JACOBS

CSO Master Plan

Syndicate District Plan

August 2019

City of Winnipeg

CSO Master Plan

Project No:	470010CH
Document Title:	Syndicate District Plan
Revision:	03
Date:	August 19, 2019
Client Name:	City of Winnipeg
Project Manager:	John Berry
Author:	Danny Tinker
File Name:	Syndicate_Plan_Final_CO1MP_08192019_Tracked

Jacobs Engineering Group Inc.

1301 Kenaston Boulevard
Winnipeg, MB R3P 2P2
Canada
www.jacobs.com

Document History and Status

Revision	Date	Description	By	Review	Approved
0	08/30/2018	Version 1 DRAFT	DT	SG	
1	02/15/2019	DRAFT 2 for City Review	MF	SG	MF
2	06/2019	Final Draft Submission	JT	MF	MF
3	08/19/2019	Final Submission For CSO Master Plan	MF	MF	SG

Contents

Tables

Figure

1. Syndicate District

1.1 District Description

The Syndicate combined sewer (CS) district is located adjacent to the Red River and north of Alexander district. Syndicate is approximately bounded by the Red River to the north, east, and south; and by King Street to the west.

Syndicate has been developed primarily as residential and industrial, with general and light manufacturing located south of Sutherland Avenue and in the southeastern corner of the district; two-family residential buildings are found north of Sutherland Avenue. Some small commercial businesses are located along Main Street. The greenspace in Syndicate runs along the riverbank on the northern and southern sections.

The Canadian Pacific Railway Mainline runs through the centre of the district and crosses the Red River into Mission district. Main Street, Higgins Avenue, and Disraeli Freeway are the major regional transportation routes within the Syndicate CS district.

1.2 Development

Syndicate district includes a significant portion of the downtown area and the potential for redevelopment in the future is high. The OurWinnipeg development plan has prioritized the Downtown for opportunities to create complete, mixed-use, higher density communities. Redevelopment within this area could impact the CS 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 Main Street is located within the Syndicate District. Portage Avenue is identified as Regional Mixed-Use Corridor as part of the OurWinnipeg future development plans. As such, focused intensification along Main Street is to be promoted in the future.

One area within the Syndicate CS district has also been identified as a Major Redevelopment Site with OurWinnipeg, the South Point Douglas Lands. This site includes the lands adjacent to the Assiniboine River north of the Waterfront neighbourhood. This Major Redevelopment Site is considered underused and will be prioritized to be developed into a higher density, mixed-use community.

Higgins Avenue within the Alexander district has been identified as part of the potential routes for the Eastern Corridor of Winnipeg's Bus Rapid Transit. The work along Higgins Avenue could result in additional development in the area. This could also present an opportunity to coordinate sewer separation works alongside the transit corridor development, providing further separation within Alexander district. This would reduce the extent of the Control Options listed in this plan required.

1.3 Existing Sewer System

Syndicate district encompasses an area of 111 ha[1] based on the district boundary GIS information. This includes an area of approximately 21 percent by area (24 ha) that contains a separate land drainage sewer (LDS) system and is partially separated, approximately 5 percent (5 ha) that is considered separation ready and approximately 13 percent (14 ha) of greenspace.

[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.

The collection system in the district includes CS, LDS and storm relief sewer (SRS) systems. The CS system includes a flood pump station (FPS), a CS lift station (LS) system and a combined CS/FPS outfall.

The CS system flows towards the Syndicate outfall, located at the northern end of Syndicate Street, where combined sewage is pumped to the Main Interceptor or may be discharged into the Red River. The Syndicate CS LS is located beside the Syndicate FPS at the outfall.

There are three main flow paths for CS connecting to the pump station. A 1050 mm CS trunk flows north on Syndicate Street, servicing the district east of that street; a 1350 mm CS trunk also flows north on Syndicate Street, servicing the district south of Euclid Avenue and Sutherland Avenue; and a 600 mm CS trunk flows east on Rover Avenue servicing the district north of Euclid Avenue. An interceptor pipe flows west on Sutherland Avenue through the Syndicate district, carrying pumped flows from the Montcalm CS LS in the Mission district to the Main Interceptor pipe on Main Street. This interceptor does not interact with the CS system in the Syndicate district.

