WATER STREET
ENGINEERING

Sanitary Sewer Master Plan

Village of Harrison Hot Springs

4 Dec 2025

Document Information

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EGBC permit number 1000830.

Revision History

Version	Status	Date	Description of Revisions	Author
0	Final	4 Dec 2025	Final document	AC / NW

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EXECUTIVE SUMMARY

Water Street Engineering Ltd. (Water Street) was retained by the Village of Harrison Hot Springs (Village) to provide engineering services for the development of the Village's Sanitary Sewer Master Plan. The objectives of the plan are to:

- Identify existing and future capacity deficiencies in the sanitary sewer system
- Develop a plan of upgrades to address deficiencies

There are two key studies that previously provided system wide master planning for the sanitary sewer utility: 2016 Village of Harrison Hot Springs Liquid Waste Management Plan (CTQ Consultants Ltd, Dec 2016) and 2003 Sanitary Sewer Modelling to Address System Deficiencies (Dayton & Knight Ltd., Jan 2003). Since the 2016 study, key upgrades include upgrading of Lift Station 1 (LS1; 2025), and LS3 (2019).

The sewer collection infrastructure is broken into nine catchments and includes the following elements:

- About 12 km of gravity sewers
- Sewage lift stations (six owned by the Village and other private lift stations owned by the Harrison Holiday Park (HHP), 520 Hot Springs Rd, Harrison RV Country Club, Springs RV Resort, and Rainbows End RV Park)
- Seven pressurized forcemains (LS1 has a dual forcemain)
- One siphon that crosses the Miami River

Water Street utilized the Village-wide Official Community Plan (OCP) to develop a population and base sanitary flow (BSF) loading assessment and forecast for the Village. Existing BSF loads were developed using source flow, population, and meter data. Future BSF loads were calculated using an OCP growth estimate. For detailed information on demand development, refer to the Population, Base Sanitary Flows, and Base Water Demands Memorandum (Water Street Engineering, 2025a).

Inflow and Infiltration (I&I) is divided into two components: groundwater infiltration (GWI) and rainfall dependant inflow and infiltration (RDII). The contribution of these two components to the sanitary sewer system were calibrated using available flow monitoring data including data collected by SFE Global and summarized in the Flow Monitoring Data Analysis Memorandum (Water Street Engineering, 2025b). The results from the monitoring analysis indicate that RDII rates are relatively high compared to other municipalities in the Lower Mainland. Reducing I&I was found to be critical to reduce capacity deficiencies throughout the sanitary sewer network and several high priority areas for I&I reduction targeting were identified.

Three loading conditions were developed for evaluating the performance of the sanitary network:

- **Dry weather flows**: Dry weather flows include a BSF and GWI derived from existing demand and flow monitoring data. BSFs are applied with diurnal patterns to simulate typical daily flows.
- **Wet weather flows – Observed**: Observed wet weather flows represent RDII rates that were derived from flow monitoring data collected in 2025 and extended to a 5-year, 24-hour storm that is adjusted for a 2050 moderate emissions climate change scenario. Existing BSFs and GWI are also included in the wet weather flow simulations.
- **Wet weather flows – OCP**: OCP loading includes BSFs that were adjusted for changes to population and assumes that BSF and GWI flows from HHSR are reduced. This loading also assumes that there is a Village-wide RDII reduction program.

Two initial sanitary networks were evaluated for each of the three loading conditions:

- The **Existing System** reflects conditions during the summer of 2025, after completion of the LS1 upgrades.
- The **Buildout System** reflects conditions after completion of the currently design upgrades that are planned for 2026.

The background review, load development, and sanitary system modelling revealed the following deficiencies after the completion of planned projects:

- RDII in the Village's sanitary system is relatively high compared to other municipalities within the Lower Mainland with similar infrastructure ages.
- Inflows from the RV parks and HHSR are undocumented.
- FM3, FM5, and FM6 will experience high velocities.
- LS3 has insufficient capacity for peak wet weather flow (PWWF) conditions.
- Gravity sewers in select locations along the main sewer trunk and near the waterfront area on Lillooet Ave and Cedar Ave have insufficient capacity for PWWF conditions.
- The Miami River Siphon has sufficient capacity for PWWF conditions. However, back-ups in the inlet chamber have been noted as occurring in the past.

Following the modelling and deficiency analysis, 26 projects were identified and include the following project types:

- Inflow and infiltration monitoring and reduction programs
- Projects to address existing capacity deficiencies
- Projects to address forecast capacity deficiencies due to growth
- System maintenance and assessment projects

From the initial 26 projects, three lift station upgrades are already planned for construction, and three projects are not recommended. Three improvement projects were classified as "High" along the trunk line to address these limitations. The replacement of the sewer along Cedar Ave (Project 4) is required to convey flow from almost the entire Village network and is close to an area with recurring sewer connection back-ups. The other two projects along this line include improvements to FM3 (Project 5) and the gravity sewer along Hot Springs Rd from 318 Hot Springs Rd (MH113) to Cedar Ave (MH40) (Project 6). The monitoring project for HHSR (Project 7) is also assessed as "High" priority because it is an area that is known to have large contribution to inflows to LS1 and the WWTP.

"Medium" priority projects included I&I investigations and reduction programs to limit design flows and prevent the need for expensive sewer replacements throughout the network. Sewers that were identified as having capacity limitations after an assumed reduction to I&I are also classified as "Medium" priority projects.

Other "Medium" priority projects include the Miami River Siphon Inlet Chamber improvements, preparing an emergency response plan, and past recommendations from the 2016 LWMP for improving the documentation and maintenance of sanitary infrastructure.

"Low" priority projects include forcemain replacements that have relatively high velocities, gravity sewer improvements that address capacity limitations when both pumps are active in LS3, and the replacement of the Miami River Siphon.

The upgraded system was modelled to reflect conditions after implementing "Very High", "High", and "Medium" priority projects, as well as Project 18. Critical deficiencies including sewer capacity and manhole surcharging are addressed with the implementation of these projects.

High-level cost estimates were prepared for each recommended project. The total costs of projects summarized by priority is as follows:

- Planned projects (3 projects): $980,000
- "High" priority projects (4 project): $1,205,000
- "Medium" priority projects (11 project): $2,195,000
- "Low" priority projects (5 project): $2,176,000
- "Conditional" priority projects (1 project): TBD

1 INTRODUCTION

1.1 PURPOSE

Water Street Engineering Ltd. (Water Street) was retained by the Village of Harrison Hot Springs (Village) to provide engineering services for the development of the Village's Sanitary Sewer Master Plan. The objectives of the plan are to:

- Identify existing and future capacity deficiencies in the sanitary sewer system
- Develop a plan of upgrades to address deficiencies

1.2 SCOPE

The scope of work for the Sanitary Sewer Master Plan included:

- Review of the existing system and background reports
- Field investigations including lift station pump testing and flow monitoring from Jan – Jun 2025.
- Review of lift station logs from 2023-2024, review of lift station SCADA data from Apr – Jun 2025.
- Development of an updated hydraulic model of the sanitary sewer system (in SewerCAD).
- Development of existing and future sanitary flows
- Evaluation of existing inflow and infiltration
- Development of a master plan to address sewer system capacity constraints.

1.3 PREVIOUS WORK

There are two key studies that previously provided system wide master planning for the sanitary sewer utility:

2016 Village of Harrison Hot Springs Liquid Waste Management Plan (CTQ Consultants Ltd, Dec 2016): The 2016 Liquid Waste Management Plan (LWMP) included both sanitary and storm systems. The sanitary sewer component of the plan was based on a design population of 4447 ca, 300 L/ca/day, and an inflow filtration rate of 0.17 L/s/ha (15,000 L/day/ha) to develop a peak design flow of 89.8 L/s (at Lift Station 1 (LS1)). The master plan recommended three capital projects (McCombs Dr sewer, Miami River Drive sewer, and replacement of the Miami River Siphon (with LS7)). The study also recommended further flow monitoring and an inventory survey. The study did note that inflow and infiltration may be higher (hence the need for flow monitoring).

2003 Sanitary Sewer Modelling to Address System Deficiencies (Dayton & Knight Ltd., Jan 2003): The 2003 study was based on an existing population of 1341 ca with growth to a population of 4420 by 2014. The 2003 planning identified a peak flow at LS1 of 71.1 L/s using the above population at an average flow of 330 L/ca/day, and an I&I allowance of 0.1 L/s (8640 L/ha/day). The study recommended replacement of LS3 (completed), the LS3 forcemain (not complete) and sewer upgrades in the LS3 direct catchment (McCombs Drive trunk sewer manhole (MH) 14 to MH26), and the siphon direct catchment (segments between LS3 and the Siphon), LS1 direct catchment (segments between the siphon and LS1).

Since the 2016 study, key upgrades include upgrading of LS1 (2025), and LS3 (2019).

1.4 LIMITATIONS

The project scope does not include evaluation of the Village's Wastewater Treatment Plant (WWTP).

The following data limitations affect the accuracy of the model and calculated results:

- Potential inaccuracies and/or missing information from the GIS shapefiles and record drawings provided to update the model. Specifically, this includes pipe materials and age of install for many sewers, missing pump information for LS 4, 5, and 6),

- Limited flow monitoring data (data was collected at two manholes from Feb to Jun 2025, SCADA data for LS1 and LS3 from Apr to Jun 2025, and lift station logbook data).
- Limitations on forecasting of expected / design sanitary sewer loads
- Inherent uncertainty in OCP forecasts (i.e. dwelling unit counts and population loading forecasts for residential and industrial, commercial, and industrial (ICI) lots)

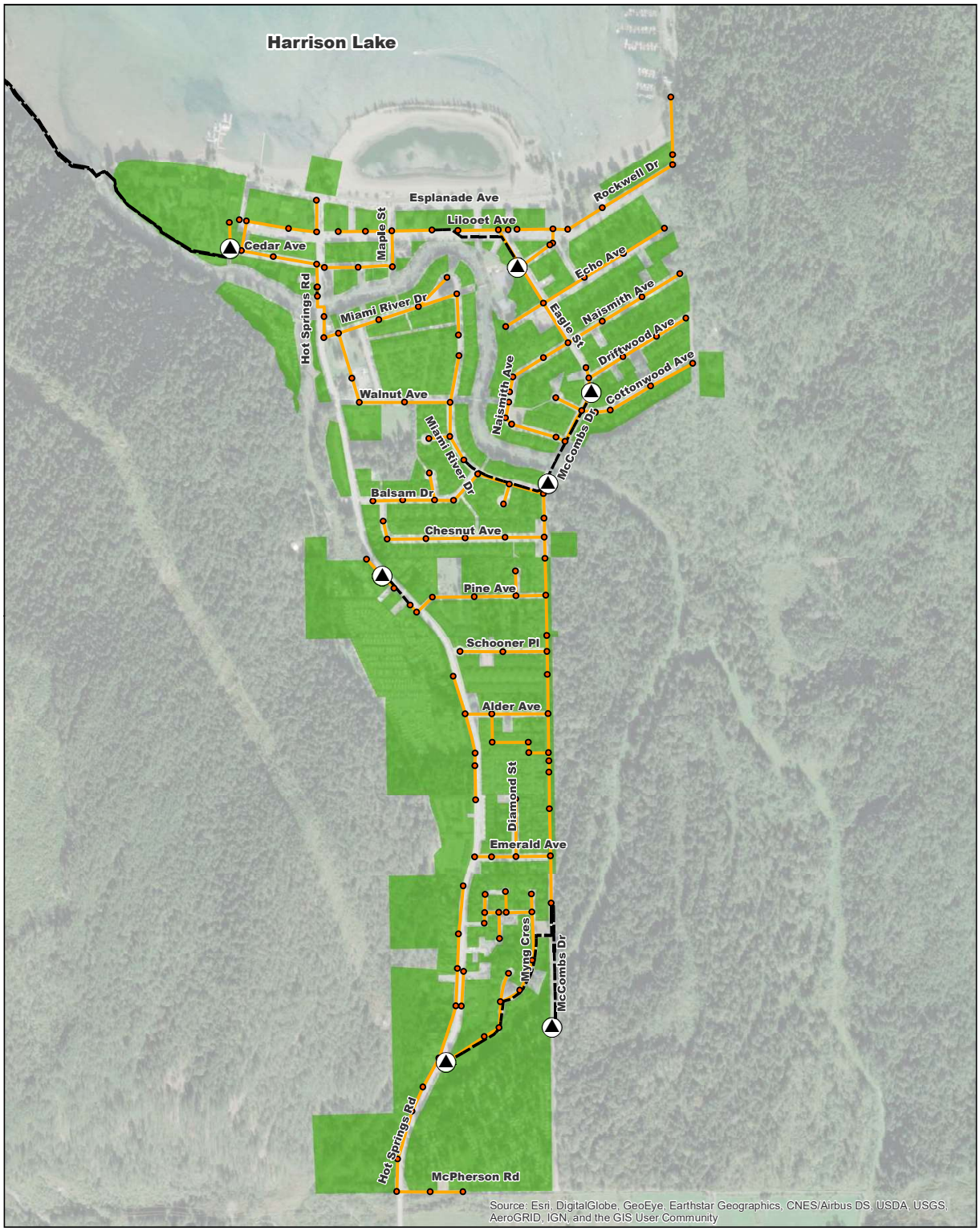
1.5 ACKNOWLEDGEMENTS

The project development, leadership, and review of interim deliverables was accomplished with the assistance of the following individuals.

- Village of Harrison Hot Springs:
  - Director of Operations
  - CWWP; Utilities Supervisor
- SFE Global (flow monitoring program)
  - Nicole Moen
  - Sam Cumyn
- Wedler Engineering (information on recent upgrades, system background):
  - Jonathan Funk, PEng; Principal

In addition to the authors, the Water Street Engineering team included: Laura Christensen, PEng; David Marshall, PEng; Connor Dickson, EIT; Jade Sangha, EIT; and Mackenzie Cameron, EIT.

We acknowledge ClimateData.ca for providing the climate information used. ClimateData.ca was created through a collaboration between the Pacific Climate Impacts Consortium (PCIC), Ouranos Inc., the Prairie Climate Centre (PCC), Environment and Climate Change Canada (ECCC), Centre de Recherche Informatique de Montréal (CRIM), and Habitat7.



Legend

- Forcemains
- Sanitary Sewer
- Serviced Lots
- Lift Stations
- Saniatry Manholes

N

0 150 300 450 m

1:10,000

WATER STREET ENGINEERING

EGBC Permit to Practice #1000830

Sanitary Sewer Master Plan

PREPARED FOR

Village of Harrison Hot Springs

PROJECT NO. 456.3

DATE 04 DEC 2025

REVISION 0

Sanitary Sewer Infrastructure Overview

Figure 1-1

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2 SYSTEM BACKGROUND

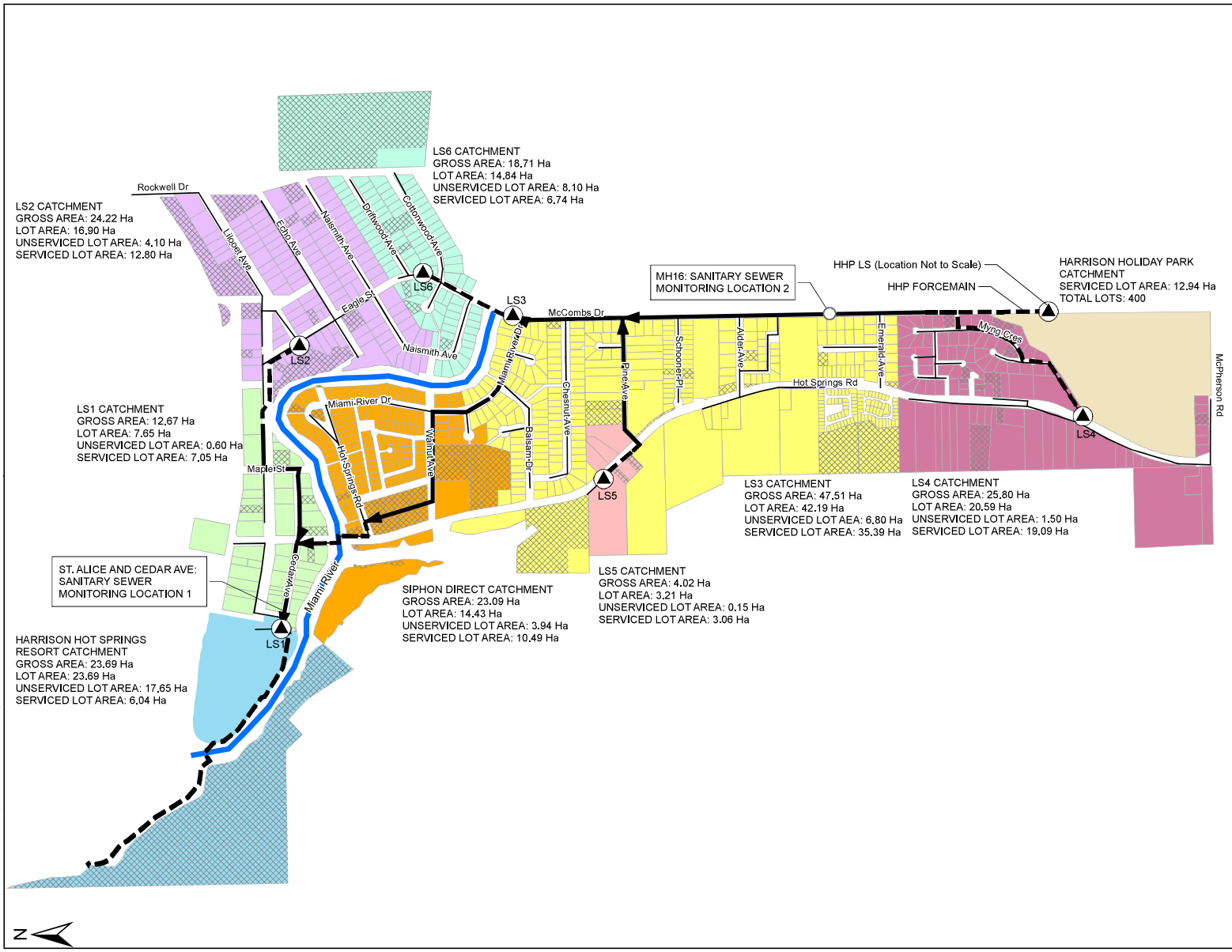
2.1 EXISTING INFRASTRUCTURE

The Village's existing sanitary sewer system is shown on Figure 2-1 (key plan) and Figure 2-2 (schematic). The sewer collection infrastructure includes the following elements:

- About 12 km of gravity sewers
- Sewage lift stations (six owned by the Village and other private lift stations owned by the Harrison Holiday Park (HHP), 520 Hot Springs Rd, Harrison RV Country Club, Springs RV Resort, and Rainbows End RV Park)
- Seven pressurized forcemains (LS1 has a dual forcemain)
- One siphon that crosses the Miami River

The sanitary sewer service area is broken into nine catchments. Each catchment contains gravity sewers flowing to a sewage lift station (LS) that pumps the collected flows. The LS pressurized forcemains typically pump to a downstream catchment where the pumped flows then flow by gravity to the next LS.

The last (and largest) LS is LS1 which pumps all the collected sewage to the WWTP via two 200 mm parallel forcemains. This station was upgraded in 2024-2025.



WATER STREET ENGINEERING

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Legend

- LIFT STATIONS
- SEWERMAIN / TRUNK SEWER
- FORCEMAIN / SIPHON
- Miami River

SANITARY CATCHMENTS

- NOT CONNECTED
- HARRISON HOT SPRINGS RESORT
- LS1 DIRECT
- LS2
- LS3 DIRECT
- LS4
- LS5
- LS6
- SIPHON DIRECT
- HARRISON HOLIDAY PARK
- LOTS NOT CURRENTLY CONNECTED TO SANITARY SYSTEM

0 150 300 450 m

1:10,000

PREPARED FOR

VILLAGE OF HARRISON HOT SPRINGS

SANITARY MASTER PLAN

KEY PLAN

PROJECT NO.	DATE	REVISION
456	04 DEC 2025	0

Figure 2-1

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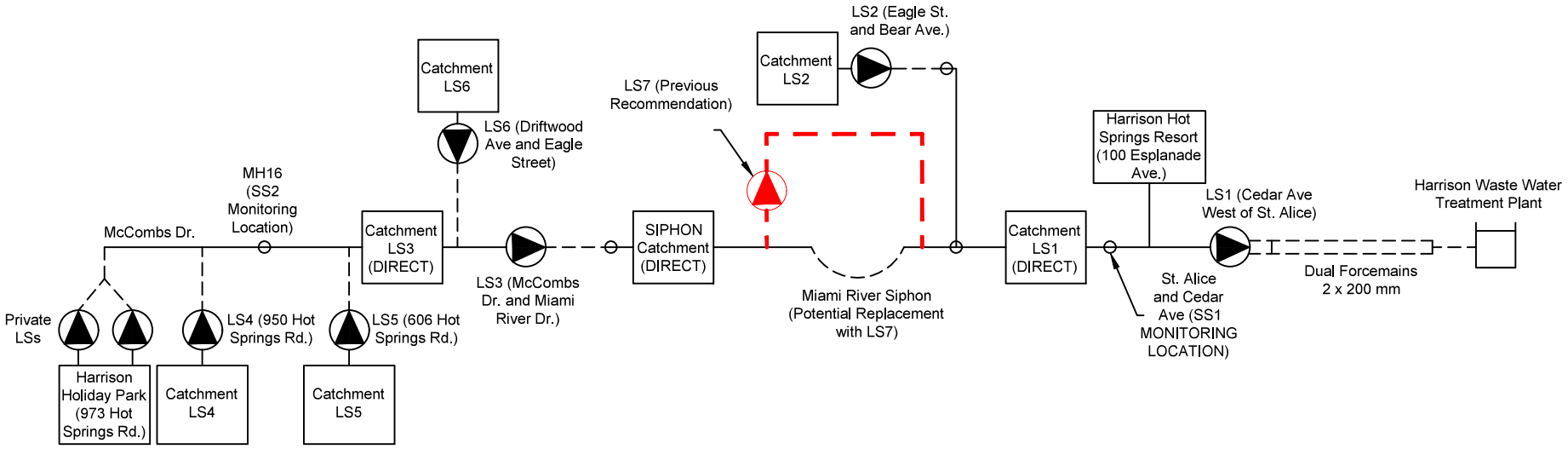

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WATER STREET ENGINEERING

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PREPARED FOR

HARRISON HOT SPRINGS
Naturally Refreshed

PROJECT NO.
456

DATE
20 Nov 2025

REVISION
0

Village of Harrison Hot Springs
Sanitary Sewer Master Plan

Existing System Schematic

Figure 2-2

2.2 EXISTING LOADS

Sanitary loading is unique and increases significantly during the summer months due to seasonal residents and tourists. However, winter is typically when the largest rainfall occurs and would produce the peak design flow condition (high rainfall derived inflow and infiltration (RDII)). A detailed loading analysis was completed as part of the Population, Base Sanitary Flows, and Base Water Demands Memorandum (Water Street Engineering, 2025a) provided as Appendix 1.

2.3 EXISTING DEFICIENCIES AND PAST PROJECT RECOMMENDATIONS

The 2016 LWMP identified deficiencies in the existing sanitary sewer system. The 2016 deficiencies and respective project recommendations are summarized in Table 2-1. Two additional projects were identified in the 2016 LWMP to improve the data and documentation of sanitary sewer infrastructure throughout the Village and are listed in Table 2-2.

Table 2-1: Existing Condition Deficiencies from 2016 LWMP

2016 ID	Location	Deficiency	Project	Status	WSE recommendation / project
S1	McCombs Drive	Low flow velocity and capacity	Upgrade 148 m of 300 mm sewer to 375 mm	Incomplete	23: Not recommended. Address by reducing I&I
S2	Miami River Drive	Low pipe-full flow velocity	Upgrade 88 m of 350 mm sewer to 450 mm	Incomplete	10
S3	PS-7 Siphon Replacement	Exposed pipeline in Miami River bed	Replacement of pipe and construct LS	Incomplete	14 and 17

Table 2-2: Sewer System Documentation Recommendations from 2016 LWMP

Project	Status	WSE recommendation / project
Inventory, Survey, and Infrastructure Assessment	Partially Complete	15
Flow meter installation	Incomplete	24: Not recommended. Flow monitoring completed for this study and targeted monitoring is recommended

In addition to the deficiencies described in the tables above, the 2016 LWMP identified four deficiencies where top end / dead end segments of sanitary pipe would have insufficient velocity to ensure pipe cleanout:

- Echo Avenue, from manhole S59 to S60
- Lakberg Crescent, from manhole S98 to S97
- Miami River Drive, from manhole S144 to S145
- Rockwell Drive, from manhole S148 to S149

Rather than replacing these pipes, an inspection and maintenance plan was recommended. This is included as WSE Project 16. All project recommendations from the 2016 LWMP are discussed further in Section 7 along with current recommendations.

An additional deficiency, as communicated by Village staff, is the reoccurring backup of the sewer connection into the Old Settler Pub at 200 Cedar Ave. The pub is located 250 m east (upstream) of LS1, near where discharge from the Miami River Siphon and LS2 catchment join before flowing through a gravity sewer along Cedar Ave to LS1.

2.4 SERVICE AREAS

The service areas considered are shown on Figure 2-1 and the applicable catchment areas are presented in Table 2-3.

Table 2-3: Service Area Summary

Catchment #	Gross Area (Ha)	Lot Area (Ha)	Un-serviced Lot Area (Ha)	Serviced Lot Area (Ha)
LS1 Direct	12.67	7.65	1.53	6.12
LS2	24.22	16.9	4.1	12.8
LS3 Direct	38.58	33.26	3.75	29.51
LS4	25.8	20.59	1.5	19.09
LS5	9.84	9.03	0.09	8.94
LS6	18.71	14.84	8.1	6.74
Siphon Direct	24.79	16.13	4.85	11.28
HHSR	23.69	23.69	17.65	6.04
HHP	12.95	12.94	0	12.94
Total	191.25	155.03	41.57	113.46

2.5 WASTEWATER TREATMENT PLANT

The Village's WWTP discharges to Harrison River (near the lake outlet). The Village's discharge permit is for 2,400 m^3/day (average flow of 28 L/s). The two parallel flow trains are capable of treating a total of 3,000 m^3/day however. It is also understood that space for a third treatment train exists in the current plant footprint.

Evaluation of the WWTP is outside the scope of this plan.

2.6 LIFT STATIONS

LIFT STATION #1

LS1 is located at the west end of Cedar Ave, south of the Harrison Hot Springs Resort (west of St. Alice St). LS1 was constructed in 1992 and was upgraded in 2024-5 (construction now complete). Key information for the station is summarized in Table 2-4.

LS1 conveys all flows from the Village's sanitary sewer system, all the other lift stations in the system flow into the gravity catchment (LS1 direct) for this station. LS1 flows are conveyed to the WWTP via two parallel, 910 m long, 200 mm dia PVC forcemains. The forcemains are connected and discharge to the inlet screen channel at the WWTP upstream of the equalization basin. It was noted by Village staff that there were leaks in the forcemain and there is minimal bedding below the pipe in some areas.

The wet well inlet is via a 375 mm gravity sewer (inv. el. 8.80 m). Immediately upstream the inflow splits at a MH (previous LS1, prior to 1992) with inflow from the Harrison Hot Springs Resort (200 mm dia, N. Inv el. 9.11 m) and the remainder of the flow (375 mm dia, E. Inv. el. 9.0 m).

The current LS1 pump operation (since new pump station was commissioned in Mar 2025) is as follows:

- Pumps Off at el. 8.5 m[1]
- Pump 1 On at el. 9.5 m min. speed (40.4 hz), producing 46 L/s
- Pump 1 On at el. 9.8 m, full speed (60 hz), producing 77 L/s
- Pumps 1 and 2 On at el. 10.0, both full speed, combined capacity of 103 L/s (~ 51 L/s ea pump).

The pumps have separate flow meters. The two forcemains have a cross-over valve which is normally open, so pumped flows are equally split between the two forcemains (reducing friction losses with one pump operation).

Table 2-4: LS1 Information

Component	Pre-2024	2025 Upgrade	Notes
Wet Well Cross Section(m)	2.44 x 3.05	2.261 ID	New FRP wet well inside existing conc. box culvert
Wet Well Inv. (m)	8.15	8.22	
Inlet El. (m)	8.80	No change	
Ground El. (m)	13.42	No change	
Pumping arrangement	Triplex	Duplex	
Pumps	Flygt 3152 HT Imp 434, 1750 rpm	Flygt NP3171HT Imp 454, 270 mm, 1750 rpm	
Pump Nameplate Rating	30 L/s @ 25 m TDH	58 L/s @ 25 m TDH	
Pump Motor Rating	17.5 Hp	34 Hp	
Pump Discharge Valves (mm)	150	200	
Forcemain diameter (mm)	2 x 200	No change	
Forcemain length (m)	910	No change	
Forcemain termination El. (m)	14.19	No change	Discharges to WWTP screen channel
Rated capacity	90	77	Rated capacity of 77 L/s is with 1 pump at full speed. 2 pumps full speed can output 103 L/s.

LIFT STATION #2

LS2 is located at the intersection of Bear Avenue and Eagle Street. LS2 conveys the flows from the surrounding catchment which can be seen in Figure 2-1. LS2 pumps into the LS1 catchment.

The wet well inlet is via a 300 mm gravity sewer (inv. el. 9.18 m).

LS2 was constructed in 1993 and was upgraded in 2009. The upgrades included converting the existing LS to a manhole and construction of an entire new LS2 southwest of the previous LS. Key information for the station is summarized in Table 2-5.

[1] Pump on/off elevations to be confirmed.

Table 2-5: LS2 Information

Component	2009 Upgrade	Notes
Wet Well Cross Section (m)	2.4 ID	
Wet Well Inv. (m)	7.60	
Inlet El. (m)	9.18	
Ground El. (m)	13.35	
Pumping arrangement	Duplex	
Pumps	Flygt NP-3153, MT 437	
Measured capacity	26 L/s @ 13.3 m	From model
Pump Motor Rating	12 Hp	
Pump Discharge Valves (mm)	150	
Forcemain diameter (mm)	150	
Forcemain length (m)	No change	
Forcemain termination el.	No change	

LIFT STATION #3

LS3 is located near the intersection of Miami River Dr and McCombs Dr. LS3 conveys the flows from the surrounding catchment which can be seen in Figure 2-1. LS3 pumps into the siphon catchment.

The wet well inlet is via a 300 mm gravity sewer (inv. el. 9.98 m).

LS3 was upgraded in 2019. The upgrades included building an entire new LS west of the original LS. Key information for the station is summarized in Table 2-6.

The LS3 forcemain is a 150 mm dia pipe and was only partially upgraded (first 25 m of 209 m) in 2019. This forcemain was connected to and significantly constrains the station capacity.

Table 2-6: LS3 Information

Component	2019 Upgrade	Notes
Wet Well Cross Section(m)	3.048 ID	
Wet Well Inv. (m)	8.60	
Inlet El. (m)	9.98 & 9.77	
Ground El. (m)	12.85	
Pumping arrangement	Duplex	
Pumps	Flygt NP-3153, MT 437	
Measured capacity	33 L/s @ 12.4 m TDH	From flow test
Pump Motor Rating	12 Hp	

Component	2019 Upgrade	Notes
Pump Discharge Valves (mm)	150	
Forcemain diameter (mm)	150	Material unknown
Forcemain length (m)	209	
Forcemain termination inv. el. (m)	12.03 m	

LIFT STATION #4

LS4 is located across the street from 950 Hot Springs Rd. LS4 conveys the flows from the surrounding catchment which can be seen in Figure 2-1. LS4 pumps into the LS3 catchment.

The wet well has two inlets, inlet #1 is via a 200 mm gravity sewer (inv. el. 8.78 m) and inlet #2 is via a 200 mm gravity sewer (inv. el. 10.16m).

LS4 is proposed to be upgraded, the upgrades will consist of a new wet well installed within the existing wet well. The existing pumps will continue to be used. Key information for the station is summarized in Table 2-7.

Table 2-7: LS4 Information

Component	Existing	2026 Upgrade	Notes
Wet Well Cross Section(m)	1.83 m ID	1.651 ID	
Wet Well Inv. (m)	8.56	No change	
Inlet #1 El. (m)	10.16	No change	
Inlet #2 El. (m)	8.78	No change	
Ground El. (m)	12.80	13.80	
Pumping arrangement	Duplex	No change	
Pumps	Flygt, 3101, 432 impeller	No change	
Measured Capacity or Pump Nameplate Rating	14.7 L/s @ 11.3 m TDH	No change	From observed flow at SS2 (Existing)
Pump Motor Rating	5 Hp	No change	
Pump Discharge Valves (mm)	75	No change	From model
Forcemain diameter (mm)	150	No change	
Forcemain length (m)	528	No change	
Forcemain termination El. (m)	12.17	No change	

LIFT STATION #5

LS5 is located in front of 606 Hot Springs Rd. LS5 conveys the flows from the surrounding catchment which can be seen in Figure 2-1. LS5 pumps into the LS3 direct catchment.

The wet well inlet is via three 200 mm gravity sewers (inv. el. 10.98 m, 11.10 m, and 11.98 m).

LS5 is planned to receive upgrades. The upgrades include adding a concrete riser to increase the elevation of the top of the wet well to prevent localized flooding and replacement of the existing pumps (no other changes). Key information for the station is summarized in Table 2-8.

Table 2-8: LS5 Information

Component	Existing	2026 Upgrade	Notes
Wet Well Cross Section(m)	1.83 m ID	No change	
Wet Well Inv. (m)	10.26	No change	From model
Inlet El. (m)	10.98, 11.10, 11.98	No change	From model
Ground El. (m)	14.07	No change	From model
Pumping arrangement	Single	No change	From model
Pumps	Flygt, MT440 impeller	Flygt, NP-3085, MT 462	
Measured Capacity or Pump Nameplate Rating	4.4 L/s @ 4.3 m TDH	20 L/s @ 21 m TDH	From flow test (Existing)
Pump Motor Rating	2.2 Hp	3 Hp	
Pump Discharge Valves (mm)	150	No change	From model
Forcemain diameter (mm)	75	No change	From record drawings
Forcemain length (m)	106.4	No change	From model
Forcemain termination El. (m)	11.98	No change	From model

LIFT STATION #6

LS6 is located across the street from 432 Eagle St. LS6 conveys the flows from the surrounding catchment which can be seen in Figure 2-1. LS6 pumps directly to LS3.

The wet well has two inlets, inlet #1 (inv. el. 10.57 m) and inlet #2 (inv. el. 10.59 m).

LS6 is planned for upgrades, including a new wet well installed within the existing wet well, new LS system, and a new forcemain. Key information for the station is summarized in Table 2-9.

Table 2-9: LS6 Information

Component	Existing	2026 Upgrade	Notes
Wet Well Cross Section(m)	1.83 ID	1.651 ID	
Wet Well Inv. (m)	9.82	9.82	
Inlet #1 El. (m)	10.57	No change	
Inlet #2 El. (m)	10.59	No change	
Ground El. (m)	13.05	No change	
Pumping arrangement	Duplex	No change	
Pumps	Myers, 4V150M-21	Flygt, NP-3085, MT 462	
Measured Capacity or Pump Nameplate Rating	10.5 L/s @ 3.5 m	20 L/s @ 21 m TDH	From flow test (Existing)
Pump Motor Rating	1.5 Hp	3 Hp	
Pump Discharge Valves (mm)	100	75	
Forcemain diameter (mm)	100	100 PVC	2026 Upgrade design drawings show replacement of first 11 m of FM
Forcemain length (m)	213.7	No change	
Forcemain termination El. (m)	9.98	No change	Termination at WW3

LIFT STATION HISTORICAL PERFORMANCE

Logbook data from 2021 to 2024 was evaluated and compared to historical rainfall, see Table 2-10. Note the logbook data only provides pump run hours daily, hence a pump station's capacity may be temporarily exceeded for a portion of a day even if the data indicates that average pump running time is less than 1.0 (i.e. total pump run hours < 24 for the day). Also pump malfunction / clogging could lead to erroneous conclusions. Nevertheless, the log data does provide a gauge of the relative loading on the stations.

In addition to pump run hours, the logbook data included flows from flow meter totalizers at the WWTP (effluent) and LS3 discharge.

