
| Depressed Submerged Coefficient | 0.000 | Full Bench Unsubmerged Coefficient | -0.930 |
| Depressed Unsubmerged Coefficient | 0.000 | Improved Submerged Coefficient | -0.600 |
| Half Bench Submerged Coefficient | -0.050 | Improved Unsubmerged Coefficient | -0.980 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On - 3/8 HP)

## Calculation Summary (498: 5 Pumps On - 3/8 HP)

| Time (hours) | Balanced? | Trials | Relative Flow Change |
|---|---|---|---|
| All Time Steps (0) | True | 11 | 0.0001480 |
| 0.00 | True | 11 | 0.0001480 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On - 3/8 HP)

## Pipe Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Gravity Subnetwork |

### Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-3 | 0.000 | 4.48 | 2.41 | (N/A) |
| P-4 | 0.000 | 2.43 | 1.30 | (N/A) |
| P-17 | 0.000 | 4.48 | 1.11 | (N/A) |
| P-18 | 0.000 | 4.48 | 1.11 | (N/A) |
| P-139 | 0.000 | 4.48 | 1.11 | (N/A) |
| P-2 | 0.000 | 2.05 | 1.10 | (N/A) |
| P-122 | 0.000 | 2.05 | 1.10 | (N/A) |
| P-121 | 0.000 | 2.05 | 1.10 | (N/A) |
| P-120 | 0.000 | 2.05 | 1.10 | (N/A) |
| P-119 | 0.000 | 2.05 | 1.10 | (N/A) |
| P-118 | 0.000 | 2.05 | 1.10 | (N/A) |
| P-127 | 0.000 | 1.22 | 0.66 | (N/A) |
| P-126 | 0.000 | 1.22 | 0.66 | (N/A) |
| P-125 | 0.000 | 1.22 | 0.66 | (N/A) |
| P-124 | 0.000 | 1.22 | 0.66 | (N/A) |
| P-123 | 0.000 | 1.22 | 0.66 | (N/A) |
| P-10 | 0.000 | 1.20 | 0.65 | (N/A) |
| P-88 | 0.000 | 1.16 | 0.62 | (N/A) |
| P-79 | 0.000 | 0.91 | 0.49 | (N/A) |
| P-113 | 0.000 | 0.91 | 0.49 | (N/A) |
| P-112 | 0.000 | 0.91 | 0.49 | (N/A) |
| P-111 | 0.000 | 0.91 | 0.49 | (N/A) |
| P-63 | 0.000 | 0.90 | 0.48 | (N/A) |
| P-69 | 0.000 | 0.89 | 0.48 | (N/A) |
| P-61 | 0.000 | 0.89 | 0.48 | (N/A) |
| P-1 | 0.000 | 0.89 | 0.48 | (N/A) |
| P-84 | 0.000 | 0.88 | 0.47 | (N/A) |
| P-89 | 0.000 | 0.88 | 0.47 | (N/A) |
| P-9 | 0.000 | 0.64 | 0.35 | (N/A) |
| P-135 | 0.000 | 0.64 | 0.35 | (N/A) |
| P-134 | 0.000 | 0.64 | 0.35 | (N/A) |
| P-133 | 0.000 | 0.64 | 0.35 | (N/A) |
| P-132 | 0.000 | 0.64 | 0.35 | (N/A) |
| P-131 | 0.000 | 0.64 | 0.35 | (N/A) |
| P-130 | 0.000 | 0.64 | 0.35 | (N/A) |
| P-8 | 0.000 | 0.59 | 0.32 | (N/A) |
| P-104 | 0.000 | 0.59 | 0.32 | (N/A) |
| P-13 | 0.000 | 0.56 | 0.30 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-136 | 0.000 | 0.56 | 0.30 | (N/A) |
| P-137 | 0.000 | 0.56 | 0.30 | (N/A) |
| P-11 | 0.000 | 0.56 | 0.30 | (N/A) |
| P-138 | 0.000 | 0.56 | 0.30 | (N/A) |
| P-6 | 0.000 | 0.33 | 0.18 | (N/A) |
| P-129 | 0.000 | 0.33 | 0.18 | (N/A) |
| P-128 | 0.000 | 0.33 | 0.18 | (N/A) |
| P-12 | 0.000 | 0.32 | 0.17 | (N/A) |
| P-5 | 0.000 | 0.26 | 0.14 | (N/A) |
| P-49 | 0.000 | 0.91 | 0.00 | (N/A) |
| P-33 | 0.000 | 0.90 | 0.00 | (N/A) |
| P-39 | 0.000 | 0.89 | 0.00 | (N/A) |
| P-31 | 0.000 | 0.89 | 0.00 | (N/A) |
| P-57 | 0.000 | 0.88 | 0.00 | (N/A) |
| P-105 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-116 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-90 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-87 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-114 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-106 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-117 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-86 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-85 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-91 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-74 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-101 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-102 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-75 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-76 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-103 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-72 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-77 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-16 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-60 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-100 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-73 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-66 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-99 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-68 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-70 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-65 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-64 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-67 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-78 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-21 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-96 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-24 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-71 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-81 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-23 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-97 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-25 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-93 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-82 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-80 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-115 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-62 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-29 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-110 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-107 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-83 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-14 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-53 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-30 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-19 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-98 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-94 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-20 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-54 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-58 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-59 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-95 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-37 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-32 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-41 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-34 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-43 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-48 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-51 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-38 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-27 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-55 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-109 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-46 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-52 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-42 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-44 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-47 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-36 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-40 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-26 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-22 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-35 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-28 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-50 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-56 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-92 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-45 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-15 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-108 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-7 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On - 3/8 HP)

## Node Report

Subnetwork Summary

| Subnetwork | Gravity Subnetwork |
|---|---|

### Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-10 | 0.000 | 892.40 | (N/A) | 28 |
| J-9 | 0.000 | 892.10 | (N/A) | 27 |
| J-13 | 0.000 | 893.54 | (N/A) | 27 |
| J-19 | 0.000 | 893.54 | (N/A) | 27 |
| J-20 | 0.000 | 893.54 | (N/A) | 27 |
| J-21 | 0.000 | 893.54 | (N/A) | 27 |
| J-45 | 0.000 | 892.33 | (N/A) | 27 |
| J-53 | 0.000 | 892.68 | (N/A) | 27 |
| J-52 | 0.000 | 892.74 | (N/A) | 27 |
| J-46 | 0.000 | 892.44 | (N/A) | 26 |
| J-47 | 0.000 | 892.54 | (N/A) | 26 |
| J-51 | 0.000 | 892.83 | (N/A) | 26 |
| J-48 | 0.000 | 892.60 | (N/A) | 26 |
| J-49 | 0.000 | 892.66 | (N/A) | 26 |
| J-11 | 0.000 | 892.89 | (N/A) | 26 |
| J-1 | 0.000 | 892.87 | (N/A) | 26 |
| J-14 | 0.000 | 892.87 | (N/A) | 26 |
| J-17 | 0.000 | 892.87 | (N/A) | 26 |
| J-50 | 0.000 | 892.72 | (N/A) | 26 |
| J-42 | 0.000 | 892.38 | (N/A) | 26 |
| J-8 | 0.000 | 892.78 | (N/A) | 26 |
| J-41 | 0.000 | 892.18 | (N/A) | 26 |
| J-22 | 0.000 | 892.72 | (N/A) | 26 |
| J-40 | 0.000 | 891.93 | (N/A) | 26 |
| J-43 | 0.000 | 892.41 | (N/A) | 26 |
| J-39 | 0.000 | 891.71 | (N/A) | 26 |
| J-44 | 0.000 | 892.43 | (N/A) | 26 |
| J-38 | 0.000 | 891.48 | (N/A) | 26 |
| J-5 | 0.000 | 892.44 | (N/A) | 25 |
| J-18 | 0.000 | 892.38 | (N/A) | 25 |
| J-26 | 0.000 | 893.05 | (N/A) | 25 |
| J-4 | 0.000 | 890.81 | (N/A) | 25 |
| J-2 | 0.000 | 892.16 | (N/A) | 25 |
| J-27 | 0.000 | 893.16 | (N/A) | 25 |
| J-37 | 0.000 | 891.62 | (N/A) | 24 |
| J-28 | 0.000 | 893.38 | (N/A) | 24 |
| J-23 | 0.000 | 892.44 | (N/A) | 24 |
| J-31 | 0.000 | 892.89 | (N/A) | 24 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On - 3/8 HP)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-36 | 0.000 | 891.06 | (N/A) | 24 |
| J-29 | 0.000 | 893.38 | (N/A) | 23 |
| J-35 | 0.000 | 890.56 | (N/A) | 23 |
| J-24 | 0.000 | 892.44 | (N/A) | 23 |
| J-32 | 0.000 | 892.89 | (N/A) | 22 |
| J-30 | 0.000 | 893.38 | (N/A) | 22 |
| J-34 | 0.000 | 889.53 | (N/A) | 22 |
| J-7 | 0.000 | 893.38 | (N/A) | 22 |
| J-33 | 0.000 | 888.97 | (N/A) | 22 |
| J-25 | 0.000 | 892.44 | (N/A) | 22 |
| J-12 | 0.000 | 892.89 | (N/A) | 21 |
| J-6 | 0.000 | 892.44 | (N/A) | 20 |
| J-3 | 0.000 | 886.25 | (N/A) | 19 |
| J-15 | 0.000 | 873.04 | (N/A) | 1 |
| W-11 | 0.000 | 874.39 | (N/A) | 1 |
| W-13 | 0.000 | 873.92 | (N/A) | 1 |
| W-14 | 0.000 | 873.47 | (N/A) | 1 |
| W-15 | 0.000 | 873.76 | (N/A) | 1 |
| W-16 | 0.000 | 874.05 | (N/A) | 1 |
| W-19 | 0.000 | 874.10 | (N/A) | 1 |
| W-20 | 0.000 | 874.36 | (N/A) | 1 |
| W-26 | 0.000 | 876.16 | (N/A) | 1 |
| W-27 | 0.000 | 877.65 | (N/A) | 1 |
| W-30 | 0.000 | 874.31 | (N/A) | 1 |
| W-1 | 0.000 | 874.50 | (N/A) | 1 |
| W-2 | 0.000 | 874.50 | (N/A) | 1 |
| W-3 | 0.000 | 874.24 | (N/A) | 1 |
| W-4 | 0.000 | 874.12 | (N/A) | 1 |
| W-5 | 0.000 | 874.37 | (N/A) | 1 |
| W-6 | 0.000 | 873.72 | (N/A) | 1 |
| W-7 | 0.000 | 874.50 | (N/A) | 1 |
| W-8 | 0.000 | 874.50 | (N/A) | 1 |
| W-9 | 0.000 | 873.85 | (N/A) | 1 |
| W-10 | 0.000 | 874.50 | (N/A) | 1 |
| W-12 | 0.000 | 873.62 | (N/A) | 1 |
| W-17 | 0.000 | 874.24 | (N/A) | 1 |
| W-18 | 0.000 | 875.28 | (N/A) | 1 |
| W-21 | 0.000 | 873.51 | (N/A) | 1 |
| W-22 | 0.000 | 873.78 | (N/A) | 1 |
| W-23 | 0.000 | 873.98 | (N/A) | 1 |
| W-24 | 0.000 | 874.24 | (N/A) | 1 |
| W-25 | 0.000 | 875.24 | (N/A) | 1 |
| W-28 | 0.000 | 873.87 | (N/A) | 1 |
| W-29 | 0.000 | 874.03 | (N/A) | 1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On - 3/8 HP)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| W-31 | 0.000 | 875.84 | (N/A) | 1 |
| W-32 | 0.000 | 877.11 | (N/A) | 1 |
| W-33 | 0.000 | 878.00 | (N/A) | 1 |
| W-34 | 0.000 | 874.50 | (N/A) | 1 |
| W-35 | 0.000 | 874.50 | (N/A) | 1 |
| W-36 | 0.000 | 874.50 | (N/A) | 1 |
| W-37 | 0.000 | 876.22 | (N/A) | 1 |
| W-38 | 0.000 | 875.53 | (N/A) | 1 |
| W-39 | 0.000 | 876.85 | (N/A) | 1 |
| W-40 | 0.000 | 874.50 | (N/A) | 1 |
| W-41 | 0.000 | 877.22 | (N/A) | 1 |
| MH-1 | 0.000 | (N/A) | (N/A) | 0 |
| AV-3 | 0.000 | 867.02 | (N/A) | 0 |
| J-16 | 0.000 | 866.33 | (N/A) | -1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 5 Pumps On - 3/8 HP)

## Pond Report

Subnetwork Summary

| Subnetwork | Gravity Subnetwork |
|---|---|

### Pond Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) |
|---|---|---|

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On - 3/8 HP)

## Executive Summary

| Scenario | |
|---|---|
| Label | 10 Pumps On - 3/8 HP |

| Computation Results | |
|---|---|
| Subnetwork Results | Number of Gravity Subnetworks: 1<br>Number of Pressure Subnetworks: 1<br><br>>>>> Info: Pressure subnetwork flowing to: MH-1<br>>>>> Info: Pressure analysis iterations: 11<br>>>>> Info: Convergence was achieved.<br><br>>>>> Info: Gravity subnetwork draining to: O-8<br>>>>> Info: Convergence was achieved. |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On - 3/8 HP)

## Calculation Options

### <General>

| | | | |
|---|---|---|---|
| Label | Base Calculation Options | Calculation Type | Analysis |
| Time Analysis Type | Steady State | | |

### Gravity Hydraulics

| | | | |
|---|---|---|---|
| Maximum Network Traversals | 5 | Governing Upstream Pipe Selection Method | Pipe with Maximum QV |
| Flow Convergence Test | 0.001 | Structure Loss Mode | Hydraulic Grade |
| Tractive Stress (Global Minimum) | 0.000 Pascals | Report Hydrologic Time Step? | True |
| Flow Profile Method | Backwater Analysis | Save Detailed Headloss Data? | False |
| Number of Flow Profile Steps | 5 | Gravity Friction Method | Manning's |
| Hydraulic Grade Convergence Test | 0.00 m | Liquid Label | Water at 20C (68F) |
| Average Velocity Method | Actual Uniform Flow Velocity | Use Explicit Depth and Slope Equations? | False |
| Minimum Structure Headloss | 0.00 m | | |

