CSO Master Plan

Marion District Plan

August 2019

City of Winnipeg

CSO Master Plan

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2	07/2019	Final Draft Submission	DT	MF	MF
3	08/19/2019	Final Submission For CSO Master Plan	MF	MF	SG

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1. Marion District

1.1 District Description

Marion district is located along the eastern edge of the Red River and west of Seine River. The district is bounded by Despins district to the north and east, Metcalfe and Mager districts to the south, Mission district to the east, and the Red River to the west. Coniston Street, Niverville Avenue, and Carriere Avenue form the southern border, the Seine River and Des Meurons Street form the eastern border, and Bertrand Street forms the northern border.

The land use within Marion district developed gradually from 1900 to 1950 as single-family residential land. Single family housing is primarily located to the southwest of St Mary's Road and multi-family housing extends to the northwest of St. Mary's Road. Marion is mostly residential, but it has many commercial businesses on St. Mary's Road, Marion and Goulet Streets, and Taché Avenue. The area includes the St. Boniface Hospital and Research facilities, Dominion Centre, Nelson McIntyre Collegiate, the Champlain and Norwood Community Centres and a portion of the St. Boniface Golf Club.

Marion district contains numerous regional transportation routes: St. Mary's Road, Taché Avenue, and Marion and Goulet Streets. St. Mary's Road and Marion Street converge and cross the Red River at the Norwood Bridge. Approximately 20 ha of the district is classified as greenspace, which includes Coronation Park and Lyndale Drive Park.

1.2 Development

Marion is a medium density residential neighbourhood located around a commercial corridor and close to downtown. Due to its location close to the downtown however, there is a high potential for further densification via infill in the district. Redevelopment within this area could impact the CS system and will be investigated on a case-by-case basis for potential impacts to the combined sewer overflow (CSO) Master Plan. All developments within the CS districts are mandated to offset any peak combined sewage discharge by adding localized storage and flow restrictions, in order to comply with Clause 8 of the Environment Act Licence 3042.

A portion of St. Mary's Road is located within the Marion district. St. Mary's Road is identified as Regional Mixed Use Corridor as part of the OurWinnipeg future development plans. As such, focused intensification along St. Mary's Road is to be promoted in the future.

1.3 Existing Sewer System

Marion district has an approximate area of 233 ha[1] based on the district boundary. There is approximately 24 percent (55 ha) separated, 13 percent (30 ha) partial separation, and 14 percent (33 ha) separation ready areas.

The district is serviced by combined sewer (CS), storm relief sewer (SRS), land drainage sewer (LDS), and wastewater sewer (WWS) systems. There are two CS outfalls (one CS outfall to the Red River and another CS outfall to the Seine River), one flood pumping station (FPS) outfall, and one SRS outfall. The second CS outfall to the Seine River however has been disconnected from the CS system and is no longer in use. Figure 25 provides an overview of the Marion district and includes key infrastructure locations for existing sewer infrastructure and additional CSO Master Plan details.

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[1] City of Winnipeg GIS information relied upon for area statistics. The GIS records may vary slightly from the city representation in the InfoWorks sewer model. Therefore, minor discrepancies in the area values reported in Section 1.3 Existing Sewer System, and in Section 1.8 Performance Estimate may occur.

Three CS trunk sewers connect to the Marion FPS and sewage pumping station (SPS) that service the district, located near the intersection of Lyndale Drive and St Marys Road. A 900 mm by 1350 mm sewer trunk and a 1650 mm trunk on St. Mary's Avenue run parallel along St. Mary's Road. The 1650 mm services the southwest area, and the 900 mm by 1350 mm services the south-central portion along St. Mary's Road. A 1650 mm trunk sewer runs along Horace Street and services the northern and eastern portions of the district. The sewer trunks converge and flow adjacent to the FPS to the Marion SPS. A portion of the collection system for the St. Boniface Hospital connects downstream of the FPS through a 450 mm sewer. Within the Marion FPS and SPS, there is a separate control structure that includes a primary weir and a 1600 mm CS outfall pipe to the Red River protected by flap and sluice gates against back-up due to high river levels. The FPS pumps directly to the river through an independent 1800 mm outfall with no flap gate or sluice gate installed. A 300 mm CS outfall was located off Dubuc Street in the eastern portion of the district to provide relief as needed. This secondary outfall has recently been disconnected from the Marion CS system, and is no longer in use.

Separate wastewater sewers (WWS) were installed in the eastern portion of the district in the early 2000s. Wastewater is collected from a portion of the district and flows by gravity along Enfield Crescent before it is pumped back into the existing CS system via a CS lift station (LS) at Enfield Crescent and St. Mary's Road. This SPS pumps into the 900 mm CS sewer on Enfield Crescent. These separate wastewater sewers in the Marion district also receive wastewater from separate sewers installed in the Despins district to the north.

The Marion SRS system includes a 1200 mm outfall to the Red River and extends as a 1500 mm SRS trunk along Walmer Street to provide relief to the CS system in the southwestern portion of the district. A disconnected upstream portion of the SRS provides some additional capacity to the south-central portion of the district by interconnecting the two trunk sewers running along St. Mary's Road. This SRS pipe connects back into the CS system.