Table 2-10: Sanitary Lift Stations Logbook Summary

#	Location	Rated Capacity (L/s)	Ave. Pumps On (from daily records)			Comments
			DW	WW	PWW	
LS1	Cedar Ave south of HHSR	77	0.31	0.63	2.76	2024/2025 Upgrade now complete (duplex station), former station was triplex station. Note pump On info is from before upgrades.
LS2	Bear Ave and Eagle St	23	0.04	0.14	0.74	2009 upgrade
LS3	McCombs and Miami River Dr	29	0.18	0.47	2.00	2019 upgrade

#	Location	Rated Capacity (L/s)	Ave. Pumps On (from daily records)			Comments
			DW	WW	PWW	
LS4	905 Hot Springs Rd	9	0.05	0.18	0.98	upgrade planned
LS5	606 Hot Springs Rd	3.2	0.02	0.35	0.84	upgrade planned
LS6	432 Eagle St	11	0.06	0.16	1.44	upgrade planned
		Flow Data		L/s		
LS3	McCombs and Miami River Dr	29	5.0	14.1	37.0	
WWTP	WWTP Effluent	28	15.9	32.9	40.5	2,400 m3/day (28 L/s) discharge permit

Note: DW = dry weather pumps on from Sep 2024 average, WW = typical wet weather pumps on from Oct 19-21,2024 (44 mm rain / 72 hr), PWW = max pumps on from Nov 14-16, 2021 (220 mm / 72 hr, peak of 110 mm on Nov 15), Data from Agassiz RCS.

Underline: design capacity of normal pump operations exceeded

The following conclusions are noted:

- The system has ample capacity during dry weather flows.
- Even with routine rainfall, the WWTP discharge permit is exceeded at times. Exceedances require the submission of a letter to Environmental compliance, and no further action has been requested to date.
- LS1, LS3 and LS6 were significantly overloaded in the Nov 2021 peak event.
- Both pumps at LS3 ran continuously during this event on Nov 16, 2021. It is understood that a sanitary sewer overflow (SSO) may have occurred during this event upstream of LS3.
- LS2, LS4 and LS5 were running near the one pump capacity during the Nov 2021 event and may have been over their rated (1-pump) capacity at times.

MIAMI RIVER SIPHON

The existing Miami River dual siphon crosses under the Miami River in the Hot Springs Rd right of way. The siphons convey all of the Village's sewer flows with the exception of the LS1 direct and LS2 catchments. The layout of the existing siphon is shown in Figure 2-3 and Figure 2-4. The details of the dual siphon are summarized in Table 2-11.

The 2003 and 2016 master plans proposed replacing the siphon with a lift station ("LS7") located near the intersection of Maimi River Dr and Hot Springs Rd and a forcemain crossing the bridge.

The 150 mm siphon conveys low flows, with higher flows being diverted to the 275 mm syphon. VHHS Operations has indicated that the screen on the inlet chamber requires frequent routine cleaning (daily work procedure).

Figure 2-3: Miami River Dual Siphon Plan (Dayton & Knight, 1977)

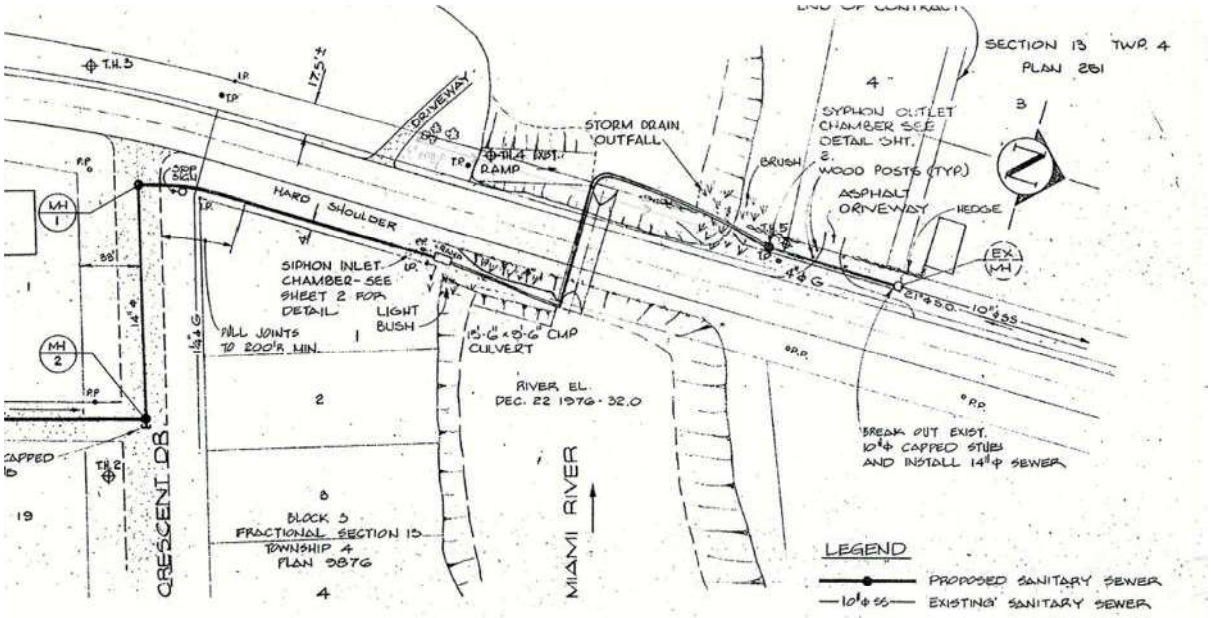


Figure 2-4: Miami River Dual Siphon Profile (Dayton & Knight, 1977)

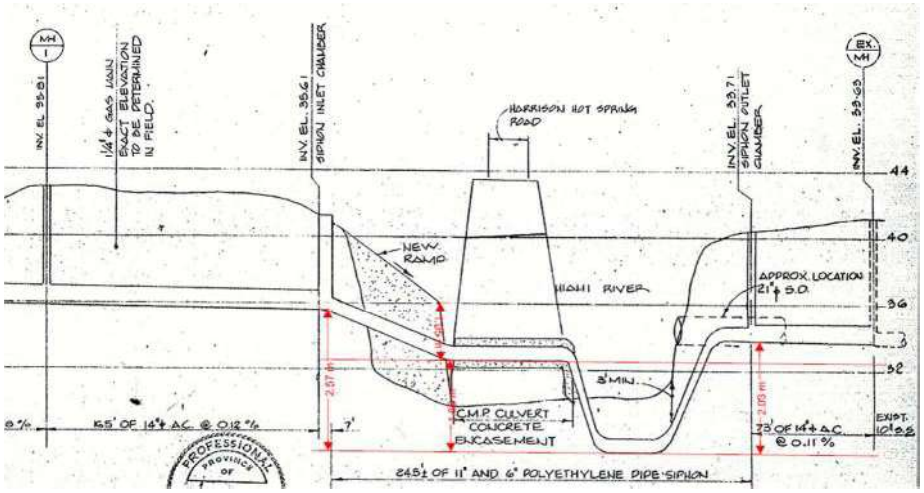


Table 2-11: Siphon / LS7 Information

Component	Existing	Notes
Siphon nominal diameters (mm)	150 275	6" HDPE 11" HDPE
Siphon length (m)	74.7	From record drawings
Inlet Chamber Cross Section (m x m)	2.13 x 1.22	Inlet has a 350 mm wide screen with overflow el of 11.28 m
Inlet Ground El. (m)	12.88	
Siphon Inlet El. (m)	10.85 10.95	6" 11"
Inlet Chamber Inv El. (m)	10.55	Settling chamber
Outlet Chamber Cross Section (m x m)	1.22 x 1.22	
Siphon Outlet Ground El. (m)	12.46	
Siphon Outlet Inv. El. (m)	10.27	Common outlet both pipes
Capacity (C=110), 6" only 11" only Combined	15 L/s 53 L/s 68 L/s	ID assumed, as not given on record drawings in calculations are approximate.

3 DESIGN CRITERIA

The design criteria used to review the system are presented in Table 3-1 and described in more detail under this section. Except where noted these are based on the Village's Subdivision and Development Servicing Bylaw (SDSB) No. 1179 (Village of Harrison Hot Springs, 2022).

3.1 SDSB DESIGN CRITERIA FOR SEWER LOADS

The SDSB includes design criteria rates for developing sanitary sewer system loads in the absence of flow monitoring data. However, these loading rates are generally conservative and would result in significantly over-designed systems if applied to an entire network. A detailed discussion of the development of sanitary load development is provided in Section 4.

3.2 SEWER LOADS FOR EVALUATION

As part of the sewer system monitoring program, the unit rates, peaking factors, and infiltration allowances in Table 3-1 were fine-tuned. These are described in more detail in Section 4 and include:

- Updating per capita (L/ca/day) loading rates
- Use of diurnal pattern to assign peaking factor per dry-weather flow monitoring
- Use of observed rainfall to assign wet-weather RDII for calibration
- Use of a design storm to forecast design wet-weather RDII

3.3 SEWER SIZING ROUGHNESS

The following roughness values are prescribed by the SDSB:

- For gravity sewers: Manning's n = 0.013 for concrete and 0.011 for PVC
- For pressure forcemains: Hazen Williams C=120 for all pipe

3.4 FLOW VELOCITIES

The following minimum design velocities are prescribed by the SDSB:

- Gravity sewers = 0.60 m/s
- Forcemains = 0.75 m/s

A maximum velocity of 4 m/s in forcemains is prescribed by the SDSB. A more limiting velocity of 2 m/s is recommended for the design of forcemains to limit headloss during normal pump operations and improve the efficiency of pump.

3.5 MINIMUM SEWER SIZES

The following minimum pipe diameters are prescribed by the SDSB:

- Residential gravity sewers: 200 mm except for dead-ends with slope of >1%, 150 mm
- Commercial gravity sewers: 250 mm except for dead-ends with slope of >0.6%, 200 mm
- Service connections: 100 mm
- Sewage forcemains: 100 mm
- Gravity sewers must be designed so that the sewer flow does not exceed d/D = 0.67 for pipes 250 mm or less, or d/D = 0.75 for pipes greater than 250 mm.

Table 3-1: Design Criteria

Component	Attribute	Min / Max / Design Value	Value	Unit	Source	Notes
Gravity Sewer	d/D	Max	0.67	n/a	VHHS	250 mm or less (equates to 80% q/Q)
Gravity Sewer	d/D	Max	0.75	n/a	VHHS	> 250 mm dia (equates to approx. 90% q/Q)
Forcemain	Diameter	Min	100	mm	VHHS & MMCD	
Gravity Sewer	Diameter	Min	200	mm	VHHS	Residential (general), 150 mm allowed for uppermost section where extension not possible, separate requirements for ICI
Pump Stations	Elevation	Min	14.55	m geo	VHHS	Min flood elevation for control panels, kiosk, and generators
Gravity Sewer	Grade / Slope	Min	0.6	%	MMCD	Only applies to upstream section of gravity sewers servicing less than 25 PE (12 DU)
Forcemain	Hazen Williams C	Design Value	120	n/a	MMCD	Except where calibration shows a different value
Forcemain	Velocity	Min	0.75	m/s	VHHS & MMCD	Minimum velocity when pump station operating with 1 pump on, full speed (i.e. once per day)
Forcemain	Velocity	Max	2	m/s	Water Street	Normal pump operations
Forcemain	Headloss Gradient	Design Value	1%		Water Street	Headloss gradient of 1 m / 100 m of length equates to 1.5 m/s for 200 mm pipe
Forcemain	Velocity	Max	4	m/s	VHHS	All pumps on
Gravity Sewer	Velocity	Min	0.6	m/s	VHHS & MMCD	Apply to new pipes only, should attain this velocity with PDWF
Gravity Sewer	Infiltration Allowance	Design Value	11,200	L/ha/day	MMCD	New pipe, not used presented for reference only (see Section 4)
Gravity Sewer	Infiltration Allowance	Design Value	22,500	L/ha/day	MMCD	Old pipes (> 25 years) and/or below groundwater table, not used presented for reference only (see Section 4)
Gravity Sewer	Infiltration Allowance	Design Value	5,184	L/ha/day	VHHS	Above groundwater table, not used presented for reference only (see Section 4)
Gravity Sewer	Infiltration Allowance	Design Value	14,688	L/ha/day	VHHS	Old pipes (pre-1980) and/or below groundwater table, not used presented for reference only (see Section 4)

Sources
MMCD: (MMCD, 2022)
VHHS: (Village of Harrison Hot Springs, 2022)

3.6 DESIGN STORM AND SEASONALITY

The nearest climate station to the Village with sufficient rainfall records to develop design storms is in Agassiz, 6 km to the south. Three quarters of precipitation in the region comes as rainfall in the winter between October and April. Summer storms are notably smaller and were not considered for the sanitary network analysis, despite higher seasonal populations. The sanitary network was evaluated using a 5-yr, 24-hr rainfall event to characterize RDII loading. As developed from Agassiz historical data, the 24-hr rainfall intensity is 3.8 mm/hr, and the yr-2050 moderate emission climate change design is 5.5 mm/hr (PCIC, 2025).

4 LOAD DEVELOPMENT

4.1 BASE SANITARY FLOWS

Water Street utilized the Village-wide Official Community Plan (OCP) to develop a population and base sanitary flow (BSF) loading assessment and forecast for the Village. Existing BSF loads were developed using source flow, population, and meter data. Future BSF loads were calculated using an OCP growth estimate. For detailed information on demand development, refer to the Population, Base Sanitary Flows, and Base Water Demands Memorandum (Water Street Engineering, 2025a) provided as Appendix 1.

The resulting BSF loads used for the master plan are shown in Table 4-1. This considers an existing and OCP serviced residential population of 1,834 ca and 2,551 ca, respectively. From calibration of the flow monitoring, as described in Section 4.2, the BSF rate was set to 160 L/PE/day for metered and 190 L/PE/day for unmetered (BSF/BD ratio of 80%). Additional BSF loads of 0.55 L/s and 4.17 L/s were applied at HHP and HHSR, respectively.

Table 4-1: Existing and future BSF summary

Use	Demand (m^3/day)	
	Existing	OCP
Winter BSF Load (BSF-W)		
ICI[1]	267	480
Residential	396	470
HHSR[2]	410	157
Total BSF-W	1,073	1,107

Notes:
1. OCP ICI includes HHP, Springs RV, and Harrison RV Country Club at full occupancy (as opposed to winter occupancy observed from flow monitoring)
2. Significant reduction in HHSR flows is included in the forecast. Note HHSR enters the system at LS1 (recommendations for the system upstream of LS1 are not dependant on this reduction.

4.2 INFLOW AND INFILTRATION

Inflow and Infiltration (I&I) is divided into two components: groundwater infiltration (GWI) and rainfall dependant inflow and infiltration (RDII). The contribution of these two components to the sanitary sewer system were calibrated using available flow monitoring data. The results from the monitoring analysis indicate that RDII rates are relatively high compared to other municipalities in the Lower Mainland. A further analysis of typical I&I rates based on pipe materials and age was completed to assess the potential I&I that is reasonably achievable for the Village's sanitary network.

FLOW MONITORING

Flow monitoring was completed by SFE Global (SFE), and the data includes flow monitoring at two gravity manholes (sites SS1 and SS2) as well as data from a rain gauge installed as part of the program. Data was gathered from 23 Jan to 17 Jun 2025 (note SS2 data period was slightly shorter). Data was also available from the Village's SCADA system for LS1 and LS3. Based on the layout of the flow monitors, the system was divided into four catchments:

- SS2: including the LS4 catchment, HHP and a portion of the gravity sewers feeding LS3.
- LS3 – SS2: including all flows into LS3 less observed flow at SS2, including LS5 and LS6 catchments and direct gravity connections.

- SS1 – LS3: including all flows into SS1 (the manhole at Cedar and St. Alice) less the LS3 flows including Lift Station 2 and local direct gravity connections.

- HHSR: including all flows out of LS1 less the flow measured at SS1 (the manhole at Cedar and St. Alice), the only connection for this catchment is the HHSR.

For detailed information on the flow monitoring data collected by SFE, refer to the Flow Monitoring Data Analysis Memorandum (Water Street Engineering, 2025b) provided as Appendix 2

Based on calibration, a global GWI rate of 2,000 L/ha/day was applied to serviced lot areas. An additional GWI of 7.3 L/s was added for the HHSR due to very high minimum night flow at LS1 and not present at SS1 site. The observed RDII rates derived from flow monitoring data are presented in Table 4-2.

Table 4-2: Observed RDII rates (from flow monitoring)

Catchment	SS2	SS1	Units
Rated 5-yr Storm RDII Rate, based on gross catchment area, existing conditions	77,500	63,400	L/ha/day
Rated 5-yr Storm RDII, Existing conditions	63,000	48,000	L/ha/day
Observed RDII	31	78	L/s

TYPICAL I&I VALUES

There is a significant range in I&I observed within Metro Vancouver (MV), as reported in the 2021-2022 MV Integrated Liquid Waste and Resource Management Plan (Metro Vancouver, 2023). I&I design (5-yr 24-hr) rates within catchments in Lower Mainland municipalities were recorded as follows in this report[2]:

- City of Maple Ridge: 5,000 to 155,000 L/ha/day
- City of Burnaby: 10,600 to 126,000 L/ha/day (excl. combined sewer areas)
- City of Coquitlam: 8,000 to 74,000 L/ha/day
- City of Pitt Meadows: 3,000 to 11,000 L/ha/day
- City of Port Coquitlam: 4,000 to 51,000 L/ha/day
- Township of Langley: 4,000 to 39,000 L/ha/day

At a high level, the main conclusion of an overview of this report is that I&I rates vary significantly by catchment even within the same municipality.

I&I VS CATCHMENT AGE AND PIPE MATERIAL

Components affecting I&I may include:

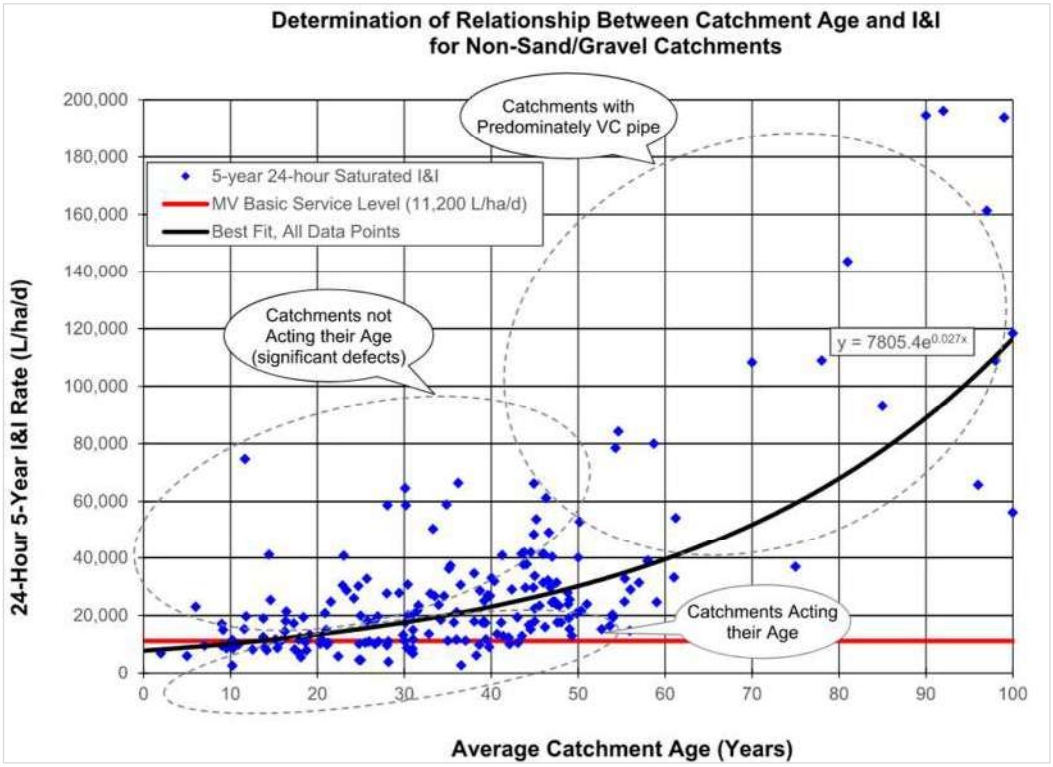
- Catchment age: Older homes may predate current standards (with roof or foundation drain connections) and pipe degradation associated with age may result in cracks or other defects.
- Pipe material: Sewers constructed from materials such as asbestos cement (AC) or vitrified clay (VC) used in older construction may be more prone to cracking with age (compared to modern pipe materials like PVC).

[2] Values are rates per gross catchment area (including serviced lots, roads, and parks etc.).

In 2022, KWL completed an I&I Management Plan Template (I&IMP) for Metro Vancouver (KWL, 2022). As part of the project, a relationship between I&I and catchment age was developed as shown in Figure 4-1.

Further analysis was completed for newer catchments (≤ 32 yrs) with primarily PVC pipe (≥ 95% PVC). No correlation with age and I&I was found, but the average 5-year, 24-hour I&I was near MV's target of 11,200 L/ha/day (at 12,688 L/ha/day). There are some outlier catchments that exhibited high I&I for their age, which is expected due to variance in construction practices.

Figure 4-1: I&I and catchment age relationship (KWL, 2022)



DESIGN I&I RATES

The Village's sanitary sewer system includes sewers from the 1970s to today. Reviewing the available record drawing information an average age of 40 years is estimated. Applying the relationships from Figure 4-1 to the Village's sanitary sewer system, it can be concluded that a rate of 22,000 L/ha/day I&I for gross area would be a reasonable assumption in the absence of significant defects in the system. This equates to an RDII rate of 27,097 L/ha/day of connected area when considering the 2,000 L/ha/day of GWI. In contrast to this, the calibrated I&I rates were 50,000 L/ha/day and 65,000 L/ha/day for catchment areas SS1 and SS2, respectively. A design existing RDII rate of 63,400 L/ha/day of serviced area was applied to the Village's system, except for SS2 catchment where a higher rate of 77,500 L/ha/day was applied.

As discussed in later sections, an RDII reduction program is recommended to reduce the current RDII rates. Without this program, peak wet weather flows will continue to cause WWTP discharges to exceed permit allowances. Accordingly, the master plan assumes a significant RDII reduction effort is successful, limiting the required hydraulic capacity improvements.

STORM SEWER DEFICIENCIES

The Storm Sewer Master Plan (Water Street Engineering, 2025c) identified the absence of any storm sewer along Hot Springs Rd north of Alder Ave. The drainage system in this area is undocumented and it is possible that storm services have been connected to the sanitary sewer contributing to high I&I. It was also noted that storm services within the Angus Estates development may connect to the existing sanitary sewer based on the limited extents of storm sewer in this area and high I&I observed in the sanitary sewer.

4.3 GROUNDWATER HGL / FLOODING POTENTIAL

As identified in the storm sewer master plan, the 2014 *Miami Creek Pump Station Hydrologic Assessment* by Northwest Hydraulic Consultants (NHC), a maximum water elevation of 12.0 m was targeted for the 200-year design event (Northwest Hydraulic Consultants Ltd., 2014) at the Miami River / Harrison Lake Dike.

Normal water levels in the Miami River at the outlet to Harrison Lake are kept between 10.9 m and 11.0 m el during freshet, and otherwise typically in the range of 9 m to 10 m el. Upstream of the lake water levels will also increase nominally. The groundwater hydraulic grade line (HGL) which impacts infiltration rates will vary seasonally with Miami River levels in this range. A significant portion of the Village's sanitary sewers (sewer inverts) are below 12.0 m el. Manhole rim elevations in some locations are also near 12.0 m although most are above 13.0 m.

To provide a high-level understanding of the location of areas most at risk to high infiltration rates sanitary manhole rim elevations and sanitary sewer inverts are mapped on Figure 4-2. This figure also highlights a number of locations without known drainage systems. Properties without drainage system are more likely to have direct cross-connections from property storm systems (roof leaders, foundation drains) to the sanitary system.

4.4 I&I REDUCTION PRIORITIES

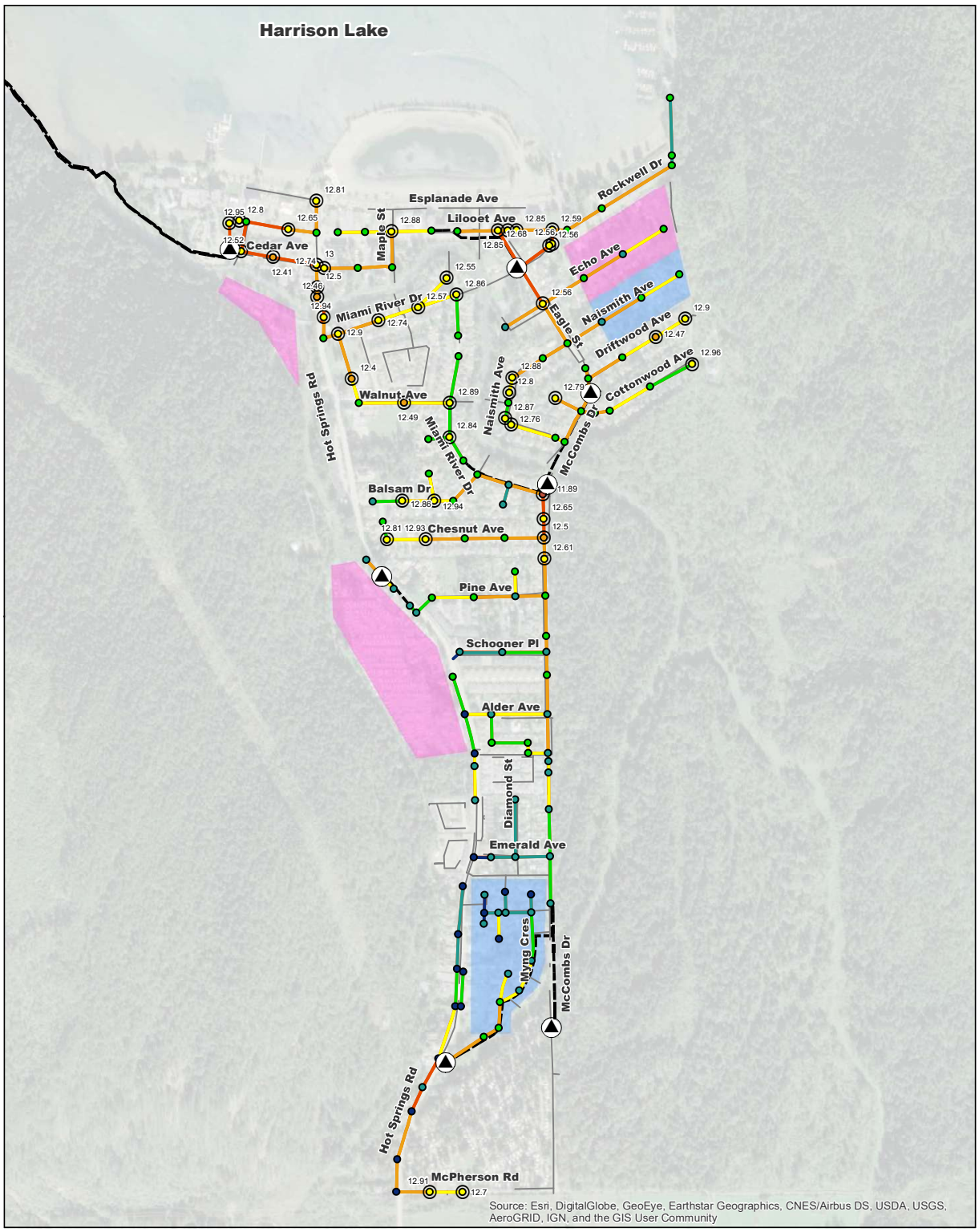
A number of high priority areas for I&I reduction targeting were identified. Areas of concern include:

1. Areas with noted high I&I from flow monitoring:
    a. Harrison Hot Springs Resort (direct measurement recommended to quantify accurately)
    b. SS2 Flow Monitoring area (upstream of MH16 including LS4 catchment, HHP catchment, and upper portion of LS3 direct catchment)
2. Areas without documented drainage systems:
    a. West side of Hot Springs Rd between Alder Ave and Miami River Dr (LS3 direct and LS5 catchments)
    b. Portions of Echo Ave and Naismith Ave east of Eagle St (LS2 catchment)
    c. HHP catchment
3. Areas with potential storm service connections to sanitary sewers
    a. Angus Estates (area bound by Hot Springs Rd to the west, Emerald Ave to the north, and Miami River to the south)
4. Areas with low MH rim elevations (in order of concern):
    a. Along McPherson Rd (LS4 catchment)
    b. Miami River Dr / Walnut Ave including siphon inlet chamber (Siphon direct catchment)
    c. Cedar Ave / Hot Springs Rd including siphon outlet chamber (LS1 direct catchment)
    d. Driftwood Ave, Naismith Ave (LS6 catchment)
    e. McCombs Dr near LS3 (LS3 direct catchment)
    f. Eagle St, Lillooet Ave (LS2 catchment)

4.5 LOADING CONDITIONS

Three loading conditions were developed for evaluating the performance of the sanitary network:

- **Dry weather flows**: Dry weather flows include a BSF and GWI derived from existing demand and flow monitoring data. BSFs are applied with diurnal patterns to simulate typical daily flows.
- **Wet weather flows – Observed**: Observed wet weather flows represent RDII rates that were derived from flow monitoring data collected in 2025 and extended to a 5-year, 24-hour storm that is adjusted for a 2050 moderate emissions climate change scenario. Existing BSFs and GWI are also included in the wet weather flow simulations.
- **Wet weather flows – OCP**: OCP loading includes BSFs that were adjusted for changes to population and assumes that BSF and GWI flows from HHSR are reduced. This loading also assumes that there is a Village-wide RDII reduction program as discussed in Section 4.2.



Legend

- Storm Sewer
- Forcemains
- No Storm System Area
- No Street Storm Sewer. Uncertain Stromr Service Connections
- MH Rim Elevation < 13.00 m
- Lift Stations

Sanitary Manhole Rim Elevations (m)

- <= 12.00
- <= 12.50
- <= 13.00
- <= 13.50
- <= 14.00
- <= 15.00

Sanitary Sewer Invert Elevations (m)

- <= 10.00
- <= 11.00
- <= 11.50
- <= 12.00
- <= 12.50
- <= 13.00

N

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Sanitary Sewer Master Plan

PREPARED FOR

Village of Harrison Hot Springs

PROJECT NO. 456.3

DATE 04 DEC 2025

REVISION 0

Sanitary Sewer Infrastructure Elevations

Figure 4-2

WATER STREET ENGINEERING

EGBC Permit to Practice #1000830

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5 HYDRAULIC ANALYSIS OF EXISTING SYSTEM

The existing system was modelled to reflect conditions during the summer of 2025, after completion of the LS1 upgrades. These scenarios include the upgrades to LS1 (2025), LS2 (2009), and LS3 (2019). Gravity sewer deficiencies were evaluated for the buildout scenario in Section 6 to account for discharge from lift stations operating without capacity limitations.

5.1 DRY WEATHER FLOWS

No lift station deficiencies related to capacity were identified for average dry weather flows.

5.2 WET WEATHER FLOWS (OBSERVED, EXISTING LEVEL OF DEVELOPMENT)

Deficiencies:

- LS1: Pump 1 at full speed is insufficient to convey the peak inflow to LS1 (87.4 L/s) and Pump 2 is required to prevent surcharging of the wet well.
- LS3: There is insufficient capacity to convey peak wet weather inflows at LS3, leading to surcharging of the wet well and the manhole to the south (MH25).
- LS6: Existing LS6 pumps have insufficient head capacity to discharge when LS3 is surcharging. The wet well in LS6, as well as manholes within the LS6 catchment, surcharge as a result.

5.3 WET WEATHER FLOWS (OCP, WITH RDII REDUCTION PROGRAM)

Deficiencies:

- LS1: Pump 1 is sufficient to discharge peak inflows when running at full speed and no deficiency was identified for this scenario.
- LS3: The pumping capacity ranges from 30 L/s with one pump running to 35 L/s when both are active. The peak inflow was 40.4 L/s, exceeding the capacity of the pump station.
- LS6: Without the surcharging of LS3, LS6 has the capacity to discharge the design wet weather flows.

6 HYDRAULIC ANALYSIS AT BUILDOUT

The buildout system was modelled to reflect conditions after completion of the currently design upgrades that are planned for 2026. These scenarios include the existing system as well as upgrades to LS4, LS5, and LS6.

6.1 DRY WEATHER FLOWS

Deficiencies:

- FM3: The velocity in FM3 is calculated to reach 1.9 m/s (at flow of 34 L/s). Although this does not exceed the velocity design criteria of 2 m/s, the relatively high velocity increases headloss downstream of LS3 and limits the pump capacity. The high velocity contributes to the capacity deficiencies identified for wet weather flows.
- FM5: After upgrading the pump in LS5, the velocity in the existing FM5 will exceed 3 m/s.
- FM6: After upgrading the pump in LS6, the velocity in the existing FM6 will exceed 2.7 m/s.

6.2 WET WEATHER FLOWS (OBSERVED, WITHOUT RDII PROGRAM)

Deficiencies:

- LS1: Pump 1 at full speed is insufficient to convey the peak inflow to LS1 (99 L/s) and Pump 2 is required to prevent surcharging of the wet well.
- LS3: There is insufficient capacity to convey peak wet weather inflows at LS3, leading to surcharging of the wet well and the manhole to the south (MH25).
- LS6: Existing LS6 pumps have insufficient head capacity to discharge when LS3 is surcharging. The wet well in LS6, as well as manholes within the LS6 catchment, surcharge as a result.

Gravity sewer deficiencies were evaluated for OCP wet weather flows with the RDII Reduction Program.

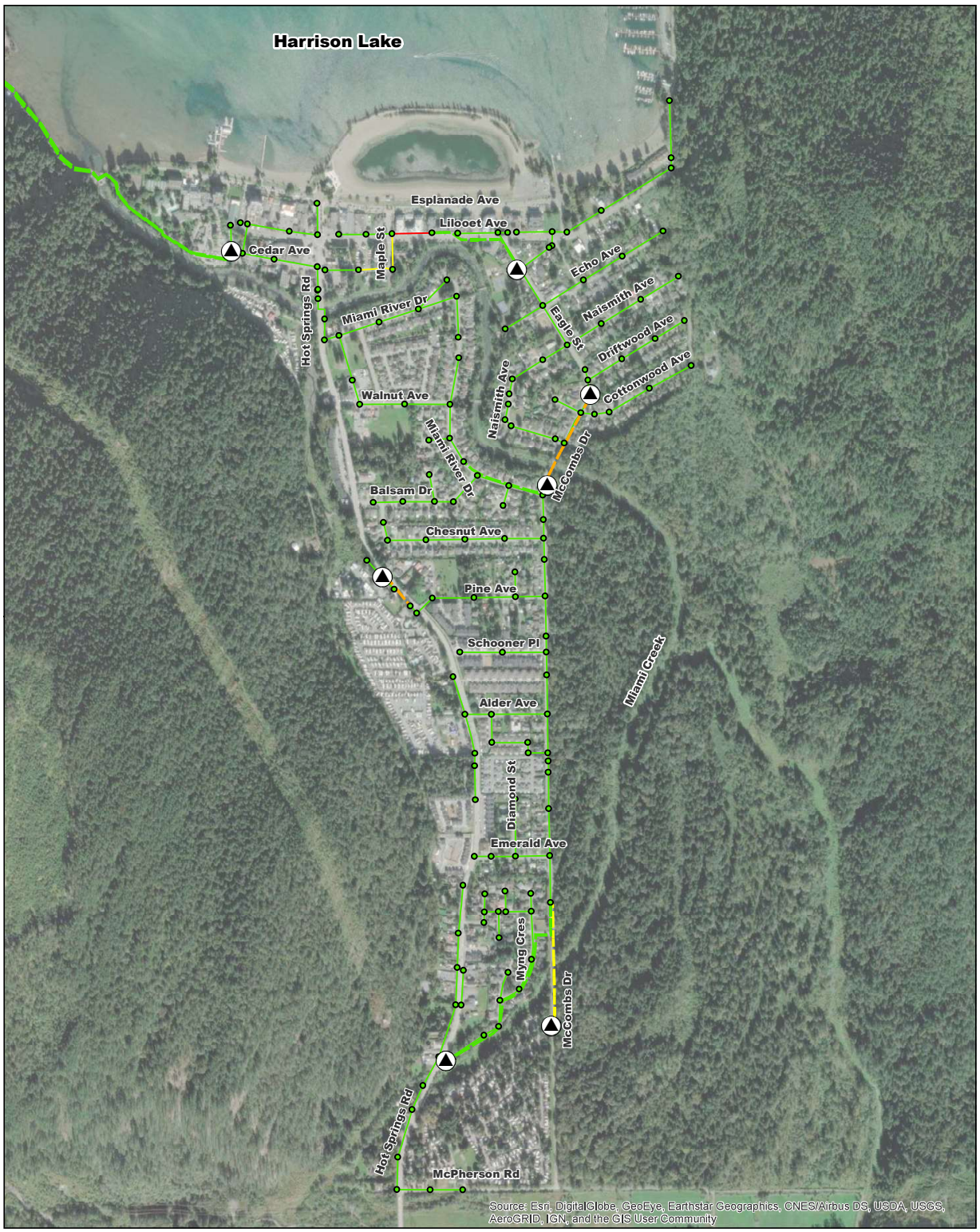
6.3 WET WEATHER FLOWS (OCP, WITH RDII REDUCTION PROGRAM)

Deficiencies:

- LS3: Pump 1 was predicted to be sufficient for this scenario and Pump 2 was never activated. However, the peak inflow exceeded 50 L/s for short durations after the upgrade at LS6. With the Pump 1 capacity ranging between 30 L/s and 35 L/s, there could be cases where Pump 2 is activated.
- LS6: Without the surcharging of LS3, LS6 has the capacity to discharge the design wet weather flows.
- Gravity sewer along Lillooet Ave, Maple St, and Cedar Ave from FM2 (360 Lillooet Ave; MH74) to Hot Springs Rd: Insufficient capacity for design flows due to small pipe diameter (200 mm).
- Gravity sewer along Hot Springs Rd from 318 Hot Springs Rd (MH113) to Cedar Ave: Insufficient capacity for design flows due to small pipe diameter (250 mm).
- Gravity sewer along Cedar Ave from Hot Springs Rd to LS1 near 114 Cedar Ave: Insufficient capacity for design flows due to small pipe diameter (250 mm).
- Gravity sewer along Miami River Dr from 407 Miami River Dr (MH29) to Walnut Ave (MH30): Insufficient capacity for design flows due to shallow pipe slope (<0.1 %) assuming FM3 improvements are completed.