### Pressure

| | | | |
|---|---|---|---|
| Peak Flow Ratio | 75.0 % | Pattern Setup | <None> |
| Extreme Flow Setup | <None> | Steady State Hydrograph Equivalent | Peak |

### Pressure Hydraulics

| | | | |
|---|---|---|---|
| Use Controls During Steady State? | True | Use Linear Interpolation For Multipoint Pumps? | False |
| Wet Well Convergence Increment | 0.2 m | Use Controls During Steady State? | True |
| Use Pumped Flows? | True | Liquid Specific Gravity | 0.998 |
| Pressure Subnetwork Accuracy | 0.001 | Pressure Subnetwork Minimum Possible Pressure | -14 psi |
| Pressure Subnetwork Trials | 40 | Pressure Friction Method | Hazen-Williams |

### SWMM Hydrology

| | | | |
|---|---|---|---|
| Default Infiltration Method | Horton | SWMM Hydrologic Increment | 0.250 hours |

### Headloss (AASHTO)

| | | | |
|---|---|---|---|
| Expansion, Ke | 0.350 | Shaping Adjustment, Cs | 0.500 |
| Contraction, Kc | 0.250 | Non-Piped Flow Adjustment, Cn | 1.300 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On - 3/8 HP)

## Bend Angle vs. Bend Loss Curve

| Bend Angle (degrees) | Bend Loss Coefficient, Kb |
|---|---|
| 0.00 | 0.000 |
| 15.00 | 0.190 |
| 30.00 | 0.350 |
| 45.00 | 0.470 |
| 60.00 | 0.560 |
| 75.00 | 0.640 |
| 90.00 | 0.700 |

| HEC-22 Energy Losses | |
|---|---|
| Consider Non-Piped Plunging Flow? | True |

| HEC-22 Energy Losses (Second Edition) | | | |
|---|---|---|---|
| Elevations Considered Equal Within | 0.15 m | Half Bench Submerged Factor | 0.950 |
| Flat Unsubmerged Factor | 1.000 | Full Bench Unsubmerged Factor | 0.070 |
| Flat Submerged Factor | 1.000 | Full Bench Submerged Factor | 0.750 |
| Depressed Unsubmerged Factor | 1.000 | Improved Bench Unsubmerged Factor | 0.035 |
| Depressed Submerged Factor | 1.000 | Improved Bench Submerged Factor | 0.375 |
| Half Bench Unsubmerged Factor | 0.150 | | |

| HEC-22 Energy Losses (Third Edition) | | | |
|---|---|---|---|
| Flat Submerged Coefficient | -0.050 | Half Bench Unsubmerged Coefficient | -0.850 |
| Flat Unsubmerged Coefficient | -0.050 | Full Bench Submerged Coefficient | -0.250 |
| Depressed Submerged Coefficient | 0.000 | Full Bench Unsubmerged Coefficient | -0.930 |
| Depressed Unsubmerged Coefficient | 0.000 | Improved Submerged Coefficient | -0.600 |
| Half Bench Submerged Coefficient | -0.050 | Improved Unsubmerged Coefficient | -0.980 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On - 3/8 HP)

## Calculation Summary (499: 10 Pumps On - 3/8 HP)

| Time (hours) | Balanced? | Trials | Relative Flow Change |
|---|---|---|---|
| All Time Steps (1) | True | 11 | 0.0001230 |
| 0.00 | True | 11 | 0.0001230 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On - 3/8 HP)

## Pipe Report

Subnetwork Summary

| Subnetwork | Gravity Subnetwork |
|---|---|

### Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-3 | 0.000 | 5.95 | 3.19 | (N/A) |
| P-4 | 0.000 | 3.31 | 1.78 | (N/A) |
| P-17 | 0.000 | 5.95 | 1.47 | (N/A) |
| P-18 | 0.000 | 5.95 | 1.47 | (N/A) |
| P-139 | 0.000 | 5.95 | 1.47 | (N/A) |
| P-122 | 0.000 | 2.64 | 1.42 | (N/A) |
| P-121 | 0.000 | 2.64 | 1.42 | (N/A) |
| P-120 | 0.000 | 2.64 | 1.42 | (N/A) |
| P-119 | 0.000 | 2.64 | 1.42 | (N/A) |
| P-118 | 0.000 | 2.64 | 1.42 | (N/A) |
| P-2 | 0.000 | 2.01 | 1.08 | (N/A) |
| P-10 | 0.000 | 1.78 | 0.95 | (N/A) |
| P-126 | 0.000 | 1.54 | 0.83 | (N/A) |
| P-125 | 0.000 | 1.54 | 0.83 | (N/A) |
| P-124 | 0.000 | 1.54 | 0.83 | (N/A) |
| P-123 | 0.000 | 1.54 | 0.83 | (N/A) |
| P-5 | 0.000 | 1.39 | 0.75 | (N/A) |
| P-88 | 0.000 | 1.39 | 0.75 | (N/A) |
| P-105 | 0.000 | 1.21 | 0.65 | (N/A) |
| P-111 | 0.000 | 1.18 | 0.63 | (N/A) |
| P-8 | 0.000 | 1.13 | 0.61 | (N/A) |
| P-104 | 0.000 | 1.13 | 0.61 | (N/A) |
| P-133 | 0.000 | 0.97 | 0.52 | (N/A) |
| P-132 | 0.000 | 0.97 | 0.52 | (N/A) |
| P-131 | 0.000 | 0.97 | 0.52 | (N/A) |
| P-130 | 0.000 | 0.97 | 0.52 | (N/A) |
| P-6 | 0.000 | 0.95 | 0.51 | (N/A) |
| P-129 | 0.000 | 0.95 | 0.51 | (N/A) |
| P-128 | 0.000 | 0.95 | 0.51 | (N/A) |
| P-127 | 0.000 | 0.95 | 0.51 | (N/A) |
| P-137 | 0.000 | 0.81 | 0.43 | (N/A) |
| P-11 | 0.000 | 0.81 | 0.43 | (N/A) |
| P-138 | 0.000 | 0.81 | 0.43 | (N/A) |
| P-24 | 0.000 | 0.63 | 0.34 | (N/A) |
| P-61 | 0.000 | 0.62 | 0.33 | (N/A) |
| P-1 | 0.000 | 0.62 | 0.33 | (N/A) |
| P-93 | 0.000 | 0.61 | 0.33 | (N/A) |
| P-106 | 0.000 | 0.61 | 0.33 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-82 | 0.000 | 0.61 | 0.33 | (N/A) |
| P-117 | 0.000 | 0.61 | 0.33 | (N/A) |
| P-116 | 0.000 | 0.61 | 0.33 | (N/A) |
| P-97 | 0.000 | 0.60 | 0.32 | (N/A) |
| P-114 | 0.000 | 0.60 | 0.32 | (N/A) |
| P-113 | 0.000 | 0.60 | 0.32 | (N/A) |
| P-112 | 0.000 | 0.60 | 0.32 | (N/A) |
| P-71 | 0.000 | 0.60 | 0.32 | (N/A) |
| P-66 | 0.000 | 0.59 | 0.32 | (N/A) |
| P-78 | 0.000 | 0.58 | 0.31 | (N/A) |
| P-72 | 0.000 | 0.56 | 0.30 | (N/A) |
| P-102 | 0.000 | 0.56 | 0.30 | (N/A) |
| P-9 | 0.000 | 0.41 | 0.22 | (N/A) |
| P-135 | 0.000 | 0.41 | 0.22 | (N/A) |
| P-134 | 0.000 | 0.41 | 0.22 | (N/A) |
| P-12 | 0.000 | 0.36 | 0.19 | (N/A) |
| P-13 | 0.000 | 0.25 | 0.13 | (N/A) |
| P-136 | 0.000 | 0.25 | 0.13 | (N/A) |
| P-27 | 0.000 | 0.63 | 0.00 | (N/A) |
| P-31 | 0.000 | 0.62 | 0.00 | (N/A) |
| P-92 | 0.000 | 0.61 | 0.00 | (N/A) |
| P-55 | 0.000 | 0.61 | 0.00 | (N/A) |
| P-95 | 0.000 | 0.60 | 0.00 | (N/A) |
| P-41 | 0.000 | 0.60 | 0.00 | (N/A) |
| P-36 | 0.000 | 0.59 | 0.00 | (N/A) |
| P-48 | 0.000 | 0.58 | 0.00 | (N/A) |
| P-42 | 0.000 | 0.56 | 0.00 | (N/A) |
| P-52 | 0.000 | 0.56 | 0.00 | (N/A) |
| P-89 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-90 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-87 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-101 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-74 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-75 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-76 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-103 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-77 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-85 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-84 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-86 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-91 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-73 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-99 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-96 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-81 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-79 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-69 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-70 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-64 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-68 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-65 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-67 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-80 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-115 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-16 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-60 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-100 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-63 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-21 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-14 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-83 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-110 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-107 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-23 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-25 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-62 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-29 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-19 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-30 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-33 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-20 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-32 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-43 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-34 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-37 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-53 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-57 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-58 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-59 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-98 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-94 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-54 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-39 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-28 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-26 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-22 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-35 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-50 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-40 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-44 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-45 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-46 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-47 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-51 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-49 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-56 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-109 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-38 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-108 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-15 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-7 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On - 3/8 HP)

## Node Report

Subnetwork Summary

| Subnetwork | Gravity Subnetwork |
|---|---|

### Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-10 | 0.000 | 910.95 | (N/A) | 54 |
| J-53 | 0.000 | 911.50 | (N/A) | 53 |
| J-52 | 0.000 | 911.61 | (N/A) | 53 |
| J-9 | 0.000 | 910.36 | (N/A) | 53 |
| J-45 | 0.000 | 910.85 | (N/A) | 53 |
| J-48 | 0.000 | 911.43 | (N/A) | 53 |
| J-46 | 0.000 | 911.10 | (N/A) | 53 |
| J-47 | 0.000 | 911.30 | (N/A) | 53 |
| J-51 | 0.000 | 911.63 | (N/A) | 53 |
| J-49 | 0.000 | 911.46 | (N/A) | 53 |
| J-11 | 0.000 | 911.64 | (N/A) | 53 |
| J-13 | 0.000 | 911.64 | (N/A) | 53 |
| J-19 | 0.000 | 911.64 | (N/A) | 53 |
| J-20 | 0.000 | 911.64 | (N/A) | 53 |
| J-21 | 0.000 | 911.64 | (N/A) | 53 |
| J-50 | 0.000 | 911.48 | (N/A) | 53 |
| J-8 | 0.000 | 911.51 | (N/A) | 53 |
| J-22 | 0.000 | 911.31 | (N/A) | 52 |
| J-26 | 0.000 | 911.93 | (N/A) | 52 |
| J-27 | 0.000 | 911.98 | (N/A) | 52 |
| J-31 | 0.000 | 911.86 | (N/A) | 51 |
| J-28 | 0.000 | 912.08 | (N/A) | 51 |
| J-41 | 0.000 | 909.80 | (N/A) | 51 |
| J-42 | 0.000 | 909.92 | (N/A) | 51 |
| J-43 | 0.000 | 910.10 | (N/A) | 51 |
| J-5 | 0.000 | 910.35 | (N/A) | 51 |
| J-44 | 0.000 | 910.24 | (N/A) | 51 |
| J-40 | 0.000 | 909.42 | (N/A) | 51 |
| J-23 | 0.000 | 910.83 | (N/A) | 50 |
| J-39 | 0.000 | 909.08 | (N/A) | 50 |
| J-29 | 0.000 | 912.20 | (N/A) | 50 |
| J-38 | 0.000 | 908.73 | (N/A) | 50 |
| J-32 | 0.000 | 912.08 | (N/A) | 50 |
| J-24 | 0.000 | 910.99 | (N/A) | 49 |
| J-4 | 0.000 | 907.69 | (N/A) | 49 |
| J-30 | 0.000 | 912.20 | (N/A) | 49 |
| J-1 | 0.000 | 909.01 | (N/A) | 49 |
| J-14 | 0.000 | 909.01 | (N/A) | 49 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On - 3/8 HP)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-17 | 0.000 | 909.01 | (N/A) | 49 |
| J-18 | 0.000 | 908.96 | (N/A) | 49 |
| J-7 | 0.000 | 912.20 | (N/A) | 49 |
| J-2 | 0.000 | 908.65 | (N/A) | 48 |
| J-12 | 0.000 | 912.08 | (N/A) | 48 |
| J-25 | 0.000 | 910.99 | (N/A) | 48 |
| J-37 | 0.000 | 908.14 | (N/A) | 48 |
| J-36 | 0.000 | 907.25 | (N/A) | 47 |
| J-6 | 0.000 | 910.99 | (N/A) | 47 |
| J-35 | 0.000 | 906.45 | (N/A) | 46 |
| J-34 | 0.000 | 904.80 | (N/A) | 44 |
| J-33 | 0.000 | 903.92 | (N/A) | 43 |
| J-3 | 0.000 | 899.58 | (N/A) | 38 |
| J-15 | 0.000 | 877.21 | (N/A) | 7 |
| W-11 | 0.000 | 874.39 | (N/A) | 1 |
| W-13 | 0.000 | 873.92 | (N/A) | 1 |
| W-14 | 0.000 | 873.47 | (N/A) | 1 |
| W-15 | 0.000 | 873.76 | (N/A) | 1 |
| W-16 | 0.000 | 874.05 | (N/A) | 1 |
| W-19 | 0.000 | 874.10 | (N/A) | 1 |
| W-20 | 0.000 | 874.36 | (N/A) | 1 |
| W-26 | 0.000 | 876.16 | (N/A) | 1 |
| W-27 | 0.000 | 877.65 | (N/A) | 1 |
| W-30 | 0.000 | 874.31 | (N/A) | 1 |
| W-1 | 0.000 | 874.50 | (N/A) | 1 |
| W-2 | 0.000 | 874.50 | (N/A) | 1 |
| W-3 | 0.000 | 874.24 | (N/A) | 1 |
| W-4 | 0.000 | 874.12 | (N/A) | 1 |
| W-5 | 0.000 | 874.37 | (N/A) | 1 |
| W-6 | 0.000 | 873.72 | (N/A) | 1 |
| W-7 | 0.000 | 874.50 | (N/A) | 1 |
| W-8 | 0.000 | 874.50 | (N/A) | 1 |
| W-9 | 0.000 | 873.85 | (N/A) | 1 |
| W-10 | 0.000 | 874.50 | (N/A) | 1 |
| W-12 | 0.000 | 873.62 | (N/A) | 1 |
| W-17 | 0.000 | 874.24 | (N/A) | 1 |
| W-18 | 0.000 | 875.28 | (N/A) | 1 |
| W-21 | 0.000 | 873.51 | (N/A) | 1 |
| W-22 | 0.000 | 873.78 | (N/A) | 1 |
| W-23 | 0.000 | 873.98 | (N/A) | 1 |
| W-24 | 0.000 | 874.24 | (N/A) | 1 |
| W-25 | 0.000 | 875.24 | (N/A) | 1 |
| W-28 | 0.000 | 873.87 | (N/A) | 1 |
| W-29 | 0.000 | 874.03 | (N/A) | 1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On - 3/8 HP)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| W-31 | 0.000 | 875.84 | (N/A) | 1 |
| W-32 | 0.000 | 877.11 | (N/A) | 1 |
| W-33 | 0.000 | 878.00 | (N/A) | 1 |
| W-34 | 0.000 | 874.50 | (N/A) | 1 |
| W-35 | 0.000 | 874.50 | (N/A) | 1 |
| W-36 | 0.000 | 874.50 | (N/A) | 1 |
| W-37 | 0.000 | 876.22 | (N/A) | 1 |
| W-38 | 0.000 | 875.53 | (N/A) | 1 |
| W-39 | 0.000 | 876.85 | (N/A) | 1 |
| W-40 | 0.000 | 874.50 | (N/A) | 1 |
| W-41 | 0.000 | 877.22 | (N/A) | 1 |
| MH-1 | 0.000 | (N/A) | (N/A) | 0 |
| AV-3 | 0.000 | 867.02 | (N/A) | 0 |
| J-16 | 0.000 | 866.52 | (N/A) | -1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 10 Pumps On - 3/8 HP)