The southwestern and eastern areas of the Marion district are partially separated, in which separate LDSs were installed. The southwestern LDS system has a separate outfall into the Red River, constructed near the intersection of Lyndale Drive and Balsam Place, and the eastern LDS system discharges to the Seine River along Edgewood Street. Both LDS outfalls have positive and flap gate protection against high river levels.

During DWF, the sewage flows by gravity through the Marion FPS and is diverted by a weir to the Marion SPS. The SPS pumps through a 500 mm force main across the Red River to the River district, across the Assiniboine River to the Assiniboine District, and ultimately to the Main Street interceptor in the Bannatyne district, which flows by gravity to the North End Sewage Treatment Plant (NEWPCC).

High flow in the system from runoff events may cause the level in the trunk sewer to increase above the outfall weir and overflow to the Red River. The FPS is available to pump excess flow in the system directly to the Red River as required.

The three outfalls to the Red River and Seine River (one CS, one SRS, and one FPS) are as follows:

- ID12 (S-MA50008337) – Marion CS Outfall
- ID85 (S-MA70105998) – Marion FPS Outfall
- ID11 (S-MA70008060) – Walmer SRS Outfall

1.3.1 District-to-District Interconnections

There are several district-to-district interconnections between Marion and the surrounding districts. Each interconnection is shown on Figure 25 and shows locations where gravity and pumped flow can cross from one district to another. Each interconnection is listed as follows:

1.3.1.1 Interceptor Connections – Downstream of Primary Weir

River

- A 500 mm force main conveys CS from Marion LS across the Red River and into the River district:
  - Queen Elizabeth Way invert at district boundary – 225.06 m (S-MA70057928)

1.3.1.2 District Interconnections

Metcalfe

<u>CS to CS</u>

- High Point Manholes (flow is directed into both districts from these manholes):
  - Lyndale Drive and Tache Avenue – 229.00 m (S-MH50003338)
  - Niverville Avenue and Braemar Avenue invert at district boundary – 227.28 m (S-MH50006462)
- A 300 mm CS sewer acts as an overflow pipe from the Metcalfe district to the Marion district:
  - Coniston Street and Crawford – 228.37 m (S-MH50003505)
- A 300 mm CS sewer acts as an overflow pipe from the Metcalfe district to the Marion district:
  - Coniston Street and Chandos Avenue – 228.08 m (S-MH50003573)
- A 450 mm CS sewer acts as an overflow pipe from the Marion district to the Metcalfe district:
  - Dubuc Street and Hill Street – 225.67 m (S-MH50006379)
- A 450 mm CS sewer acts as an overflow pipe from the Metcalfe district to the Marion district:
  - Dubuc Street and Des Meurons Street – 225.83 m (S-MH50006377)

<u>SRS to SRS</u>

- The SRS from Marion's CS system flows by gravity into Metcalfe's SRS system at the intersection of Des Meurons Street and Yardley Street, and the intersection of Des Muerons Street and Bristol Avenue. The Metcalfe SRS system then connects to the CS system in Metcalfe near the intersection of Carriere Avenue and Des Meurons:
  - 450 mm on Yardley Street, invert at Marion district boundary – 226.07 m (S-MA70026907)
  - 375 mm on St Luc Street, invert at Marion district boundary - 226 m (S-MA70026912)

Despins

<u>CS to CS</u>

- Common high point sewer manholes:
  - Horace Street invert at Marion invert – 226.85 m (S-MH50002230)
  - Goulet Street and Des Meurons Street invert – 227.34 m (S-MH50002282)
- A 250 mm CS pipe from Marion flows by gravity westbound into Despins CS system at the intersection of Taché Avenue and Thomas Berry Street:
  - Tache Avenue and Thomas Berry invert – 226.50 m (S-MH50002657)
- A 375 mm SRS overflow pipe from Marion flows by gravity westbound into Despins CS system during an overflow:
  - Tache Avenue and Rinella Place invert – 226.13 m (S-MH50002666)
- A 450 mm CS pipe from Marion flows by gravity eastbound into Despins CS system at the intersection of Enfield Crescent and Bertrand Street:
  - Enfield Crescent and Bertrand Street Invert – 224.56 m (S-MH50007262)

- A 1050 mm CS pipe from Despins flows by gravity westbound into Marion CS system at the intersection of Enfield Crescent and Bertrand Street:
  - Enfield Crescent and Bertrand Street Invert – 224.74 m (S-MH50002428)
- A 600 mm CS pipe from Marion flows by gravity eastbound into Despins district CS system at the intersection of Marion Street and Des Meurons Street:
  - Marion Street and Des Meurons Street Invert – 226.68 m (S-MH50002243)
- A 300 mm CS pipe from Despins flows by gravity westbound into Marion district CS system on Horace Street into the manhole near the intersection with Youville Street:
  - Horace Street near Youville Street Invert – 226.85 m (S-MH50002230)

WWS to WWS

- A 250 mm WWS and a 300 mm WWS flows southbound by gravity and converge at a manhole at the corner of Bertrand Street and Enfield Crescent and flow by gravity from Despins district into the localized WWS installed in the Marion district:
  - Bertrand Street and Enfield Crescent Invert – 223.00 m (S-MH70025546)