Discussion:

- LS1: Pump 1 is sufficient to discharge peak inflows when running at full speed and no deficiency was identified for this scenario.
- Discharge through the Miami River Siphon is predicted to reach 37 L/s for buildout scenario and as high as 40 L/s with FM3 improvements completed and two pumps active at LS3. This is below the predicted capacity of 53 L/s through the existing siphon.



Legend

Lift Stations

Manhole Surcharging
- Well Below Crown (>0.1 m Below Crown)

Forcemain Velocity
- Within Normal Velocity Range (0.75 m/s to 2 m/s)
- Below Minimum Velocity (< 0.75 m/s)
- High Velocity (2 m/s to 4 m/s)

Pipe Surcharging
- Under Capacity (<80%)
- Near Capacity (80%-100%)
- Over Capacity (>100%)

N

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WATER STREET ENGINEERING

EGBC Permit to Practice #1000830

Sanitary Sewer Master Plan

PREPARED FOR

Village of Harrison Hot Springs

PROJECT NO. 456.3

DATE 04 DEC 2025

REVISION 0

Sanitary Sewer System Performance at Buildout with PDWF

Figure 6-1

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Legend

Lift Stations

Manhole Surcharging
- Well Below Crown (>0.1 m Below Crown)
- Near Crown (Within 0.1 m Below Crown)
- Surcharging (Above Crown)

Forcemain Velocity
- Within Normal Velocity Range (0.75 m/s to 2 m/s)
- Below Minimum Velocity (< 0.75 m/s)
- High Velocity (2 m/s to 4 m/s)

Pipe Surcharging
- Under Capacity (<80%)
- Near Capacity (80%-100%)
- Over Capacity (>100%)

N

0 150 300 450 m

1:10,000

WATER STREET ENGINEERING

EGBC Permit to Practice #1000830

Sanitary Sewer Master Plan

PREPARED FOR

Village of Harrison Hot Springs

PROJECT NO. 456.3

DATE 04 DEC 2025

REVISION 0

Sanitary Sewer System Performance at Buildout with PWWF

Figure 6-2

Document Path: D:\WSE Dropbox\001-Projects\456-Harrison Hot Springs Master Plans\430-GIS\data\Sanitary\ArcMap Working Folder\Figure 6-2 Sanitary Sewer System Performance at Buildout with PWWF.mxd

Legend

Lift Stations

Manhole Surcharging
- Well Below Crown (>0.1 m Below Crown)
- Near Crown (Within 0.1 m Below Crown)
- Surcharging (Above Crown)

Forcemain Velocity
- Within Normal Vel city Range (0.75 m/s to 2 m/s)
- Below Minimum Velocity (< 0.75 m/s)
- High Velocity (2 m/s to 4 m/s

Pipe Surcharging
- Under Capacity (<80%)
- Near Capacity (80%-100%)
- Over Capacity (>100%)

N

0 150 300 450 m

1:10,000

WATER STREET ENGINEERING

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Sanitary Sewer Master Plan

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Village of Harrison Hot Springs

PROJECT NO. 456.3

DATE 04 DEC 2025

REVISION 0

Sanitary Sewer System Performance at Buildout with PWWF with RDII Reduction Program

Figure 6-3

Document Path: D:\WSE Dropbox\001-Projects\456-Harrison Hot Springs Master Plans\430-GIS\data\Sanitary\ArcMap Working Folder\Figure 6-3 Sanitary Sewer System Performance at Buildout with PWWF with RDII Reduction Program.mxd

7 PROJECT IDENTIFICATION AND PRIORITIZATION

The proposed project list is presented in Table 7-1 with project locations shown on Figure 7-1.. The proposed projects include the following project types:

- Inflow and infiltration monitoring and reduction programs
- Projects to address existing capacity deficiencies
- Projects to address forecast capacity deficiencies due to growth
- System maintenance and assessment projects

Individual project definition sheets are included in Appendix 3.

7.1 I&I MONITORING PROGRAMS

The Harrison Hot Springs Resort and three RV parks (Harrison RV Country Club, Springs RV Resort, and HHP) have large lot areas but no documentation of discharge rates to the Villages sewer infrastructure. Monitoring programs (Projects 7 and 11 to 13) are recommended for each of these sites to characterizing loading and inform future decisions on how to reduce I&I from these sites if they are found to be significant sources.

7.2 I&I REDUCTION PROGRAMS

Flow monitoring identified that I&I is high in the Village and there are a number of undocumented sources, resulting in capacity exceedances throughout the sanitary system, including permitted WWTP discharges. Reducing I&I by implementing programs will limit the number of exceedances without having to expand capacity at critical lift stations and trunk sewers. A list of areas with high priority for I&I reduction is included in Section 4.4. I&I reduction program actions are all included within a single project (Project 8). The following recommended actions (from Metro Vancouver's I&I Management Plan Template (KWL, 2022)) are outlined actions that can be applied in I&I reduction programs:

- CCTV 100% of catchment (if not already done)
- Smoke and dye testing
- Identify and eliminate cross-connections (foundation and roof drains connected to the sanitary system)
- Use a summertime flow monitoring program to identify extent and tributary area of cross-connections
- Investigate storm drainage system improvements to mitigate inflows into the sanitary system

7.3 CAPACITY IMPROVEMENT PROJECTS

As identified in Section 6.3, the are a number of gravity sewers that have insufficient capacity to fully convey design flows without exceeding design criteria flow depths. Projects to expand the capacity of gravity sewers include the replacement of pipes with larger diameters along existing alignments (Projects 4, 6, and 9).

The capacity of LS3 is primarily limited by the forcemain diameter (150 mm) and a replacement of the forcemain is recommended (Project 5). LS3 was recently refurbished with updated pumps in 2019, and new pumps are not recommended.

The gravity sewers downstream of FM3 along Miami River Dr have low slopes and insufficient capacity assuming improvements to FM3 (Project 5) are completed. Peak discharge from FM3 is estimated to be 56 L/s with one pump in LS3 active and nearly reach 100 L/s with two pumps active. The gravity sewer immediately downstream of FM3 from 413 Miami River Dr (MH28) to 407 Miami River Dr (MH29) is insufficient for instances when two pumps at LS3 are active, while the next sewer downstream from 407 Miami River Dr (MH29) to Walnut Ave (MH30) is insufficient for when a single pump is active, due to it having the shallowest slope (<0.1%). The gravity sewer along Walnut Ave from Miami River Dr (MH30) to behind 22-349 Walnut Ave (MH32) could surcharge when two pumps are active and the sewers upstream along Miami River Dr are improved.

Project 10 involves improving the capacity of the most limiting pipe from 407 Miami River Dr (MH29) to Walnut Ave (MH30). Two separate projects are included for the neighbouring gravity sewers: Project 20 covers improvements from 413 Miami River Dr (MH28) to 407 Miami River Dr (MH29), and Project 21 covers improvements from Miami River Dr (MH30) to behind 22-349 Walnut Ave (MH32). The priority of Projects 20 and 21 are lower than Project 10 because issues are only identified for when two pumps are active. However, there could be cost savings if these projects are completed at the same time.

The Miami River Siphon is along the main sewer trunk and has been observed to surcharge during wet conditions. Modelling of the siphon indicates that it should have sufficient capacity (53 L/s) for design flows (40 L/s) and that back-ups are likely caused by capacity deficiencies downstream of the siphon along Hot Springs Rd and Cedar Ave. Project 14 includes improvements to monitoring and maintenance at the inlet chamber this will allow for better assessment of inflows to the siphon and siphon performance. Project 19 is included to address capacity of the siphon (if required). This project may also be required for asset management reasons if the existing siphons are found to be at risk due to Miami River erosion or scour. It is identified as a low priority project and may not be required if inflow and infiltration reduction projects are successful in limiting peak flows to less than the siphon capacity and the condition of the siphon is acceptable.

The capacity of LS1 and FM1 was found to be sufficient for design conditions. However, it was noted by Village staff that there were leaks in the forcemain and there is minimal bedding below the pipe in some areas. Replacement of FM1 is included in Project 16 to address concerns regarding the pipe condition. The improvements include the installation of a larger forcemain to address potential capacity limitations in the future. This project could be combined with other utilities (water, fibre, and other conduits).

7.4 SYSTEM MAINTENANCE AND ASSESSMENTS

The 2016 LWMP recommended completing an inventory, survey, and infrastructure assessment. This would include surveying most sewer pipes and manholes while recording pipe sizes and materials. It is understood that this is partially completed and further work to continue the assessment is recommended (Project 17). Within this, it is recommended to include the gravity sewer along Miami River Dr (Project 10) to confirm the pipe slope and whether the capacity would be limited.

The 2016 LWMP also recommended that the Village monitor and flush out top-end sewers with low design flows and purchase two flow meters and a portable rain gauge. These are included within the recommended projects list as Projects 18 and 26, respectively.

7.5 EMERGENCY PREPAREDNESS

During the preparation of this master plan, it was noted that there is no available emergency response plan for the storm or sanitary systems. It is recommended that an Emergency Response Plan be developed (Project 15) that considers failures within the storm or sanitary systems. These failures could be the result of natural disasters (flooding, earthquakes, landslides) or infrastructure degradation. The *Village of Harrison Hot Springs Water System Emergency Response Plan* was last updated in January 2025 and could be used as the basis for a more comprehensive Emergency Response Plan that considers the storm and sanitary systems.

7.6 PROJECT PRIORITIES

Projects are rated as either High, Medium, or Low. These designations are defined as follows:

- High: Project addresses an existing serious deficiency or system need. Typical timeline is completion within 5 years.
- Medium: Project addresses growth and/or expected end of economic service life of existing critical asset required for overall system operation. Generic timeline is completion within 5 to 10 years but subject to project specifics.
- Low: Project addresses growth and/or expected end of economic service life of minor assets or improvements to level of service. Generic timeline is completion within 10-20 years but subject to project specifics.

- Conditional: Projects may or may not be required subject to completion of additional work to verify need. No recommended timeline

The conveyance systems along the main sewer trunk line are critical to prevent surcharging at manholes and service connections throughout the entire sewer network. Capacity is limited at various locations between LS3 and LS1, and three projects were classified as "High" along the trunk line to address these limitations. The replacement of the sewer along Cedar Ave (Project 4) is assessed the top priority because it is required to convey flow from almost the entire Village network and is close to an area with recurring sewer connection back-ups. The other two projects include improvements to FM3 (Project 5) and gravity sewer improvements along Hot Springs Rd from 318 Hot Springs Rd (MH113) to Cedar Ave (MH40; Project 6). The monitoring project for HHSR (Project 7) is also assessed as "High" priority because it is an area that is known to have large contribution to inflows to LS1 and the WWTP.

"Medium" priority projects included I&I investigations and reduction programs to limit design flows and prevent the need for expensive sewer replacements throughout the network. Sewers that were identified as having capacity limitations after an assumed reduction to I&I are also classified as "Medium" priority projects.

Other "Medium" priority projects include the Miami River Siphon Inlet Chamber improvements, preparing an emergency response plan, and past recommendations from the 2016 LWMP for improving the documentation and maintenance of sanitary infrastructure.

"Low" priority projects include forcemain replacements that have relatively high velocities, gravity sewer improvements that address capacity limitations when both pumps are active in LS3, and the replacement of the Miami River Siphon.

Improving LS1 forcemain was prioritized as "Conditional". The forcemain condition is variable and was noted as aging with historical leaks by Village staff along the older PVC section (constructed in 1994). Modelling did not identify FM1 as a limit to the network capacity (subject to effectiveness of I&I reduction), but upsizing would be recommended if improvements are constructed. Priority would increase if condition warrants or I&I reduction is not successful.

Upgrading the pumps in LS3 and improving the sewer along McCombs Dr are not recommended.

7.7 PROJECT COMBINATIONS

The following projects could be combined to reduce administration and construction costs and should be reviewed together when selecting projects to complete:

- **Gravity sewer upgrades north of Miami River:** Project 4, Project 6, Project 9, water main looping project (Water Project 1) from Water Master Plan (Water Street Engineering, 2025d).
- **Capacity limitations from LS3 to Walnut Ave:** Project 5, Project 10, Project 20, Project 21

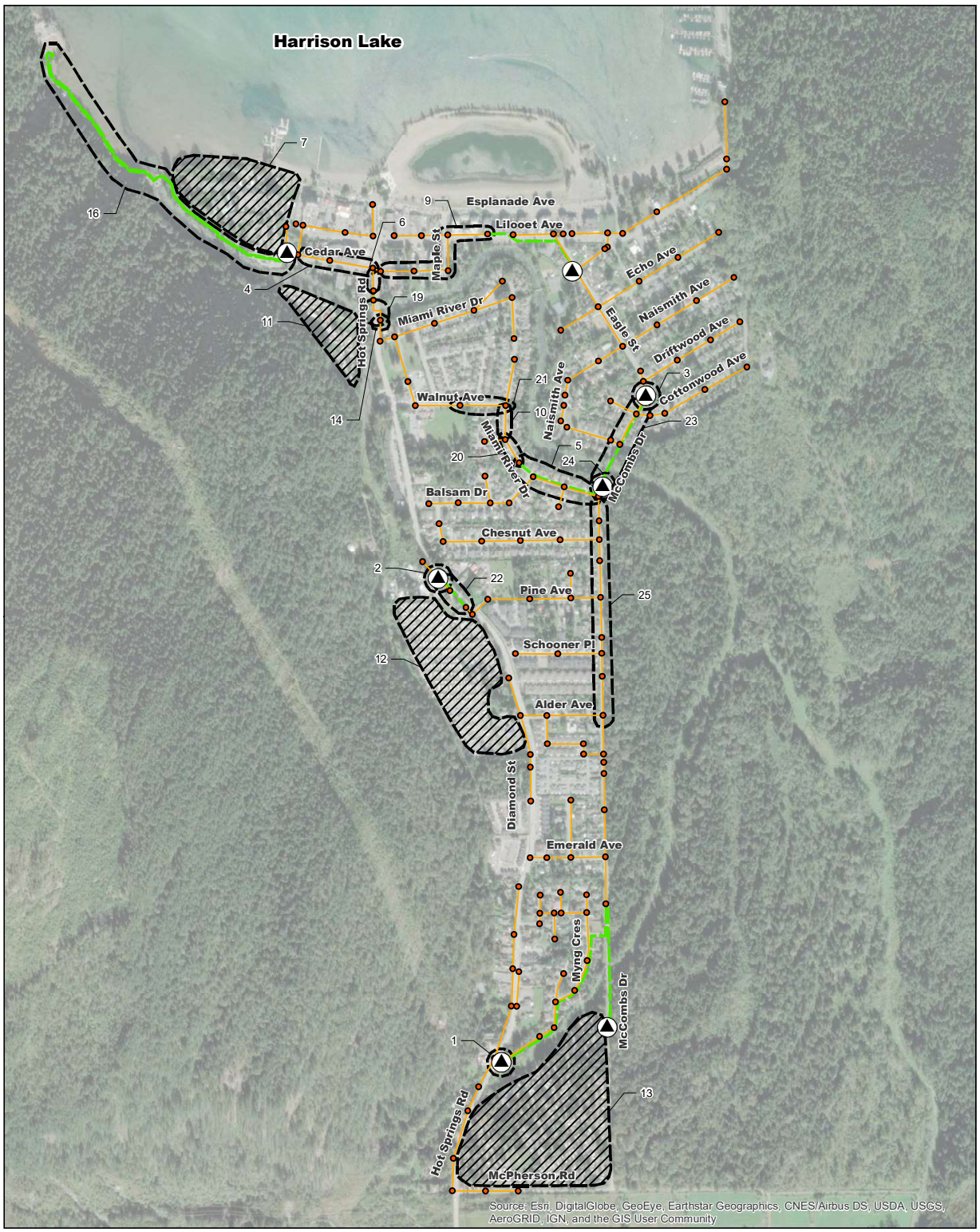
7.8 HYDRAULIC ANALYSIS WITH UPGRADES

The upgraded system was modelled to reflect conditions after implementing "High" and "Medium" priority projects, as well as Project 20. Critical deficiencies including sewer capacity and manhole surcharging are addressed with the implementation of these projects. The remaining discharge deficiencies are shown in Figure 7-2 and include high velocity in two forcemains (FM5 and FM6).

Table 7-1: Capital Project List

Project Number	Description	Deficiency	Action	Additional Notes	Primary Justification Category	DCC Eligible?	Priority
1	LS4 Improvements	New wet well to improve maintenance.	FRP wet well insert	Per existing Wedler design. Planned project.	Asset management / life cycle replacement	No	Planned
2	LS5 Improvements	Pumps at end of service life. Raise concrete wet well to avoid flooding.	Pump replacement and raise wet well	Per existing Wedler design. Planned project.	Asset management / life cycle replacement	No	Planned
3	LS6 Improvements	Pumps at end of service life. New wet well to improve maintenance.	Pump replacement and FRP wet well inset	Per existing Wedler design. Planned project.	Asset management / life cycle replacement	No	Planned
4	Cedar Ave sewer improvements	Capacity exceedance along sewers	Replace 250 mm gravity sewer with 350 mm dia, length 192 m	Risk of surcharging upstream of LS1. Can be constructed concurrently with water main looping project discussed in the Water Master Plan (Water Street Engineering, 2025d).	Address growth hydraulic deficiency	Yes	Very High
5	Forcemain 3 improvements	Capacity exceedance at LS3 and high velocity in FM3	Replace 150 mm forcemain with 250 mm dia, length 209 m	Existing FM constrains LS3 capacity. Original FM (1970s nearing end of service life). Avoids potential SSO at MH25 (upstream of LS3), as well as surcharging in LS3 and LS6, and surrounding gravity sewers. FM3 could be extended to Walnut Ave to address capacity deficienies along Miami River Dr currently noted in Projects 10, 20, and 21.	Address existing hydraulic deficiency	No	High
6	Hot Springs Rd sewer improvements	Capacity exceedance along sewers	Replace 250 mm gravity sewer with 350 mm dia, length 58 m	Risk of surcharging at Miami River Siphon.	Address growth hydraulic deficiency	Yes	High
7	Harrison Hot Springs Resort sewer flow investigation	Significant source of additional base flows and I&I that is not fully characterized	Monitor discharge from HHSR service, directly	High inflows were back calculated from available monitoring data at SS1 and LS1.	Reduce PWWF to maintain system capacity	No	High
8	System-wide I&I reduction program	Existing 5-yr I&I rates are estimated as 50,000 L/ha/day and 65,000 L/ha/day (on gross area basis) for catchment areas SS1 and SS2, respectively.	System wide program to reduced existing I&I rates to achievable levels. Target of 22,000 L/ha/day (on gross area basis) for a 5-yr storm.	Existing I&I rates observed at SS1 and SS2 during flow monitoring and from previous storms show higher than normal I&I rates. Reducing I&I rates needed to convey sanitary flows during significant storms and stay within discharge permit. Avoids significant system wide upgrades.	Reduce PWWF to maintain system capacity	No	Medium
9	Lillooet Ave, Maple St, and Cedar Ave sewer improvements	Capacity exceedance along sewers	Replace 200 mm gravity sewer with 250 mm dia, length 391 m	Risk of surcharging along waterfront properties with LS1 Catchment.	Address growth hydraulic deficiency	Yes	Medium
10	Miami River Dr sewer improvements	Capacity exceedance along sewers	Replace 350 mm gravity sewer with 450 mm dia, length 87 m	Capacity exceedance was identified due to a shallow sewer slope and increased discharge from LS3. Risk of surcharging along Miami River Dr. Capacity requirement could be reduced if FM3 is extended to Walnut Ave (ref Project 5).	Address growth hydraulic deficiency	Yes	Medium
11	Harrison RV Country Club I&I investigation	Potential source of I&I that is not characterized	Monitor discharge from 398 Hot Springs Road service	Details of runoff in Harrison RV Country Club are unknown and could result in high I&I. No known onsite storm sewer system.	Reduce PWWF to maintain system capacity	No	Medium
12	Springs RV Resort I&I investigation	Potential source of I&I that is not characterized	Monitor discharge from Springs RV Resort service (670 Hot Springs Rd)	Details of runoff in Springs RV Resort are unknown and could result in high I&I. No known onsite storm sewer system.	Reduce PWWF to maintain system capacity	No	Medium
13	Harrison Holiday Park I&I investigation	Potential source of I&I that is not characterized	Monitor discharge from HHP (973 Hot Springs Rd) at MH14 on McCombs Dr	Details of runoff in HHP are unknown and could result in high I&I. No known onsite storm sewer system. Area of higher I&I from SS2 monitoring	Reduce PWWF to maintain system capacity	No	Medium
14	Miami River Siphon Inlet Chamber Improvements	Monitoring of levels to verify siphon performance, improvements to trash rack	Instrumentation to notify of flooding, clogging of inlet trash rack.	Improve maintainability of trash rack, settling chamber. Add instrumentation for alarming.	Asset management / life cycle replacement	No	Medium
15	Emergency response plan	No existing response plan for storm or sanitary systems	Prepare updated Emergency Response Plan	Water System Emergency Response Plan was last updated in January 2025 and could be used as a basis for a plan for a more comprehensive Emergency Response Plan.	Emergency preparedness	No	Medium

Project Number	Description	Deficiency	Action	Additional Notes	Primary Justification Category	DCC Eligible?	Priority
16	LS1 Forcemain replacement	Condition of forcemain. Growth (if I&I reduction targets not met).	Replace 200 mm forcemain with 250 mm dia, length 910 m	Forcemain condition is variable and was noted as aging with historical leaks by Village staff along the older PVC section (constructed in 1994). Modelling did not identify FM1 as a limit to the network capacity (subject to effectiveness of I&I reduction), but upsizing would be recommended if improvements are constructed. Priority would increase if condition warrants or I&I reduction is not successful.	Asset management / life cycle replacement	Partial	Conditional
17	Inventory, Survey, and Infrastructure Assessment	Improve documentation of infrastructure	Perform inventory survey compatible with modern GIS and design software.	Recommendation from 2016 LWMP, partially completed. Material information is still lacking.	Asset documentation	No	Medium
18	Inspect and maintain top end / dead end segments	Low flow velocity and capacity exceedances	Periodic inspection by CCTV and flushing at regular intervals	Recommendation from 2016 LWMP, status unknown.	Monitor existing hydraulic deficiency	No	Medium
19	Miami River Siphon Replacement or 3rd pipe	Capacity hydraulically adequate but subject to flooding, undersized compared to FM3 capacity.	Replace existing siphon with 300 mm pipe. Construct new inlet chamber for siphon and extend siphons away from the Miami River.	Capacity OK but marginal. Likely would be HDD construction. Requires further study to determine if required (condition of existing siphon).	Asset management / life cycle replacement	No	Low
20	Miami River Dr sewer improvements	Capacity exceedance along sewers	Replace 350 mm gravity sewer with 450 mm dia, length 70 m	Capacity exceedance after upgrades to FM3 when two pumps active. Capacity requirement could be reduced if FM3 is extended to Walnut Ave (ref Project 5).	Address growth hydraulic deficiency	Yes	Low
21	Walnut Ave sewer improvements	Capacity exceedance along sewers	Replace 350 mm gravity sewer with 450 mm dia, length 117 m	Capacity exceedance after improvements to FM3 when two pumps active and with improvements to Miami River Dr sewer. Capacity requirement could be reduced if FM3 is extended to Walnut Ave (ref Project 5).	Address growth hydraulic deficiency	Yes	Low
22	Forcemain 5 improvements	High velocity in FM5, end of service life	Replace 75 mm forcemain with 150 mm dia, length 106 m	Existing FM is undersized, constricting flows.	Asset management / life cycle replacement	No	Low
23	Forcemain 6 improvements	High velocity in FM6, end of service life	Replace 100 mm forcemain with 150 mm dia, length 214 m	Existing FM is undersized, constricting flows. Alternate alignment to discharge toward LS2 could be considered.	Asset management / life cycle replacement	No	Low
24	Lift Station 3 improvements	Capacity exceedance at LS3	Upgrade pumps in LS3	Risk of surcharging in sanitary sewer MH25, LS3, and LS6. Secondary to FM3 improvements. Not recommended if upstream RDII can be reduced per Project 8.	Not recommended	No	n/a
25	McCombs Drive sewer improvements	Low flow velocity and capacity exceedances	Replace 300 mm forcemain with 375 mm dia, length 148 m	Recommendation from 2016 LWMP, not completed.	Not recommended	Yes	n/a
26	Flow Meter Installation	Limited flow data	Purchase of 2 non-contact area/velocity flow meters plus one portable rain gauge	Recommendation from 2016 LWMP, not completed. Flow monitoring completed as part of this study and additional monitoring recommended through other projects.	Not recommended	No	n/a



Legend

- Sanitary Sewer
- Forcemains
- Lift Stations
- Saniatry Manholes

Sanitary Project Area

- I&I Investigation Project
- Infrastructure Projects

N

0 150 300 450 m

1:10,000

WATER STREET ENGINEERING

EGBC Permit to Practice #1000830

Sanitary Sewer Master Plan

PREPARED FOR

Village of Harrison Hot Springs

PROJECT NO. 456.3

DATE 04 DEC 2025

REVISION 0

Sanitary Sewer Infrastructure Project Area

Figure 7-1

Document Path: D:\WSE Dropbox\001-Projects\456-Harrison Hot Springs Master Plans\430-GIS\data\Sanitary\ArcMap Working Folder\Figure 7-1 Sanitary Sewer System Project Areas (2).mxd

Legend

Lift Stations

Manhole Surcharging
- Well Below Crown (>0.1 m Below Crown)

Forcemain Velocity
- Within Normal Velocity Range (0.75 m/s to 2 m/s)
- Below Minimum Velocity (< 0.75 m/s)
- High Velocity (2 m/s to 4 m/s)

Pipe Surcharging
- Under Capacity (<80%)
- Near Capacity (80%-100%)
- Over Capacity (>100%)

N

0 150 300 450 m

1:10,000

WATER STREET ENGINEERING

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Future Sanitary Sewer System Performance with Upgrades

Figure 7-2

Document Path: D:\WSE Dropbox\001-Projects\456-Harrison Hot Springs Master Plans\430-GIS\data\Sanitary\ArcMap Working Folder\Figure 7-2 Future Sanitary Sewer System Performance with Upgrades.mxd

8 CAPITAL WORKS PLAN

Based on the identified deficiencies and the project prioritization outlined in above, a capital works plan has been developed. Recommended projects are listed in order of priority with associated costs in Table 8-1. Detailed projects sheets with cost breakdowns are included in Appendix 3. A non-exhaustive list of potential grant sources for each project is included on each sheet.

Except where noted otherwise, the capital costs for construction projects include an allowance of 20% for design and contract administration and 30% for construction contingency while projects without construction scopes include a 20% contingency.

The cost opinions presented are EGBC/ACEC-BC Class C estimates, based on unit rates from similar projects. They are intended for initial capital project budgeting. The expected accuracy range is between a low of -25% and a high of +40% for the given scope. Costs are to yr-2025, no escalation is included for future completion of the projects.

Table 8-1: Capital Projects

Project Number	Description	Deficiency	Priority	Capital Cost	DCC Eligible?
1	LS4 Improvements	New wet well to improve maintenance.	Planned	$530,000	No
2	LS5 Improvements	Pumps at end of service life. Raise concrete wet well to avoid flooding.	Planned	$60,000	No
3	LS6 Improvements	Pumps at end of service life. New wet well to improve maintenance.	Planned	$390,000	No
4	Cedar Ave sewer improvements	Capacity exceedance along sewers	Very High	$514,000	Yes
5	Forcemain 3 improvements	Capacity exceedance at LS3 and high velocity in FM3	High	$470,000	No
6	Hot Springs Rd sewer improvements	Capacity exceedance along sewers	High	$203,000	Yes
7	Harrison Hot Springs Resort sewer flow investigation	Significant source of additional base flows and I&I that is not fully characterized	High	$18,000	No
8	System-wide I&I reduction program	Existing 5-yr I&I rates are estimated as 50,000 L/ha/day and 65,000 L/ha/day (on gross area basis) for catchment areas SS1 and SS2, respectively.	Medium	$580,000	No
9	Lillooet Ave, Maple St, and Cedar Ave sewer improvements	Capacity exceedance along sewers	Medium	$953,000	Yes
10	Miami River Dr sewer improvements	Capacity exceedance along sewers	Medium	$274,000	Yes
11	Harrison RV Country Club I&I investigation	Potential source of I&I that is not characterized	Medium	$18,000	No
12	Springs RV Resort I&I investigation	Potential source of I&I that is not characterized	Medium	$18,000	No

Project Number	Description	Deficiency	Priority	Capital Cost	DCC Eligible?
13	Harrison Holiday Park I&I investigation	Potential source of I&I that is not characterized	Medium	$18,000	No
14	Miami River Siphon Inlet Chamber Improvements	Monitoring of levels to verify siphon performance, improvements to trash rack	Medium	240,000	No
15	Emergency response plan	No existing response plan for storm or sanitary systems	Medium	$24,000	No
16	LS1 Forcemain replacement	Condition of forcemain. Growth (if I&I reduction targets not met).	Conditional	TBD	Partial
17	Inventory, Survey, and Infrastructure Assessment	Improve documentation of infrastructure	Medium	$60,000	No
18	Inspect and maintain top end / dead end segments	Low flow velocity and capacity exceedances	Medium	$10,000	No
19	Miami River Siphon Replacement or 3rd pipe	Capacity hydraulically adequate but subject to flooding, undersized compared to FM3 capacity.	Low	$999,000	No
20	Miami River Dr sewer improvements	Capacity exceedance along sewers	Low	$227,000	Yes
21	Walnut Ave sewer improvements	Capacity exceedance along sewers	Low	$351,000	Yes
22	Forcemain 5 improvements	High velocity in FM5, end of service life	Low	$199,000	No
23	Forcemain 6 improvements	High velocity in FM6, end of service life	Low	$400,000	No

Notes:
1. Cost of siphon replacement was assumed to be similar magnitude of estimate from 2016 LWMP with additional adjusted for inflation.
2. The cost of improvements to the Miami River Siphon Inlet include an allowance for installation of level or flow meters and additional electrical components.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 SUMMARY

The background review, load development, and sanitary system modelling revealed the following deficiencies after the completion of planned projects:

- RDII in the Village's sanitary system is relatively high compared to other municipalities within the Lower Mainland with similar infrastructure ages.
- Indirect flows attributed to HHSR indicate high base flows and RDII, that should be addressed.
- Inflows from three RV parks are undocumented and a specific concern for high RDII.
- FM3, FM5, and FM6 experience high velocities.
- LS3 has insufficient capacity for PWWF conditions (limited by FM3).
- Gravity sewers in select locations along the main sewer trunk and near the waterfront area on Lillooet Ave and Cedar Ave have insufficient capacity for PWWF conditions.
- The Miami River Siphon has sufficient capacity for PWWF conditions. However, back-ups in the inlet chamber have been noted as occurring in the past.
- The capital plan is developed on the basis of reducing RDII (several capital projects include tasks to address RDII), if significant RDII reductions cannot be realized additional capacity projects would be required (beyond those recommended).

9.2 RECOMMENDATIONS

Twenty-six projects were identified based on previous reports, planned projects, and the system deficiencies. Three of the projects are not recommended. The remaining 23 projects were given a project priority and high-level capital cost estimate. The total costs of the recommended projects are summarized by project priority in Table 9-1 and project type in Table 9-2. There are four projects with "High" priority:

- Project 4: Cedar Ave sewer improvements
- Project 5: Forcemain 3 improvements
- Project 6: Hot Springs Rd sewer improvements
- Project 7: Harrison Hot Springs Resort sewer flow investigation

Table 9-1: Projects Summary by Priority

Project Priority	Number of Projects	Total Capital Costs
Planned	3	$980,000
High	4	$1,205,000
Medium	11	$2,195,000
Low	5	$2,176,000
Conditional	1	TBD
Total	23	$6,556,000

Table 9-2: Projects Summary by Type

Project Type	Number of Projects	Total Capital Costs
Forcemain improvements	4	$1,069,000 [1]
Lift station improvements	3	$980,000
Gravity sewer improvements	6	$2,522,000
I&I investigations	4	$72,000
I&I reduction	1	$580,000
Siphon improvements	2	$1,239,000
System maintenance and assessment	2	$70,000
Emergency preparedness	1	$24,000
Total	23	$6,556,000

Notes:
1. Total cost of forcemain improvements excludes LS1 forcemain

10 CLOSURE

We trust this report meets your present requirements. Please contact the undersigned with any questions or comments.

WATER STREET ENGINEERING LTD.

Andrew Clow, MASc, PEng
Water Resources Engineer

Neal Whiteside, MASc, PEng
Principal, Senior Municipal Engineer

EGBC permit number 1000830

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ABBREVIATIONS

AC – asbestos cement

BD – base demand (water)

BSF – base sanitary flow

FM – forcemain

GWI – groundwater infiltration

HGL – hydraulic grade line

HHP – Harrison Holiday Park

HHSR – Harrison Hot Springs Resort

ICI – industrial, commercial, and institutional

I&I – inflow and infiltration

LS – lift station

LWMP – Liquid Water Management Plan

MH - manhole

MV – Metro Vancouver

OCP – Official Community Plan

PDWF – peak dry weather flow

PWWF – peak wet weather flow

RDII – rainfall derived inflow and infiltration

SDSB – Subdivision and Development Servicing Bylaw

VC – vitrified clay

Village – Village of Harrison Hot Springs

WWTP – wastewater treatment plant

APPENDIX 1: POPULATION, BASE SANITARY FLOWS, AND BASE WATER DEMANDS MEMORANDUM

Bound separately

APPENDIX 2: FLOW MONITORING DATA ANALYSIS MEMORANDUM

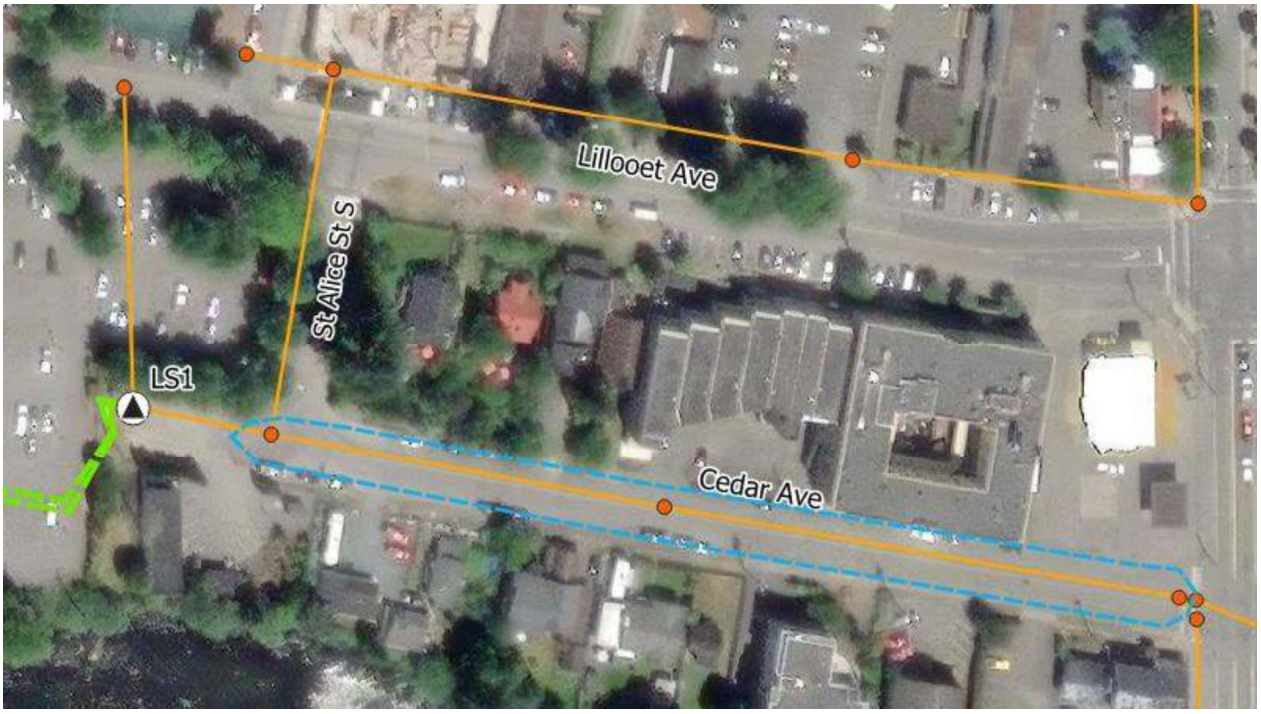
Bound separately

APPENDIX 3: PROJECT DEFINITION SHEETS

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 4
Cedar Ave sewer improvements
Priority: High

Project Description: Replace 250 mm gravity sewer along Cedar Ave with 350 mm dia. to increase capacity and reduce risk of
Deficiency: Capacity exceedance along sewers
Additional Notes: Risk of surcharging upstream of LS1. Can be constructed concurrently with water main looping project discussed in the Water Master Plan (Water Street Engineering, 2025d).