## Pond Report

Subnetwork Summary

| Subnetwork | Gravity Subnetwork |
|---|---|

### Pond Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) |
|---|---|---|

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On - 3/8 HP)

## Executive Summary

| Scenario | |
|---|---|
| Label | 15 Pumps On - 3/8 HP |

| Computation Results | |
|---|---|
| Subnetwork Results | Number of Gravity Subnetworks: 1<br>Number of Pressure Subnetworks: 1<br><br>>>>> Info: Pressure subnetwork flowing to: MH-1<br>>>>> Info: Pressure analysis iterations: 11<br>>>>> Info: Convergence was achieved.<br><br>>>>> Info: Gravity subnetwork draining to: O-8<br>>>>> Info: Convergence was achieved. |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On - 3/8 HP)

## Calculation Options

### <General>

| | | | |
|---|---|---|---|
| Label | Base Calculation Options | Calculation Type | Analysis |
| Time Analysis Type | Steady State | | |

### Gravity Hydraulics

| | | | |
|---|---|---|---|
| Maximum Network Traversals | 5 | Governing Upstream Pipe Selection Method | Pipe with Maximum QV |
| Flow Convergence Test | 0.001 | Structure Loss Mode | Hydraulic Grade |
| Tractive Stress (Global Minimum) | 0.000 Pascals | Report Hydrologic Time Step? | True |
| Flow Profile Method | Backwater Analysis | Save Detailed Headloss Data? | False |
| Number of Flow Profile Steps | 5 | Gravity Friction Method | Manning's |
| Hydraulic Grade Convergence Test | 0.00 m | Liquid Label | Water at 20C (68F) |
| Average Velocity Method | Actual Uniform Flow Velocity | Use Explicit Depth and Slope Equations? | False |
| Minimum Structure Headloss | 0.00 m | | |

### Pressure

| | | | |
|---|---|---|---|
| Peak Flow Ratio | 75.0 % | Pattern Setup | <None> |
| Extreme Flow Setup | <None> | Steady State Hydrograph Equivalent | Peak |

### Pressure Hydraulics

| | | | |
|---|---|---|---|
| Use Controls During Steady State? | True | Use Linear Interpolation For Multipoint Pumps? | False |
| Wet Well Convergence Increment | 0.2 m | Use Controls During Steady State? | True |
| Use Pumped Flows? | True | Liquid Specific Gravity | 0.998 |
| Pressure Subnetwork Accuracy | 0.001 | Pressure Subnetwork Minimum Possible Pressure | -14 psi |
| Pressure Subnetwork Trials | 40 | Pressure Friction Method | Hazen-Williams |

### SWMM Hydrology

| | | | |
|---|---|---|---|
| Default Infiltration Method | Horton | SWMM Hydrologic Increment | 0.250 hours |

### Headloss (AASHTO)

| | | | |
|---|---|---|---|
| Expansion, Ke | 0.350 | Shaping Adjustment, Cs | 0.500 |
| Contraction, Kc | 0.250 | Non-Piped Flow Adjustment, Cn | 1.300 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On - 3/8 HP)

## Bend Angle vs. Bend Loss Curve

| Bend Angle (degrees) | Bend Loss Coefficient, Kb |
|---|---|
| 0.00 | 0.000 |
| 15.00 | 0.190 |
| 30.00 | 0.350 |
| 45.00 | 0.470 |
| 60.00 | 0.560 |
| 75.00 | 0.640 |
| 90.00 | 0.700 |

| HEC-22 Energy Losses | |
|---|---|
| Consider Non-Piped Plunging Flow? | True |

| HEC-22 Energy Losses (Second Edition) | | | |
|---|---|---|---|
| Elevations Considered Equal Within | 0.15 m | Half Bench Submerged Factor | 0.950 |
| Flat Unsubmerged Factor | 1.000 | Full Bench Unsubmerged Factor | 0.070 |
| Flat Submerged Factor | 1.000 | Full Bench Submerged Factor | 0.750 |
| Depressed Unsubmerged Factor | 1.000 | Improved Bench Unsubmerged Factor | 0.035 |
| Depressed Submerged Factor | 1.000 | Improved Bench Submerged Factor | 0.375 |
| Half Bench Unsubmerged Factor | 0.150 | | |

| HEC-22 Energy Losses (Third Edition) | | | |
|---|---|---|---|
| Flat Submerged Coefficient | -0.050 | Half Bench Unsubmerged Coefficient | -0.850 |
| Flat Unsubmerged Coefficient | -0.050 | Full Bench Submerged Coefficient | -0.250 |
| Depressed Submerged Coefficient | 0.000 | Full Bench Unsubmerged Coefficient | -0.930 |
| Depressed Unsubmerged Coefficient | 0.000 | Improved Submerged Coefficient | -0.600 |
| Half Bench Submerged Coefficient | -0.050 | Improved Unsubmerged Coefficient | -0.980 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On - 3/8 HP)

## Calculation Summary (501: 15 Pumps On - 3/8 HP)

| Time (hours) | Balanced? | Trials | Relative Flow Change |
|---|---|---|---|
| All Time Steps (1) | True | 11 | 0.0001299 |
| 0.00 | True | 11 | 0.0001299 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On - 3/8 HP)

## Pipe Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Gravity Subnetwork |

### Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-3 | 0.000 | 6.66 | 3.57 | (N/A) |
| P-4 | 0.000 | 3.48 | 1.87 | (N/A) |
| P-118 | 0.000 | 3.17 | 1.70 | (N/A) |
| P-18 | 0.000 | 6.66 | 1.64 | (N/A) |
| P-139 | 0.000 | 6.66 | 1.64 | (N/A) |
| P-17 | 0.000 | 6.66 | 1.64 | (N/A) |
| P-119 | 0.000 | 2.65 | 1.42 | (N/A) |
| P-2 | 0.000 | 2.14 | 1.15 | (N/A) |
| P-122 | 0.000 | 2.14 | 1.15 | (N/A) |
| P-121 | 0.000 | 2.14 | 1.15 | (N/A) |
| P-120 | 0.000 | 2.14 | 1.15 | (N/A) |
| P-10 | 0.000 | 1.79 | 0.96 | (N/A) |
| P-125 | 0.000 | 1.69 | 0.91 | (N/A) |
| P-124 | 0.000 | 1.69 | 0.91 | (N/A) |
| P-123 | 0.000 | 1.69 | 0.91 | (N/A) |
| P-88 | 0.000 | 1.68 | 0.90 | (N/A) |
| P-126 | 0.000 | 1.26 | 0.68 | (N/A) |
| P-5 | 0.000 | 1.22 | 0.66 | (N/A) |
| P-8 | 0.000 | 1.14 | 0.61 | (N/A) |
| P-104 | 0.000 | 1.14 | 0.61 | (N/A) |
| P-132 | 0.000 | 0.90 | 0.49 | (N/A) |
| P-131 | 0.000 | 0.90 | 0.49 | (N/A) |
| P-130 | 0.000 | 0.90 | 0.49 | (N/A) |
| P-11 | 0.000 | 0.89 | 0.48 | (N/A) |
| P-138 | 0.000 | 0.89 | 0.48 | (N/A) |
| P-116 | 0.000 | 0.88 | 0.47 | (N/A) |
| P-112 | 0.000 | 0.86 | 0.46 | (N/A) |
| P-111 | 0.000 | 0.86 | 0.46 | (N/A) |
| P-127 | 0.000 | 0.83 | 0.45 | (N/A) |
| P-12 | 0.000 | 0.78 | 0.42 | (N/A) |
| P-29 | 0.000 | 0.52 | 0.28 | (N/A) |
| P-62 | 0.000 | 0.51 | 0.27 | (N/A) |
| P-9 | 0.000 | 0.50 | 0.27 | (N/A) |
| P-135 | 0.000 | 0.50 | 0.27 | (N/A) |
| P-134 | 0.000 | 0.50 | 0.27 | (N/A) |
| P-133 | 0.000 | 0.50 | 0.27 | (N/A) |
| P-13 | 0.000 | 0.49 | 0.27 | (N/A) |
| P-136 | 0.000 | 0.49 | 0.27 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-137 | 0.000 | 0.49 | 0.27 | (N/A) |
| P-110 | 0.000 | 0.48 | 0.26 | (N/A) |
| P-107 | 0.000 | 0.48 | 0.26 | (N/A) |
| P-106 | 0.000 | 0.48 | 0.26 | (N/A) |
| P-105 | 0.000 | 0.48 | 0.26 | (N/A) |
| P-61 | 0.000 | 0.46 | 0.25 | (N/A) |
| P-1 | 0.000 | 0.46 | 0.25 | (N/A) |
| P-63 | 0.000 | 0.46 | 0.25 | (N/A) |
| P-14 | 0.000 | 0.46 | 0.25 | (N/A) |
| P-83 | 0.000 | 0.46 | 0.25 | (N/A) |
| P-117 | 0.000 | 0.46 | 0.25 | (N/A) |
| P-79 | 0.000 | 0.44 | 0.24 | (N/A) |
| P-113 | 0.000 | 0.44 | 0.23 | (N/A) |
| P-68 | 0.000 | 0.43 | 0.23 | (N/A) |
| P-69 | 0.000 | 0.43 | 0.23 | (N/A) |
| P-66 | 0.000 | 0.43 | 0.23 | (N/A) |
| P-96 | 0.000 | 0.43 | 0.23 | (N/A) |
| P-81 | 0.000 | 0.42 | 0.23 | (N/A) |
| P-76 | 0.000 | 0.40 | 0.22 | (N/A) |
| P-6 | 0.000 | 0.40 | 0.22 | (N/A) |
| P-129 | 0.000 | 0.40 | 0.22 | (N/A) |
| P-128 | 0.000 | 0.40 | 0.22 | (N/A) |
| P-84 | 0.000 | 0.40 | 0.21 | (N/A) |
| P-89 | 0.000 | 0.40 | 0.21 | (N/A) |
| P-101 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-28 | 0.000 | 0.52 | 0.00 | (N/A) |
| P-32 | 0.000 | 0.51 | 0.00 | (N/A) |
| P-109 | 0.000 | 0.48 | 0.00 | (N/A) |
| P-31 | 0.000 | 0.46 | 0.00 | (N/A) |
| P-33 | 0.000 | 0.46 | 0.00 | (N/A) |
| P-56 | 0.000 | 0.46 | 0.00 | (N/A) |
| P-49 | 0.000 | 0.44 | 0.00 | (N/A) |
| P-38 | 0.000 | 0.43 | 0.00 | (N/A) |
| P-39 | 0.000 | 0.43 | 0.00 | (N/A) |
| P-36 | 0.000 | 0.43 | 0.00 | (N/A) |
| P-94 | 0.000 | 0.43 | 0.00 | (N/A) |
| P-54 | 0.000 | 0.42 | 0.00 | (N/A) |
| P-46 | 0.000 | 0.40 | 0.00 | (N/A) |
| P-57 | 0.000 | 0.40 | 0.00 | (N/A) |
| P-51 | 0.000 | 0.39 | 0.00 | (N/A) |
| P-114 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-115 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-108 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-7 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-90 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-87 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-102 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-91 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-86 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-85 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-103 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-74 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-75 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-72 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-77 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-73 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-99 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-78 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-70 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-64 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-65 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-67 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-82 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-71 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-97 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-60 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-16 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-100 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-93 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-21 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-80 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-24 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-23 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-25 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-42 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-47 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-44 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-48 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-58 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-59 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-53 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-95 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-19 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-30 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-20 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-98 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-43 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-34 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-41 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-37 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-35 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-40 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-45 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-50 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-92 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-27 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-26 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-22 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-55 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-52 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-15 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On - 3/8 HP)

