CSO Master Plan

Ferry Road District Plan

August 2019

City of Winnipeg

CSO Master Plan

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1	02/15/2019	DRAFT 2 for City Review	MF	SG	MF
2	08/13/2019	Final Draft Submission	DT	MF	MF
3	08/16/2019	Final Submission For CSO Master Plan	MF	MF	SG

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1. Ferry Road District

1.1 District Description

Ferry Road district is located towards the western edge of the combined sewer (CS) area, southeast of the Winnipeg James Armstrong Richardson International Airport (Winnipeg Airport). This district is bounded by Moorgate and Douglas Park districts to the west, Parkside and Riverbend districts to the east, and the Red River to the south. The district is bounded by Sargent Avenue to the north and the Assiniboine River to the south. The boundaries to the east and west vary but are generally from Queen Street to Winchester Street north of Portage Avenue and from Library Place to Bourkevale Drive south of Portage Avenue.

Regional transportation routes that pass through this district include Portage Avenue, Ness Avenue, Ellice Avenue and Ferry Road.

Ferry Road is primarily residential with commercial areas along Portage Avenue and Ness Avenue and a general manufacturing/industrial region north of St. Matthews Avenue near the Winnipeg Airport. A small section in the east of Ferry Road is split by the Riverbend district. This area contains a mixture of residential and commercial areas and stretches from Silver Avenue to Portage Avenue and from Century Street to St. James Street.

The most significant non-residential building in Ferry Road is the Royal Aviation Museum of Western Canada, located south of the Winnipeg Airport. Other small green spaces, such as Truro Park and a section of St. James Rods Football club, can be found within Ferry Road. Truro Creek, which flows through and divides the west side of Ferry Road, flows from the Winnipeg Airport lands to the Assiniboine River.

1.2 Development

A portion of Portage Avenue is located within the Ferry Road District. Portage Avenue is identified as Regional Mixed-Use Corridor as part of the OurWinnipeg future development plans. As such, focused intensification along Portage Avenue is to be promoted in the future.

1.3 Existing Sewer System

Ferry Road encompasses an area of 290 hectares (ha)[1] based on the district boundary. Ferry Road is currently undergoing separation work that includes the installation of a separate land drainage sewer (LDS) system. The area to the north west of the district, around the airport lands has been classed as a separation ready area, covering approximately 7 percent by area. As of December 2018, the area east of Hampton Street has been completed and overall 30 percent of the district by area has been separated. As part of the separation work ongoing 100 percent of the district is anticipated to be separated in the future.

The CS system includes a CS lift station (LS) and one CS outfall. CS collected from the northern, western, and eastern sections flows into collector pipes along Ness Avenue, St. Matthews, and Ferry Road. These collectors then meet at the intersection of Ness Avenue and Ferry Road and flow southbound through the main 1950 by 3000 mm egg-shaped sewer trunk. The Ferry Road CS outfall located on the Assiniboine River near Assiniboine Avenue and Ferry Road receives the CS from this main trunk and from a 900 mm CS on Assiniboine Avenue serving the district area south of Portage Avenue.

[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 Ferry Road main trunk also receives the intercepted CS from the Douglas Park district via a 375 mm interceptor pipe which connects upstream of the primary interception weir.

During dry weather flow (DWF), the flow is diverted by the primary weir through a 500 mm off-take pipe to the Ferry Road CS LS. The sewage is then pumped through the 350 mm force main pipe north towards to the Portage Interceptor along Portage Avenue, where it flows eastwards ultimately towards the North End Sewage Treatment Plant (NEWPCC) for treatment.

During wet weather flow (WWF), high flow in the system may cause the level in the trunk sewer to increase above the primary weir and overflow to the Assiniboine River via the Ferry Road CS outfall. The outfall consists of a positive and flap gate to protect against back-up due to high river levels. Under these same conditions however gravity discharge from the CS outfall is not possible, due to sewage backing up against the flap gate. There is no flood station at this location; however, in the case where high river levels are predicted to prevent flap gate operation during a WWF event, temporary flood pumping can be put in place.