LDS to LDS

- A 300 mm LDS pipe from Marion flows eastbound by gravity into Despins on Horace Street, between Youville Street and Des Meurons Street:
  - Youville Street and Des Meurons Street Invert – 225.37 m (S-MH70007961)
- A 525 mm LDS pipe from Despins flows southbound along Youville Street by gravity into Marion district LDS system between Eugenie Street and Edgewood Street:
  - Invert at Marion district boundary – 224.34 m (S-MH70007984)

LDS to CS

- A 250 mm LDS short section of the LDS system extends from Marion and flows by gravity into Despins CS at Tache Avenue near the back alley of Thomas Berry Street:
  - Invert at Marion district boundary – 226.15 m (S-MH50002944)

A district interconnection schematic is included as Figure 1-1. The drawing illustrates the collection areas, interconnections, pumping systems, and discharge points for the existing district.

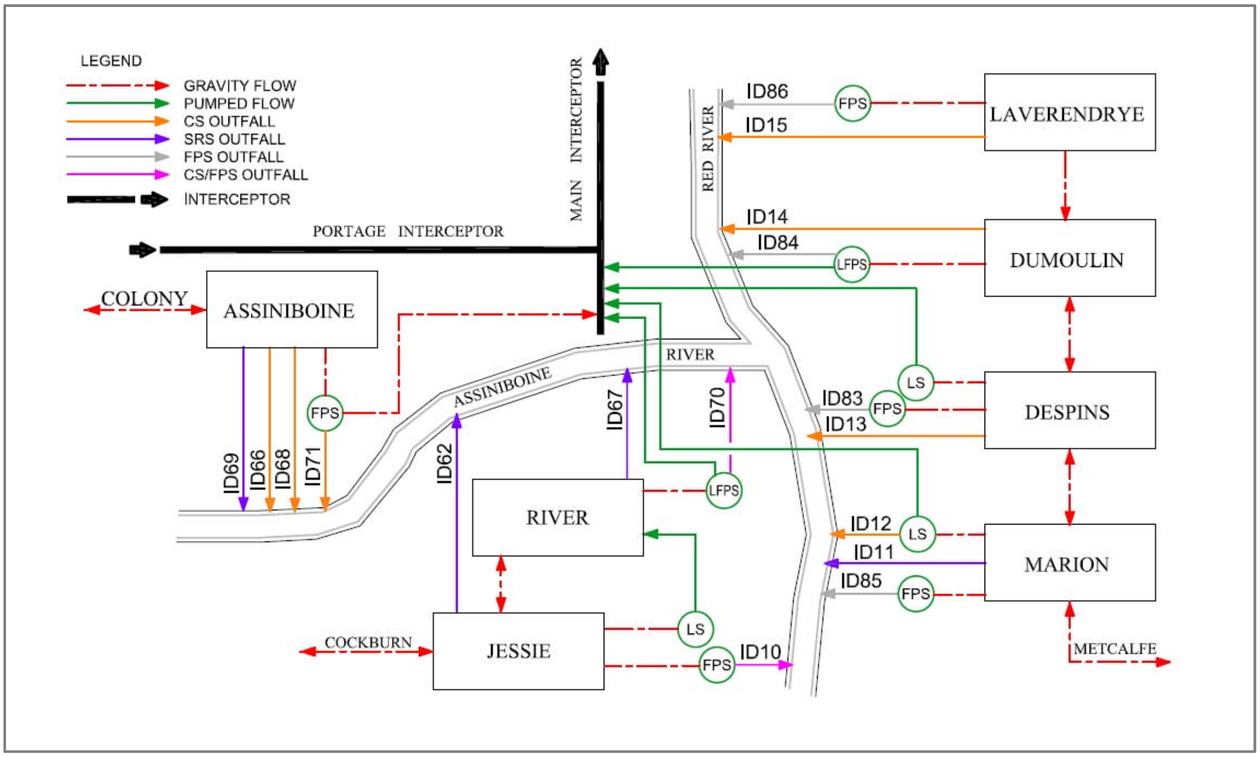


Figure 1-1. District Interconnection Schematic

1.3.2 Asset Information

The main sewer system features for the district are shown on Figure 25 and listed in Table 1-1.

Table 1-1. Sewer District Existing Asset Information

Asset	Asset ID (Model)	Asset ID (GIS)	Characteristics	Comments
Combined Sewer Outfall (ID12)	S-CO70008489.1	S-MA50008337	1600 mm	Red River Invert = 221.89 m
Flood Pumping Outfall (ID85)	S-AC70008319.1	S-MA70015955	1800 mm	Red River Invert = 222.20 m
Other Overflows	N/A	N/A	N/A	CS secondary outfall into Seine River has been disconnected.
Main Trunk	N/A	S-MA70101974	1650 mm	Circular Invert: 222.44 m
SRS Outfalls	S-RE70003431.1	S-MA70008060	1200 mm	Red River
SRS Interconnections	N/A	N/A	N/A	24 SRS - CS
Main Trunk Flap Gate	N/A	S-CG00001116	1650 mm	Invert: 222.65 m
Main Trunk Sluice Gate	N/A	S-CG00000837	1351 mm	Invert: 222.03 m
Off-Take	N/A	S-MA70040771	600 mm	Circular Invert: 222.56 m