## Node Report

Subnetwork Summary

| Subnetwork | Gravity Subnetwork |
|---|---|

### Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-10 | 0.000 | 919.39 | (N/A) | 66 |
| J-53 | 0.000 | 920.05 | (N/A) | 66 |
| J-52 | 0.000 | 920.09 | (N/A) | 65 |
| J-13 | 0.000 | 920.36 | (N/A) | 65 |
| J-19 | 0.000 | 920.36 | (N/A) | 65 |
| J-20 | 0.000 | 920.36 | (N/A) | 65 |
| J-21 | 0.000 | 920.36 | (N/A) | 65 |
| J-51 | 0.000 | 920.16 | (N/A) | 65 |
| J-11 | 0.000 | 920.21 | (N/A) | 65 |
| J-9 | 0.000 | 918.69 | (N/A) | 65 |
| J-45 | 0.000 | 919.11 | (N/A) | 65 |
| J-46 | 0.000 | 919.34 | (N/A) | 65 |
| J-47 | 0.000 | 919.51 | (N/A) | 65 |
| J-48 | 0.000 | 919.55 | (N/A) | 65 |
| J-49 | 0.000 | 919.59 | (N/A) | 64 |
| J-50 | 0.000 | 919.62 | (N/A) | 64 |
| J-8 | 0.000 | 919.67 | (N/A) | 64 |
| J-22 | 0.000 | 919.46 | (N/A) | 64 |
| J-31 | 0.000 | 920.66 | (N/A) | 64 |
| J-26 | 0.000 | 919.90 | (N/A) | 63 |
| J-27 | 0.000 | 920.00 | (N/A) | 63 |
| J-41 | 0.000 | 918.30 | (N/A) | 63 |
| J-42 | 0.000 | 918.40 | (N/A) | 63 |
| J-40 | 0.000 | 918.04 | (N/A) | 63 |
| J-43 | 0.000 | 918.44 | (N/A) | 63 |
| J-44 | 0.000 | 918.46 | (N/A) | 63 |
| J-39 | 0.000 | 917.64 | (N/A) | 62 |
| J-5 | 0.000 | 918.49 | (N/A) | 62 |
| J-28 | 0.000 | 920.06 | (N/A) | 62 |
| J-38 | 0.000 | 917.22 | (N/A) | 62 |
| J-32 | 0.000 | 920.78 | (N/A) | 62 |
| J-23 | 0.000 | 918.57 | (N/A) | 61 |
| J-29 | 0.000 | 920.06 | (N/A) | 61 |
| J-4 | 0.000 | 915.98 | (N/A) | 61 |
| J-18 | 0.000 | 917.40 | (N/A) | 61 |
| J-12 | 0.000 | 920.87 | (N/A) | 61 |
| J-1 | 0.000 | 917.16 | (N/A) | 61 |
| J-14 | 0.000 | 917.16 | (N/A) | 61 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On - 3/8 HP)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-17 | 0.000 | 917.16 | (N/A) | 61 |
| J-24 | 0.000 | 918.68 | (N/A) | 60 |
| J-2 | 0.000 | 916.95 | (N/A) | 60 |
| J-30 | 0.000 | 920.06 | (N/A) | 60 |
| J-7 | 0.000 | 920.06 | (N/A) | 60 |
| J-37 | 0.000 | 916.37 | (N/A) | 60 |
| J-25 | 0.000 | 918.79 | (N/A) | 59 |
| J-36 | 0.000 | 915.77 | (N/A) | 59 |
| J-35 | 0.000 | 915.23 | (N/A) | 58 |
| J-6 | 0.000 | 918.79 | (N/A) | 58 |
| J-34 | 0.000 | 914.11 | (N/A) | 57 |
| J-33 | 0.000 | 913.21 | (N/A) | 56 |
| J-3 | 0.000 | 907.10 | (N/A) | 48 |
| J-15 | 0.000 | 879.55 | (N/A) | 11 |
| W-11 | 0.000 | 874.39 | (N/A) | 1 |
| W-13 | 0.000 | 873.92 | (N/A) | 1 |
| W-14 | 0.000 | 873.47 | (N/A) | 1 |
| W-15 | 0.000 | 873.76 | (N/A) | 1 |
| W-16 | 0.000 | 874.05 | (N/A) | 1 |
| W-19 | 0.000 | 874.10 | (N/A) | 1 |
| W-20 | 0.000 | 874.36 | (N/A) | 1 |
| W-26 | 0.000 | 876.16 | (N/A) | 1 |
| W-27 | 0.000 | 877.65 | (N/A) | 1 |
| W-30 | 0.000 | 874.31 | (N/A) | 1 |
| W-1 | 0.000 | 874.50 | (N/A) | 1 |
| W-2 | 0.000 | 874.50 | (N/A) | 1 |
| W-3 | 0.000 | 874.24 | (N/A) | 1 |
| W-4 | 0.000 | 874.12 | (N/A) | 1 |
| W-5 | 0.000 | 874.37 | (N/A) | 1 |
| W-6 | 0.000 | 873.72 | (N/A) | 1 |
| W-7 | 0.000 | 874.50 | (N/A) | 1 |
| W-8 | 0.000 | 874.50 | (N/A) | 1 |
| W-9 | 0.000 | 873.85 | (N/A) | 1 |
| W-10 | 0.000 | 874.50 | (N/A) | 1 |
| W-12 | 0.000 | 873.62 | (N/A) | 1 |
| W-17 | 0.000 | 874.24 | (N/A) | 1 |
| W-18 | 0.000 | 875.28 | (N/A) | 1 |
| W-21 | 0.000 | 873.51 | (N/A) | 1 |
| W-22 | 0.000 | 873.78 | (N/A) | 1 |
| W-23 | 0.000 | 873.98 | (N/A) | 1 |
| W-24 | 0.000 | 874.24 | (N/A) | 1 |
| W-25 | 0.000 | 875.24 | (N/A) | 1 |
| W-28 | 0.000 | 873.87 | (N/A) | 1 |
| W-29 | 0.000 | 874.03 | (N/A) | 1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On - 3/8 HP)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| W-31 | 0.000 | 875.84 | (N/A) | 1 |
| W-32 | 0.000 | 877.11 | (N/A) | 1 |
| W-33 | 0.000 | 878.00 | (N/A) | 1 |
| W-34 | 0.000 | 874.50 | (N/A) | 1 |
| W-35 | 0.000 | 874.50 | (N/A) | 1 |
| W-36 | 0.000 | 874.50 | (N/A) | 1 |
| W-37 | 0.000 | 876.22 | (N/A) | 1 |
| W-38 | 0.000 | 875.53 | (N/A) | 1 |
| W-39 | 0.000 | 876.85 | (N/A) | 1 |
| W-40 | 0.000 | 874.50 | (N/A) | 1 |
| W-41 | 0.000 | 877.22 | (N/A) | 1 |
| MH-1 | 0.000 | (N/A) | (N/A) | 0 |
| AV-3 | 0.000 | 867.02 | (N/A) | 0 |
| J-16 | 0.000 | 866.62 | (N/A) | -1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 15 Pumps On - 3/8 HP)

## Pond Report

Subnetwork Summary

| Subnetwork | Gravity Subnetwork |
|---|---|

### Pond Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) |
|---|---|---|

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On - 3/8 HP)

## Executive Summary

| Scenario | |
|---|---|
| Label | 20 Pumps On - 3/8 HP |

| Computation Results | |
|---|---|
| Subnetwork Results | Number of Gravity Subnetworks: 1<br>Number of Pressure Subnetworks: 1<br><br>>>>> Info: Pressure subnetwork flowing to: MH-1<br>>>>> Info: Pressure analysis iterations: 11<br>>>>> Info: Convergence was achieved.<br><br>>>>> Info: Gravity subnetwork draining to: O-8<br>>>>> Info: Convergence was achieved. |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On - 3/8 HP)

## Calculation Options

### <General>

| | | | |
|---|---|---|---|
| Label | Base Calculation Options | Calculation Type | Analysis |
| Time Analysis Type | Steady State | | |

### Gravity Hydraulics

| | | | |
|---|---|---|---|
| Maximum Network Traversals | 5 | Governing Upstream Pipe Selection Method | Pipe with Maximum QV |
| Flow Convergence Test | 0.001 | Structure Loss Mode | Hydraulic Grade |
| Tractive Stress (Global Minimum) | 0.000 Pascals | Report Hydrologic Time Step? | True |
| Flow Profile Method | Backwater Analysis | Save Detailed Headloss Data? | False |
| Number of Flow Profile Steps | 5 | Gravity Friction Method | Manning's |
| Hydraulic Grade Convergence Test | 0.00 m | Liquid Label | Water at 20C (68F) |
| Average Velocity Method | Actual Uniform Flow Velocity | Use Explicit Depth and Slope Equations? | False |
| Minimum Structure Headloss | 0.00 m | | |

### Pressure

| | | | |
|---|---|---|---|
| Peak Flow Ratio | 75.0 % | Pattern Setup | <None> |
| Extreme Flow Setup | <None> | Steady State Hydrograph Equivalent | Peak |

### Pressure Hydraulics

| | | | |
|---|---|---|---|
| Use Controls During Steady State? | True | Use Linear Interpolation For Multipoint Pumps? | False |
| Wet Well Convergence Increment | 0.2 m | Use Controls During Steady State? | True |
| Use Pumped Flows? | True | Liquid Specific Gravity | 0.998 |
| Pressure Subnetwork Accuracy | 0.001 | Pressure Subnetwork Minimum Possible Pressure | -14 psi |
| Pressure Subnetwork Trials | 40 | Pressure Friction Method | Hazen-Williams |

### SWMM Hydrology

| | | | |
|---|---|---|---|
| Default Infiltration Method | Horton | SWMM Hydrologic Increment | 0.250 hours |

### Headloss (AASHTO)

| | | | |
|---|---|---|---|
| Expansion, Ke | 0.350 | Shaping Adjustment, Cs | 0.500 |
| Contraction, Kc | 0.250 | Non-Piped Flow Adjustment, Cn | 1.300 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On - 3/8 HP)

## Bend Angle vs. Bend Loss Curve

| Bend Angle (degrees) | Bend Loss Coefficient, Kb |
|---|---|
| 0.00 | 0.000 |
| 15.00 | 0.190 |
| 30.00 | 0.350 |
| 45.00 | 0.470 |
| 60.00 | 0.560 |
| 75.00 | 0.640 |
| 90.00 | 0.700 |

| HEC-22 Energy Losses | |
|---|---|
| Consider Non-Piped Plunging Flow? | True |

| HEC-22 Energy Losses (Second Edition) | | | |
|---|---|---|---|
| Elevations Considered Equal Within | 0.15 m | Half Bench Submerged Factor | 0.950 |
| Flat Unsubmerged Factor | 1.000 | Full Bench Unsubmerged Factor | 0.070 |
| Flat Submerged Factor | 1.000 | Full Bench Submerged Factor | 0.750 |
| Depressed Unsubmerged Factor | 1.000 | Improved Bench Unsubmerged Factor | 0.035 |
| Depressed Submerged Factor | 1.000 | Improved Bench Submerged Factor | 0.375 |
| Half Bench Unsubmerged Factor | 0.150 | | |

| HEC-22 Energy Losses (Third Edition) | | | |
|---|---|---|---|
| Flat Submerged Coefficient | -0.050 | Half Bench Unsubmerged Coefficient | -0.850 |
| Flat Unsubmerged Coefficient | -0.050 | Full Bench Submerged Coefficient | -0.250 |
| Depressed Submerged Coefficient | 0.000 | Full Bench Unsubmerged Coefficient | -0.930 |
| Depressed Unsubmerged Coefficient | 0.000 | Improved Submerged Coefficient | -0.600 |
| Half Bench Submerged Coefficient | -0.050 | Improved Unsubmerged Coefficient | -0.980 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On - 3/8 HP)

## Calculation Summary (502: 20 Pumps On - 3/8 HP)

| Time (hours) | Balanced? | Trials | Relative Flow Change |
|---|---|---|---|
| All Time Steps (0) | True | 0 | (N/A) |
| 0.00 | True | (N/A) | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On - 3/8 HP)