Primary Justification: Address growth hydraulic deficiency
DCC Eligible: Yes
Grant Opportunities: Canada Community Building Fund, British



Assumptions: All manholes require replacement

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	350 mm Dia. Sanitary Sewer (2.5-3m)	m	83	$ 1,550.00	$ 128,805
2	350 mm Dia. Sanitary Sewer (2.5-3m)	m	109	$ 1,550.00	$ 168,950
3	1050 mm Dia. Manhole	ea.	3	$ 14,750.00	$ 44,250

Subtotal:		**$ 342,005**
Design / Construction Management / Contingency (%)	**50%**	**$ 171,003**
Total Estimated Cost:		**$ 513,008**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 5
Forcemain 3 improvements
Priority: High

Project Description: Replace 150 mm forcemain along Miami River Dr from LS3 with 250 mm dia. to increase LS3 capacity.
Deficiency: Capacity exceedance at LS3 and high velocity in FM3
Additional Notes: Existing FM constrains LS3 capacity. Original FM (1970s nearing end of service life). Avoids potential SSO at MH25 (upstream of LS3), as well as surcharging in LS3 and LS6, and surrounding gravity sewers. FM3 could be extended to Walnut Ave to address capacity deficiencies along Miami River Dr currently noted in
Primary Justification: Address existing hydraulic deficiency
DCC Eligible: No
Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund

Assumptions: Manholes and lift station will not be replaced.

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	250 mm Dia. Forcemain	m	209	$ 1,495.00	$ 312,904
			Subtotal:		**$ 312,904**
	Design / Construction Management / Contingency (%)			**50%**	**$ 156,452**
			Total Estimated Cost:		**$ 469,355**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 6
Hot Springs Rd sewer improvements
Priority: High

Project Description: Replace 250 mm sanitary gravity sewer along Hot Springs Rd with 350 mm dia. to increase capacity and reduce risk of surcharging at the Miami River Siphon.

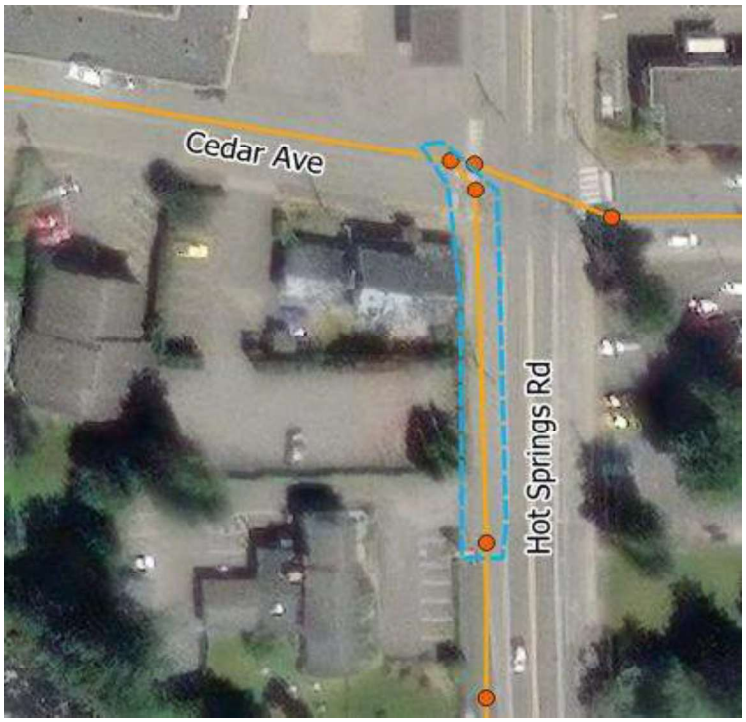
Deficiency: Capacity exceedance along sewers

Additional Notes: Risk of surcharging at Miami River Siphon.

Primary Justification: Address growth hydraulic deficiency

DCC Eligible: Yes

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund



Assumptions: All manholes require replacement

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	350 mm Dia. Sanitary Sewer (2.5-3m)	m	55	$ 1,550.00	$ 85,250
2	351 mm Dia. Sanitary Sewer (2.5-3m)	m	3.5	$ 1,550.00	$ 5,425
3	1050 mm Dia. Manhole	ea.	3	$ 14,750.00	$ 44,250
			Subtotal:		**$ 134,925**
	Design / Construction Management / Contingency (%)			**50%**	**$ 67,463**
			Total Estimated Cost:		**$ 202,388**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 7
Harrison Hot Springs Resort sewer flow investigation
Priority: High

Project Description: Directly monitor discharge from Harrison Hot Springs Resort service to fully characterize base flows and I&

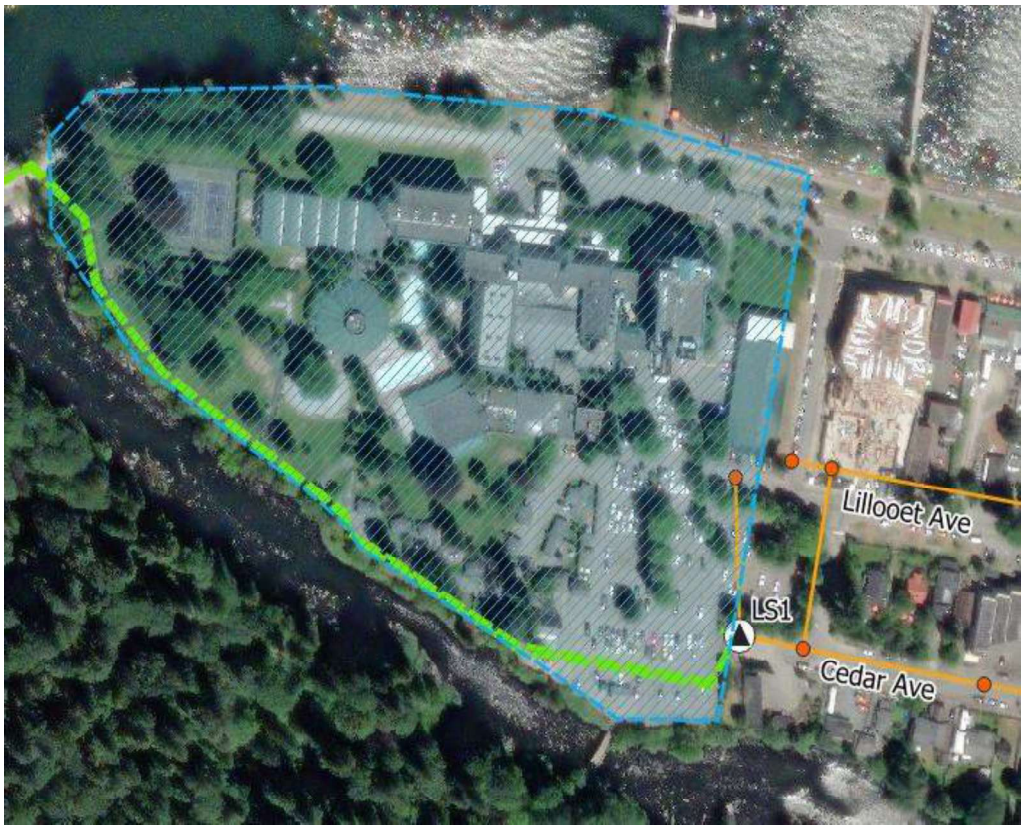
Deficiency: Significant source of additional base flows and I&I that is not fully characterized

Additional Notes: High inflows were back calculated from available monitoring data at SS1 and LS1.

Primary Justification: Reduce PWWF to maintain system capacity

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Infrastructure Planning Grant Program, Union of BC Municipalities Asset Management Planning Program



Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Sanitary flow monitoring - 6 months	-	1	$ 15,000.00	$ 15,000
			Subtotal:		**$ 15,000**
			Administration / Installation Contingency:	**20%**	**$ 3,000**
			Total Estimated Cost:		**$ 18,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 8
System-wide I&I Reduction Program
Priority: Medium

Project Description: Implement a system wide program to reduce existing I&I rates to achievable levels. Target of 22,000 L/ha/day (on gross area basis) for a 5-year storm. Recommended actions include CCTV of the entire catchment, smoke and dye testing, identifying and eliminating cross connections, using summertime flow monitoring to identify extent and tributary area of cross connections, and investigating storm drainage system improvements to mitigate inflows into the sanitary system. Costs from MV I&I Management template (Archetype E).

Deficiency: Existing 5-yr I&I rates are estimated as 50,000 L/ha/day and 65,000 L/ha/day (on gross area basis) for catchment areas SS1 and SS2, respectively.

Primary Justification: Reduce PWWF to maintain system capacity

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Targeted I&I Reduction	m	13600	$ 40.00	$ 544,000
2	Flow monitoring and analysis	-	1	$ 36,000.00	$ 36,000
			Subtotal:		**$ 580,000**
	Administration / Installation Contingency:		**incl.**		**$ -**
			Total Estimated Cost:		**$ 580,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 9
Lillooet Ave, Maple St, and Cedar Ave sewer improvements
Priority: Medium

Project Description: Replace 200 mm sanitary gravity sewer along Lillooet Ave, Maple St, and Cedar Ave with 250 mm dia. to increase capacity and reduce risk of surcharging.
Deficiency: Capacity exceedance along sewers
Additional Notes: Risk of surcharging along waterfront properties with LS1 Catchment.
Primary Justification: Address growth hydraulic deficiency
DCC Eligible: Yes
Grant Opportunities Canada Community Building Fund, British Columbia Growing Communties Fund

Assumptions: All manholes require replacement

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	250 mm Dia. Sanitary Sewer (0-2m)	m	102	$ 1,300.00	$ 132,470
2	250 mm Dia. Sanitary Sewer (2-2.5m)	m	92	$ 1,340.00	$ 123,816
3	250 mm Dia. Sanitary Sewer (2.5-3m)	m	87	$ 1,400.00	$ 121,800
4	250 mm Dia. Sanitary Sewer (2.5-3m)	m	86	$ 1,400.00	$ 120,120
5	250 mm Dia. Sanitary Sewer (2.5-3m)	m	21	$ 1,400.00	$ 29,400
6	250 mm Dia. Sanitary Sewer (2.5-3m)	m	3	$ 1,400.00	$ 4,200
7	1050 mm Dia. Manhole	ea.	7	$ 14,750.00	$ 103,250
			Subtotal:		**$ 635,056**
	Design / Construction Management / Contingency (%)			**50%**	**$ 317,528**
			Total Estimated Cost:		**$ 952,584**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 10
Miami River Dr sewer improvements
Priority: Medium

Project Description: Replace 350 mm gravity sewer along Miami River Dr with 450 mm dia. at steeper slope to increase capacity and reduce risk of surcharging. Can be combined with Project 20 and Project 21

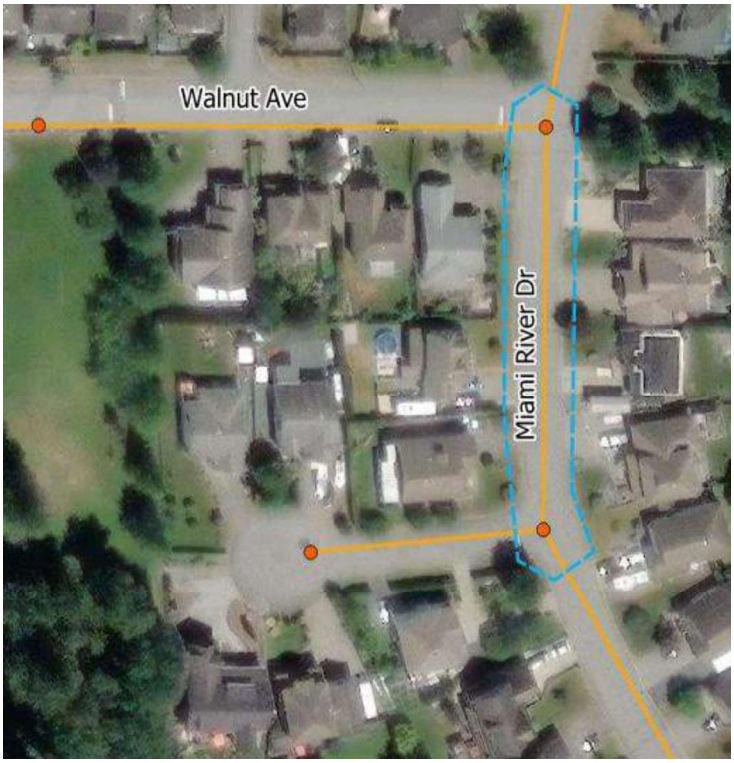
Deficiency: Capacity exceedance along sewers

Additional Notes: Capacity exceedance was identified due to a shallow sewer slope and increased discharge from LS3. Risk of surcharging along Miami River Dr. Capacity requirement could be reduced if FM3 is extended to Walnut Ave (ref Project 5).

Primary Justification: Address growth hydraulic deficiency

DCC Eligible: Yes

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund



Assumptions: All manholes require replacement.

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	450 mm Dia. Sanitary Sewer (0-2m)	m	87	$ 1,750.00	$ 152,600
2	1050 mm Dia. Manhole	ea.	2	$ 14,750.00	$ 29,500
			Subtotal:		**$ 182,100**
	Design / Construction Management / Contingency (%)			**50%**	**$ 91,050**
			Total Estimated Cost:		**$ 273,150**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 11
Harrison RV Country Club I&I investigation
Priority: Medium

Project Description: Directly monitor discharge from Harrison RV Country Club (398 Hot Springs Rd) service to fully characterize base flows and I&I.

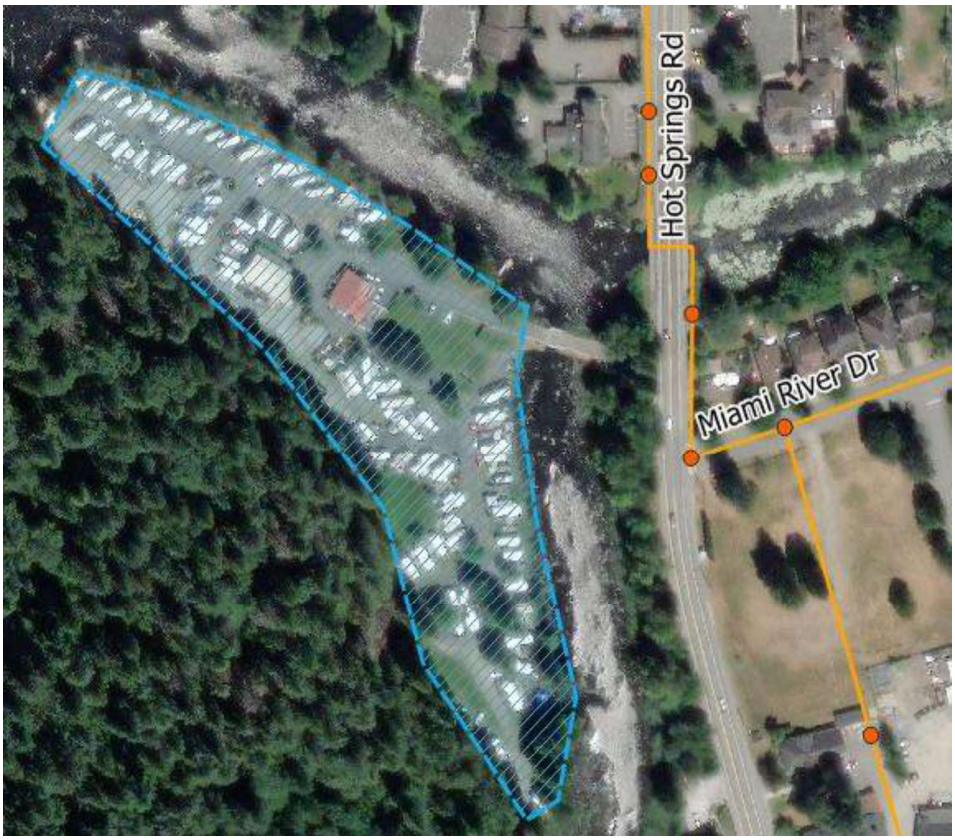
Deficiency: Potential source of I&I that is not characterized

Additional Notes: Details of runoff in Harrison RV Country Club are unknown and could result in high I&I. No known onsite storm sewer system.

Primary Justification: Reduce PWWF to maintain system capacity

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Infrastructure Planning Grant Program, Union of BC Municipalities Asset Management Planning Program



Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Sanitary flow monitoring - 6 months	-	1	$ 15,000.00	$ 15,000
			Subtotal:		**$ 15,000**
			Administration / Installation Contingency:	**20%**	**$ 3,000**
			Total Estimated Cost:		**$ 18,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 12
Springs RV Resort I&I investigation
Priority: Medium

Project Description: Directly monitor discharge from Springs RV Resort (670 Hot Springs Rd) service to fully characterize base flows and I&I.

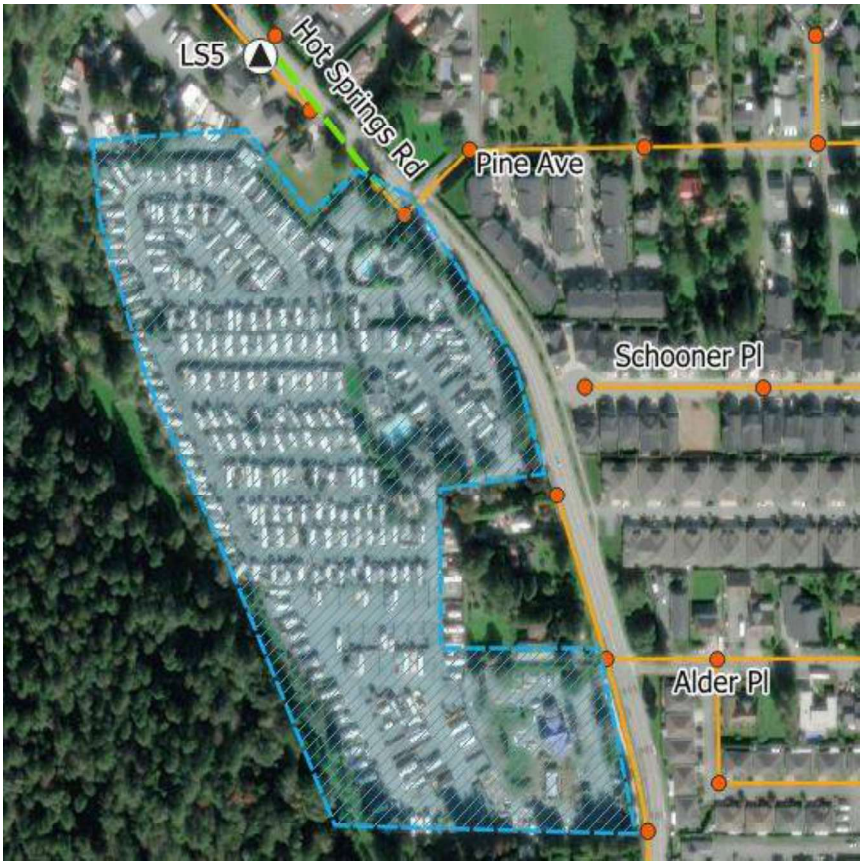
Deficiency: Potential source of I&I that is not characterized

Additional Notes: Details of runoff in Springs RV Resort are unknown and could result in high I&I. No known onsite storm sewer system.

Primary Justification: Reduce PWWF to maintain system capacity

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Infrastructure Planning Grant Program, Union of BC Municipalities Asset Management Planning Program



Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Sanitary flow monitoring - 6 months	-	1	$ 15,000.00	$ 15,000
				Subtotal:	**$ 15,000**
				Administration / Installation Contingency: 20%	**$ 3,000**
				Total Estimated Cost:	**$ 18,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 13
Harrison Holiday Park I&I investigation
Priority: Medium

Project Description: Directly monitor discharge from Harrison Holiday Park (973 Hot Springs Rd) at Manhole 14 on McCombs Dr to fully characterize base flows and I&I.

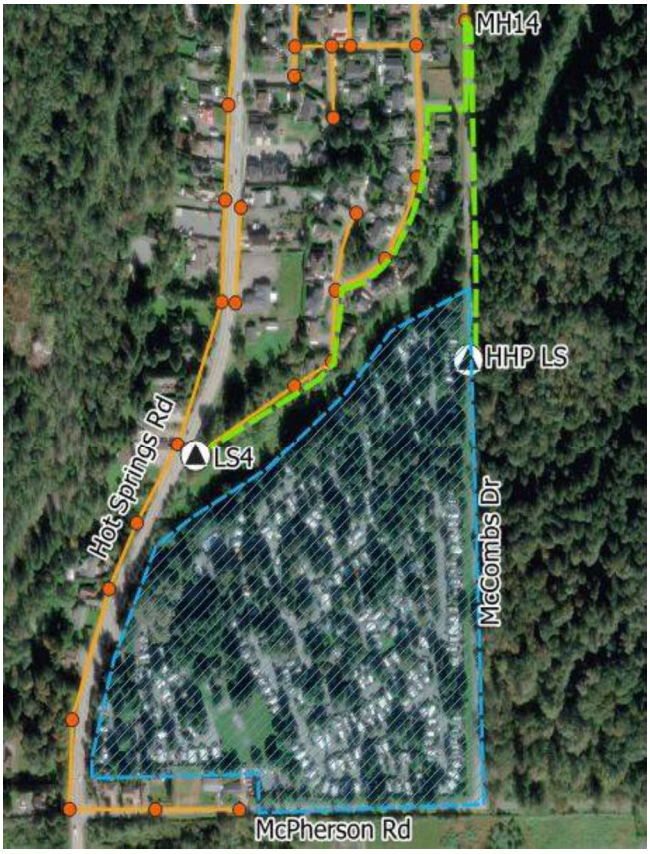
Deficiency: Potential source of I&I that is not characterized

Additional Notes: Details of runoff in HHP are unknown and could result in high I&I. No known onsite storm sewer system. Area of higher I&I from SS2 monitoring

Primary Justification: Reduce PWWF to maintain system capacity

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Infrastructure Planning Grant Program, Union of BC Municipalities Asset Management Planning Program



Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Sanitary flow monitoring - 6 months	-	1	$ 15,000.00	$ 15,000
				Subtotal:	**$ 15,000**
				Administration / Installation Contingency:	**20% $ 3,000**
				Total Estimated Cost:	**$ 18,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 14
Miami River Siphon Inlet Chamber Improvements
Priority: Medium

Project Description: Install instrumentation to monitor water levels and notify of flooding or clogging of inlet trash rack. Adjustments could be made to trash rack for simpler maintenance.

Deficiency: Monitoring of levels to verify siphon performance, improvements to trash rack

Additional Notes: Improve maintainability of trash rack, settling chamber. Add instrumentation for alarming.

Primary Justification: Asset management / life cycle replacement

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Instrumentation allowance	-	1	$ 200,000.00	$ 200,000
			Subtotal:		**$ 200,000**
			Administration / Installation Contingency:	**20%**	**$ 40,000**
			Total Estimated Cost:		**$ 240,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 15
Emergency response plan
Priority: Medium

Project Description: Prepare more comprehensive Emergency Response Plan to outline responsibilities and actions in the case of an emergency situation impacting the storm or sanitary systems.

Deficiency: No existing response plan for storm or sanitary systems

Additional Notes: Water System Emergency Response Plan was last updated in January 2025 and could be used as a basis for a more comprehensive Emergency Response Plan.

Primary Justification: Emergency preparedness

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, Disaster Risk Reduction-Climate Adaptation

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Emergency Response Plan	-	1	$ 20,000.00	$ 20,000
			Subtotal:		**$ 20,000**
			Administration / Installation Contingency:	**20%**	**$ 4,000**
			Total Estimated Cost:		**$ 24,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 16
LS1 Forcemain replacement
Priority: Conditional

Project Description: Replace two parallel 200 mm forcemains from LS1 to the WWTP with 250 mm dia. to address pipe deterioration and improve capacity.

Deficiency: Condition of forcemain (leak history), and growth if I&I reduction targets can not be met.

Additional Notes: Forcemain condition is variable and was noted as aging with historical leaks by Village staff along the older PVC section (constructed in 1994). Modelling did not identify FM1 as a limit to the network capacity (subject to effectiveness of I&I reduction), but upsizing would be recommended if improvements are constructed. Priority would increase if condition warrants or I&I reduction is not successful.

Primary Justification: Asset management / life cycle

DCC Eligible: Yes (partial)

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund

Item No.	Description	Unit	Estimated Quantity (Total Length)	Estimated Unit Price	Estimated Amount
1	150 mm Dia. Force Main	m	1,820	TBD	
			Total Estimated Cost:		**TBD**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 17
Inventory, Survey, and Infrastructure Assessment
Priority: Medium

Project Description: Perform inventory survey that is compatible with modern GIS and design software. Material information, diameters, and elevations should be included with age of construction where possible.

Deficiency: Improve documentation of infrastructure

Additional Notes: Recommendation from 2016 LWMP, partially completed. Material information is still lacking.

Primary Justification: Asset documentation

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Infrastructure Planning Grant Program, Union of BC Municipalities Asset Management Planning Program

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Survey and data processing	-	1	$ 50,000.00	$ 50,000
				Subtotal:	**$ 50,000**
				Administration Contingency: 20%	**$ 10,000**
				Total Estimated Cost:	**$ 60,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 18
Inspect and maintain top end / dead end segments
Priority: Medium

Project Description: Periodic inspection by CCTV and flushing at regular intervals at dead-end sewer segments with low velocities.

Deficiency: Low flow velocity and capacity exceedances

Additional Notes: Recommendation from 2016 LWMP, status unknown.

Primary Justification: Monitor existing hydraulic deficiency

DCC Eligible: No

Grant Opportunities: n/a

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Echo Ave	m	122	$ 10.00	$ 1,220
2	Lakeburg Cres	m	62	$ 10.00	$ 620
3	Miami River Dr	m	104	$ 10.00	$ 1,040
4	Rockwell Dr	m	146	$ 10.00	$ 1,460
5	Flushing	hr	8	$ 400.00	$ 3,200
			Subtotal:		**$ 7,540**
			Administration Contingency:	**20%**	**$ 1,508**
			Total Estimated Cost:		**$ 9,048**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 19
Miami River Siphon Replacement or 3rd pipe
Priority: Low

Project Description: Replace existing Miami River Siphon with 300 mm dia. Pipe. Construct new inlet chamber for the siphon and extend the siphons away from the Miami River.

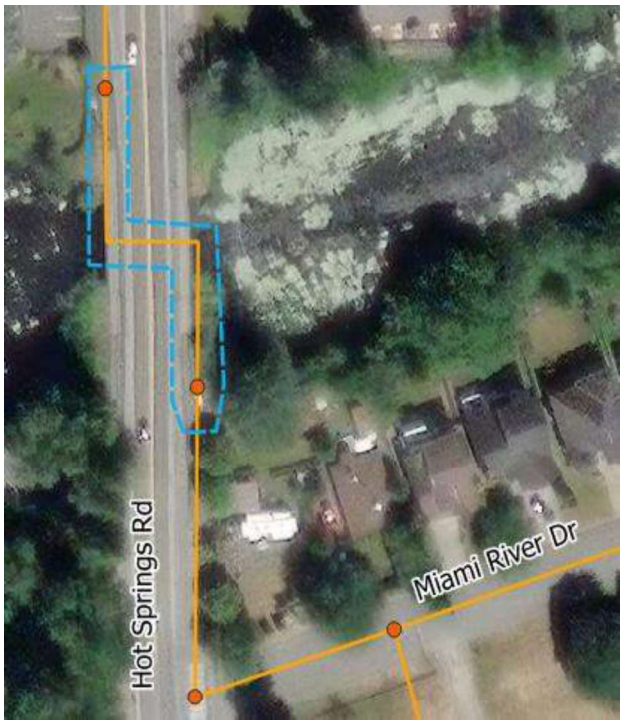
Deficiency: Capacity hydraulically adequate but subject to flooding, undersized compared to FM3 capacity.

Additional Notes: Capacity OK but marginal. Likely would be HDD construction. Requires further study to determine if required (condition of existing siphon).

Primary Justification: Asset management / life cycle replacement

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund



Assumptions: Adjustment for inflation based on ENR Construction Cost Index

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	2016 LWMP Estimate	-	1	$ 497,000.00	$ 497,000
			Subtotal:		**$ 497,000**
	Inflation Adjustment (Dec 2016 index = 10530, Nov 2025 index = 14097)			**34%**	**$ 168,357**
	Design / Construction Management / Contingency (%)			**50%**	**$ 332,678**
			Total Estimated Cost:		**$ 998,035**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 20
Miami River Dr sewer improvements
Priority: Low

Project Description: Replace 350 mm gravity sewer along Miami River Dr with 450 mm dia. to increase capacity and reduce risk of surcharging. Can be combined with Project 10 and Project 21.

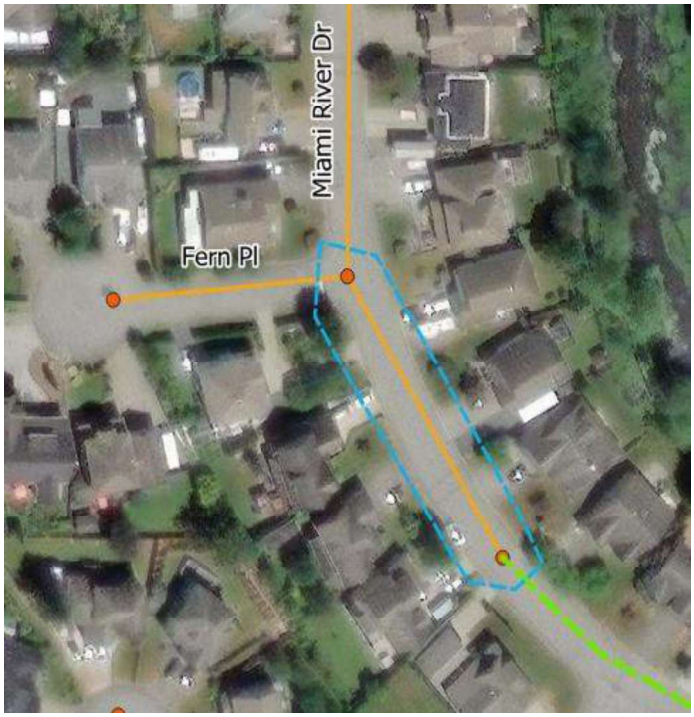
Deficiency: Capacity exceedance along sewers

Additional Notes: Capacity exceedance after upgrades to FM3 when two pumps active. Capacity requirement could be reduced if FM3 is extended to Walnut Ave (ref Project 5).

Primary Justification: Address growth hydraulic deficiency

DCC Eligible: Yes

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund



Assumptions: All manholes require replacement.

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	450 mm Dia. Sanitary Sewer (0-2m)	m	70	$ 1,750.00	$ 121,800
2	1050 mm Dia. Manhole	ea.	2	$ 14,750.00	$ 29,500
			Subtotal:		**$ 151,300**
	Design / Construction Management / Contingency (%)			**50%**	**$ 75,650**
			Total Estimated Cost:		**$ 226,950**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 21
Walnut Ave sewer improvements
Priority: Low

Project Description: Replace 350 mm gravity sewer along Walnut Ave with 450 mm dia. to increase capacity and reduce risk of surcharging. Can be combined with Project 10 and Project 20.

Deficiency: Capacity exceedance along sewers

Additional Notes: Capacity exceedance after improvements to FM3 when two pumps active and with improvements to Miami River Dr sewer. Capacity requirement could be reduced if FM3 is extended to Walnut Ave (ref Project 5).

Primary Justification: Address growth hydraulic deficiency

DCC Eligible: Yes

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund

Assumptions: All manholes require replacement.

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	450 mm Dia. Sanitary Sewer (0-2m)	m	117	$ 1,750.00	$ 204,050
2	1050 mm Dia. Manhole	ea.	2	$ 14,750.00	$ 29,500
			Subtotal:		**$ 233,550**
	Design / Construction Management / Contingency (%)			**50%**	**$ 116,775**
			Total Estimated Cost:		**$ 350,325**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 22
Forcemain 5 improvements
Priority: Low

Project Description: Replace 75 mm forcemain along Hot Springs Rd from LS5 with 150 mm dia. to reduce flow velocity.

Deficiency: High velocity in FM5, end of service life

Additional Notes: Existing FM is undersized, constricting flows.

Primary Justification: Asset management / life cycle replacement

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund

Assumptions: Manholes and lift station will not be replaced.

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	150 mm Dia. Force Main	m	106	$ 1,245.00	$ 132,468
			Subtotal:		**$ 132,468**
	Design / Construction Management / Contingency (%)			**50%**	**$ 66,234**
			Total Estimated Cost:		**$ 198,702**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 23
Forcemain 6 improvements
Priority: Low

Project Description: Replace 100 mm forcemain along Hot Springs Rd from LS6 with 150 mm dia. to reduce velocity.

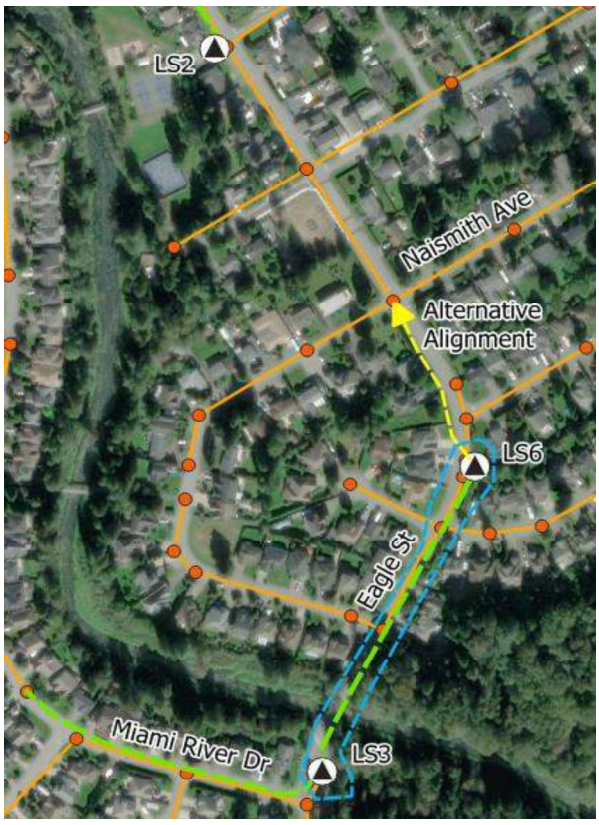
Deficiency: High velocity in FM6, end of service life

Additional Notes: Existing FM is undersized, constricting flows. Alternate alignment to discharge toward LS2 could be considered.

Primary Justification: Asset management / life cycle replacement

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund



Assumptions: Manholes and lift station will not be replaced.

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	150 mm Dia. Force Main	m	214	$ 1,245.00	$ 266,057
			Subtotal:		**$ 266,057**
	Design / Construction Management / Contingency (%)			**50%**	**$ 133,028**
			Total Estimated Cost:		**$ 399,085**

WATER STREET ENGINEERING

TECHNICAL MEMORANDUM			
Subject	Population, Base Sanitary Flows and Base Water Demands		
Project	Village of Harrison Hot Springs Sanitary Sewer and Water Master Plans		
To	Jace Hodgson Village of Harrison Hot Springs	**From**	Jade Sangha, EIT and Neal Whiteside, MASc, PEng
Date	29 Sep 2025	**File ref**	Water Street File # 456.300
Version	C	**Status**	Final

1. INTRODUCTION

1.1. PURPOSE

The Village of Harrison Hot Springs (the Village) has retained Water Street Engineering (Water Street) to complete village-wide sanitary sewer, storm, and water master plans.