Dry Well	N/A	N/A	N/A	No dry well within this lift station.
Lift Station Total Capacity	N/A	N/A	0.230 m^3/s	1 x 0.120 m^3/s 1 x 0.110 m^3/s
Lift Station ADWF	N/A	N/A	0.044 m^3/s	
Lift Station Force Main	N/A	S-MA70003510	500 mm	Invert: 224.44 m
Flood Pump Station Total Capacity	N/A	N/A	3.01 m^3/s	1 x 0.79 m^3/s, 2 x 1.11 m^3/s
Pass Forward Flow – First Overflow	N/A	N/A	0.331 m^3/s	

Notes: ADWF = average dry-weather flow
GIS = geographic information system
ID = identification
N/A = not applicable

The critical system elevations for the existing system relevant to the development of the CSO control options are listed in Table 1-2. Critical elevation reference points are identified on the district overview and detailed maps.

Table 1-2. Critical Elevations

Reference Point	Item	Elevation (m)[a]
1	Normal Summer River Level	Marion – 223.73 Dubuc – 225.00 Walmer – 223.73
2	Trunk Invert at Off-Take	222.56
3	Top of Weir	222.87
4	Relief Outfall Invert at Flap Gate	222.31
5	Low Relief Interconnection	224.17
6	Sewer District Interconnection (Despins)	223.00
7	Low Basement (Metcalfe, Marion, Despins)	224.64
8	Flood Protection Level (Metcalfe, Marion, Despins)	229.81

[a] City of Winnipeg Data, 2013

1.4 Previous Investment Work

Table 1-3 provides a summary of the district status in terms of data capture and study. The most recent study completed in Marion district was the *Marion and Despins Sewer Relief Project Preliminary Design Report* (Wardrop, 2005). The Marion and Despins CS Relief Project improved the capacity of the existing CS system to alleviate basement flooding. The CS district relief, including the separate LDS and WWS installation, was completed between 2000 and 2003. is aligned with the Wardrop Sewer Relief project. Note that the final draft of the report was issued in 2005 after the work was complete, but the original design report was prepared prior to the work taking place. No other relief or CSO related sewer work has been completed since that time.

Between 2009 and 2015, the City invested $12 million in the CSO Outfall Monitoring Program. The program was initiated to permanently install instruments in the primary CSO outfalls. The outfall from the Marion district was included as part of this program. Instruments installed at each of the 39 primary CSO outfall locations has a combination of inflow and overflow level meters and flap gate inclinometers if available.

Table 1-3. District Status

District	Most Recent Study	Flow Monitoring	Hydraulic Model	Status	Expected Completion
25 - Marion	2005 - Conceptual	Future Work	2013	Complete	N/A

1.5 Ongoing Investment Work

There is ongoing maintenance and calibration of permanent instruments installed within the primary outfall of the Marion district. This consists of monthly site visits in confined entry spaces to verify physical readings concur with displayed transmitted readings and replacing desiccants where necessary.

1.6 Control Option 1 Projects

1.6.1 Project Selection

The proposed projects selected to meet Control Option 1 – 85 Percent Capture in a Representative Year for the Marion sewer district are listed in Table 1-4. The proposed CSO control projects will include latent storage and an alternative floatable management approach.. Program opportunities including green infrastructure (GI) and real time control (RTC) will also be included as applicable.

Table 1-4. District Control Option

Control Limit	Latent Storage	Flap Gate Control	Gravity Flow Control	Control Gate	In-line Storage	Off-line Storage Tank	Off-line Storage Tunnel	Sewer Separation	Green Infrastructure	Real Time Control	Floatable Management
85 Percent Capture in a Representative Year	✓	-	-	-	-	-	-	-	✓	✓	✓

Notes:- = not included
✓ = included

The existing SRS system is suitable for use as latent storage. This option would take advantage of the some of the existing pipe networks for additional storage volume. Existing DWF from the collection system would remain the same, and overall district operations would remain the same.

The existing CS system is not suitable for in-line storage as the relative low level of the SPS and associated CS outfall results in the NWSL level being at a higher level than the recommended control gate level during the 1992 representative year assessment.

Floatable control will be necessary to capture any undesirable floatables in the sewage overflows. Floatables are typically captured via a screening facility, however, the hydraulic constraints within the Marion district do not allow sufficient positive head to be achieved and an alternative floatables management approach will be necessary.

GI and RTC will be applied within each district on a system wide basis with consideration of the entire CS area. The level of implementation for each district will be determined through evaluations completed through district level preliminary design. RTC is not included in detail within each plan and is described further in Section 3 of Part 3A.

1.6.2 Latent Storage

Latent storage is the first consideration for district controls and would be a suitable control option for Marion because of the existing SRS system. The latent storage level and volume would be controlled by the backpressure of the river on the Walmer SRS outfall flap gate, as explained in Part 3C. The latent storage design criteria are identified in Table 1-5.