During dry weather flow (DWF), LDS and SRS are not required; sanitary sewage passes through the main CS trunk sewers and is diverted by the primary diversion weir for the district through the 1350 mm off-take pipe to the Syndicate CS LS, where it is pumped to the Main Interceptor pipe and on to the North End Sewage Treatment Plant (NEWPCC) for treatment. During wet weather flow (WWF), any flow that exceeds the diversion capacity overtops the primary weir and is discharged to the river. A sluice gate and flap gate are installed on the CS outfall. The flap gate prevents flow from entering the CS system from the Red River when river levels are above the flap gate invert.When the river level are above the flap gate invert, gravity discharge through the CS outfall is not possible. The excess flow under these high river level conditions is instead pumped by the Syndicate FPS to discharge to the river at point downstream of the flap gate.

Approximately 21 percent of Syndicate district is separated with land drainage sewers installed to collect the surface runoff. These sewers discharge directly to the Red River through a separate LDS outfall located on the northern end of Disraeli Street. The southwestern section of Syndicate includes SRS pipework that relieve the CS network during runoff events but do not interconnect with other district SRS systems.

The one outfall to the Red River (one CS) is as follows:

- ID22 (S-MA70003283) – Syndicate CS Outfall

1.3.1 District-to-District Interconnections

There are several district-to-district interconnections between the Syndicate district and the surrounding districts. Each interconnection is shown on Figure 40 and shows locations where gravity and pumped flow can cross from one district to another. Each interconnection is listed in the following subsections.

1.3.1.1 Interceptor Connections – Downstream of Primary Weir

Selkirk

- The 2250mm Main Interceptor pipe flows by gravity from the Syndicate district into the Selkirk district and on to the North End Sewage Treatment Plant (NEWPCC) for treatment.
  - Main Street interceptor invert – 220.406 m (S-MH00012082)

1.3.1.2 Interceptor Connections – Upstream of Primary Weir

Alexander

The 1950mm Main Interceptor pipe flows by gravity north on Main Street into the Syndicate district from the Alexander district and carries sewage to the NEWPCC for treatment

- Main Street interceptor invert – 220.861 m (S-MH20017433-CG)

Mission

- Two 600 mm force mains cross the Red River carrying pumped sewage from Montcalm CS LS in Mission district to the 1200 mm interceptor sewer in Syndicate:
  - Across Red River – Invert at Syndicate district boundary 227.28 m (S-MH20012321)
  - Across Red River – Invert at Syndicate district boundary 227.50 m (S-MH20012321)

1.3.1.3 District Interconnections

Selkirk

CS to CS

- A 375 mm CS sewer acts as an overflow pipe from the Selkirk CS system into the Syndicate CS system.
  - 375 mm CS on Main Street at Dufferin Avenue – 228.52 m (S-MH00012094)

CS to SRS

- A 250 mm SRS sewer acts as an overflow pipe from the Syndicate CS system into the Selkirk SRS system.
  - Euclid Avenue at Lusted Avenue – 228.60 m (S-MH00012247)
- A 250 mm SRS sewer acts as an overflow pipe from the Syndicate CS system into the Selkirk SRS system
  - Austin Street N at Euclid Avenue – 228.62 m (S-MH00012114)

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.