This technical memorandum evaluates populations, base sanitary flows and base water demands for use in the sanitary sewer and water master plans. Specifically, this memorandum aims to:

1. Identify current and future village-wide residential populations based on BC Stats and Fraser Valley Regional District (FVRD) data.
2. Assess current and future Industrial, Commercial, and Institutional (ICI) population equivalents, to develop the current and future design population equivalents (sum of residential population and ICI population equivalent).
3. Estimate the (winter base and summer peak) residential populations and ICI population equivalents. connected to the sanitary sewer and water systems.
4. Develop estimated current sanitary sewer base sanitary flow (total and per capita rate), and groundwater infiltration (GWI) based on 2025 flow monitoring.
5. Develop estimates of current water demands (BD, SD, UFW), based on 2023 data.

1.2. BACKGROUND

The VHHS is experiencing population growth and redevelopment, which necessitates a long-term improvement plan to ensure the water and sanitary sewer systems can meet the increasing demands / loads and fire protection requirements.

As noted in the 2015 Water Master Plan, the growth in the village is unique and has not been consistent with the surrounding municipalities. The Village has a developed tourism industry and a significant number of seasonal residents. Estimating the seasonal residents and seasonal commercial population equivalents is important for planning and evaluation of the Village sanitary sewer and water systems.

1.3. PREVIOUS WORK

2016 LIQUID WASTE MANAGEMENT PLAN (CTQ, 2016)

The 2016 Liquid Water Management Plan (LWMP) noted a 2011 Census population of 1,468 ca and an average growth rate (1996 -2011) of 4.2%. A yr-2036 population forecast range of 2,367 to 2,733 ca was developed based

on growth rates. A "full-capacity" population of 4,447 ca was also developed based on current (at the time) land use zoning.

1.4. LIMITATIONS

This technical memorandum must be read with the Statement of Limitations at the end of this document.

2. BASE (WINTER) POPULATION

The BC Stats Population Estimates & Projections for British Columbia (BC Stats, 2024a) and the FVRD regional growth strategy (Fraser Valley Regional District, 2024) were used to assess current and future base (winter) village-wide populations. BC Stats uses the Component/Cohort-Survival method to project populations, which grows the population from the latest base year estimate by forecasting births, deaths and migration. Similarly, the BC Stats Household Estimates & Projections for British Columbia (BC Stats, 2024b) is used to assess current and future dwelling units and per-capita dwelling unit densities. Note that households include occupied dwellings only. The FVRD regional growth strategies presents populations and number of households for 2021 and projections for 2030, 2040 and 2050.

The historical estimates and future projections of populations and household within the Village are shown in Figure 1. Note the future projections provided by BC Stats only include up to the year 2046. The FVRD projections for populations and population per housing unit differ slightly from corresponding BC Stats projections.

For the Master Planning work, 2023 population data from BC Stats was selected to represent existing conditions, as this is consistent with the data available. The Village has selected the 2050 FVRD projections as their preferred option for future growth estimates. These are presented in Table 1.

Figure 1: BC Stats population and household estimates / projections

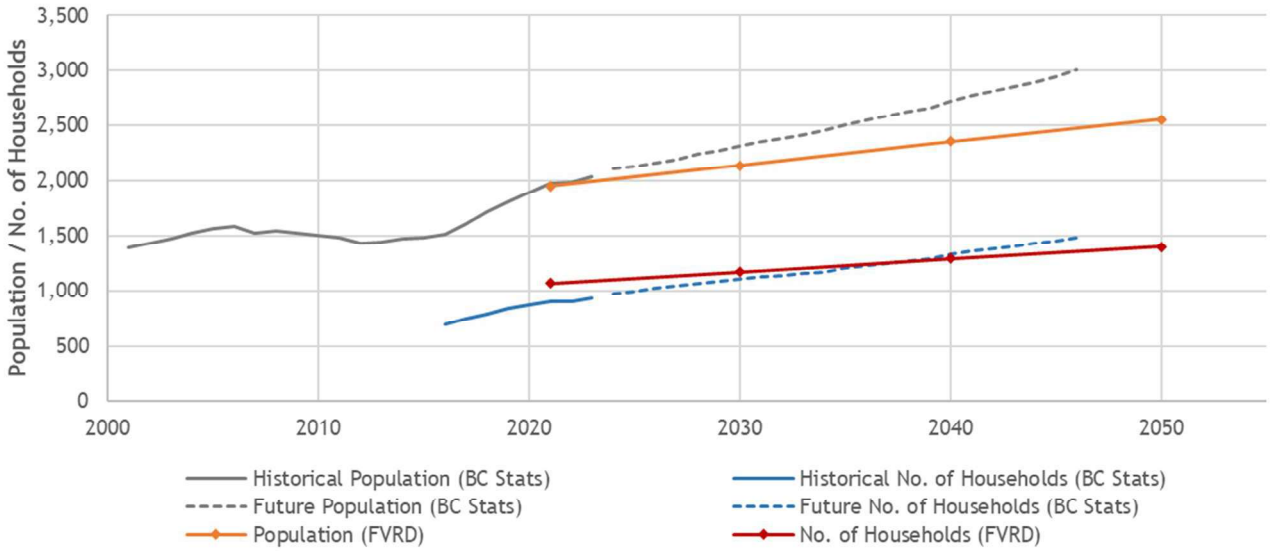


Table 1: Village-wide base (winter) populations

Master Plan Scenario	BC Stats		FVRD	
	Population	No. of Households	Population	No. of Housing Units
2021 for reference*	1,979	897	1,951	1,070
Existing (2023)	2,032	932	-	-
2046 BC Stats*	3,004	1,488	-	-
Future (2050)	-	-	2,553	1,400
* Not considered in master plan modelling, provided for reference only.				

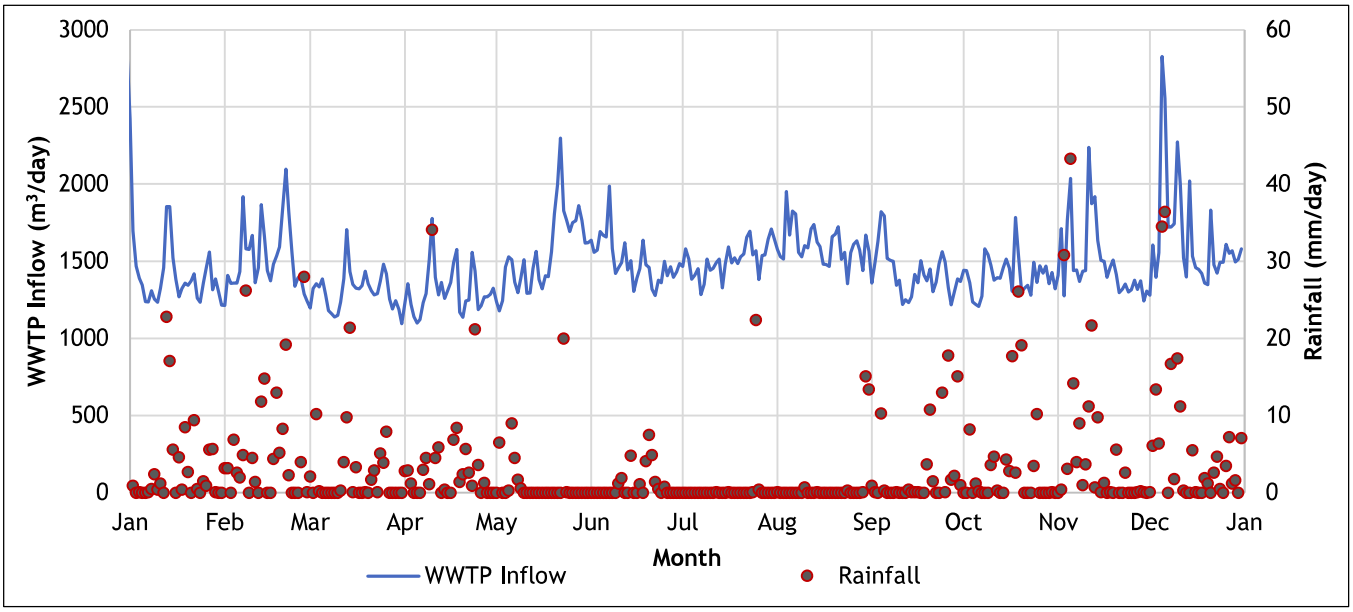
The 2023 BC Stats population projection is used for the existing master plan scenarios; the 2050 FVRD population projection is used for the future master plan scenarios.

3. WWTP & WTP FLOWS

3.1. WWTP EFFLUENT FLOWS

The daily recorded effluent discharge from 2023 is shown in Figure 2. The wastewater treatment plant (WWTP) effluent flows were used to assist in determining base sanitary flows (winter and seasonal component) and in turn establishing the seasonal population.

Figure 2: 2023 WWTP effluent flow



Implicitly included in the WWTP effluent flows would be:

- Some daily fluctuation compared to inflows to the WWTP (due to changes in levels in the WWTP aeration basins),
- Rainfall derived inflow and infiltration (RDII), and
- Sanitary ground water inflows (GWI)

The first two factors were minimized by averaging flows over a number of dry days in the summer and winter periods. It was assumed that the GWI would not vary considerably from summer to winter.

Table 2: 2023 WWTP effluent flow summary

Period	Flow		Dates
	m³/day	L/s	
Average (for reference incl. wet periods)	1479	17.1	1 Jan - 31 Dec
Winter Dry Weather	1185	13.7	5-10, 27-31 Mar, 4-6 Apr
Summer Dry Weather	1617	18.7	26 Jul - 29 Aug
Seasonal Component of DWF	432	5.00	Summer less Winter dry weather flow

Data for 2021 was checked and showed a similar increase in summer dry weather WWTP flows.

3.2. WTP FLOWS

Source flows to the Village are metered at the water treatment plant (WTP), which flows to the Village's tank before supplying the Village. The flows are manually recorded daily, and do not include peak hour consumption. The data for the village is shown in Figure 3 and Table 3.

Figure 3: 2023 WTP discharge

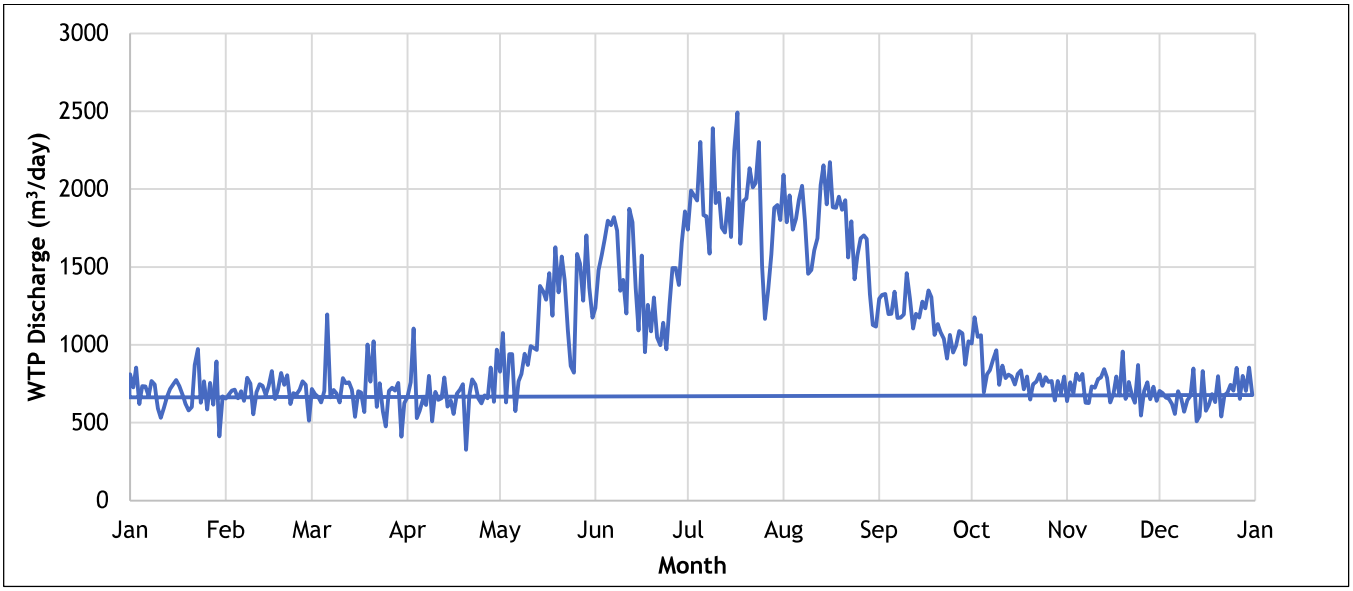


Table 3: 2023 WTP discharge summary

Demand Type	Demand		Dates
	m³/day	L/s	
Average Day (ADD)	1034	12.0	1 Jan - 31 Dec
Base (BD)	703	8.14	1 Jan - 31 Mar (Q1)
Maximum Day (MDD)	2492	28.8	17 Jul
Seasonal (SD)	1789	20.7	Maximum Day less Base demand

It is noted that due to the location of the WTP water meter, there can be significant fluctuations in the daily flow recordings (due to tank level fluctuations). As such, the above measured peak day flow (28.8 L/s) may be higher than the actual system MDD.

3.3. 2025 SANITARY SEWER FLOW MONITORING

Flow monitoring was completed between Jan and Jun 2025 as described in a separate technical memorandum (Water Street Engineering, 2025).

4. SERVICED & METERED PROPERTIES

4.1. SERVICED WATER AND SEWER LOTS

Not all of the Village is serviced by the respective water and sanitary sewer systems. A list of properties connected to the water and sanitary systems was provided by the Village, and mapped to GIS data to determine whether a property is serviced with water and/or sewer, or neither, and number of service connections. BCAA actual use codes were used to assign usage type and dwelling unit counts.

- Un-serviced lots: 175 GIS parcels were identified as un-serviced. These parcels include several large lots and the total area of unserviced parcels is 211.2 ha (63% of total lot area of parcels within Village).
- Lots serviced by **both water and sewer**: 659 lots, 78.4 ha, accounting for 1098 dwelling units, including 622 single-family dwelling units and 13 multi-family units (with a total of 475 water service connections noted). It is noted that many of the multi-family units are understood to be unoccupied in the winter.
- Lots serviced by **sanitary sewer only**: 82 lots, 47.3 ha, accounting for 97 dwelling units. A review of the lots serviced by sanitary but not water indicates that these generally have their own groundwater source (i.e. well(s)).
- Lots serviced by **water only**: 2 lots both indicated as vacant by BCAA actual use code.

Notable properties / exceptions are as follows:

- **Springs RV Resort (SRVR, 640 & 670 Hot Springs Rd.):** The SRVR is connected to both the Village water and sewer systems. HHP is set-up for seasonal RV use. The water system is metered. It is understood that the facility is open year-round.
    - Serviced area (for calculation of sanitary GWI and RDII): 47,464 m^2 / 4.75 ha
    - Metered water use: Winter 15 m^3/day (Q1 2023) and Summer 115 m^3/day (Q3 2023)
    - Outdoor water use allowance (summer typical only, not included in BSF): 9 m^3/day (assumed based on 3,000 m^2 irrigated area at 3 mm/day irrigation rate)
    - Winter and summer BSF water: Assumed equal to metered water consumption less outdoor usage. 15 m^3/day winter, 106 m^3/day summer total.
    - Typical winter and summer occupancy: 12% winter (back calculated from Q1 2023 meter data) and 90% summer (assumed)
    - Total number of RV pads: 288 sites plus additional 82 RV sites being added in 2025 (Phase 3).
    - Occupancy per occupied pad (based on indoor water consumption at 200 L/ca/day): 2.04 ca/site
- **Harrison Holiday Park (HHP, 973 Hot Springs Rd.):** The HHP has its own water supply system (groundwater wells). The sanitary system discharges to MH14 on McCombs Rd. HHP is set-up for seasonal RV use. It is understood that the facility is empty in the winter (except for caretaker occupancy), and open April - October.
    - BSF rate: 388 L/occupied site/ day; 2.04 ca/site at 190 L/ca/day (matching Springs RV rates)
    - Total number of RV pads: 400
    - Typical winter and summer occupancy: 32 % winter (126 sites) and 90% summer (360 sites)
    - Note winter occupancy derived from April calibration data
    - Serviced area (for calculation of sanitary GWI and RDII): 129,447 m^2 / 12.9 ha
    - Winter discharge BSF: 49 m^3/day
    - Summer BSF: 140 m^3/day

- **Harrison Hot Springs Resort (HHSR, 100 Esplanade Ave):** The HHSR has its own water supply but is connected to the sanitary sewer system. The sanitary sewer system is metered but volume measured is only the discharge from the onsite pools.[1] Key information on the HHSR:
    - Serviced area (for calculation of sanitary GWI and RDII): 60,347 m^2 / 6.03 ha
    - Total number of rooms: 342
    - Typical winter and summer occupancy: 30 % winter and 90 % summer (note this is arbitrary)
    - BSF rate: 460 L/occupied room/day; 2 BU x 230 L/BU/day (Province of BC (MFNRO), 2012)
    - Metered discharge (emptying of pools): 15.2 m^3/day (average from 2020 - 2023 meter data)
    - Winter discharge BSF estimate: 47 m^3/day (indoor), 62 m^3/day (total incl. pool) – pre-calibration
    - Summer BSF estimate: 142 m^3/day (indoor), 157 m^3/day (total incl. pool) – pre-calibration
    - Observed April 2025 average dry weather flow (ADWF) of 12.1 L/s (1,045 m^3/day) including 7.3 L/s GWI and 4.8 L/s BSF (see flow monitoring TM)Revised existing summer BSF estimate to match Apr 2025 data.

- **Harrison Hot Springs Public Mineral Pool (HHSMP, 101 Hot Springs Rd):** The HHSMP is not supplied from the Village water system but is connected to the sanitary sewer system. The HHSMP's discharge is metered.
    - Metered discharge (emptying of pools): 103 m^3/day (average from 2022 - 2023 meter data)
    - Assume other uses are not significant.
    - Winter and Summer BSF = 103 m^3/day

- **Harrison RV Country Club (398 Hot Springs Rd):** This site is also not supplied from the Village water system but is connected to the sanitary sewer system. No metering.
    - Estimated 70 RV sites (year-round occupancy assumed)
    - Assumed 2.04 ca/site and 160 L/ca/day, to arrive at 23 m^3/day
    - No future growth assumed.

4.2. WATER SERVICE METER DATA

The Village meters all ICI users and all new multi-family (MF) residential lots connected to the water system. Single-family and older multi-family residential lots are not metered. Meters are read quarterly, and the metered consumption customer data was provided by the Village. Note the exact dates of meter read were not provided (hence the length of billing periods is estimated as 365 /4 days for each period).

Meter data was matched to GIS parcel data, to determine existing metered consumption for each metered lot and assign metered consumption to a use type (ICI or MF residential).

The data provided included 30 active water meters including:

- 21 on ICI (industrial, commercial, institutional) properties
- 9 residential (multi-family) properties (incl. 3 mixed use properties with commercial uses as well)
- A total of 369 dwelling units (most of the estimated 506 MF dwelling units in the Village).

Metered consumption data was used to estimate water demands as follows:

- Base demand (BD): Q1 demand (excluding missing readings).
- Maximum day demand (MDD): Assume metered usage is same as Q3 consumption

[1] 27 Nov 2024 email from VHHS (Tyler Simmonds).

Table 4: 2023 ICI and multi-family metered consumption (L/s)

Use	Quarter				ADD	Winter BD	MDD
	Q1	Q2	Q3	Q4			
ICI	1.36	2.05	3.28	1.62	1.99	1.36	3.28
Residential (Multi-family)	0.54	0.85	1.22	0.59	0.79	0.54	1.22
Total	1.90	2.90	4.50	2.21	2.78	1.90	4.50

In 2023, metered consumption made up 23% of total water delivered by the WTP.

5. EXISTING WATER BALANCE

5.1. WATER BASE DEMANDS

Winter base and summer MDD water demands were derived from the data as follows.

Table 5: 2023 existing water demands

Use	Use Code	Demand (m^3/day)	Source / Unit Rates
Base Demand			
ICI	BD-ICI-M	117	From meter data
Residential MF Metered [1,2]	BD-RES-MF-M	46	From meter data. 280 DU, 232 ca
Residential MF Unmetered[1,2]	BD-RES-MF-UM	29	197 DUo x 0.63 ca/DU x 237 L/ca/day
Residential SF [1,2]	BD-RES-SF	363	622 DU x 2.47 ca/DU x 237 L/ca/day
Unaccounted for Water[3]	BD-UFW	147	125 L/service/day x 1176
Total Base Demand		704	
Seasonal Component (in addition to BD)			
ICI	SD-ICI-M	166	From meter data
Residential MF Metered	SD-RES-MF-M	58	From meter data
Residential MF Unmetered Addl. Indoor Use	SD-RES-MF-UM-I	7	Assume addl. 22 % occupancy
Residential MF Unmetered Outdoor Use	SD-RES-MF-UM-O	91	Same rate as SF lots
Residential SF Addl. Indoor Use[4]	SD-RES-SF-I	80	Assume addl. 22 % occupancy
Residential SF Outdoor Use[5]	SD-RES-SF-O	1390	4.78 L/m^2/day on irrigable area of 50% of lot area up to maximum of 2000 m^2/DU
Total Addl. Seasonal Demand		1791	
Maximum Day Demand		2494	

Notes:
1. 237 L/ca/day represents typical indoor water use rate observed in lower mainland with current mix of indoor water fixture (excl. unusual leakage)
2. Total population of 2032 ca for Harrison; distributed first to SF DU at 2.47 ca/DU; then remainder to MF DU. Note the low population density is expected to be primarily due to seasonal occupancy.
3. UFW estimated from water balance; i.e. total delivered water from source flow data less metered consumption and unmetered estimate.
4. Additional seasonal occupancy allowance of 22% (note 2021 census data indicates 18% of DU are not occupied normally).
5. Outdoor water use rate of 4.78 L/m^2/day is back-calculated from observed seasonal demand after accounting for an allowance for addl. occupancy.

5.2. SANITARY DRY WEATHER FLOWS

Sanitary dry weather flows were developed from the data as follows.

Table 6: Existing sanitary dry weather flows

Use	Use Code	Load (m^3/day)	Source / Unit Rates
ADWF (Winter) – April 2025			
ICI with Water Connection	BSF-ICI	92	80% of ICI water BD
ICI without Water Connection	BSF-ICI-NW	175	Incl. HHP and HHSMP (see section 4)
Residential with Water Connection	BSF-RES	351	Equal to residential water BD
Residential without Water Connection [1]	BSF-RES-NW	45	97 DU x 2.47 ca/DU x 190 L/ca/day
BSF HHSR	BSF-ICI-HHSR	410	From calibration
Groundwater Infiltration (except HHSR)	GWI	211	2,000 L/ha/day (calibrated)
GWI (HHSR)	GWI-HHSR	631	From calibration
Total ADWF (Winter)		1916	

Notes:
1. Residential base sanitary flow rates are 80% of indoor water use rates per calibration.
2. HHSR loads from calibration

Note that the base sanitary flow cannot be directly compared to the water base demand, as there are several properties serviced by the sanitary system but not the water system (these lots have a separate private water supply).

A summer forecast is not produced as the design flow condition (high rainfall and RDII) occurs in the winter season.

5.3. EXISTING POPULATION AND SUMMER (SEASONAL) COMPONENT

Harrison Hot Springs has a significant seasonal population. From the water balance a 22% increase in serviced water population (1834 ca winter to 2237 ca summer) is estimated. Compared to the water system, the sanitary sewer system services an additional 186 ca in the winter (2020 ca total). The total residential sanitary sewer service population in the summer is estimated as 2464 ca.

The above values exclude the additional flows from the SRVR and HHP and additional occupancy at hotels including the HHR.

The above values are substantiated by the increased WTP and WWTP flows that were used in the water and sewer flow balances. The 2023 dry weather flow increase at the WWTP was 36% from 1185 m^3/day in the winter to 1617 m^3/day in the summer.

The existing serviced residential populations are estimated as shown in Table 7.

Table 7: 2023 serviced residential populations

Utility System Serviced	Winter Population (ca)	Summer Population Increase	Summer Population Increase (ca)	Summer Population (ca)
Sanitary	1834	+22%	+403	2237
Water	2020		+444	2464

6. OCP FORECAST

6.1. LAND USE DESIGNATIONS

The future residential population was based on the FVRD population projects (see Section 2). The projected distribution of residential population and ICI growth was developed based on the Village's Official Community Plan (OCP).

The various OCP designations considered are provided in the table below.

Table 8: OCP designations

Abbr.	OCP Designation	Subtype	Residential Uses	Lot Area (ha)
LB	Lakeshore Beach	Park		19
LDR	Low Density Residential	Residential	Single-family, duplex	60
LR	Lakeshore Residential	Residential	Townhomes, row homes	1
MDR	Medium Density Residential	Residential	Townhomes, row homes	4
MTC	Marine Tourist Commercial	ICI		10
PU	Public Use	ICI or Park		75
R	Resources	Vacant		90
TC	Tourist Commercial	ICI		24
VC	Village Centre	Mixed Use	Apartments	6
WC	Waterfront Commercial	Mixed Use	Apartments	25
TC-HDR[1,2]	Tourist Commercial - High Density Residential	Residential	Apartments	2
TC-MDR[1,3]	Tourist Commercial - Medium Density Residential	Residential	Townhomes, row homes	4
TC-SLR[1,4]	Tourist Commercial - Small Lot Residential	Residential	Resort (small lot) residential	1
Total				325

Notes:
1. New categories created for residential properties with the Tourist Commercial (TC) OCP designation.
2. Singular property at 740 Hot Springs Rd (planned apartment development).
3. 628 McCombs Dr, 386 & 388 Pine Ave, and all properties on Schooner Pl.
4. 750 & 798 Hot Springs Rd.

6.2. RESIDENTIAL POPULATION GROWTH

The FVRD projects a Village 2050 residential population of 2,553 ca with 1,400 occupied housing units. This translates to a population increase of +521 ca (or +26%). Assuming a seasonal occupancy of 78% of units being occupied year-round (based on current occupancy), a total of 1,804 total dwelling units in the village are projected (with 404 unoccupied). This translates to +603 new dwelling units.

To distribute these dwelling units spatially amongst the Village, future densities (DU/ha or DU/lot) were set based on a combination of current densities, typical densities in other municipalities, and judgement, such that the total resulted in a net +603 new dwelling units. The actual densities will depend on the ultimate development of the lot.

Residential dwelling units were assigned as either the current number of dwelling units or calculated using the estimated future density, whichever resulted in a greater number of dwelling units for a given property. Constraints to buildable areas were created for larger lots, particularly those fronting Hot Springs Rd, where steep topography to the west limits the total developable area.

Two OCP designations are classified as mixed-use: Village Centre (VC) and Waterfront Commercial (WC). For properties with these OCP designations, future residential usage was considered only for properties that currently have residential usage (including both multi- and single-family uses).

The residential densities and resulting dwelling units for each OCP designation are shown in the table below.

Table: OCP residential dwelling unit projections

Abbr.	Lot Area (ha)	Buildable Area (ha)	Dwelling Unit Density		Dwelling Units (DU)	Dwelling Unit Growth (DU)
			DU/ha	DU/lot		
LDR	60	55	13	-	798	189
LR	1	1	25	-	35	4
MDR	4	4	25	-	110	53
VC	2*	2*	150	-	242	124
WC	2*	2*	150	-	319	79
TC-HDR	2	1	150	-	105	105
TC-MDR	4	4	25	-	107	5
TC-SLR	1	1	-	1	87	52
Total	76	69	-	-	1803	611
Dwelling Unit Decrease on ICI Properties						-9
Net Dwelling Unit Growth						602
* Mixed-use OCP designations; this table only includes those properties identified as residential.						

The future residential population (2,553 ca as per FVRD projections) was distributed using estimated population densities. The population densities were set for each land use category generally based on current densities such that the total population was approximately equal to the FVRD projection of 2,553 ca. Note the population densities used for the future projections are less than existing population density estimates. This trend of declining population density is consistent with the BC Stats projections.

Table 9: OCP residential population projections

Abbr.	Dwelling Units (DU)	Population Density (ca/DU)		Population (ca)		Population Growth (ca)	
		Winter	Summer	Winter	Summer	Winter	Summer
LDR	798	2.16	2.64	1724	2103	296	361
LR	35	1.40	1.71	48	59	25	31
MDR	110	1.40	1.71	154	187	61	74
VC	242	0.53	0.65	128	157	36	44
WC	319	0.53	0.65	169	206	7	9
TC-HDR	105	0.53	0.65	56	68	56	68
TC-MDR	107	1.40	1.71	150	183	25	31
T-SLR	87	1.40	1.71	122	149	36	43
Total	1803	-	-	2553	3112	541	660
Population Decrease on ICI Properties						-22	-27
Net Population Growth						519	633

Note the above tables indicate a dwelling unit and population decrease for some ICI properties. These properties are currently used for single-family dwellings, however their OCP designations indicate they will be used for ICI or be vacant in the future.

6.3. ICI GROWTH

ICI growth is assumed to be consistent with residential growth (i.e. an overall ICI growth of +26% is assumed).

There are some properties which are currently residential but have ICI OCP designations. These properties are as follows:

- Town Centre (TC): 694, 674, 682, 690, and 728 Hot Springs Rd. Assumed to be commercial in the future. Assigned new water and sanitary demands.
- Public Use (PU): 590 Hot Springs Rd and 520 Lillooet Ave. Assumed to be vacant or used as parks in the future, with no water or sanitary demands.
- Resources (R): 480 and 980 Hot Springs Rd. Assumed to be vacant in the future, with no water or sanitary demands.

Additionally, there are some properties that are currently vacant ICI but are assumed to be developed at OCP:

- Town Centre (TC): 720 Hot Springs Rd. Assumed to be commercial in the future. Assigned new water and sanitary demands.
- Village Commercial (VC): 316 Hot Springs Rd, 260 Esplanade Ave, and 260 Cedar Ave. Assumed to be commercial in the future. Assigned new water and sanitary demands.
- Waterfront Commercial (WC): 490 Esplanade Ave, 498 Esplanade Ave, and 511 Lillooet Ave. Assumed to be commercial in the future. Assigned new water and sanitary demands.
- Public Use (PU): 22 lots throughout the Village. Assumed to remain vacant or used as parks in the future, with no water or sanitary demands.

It is assumed that properties with Marine Tourist Commercial (MTC) OCP designation will not be developed / not produce water or sanitary demands at OCP.

6.4. WATER BASE DEMANDS

Projected winter base and summer MDD water demands are summarized in Table 10.

It is assumed that all new residential and ICI properties will be connected to both the water and sanitary systems at OCP, and that currently un-serviced residential properties will become connected. Currently un-serviced ICI properties are assumed to remain un-serviced.

Table 10: OCP water demands

Use	Use Code	Demand (m^3/day)	Source / Unit Rates
Base Demand			
ICI New [1]	OCP-BD-ICI-N	34	2.01 L/m^2/day x 1700 m^2
ICI Existing [2]	OCP-BD-ICI	127	Assume 117% existing demand
Residential [3]	OCP-BD-RES	605	2551 ca x 237 L/ca/day
Unaccounted for Water [3,4]	OCP-BD-UFW	237	125 L/service/day x 1900 services
Total Base Demand		1004	Overall growth of +300 m^3/day (43%)
Seasonal Component (in addition to BD)			
ICI New [5]	OCP-SD-ICI-N	26	1.55 L/m^2/day x 1700 m^2
ICI Existing [2]	OCP-SD-ICI	190	Assume 117% existing demand
Residential Addl. Indoor Use [6]	OCP-SD-RES-I	133	Assume addl. 22 % occupancy

Residential Outdoor Use [3]	OCP-SD-RES-O	1808	4.78 L/m²/day on irrigable area of 50% of lot area up to maximum of 2000 m²/DU
Total Addl. Seasonal Demand		2157	Overall growth of +366 m³/day (20%)
Maximum Day Demand		3161	Overall growth of +657 m³/day (26%)

Notes:
1. New ICI BD rate of 2.01 L/m²/day selected based on existing ICI BD.
2. 117% selected to maintain an overall ICI winter BSF growth of 26%. See Table 11.
3. Unit-rate as per existing water balance. See Table 5.
4. Includes existing services plus new services, which consist of currently un-serviced residential properties and all new residential or ICI properties.
5. New ICI SD rate of 1.55 L/m²/day selected based on existing ICI SD.
6. Additional seasonal occupancy allowance of 22% as per existing water balance.

6.5. SANITARY DRY WEATHER FLOWS

Projected OCP sanitary dry weather flows were developed as follows

- Using unit rates for base sanitary loads (190 L/PE/day, 80% of water BD) and RDII (2000 L/ha/day)
- Note that the forecast assumes that the observed high BSF and GWI loads from HHSR are significantly reduced to design criteria values (460 L/room/day BSF and 2000 L/ha/day for GWI).
- HHP, Springs RV and Harrison RV Country Club full occupancy (as opposed to winter occupancy observed from flow monitoring)

Due to the large impact of the HHSR reduction, OCP flows (for ADWF) are similar to existing (i.e. the increase in loading from other areas can be offset by reductions in HHSR flows).

Table 11: OCP sanitary dry weather flows

Use	Use Code	Demand (m³/day)	Source / Unit Rates
ADWF (Winter)			
ICI New	OCP-BSF-ICI-N	27	80% of water BD
ICI Existing [1]	OCP-BSF-ICI	93	Assume 117% existing loads + HHSR
ICI Existing (no current water connection)	OCP-BSF-NW	360	HHP, Springs RV, HHMP, Harrison RV Country Club
Residential	OCP-BSF-RES	470	80% of water BD
Groundwater Infiltration	OCP-GWI	228	2,200 L/ha/day (calibrated)
HHSR BSF		157	
HHSR GWI		12	
Total ADWF (Winter)		1347	Overall growth of + m³/day (%)

Notes:
1. 117% selected to maintain an overall ICI winter BSF growth of 26%
2. HHSR loads reduced from existing observed.

7. CONCLUSIONS AND RECOMMENDATIONS

The recommended water demands for the water master plan are summarized in Table 12, and the sanitary dry weather flows recommended for the sanitary master plan are summarized in Table 13.

Table 12: Water demands summary

Use	Demand (m^3/day)	
	Existing	OCP
Base Demand		
ICI	117	162
Residential	439	605
Unaccounted for Water	147	237
Total Base Demand	704	1004
Seasonal Component (in addition to BD)		
ICI	166	216
Residential	1625	1941
Total Addl. Seasonal Demand	1791	2157
Maximum Day Demand	2494	3161

Table 13: Sanitary dry weather flows summary

Use	Demand (m^3/day)	
	Existing	OCP
ADWF (Winter)		
ICI BSF (water connected)	94	120
ICI BSF (no water connection)	175	360
HHSR BSF	410	157
Residential BSF	396	470
Groundwater Infiltration	211	227
HHSR GWI	631	12
Total ADWF (Winter)	1916	1347

WATER STREET ENGINEERING LTD. *(EGBC permit to practice # 1000830)*

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA W. N. WHITESIDE 29 Sep. 2025

Jade Sangha, EIT
Project Engineer

Neal Whiteside, MASc, PEng
Senior Municipal Engineer

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ABBREVIATIONS

ADD	Average Day Demand (Water)
ADWF	Average Dry Weather Flow
BD	Base Demand (Water)
BSF	Base Sanitary Flow (Sanitary)
GWI	Ground water Infiltration (Sanitary)
HHP	Harrison Holiday Park
HHSMP	Harrison Hot Springs (Public) Mineral Pool
HHSR	Harrison Hot Springs Resort
FVRD	Fraser Valley Regional District
ICI	Industrial, Commercial, and Institutional
LWMP	Liquid Water Management Plan
MDD	Maximum Day Demand (Water)
MF	Multi-Family
RDII	Rainfall Derived Inflow and Infiltration (Sanitary)
SD	Seasonal (Outdoor) Demand
SF	Single-Family
SRVR	Springs RV Resort
UFW	Unaccounted for Water
Village	Village of Harrison Hot Springs
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

STATEMENT OF LIMITATIONS

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REVISION HISTORY

Version	Status	Date	Description of Revisions	Author
A	Draft	15 Apr 2025	For client review	JAS / NW
B	Draft	17 Jun 2025	Add OCP forecast, address comments	JAS / NW
C	Final	29 Sep 2025	Updated sanitary flows per flow monitoring	NW

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WATER STREET ENGINEERING

TECHNICAL MEMORANDUM

Subject	Flow Monitoring Data Analysis		
Project	Village of Harrison Hot Springs Sanitary Sewer Master Plan		
To	Village of Harrison Hot Springs	**From**	Neal Whiteside, MASc, PEng and Laura Christensen, PEng
Date	29 Sep 2025	**File ref**	Water Street File # 456.303
Version	A	**Status**	Draft

1. INTRODUCTION

1.1. PURPOSE

This technical memorandum assesses the flow monitoring data collected by SFE Global (SFE). The data includes flow monitoring at two gravity manholes (sites SS1 and SS2) as well as data from a rain gauge installed as part of the program. Data was gathered from 23 Jan to 17 Jun 2025 (note SS2 data period was slightly shorter). The data was used to calculate base sanitary flow (BSF), rainfall derived infiltration and inflow (RDII), and groundwater infiltration (GWI) for the two monitored sites.