Table 1-5. Latent Storage Conceptual Design Criteria

Item	Elevation/Dimension	Comment
Invert Elevation	222.56 m	
NSWL	223.73 m	Above invert elevation
Trunk Diameter	1500 mm	
Design Depth in Trunk	1170 mm	
Maximum Storage Volume	563 m^3	
Force Main	100 mm	
Flap Gate Control	N/A	NSWL > SRS Invert at Flap Gate
Lift Station	Included	Off-line wet well
Nominal Dewatering Rate	0.02 m^3/s	Based on existing pump capacity
RTC Operational Rate	TBD	Future RTC / dewatering review on performance

Notes:

NSWL – normal summer water level

RTC – Real Time Control

The addition of latent storage pump station (LSPS) and force main that connects back to the CS system will be required for latent storage. A conceptual layout for the LSPS and force main is shown on Figure 25-01. The LSPS will be on the Walmer Street and Pinedale Avenue intersection to avoid interference with nearby residential lands and disruption to existing sewers. The latent force main will connect directly to the nearest CS manhole (S-MH50002905), which is located within the property of the Norwood Community Centre. The LSPS will operate to dewater the SRS system in preparation for the next runoff event, with the requirement that the system is ready for the next event within a 24-hour period after completion of the previous event.

Figure 25 identifies the extent of the SRS system within Marion district that would be used for latent storage. The maximum storage level is directly related to the NSWL and the size and depth of the SRS system. Once the level in the SRS exceeds the river level, the flap gate opens, and the combined sewage is discharged to the river.

As described in the standard details in Part 3C, wet well sizing will be determined based on the final pump selection, operation, and dewatering capacity required. The interconnecting piping between the new gate chamber and the pump station would be sized to provide sufficient flow to the pumps while all pumps are operating. Flap gate control was not deemed necessary for this control option. Flap gate control may be considered if additional storage is required or if he river level regularly drops below the SRS flap gate elevation. The SRS flap gate control is described in the standard details in Part 3C

1.6.3 Floatables Management

Floatables management for the Marion district, due to the existing hydraulic constraints, is proposed to be an alternative floatables management approach. This approach is to ensure that the proposed required floatable management requirements outlined within the Environment Act Licence 3042 can be maintained.

This alternative approach to floatables management will be achieved by targeting floatables source control. This will be achieved by implementing more focused efforts towards street cleaning and catch-basin cleaning, to remove floatable material from surface runoff before it enters the combined sewer system. The second broad component of this alternative approach will focus on public education in an effort to reduce the sanitary components from ever entering plumbing systems. This is expected to achieve similar or better results while eliminating the end-of-pipe screening. The proposed approach will be similar to the program currently carried out in the City of Ottawa to meet their CSO mitigation requirements.

The alternative approach will be further investigated and demonstrated during the interim period between the submission of the CSO Master Plan (August 2019) and the revised CSO Master Plan submission (April 2030), and is discussed in further detail in Part 2 of the CSO Master Plan. It is recommended that as part of this work these measures will be undertaken in the Marion district, due to screening limitations mentioned above.

1.6.4 Green Infrastructure

The approach to GI is described in Section 5.2.1 of Part 2 of the CSO Master Plan. Opportunities for the application of GI will be evaluated and applied with any projects completed in the district. Opportunistic GI will be evaluated for the entire district during any preliminary design completed. The land use, topography and soil classification for the district was reviewed to identify the most applicable GI controls.

Marion has been classified as a medium GI potential district. Land use in Marion is mostly single-family residential, while St Mary's Road includes a mix of commercial businesses. This means the district would be an ideal location for bioswales, permeable paved roadways, cisterns/rain barrels, and rain gardens. The flat roof commercial buildings along St. Mary's Road make would be an ideal location for green roofs.

1.6.5 Real Time Control

The approach to RTC is described in Section 5.2.2 of Part 2 of the CSO Master Plan. The application of RTC will be evaluated and applied on a district by district basis through the CSO Master Plan projects with long term consideration for implementation on a system wide basis.

1.7 System Operations and Maintenance

System operations and maintenance (O&M) changes will be required to address the proposed control options. This section identifies general O&M requirements for each control option proposed for the district. More specific details on the assumptions used for quantifying the O&M requirements are described in Part 3C of the CSO Master Plan.

The SRS latent storage would fill by gravity during wet weather events and would be dewatered through the dedicated LSPS back to the existing CS. The latent storage would take advantage of the infrastructure already in place, and the sewer would require minimal additional maintenance. The additional LSPS would require intermittent maintenance which would depend on the frequency of operation.

The alternative floatable management control is based on implementing additional operating and maintenance measures, in an effort to match the performance of the capital construction projects to meet the floatables management requirements. As such dedicated additional operating and maintenance costs should be allocated to this district. The goal however is for this work to overall be more cost effective from a life cycle perspective, considering the upfront capital and operating and maintenance costs associated with screening facilities.

1.8 Performance Estimate

An InfoWorks CS hydraulic model was created as part of the CSO Master Plan development. Two versions of the sewer system model were created and used to measure system performance. The 2013 Baseline model represents the sewer system baseline in the year 2013 and the 2037 Master Plan – Control Option 1 model, which includes the proposed control options in the year 2037. A summary of relevant model data is provided in Table 1-6.

Table 1-6. InfoWorks CS District Model Data

Model Version	Total Area (ha)	Contributing Area (ha)	Population	% Impervious	Control Options Included in Model
2013 Baseline	97	97	3,652	62	N/A
2037 Master Plan – Control Option 1	97	97	3,652	62	Lat St

Notes:

Lat St = Latent Storage

No change to the future population was completed as from a wastewater generation perspective from the update to the 2013 Baseline Model to the 2037 Master Plan Model. The population generating all future wastewater will be the same due to Clause 8 of Environment Act Licence 3042 being in effect for the CS district.