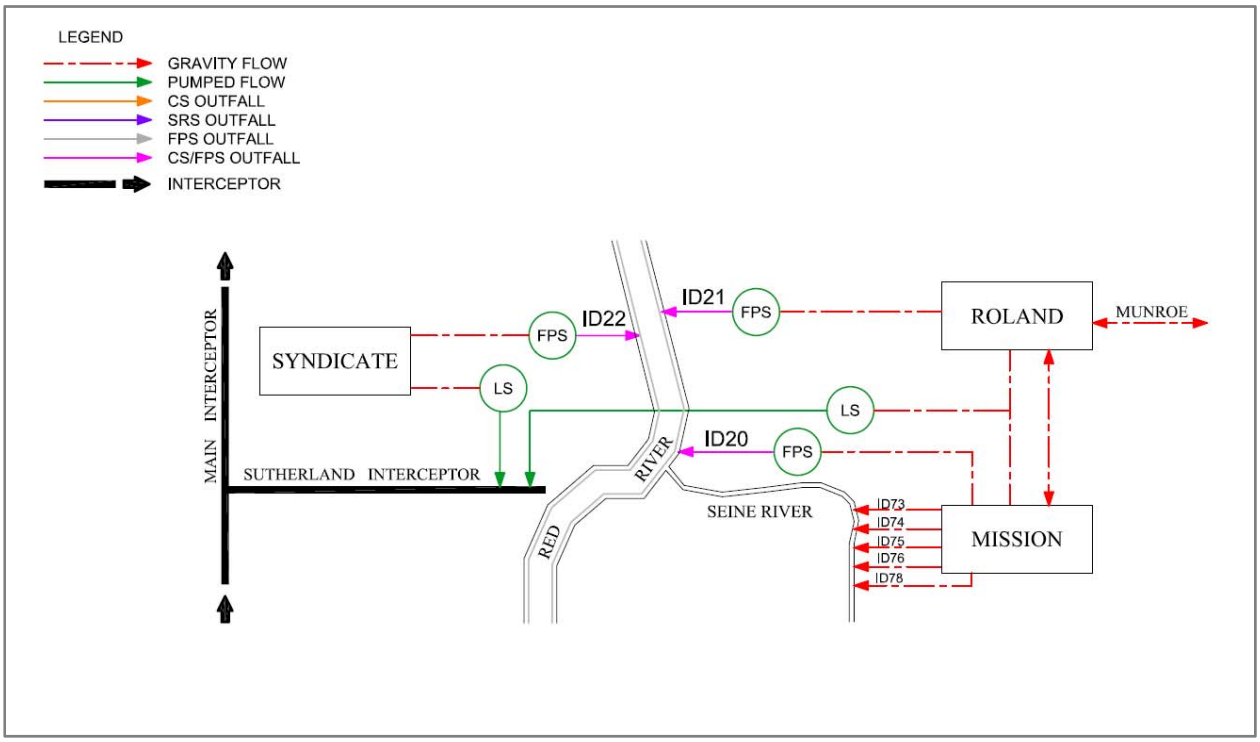


Figure 1-1. District Interconnection Schematic

1.3.2 Asset Information

The main sewer system features for the district are shown on Figure 40 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 (ID57)	S-YY70021031.1	S-MA70003283	1800 mm	Red River Invert: 223.39 m
Flood Pumping Outfall (ID82)	S-YY70021031.1	S-MA70003283	1800 mm	Red River Invert: 223.39 m
Other Overflows	N/A	N/A	N/A	
Main Trunk	S-TE70026975.2 S-YY70021032.1	S-MA70003270 S-MA70003278	1500 mm 1350 mm	Invert: 223.61 m Invert: 223.66 m
SRS Outfalls	N/A	N/A	N/A	
SRS Interconnections	N/A	N/A	N/A	2 SRS – CS
Main Trunk Flap Gate	S-TE70026956.1	S-CG00000789	1525 mm	Invert: 223.53 m
Main Trunk Sluice Gate	S-CG00000789.1	S-CG00000788	1800 x 1800 mm	Invert: 223.30 m
Off-Take	S-TE70026975.1	S-MA70003269	1350 mm	Circular Invert: 223.61 m
Wet Well	S-TE70026978	S-TE70026978	Chamber Area 12.7 m^2	
Lift Station Total Capacity	N/A	N/A	0.040 m^3/s	1 x 0.019 m^3/s 1 x 0.021 m^3/s
Lift Station ADWF	N/A	N/A	0.004 m^3/s	
Lift Station Force Main	S-YY70021034.1	S-MA70003269	250 mm	Invert: 225.80 m
Flood Pump Station Total Capacity	N/A	N/A	0.910 m^3/s	1 x 0.230 m^3/s 1 x 0.680 m^3/s
Pass Forward Flow – First Overflow	N/A	N/A	0.128 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	Syndicate – 223.70
2	Trunk Invert at Off-Take	223.61
3	Top of Weir	224.15
4	Relief Outfall Invert at Flap Gate	N/A
5	Relief Interconnection (S-MH00012247)	228.60
6	Sewer District Low Interconnection (Selkirk)	220.41