1.2. ACKNOWLEDGEMENTS

We acknowledge ClimateData.ca for providing the climate information used. ClimateData.ca was created through a collaboration between the Pacific Climate Impacts Consortium (PCIC), Ouranos Inc., the Prairie Climate Centre (PCC), Environment and Climate Change Canada (ECCC), Centre de Recherche Informatique de Montréal (CRIM), and Habitat7.

2. FLOW MONITORING CONFIGURATION

See Attachment 1 from SFE Global for details on the installed flow monitoring equipment.

2.1. RAIN GAUGE: MIAMI RIVER DRIVE AND MCCOMBS DRIVE

A tipping bucket rain gauge was located at Lift Station 3 (LS3). The apparatus was an ISCO interface module with a 506G Rain Gauge. The data was collected in 5-minute intervals and transmitted every 24 hours.

2.2. SANITARY SEWER MONITORING SITE 1: ST ALICE ST AND CEDAR AVE

Sanitary monitoring site 1 (SS1) was installed on the 350 mm outlet of the sanitary manhole at St Alice St and Cedar Ave, just upstream of Lift Station 1 (LS1). This location captures all of the Village of Harrison Hot Springs sewer inflows with the exception of the flow from Harrison Hot Springs Resort (HHSR). The sensor used was a submerged area velocity (AV) sensor. Data was collected in 5-minute intervals and transmitted every 24 hours.

2.3. SANITARY MONITORING SITE 2: 760 MCCOMBS DRIVE

Sanitary monitoring site 2 (SS2) was installed on the 300 mm outlet of MH16 on McCombs Drive. This location is downstream of LS4, and the private lift station servicing the Harrison Holiday Park (HHP).

The sensor used was a submerged AV sensor. Data was collected in 5-minute intervals and transmitted every 24 hours.

2.4. SCADA FOR LIFT STATION 1AND 3

Hourly and daily average flows were downloaded from the Village's SCADA. The data collection started on30 Mar 2025.

3. ANALYSIS

3.1. DATA

The recorded data is summarized for the two sites in Attachment 2. Data presented is hourly average to smooth out variations caused by the of upstream lift station operation.

3.2. CATCHMENT AREA CHARACTERISTICS

Table 1: Catchment Area Characteristics

	SS2	LS3	SS1	LS1	Notes
Gross Area (ha)	42.1	80.5	139.8	145.8	Includes roads and unserviced lots in the catchment.
Sewer Serviced Lot Area	34.2	75.3	105.7	111.7	
Serviced Dwelling Units	110	553	1196	1196	
Res. Population (SF)	271	1095	1701	1701	
Res. Population (MF)	0	69	319	319	
PE (ICI)	7	119	576	576	
PE (All)	278	1163	2596	2596	
Notes: LS1 catchment includes SS1 catchment plus Harrison Hot Springs Resort, HHSR is not assigned any ICI population (separate assignment during calibration)					

3.3. DRY WEATHER FLOWS

The data was analyzed to determine hourly average dry weather flows for the two sites for the period of Jan – Apr 2025, see Attachment 2 graphs. Data was excluded where there had been rainfall in the previous 48 hours. Data for May was excluded to avoid effect of increasing occupancy in shoulder season.

Table 2: Observed Winter Dry Weather Flow Summary (L/s)

	SS2	SS1	Notes
Minimum Night Flow (MNF)	1.83	3.33	@ 03:00 for SS1, 02:00 for SS2
Average Dry Weather Flow (ADWF)	2.67	6.86	
Peak Dry Weather Flow (PDWF)	3.17	10.14	@ 09:00 for SS1, 08:00 for SS2
Notes: SS2 profile indicates significantly more GWI as a proportion of the total flow.			

Note SCADA data was made available starting 30 Mar 2025 for LS1 and LS3. Using this data the following dry weather flows were calculated for April 2025.

Table 3: Observed April Dry Weather Flow Summary (L/s)

	SS2	LS3	SS1	LS1	Notes
Minimum Night Flow (MNF)	1.28	3.74	4.63	13.33	
Average Dry Weather Flow (ADWF)	2.10	5.75	7.82	19.92	
Peak Dry Weather Flow (PDWF)	2.81	7.88	11.47	26.08	
Notes:					

Using the four flow monitors, the system can be divided into four catchments:

- SS2: including the LS4 catchment, HHP and a portion of the gravity sewers feeding LS3.
- LS3 – SS2: including all flows into LS3 less observed flow at SS2, including LS5 and LS6 catchments and direct gravity connections
- SS1 – LS3: including all flows into SS1 (the manhole at Cedar and St Alice) less the LS3 flows including LS2 and local direct gravity connections
- HHSR: including all flows out of LS1 less the flow measured at SS1 (the manhole at Cedar and St Alice), the only connection for this catchment is the HHSR.

To calibrate the model the following adjustments were made to the base data:

- Additional GWI of 7.3 L/s added for the HHSR (due to very high minimum night flow (MNF) at LS1 not present at SS1 site).
- Additional 4.17 L/s of BSF (1900 PE x 190 L/PE/day) also added to HHSR to account for variable flows at LS1.
- Additional 0.55 L/s of BSF (250 PE) applied at HHP to account for higher than expected flows observed at SS2.
- Overall BSF rate set at 80% of base demand (BD) water use rate previously developed (160 L/PE/day for metered connections, 190 L/PE/day for unmetered water connections).
- MNF analysis was used to estimate a groundwater infiltration rate for the remainder of the service area. Assuming minimum night flow usage of 30% of average base sanitary flow (at SS1), the remainder of MNF is assigned as GWI, resulting in a GWI rate of 2000 L/ha/day (ha of serviced lot area).

The resulting calibration is summarized in the following table.

Table 4: Dry Weather Flow Catchment Calibration Summary

	SS2	LS3-SS2	SS1-LS3	HHSR	Notes
Observed Values					
MNF, L/s	1.28	2.45	0.90	8.70	
ADWF, L/s	2.10	3.66	2.06	12.10	
PDWF, L/s	2.81	5.33	4.98	16.30	
Serviced Lot Area (ha)	34.21	41.10	30.38	6.04	
Calibrated Values					
Model GWI, L/s - calibrated	0.79	0.95	0.70	7.30	
Model BSF, L/s - calibrated	1.17	2.22	3.78	4.75	

Model ADWF, L/s - calibrated	1.96	3.17	4.49	12.05	
ADWF Error % (Calibrated/ Observed)-1	-6%	-13%	117%	0%	

The resulting calibration is deemed acceptable with the exception of the SS1 – LS3 catchment. It is believed that the SS1 site may have been underreading. This combined with potential subtraction errors would increase the % inaccuracy for the SS1 -LS3 catchment. The higher model ADWF was left.

3.4. WET WEATHER FLOWS

Lift station 1 and 3 data were not included in the wet weather flow analysis as data was not available for winter storms.

For both temporary flow monitoring sites, the peak observed flow was on the evening of 23 Mar 2025 / morning of 24 Mar 2025.

The RDII component can be developed by subtracting the dry weather component from the data (adjusted for the time of day).

Table 5: 2025 Peak Weather Flow Summary (L/s)

	SS1	SS2	Notes
Peak Wet Weather Flow (PWWF)	58.6	18.9	23:00 23 Mar for SS1, 01:00 24 Mar for SS2
RDII component of PWWF (PWWF - BSF)	53.4	16.6	
Notes: The rainfall observed for the storm averaged 2.97 mm/hr (71 mm for 24 hr from 01:00 23 Mar to 01:00 24 Mar)			

Other minor rainstorms were also analyzed for each site to determine the RDII component and compared to the 24-hour rainfall intensity. It was noted that for both stations the best correlation between rainfall intensity and RDII was found when the average intensity for previous 24-hour period was considered.

The correlation between RDII for the storms observed are shown in Attachment 3.

The best fit correlations were:

- SS1: $Q_{RDII} = 14.1 \times i$ and
- SS2: $Q_{RDII} = 5.58 \times i$

Where discharge, Q is in L/s and rainfall intensity, i is in mm/hr.

It is noted that the peak RDII intensity observed for SS1 on 24 Mar 2025 is an outlier. Based on the observed storm intensity of 2.67 mm/hr, a RDII of 38 L/s would have been expected, compared to the 53 L/s observed. The higher intensity could be attributed to lift station operation over the period.

As developed from Agassiz historical data, the 5-yr, 24-hr rainfall is 3.8 mm/hr and the yr-2050 moderate emission climate change design is 5.5 mm/hr. (PCIC, 2025)

Using the design rainfall intensity of 5.5 mm/hr, the following RDII values are derived from the data.

Table 6: Design RDII rates (from flow monitoring)

Catchment	SS2	SS1	Units
Design RDII Rate based on serviced lot area	77,500	63,400	L/ha/day

Design RDII Rate based on gross catchment area	63,000	48,000	L/ha/day
Design RDII	31	78	L/s

4. CONCLUSIONS

The following data from the flow monitoring will be used for modelling:

- BSF rate 160 L/PE/day for metered and 190 L/PE/day for unmetered (BSF/BD ratio of 80%)
- Global GWI rate of 2000 L/ha/day will be applied to serviced lot areas.
- GWI load of 7.3 L/s will be applied at HHSR
- Additional BSF loads of 0.55 L/s and 4.17 L/s will be applied at HHP and HHSR, respectively.
- Design existing RDII rate of 63,400 L/ha/day of serviced area will be applied to the system, except for SS2 catchment where a higher rate of 77,500 L/ha/day will be applied.

WATER STREET ENGINEERING LTD.

Neal Whiteside, MASc, PEng
Sr Municipal Engineer

Laura Christensen
Project Manager

EGBC permit to practice number 1000830

ATTACHMENTS

Attachment 1: Flow Monitoring Site Details (from SFE Global)

Attachment 2: Sanitary Sewer Flow Monitoring Graphs

Attachment 3: RDII Analysis

REFERENCES

CTQ Consultants Ltd. (Dec 2016). *Liquid Waste Management Plan*. Village of Harrison Hot Springs.

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ABBREVIATIONS

ADWF – Average Dry Weather Flow
AV – area velocity
BD – Base Demand (Water)
BSF – Base Sanitary Flow
CRIM – Centre de Recherche Informatique de Montréal
ECCC – Environment and Climate Change Canada
GWI – Groundwater Infiltration
HHP – Harrison Holiday Park
HHSR – Harrison Hot Springs Resort
ICI – Industrial, Commercial, and Institutional
LS – Lift Station
MNF – Minimum Night Flow
PCC – Prairie Climate Centre
PCIC – Pacific Climate Impacts Consortium
PDWF – Peak Dry Weather Flow
PWWF – Peak Wet Weather Flow
RDII – rainfall derived infiltration and inflow
SS – Sanitary monitoring site

STATEMENT OF LIMITATIONS

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REVISION HISTORY

Version	Status	Date	Description of Revisions	Author
A	Draft	29 Sep 2025	Original	NW

https://wopi.dropbox.com/wopi/files/oid_4011581495531058944/WOPIServiceId_TP_DROPBOX_PLUS/WOPIUserId_680855889/Flow Monitoring Data Analysis.docx

Site Details Sheet

CLIENT MONITORING #: 506G
NAME: Harrison Hot Springs Flow Monitoring
SFE PROJECT #: 506G
SFE SITE #: 506G Rain Gauge

Project Specific Information

Client Name:	Water Street Engineering	
End User Name:	Village of Harrison Hot Springs	
Project Name:	Sanitary and Storm Master Plan	
Client Contact:	Neal Whiteside	
Field Contact:	Jace Hogdson	
SFE PM Contact:	Glenn Cumyn	Sam Cumyn
Site Maintenance:	as required	

Site Location Information

Client Site Name/ #:	506G	
Street Address:	Miami River Dr & McCombs Dr	
City, Province:	Harrison Hot Springs, BC	
GPS (North - West):	49.29665	-121.777416
Landmarks:	Pump Station	
Traffic Control Req's:	No Traffic	
Additional Information:	Inside locked pump station.	

Site Equipment

Installation Date:	January 24, 2025	
Removal Date:	May 24, 2025	
Meter Make & Model:	ISCO Interface Module	
Meter ID - #1:	506G Rain Gauge	
Meter ID - #2:	N/A	
Wireless ID #:	506G Rain Gauge	
Cellular #:	N/A	
Level / Velocity Type:	n/a	n/a
Sensor Mounting:	other	
Primary Device:	Rain Gauge	
Logging Rate / Call out:	5 minute	24hr

Site Profile

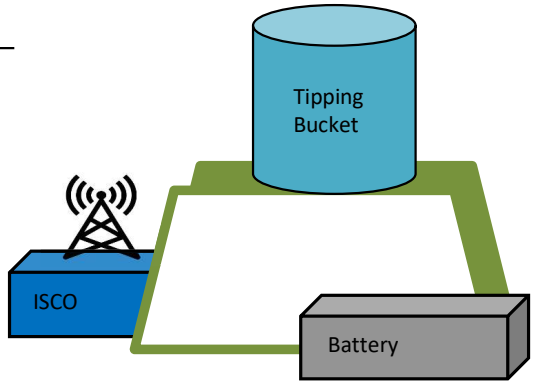
Overall Site Condition:	Good	
Access:	Other	
Invert Distance (cm):	N/A	
Overall Pipe Condition:		
Per Tip (mm):	#1:	0.25
	#2	N/A
Sensor (x)	#3:	N/A
	#4:	N/A
Additional Information:	N/A	

all setup by SFE, located in city pump station

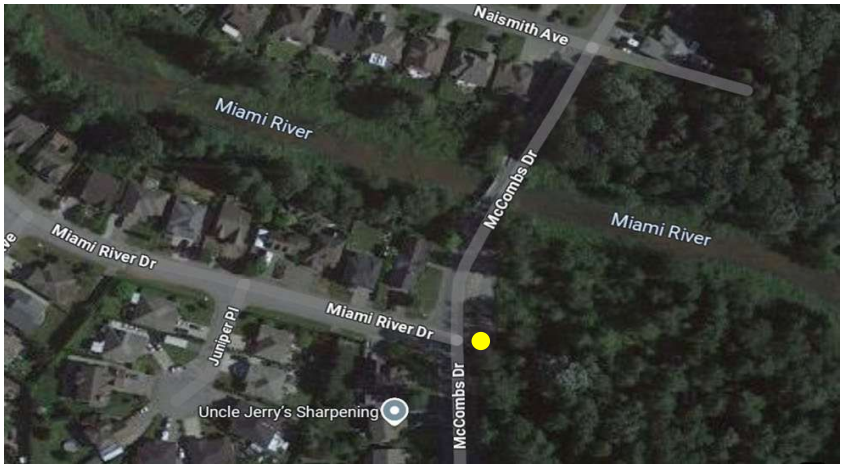
Site Set up

Sensor in Pipe #: 0.25mm Per Tip

Sensor Placement: Leveled Ground



Map



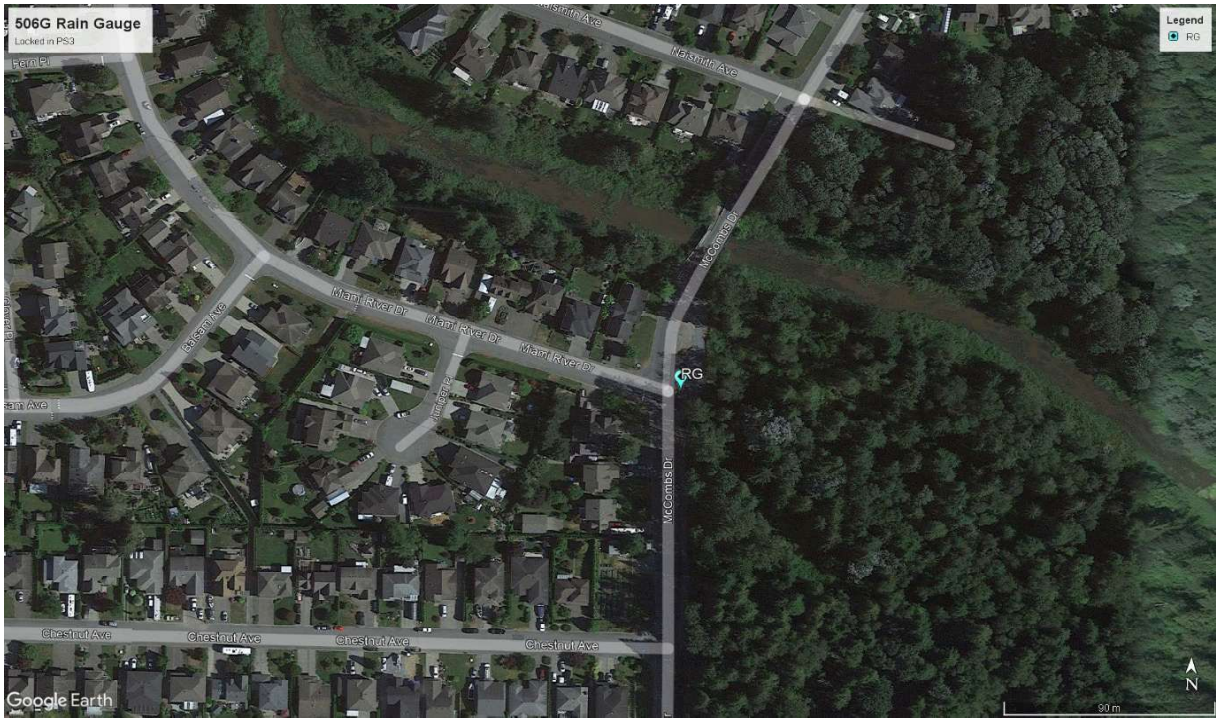
N

Site Pictures

CLIENT MONITORING #: 506G
NAME: Harrison Hot Springs Flow Monitoring
SFE PROJECT #: 506G
SFE SITE #: 506G Rain Gauge

Photo: Streetview Map

Map - Aerial



Site Pictures

CLIENT MONITORING #: 506G
NAME: Harrison Hot Springs Flow Monitoring

SFE PROJECT #: 506G
SFE SITE #: 506G Rain Gauge

Site Details Sheet

CLIENT MONITORING #:	**506G**	**SFE PROJECT #:**	**506G**
NAME:	**Harrison Hot Springs Sanitary Flow Monitoring**	**SFE SITE #:**	**Sani Site 1**

Project Specific Information

Client Name:	Water Street Engineering
End User Name:	Harrison Hot Springs
Project Name:	Temporary Flow Monitoring
Client Contact:	Neal Whiteside
Field Contact:	Jace Hogdson
SFE PM Contact:	Sam Cumyn
Site Maintenance:	as required

Site Location Information

Client Site Name/ #:	N/A	
Street Address:	Cedar Ave & St. Alice St	
City, Province:	Harrison Hot Springs, BC	
GPS (North - West):	49.302187	-121.788143
Landmarks:	N/A	
Traffic Control Req's:	Local Traffic	
Additional Information:	N/A	
Sewer Type:	Sanitary	

Site Equipment

Installation Date:	January 23, 2025	
Removal Date:	May 23, 2025	
Meter Make & Model:	ISCO 2150	
Meter ID - #1:	506G Sani Site 1	
Meter ID - #2:	506G Sani Site 1	
Wireless ID #:	506G Sani Site 1	
Cellular #:	SFEBC	
Level / Velocity Type:	Submerged	AV Sensor
Sensor Mounting:	Compression	
Primary Device:	Area Velocity	
Logging Rate / Call out:	5 minute	24hr

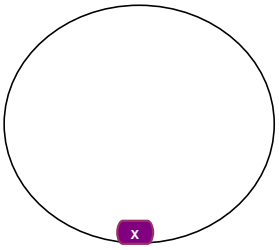
Site Profile

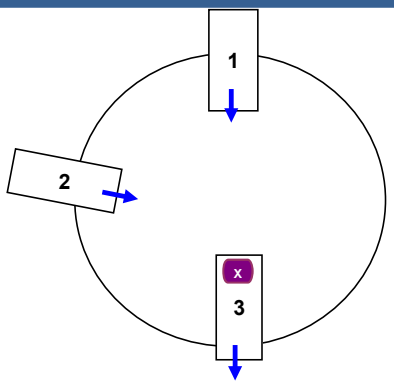
Overall Site Condition:	Good	
Access:	Road	
Invert Distance (cm):	210	
Overall Pipe Condition:	Good	
Pipe Size (mm): #1:	350	
#2	250	
Sensor (x) #3:	x ~~250~~ 350	
#4:	N/A	
Additional Information:	Sensor downstream.	

Site Set up

Sensor in Pipe #: #3 350mm outlet

Sensor Placement: Bottom Center





Map

Site Pictures

CLIENT MONITORING #: 506G
NAME: Harrison Hot Springs Sanitary Flow Monitoring
SFE PROJECT #: 506G
SFE SITE #: Sani Site 1

Photo: Streetview Map

Photo: Sewer Map N/A

Site Pictures

CLIENT MONITORING #: 506G
NAME: ırrison Hot Springs Sanitary Flow Monitorir

SFE PROJECT #: 506G
SFE SITE #: Sani Site 1

Photo: Surrounding Area

Photo: Inside MH prior to installation

Photo: Inside MH after installation

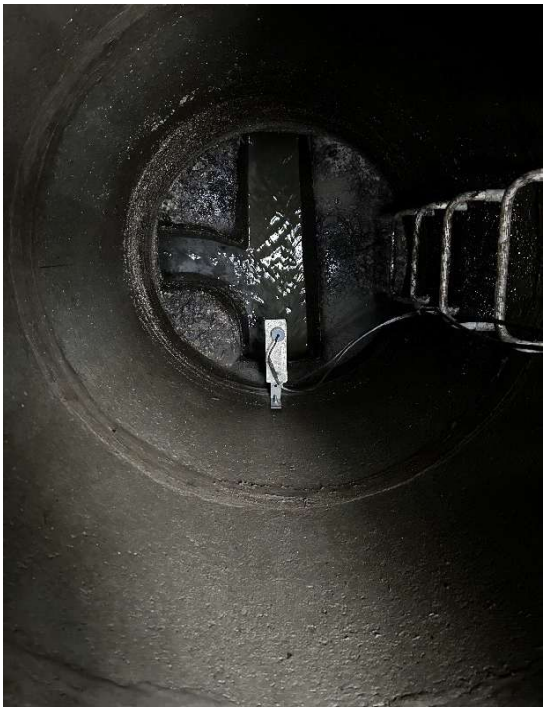


Photo: MH with equipment & battery

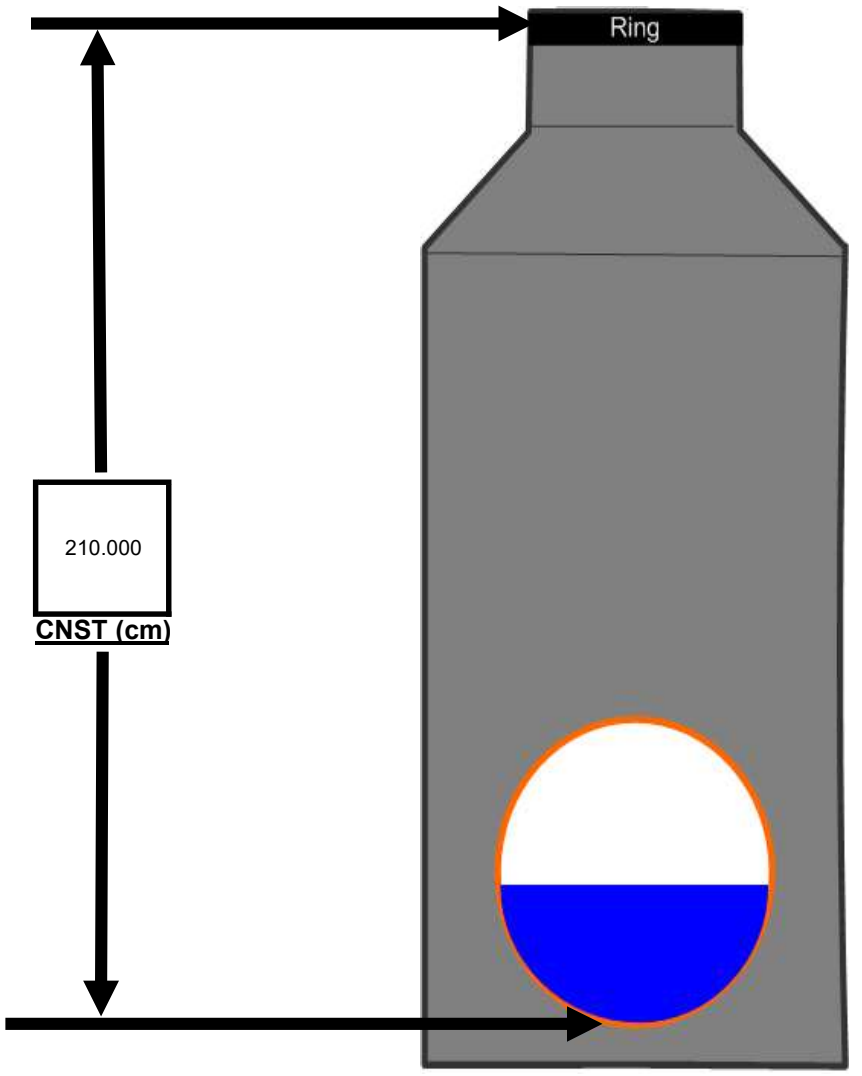
Install Sheet

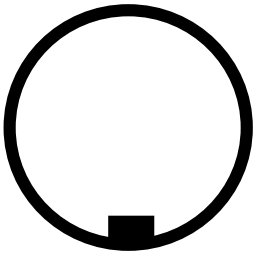
CLIENT FLOW MONITORING #: 506G
NAME: arrison Hot Springs Sanitary Flow Monitorin

SFE PROJECT #: 506G
SFE SITE #: Sani Site 1
Technician 1: Sam Cumyn
Technician 2: Sachin Ahlwat
Technician 3:

Meter Depth vs. Field Depth Calibration / Verification

Reading Number	Date (m/d/yyyy)	Time (hh:mm)	Field Meas (cm)	Meter Depth (cm)	Comments (Zero Meter Level before Installation)
Initial	1-23-2025	13:35	18.2	18.2	Installed AV sensor & US Velocity Reading (m/s): 0.248
1		(PST)	18.2	18.0	Level Offset +2000mm for AV. 506G Sani Site 1
2			18.2	18.2	US no offset.
3			18.2	18.2	Pipe Diameter (mm) = 350mm outlet
Average			18.2	18.1	Installed sensor downstream. Surcharge evidence.





Sensor Location

Site Details Sheet

CLIENT MONITORING #: 506G
NAME: Harrison Hot Springs Sanitary Flow Monitoring

SFE PROJECT #: 506G
SFE SITE #: Sani Site 2

Project Specific Information

Client Name:	Water Street Engineering
End User Name:	Harrison Hot Springs
Project Name:	Sanitary Sewer Master Plan
Client Contact:	Neal Whiteside
Field Contact:	Jace Hogdson
SFE PM Contact:	Sam Cumyn
Site Maintenance:	as required

Site Location Information

Client Site Name/ #:	MH16	
Street Address:	760 McCombs Dr.	
City, Province:	Harrison Hot Springs, BC	
GPS (North - West):	49.290230	-121.777550
Landmarks:	N/A	
Traffic Control Req's:	Full Traffic TMP req.	
Additional Information:	N/A	
Sewer Type:	Sanitary	

Site Equipment

Installation Date:	February 4, 2025	
Removal Date:	May 4, 2025	
Meter Make & Model:	ISCO 2150	
Meter ID - #1:	506G Sani Site 2	
Meter ID - #2:	506G Sani Site 2	
Wireless ID #:	506G Sani Site 2	
Cellular #:	SFEBC	
Level / Velocity Type:	Submerged	AV Sensor
Sensor Mounting:	Compression	
Primary Device:	Area Velocity	
Logging Rate / Call out:	5 minute	24hr

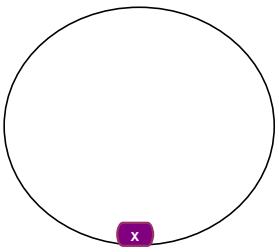
Site Profile

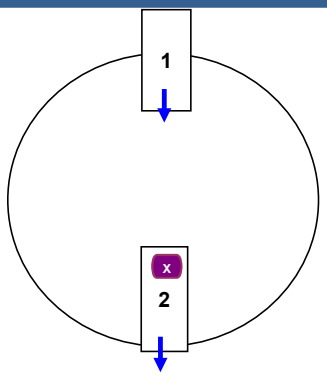
Overall Site Condition:		Good	
Access:		Road	
Invert Distance (cm):		120	
Overall Pipe Condition:		Good	
Pipe Size (mm):	#1:		300
	#2	x	300
Sensor (x)	#3:		N/A
	#4:		N/A
Additional Information:		Sensor downstream.	

Site Set up

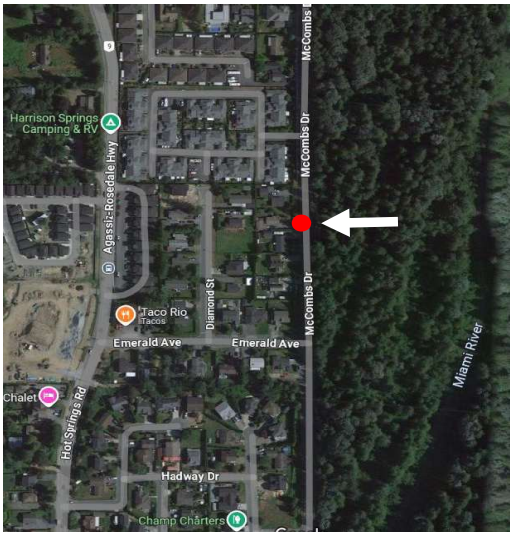
Sensor in Pipe #: #2 300mm outlet

Sensor Placement: Bottom Center





Map

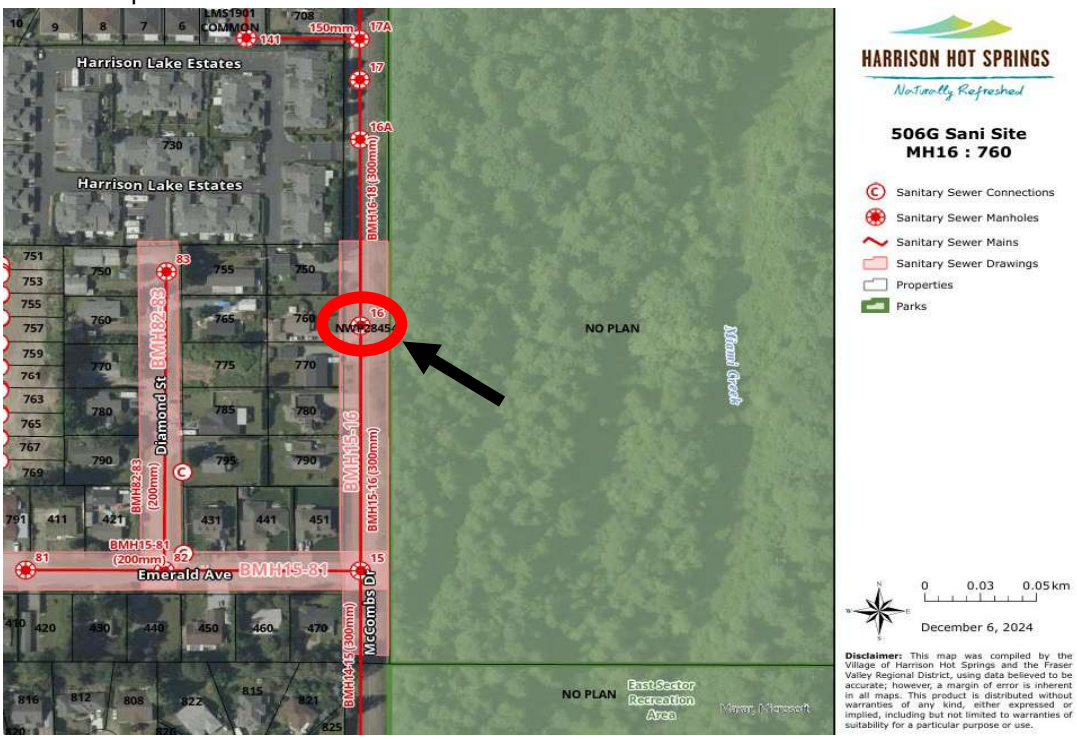


Site Pictures

CLIENT MONITORING #:	**506G**	**SFE PROJECT #:**	**506G**
NAME:	**Harrison Hot Springs Sanitary Flow Monitoring**	**SFE SITE #:**	**Sani Site 2**

Photo: Streetview Map

Photo: Sewer Map



Site Pictures

CLIENT MONITORING #: 506G
NAME: Harrison Hot Springs Sanitary Flow Monitoring
SFE PROJECT #: 506G
SFE SITE #: Sani Site 2

Photo: Surrounding Area

Photo: Inside MH prior to installation

Photo: Inside MH after installation

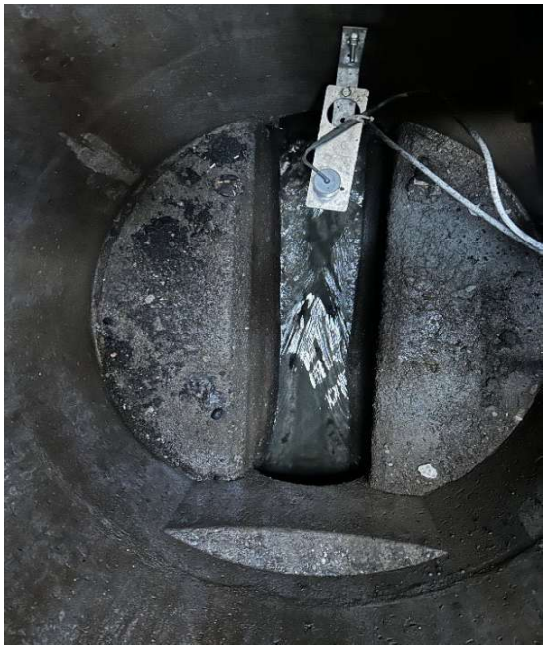


Photo: MH with equipment & battery

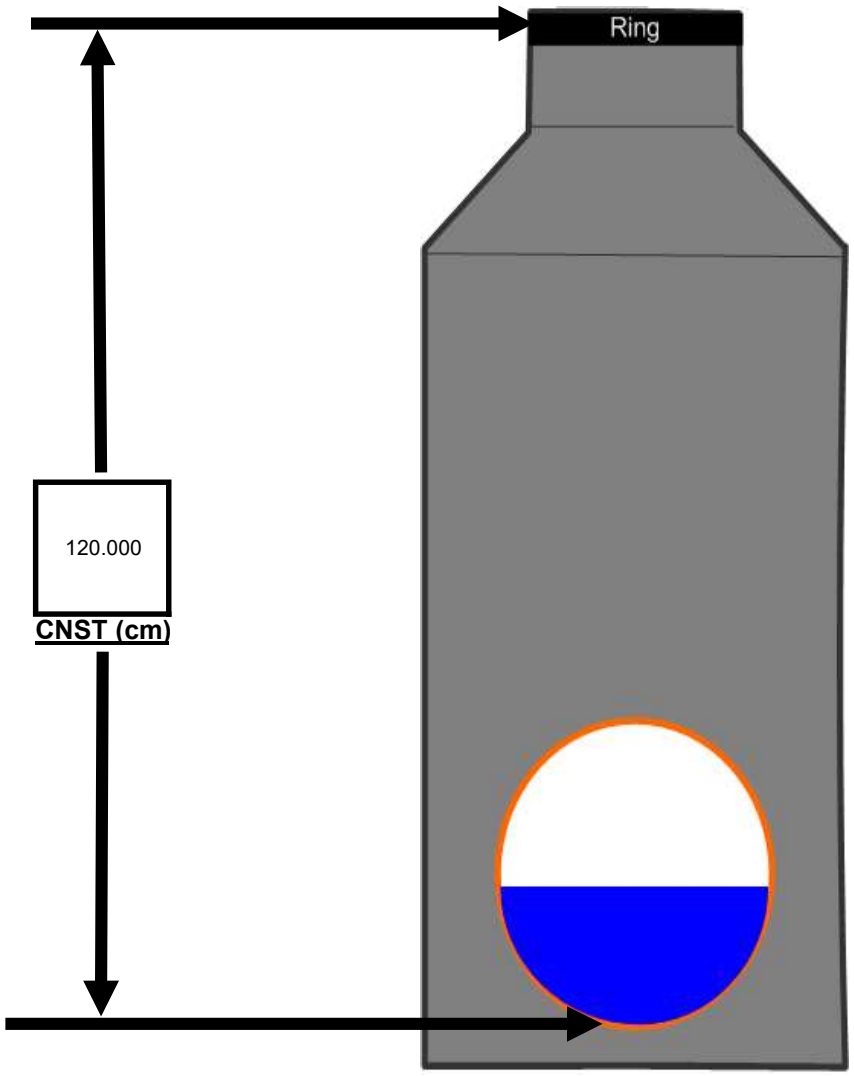
Install Sheet

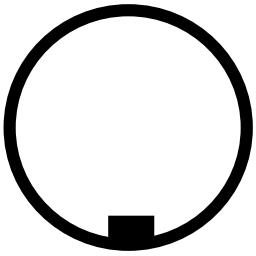
CLIENT FLOW MONITORING #: 506G
NAME: Harrison Hot Springs Sanitary Flow Monitoring