City of Winnipeg hydraulic model relied upon for area statistics. The hydraulic model representation may vary slightly from the City of Winnipeg GIS Records. Therefore minor discrepancies in the area values reported in Section 1.3 Existing Sewer System, and in Section 1.8 Performance Estimate may occur.

The performance results listed in Table 1-7 are for the hydraulic model simulations using the year-round 1992 representative year. The table lists the results for the Baseline, for each individual control option and for the proposed CSO Master Plan - Control Option 1. The Baseline and Control Option 1 performance numbers represent the comparison between the existing system and the proposed control options. The table also includes overflow volumes specific to each individual control option; these are listed to provide an indication of benefit gained only and are independent volume reductions.

Table 1-7. District Performance Summary – Control Option 1

Control Option	Preliminary Proposal	Master Plan			
	Annual Overflow Volume (m^3)	Annual Overflow Volume (m^3)	Overflow Reduction (m^3)	Number of Overflows	Pass Forward Flow at First Overflow [b]
Baseline (2013)	34,108	51,773	-	21	0.184 m^3/s
Latent Storage	30,522 [a]	37,548	14,225	13	0.241 m^3/s
Latent & In-Line Storage		37,548	0	13	0.241 m^3/s
Control Option 1	**30,522**	**37,548**	**14,225**	**13**	**0.241 m^3/s**

Note:

[a] Preliminary Proposal did not independently separate latent and in-line storage

[b] Pass forward flows assessed on the 1-year design rainfall event.

The difference between the Preliminary and CSO Master Plan Baseline and Control Option 1 results are directly due to the update in SPS pump capacity provided via the Clear SCADA data information for the existing Marion SPS. The expected no change in overflow reduction for the in-line storage is due to the modelled NSWL being continuous for the representative year. The overflows from the Walmer SRS have been completely eliminated from the assessment.

The percent capture performance measure is not included in Table 1-7, as it is applicable to the entire CS system and not for each district individually.

1.9 Cost Estimates

Cost estimates were prepared during the development of the Preliminary Proposal and have been updated for the CSO Master Plan. The CSO Master Plan cost estimates have been prepared for each control option, with overall program costs summarized and described in Section 3.4 of Part 3A. The cost estimate for each control option relevant to the district as determined in the Preliminary Proposal and updated for the CSO Master Plan are identified in Table 1-8. The cost estimates are a Class 5 planning level estimates with a level of accuracy of minus 50 percent to plus 100 percent.

Table 1-8. District Cost Estimate – Control Option 1

Control Option	2014 Preliminary Proposal Capital Cost	2019 CSO Master Plan Capital Cost	2019 Annual Operations and Maintenance Cost	2019 Total Operations and Maintenance Cost (Over 35-year period)
Latent Storage	$1,620,000	$2,170,000	$74,000	$1,600,000
Floatables Management Allowance	N/A [a]	$2,730,000 [b]	$47,000	$1,010,000
Subtotal	**$1,620,000**	**$4,900,000**	**$121,000**	**$2,610,000**
Opportunities	N/A	$490,000	$12,000	$260,000
District Total	**$1,620,000**	**$5,390,000**	**$133,000**	**$2,870,000**

[a] Solution developed as refinement to Preliminary Proposal work following submission of Preliminary Proposal costs. Costs for In-line Storage and Screening items of work found to be $2,140,000 in 2014 dollars

[b] Cost allowance to account for the alternative floatable management measures. This allowance is based on a typical district control gate cost

The estimates include changes to the control option selection since the Preliminary Proposal, updated construction costs, and the addition of GI opportunities. The calculations for the CSO Master Plan cost estimate includes the following:

- Capital costs reported in terms of present value.
- A fixed allowance of 10 percent has been included for GI, with no additional cost for RTC. This has been listed as part of the Opportunities costs.
- The Preliminary Proposal capital cost is in 2014-dollar values.
- The CSO Master Plan capital cost is based on the control options presented in this plan and in 2019-dollar values.
- The 2019 Total Annual Operations and Maintenance (over 35-year period) cost component is the present value costs of each annual O&M cost under the assumption that each control option was initiated in 2019.
- The 2019 Annual Operations and Maintenance Costs were based on the estimated additional O&M costs annually for each control option in 2019 dollars.
- Future costs will be inflated to the year of construction.

Cost estimates were prepared during the development of the Preliminary Proposal and updated for Phase 3 during the CSO Master plan development. The differences identified between the Preliminary Proposal and the CSO Master Plan are accounting for the progression from an initial estimate used to compare a series of control options, to an estimate focusing on a specific level of control for each district. Any significant differences between the Preliminary Proposal and CSO Master Plan estimates are identified in Table 1-9.