7	Low Basement	227.08
8	Flood Protection Level (Boyle, Syndicate)	229.61

[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 Syndicate was the *Boyle/Syndicate Combined Sewer Relief Program* (UMA Engineering Ltd., 2007). The turnover package describes the summary for all works completed under the program and construction costs relating to the past studies and reports for Syndicate district that provided stabilization works for the Boyle site from 1989 to 1993 and CS relief. The Contract 4 construction to provide CS relief in the catchment area known as Higgins West was the most recent work and was completed in June 2002 (UMA Engineering Ltd., 2007). No other work has been completed on the district sewer system 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 Syndicate Combined Sewer District was included as part of this program. Instruments installed at each of the 39 primary CSO outfall locations have 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
40 – Syndicate	2007	Future Work	2013	Study Complete CS Relief Work Complete 2002	N/A

1.5 Ongoing Investment Work

There is ongoing maintenance and calibration of the permanent instruments installed within the primary outfall within the Syndicate district. This consists of monthly site visits in confined entry spaces to verify that 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 the Control Option 1 – 85 Percent Capture in a Representative Year for the Syndicate sewer district are listed in Table 1-4. The proposed CSO control projects will include in-line storage via a control gate and screening. 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% Capture in a Representative Year	-	-	-	✓	✓	-	-	-	✓	✓	✓

Notes:

- = not included
✓ = included

An assessment indicated that the combination of the relatively high separation costs and the lower ranking (volumetric based) concluded that sewer separation work in this district to achieve 85 percent capture is not cost effective.

The existing CS systems are suitable for use as in-line storage. This control option will take advantage of the existing CS pipe network for additional storage volume. Existing DWF from the collection system will remain the same, and overall district operations will remain the same.

Floatable control will be necessary to capture any undesirable floatables in the sewage. Floatables will be captured with all implemented control options to some extent, but screening may be added as required to reach the desired level of capture. Screens will be installed only on the primary outfall located on the eastern end of Syndicate Street.

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.

1.6.2 In-Line Storage

The existing CS system is suitable for use as in-line storage. This control option will take advantage of the existing CS pipe network for additional storage volume. The existing CS LS will be used to dewater the in-line storage volume and direct it to the interceptor. Existing DWF from the collection system and overall district operations will remain the same

In-line storage has been proposed as a CSO control for the Syndicate district. In-line storage will require the installation of a control gate at the CS outfall. The gate will increase the storage level in the existing CS and provide an overall higher volume capture than that already provided by the primary weir.

A standard design was assumed for the control gate, as described in Part 3C of the CSO Master Plan. A standard approach was used for conceptual gate sizing by assuming it to be the lesser of the height of half of the site-specific trunk diameter or the maximum height of the gate available. The design criteria for the in-line storage are listed in Table 1-5.

Table 1-5. In-Line Storage Conceptual Design Criteria

Item	Elevation/Dimension	Comment
Invert Elevation	223.62 m	Downstream invert of pipe at weir
Trunk Diameter	1,350 mm	

Table 1-5. In-Line Storage Conceptual Design Criteria

Item	Elevation/Dimension	Comment
Gate Height	0.74 m	Based on half pipe diameter assumption
Top of Gate Elevation	224.46 m	
Bypass Weir Elevation	224.36	
Maximum Storage Volume	329 m^3	
Nominal Dewatering Rate	0.040 m^3/s	Based on existing CS LS capacity
RTC Operational Rate	TBD	Future RTC / dewatering review on performance

Note:
TBD – to be determined

The proposed control gate will cause combined sewage to back-up within the collection system to the extent shown on Figure 40. The extent of the in-line storage and volume is related to the top elevation of the bypass side weir. The level of the top of bypass side weir and adjacent control gate level are determined in relation to the critical performance levels in the system for basement flooding protection: when the system level increases above the bypass weir crest and proceeds above the top of the control gate during high flow events, the gate drops out of the way. At this point, the district will only provide its original interception capacity via the primary weir for the district, and all excess CS would flow over the weir and discharge to the river. After the sewer levels in the system drops back blow the bypass side weir critical performance level, the control gate moves back to its original position to capture the receding limb of the WWF event. The CS LS would continue with its current operationwhile the control gate is in either position, with all DWF being diverted to the CS LS and pumped to the Main Interceptor on Main Street. The CS LS will further dewater the in-line storage provided during a WWF event as downstream capacity becomes available.