SFE PROJECT #: 506G
SFE SITE #: Sani Site 2
Technician 1: Sam Cumyn
Technician 2: Sachin Ahlwat
Technician 3:

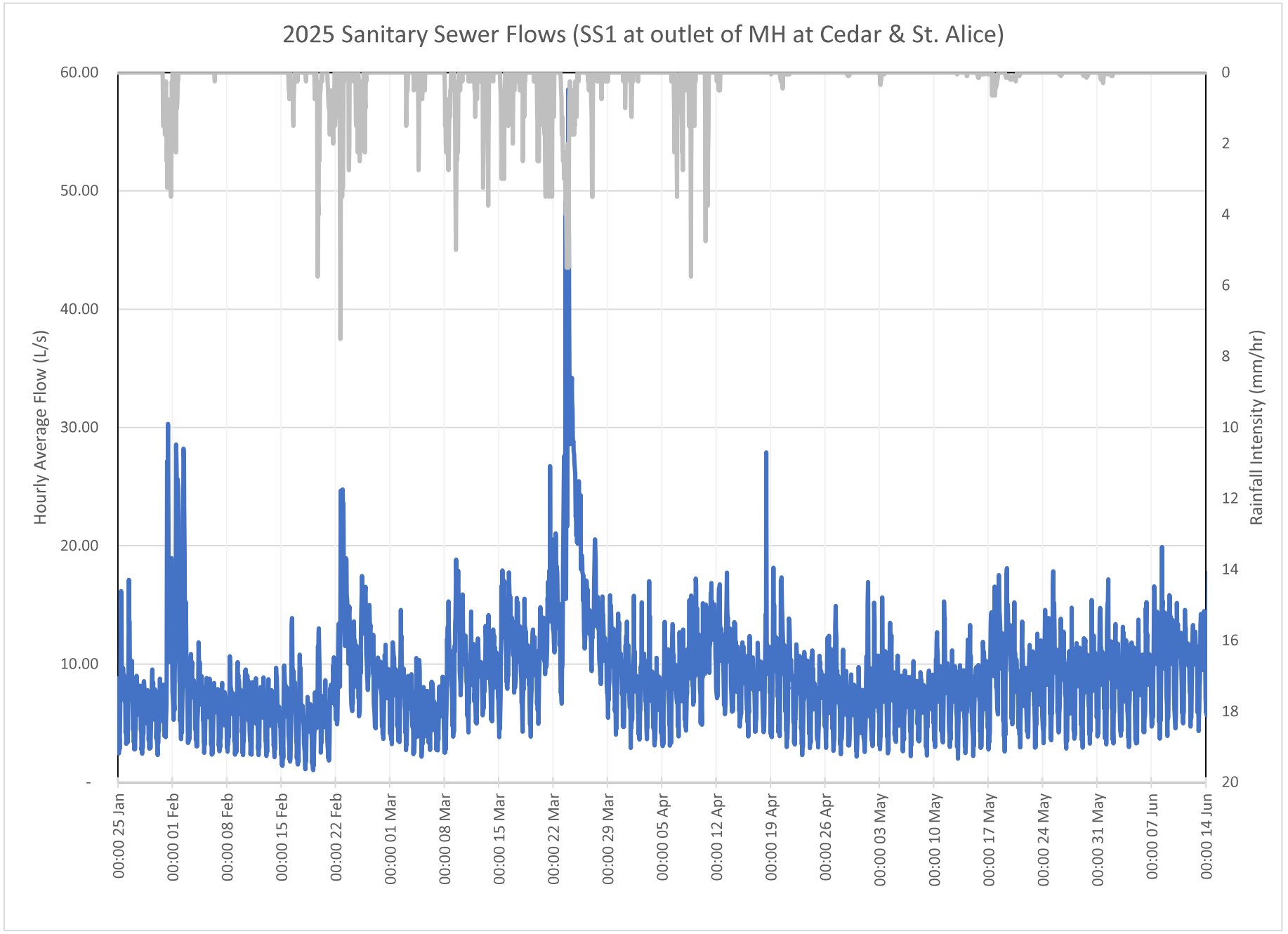
Meter Depth vs. Field Depth Calibration / Verification

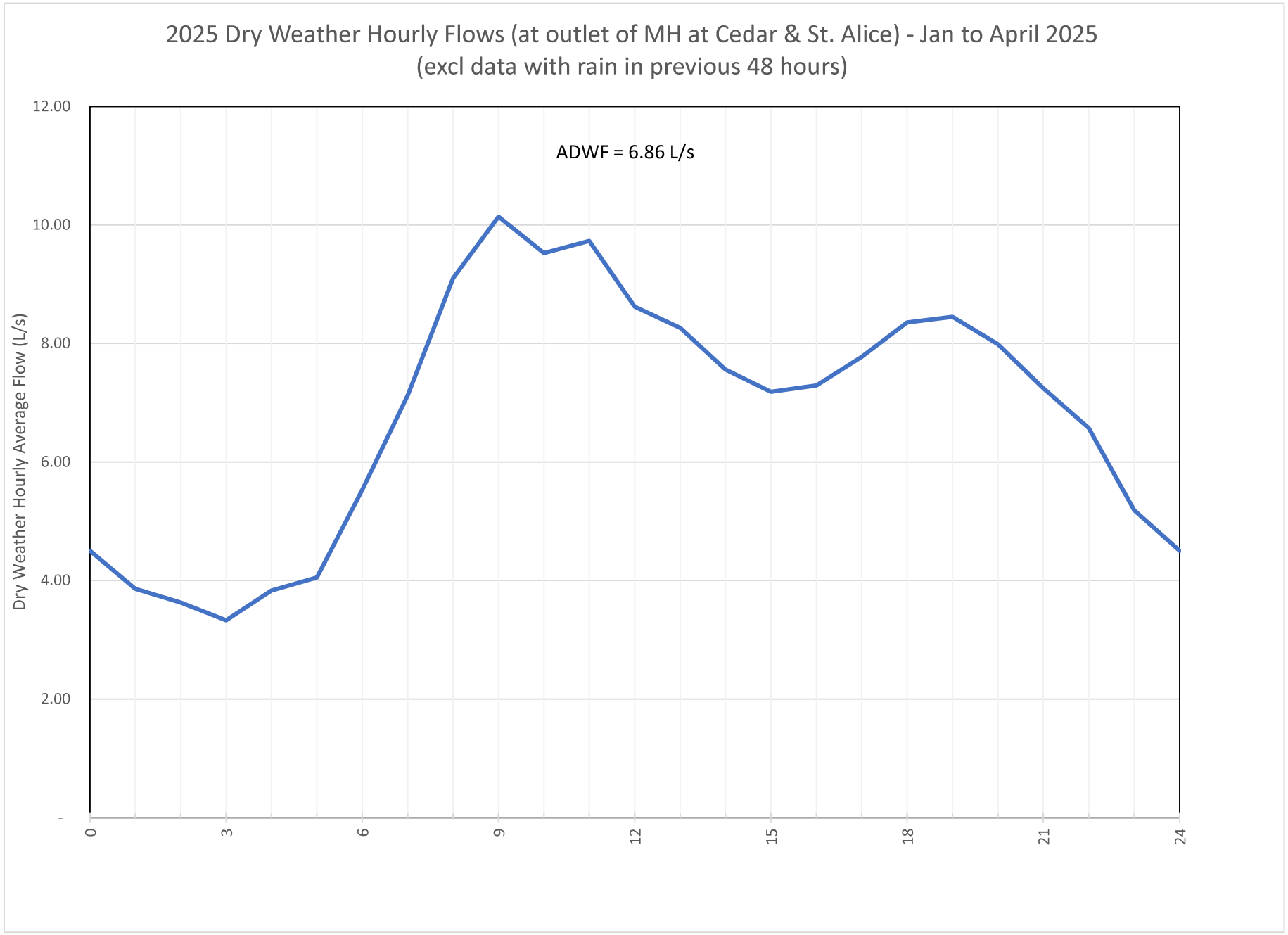
Reading Number	Date (m/d/yyyy)	Time (hh:mm)	Field Meas (cm)	Meter Depth (cm)	Comments (Zero Meter Level before Installation)
Initial	2-4-2025	11:10	3.0	3.0	Installed AV sensor & US Velocity Reading (m/s): 0.080
1		(PST)	3.0	3.0	Level Offset +2000mm for AV. 506G Sani Site 2
2			3.0	3.0	US no offset.
3			3.0	3.0	Pipe Diameter (mm) = 300mm outlet
Average			3.0	3.0	Installed sensor downstream.

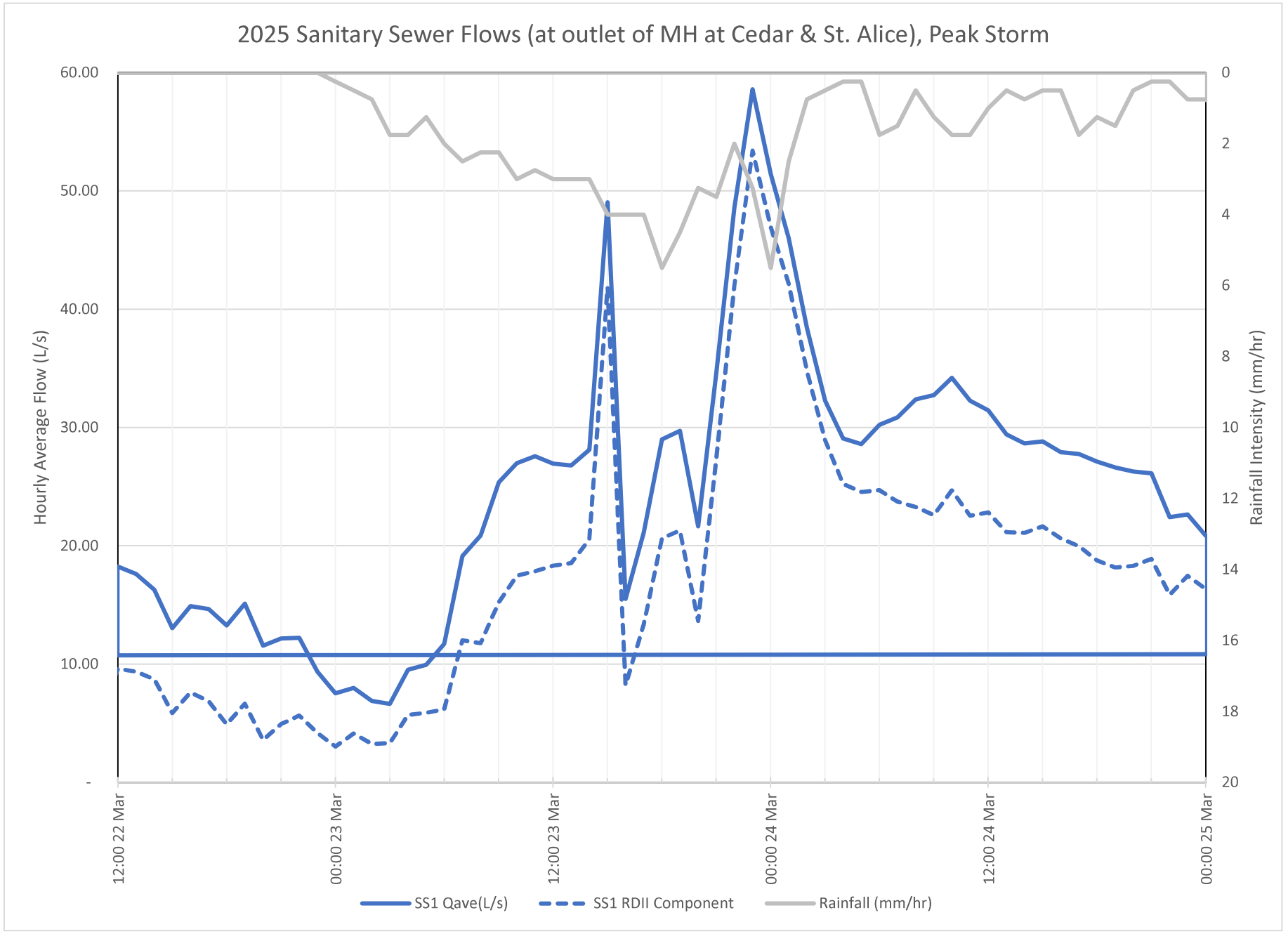


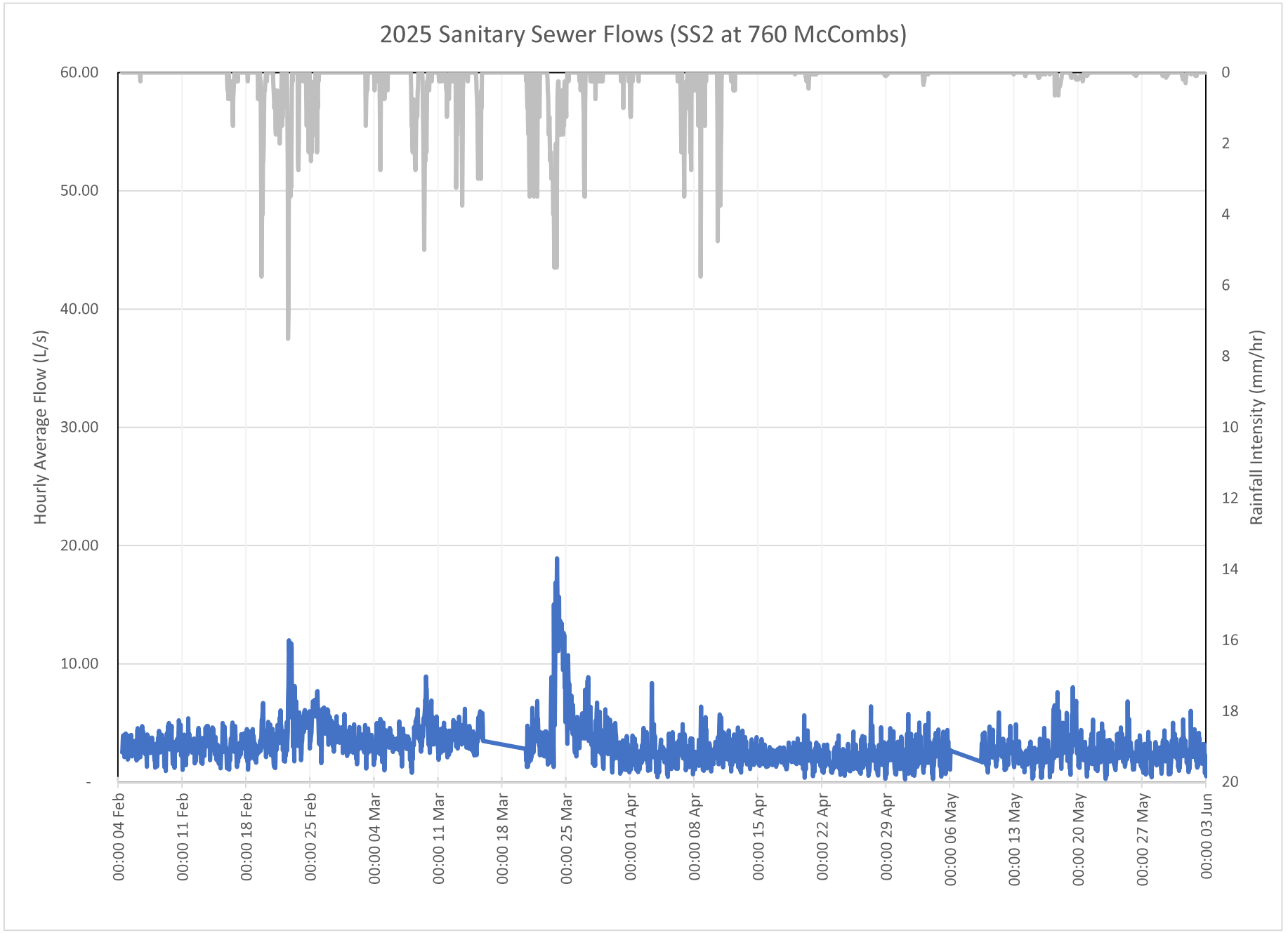


Sensor Location


2025 Sanitary Sewer Flows (SS1 at outlet of MH at Cedar & St. Alice)
Hourly Average Flow (L/s)
Rainfall Intensity (mm/hr)
60.00
50.00
40.00
30.00
20.00
10.00
-
0
2
4
6
8
10
12
14
16
18
20
00:00 25 Jan
00:00 01 Feb
00:00 08 Feb
00:00 15 Feb
00:00 22 Feb
00:00 01 Mar
00:00 08 Mar
00:00 15 Mar
00:00 22 Mar
00:00 29 Mar
00:00 05 Apr
00:00 12 Apr
00:00 19 Apr
00:00 26 Apr
00:00 03 May
00:00 10 May
00:00 17 May
00:00 24 May
00:00 31 May
00:00 07 Jun
00:00 14 Jun


2025 Dry Weather Hourly Flows (at outlet of MH at Cedar & St. Alice) - Jan to April 2025
(excl data with rain in previous 48 hours)
ADWF = 6.86 L/s
Dry Weather Hourly Average Flow (L/s)
12.00
10.00
8.00
6.00
4.00
2.00
-
0
3
6
9
12
15
18
21
24


2025 Sanitary Sewer Flows (at outlet of MH at Cedar & St. Alice), Peak Storm
Hourly Average Flow (L/s)
Rainfall Intensity (mm/hr)
60.00
50.00
40.00
30.00
20.00
10.00
-
0
2
4
6
8
10
12
14
16
18
20
12:00 22 Mar
00:00 23 Mar
12:00 23 Mar
00:00 24 Mar
12:00 24 Mar
00:00 25 Mar
SS1 Qave(L/s)
SS1 RDII Component
Rainfall (mm/hr)


2025 Sanitary Sewer Flows (SS2 at 760 McCombs)
Hourly Average Flow (L/s)
Rainfall Intensity (mm/hr)
60.00
50.00
40.00
30.00
20.00
10.00
-
0
2
4
6
8
10
12
14
16
18
20
00:00 04 Feb
00:00 11 Feb
00:00 18 Feb
00:00 25 Feb
00:00 04 Mar
00:00 11 Mar
00:00 18 Mar
00:00 25 Mar
00:00 01 Apr
00:00 08 Apr
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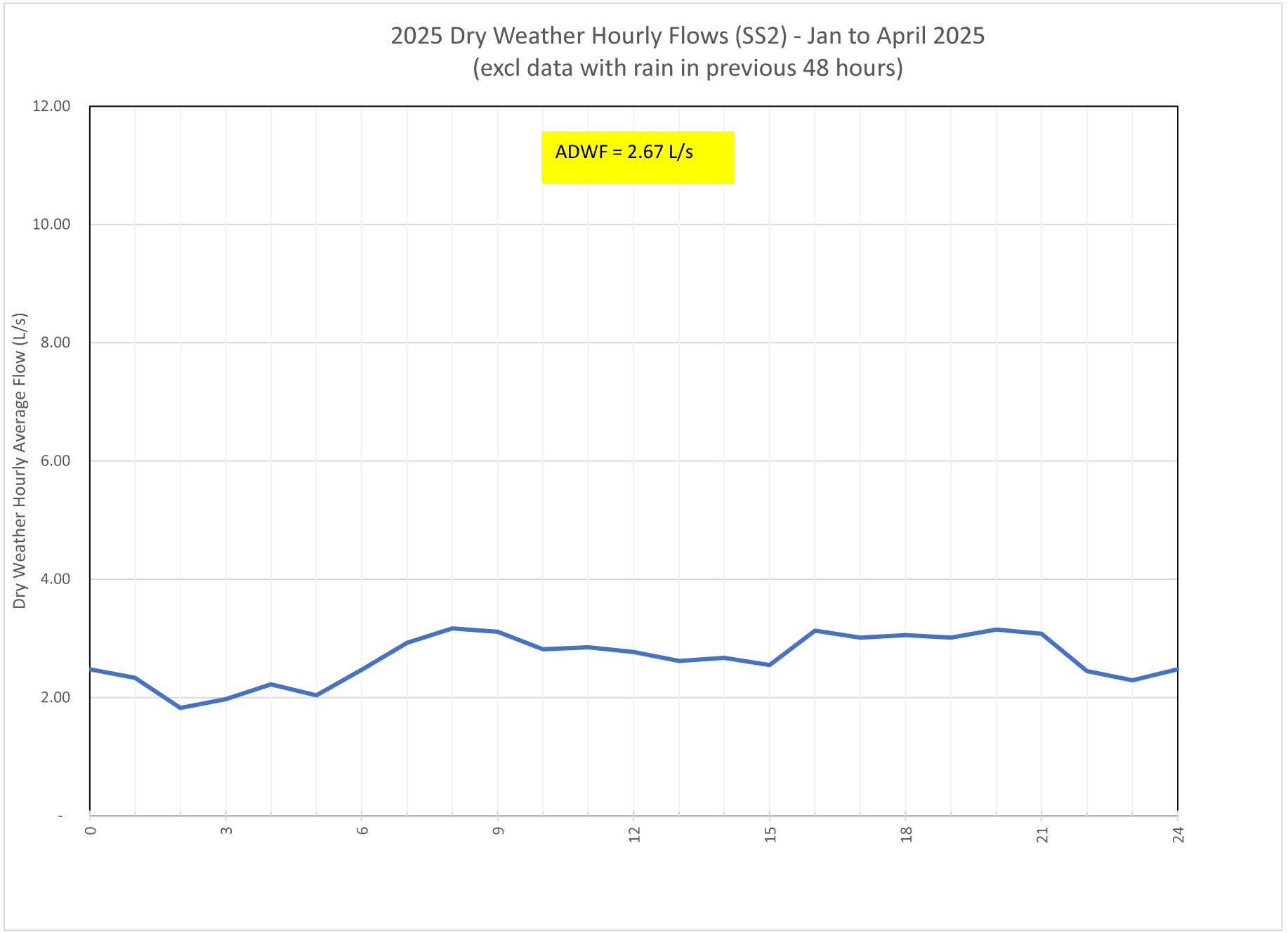
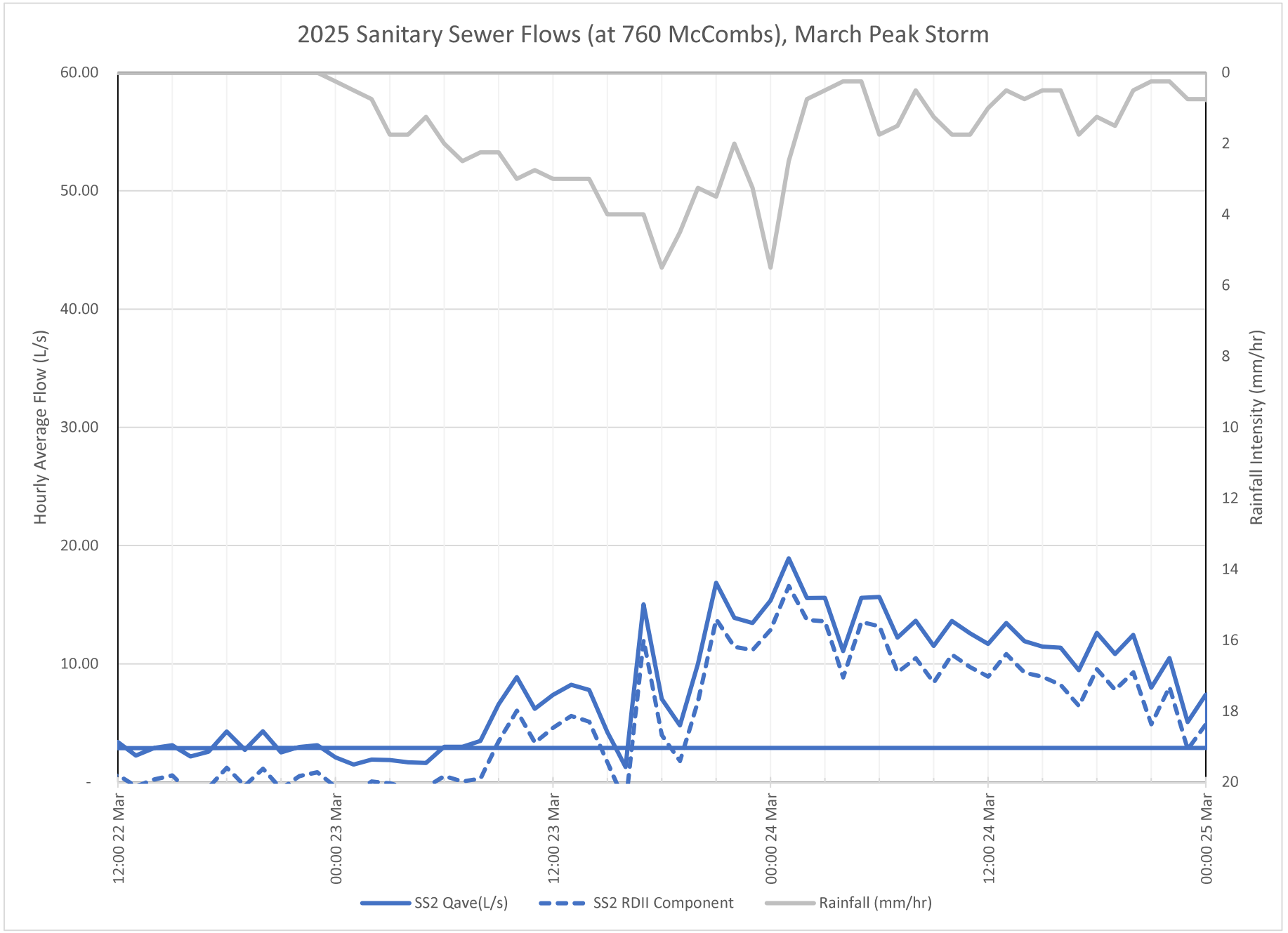
00:00 06 May
00:00 13 May
00:00 20 May
00:00 27 May
00:00 03 Jun


2025 Dry Weather Hourly Flows (SS2) - Jan to April 2025
(excl data with rain in previous 48 hours)
ADWF = 2.67 L/s
Dry Weather Hourly Average Flow (L/s)
12.00
10.00
8.00
6.00
4.00
2.00
-
0
3
6
9
12
15
18
21
24


2025 Sanitary Sewer Flows (at 760 McCombs), March Peak Storm
Hourly Average Flow (L/s)
Rainfall Intensity (mm/hr)
60.00
50.00
40.00
30.00
20.00
10.00
-
0
2
4
6
8
10
12
14
16
18
20
12:00 22 Mar
00:00 23 Mar
12:00 23 Mar
00:00 24 Mar
12:00 24 Mar
00:00 25 Mar
SS2 Qave(L/s)
SS2 RDII Component
Rainfall (mm/hr)

Water Street Engineering Ltd.
Project Title: Sanitary Sewer Master Plan - Flow Monitoring Data Analysis
Project #: 456
Purpose: *Summarizes the I&I values for observed storms*

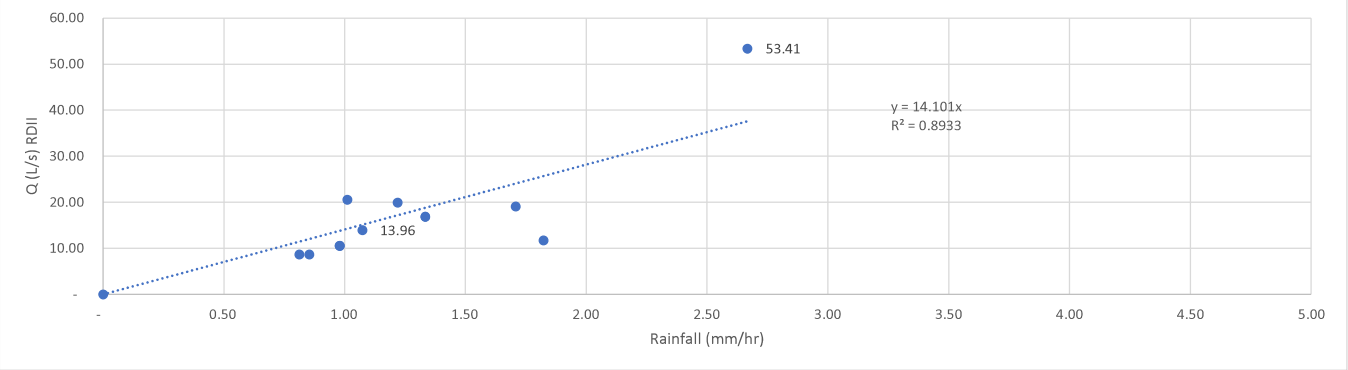
RDII Events recorded at SS1 — Rainfall Intensity (average over duration, in mm/hr)

Storm #	Date	r-1hr	r-2hr	r-4hr	r-6hr	r-12hr	r-24hr	I&I Peak Q-RDII (L/s)	Notes
0		-	-	-	-	-	-	-	
1	2025-01-31 11:00	0.75	1.13	1.88	1.92	1.52	1.01	20.58	
2	2025-01-31 21:00	2.50	3.00	2.44	2.54	2.10	1.82	11.72	
3	2025-02-01 12:00	2.00	2.13	1.13	0.79	0.42	1.22	19.93	
4	2025-02-22 17:00	2.25	4.50	4.81	3.38	1.73	1.33	16.89	
5	2025-02-22 17:00	2.25	4.50	4.81	3.38	1.73	1.33	16.89	
6	2025-02-23 0:00	1.75	2.50	2.44	2.54	3.06	1.71	19.11	
7	2025-03-09 13:00	4.00	4.50	3.50	2.54	1.27	0.98	10.57	
8	2025-03-09 13:00	4.00	4.50	3.50	2.54	1.27	0.98	10.57	
9	2025-03-15 18:00	0.50	1.75	1.25	1.13	1.56	0.81	8.66	
10	2025-03-16 8:00	-	0.25	0.50	0.38	0.23	0.85	8.65	
11	2025-03-21 22:00	0.75	2.13	1.56	1.54	1.35	1.07	13.96	
12	2025-03-23 23:00	3.25	2.63	3.00	3.67	3.58	2.67	53.41	

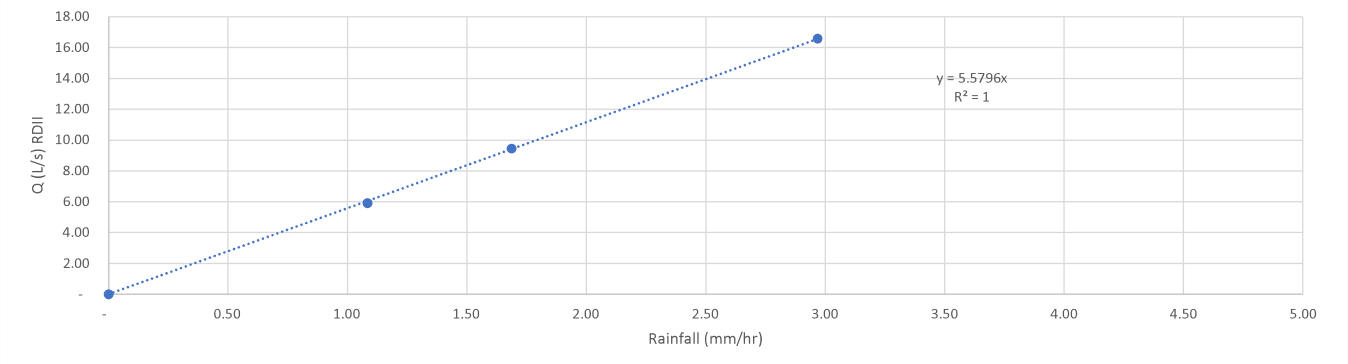
RDII Events recorded at SS2 — Rainfall Intensity (average over duration, in mm/hr)

Storm #	Date	r-1hr	r-2hr	r-4hr	r-6hr	r-12hr	r-24hr	I&I Peak Q-RDII (L/s)	Notes
0		-	-	-	-	-	-	-	
4	2025-02-22 23:00	3.25	2.25	2.81	2.46	2.92	1.69	9.45	
7	2025-03-09 17:00	1.75	1.88	2.13	2.92	1.98	1.08	5.92	
12	2025-03-24 1:00	2.50	4.00	3.31	3.33	3.75	2.97	16.59	

SS1 RDII vs average 24-hr rainfall intensity



SS2 RDII vs average 24-hr rainfall intensity



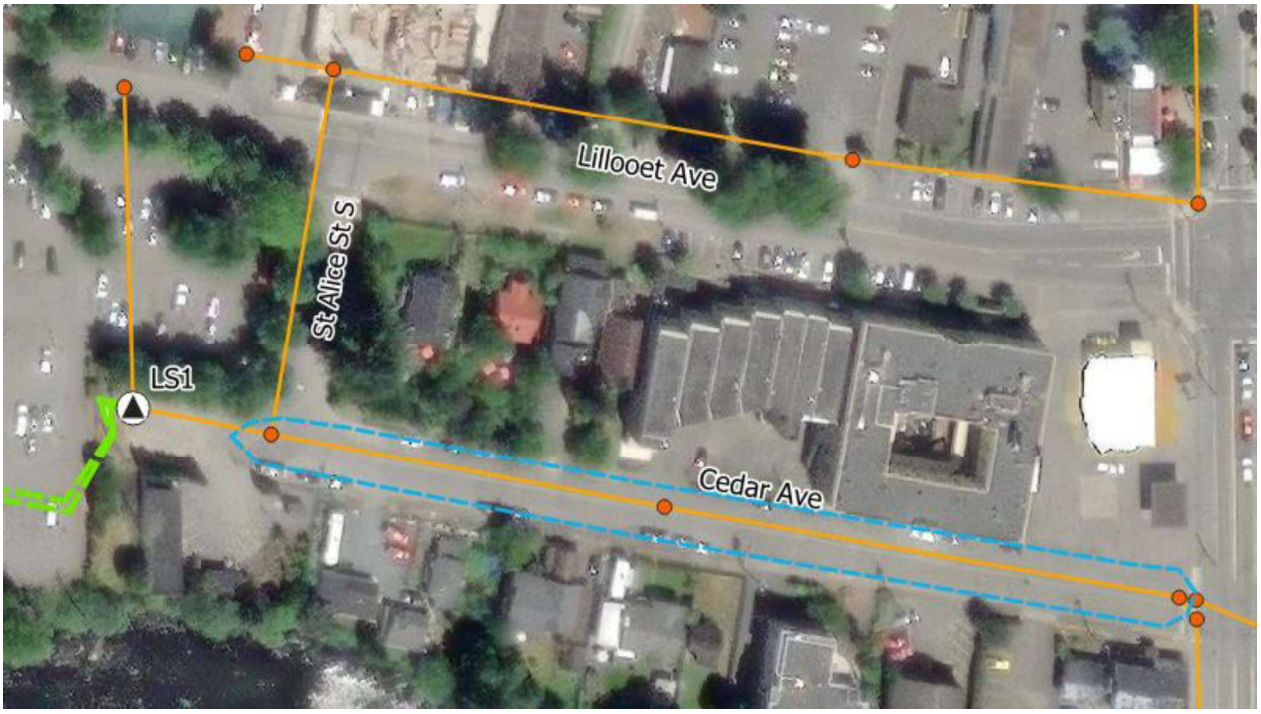
Notes: The I&I values indicate best correlation between rainfall and RDII for 24hr storm, indicating RDII is slow infiltration dominated.

https://wopi.dropbox.com/wopi/files/oid_4011581495391793920/WOPIServiceId_TP_DROPBOX_PLUS/WOPIUserId_-/[Flow Monitoring Data v2.xlsx]I&I Summary

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 4
Cedar Ave sewer improvements
Priority: High

Project Description: Replace 250 mm gravity sewer along Cedar Ave with 350 mm dia. to increase capacity and reduce risk of
Deficiency: Capacity exceedance along sewers
Additional Notes: Risk of surcharging upstream of LS1. Can be constructed concurrently with water main looping project discussed in the Water Master Plan (Water Street Engineering, 2025d).

Primary Justification: Address growth hydraulic deficiency
DCC Eligible: Yes
Grant Opportunities: Canada Community Building Fund, British



Assumptions: All manholes require replacement

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	350 mm Dia. Sanitary Sewer (2.5-3m)	m	83	$ 1,550.00	$ 128,805
2	350 mm Dia. Sanitary Sewer (2.5-3m)	m	109	$ 1,550.00	$ 168,950
3	1050 mm Dia. Manhole	ea.	3	$ 14,750.00	$ 44,250

Subtotal:		**$ 342,005**
Design / Construction Management / Contingency (%)	**50%**	**$ 171,003**
Total Estimated Cost:		**$ 513,008**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 5
Forcemain 3 improvements
Priority: High

Project Description: Replace 150 mm forcemain along Miami River Dr from LS3 with 250 mm dia. to increase LS3 capacity.
Deficiency: Capacity exceedance at LS3 and high velocity in FM3
Additional Notes: Existing FM constrains LS3 capacity. Original FM (1970s nearing end of service life). Avoids potential SSO at MH25 (upstream of LS3), as well as surcharging in LS3 and LS6, and surrounding gravity sewers. FM3 could be extended to Walnut Ave to address capacity deficiencies along Miami River Dr currently noted in
Primary Justification: Address existing hydraulic deficiency
DCC Eligible: No
Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund

Assumptions: Manholes and lift station will not be replaced.