## Pipe Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Pressure Subnetwork - 1 |

### Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-3 | 0.000 | 6.89 | 3.70 | (N/A) |
| P-4 | 0.000 | 3.72 | 2.00 | (N/A) |
| P-120 | 0.000 | 3.17 | 1.70 | (N/A) |
| P-119 | 0.000 | 3.17 | 1.70 | (N/A) |
| P-118 | 0.000 | 3.17 | 1.70 | (N/A) |
| P-18 | 0.000 | 6.89 | 1.70 | (N/A) |
| P-139 | 0.000 | 6.89 | 1.70 | (N/A) |
| P-17 | 0.000 | 6.89 | 1.70 | (N/A) |
| P-121 | 0.000 | 2.76 | 1.48 | (N/A) |
| P-2 | 0.000 | 2.37 | 1.27 | (N/A) |
| P-122 | 0.000 | 2.37 | 1.27 | (N/A) |
| P-10 | 0.000 | 1.94 | 1.04 | (N/A) |
| P-126 | 0.000 | 1.78 | 0.96 | (N/A) |
| P-125 | 0.000 | 1.78 | 0.96 | (N/A) |
| P-124 | 0.000 | 1.78 | 0.96 | (N/A) |
| P-123 | 0.000 | 1.78 | 0.96 | (N/A) |
| P-127 | 0.000 | 1.44 | 0.77 | (N/A) |
| P-5 | 0.000 | 1.28 | 0.69 | (N/A) |
| P-88 | 0.000 | 1.28 | 0.69 | (N/A) |
| P-128 | 0.000 | 1.10 | 0.59 | (N/A) |
| P-131 | 0.000 | 1.06 | 0.57 | (N/A) |
| P-130 | 0.000 | 1.06 | 0.57 | (N/A) |
| P-8 | 0.000 | 0.97 | 0.52 | (N/A) |
| P-104 | 0.000 | 0.97 | 0.52 | (N/A) |
| P-137 | 0.000 | 0.87 | 0.47 | (N/A) |
| P-11 | 0.000 | 0.87 | 0.47 | (N/A) |
| P-138 | 0.000 | 0.87 | 0.47 | (N/A) |
| P-129 | 0.000 | 0.77 | 0.41 | (N/A) |
| P-132 | 0.000 | 0.75 | 0.40 | (N/A) |
| P-105 | 0.000 | 0.74 | 0.40 | (N/A) |
| P-113 | 0.000 | 0.73 | 0.39 | (N/A) |
| P-112 | 0.000 | 0.73 | 0.39 | (N/A) |
| P-111 | 0.000 | 0.73 | 0.39 | (N/A) |
| P-1 | 0.000 | 0.72 | 0.39 | (N/A) |
| P-12 | 0.000 | 0.68 | 0.37 | (N/A) |
| P-89 | 0.000 | 0.61 | 0.33 | (N/A) |
| P-136 | 0.000 | 0.57 | 0.31 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-9 | 0.000 | 0.44 | 0.24 | (N/A) |
| P-135 | 0.000 | 0.44 | 0.24 | (N/A) |
| P-134 | 0.000 | 0.44 | 0.24 | (N/A) |
| P-133 | 0.000 | 0.44 | 0.24 | (N/A) |
| P-6 | 0.000 | 0.43 | 0.23 | (N/A) |
| P-25 | 0.000 | 0.41 | 0.22 | (N/A) |
| P-23 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-107 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-110 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-106 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-115 | 0.000 | 0.38 | 0.20 | (N/A) |
| P-80 | 0.000 | 0.38 | 0.20 | (N/A) |
| P-114 | 0.000 | 0.38 | 0.20 | (N/A) |
| P-21 | 0.000 | 0.37 | 0.20 | (N/A) |
| P-61 | 0.000 | 0.36 | 0.19 | (N/A) |
| P-16 | 0.000 | 0.36 | 0.19 | (N/A) |
| P-100 | 0.000 | 0.36 | 0.19 | (N/A) |
| P-87 | 0.000 | 0.36 | 0.19 | (N/A) |
| P-71 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-79 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-66 | 0.000 | 0.34 | 0.18 | (N/A) |
| P-81 | 0.000 | 0.34 | 0.18 | (N/A) |
| P-116 | 0.000 | 0.34 | 0.18 | (N/A) |
| P-64 | 0.000 | 0.34 | 0.18 | (N/A) |
| P-69 | 0.000 | 0.34 | 0.18 | (N/A) |
| P-70 | 0.000 | 0.34 | 0.18 | (N/A) |
| P-76 | 0.000 | 0.31 | 0.17 | (N/A) |
| P-75 | 0.000 | 0.31 | 0.17 | (N/A) |
| P-103 | 0.000 | 0.31 | 0.17 | (N/A) |
| P-84 | 0.000 | 0.30 | 0.16 | (N/A) |
| P-85 | 0.000 | 0.30 | 0.16 | (N/A) |
| P-90 | 0.000 | 0.30 | 0.16 | (N/A) |
| P-102 | 0.000 | 0.30 | 0.16 | (N/A) |
| P-13 | 0.000 | 0.26 | 0.14 | (N/A) |
| P-26 | 0.000 | 0.41 | 0.00 | (N/A) |
| P-22 | 0.000 | 0.39 | 0.00 | (N/A) |
| P-109 | 0.000 | 0.39 | 0.00 | (N/A) |
| P-50 | 0.000 | 0.38 | 0.00 | (N/A) |
| P-20 | 0.000 | 0.37 | 0.00 | (N/A) |
| P-31 | 0.000 | 0.36 | 0.00 | (N/A) |
| P-19 | 0.000 | 0.36 | 0.00 | (N/A) |
| P-41 | 0.000 | 0.35 | 0.00 | (N/A) |
| P-49 | 0.000 | 0.35 | 0.00 | (N/A) |
| P-36 | 0.000 | 0.34 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-54 | 0.000 | 0.34 | 0.00 | (N/A) |
| P-34 | 0.000 | 0.34 | 0.00 | (N/A) |
| P-39 | 0.000 | 0.34 | 0.00 | (N/A) |
| P-40 | 0.000 | 0.34 | 0.00 | (N/A) |
| P-46 | 0.000 | 0.31 | 0.00 | (N/A) |
| P-45 | 0.000 | 0.31 | 0.00 | (N/A) |
| P-53 | 0.000 | 0.31 | 0.00 | (N/A) |
| P-57 | 0.000 | 0.30 | 0.00 | (N/A) |
| P-58 | 0.000 | 0.30 | 0.00 | (N/A) |
| P-52 | 0.000 | 0.30 | 0.00 | (N/A) |
| P-117 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-101 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-86 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-91 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-74 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-72 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-77 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-73 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-99 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-78 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-96 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-68 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-65 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-60 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-67 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-97 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-63 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-82 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-93 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-24 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-14 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-83 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-62 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-29 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-48 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-30 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-33 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-32 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-37 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-43 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-59 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-98 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-94 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-95 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-44 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-47 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-42 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-51 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-55 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-27 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-35 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-38 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-92 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-15 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-56 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-28 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-7 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-108 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On - 3/8 HP)

## Node Report

Subnetwork Summary

| Subnetwork | Pressure Subnetwork - 1 |
|---|---|

### Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-10 | 0.000 | 923.59 | (N/A) | 72 |
| J-53 | 0.000 | 924.23 | (N/A) | 71 |
| J-52 | 0.000 | 924.36 | (N/A) | 71 |
| J-13 | 0.000 | 924.81 | (N/A) | 71 |
| J-20 | 0.000 | 924.81 | (N/A) | 71 |
| J-21 | 0.000 | 924.81 | (N/A) | 71 |
| J-19 | 0.000 | 924.79 | (N/A) | 71 |
| J-51 | 0.000 | 924.45 | (N/A) | 71 |
| J-46 | 0.000 | 923.79 | (N/A) | 71 |
| J-45 | 0.000 | 923.48 | (N/A) | 71 |
| J-11 | 0.000 | 924.46 | (N/A) | 71 |
| J-47 | 0.000 | 923.91 | (N/A) | 71 |
| J-9 | 0.000 | 922.91 | (N/A) | 71 |
| J-48 | 0.000 | 923.94 | (N/A) | 71 |
| J-49 | 0.000 | 923.97 | (N/A) | 71 |
| J-50 | 0.000 | 924.00 | (N/A) | 70 |
| J-8 | 0.000 | 924.03 | (N/A) | 70 |
| J-22 | 0.000 | 923.88 | (N/A) | 70 |
| J-26 | 0.000 | 924.21 | (N/A) | 70 |
| J-43 | 0.000 | 923.05 | (N/A) | 69 |
| J-42 | 0.000 | 922.81 | (N/A) | 69 |
| J-44 | 0.000 | 923.14 | (N/A) | 69 |
| J-27 | 0.000 | 924.28 | (N/A) | 69 |
| J-31 | 0.000 | 924.54 | (N/A) | 69 |
| J-5 | 0.000 | 923.17 | (N/A) | 69 |
| J-41 | 0.000 | 922.54 | (N/A) | 69 |
| J-40 | 0.000 | 922.04 | (N/A) | 69 |
| J-28 | 0.000 | 924.42 | (N/A) | 69 |
| J-23 | 0.000 | 923.36 | (N/A) | 68 |
| J-39 | 0.000 | 921.60 | (N/A) | 68 |
| J-14 | 0.000 | 922.29 | (N/A) | 68 |
| J-17 | 0.000 | 922.23 | (N/A) | 68 |
| J-1 | 0.000 | 922.19 | (N/A) | 68 |
| J-38 | 0.000 | 921.14 | (N/A) | 68 |
| J-29 | 0.000 | 924.47 | (N/A) | 68 |
| J-18 | 0.000 | 921.98 | (N/A) | 67 |
| J-32 | 0.000 | 924.54 | (N/A) | 67 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On - 3/8 HP)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-2 | 0.000 | 921.71 | (N/A) | 67 |
| J-24 | 0.000 | 923.43 | (N/A) | 67 |
| J-30 | 0.000 | 924.53 | (N/A) | 67 |
| J-4 | 0.000 | 919.78 | (N/A) | 66 |
| J-37 | 0.000 | 921.01 | (N/A) | 66 |
| J-12 | 0.000 | 924.54 | (N/A) | 66 |
| J-7 | 0.000 | 924.53 | (N/A) | 66 |
| J-25 | 0.000 | 923.50 | (N/A) | 66 |
| J-36 | 0.000 | 920.29 | (N/A) | 65 |
| J-6 | 0.000 | 923.50 | (N/A) | 65 |
| J-35 | 0.000 | 919.41 | (N/A) | 64 |
| J-34 | 0.000 | 917.09 | (N/A) | 61 |
| J-33 | 0.000 | 915.84 | (N/A) | 60 |
| J-3 | 0.000 | 909.74 | (N/A) | 52 |
| J-15 | 0.000 | 880.38 | (N/A) | 12 |
| W-11 | 0.000 | 874.39 | (N/A) | 1 |
| W-13 | 0.000 | 873.92 | (N/A) | 1 |
| W-14 | 0.000 | 873.47 | (N/A) | 1 |
| W-15 | 0.000 | 873.76 | (N/A) | 1 |
| W-16 | 0.000 | 874.05 | (N/A) | 1 |
| W-19 | 0.000 | 874.10 | (N/A) | 1 |
| W-20 | 0.000 | 874.36 | (N/A) | 1 |
| W-26 | 0.000 | 876.16 | (N/A) | 1 |
| W-27 | 0.000 | 877.65 | (N/A) | 1 |
| W-30 | 0.000 | 874.31 | (N/A) | 1 |
| W-1 | 0.000 | 874.50 | (N/A) | 1 |
| W-2 | 0.000 | 874.50 | (N/A) | 1 |
| W-3 | 0.000 | 874.24 | (N/A) | 1 |
| W-4 | 0.000 | 874.12 | (N/A) | 1 |
| W-5 | 0.000 | 874.37 | (N/A) | 1 |
| W-6 | 0.000 | 873.72 | (N/A) | 1 |
| W-7 | 0.000 | 874.50 | (N/A) | 1 |
| W-8 | 0.000 | 874.50 | (N/A) | 1 |
| W-9 | 0.000 | 873.85 | (N/A) | 1 |
| W-10 | 0.000 | 874.50 | (N/A) | 1 |
| W-12 | 0.000 | 873.62 | (N/A) | 1 |
| W-17 | 0.000 | 874.24 | (N/A) | 1 |
| W-18 | 0.000 | 875.28 | (N/A) | 1 |
| W-21 | 0.000 | 873.51 | (N/A) | 1 |
| W-22 | 0.000 | 873.78 | (N/A) | 1 |
| W-23 | 0.000 | 873.98 | (N/A) | 1 |
| W-24 | 0.000 | 874.24 | (N/A) | 1 |
| W-25 | 0.000 | 875.24 | (N/A) | 1 |
| W-28 | 0.000 | 873.87 | (N/A) | 1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On - 3/8 HP)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| W-29 | 0.000 | 874.03 | (N/A) | 1 |
| W-31 | 0.000 | 875.84 | (N/A) | 1 |
| W-32 | 0.000 | 877.11 | (N/A) | 1 |
| W-33 | 0.000 | 878.00 | (N/A) | 1 |
| W-34 | 0.000 | 874.50 | (N/A) | 1 |
| W-35 | 0.000 | 874.50 | (N/A) | 1 |
| W-36 | 0.000 | 874.50 | (N/A) | 1 |
| W-37 | 0.000 | 876.22 | (N/A) | 1 |
| W-38 | 0.000 | 875.53 | (N/A) | 1 |
| W-39 | 0.000 | 876.85 | (N/A) | 1 |
| W-40 | 0.000 | 874.50 | (N/A) | 1 |
| W-41 | 0.000 | 877.22 | (N/A) | 1 |
| MH-1 | 0.000 | (N/A) | (N/A) | 0 |
| AV-3 | 0.000 | 867.02 | (N/A) | 0 |
| J-16 | 0.000 | 866.66 | (N/A) | 0 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 20 Pumps On - 3/8 HP)

## Pond Report

Subnetwork Summary

| Subnetwork | Pressure Subnetwork - 1 |
|---|---|

### Pond Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) |
|---|---|---|

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On - 3/8 HP)

## Executive Summary

| Scenario | |
|---|---|
| Label | 25 Pumps On - 3/8 HP |

| Computation Results | |
|---|---|
| Subnetwork Results | Number of Gravity Subnetworks: 1<br>Number of Pressure Subnetworks: 1<br><br>>>>> Info: Pressure subnetwork flowing to: MH-1<br>>>>> Info: Pressure analysis iterations: 11<br>>>>> Info: Convergence was achieved.<br><br>>>>> Info: Gravity subnetwork draining to: O-8<br>>>>> Info: Convergence was achieved. |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On - 3/8 HP)

## Calculation Options

### <General>

| | | | |
|---|---|---|---|
| Label | Base Calculation Options | Calculation Type | Analysis |
| Time Analysis Type | Steady State | | |

### Gravity Hydraulics

| | | | |
|---|---|---|---|
| Maximum Network Traversals | 5 | Governing Upstream Pipe Selection Method | Pipe with Maximum QV |
| Flow Convergence Test | 0.001 | Structure Loss Mode | Hydraulic Grade |
| Tractive Stress (Global Minimum) | 0.000 Pascals | Report Hydrologic Time Step? | True |
| Flow Profile Method | Backwater Analysis | Save Detailed Headloss Data? | False |
| Number of Flow Profile Steps | 5 | Gravity Friction Method | Manning's |
| Hydraulic Grade Convergence Test | 0.00 m | Liquid Label | Water at 20C (68F) |
| Average Velocity Method | Actual Uniform Flow Velocity | Use Explicit Depth and Slope Equations? | False |
| Minimum Structure Headloss | 0.00 m | | |

### Pressure

| | | | |
|---|---|---|---|
| Peak Flow Ratio | 75.0 % | Pattern Setup | <None> |
| Extreme Flow Setup | <None> | Steady State Hydrograph Equivalent | Peak |

### Pressure Hydraulics

| | | | |
|---|---|---|---|
| Use Controls During Steady State? | True | Use Linear Interpolation For Multipoint Pumps? | False |
| Wet Well Convergence Increment | 0.2 m | Use Controls During Steady State? | True |
| Use Pumped Flows? | True | Liquid Specific Gravity | 0.998 |
| Pressure Subnetwork Accuracy | 0.001 | Pressure Subnetwork Minimum Possible Pressure | -14 psi |
| Pressure Subnetwork Trials | 40 | Pressure Friction Method | Hazen-Williams |

### SWMM Hydrology

| | | | |
|---|---|---|---|
| Default Infiltration Method | Horton | SWMM Hydrologic Increment | 0.250 hours |

### Headloss (AASHTO)

| | | | |
|---|---|---|---|
| Expansion, Ke | 0.350 | Shaping Adjustment, Cs | 0.500 |
| Contraction, Kc | 0.250 | Non-Piped Flow Adjustment, Cn | 1.300 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On - 3/8 HP)