Figure 40-01 provides an overview of the conceptual location and configuration of the control gate, bypass weir and screening chambers. The proposed control gate will be installed in a new chamber within the trunk sewer alignment and located south of the Syndicate outfall gate chamber. The dimensions of a new chamber to provide an allowance for a side weir for floatables control are 5 m in length and 2.5 m in width. . The existing sewer configuration may require the construction of an additional off-take pipe to be completed, if the future detailed design establishes that the proposed gate chamber cannot encompass the existing primary weir. This will allow CS flows captured by the proposed control gate to still be diverted to the CS LS, ensuring that the system performs as per the existing conditions. The existing primary weir would remain in place to allow flow diversion to continue when the control gate is in its lowered position. The proposed chambers (control gate and screening) are to be located within the existing City of Winnipeg Right-of-Way (ROW) adjacent to the existing infrastructure. The construction will have a minor impact on the local street traffic, and there are alternative routes that can be taken to bypass this area.

The physical requirements for the off-take and station sizing for a modification to pumping capacity have not been considered in detail, but they may be required in the future as part of an RTC program or CS LS rehabilitation or replacement project.

The nominal rate for dewatering is set at the existing CS LS capacity. This allows dewatering through the existing interceptor system within 24 hours following the runoff event, allowing it to recover in time for a subsequent event. Additionally, for RTC, an initial estimate of two times the nominal dewatering rate has been selected This allows individual districts to be dewatered within 12 hours, rather than within 24 hours. It will provide the ability to capture and treat more volume for localized storms by using the excess interceptor capacity where the runoff is less. Further assessment of the impact of the RTC and future dewatering arrangement will be necessary to review the downstream impacts on the existing force main and interceptor system.

1.6.3 Floatables Management

Floatables management will require installation of a screening system to capture floatable materials., Off-line screens will be proposed to maintain the current level of basement flooding protection.

The type and size of screens depend on the CS LS configuration and the hydraulic head available for operation. A standard design was assumed for screening and is described in Part 3C of the CSO Master Plan.

The design criteria for screening with an in-line control gate implemented, are listed in Table 1-6.

Table 1-6. Floatables Management Conceptual Design Criteria

Item	Elevation/Dimension/Rate	Comment
Top of Gate	224.46 m	
Bypass Weir Crest	224.36	
Normal Summer Water Level	223.70 m	
Maximum Screen Head	0.74 m	
Peak Screening Rate	0.30 m^3/s	
Screen Size	1.5 m wide x 1 m high	Modelled Screen Size

The proposed side bypass overflow weir and screening chamber will be located adjacent to the proposed control gate and existing combined trunk sewer, as shown on Figure 40-01. The screens will operate with the control gate in the raised position. A side bypass weir upstream of the gate will direct the overflow to the screens located in a new screening chamber, with screened flow discharged to the downstream side of the gate to the river. The screening chamber will include screenings pumps with a discharge returning the screened material to the CS LS for routing back to the interceptor and on to the NEWPCC for removal.

The dimensions for the screen chamber to accommodate influent from the side weir, the screen area, and the routing of discharge downstream of the gate are 5.5 m in length and 2.5 m in width. The existing sewer configuration including the off-take and the 1350 mm and 1050 mm CS sewers down Syndicate Street, and possibly the 600 mm CS sewer along Rover Avenue and the CS LS force main, may have to be modified to accommodate the new chamber.

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 will be reviewed to identify the most applicable GI controls.

Syndicate has been classified as a medium GI potential district. Syndicate has been developed primarily as residential and industrial. This means the district would be an ideal location for bioswales, permeable paved roadways (in the areas away to the riverbank), cisterns/rain barrels, rain gardens, and 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.