Table 1-9. Cost Estimate Tracking Table

Changed Item	Change	Reason	Comments
Control Options	Alternative Floatables Management	Control Gate and screening were not included in the Preliminary Proposal estimate. Screening later determined to not be feasible due to hydraulic constraints. Added to Master Plan cost, assumed to be comparable to typical control gate projected cost.	
	Removal of In-line Storage	The Master Plan assessment found that in-line storage not a preferred control solution.	
	Latent Storage	Unit costs updated for this control option	
Opportunities	A fixed allowance of 10 percent has been included for program opportunities such as GI	Preliminary Proposal estimate did not include a cost for opportunities.	
Lifecycle Cost	The lifecycle costs have been adjusted to 35 years	City of Winnipeg Asset Management approach	
Cost escalation from 2014 to 2019	Capital Costs have been inflated to 2019 values based on an assumed value of 3 percent per for construction inflation	Preliminary Proposal estimates were based on 2014-dollar values.	

1.10 Meeting Future Performance Targets

The regulatory process requires consideration for upgrading Control Option 1 to another higher-level performance target. For the purposes of this CSO Master Plan, the future performance target is 98 percent capture for the representative year measured on a system-wide basis. This target will permit the number of overflows and percent capture to vary by district to meet 98 percent capture. Table 1-10 provides a description of how the regulatory target adjustment could be met by building off the proposed work identified for Control Option 1.

Overall the Marion district would be classified as low potential for implementation of complete sewer separation as the only feasible approach to achieve the 98 percent capture in the representative year future performance target. Opportunistic separation of portions of the district may be achieved with synergies with other major infrastructure work to address future performance targets. The provision of an in-line control gate would provide additional storage, during periods when the actual river level is below the 1992 representative year NSWL level used in the CSO Master Plan assessment. This would provide a reduction in overflow volume for real time events although this is not reflected in the CSO Master Plan modelling assessment due to the influence of the NSWL being higher than the proposed control gate level. In addition, green infrastructure and off-line storage tank or tunnel storage may be utilized in key locations to provide additional storage and increase capture volume.

Table 1-10. Upgrade to 98 Percent Capture in a Representative Year Summary

Upgrade Option	Viable Migration Options
98 Percent Capture in a	• Increased In-line Storage

Representative Year	• Opportunistic Sewer Separation • Off-line Storage (Tunnel / Tank) • Increased GI

The control options for Marion district have been optimized for the 85 percent capture performance target based on the system wide basis. The expandability of this district to meet 98 percent capture target would be based on a system wide basis analysis and the results of the alternative floatables management approach.

The cost for upgrading to meet an enhanced performance target depends on the summation of all changes made to control options in individual districts and has not been fully estimated at this stage of master planning. The Phase In approach is to be presented in detail in a second submission for 98 percent capture in a representative year, due on or before April 30, 2030.

1.11 Risks and Opportunities

The CSO Master Plan and implementation program are large and complex, with many risks having both negative and positive effects. The objective of this section is to identify significant risks and opportunities for each control option within a district.

The CSO Master Plan has considered risks and opportunities on a program and project delivery level, as described in Section 5 of Part 2 of the CSO Master Plan. A Risk And Opportunity Control Option Matrix covering the district control options has been developed and is included as part of Appendix D in Part 3B. The identification of the most significant risks and opportunities relevant to this district are provided in Table 1-11.

Table 1-11. Control Option 1 Significant Risks and Opportunities

Risk Number	Risk Component	Latent Storage / Flap Gate Control	In-line Storage / Control Gate	Off-line Storage Tank	Off-line Storage Tunnel	Sewer Separation	Green Infrastructure	Real Time Control	Floatable Management
1	Basement Flooding Protection	R	R	-	-	-	-	-	-
2	Existing Lift Station	-	_	-	-	-	-	R	-
3	Flood Pumping Station	-	-	-	-	-	-	-	-
4	Construction Disruption	-	-	-	-	-	-	-	-
5	Implementation Schedule	-	-	-	-	-	-	R	-
6	Sewer Condition	R	_	-	-	-	-	-	-
7	Sewer Conflicts	R	-	-	-	-	-	-	-
8	Program Cost	O	-	-	-	-	-	-	O
9	Approvals and Permits	-	-	-	-	-	R	-	-
10	Land Acquisition	-	-	-	-	-	R	-	-
11	Technology Assumptions	R	-	-	-	-	O	O	-
12	Operations and Maintenance	R	-	-	-	-	R	O	R