The northern section of the Ferry Road district encompasses a small area surrounding the Winnipeg Airport lands and includes separate LDS and wastewater sewer (WWS) network that serves the buildings locally. Both the LDS and WWS for this area connect to the CS system and flow to the CS trunk on Ferry Road.

The CS outfall to the Assiniboine River is as follows:

- ID46 (S-MA70019349) – Ferry Road CS Outfall

1.3.1 District-to-District Interconnections

There are several district-to-district interconnections between Ferry Road and the surrounding districts. Each interconnection is shown on Figure 16 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

Riverbend

– The Ferry CS LS discharges to the Portage Avenue Interceptor, a 900mm interceptor carrying intercepted CS flows by gravity from the Ferry Road district into the Riverbend district and on to the North End Sewage Treatment Plant (NEWPCC) for treatment.

    o Portage Avenue interceptor invert – 230.65 m (S-MH20008213)

1.3.1.2 Interceptor Connections – Upstream of Primary Weir

Douglas Park

- Intercepted CS from the Douglas Park district crosses into Ferry Road district through the 375 mm interceptor pipe. It flows through Bourkevale Park (east of Douglas Park Road), to be discharged to the Ferry Road LS.
    - Invert at district boundary - 226.1 m (S-MA20008531)

1.3.1.3 District Interconnections

Riverbend

<u>CS to CS</u>

- High Point Manholes (flow is directed into both districts from this manhole)
    – Marjorie Street and St. Matthews Avenue. 230.65 m (S-MH20007039)

- Silver Avenue and Madison Street (Riverbend district boundary) – 231.52 m (S-MH20009635)

Parkside

CS to CS

- A 450 mm CS overflow into Parkside district from Ferry Road is at the intersection of Assiniboine Avenue and Bourkevale Drive
  - Assiniboine Avenue – 228.93 m (S-MH20008113)

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.