In-line storage will impact the existing sewer and will require the addition of a new chamber and a moving gate at the outfall. In-line storage dewatering will be controlled with the existing Clifton CS LS, which will require more frequent and longer duration pump run times. Lower velocities will occur in the CS trunk in the vicinity of the control gate due to lower pass forward flows, and may create additional debris deposition requiring cleaning. Additional system monitoring, and level controls will be installed, which will require regular scheduled maintenance.

Floatable control with outfall screening will require the addition of another chamber with screening equipment installed. The chamber will be installed adjacent to the control gate chamber and will operate in conjunction with it. Screening operation will occur during WWF events that surpass the in-line storage control level. WWF will be directed from the main CS trunk, over the side weir in the control gate chamber and through the screens to discharge into the river. The screens will operate intermittently during wet weather events and will likely require operations review and maintenance after each event. The frequency of a screened event will correlate to the number overflows identified for the district. Having the screenings pumped back to the interceptor system via a small LS and force main will be required. The screenings return will require O&M inspection after each event to assess the performance of the return pump system.

1.8 Performance Estimate

An InfoWorks CS hydraulic model was created as part of the CSO Master Plan development. An individual model was created to represent the sewer system baseline as represented in the year 2013 and a second model was created for the CSO Master Plan evaluation purposes, with all the control options recommended for the district to meet Control Option 1 implemented in the year 2037. A summary of relevant model data is provided in Table 1-7.

Table 1-7. InfoWorks CS District Model Data

Model Version	Total Area (ha)	Contributing Area (ha)	Population	% Impervious	Control Options Included in Model
2013 Baseline	104	104	1,428	59	N/A
2037 Master Plan – Control Option 1	104	104	1,428	59	IS, SC

Note:

IS = In-line Storage
SC = Screening

No change to the future population was completed as from a wastewater 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 estimates listed in Table 1-8 are for the hydraulic model simulations using the year-round 1992 representative year. This table lists the results for the Baseline, for each individual control option and 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. Table 1-8 also includes overflow volumes specific to each individual control options; these are listed to provide an indication of benefit gained only and are independent volume reductions.

Table 1-8. 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 [a]
Baseline (2013)	38,645	57,357	-	21	0.058 m^3/s
In-Line Storage	36,861	51,571	5,786	20	0.055 m^3/s
Control Option 1	**32,200**	**51,571**	**5,786**	**20**	**0.055 m^3/s**

[a] Pass forward flows assessed for the 1-year design rainfall event

The difference between the 2014 Preliminary and CSO Master Plan Baseline and Control Option 1 results are directly due to the update in CS LS pump capacity provided via the ClearSCADA data verification.

The percent capture performance measure is not included in Table 1-8, as it is applicable to the entire CS system and not for each district individually.

1.9 Cost Estimates

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 of the CSO Master Plan. 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 1-9. The cost estimates are a Class 5 planning level estimate with a level of accuracy of minus 50 percent to plus 100 percent.

Table 1-9. Cost Estimates – 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 (Over 35-year period)
In-line Control Gate	$7,700,000 [a]	$2,360,000 [b]	$40,000	$920,000
Screening		$1,870,000 [c]	$50,000	$1,120,000
Subtotal	**$7,700,000**	**$4,230,000**	**$90,000**	**$2,040,000**
Opportunities	$0	$420,000	$9,000	$200,000
District Total	**$7,700,000**	**$4,650,000**	**$99,000**	**$2,240,000**

[a] Screening and In-line costs were combined in the Preliminary Proposal 2015 costing

[b] Cost associated with new off-take construction, as required, to accommodate control gate location and allow intercepted CS flow to reach existing Aubrey LS not included.

[c] Cost for bespoke screenings return pump/force main not included in Master Plan as will depend on selection of screen and type of screening return system selected

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 and O&M costs are reported in terms of present value

- A fixed allowance of 10 percent has been included for GI, with no additional costs 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 1-10.

Table 1-10. Cost Estimate Tracking Table

Changed Item	Change	Reason	Comments
Control Options	Control Gate	Preliminary estimate was based on a standard cost per district, which has been updated to a site-specific district cost estimate.	
	Screening	Preliminary estimate was based on a standard cost per district, which has been updated to a site-specific district cost estimate.	
Opportunities	A fixed allowance of 10 percent has been included for program opportunities.	Preliminary Proposal estimate did not include a cost for GI 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 the 98 percent capture. Table 1-11 provides a description of how the regulatory target adjustment could be met by building off the proposed work identified in Control Option 1.