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	250 mm Dia. Forcemain	m	209	$ 1,495.00	$ 312,904
			Subtotal:		**$ 312,904**
	Design / Construction Management / Contingency (%)			**50%**	**$ 156,452**
			Total Estimated Cost:		**$ 469,355**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 6
Hot Springs Rd sewer improvements
Priority: High

Project Description: Replace 250 mm sanitary gravity sewer along Hot Springs Rd with 350 mm dia. to increase capacity and reduce risk of surcharging at the Miami River Siphon.

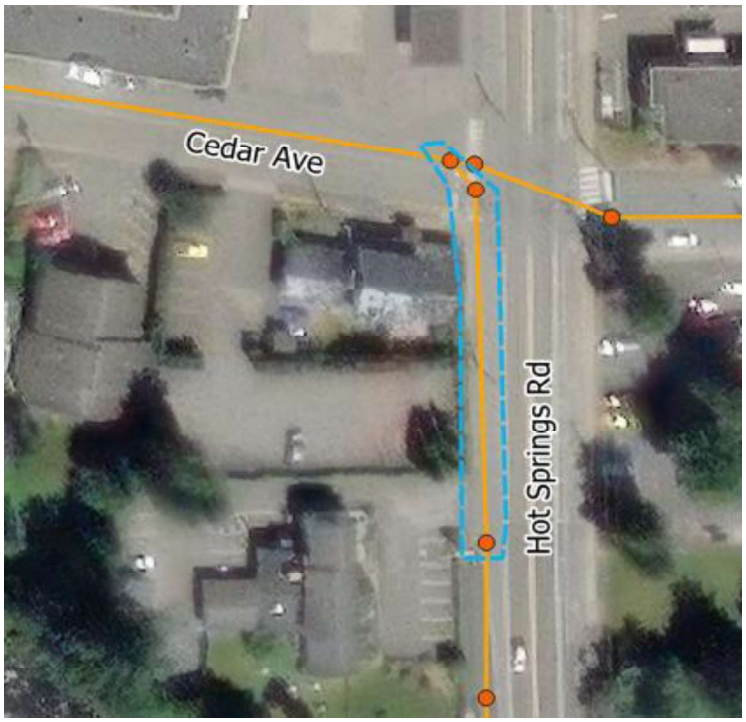
Deficiency: Capacity exceedance along sewers

Additional Notes: Risk of surcharging at Miami River Siphon.

Primary Justification: Address growth hydraulic deficiency

DCC Eligible: Yes

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund



Assumptions: All manholes require replacement

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	350 mm Dia. Sanitary Sewer (2.5-3m)	m	55	$ 1,550.00	$ 85,250
2	351 mm Dia. Sanitary Sewer (2.5-3m)	m	3.5	$ 1,550.00	$ 5,425
3	1050 mm Dia. Manhole	ea.	3	$ 14,750.00	$ 44,250
			Subtotal:		**$ 134,925**
	Design / Construction Management / Contingency (%)			**50%**	**$ 67,463**
			Total Estimated Cost:		**$ 202,388**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 7
Harrison Hot Springs Resort sewer flow investigation
Priority: High

Project Description: Directly monitor discharge from Harrison Hot Springs Resort service to fully characterize base flows and I&

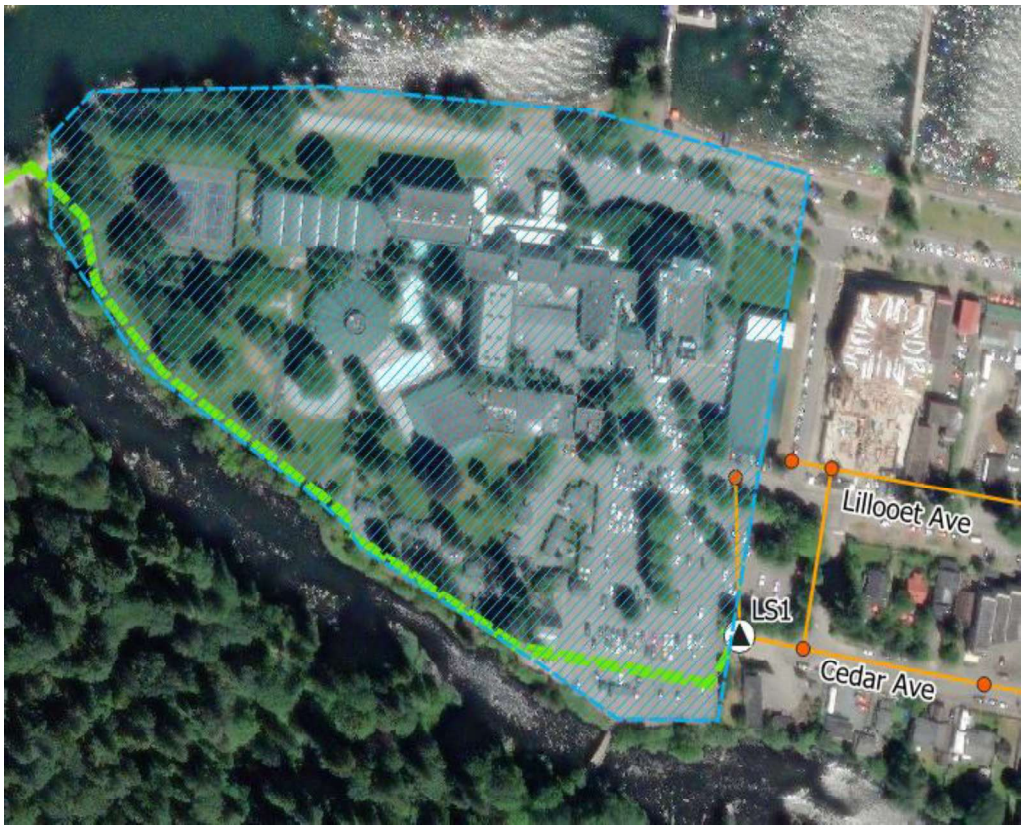
Deficiency: Significant source of additional base flows and I&I that is not fully characterized

Additional Notes: High inflows were back calculated from available monitoring data at SS1 and LS1.

Primary Justification: Reduce PWWF to maintain system capacity

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Infrastructure Planning Grant Program, Union of BC Municipalities Asset Management Planning Program



Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Sanitary flow monitoring - 6 months	-	1	$ 15,000.00	$ 15,000
			Subtotal:		**$ 15,000**
			Administration / Installation Contingency:	**20%**	**$ 3,000**
			Total Estimated Cost:		**$ 18,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 8
System-wide I&I Reduction Program
Priority: Medium

Project Description: Implement a system wide program to reduce existing I&I rates to achievable levels. Target of 22,000 L/ha/day (on gross area basis) for a 5-year storm. Recommended actions include CCTV of the entire catchment, smoke and dye testing, identifying and eliminating cross connections, using summertime flow monitoring to identify extent and tributary area of cross connections, and investigating storm drainage system improvements to mitigate inflows into the sanitary system. Costs from MV I&I Management template (Archetype E).

Deficiency: Existing 5-yr I&I rates are estimated as 50,000 L/ha/day and 65,000 L/ha/day (on gross area basis) for catchment areas SS1 and SS2, respectively.

Primary Justification: Reduce PWWF to maintain system capacity

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Targeted I&I Reduction	m	13600	$ 40.00	$ 544,000
2	Flow monitoring and analysis	-	1	$ 36,000.00	$ 36,000
			Subtotal:		**$ 580,000**
	Administration / Installation Contingency:		**incl.**		**$ -**
			Total Estimated Cost:		**$ 580,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 9
Lillooet Ave, Maple St, and Cedar Ave sewer improvements
Priority: Medium

Project Description: Replace 200 mm sanitary gravity sewer along Lillooet Ave, Maple St, and Cedar Ave with 250 mm dia. to increase capacity and reduce risk of surcharging.
Deficiency: Capacity exceedance along sewers
Additional Notes: Risk of surcharging along waterfront properties with LS1 Catchment.
Primary Justification: Address growth hydraulic deficiency
DCC Eligible: Yes
Grant Opportunities Canada Community Building Fund, British Columbia Growing Communties Fund

Assumptions: All manholes require replacement

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	250 mm Dia. Sanitary Sewer (0-2m)	m	102	$ 1,300.00	$ 132,470
2	250 mm Dia. Sanitary Sewer (2-2.5m)	m	92	$ 1,340.00	$ 123,816
3	250 mm Dia. Sanitary Sewer (2.5-3m)	m	87	$ 1,400.00	$ 121,800
4	250 mm Dia. Sanitary Sewer (2.5-3m)	m	86	$ 1,400.00	$ 120,120
5	250 mm Dia. Sanitary Sewer (2.5-3m)	m	21	$ 1,400.00	$ 29,400
6	250 mm Dia. Sanitary Sewer (2.5-3m)	m	3	$ 1,400.00	$ 4,200
7	1050 mm Dia. Manhole	ea.	7	$ 14,750.00	$ 103,250
			Subtotal:		**$ 635,056**
	Design / Construction Management / Contingency (%)			**50%**	**$ 317,528**
			Total Estimated Cost:		**$ 952,584**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 10
Miami River Dr sewer improvements
Priority: Medium

Project Description: Replace 350 mm gravity sewer along Miami River Dr with 450 mm dia. at steeper slope to increase capacity and reduce risk of surcharging. Can be combined with Project 20 and Project 21

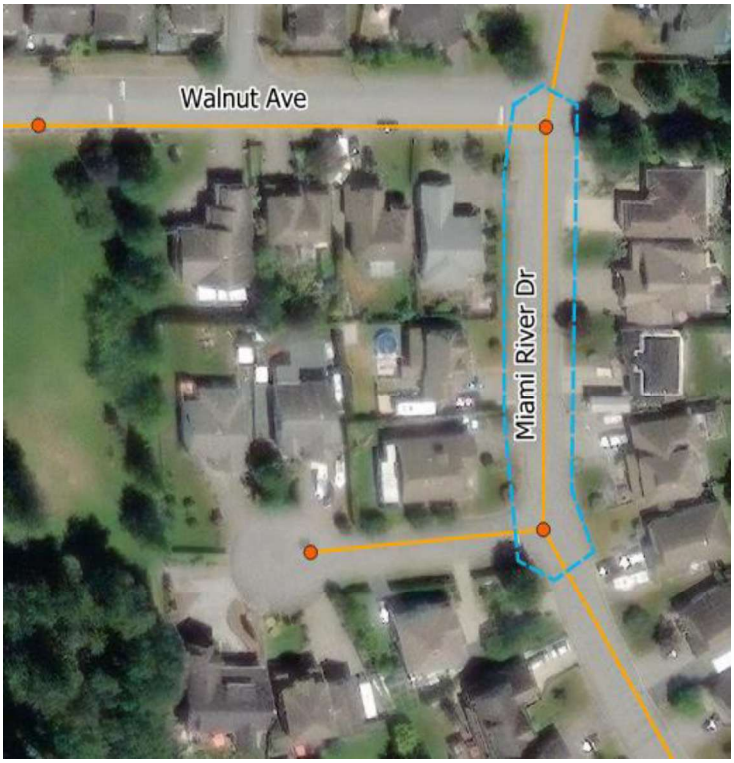
Deficiency: Capacity exceedance along sewers

Additional Notes: Capacity exceedance was identified due to a shallow sewer slope and increased discharge from LS3. Risk of surcharging along Miami River Dr. Capacity requirement could be reduced if FM3 is extended to Walnut Ave (ref Project 5).

Primary Justification: Address growth hydraulic deficiency

DCC Eligible: Yes

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund



Assumptions: All manholes require replacement.

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	450 mm Dia. Sanitary Sewer (0-2m)	m	87	$ 1,750.00	$ 152,600
2	1050 mm Dia. Manhole	ea.	2	$ 14,750.00	$ 29,500
			Subtotal:		**$ 182,100**
	Design / Construction Management / Contingency (%)			**50%**	**$ 91,050**
			Total Estimated Cost:		**$ 273,150**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 11
Harrison RV Country Club I&I investigation
Priority: Medium

Project Description: Directly monitor discharge from Harrison RV Country Club (398 Hot Springs Rd) service to fully characterize base flows and I&I.

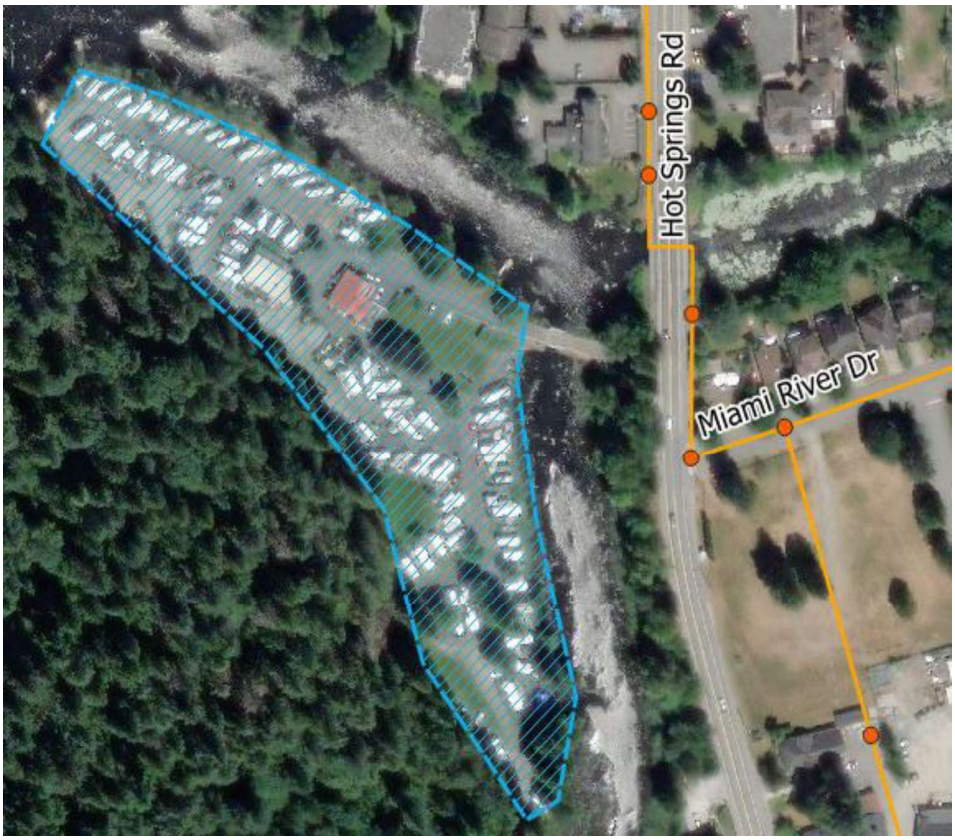
Deficiency: Potential source of I&I that is not characterized

Additional Notes: Details of runoff in Harrison RV Country Club are unknown and could result in high I&I. No known onsite storm sewer system.

Primary Justification: Reduce PWWF to maintain system capacity

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Infrastructure Planning Grant Program, Union of BC Municipalities Asset Management Planning Program



Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Sanitary flow monitoring - 6 months	-	1	$ 15,000.00	$ 15,000
			Subtotal:		**$ 15,000**
			Administration / Installation Contingency:	**20%**	**$ 3,000**
			Total Estimated Cost:		**$ 18,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 12
Springs RV Resort I&I investigation
Priority: Medium

Project Description: Directly monitor discharge from Springs RV Resort (670 Hot Springs Rd) service to fully characterize base flows and I&I.

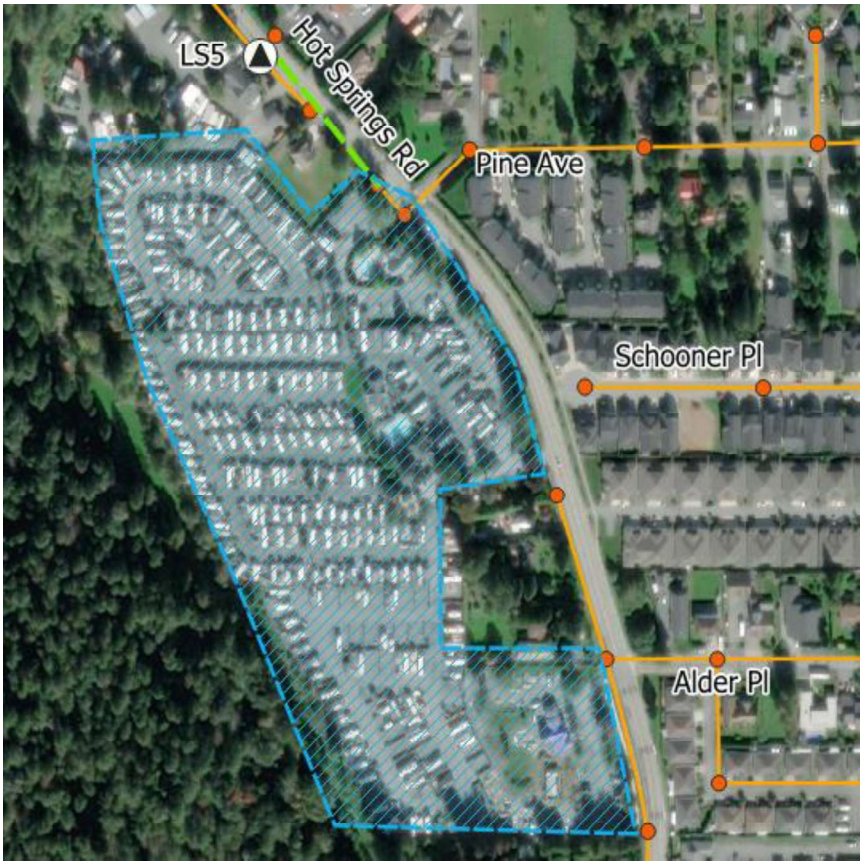
Deficiency: Potential source of I&I that is not characterized

Additional Notes: Details of runoff in Springs RV Resort are unknown and could result in high I&I. No known onsite storm sewer system.

Primary Justification: Reduce PWWF to maintain system capacity

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Infrastructure Planning Grant Program, Union of BC Municipalities Asset Management Planning Program



Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Sanitary flow monitoring - 6 months	-	1	$ 15,000.00	$ 15,000
			Subtotal:		**$ 15,000**
			Administration / Installation Contingency:	**20%**	**$ 3,000**
			Total Estimated Cost:		**$ 18,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 13
Harrison Holiday Park I&I investigation
Priority: Medium

Project Description: Directly monitor discharge from Harrison Holiday Park (973 Hot Springs Rd) at Manhole 14 on McCombs Dr to fully characterize base flows and I&I.

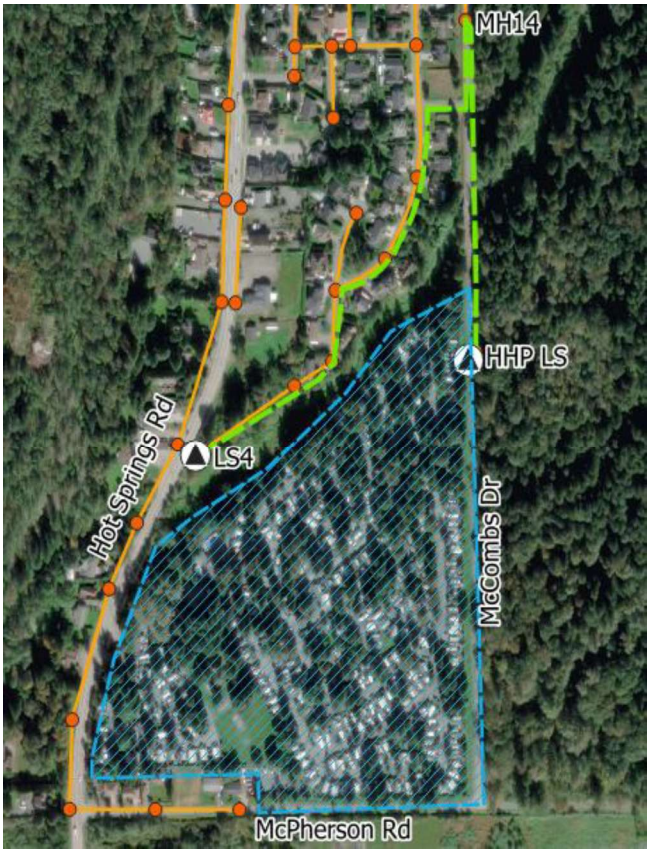
Deficiency: Potential source of I&I that is not characterized

Additional Notes: Details of runoff in HHP are unknown and could result in high I&I. No known onsite storm sewer system. Area of higher I&I from SS2 monitoring

Primary Justification: Reduce PWWF to maintain system capacity

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Infrastructure Planning Grant Program, Union of BC Municipalities Asset Management Planning Program



Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Sanitary flow monitoring - 6 months	-	1	$ 15,000.00	$ 15,000
			Subtotal:		**$ 15,000**
			Administration / Installation Contingency:	**20%**	**$ 3,000**
			Total Estimated Cost:		**$ 18,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 14
Miami River Siphon Inlet Chamber Improvements
Priority: Medium

Project Description: Install instrumentation to monitor water levels and notify of flooding or clogging of inlet trash rack. Adjustments could be made to trash rack for simpler maintenance.

Deficiency: Monitoring of levels to verify siphon performance, improvements to trash rack

Additional Notes: Improve maintainability of trash rack, settling chamber. Add instrumentation for alarming.

Primary Justification: Asset management / life cycle replacement

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Instrumentation allowance	-	1	$ 200,000.00	$ 200,000
			Subtotal:		**$ 200,000**
			Administration / Installation Contingency:	**20%**	**$ 40,000**
			Total Estimated Cost:		**$ 240,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 15
Emergency response plan
Priority: Medium

Project Description: Prepare more comprehensive Emergency Response Plan to outline responsibilities and actions in the case of an emergency situation impacting the storm or sanitary systems.

Deficiency: No existing response plan for storm or sanitary systems

Additional Notes: Water System Emergency Response Plan was last updated in January 2025 and could be used as a basis for a more comprehensive Emergency Response Plan.

Primary Justification: Emergency preparedness

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, Disaster Risk Reduction-Climate Adaptation

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Emergency Response Plan	-	1	$ 20,000.00	$ 20,000
			Subtotal:		**$ 20,000**
			Administration / Installation Contingency:	**20%**	**$ 4,000**
			Total Estimated Cost:		**$ 24,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 16
LS1 Forcemain replacement
Priority: Conditional

Project Description: Replace two parallel 200 mm forcemains from LS1 to the WWTP with 250 mm dia. to address pipe deterioration and improve capacity.

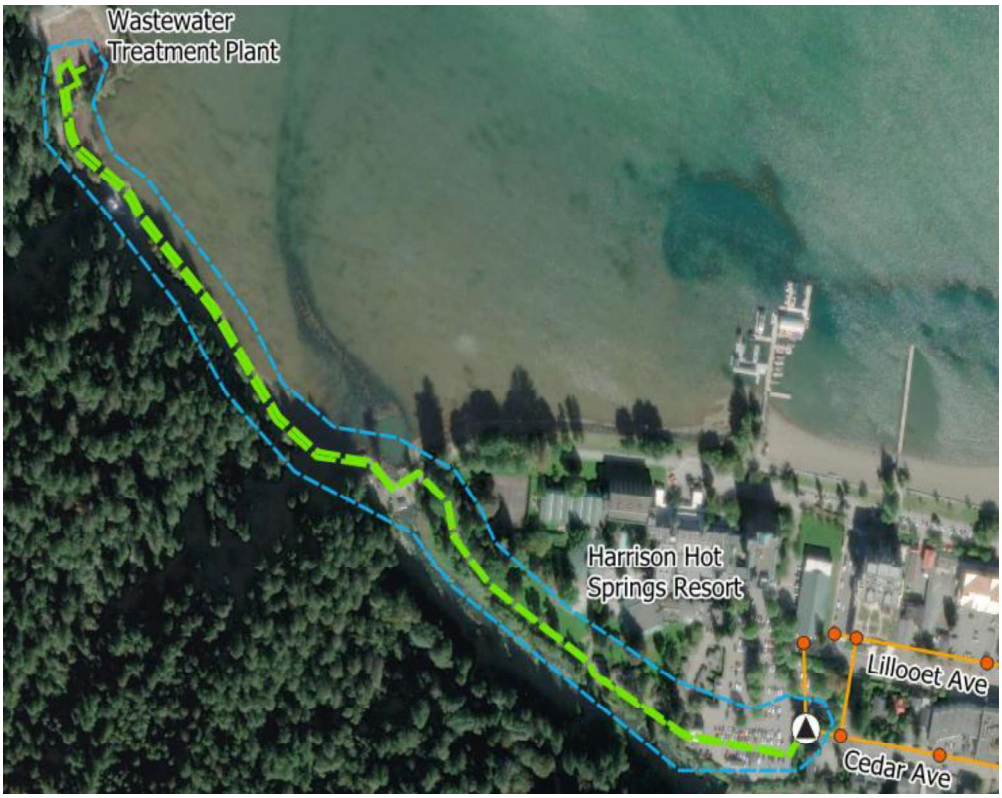
Deficiency: Condition of forcemain (leak history), and growth if I&I reduction targets can not be met.

Additional Notes: Forcemain condition is variable and was noted as aging with historical leaks by Village staff along the older PVC section (constructed in 1994). Modelling did not identify FM1 as a limit to the network capacity (subject to effectiveness of I&I reduction), but upsizing would be recommended if improvements are constructed. Priority would increase if condition warrants or I&I reduction is not successful.

Primary Justification: Asset management / life cycle

DCC Eligible: Yes (partial)

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund



Item No.	Description	Unit	Estimated Quantity (Total Length)	Estimated Unit Price	Estimated Amount
1	150 mm Dia. Force Main	m	1,820	TBD	
			Total Estimated Cost:		**TBD**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 17
Inventory, Survey, and Infrastructure Assessment
Priority: Medium

Project Description: Perform inventory survey that is compatible with modern GIS and design software. Material information, diameters, and elevations should be included with age of construction where possible.

Deficiency: Improve documentation of infrastructure

Additional Notes: Recommendation from 2016 LWMP, partially completed. Material information is still lacking.

Primary Justification: Asset documentation

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Infrastructure Planning Grant Program, Union of BC Municipalities Asset Management Planning Program

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Survey and data processing	-	1	$ 50,000.00	$ 50,000
				Subtotal:	**$ 50,000**
				Administration Contingency: 20%	**$ 10,000**
				Total Estimated Cost:	**$ 60,000**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 18
Inspect and maintain top end / dead end segments
Priority: Medium

Project Description: Periodic inspection by CCTV and flushing at regular intervals at dead-end sewer segments with low velocities.

Deficiency: Low flow velocity and capacity exceedances

Additional Notes: Recommendation from 2016 LWMP, status unknown.

Primary Justification: Monitor existing hydraulic deficiency

DCC Eligible: No

Grant Opportunities: n/a

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	Echo Ave	m	122	$ 10.00	$ 1,220
2	Lakeburg Cres	m	62	$ 10.00	$ 620
3	Miami River Dr	m	104	$ 10.00	$ 1,040
4	Rockwell Dr	m	146	$ 10.00	$ 1,460
5	Flushing	hr	8	$ 400.00	$ 3,200
			Subtotal:		**$ 7,540**
			Administration Contingency:	**20%**	**$ 1,508**
			Total Estimated Cost:		**$ 9,048**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 19
Miami River Siphon Replacement or 3rd pipe
Priority: Low

Project Description: Replace existing Miami River Siphon with 300 mm dia. Pipe. Construct new inlet chamber for the siphon and extend the siphons away from the Miami River.

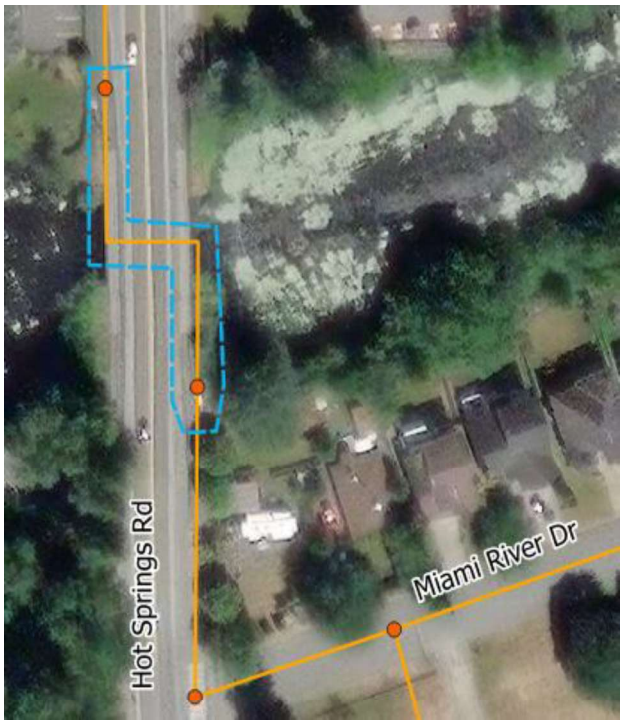
Deficiency: Capacity hydraulically adequate but subject to flooding, undersized compared to FM3 capacity.

Additional Notes: Capacity OK but marginal. Likely would be HDD construction. Requires further study to determine if required (condition of existing siphon).

Primary Justification: Asset management / life cycle replacement

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund



Assumptions: Adjustment for inflation based on ENR Construction Cost Index

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	2016 LWMP Estimate	-	1	$ 497,000.00	$ 497,000
			Subtotal:		**$ 497,000**
	Inflation Adjustment (Dec 2016 index = 10530, Nov 2025 index = 14097)			**34%**	**$ 168,357**
	Design / Construction Management / Contingency (%)			**50%**	**$ 332,678**
			Total Estimated Cost:		**$ 998,035**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 20
Miami River Dr sewer improvements
Priority: Low

Project Description: Replace 350 mm gravity sewer along Miami River Dr with 450 mm dia. to increase capacity and reduce risk of surcharging. Can be combined with Project 10 and Project 21.

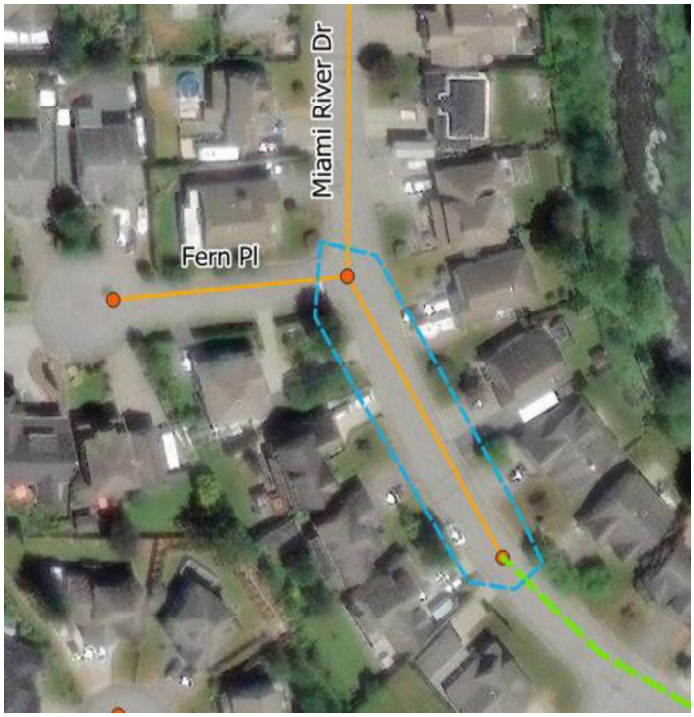
Deficiency: Capacity exceedance along sewers

Additional Notes: Capacity exceedance after upgrades to FM3 when two pumps active. Capacity requirement could be reduced if FM3 is extended to Walnut Ave (ref Project 5).

Primary Justification: Address growth hydraulic deficiency

DCC Eligible: Yes

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund



Assumptions: All manholes require replacement.

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	450 mm Dia. Sanitary Sewer (0-2m)	m	70	$ 1,750.00	$ 121,800
2	1050 mm Dia. Manhole	ea.	2	$ 14,750.00	$ 29,500
			Subtotal:		**$ 151,300**
	Design / Construction Management / Contingency (%)			**50%**	**$ 75,650**
			Total Estimated Cost:		**$ 226,950**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 21
Walnut Ave sewer improvements
Priority: Low

Project Description: Replace 350 mm gravity sewer along Walnut Ave with 450 mm dia. to increase capacity and reduce risk of surcharging. Can be combined with Project 10 and Project 20.

Deficiency: Capacity exceedance along sewers

Additional Notes: Capacity exceedance after improvements to FM3 when two pumps active and with improvements to Miami River Dr sewer. Capacity requirement could be reduced if FM3 is extended to Walnut Ave (ref Project 5).

Primary Justification: Address growth hydraulic deficiency

DCC Eligible: Yes

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund

Assumptions: All manholes require replacement.

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	450 mm Dia. Sanitary Sewer (0-2m)	m	117	$ 1,750.00	$ 204,050
2	1050 mm Dia. Manhole	ea.	2	$ 14,750.00	$ 29,500
			Subtotal:		**$ 233,550**
	Design / Construction Management / Contingency (%)			**50%**	**$ 116,775**
			Total Estimated Cost:		**$ 350,325**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 22
Forcemain 5 improvements
Priority: Low

Project Description: Replace 75 mm forcemain along Hot Springs Rd from LS5 with 150 mm dia. to reduce flow velocity.

Deficiency: High velocity in FM5, end of service life

Additional Notes: Existing FM is undersized, constricting flows.

Primary Justification: Asset management / life cycle replacement

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund

Assumptions: Manholes and lift station will not be replaced.

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	150 mm Dia. Force Main	m	106	$ 1,245.00	$ 132,468
			Subtotal:		**$ 132,468**
	Design / Construction Management / Contingency (%)			**50%**	**$ 66,234**
			Total Estimated Cost:		**$ 198,702**

Village of Harrison Hot Springs Sanitary Sewer Master Plan
November 2025 Cost Estimate
Project Number 23
Forcemain 6 improvements
Priority: Low

Project Description: Replace 100 mm forcemain along Hot Springs Rd from LS6 with 150 mm dia. to reduce velocity.

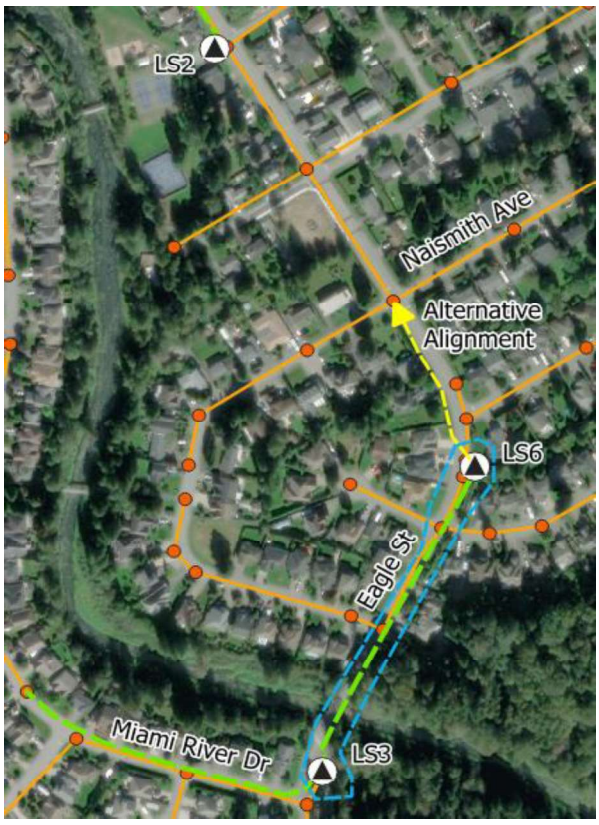
Deficiency: High velocity in FM6, end of service life

Additional Notes: Existing FM is undersized, constricting flows. Alternate alignment to discharge toward LS2 could be considered.

Primary Justification: Asset management / life cycle replacement

DCC Eligible: No

Grant Opportunities: Canada Community Building Fund, British Columbia Growing Communties Fund



Assumptions: Manholes and lift station will not be replaced.

Item No.	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	150 mm Dia. Force Main	m	214	$ 1,245.00	$ 266,057
			Subtotal:		**$ 266,057**
	Design / Construction Management / Contingency (%)			**50%**	**$ 133,028**
			Total Estimated Cost:		**$ 399,085**