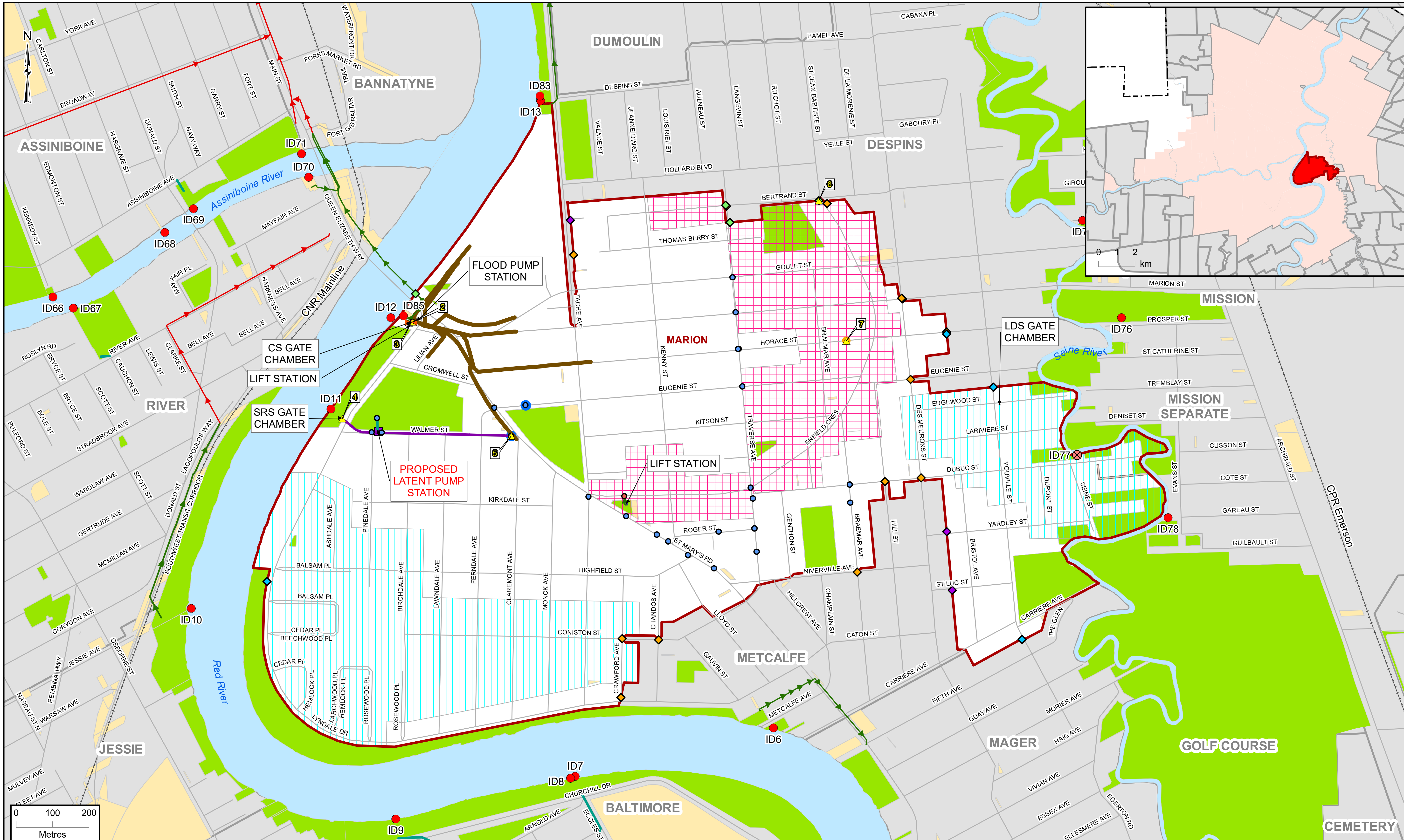
Table 1-11. Control Option 1 Significant Risks and Opportunities

Risk Number	Risk Component	Latent Storage / Flap Gate Control	In-line Storage / Control Gate	Off-line Storage Tank	Off-line Storage Tunnel	Sewer Separation	Green Infrastructure	Real Time Control	Floatable Management
13	Volume Capture Performance	O	-	-	-	-	O	O	-
14	Treatment	R	-	-	-	-	O	O	R

Risks and opportunities will require further review and actions at the time of project implementation.

1.12 References

Wardrop. 2005. *Marion and Despins Sewer Relief Project Preliminary Design Report*. Prepared for the City of Winnipeg Water and Waste Department. March.



LEGEND

- Primary Weir
- Critical Elevation
- Decommissioned Outfall
- CSO Outfall
- Low CS Manhole
- Low SRS Connection

Inter-System Connection
- CS - WWS
- SRS - CS

District Boundary Crossing
- CS
- LDS
- SRS
- WWS

- Extent of Existing In-line Storage
- Interceptor Sewer
- Force Main
- Street
- Railway

- District Boundary
- Watercourse
- Greenspace
- City Owned Land

CSO MASTER PLAN PROPOSED SOLUTIONS

- Proposed SRS Latent Storage Pump
- Latent Storage Limit
- Latent Force Main
- Sewer Separation - Complete
- Sewer Separation - Ready

Note: Alternative Floatables Management Approach to be tested prior to implementation.

ALL PROPOSED SOLUTIONS SHOWN IN RED TEXT

JACOBS

Notes:
1. Map data source - City of Winnipeg, 2013

Winnipeg

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

FIGURE 25
District Overview Map
Sewer District: Marion
City of Winnipeg
Combined Sewer Overflow Master Plan

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LEGEND

- Critical Elevation
- CSO Outfall
- Manhole
- Flap Gate
- Sluice Gate
- Sewer By Type
  - CS
  - SRS
- Control Structure Type
  - Gate Chamber
- Land Parcel

CSO MASTER PLAN PROPOSED SOLUTIONS

- Proposed Latent Force Main
- Latent Pump

ALL PROPOSED SOLUTIONS SHOWN IN RED TEXT

JACOBS

Notes:
1. Map data source - City of Winnipeg, 2013

Winnipeg

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

FIGURE 25-01
Latent SRS Control
Sewer District: Marion
City of Winnipeg
Combined Sewer Overflow Master Plan

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