Overall the Syndicate district would be classified as low to medium for implementation of complete sewer separation as the only feasible approach to achieve the 98 percent capture in the representative year future performance target. The relatively high cost of sewer separation for the remaining district points to a low potential, however, the extent of the existing SRS system with CS connections may have potential for cost effective opportunistic separation that would point to a medium potential. This would require further study to evaluate the district runoff performance. Should it be confirmed that complete separation is the recommended solution to meet future performance targets, then complete separation will likely be pursued to address Control Option 1 instead of implementing the non-separation measures recommended in this district engineering plan. This will be with the understanding that while initially complete separation is less cost-effective to meet Control Option 1, it is the most cost effective solution to meet the future performance target and removes the capital costs on short term temporary solutions.

Opportunistic separation of portions of the district may also be achieved with synergies with other major infrastructure work to address future performance targets. The inclusion of off-line storage elements such as an underground tank or storage tunnel with dewatering pump infrastructure could be utilized to provide any additional volume capture. As with all districts, the use of green infrastructure will be investigated in the future as a potential benefit to meet future performance targets.

Table 1-11. Upgrade to 98 Percent Capture in a Representative Year Summary

Upgrade Option	Viable Migration Options
98 Percent Capture in a Representative Year	• Opportunistic separation • Increased use of GI • Increased use of In-line • Off-Line Storage (Tunnel/Tank)

The control options for the Syndicate district have been aligned for the 85 percent capture performance target and the expandable nature to the 98 percent capture would be based on the system wide basis. The applicability of the listed viable migration options will be stepped rather than full district solutions.

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 Appendix D in Part 3B. The

identification of the most significant risks and opportunities relevant to this district are provided in Table 1-12.

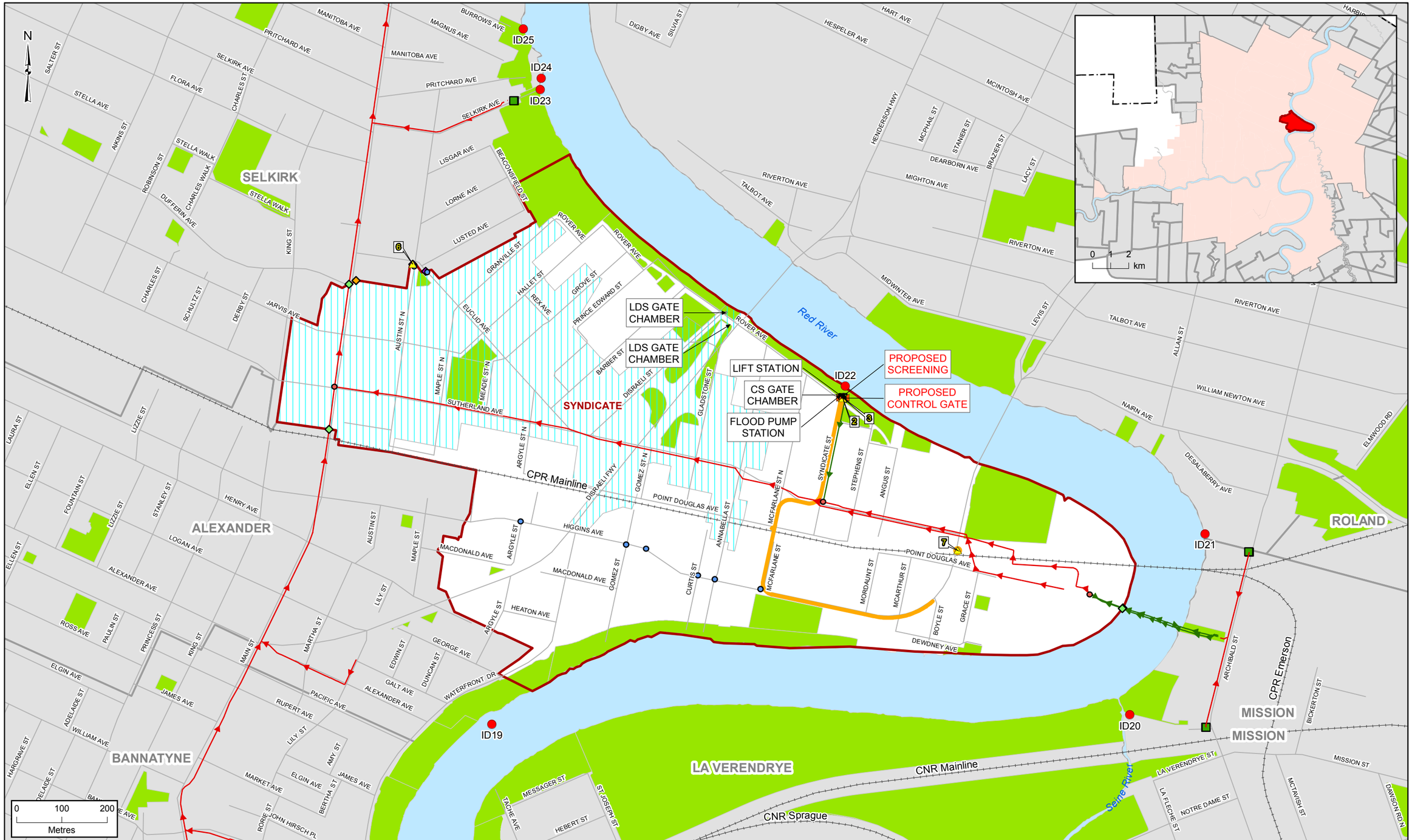
Table 1-12. Control Option 1 Significant Risks and Opportunities