## Bend Angle vs. Bend Loss Curve

| Bend Angle (degrees) | Bend Loss Coefficient, Kb |
|---|---|
| 0.00 | 0.000 |
| 15.00 | 0.190 |
| 30.00 | 0.350 |
| 45.00 | 0.470 |
| 60.00 | 0.560 |
| 75.00 | 0.640 |
| 90.00 | 0.700 |

| HEC-22 Energy Losses | |
|---|---|
| Consider Non-Piped Plunging Flow? | True |

| HEC-22 Energy Losses (Second Edition) | | | |
|---|---|---|---|
| Elevations Considered Equal Within | 0.15 m | Half Bench Submerged Factor | 0.950 |
| Flat Unsubmerged Factor | 1.000 | Full Bench Unsubmerged Factor | 0.070 |
| Flat Submerged Factor | 1.000 | Full Bench Submerged Factor | 0.750 |
| Depressed Unsubmerged Factor | 1.000 | Improved Bench Unsubmerged Factor | 0.035 |
| Depressed Submerged Factor | 1.000 | Improved Bench Submerged Factor | 0.375 |
| Half Bench Unsubmerged Factor | 0.150 | | |

| HEC-22 Energy Losses (Third Edition) | | | |
|---|---|---|---|
| Flat Submerged Coefficient | -0.050 | Half Bench Unsubmerged Coefficient | -0.850 |
| Flat Unsubmerged Coefficient | -0.050 | Full Bench Submerged Coefficient | -0.250 |
| Depressed Submerged Coefficient | 0.000 | Full Bench Unsubmerged Coefficient | -0.930 |
| Depressed Unsubmerged Coefficient | 0.000 | Improved Submerged Coefficient | -0.600 |
| Half Bench Submerged Coefficient | -0.050 | Improved Unsubmerged Coefficient | -0.980 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On - 3/8 HP)

## Calculation Summary (503: 25 Pumps On - 3/8 HP)

| Time (hours) | Balanced? | Trials | Relative Flow Change |
|---|---|---|---|
| All Time Steps (0) | True | 0 | (N/A) |
| 0.00 | True | (N/A) | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On - 3/8 HP)

## Pipe Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Pressure Subnetwork - 1 |

### Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-3 | 0.000 | 7.13 | 3.83 | (N/A) |
| P-4 | 0.000 | 3.81 | 2.04 | (N/A) |
| P-118 | 0.000 | 3.33 | 1.79 | (N/A) |
| P-18 | 0.000 | 7.14 | 1.76 | (N/A) |
| P-139 | 0.000 | 7.14 | 1.76 | (N/A) |
| P-17 | 0.000 | 7.13 | 1.76 | (N/A) |
| P-120 | 0.000 | 2.92 | 1.57 | (N/A) |
| P-119 | 0.000 | 2.92 | 1.57 | (N/A) |
| P-121 | 0.000 | 2.57 | 1.38 | (N/A) |
| P-122 | 0.000 | 2.24 | 1.20 | (N/A) |
| P-10 | 0.000 | 1.93 | 1.03 | (N/A) |
| P-2 | 0.000 | 1.92 | 1.03 | (N/A) |
| P-123 | 0.000 | 1.88 | 1.01 | (N/A) |
| P-124 | 0.000 | 1.59 | 0.85 | (N/A) |
| P-104 | 0.000 | 1.41 | 0.76 | (N/A) |
| P-125 | 0.000 | 1.31 | 0.70 | (N/A) |
| P-5 | 0.000 | 1.30 | 0.70 | (N/A) |
| P-88 | 0.000 | 1.30 | 0.70 | (N/A) |
| P-8 | 0.000 | 1.16 | 0.62 | (N/A) |
| P-131 | 0.000 | 1.10 | 0.59 | (N/A) |
| P-130 | 0.000 | 1.10 | 0.59 | (N/A) |
| P-126 | 0.000 | 1.03 | 0.55 | (N/A) |
| P-132 | 0.000 | 0.87 | 0.47 | (N/A) |
| P-111 | 0.000 | 0.83 | 0.45 | (N/A) |
| P-137 | 0.000 | 0.83 | 0.44 | (N/A) |
| P-11 | 0.000 | 0.83 | 0.44 | (N/A) |
| P-138 | 0.000 | 0.83 | 0.44 | (N/A) |
| P-6 | 0.000 | 0.75 | 0.40 | (N/A) |
| P-129 | 0.000 | 0.75 | 0.40 | (N/A) |
| P-128 | 0.000 | 0.75 | 0.40 | (N/A) |
| P-127 | 0.000 | 0.75 | 0.40 | (N/A) |
| P-106 | 0.000 | 0.65 | 0.35 | (N/A) |
| P-105 | 0.000 | 0.65 | 0.35 | (N/A) |
| P-133 | 0.000 | 0.63 | 0.34 | (N/A) |
| P-87 | 0.000 | 0.61 | 0.33 | (N/A) |
| P-1 | 0.000 | 0.61 | 0.33 | (N/A) |
| P-117 | 0.000 | 0.60 | 0.32 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-116 | 0.000 | 0.60 | 0.32 | (N/A) |
| P-136 | 0.000 | 0.59 | 0.32 | (N/A) |
| P-112 | 0.000 | 0.57 | 0.31 | (N/A) |
| P-12 | 0.000 | 0.48 | 0.26 | (N/A) |
| P-29 | 0.000 | 0.40 | 0.22 | (N/A) |
| P-135 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-134 | 0.000 | 0.39 | 0.21 | (N/A) |
| P-13 | 0.000 | 0.36 | 0.19 | (N/A) |
| P-25 | 0.000 | 0.35 | 0.19 | (N/A) |
| P-23 | 0.000 | 0.34 | 0.18 | (N/A) |
| P-110 | 0.000 | 0.33 | 0.18 | (N/A) |
| P-107 | 0.000 | 0.33 | 0.18 | (N/A) |
| P-24 | 0.000 | 0.32 | 0.17 | (N/A) |
| P-93 | 0.000 | 0.31 | 0.17 | (N/A) |
| P-14 | 0.000 | 0.31 | 0.17 | (N/A) |
| P-83 | 0.000 | 0.31 | 0.17 | (N/A) |
| P-115 | 0.000 | 0.31 | 0.17 | (N/A) |
| P-80 | 0.000 | 0.31 | 0.17 | (N/A) |
| P-114 | 0.000 | 0.31 | 0.17 | (N/A) |
| P-113 | 0.000 | 0.31 | 0.17 | (N/A) |
| P-16 | 0.000 | 0.31 | 0.16 | (N/A) |
| P-100 | 0.000 | 0.31 | 0.16 | (N/A) |
| P-60 | 0.000 | 0.30 | 0.16 | (N/A) |
| P-82 | 0.000 | 0.29 | 0.16 | (N/A) |
| P-67 | 0.000 | 0.29 | 0.15 | (N/A) |
| P-65 | 0.000 | 0.28 | 0.15 | (N/A) |
| P-68 | 0.000 | 0.28 | 0.15 | (N/A) |
| P-66 | 0.000 | 0.28 | 0.15 | (N/A) |
| P-96 | 0.000 | 0.26 | 0.14 | (N/A) |
| P-78 | 0.000 | 0.26 | 0.14 | (N/A) |
| P-99 | 0.000 | 0.25 | 0.13 | (N/A) |
| P-73 | 0.000 | 0.24 | 0.13 | (N/A) |
| P-84 | 0.000 | 0.24 | 0.13 | (N/A) |
| P-89 | 0.000 | 0.24 | 0.13 | (N/A) |
| P-72 | 0.000 | 0.24 | 0.13 | (N/A) |
| P-103 | 0.000 | 0.24 | 0.13 | (N/A) |
| P-76 | 0.000 | 0.24 | 0.13 | (N/A) |
| P-75 | 0.000 | 0.24 | 0.13 | (N/A) |
| P-102 | 0.000 | 0.23 | 0.12 | (N/A) |
| P-9 | 0.000 | 0.15 | 0.08 | (N/A) |
| P-28 | 0.000 | 0.40 | 0.00 | (N/A) |
| P-26 | 0.000 | 0.35 | 0.00 | (N/A) |
| P-22 | 0.000 | 0.34 | 0.00 | (N/A) |
| P-109 | 0.000 | 0.33 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-27 | 0.000 | 0.32 | 0.00 | (N/A) |
| P-92 | 0.000 | 0.31 | 0.00 | (N/A) |
| P-56 | 0.000 | 0.31 | 0.00 | (N/A) |
| P-50 | 0.000 | 0.31 | 0.00 | (N/A) |
| P-19 | 0.000 | 0.31 | 0.00 | (N/A) |
| P-30 | 0.000 | 0.30 | 0.00 | (N/A) |
| P-55 | 0.000 | 0.29 | 0.00 | (N/A) |
| P-37 | 0.000 | 0.29 | 0.00 | (N/A) |
| P-35 | 0.000 | 0.28 | 0.00 | (N/A) |
| P-38 | 0.000 | 0.28 | 0.00 | (N/A) |
| P-36 | 0.000 | 0.28 | 0.00 | (N/A) |
| P-94 | 0.000 | 0.26 | 0.00 | (N/A) |
| P-48 | 0.000 | 0.26 | 0.00 | (N/A) |
| P-98 | 0.000 | 0.25 | 0.00 | (N/A) |
| P-43 | 0.000 | 0.24 | 0.00 | (N/A) |
| P-57 | 0.000 | 0.24 | 0.00 | (N/A) |
| P-42 | 0.000 | 0.24 | 0.00 | (N/A) |
| P-53 | 0.000 | 0.24 | 0.00 | (N/A) |
| P-46 | 0.000 | 0.24 | 0.00 | (N/A) |
| P-45 | 0.000 | 0.24 | 0.00 | (N/A) |
| P-52 | 0.000 | 0.23 | 0.00 | (N/A) |
| P-90 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-91 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-15 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-108 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-101 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-74 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-86 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-85 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-77 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-81 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-79 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-69 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-70 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-64 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-97 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-71 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-61 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-63 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-21 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-62 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-58 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-59 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-54 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On - 3/8 HP)

## Pipe Report

| Label | Time (Maximum Flow) (hours) | Flow (Maximum) (L/s) | Velocity (Maximum Calculated) (m/s) | Depth (Maximum) / Rise (%) |
|---|---|---|---|---|
| P-95 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-32 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-31 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-33 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-20 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-41 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-39 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-34 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-51 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-47 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-44 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-49 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-40 | 0.000 | 0.00 | 0.00 | (N/A) |
| P-7 | 0.000 | 0.00 | 0.00 | (N/A) |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On - 3/8 HP)

## Node Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Pressure Subnetwork - 1 |

### Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-10 | 0.000 | 926.79 | (N/A) | 76 |
| J-53 | 0.000 | 927.36 | (N/A) | 76 |
| J-52 | 0.000 | 927.48 | (N/A) | 76 |
| J-46 | 0.000 | 927.11 | (N/A) | 76 |
| J-47 | 0.000 | 927.27 | (N/A) | 76 |
| J-45 | 0.000 | 926.79 | (N/A) | 76 |
| J-51 | 0.000 | 927.58 | (N/A) | 76 |
| J-48 | 0.000 | 927.33 | (N/A) | 76 |
| J-9 | 0.000 | 926.17 | (N/A) | 75 |
| J-13 | 0.000 | 927.66 | (N/A) | 75 |
| J-19 | 0.000 | 927.66 | (N/A) | 75 |
| J-20 | 0.000 | 927.66 | (N/A) | 75 |
| J-21 | 0.000 | 927.66 | (N/A) | 75 |
| J-49 | 0.000 | 927.35 | (N/A) | 75 |
| J-11 | 0.000 | 927.60 | (N/A) | 75 |
| J-50 | 0.000 | 927.38 | (N/A) | 75 |
| J-8 | 0.000 | 927.38 | (N/A) | 75 |
| J-22 | 0.000 | 927.17 | (N/A) | 75 |
| J-26 | 0.000 | 927.60 | (N/A) | 74 |
| J-27 | 0.000 | 927.65 | (N/A) | 74 |
| J-31 | 0.000 | 927.82 | (N/A) | 74 |
| J-28 | 0.000 | 927.68 | (N/A) | 73 |
| J-41 | 0.000 | 925.38 | (N/A) | 73 |
| J-40 | 0.000 | 925.19 | (N/A) | 73 |
| J-42 | 0.000 | 925.46 | (N/A) | 73 |
| J-43 | 0.000 | 925.57 | (N/A) | 73 |
| J-39 | 0.000 | 924.95 | (N/A) | 73 |
| J-44 | 0.000 | 925.66 | (N/A) | 73 |
| J-5 | 0.000 | 925.74 | (N/A) | 73 |
| J-38 | 0.000 | 924.57 | (N/A) | 73 |
| J-32 | 0.000 | 928.03 | (N/A) | 72 |
| J-29 | 0.000 | 927.71 | (N/A) | 72 |
| J-23 | 0.000 | 925.89 | (N/A) | 72 |
| J-14 | 0.000 | 924.73 | (N/A) | 71 |
| J-17 | 0.000 | 924.68 | (N/A) | 71 |
| J-30 | 0.000 | 927.75 | (N/A) | 71 |
| J-1 | 0.000 | 924.58 | (N/A) | 71 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On - 3/8 HP)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| J-12 | 0.000 | 928.07 | (N/A) | 71 |
| J-4 | 0.000 | 923.07 | (N/A) | 71 |
| J-18 | 0.000 | 924.50 | (N/A) | 71 |
| J-24 | 0.000 | 926.06 | (N/A) | 71 |
| J-7 | 0.000 | 927.75 | (N/A) | 71 |
| J-2 | 0.000 | 924.23 | (N/A) | 71 |
| J-37 | 0.000 | 923.75 | (N/A) | 70 |
| J-25 | 0.000 | 926.12 | (N/A) | 69 |
| J-36 | 0.000 | 923.10 | (N/A) | 69 |
| J-35 | 0.000 | 922.34 | (N/A) | 68 |
| J-6 | 0.000 | 926.12 | (N/A) | 68 |
| J-34 | 0.000 | 920.34 | (N/A) | 66 |
| J-33 | 0.000 | 919.27 | (N/A) | 65 |
| J-3 | 0.000 | 912.59 | (N/A) | 56 |
| J-15 | 0.000 | 881.27 | (N/A) | 13 |
| W-11 | 0.000 | 874.39 | (N/A) | 1 |
| W-13 | 0.000 | 873.92 | (N/A) | 1 |
| W-14 | 0.000 | 873.47 | (N/A) | 1 |
| W-15 | 0.000 | 873.76 | (N/A) | 1 |
| W-16 | 0.000 | 874.05 | (N/A) | 1 |
| W-19 | 0.000 | 874.10 | (N/A) | 1 |
| W-20 | 0.000 | 874.36 | (N/A) | 1 |
| W-26 | 0.000 | 876.16 | (N/A) | 1 |
| W-27 | 0.000 | 877.65 | (N/A) | 1 |
| W-30 | 0.000 | 874.31 | (N/A) | 1 |
| W-1 | 0.000 | 874.50 | (N/A) | 1 |
| W-2 | 0.000 | 874.50 | (N/A) | 1 |
| W-3 | 0.000 | 874.24 | (N/A) | 1 |
| W-4 | 0.000 | 874.12 | (N/A) | 1 |
| W-5 | 0.000 | 874.37 | (N/A) | 1 |
| W-6 | 0.000 | 873.72 | (N/A) | 1 |
| W-7 | 0.000 | 874.50 | (N/A) | 1 |
| W-8 | 0.000 | 874.50 | (N/A) | 1 |
| W-9 | 0.000 | 873.85 | (N/A) | 1 |
| W-10 | 0.000 | 874.50 | (N/A) | 1 |
| W-12 | 0.000 | 873.62 | (N/A) | 1 |
| W-17 | 0.000 | 874.24 | (N/A) | 1 |
| W-18 | 0.000 | 875.28 | (N/A) | 1 |
| W-21 | 0.000 | 873.51 | (N/A) | 1 |
| W-22 | 0.000 | 873.78 | (N/A) | 1 |
| W-23 | 0.000 | 873.98 | (N/A) | 1 |
| W-24 | 0.000 | 874.24 | (N/A) | 1 |
| W-25 | 0.000 | 875.24 | (N/A) | 1 |
| W-28 | 0.000 | 873.87 | (N/A) | 1 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On - 3/8 HP)