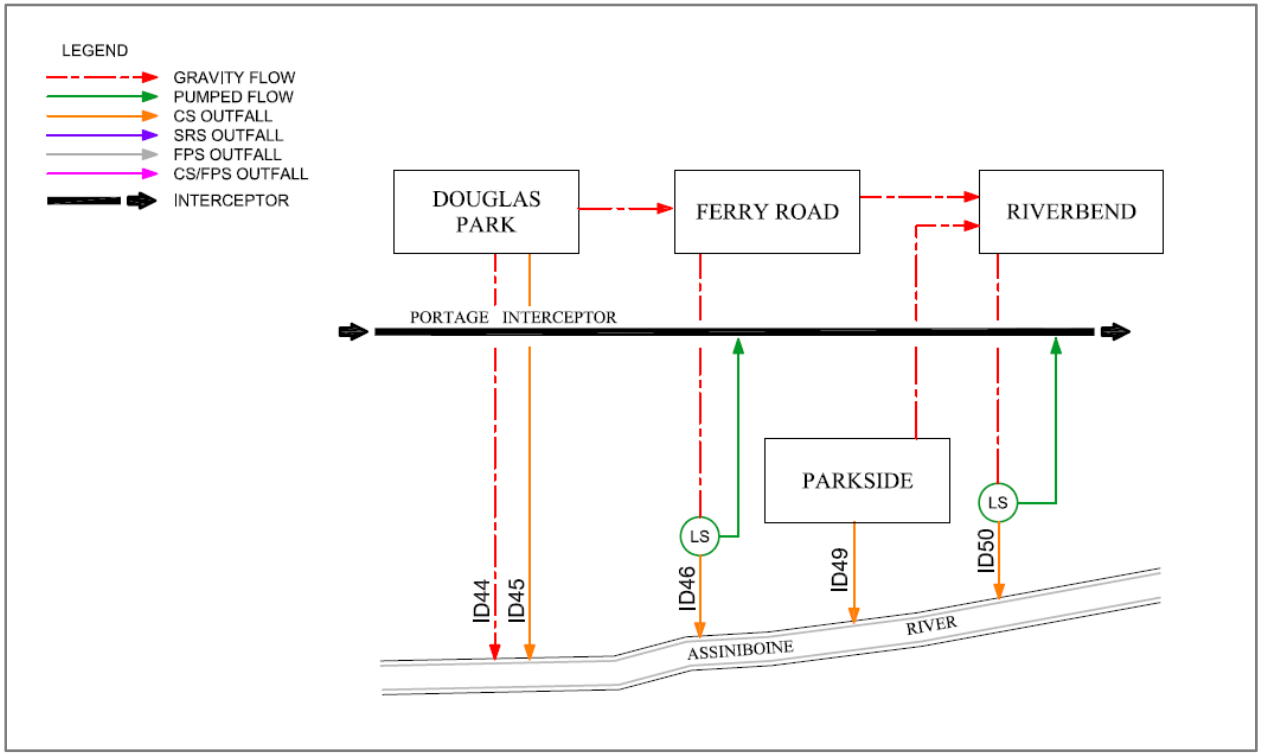

Figure 1-1. District Interconnection Schematic

1.3.2 Asset Information

The main sewer system features for the district are shown on Figure 16 and are 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 (ID46)	S-AC70009025.1	S-MA70019346	1800 mm	Circular Invert: 224.99 m
Flood Pumping Outfall (ID46)	N/A	N/A	N/A	No flood pump station within the district.
Other Overflows	N/A	N/A	N/A	
Main Trunk	S-AC70013535.1	S-MA70028302	1980 x 3050 mm	Egg-shaped Invert: 224.99 m
SRS Outfalls	N/A	N/A	N/A	No SRS within the district.
SRS Interconnections	N/A	N/A	N/A	No SRS within the district.
Main Trunk Flap Gate	S-AC70013537.1	S-CG00000807	1800 mm	Invert: 224.97 m

Table 1-1. Sewer District Existing Asset Information

Asset	Asset ID (Model)	Asset ID (GIS)	Characteristics	Comments
Main Trunk Sluice Gate	S-AC70009023.1	S-CG00000808	1800 x 1800 mm	Invert: 224.97 m
Off-Take	S-MH70010263.1	S-MA70019359	500 mm	Circular Invert: 224.99 m
Dry Well	N/A	N/A	N/A	
Lift Station Total Capacity	N/A	N/A	0.158 m^3/s	1 x 0.082 m^3/s 1 x 0.076 m^3/s
Lift Station ADWF	N/A	N/A	0.061 m^3/s	Ferry Road district as 0.057 m^3/s (no Douglas Park contribution)
Lift Station Force Main	S-AC70009022.1	S-MA70019343	350 mm	Invert: 223.35 m
Flood Pump Station Total Capacity	N/A	N/A	N/A	No flood pump station within the district.
Pass Forward Flow – First Overflow	N/A	N/A	0.155 m^3/s	

Note:
ADWF = average dry-weather flow
GIS = geographic information system ID = identification m^3/s = cubic metre(s) per second
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	224.55
2	Trunk Invert at Off-Take	224.99
3	Top of Weir	225.29
4	Relief Outfall Invert at Flap Gate	N/A
5	Low Relief Interconnection	N/A
6	Sewer District Interconnection (Douglas Park)	226.34
7	Low Basement	228.75
8	Flood Protection Level	230.55

[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 for Ferry Road was in 2006 with the *Ferry Road and Riverbend Combined Sewer Relief Works* (Wardrop, 2006). This study discussed the possible separation work available for both Ferry Road and Riverbend CS systems to reduce the incidence of basement flooding. Since that time dedicated sewer separation work aligned with this study has been designed and constructed. To date, the area located to the east of Hampton Street has been completely separated.