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	-	-	-	-	-	-
2	Existing Lift Station	-	R	-	-	-	-	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	-	-	-	-	-	O	O	-
12	Operations and Maintenance	-	R	-	-	-	R	O	R
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

UMA Engineering Ltd. 2007. *Boyle/Syndicate Combined Sewer Relief Program Final Turnover Package*. Prepared for the City of Winnipeg. July.



LEGEND

Primary Weir	Inter-System Connection	District Boundary Crossing	Interceptor Sewer	District Boundary
Critical Elevation	CS - WWS	CS	Force Main	Watercourse
CSO Outfall	SRS - CS	SRS	Street	Greenspace
Low CS Manhole		WWS	Railway	

CSO MASTER PLAN PROPOSED SOLUTIONS

- Proposed Control Gate
- Extent of In-line Storage
- Sewer Separation - Complete

ALL PROPOSED SOLUTIONS SHOWN IN RED TEXT

JACOBS

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

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

FIGURE 40
District Overview Map
Sewer District: Syndicate
City of Winnipeg
Combined Sewer Overflow Master Plan

\\WPGFSP01\PROJ\WINNIPEGCITYOF\470010MASTERPLANCSO\500DESIGNWORKFILES\503STUDIES\MASTER PLAN CONCEPTUAL DEVELOPMENT\MAPPING\MAPS\PACKAGE5\SYNDICATE\SYNDICATE_DISTRICT_OVERVIEW_MAP.MXD SBEGG1 7/29/2019 9:24:35 AM

LEGEND

- Primary Weir
- Critical Elevation
- CSO Outfall
- Manhole
- Flap Gate
- Sluice Gate
- Pump Location
- Force Main

Sewer By Type
- CS
- WWS

Control Structure Type
- Gate Chamber

Pump Station Type
- Flood Pump Station
- Lift Station

CSO MASTER PLAN PROPOSED SOLUTIONS
- Control Gate
- Screening

ALL PROPOSED SOLUTIONS SHOWN IN RED TEXT

JACOBS

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

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

FIGURE 40-01
Control Gate and Screening
Sewer District: Syndicate
City of Winnipeg
Combined Sewer Overflow Master Plan

\\WPGFSP01\PROJ\WINNIPEGCITYOF\470010MASTERPLANCSO\500DESIGNWORKFILES\503STUDIES\MASTER PLAN CONCEPTUAL DEVELOPMENT\MAPPING\MAPS\PACKAGE5\SYNDICATE\SYNDICATE_DISTRICT_DETAIL.MXD SBEGG1 7/29/2019 9:26:10 AM