## Node Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) | Depth (Maximum) (m) | Pressure (Maximum) (psi) |
|---|---|---|---|---|
| W-29 | 0.000 | 874.03 | (N/A) | 1 |
| W-31 | 0.000 | 875.84 | (N/A) | 1 |
| W-32 | 0.000 | 877.11 | (N/A) | 1 |
| W-33 | 0.000 | 878.00 | (N/A) | 1 |
| W-34 | 0.000 | 874.50 | (N/A) | 1 |
| W-35 | 0.000 | 874.50 | (N/A) | 1 |
| W-36 | 0.000 | 874.50 | (N/A) | 1 |
| W-37 | 0.000 | 876.22 | (N/A) | 1 |
| W-38 | 0.000 | 875.53 | (N/A) | 1 |
| W-39 | 0.000 | 876.85 | (N/A) | 1 |
| W-40 | 0.000 | 874.50 | (N/A) | 1 |
| W-41 | 0.000 | 877.22 | (N/A) | 1 |
| MH-1 | 0.000 | (N/A) | (N/A) | 0 |
| AV-3 | 0.000 | 867.02 | (N/A) | 0 |
| J-16 | 0.000 | 866.70 | (N/A) | 0 |

# Detailed Calculation Summary (Huxley Sewer Model.stsw, 25 Pumps On - 3/8 HP)

## Pond Report

| Subnetwork Summary | |
|---|---|
| Subnetwork | Pressure Subnetwork - 1 |

### Pond Report

| Label | Time to Maximum Hydraulic Grade (hours) | Hydraulic Grade (Maximum) (m) |
|---|---|---|

# APPENDIX C

## Submersible Pumps

# Orenco® PF-Series 60Hz, 1-Phase Pumps

## Applications

Orenco's 60Hz, 1-phase, 4in (100mm) Submersible Effluent Pumps are designed to transport screened effluent (with low TSS counts) from septic or dosing tanks. These pumps are engineered using lightweight, corrosion-resistant stainless steel and polymers, and are field serviceable and repairable with common tools. They're also CSA and UL certified to US and Canadian safety standards for effluent pumps.

PF-Series pumps are used in a variety of applications, including pressurized drainfields, packed-bed filters, mounds, aerobic units, effluent irrigation, liquid-only (effluent) sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault or after a secondary treatment system.


C US
LR80980
LR2053896

Powered by Franklin Electric

## General

To specify this pump for your installation, require the following:

- Minimum 24-hour run-dry capability (liquid end) with no deterioration in pump life or performance*
- 1/8in (3mm) bypass orifice to ensure flow recirculation for motor cooling and to prevent air binding
- 1/8in (3mm) mesh intake screen to limit solids
- Liquid-end repair kit availability for better long-term cost to own
- TRI-SEAL™ floating impeller design on 10, 20, and 30gpm (0.6, 1.3, and 1.9L/sec) models; floating stack design on 50 and 75gpm (3.2 and 4.7L/sec) models
- Franklin Electric Super Stainless motors are rated for continuous use and frequent cycling, with surge arrestors, hermetically sealed motor housing for moisture-free windings, and Kingsbury-type thrust bearing for thrust absorption
- Thermal overload protection trips at 203-221˚F (95-105˚C) for 1-phase motors through 1.5hp (1.12kW)
- Type SOOW 600V motor cable (model PF751512 uses 14 AWG, SJOOW, 300V cord)

** Not applicable for 5hp (3.73kW) models*

## Standard Models

See Specifications on page 2 for a list of standard pumps. For a complete list of available pumps, call Orenco.

## Product Code Diagram

PF □ □ □ □ □ - □ - □

- Pump, PF-Series
- Nominal flow, gpm (L/sec): 10 = 10 (0.6) 20 = 20 (1.3) 30 = 30 (1.9) 50 = 50 (3.2) 75 = 75 (4.7)
- Horsepower (kW): 05 = 1/2hp (0.37) 07 = 3/4hp (0.56) 10 = 1hp (0.75) 15 = 1 1/2hp (1.12) 20 = 2hp (1.50) 30 = 3hp (2.24) 50 = 5hp (3.73)
- Frequency: 1 = 1-phase, 60Hz
- Voltage, nameplate: 1 = 115* 2 = 230
- Check valve: Blank = no internal check valve CV = internal check valve†
- Cord length, ft (m):‡ Blank = 10 (3) 20 = 20 (6) 30 = 30 (9) 50 = 50 (15)
- CLK = ClickTight™ compatible

* 1/2hp (0.37kW) only
† Available for 10gpm (0.6L/sec), 1/2hp (0.37kW)
‡ Note: 20ft cords are available only for pumps through 1 1/2hp

## Specifications

| Pump Model | Design gpm (L/sec) | Horsepower (kW) | Phase | Nameplate voltage | Actual voltage | Design flow amps | Max amps | Discharge size and material[1] | Length in (mm) | Min. liquid level in (mm)[2] | Weight lb (kg)[3] | Rated cycles per day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PF100511 [9] | 10 (0.6) | 0.50 (0.37) | 1 | 115 | 120 | 12.7 | 12.7 | 1¼in GFP | 23.0 (584) | 16 (406) | 26 (12) | 300 |
| PF100511CV [9] | 10 (0.6) | 0.50 (0.37) | 1 | 115 | 120 | 12.7 | 12.7 | 1¼in GFP | 23.0 (584) | 16 (406) | 26 (12) | 300 |
| PF100512 [9] | 10 (0.6) | 0.50 (0.37) | 1 | 230 | 240 | 6.3 | 6.3 | 1¼in GFP | 23.0 (584) | 16 (406) | 26 (12) | 300 |
| PF100712 [4,5,9] | 10 (0.6) | 0.75 (0.56) | 1 | 230 | 240 | 8.3 | 8.3 | 1¼in GFP | 25.9 (658) | 17 (432) | 30 (14) | 300 |
| PF101012 [5,6,9] | 10 (0.6) | 1.00 (0.75) | 1 | 230 | 240 | 9.6 | 9.6 | 1¼in GFP | 27.9 (709) | 18 (457) | 33 (15) | 100 |
| PF200511 [9] | 20 (1.3) | 0.50 (0.37) | 1 | 115 | 120 | 12.3 | 12.5 | 1¼in GFP | 22.3 (566) | 18 (457) | 25 (11) | 300 |
| PF200512 [9] | 20 (1.3) | 0.50 (0.37) | 1 | 230 | 240 | 6.4 | 6.5 | 1¼in GFP | 22.5 (572) | 18 (457) | 26 (12) | 300 |
| PF201012 [4,5,9] | 20 (1.3) | 1.00 (0.75) | 1 | 230 | 240 | 10.5 | 10.5 | 1¼in GFP | 28.4 (721) | 20 (508) | 33 (15) | 100 |
| PF201512 [4,5] | 20 (1.3) | 1.50 (1.12) | 1 | 230 | 240 | 12.4 | 12.6 | 1¼in GFP | 34.0 (864) | 24 (610) | 41 (19) | 100 |
| PF300511 [9] | 30 (1.9) | 0.50 (0.37) | 1 | 115 | 120 | 11.8 | 11.8 | 1¼in GFP | 21.3 (541) | 20 (508) | 28 (13) | 300 |
| PF300512 [9] | 30 (1.9) | 0.50 (0.37) | 1 | 230 | 240 | 6.2 | 6.2 | 1¼in GFP | 21.3 (541) | 20 (508) | 25 (11) | 300 |
| PF300712 [9] | 30 (1.9) | 0.75 (0.56) | 1 | 230 | 240 | 8.5 | 8.5 | 1¼in GFP | 24.8 (630) | 21 (533) | 29 (13) | 300 |
| PF301012 [4,9] | 30 (1.9) | 1.00 (0.75) | 1 | 230 | 240 | 10.4 | 10.4 | 1¼in GFP | 27.0 (686) | 22 (559) | 32 (15) | 100 |
| PF301512 [4,5] | 30 (1.9) | 1.50 (1.12) | 1 | 230 | 240 | 12.6 | 12.6 | 1¼in GFP | 32.8 (833) | 24 (610) | 40 (18) | 100 |
| PF302012 [5,6,7] | 30 (1.9) | 2.00 (1.49) | 1 | 230 | 240 | 11.0 | 11.0 | 1¼in SS | 35.5 (902) | 26 (660) | 44 (20) | 100 |
| PF303012 [5,6,7,8] | 30 (1.9) | 3.00 (2.23) | 1 | 230 | 240 | 16.8 | 16.8 | 1¼in SS | 44.5 (1130) | 33 (838) | 54 (24) | 100 |
| PF305012 [5,6,7,8] | 30 (1.9) | 5.00 (3.73) | 1 | 230 | 240 | 25.6 | 25.8 | 1¼in SS | 66.5 (1689) | 53 (1346) | 82 (37) | 100 |
| PF500511 [9] | 50 (3.2) | 0.50 (0.37) | 1 | 115 | 120 | 12.1 | 12.1 | 2in SS | 20.3 (516) | 24 (610) | 27 (12) | 300 |
| PF500512 [9] | 50 (3.2) | 0.50 (0.37) | 1 | 230 | 240 | 6.2 | 6.2 | 2in SS | 20.3 (516) | 24 (610) | 27 (12) | 300 |
| PF500712 [9] | 50 (3.2) | 0.75 (0.56) | 1 | 230 | 240 | 8.5 | 8.5 | 2in SS | 23.7 (602) | 25 (635) | 31 (14) | 300 |
| PF501012 [9] | 50 (3.2) | 1.00 (0.75) | 1 | 230 | 240 | 10.1 | 10.1 | 2in SS | 27.0 (686) | 26 (660) | 35 (16) | 100 |
| PF501512 [4] | 50 (3.2) | 1.50 (1.12) | 1 | 230 | 240 | 12.5 | 12.6 | 2in SS | 32.5 (826) | 30 (762) | 41 (19) | 100 |
| PF503012 [4,5,7,8] | 50 (3.2) | 3.00 (2.23) | 1 | 230 | 240 | 17.7 | 17.7 | 2in SS | 52.0 (1321) | 37 (940) | 55 (25) | 100 |
| PF505012 [5,6,7,8] | 50 (3.2) | 5.00 (3.73) | 1 | 230 | 240 | 26.2 | 26.4 | 2in SS | 77.0 (1956) | 55 (1397) | 64 (29) | 100 |
| PF751012 [9] | 75 (4.7) | 1.00 (0.75) | 1 | 230 | 240 | 9.9 | 10.0 | 2in SS | 27.0 (686) | 27 (686) | 34 (15) | 100 |
| PF751512 | 75 (4.7) | 1.50 (1.12) | 1 | 230 | 240 | 12.1 | 12.3 | 2in SS | 33.4 (848) | 30 (762) | 44 (20) | 100 |

*1. GFP = glass-filled polypropylene; SS = stainless steel. The 1 1/4in NPT GFP discharge is 2 7/8in octagonal across flats; the 1 1/4in NPT SS discharge is 2 1/8in octagonal across flats; and the 2in NPT SS discharge is 2 7/8in hexagonal across flats. Discharge is NPT threaded receptacle-style port, US nominal size, to accommodate Orenco discharge hose and valve assemblies. Consult your Orenco distributor about fittings to connect hose and valve assemblies to metric-sized piping.*

*2. Minimum liquid level is for single pumps when installed in an Orenco Biotube Pump Vault or Universal Flow Inducer. In other applications, minimum liquid level should be top of pump. Consult Orenco for more information.*

*3. Weight includes carton and 10ft (3m) cord.*

*4. High-pressure discharge assembly required.*

*5. Do not use cam-lock option (Q) on discharge assembly.*

*6. Custom discharge assembly required for these pumps. Contact Orenco.*

*7. Capacitor pack (sold separately or installed in a custom control panel) required for this pump. Contact Orenco.*

*8. Torque locks are available for all pumps, and they are supplied with 3hp and 5hp pumps.*

*9. ClickTight™ compatible.*

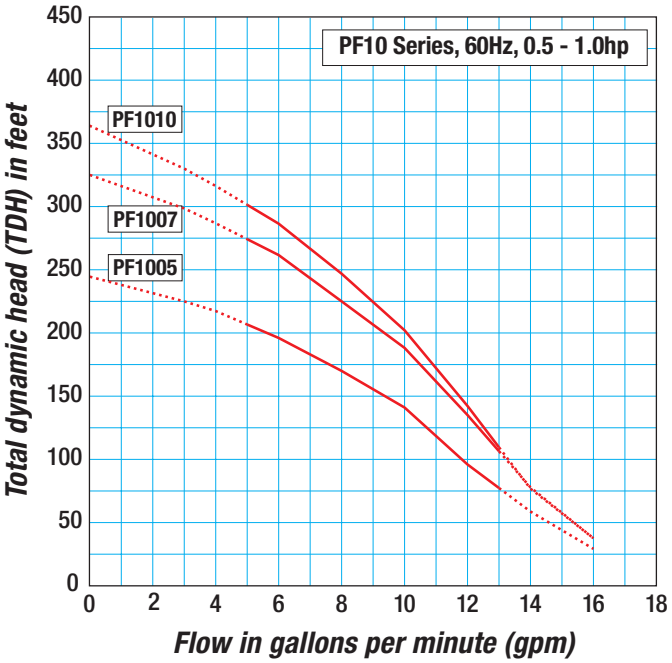
## Materials of Construction

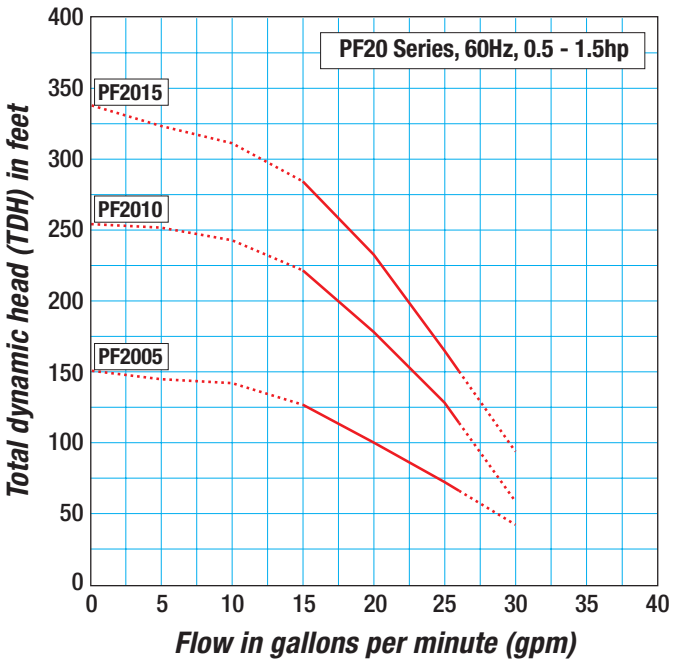
| | |
|---|---|
| Discharge | Glass-filled polypropylene or stainless steel |
| Discharge bearing | Engineered thermoplastic (PEEK) |
| Diffusers | Glass-filled PPO (SABIC's NORYL™ GFN3 resin) |
| Impellers | Celanese's Celcon® acetal copolymer on 10, 20, and 30gpm models; 50gpm impellers are NORYL GFN3 resin |
| Intake screen | Polypropylene |
| Suction connection | Stainless steel |
| Drive shaft | 7/16in hexagonal stainless steel, 300 series |
| Coupling | Sintered stainless steel, 300 series |
| Shell | Stainless steel, 300 series |
| Motor | Franklin Electric motor filled with deionized water and propylene glycol for constant lubrication. Stainless steel shell. |

## Using a Pump Curve

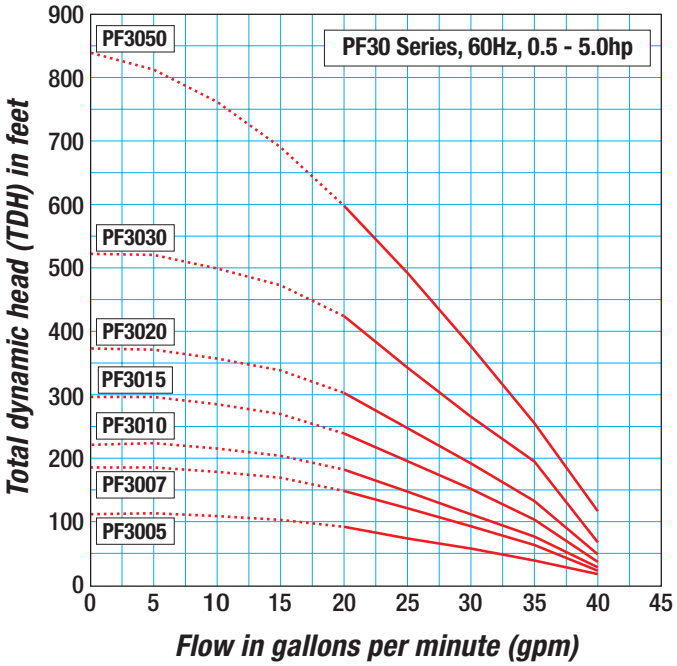
A pump curve helps you determine the best pump for your system. Pump curves show the relationship between flow (gpm or L/sec) and pressure (total dynamic head or TDH), providing a graphical representation of a pump's optimal performance range. Pumps perform best at their nominal flow rate – the value, measured in gpm, expressed by the first two numerals in an Orenco pump nomenclature. These graphs use solid lines to show the optimal pump operation range. Dashed lines indicate flow rates outside of the optimal range for each pump. For the most accurate pump specifications, use Orenco's PumpSelect™ software.

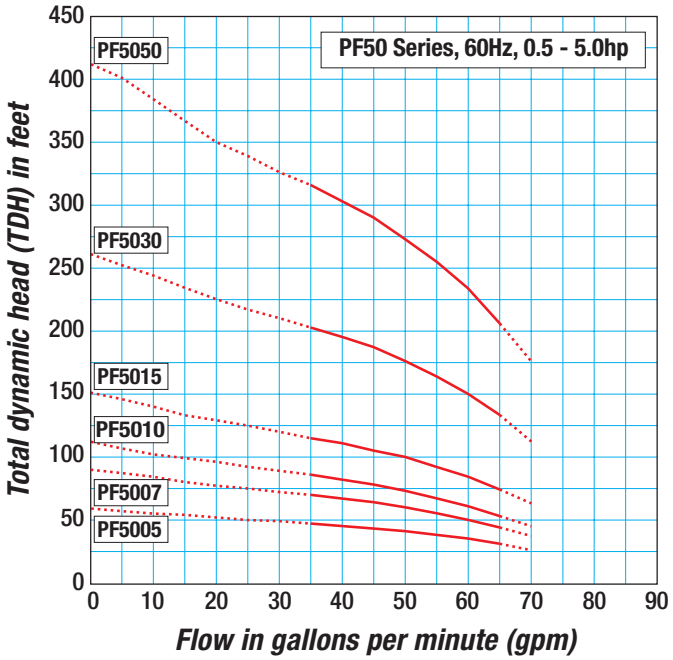
## Pump Curves

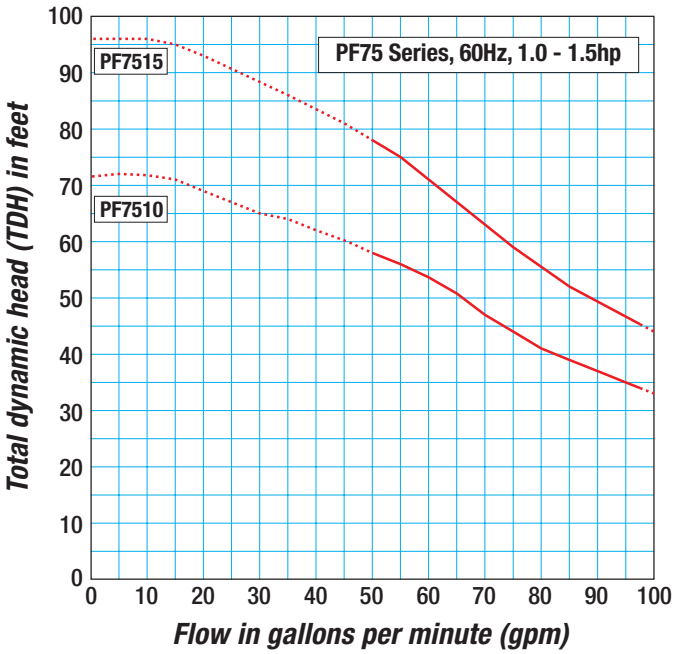


## Pump Curves, cont.



# << QUOTE >>

ALBERTA WILBERT SALES LTD.
16910-129 AVENUE
EDMONTON, AB T5V 1L1
(780) 447 - 2222
(780) 447 - 1984



**QUOTE DATE** 2023-12-13
**QUOTE NO** 15485

**SOLD TO**
CASH
CASH SALE

**SHIP TO**
CASH SALE

**TOTAL DUE** 11,437.37

| SLS1 | SLS2 | DUE DATE | DISC DUE DATE | ORDER NO | ORDER DATE | SHIP DATE | SHIP NO |
|---|---|---|---|---|---|---|---|
| | | 2024-01-30 | 2023-12-13 | 00192902 | 2023-12-13 | | |

| TERMS DESCRIPTION | CUSTOMER PO NO | SHIP VIA |
|---|---|---|
| n/30 EOM | PME | |

| ITEM ID | TX CL | UNITS | ORDERED | SHIPPED | UNIT PRICE | EXTENSION |
|---|---|---|---|---|---|---|
| 19755 | 0 | EA. | 1.0000 | 0.0000 | 2,325.2400 | 2,325.24 |
| Orenco PF100511-20 Pump 10gpm 1/2Hp<br>Orenco Effluent Pump 10gpm, 1/2Hp, 115V, 60Hz, 1-Phase, 20' Cord | | | | | | |
| PUMP | 0 | EA | 1.0000 | 0.0000 | 2,725.5000 | 2,725.50 |
| Orenco PF100711-20 Pump 10gpm 1/2Hp<br>Orenco Effluent Pump 10gpm, 3/4Hp, 115V, 60Hz, 1-Phase, 20' Cord | | | | | | |
| 19800RMWB-A | 0 | EA | 1.0000 | 0.0000 | 5,841.9900 | 5,841.99 |
| ProStep Package A<br>ProSTEP Pump Package c/w Hanging Discharge, ClickTight MVP Panel, ClickTight Floats, 10GPM Pump (PF1005), Biotube Pump Vault, etc. | | | | | | |

**GST SALES TAX**
544.64

| TAXABLE | NONTAXABLE | FREIGHT | SALES TAX | FUEL SURCHARGE | TOTAL |
|---|---|---|---|---|---|
| 10,892.73 | 0.00 | 0.00 | 544.64 | 0.00 | 11,437.37 |

**TOTAL DUE** 11,437.37

Kim Schurtz

From: Kory Read <KoryR@wilbert.ca>
Sent: December 13, 2023 12:21 PM
To: Ashwin Kumar Kamalesh
Cc: Kim Schurtz
Subject: RE: Huxley Wastewater Study - Pump Quotes
Attachments: QUOTE - PUMPS - PME - 00192902.Pdf



Hi Ashwin,

Attached you will find a quote for these pumps. I also included the kit, which these pumps are part of. It includes filter, housing, pump, fittings, panel, floats.

Please let me know if you have any questions.

Take care and happy holidays,

Kory Read
Commercial Sales & Marketing
Alberta Wilbert Sales Ltd.
Cell: 587.926.1655
Office: 780.447.2222
Direct Line: 780.732.4302
Web: www.wilbert.ca

From: Ashwin Kumar Kamalesh <akamalesh@mpe.ca>
Sent: December 13, 2023 12:04 PM
To: Kory Read <KoryR@wilbert.ca>
Cc: Kim Schurtz <kschurtz@mpe.ca>
Subject: [EXTERNAL] Huxley Wastewater Study - Pump Quotes

Hi Kory,

I just left you a voicemail asking for a quote for low pressure pumps. I got your contact information from Saadia from the MPE Edmonton office.

We are looking for a quote for PF1005/PF1007 pumps (attached). This is for a low-pressure system that has a 2” and 3” HDPE sewer lines. Please feel free to call me to discuss.

Thanks,

*Ashwin Kumar Kamalesh, M.Sc., E.I.T.*
Environmental Systems Engineer-in-Training
Tel. (403) 219-6308
Cel. (403) 714-4474
Email. akamalesh@mpe.ca
www.mpe.ca

# APPENDIX D

## Cost Estimates

a division of Englobe

**Hamlet of Huxley - Wastewater Study**

## CLASS 4 COST ESTIMATE

March 18, 2024

| | DESCRIPTION | QUANTITY | UNIT | UNIT PRICE | COST |
|---|---|---|---|---|---|
| | | | | | |
| **1** | Mobilization/Demobilization | 1 | L.S. | $ 214,074 | $ 214,074 |
| **2** | Care of Water | 1 | L.S. | $ 30,000 | $ 30,000 |
| **3** | Erosion and Sediment Control | 1 | L.S. | $ 25,000 | $ 25,000 |
| **4** | Traffic Control, Vehicle Access and Parking | 1 | L.S. | $ 40,000 | $ 40,000 |
| **5** | Decommission Existing Low Pressure Sanitary Collection System | 1 | L.S. | $ 50,000 | $ 50,000 |
| **6** | Truck Haul Sewage from Existing Septic Tanks | 1 | L.S. | $ 50,000 | $ 50,000 |
| **7** | 75 mm PVC Sanitary Main | 2200 | m | $ 500 | $ 1,100,000 |
| **8** | Type 5A Manholes | 56 | V.M. | $ 2,800 | $ 156,800 |
| **9** | Road Excavation and Restoration | 5676 | m² | $ 65 | $ 368,940 |
| **10** | Landscape Restoration | 400 | m² | $ 40 | $ 16,000 |
| **11** | 100 mm Sanitary Service Connection (Provisional) | 41 | L.S. | $ 7,000 | $ 287,000 |
| **12** | Rock Excavation and Drilling (Provisional) | 200 | m | $ 85 | $ 17,000 |
| | | | | | |
| Subtotal | | | | | $ 2,354,814 |
| Contingency (40%) | | | | | $ 941,900 |
| Engineering (15%) | | | | | $ 494,500 |
| | | | | | |
| **TOTAL** | | | | | **$ 3,790,000** |

*Note: Does not include GST*