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 Ferry Road CS 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	Planned Completion
16 – Ferry Road	2006 - Conceptual	Future Work – Following Sewer Separation	2013	Sewer Separation Ongoing	TBD (estimated completion of 2028)

Note:
TBD = to be determined

1.5 Ongoing Investment Work

The Ferry Road basement flooding relief program began in 2013 with separation work being completed within the district. It is expected to continue through the beginning stages of the CSO Master Plan. Once completed, it will provide complete road drainage separation of the Ferry Road, Douglas Park, Parkside and Riverbend districts. Separation work will be integrated into the CSO Master Plan along with other control options.

To date, the separation work has been completed on the sections of Berry Street, Brooklyn Street, King Edward Street, Queen Street, and Madison Street between Portage Avenue and Silver Avenue and a section of Kensington Street between Ness Avenue and Silver Avenue. A further 10 Contracts for separation work on various segments of streets are to be completed in the future to completely separate the Ferry Road district.

There is ongoing maintenance and calibration of permanent instruments installed within the primary outfall within the Ferry Road 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 Ferry Road district are listed in Table 1-4**Error! Reference source not found.**. The proposed CSO control is sewer separation to align with work currently underway. 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

The decision to include complete sewer separation of Ferry Road under the BFR work will remove a large volume of land drainage from the CS system, thereby reducing the volume and number of CSOs for the district. The intent of complete separation would be to eliminate all CSOs from the district under the 1992 representative year rainfall conditions. This will require post separation monitoring to confirm the elimination of CSOs and remaining wet weather response in the district from existing building foundation drainage connections to the CS system.

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 Sewer Separation

Sewer separation is proposed for Ferry Road district as part of the CSO Master Plan and is underway as part of the Ferry Road and Riverbend separation work. Complete separation of Douglas Park is also included as part of this work will also remove a large volume of land drainage runoff from the neighboring district's CS system entering Ferry Road, thereby reducing the volume and number of CSOs for the district.

The work includes installation of a new independent LDS system to collect road drainage and divert this flow to a new connection point on the existing 1500 mm LDS sewer at intersection of Ness Avenue and Century Street, which is part of the Riverbend CS district. This existing LDS system drains to the Assiniboine River at near Century Street and Wolseley Avenue West.

The flows to be collected after separation will be as follows:

- DWF will remain the same – collected flow pumped from Ferry Road CS LS to the interceptor.
- WWF will consist of sanitary sewage combined with foundation drainage.

This will result in a reduction in combined sewage flow received at Ferry Road CS LS after the separation project is complete. It is proposed that future monitoring of the district is completed to verify that the sewer separation is fully compliant with the goal of elimination of all CSO overflows under 1992 rainfall conditions. A static weir elevation increase may be necessary at the CS diversion to eliminate the occurrence of all CSO events during the 1992 representative year. The initial hydraulic model assessment indicated that using the existing static weir level one CSO occurrence for the Ferry Road district would continue to occur after the separation work is complete. An increase of 580 mm in the primary weir height was assessed to be required, and this increase has been evaluated in the hydraulic model and was found to not impact the upstream hydraulic grade. This is primarily due to the removal of WWF from the separation projects in neighboring districts as part of the BFR work. Any weir elevation

raise will be further evaluated in terms of actual flow monitoring data to confirm ensure the existing level of basement flood protection remains.

1.6.3 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.

Ferry Road has been classified as a high GI potential district. The land use is primarily residential with commercial areas along Portage Avenue and Ness Avenue and a general manufacturing/industrial region north of St. Matthews Avenue near the Winnipeg Airport. This means the district would be an ideal location for bioswales, permeable paved roadways, cisterns/rain barrels, and rain gardens. The commercial buildings along Portage Avenue would be ideal for green roof projects, and the greenspace areas in the district would be ideal for bioretention garden projects.

1.6.4 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 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.

Sewer separation will include the installation of additional sewers that will require inspection, cleaning and rehabilitation. This will result in additional maintenance costs over the long term, but operational costs will be minimal. The existing larger CS pipes within the district may also receive insufficient flow with the separation work for proper scouring velocities in the sewer pipes. This could result in solids settling within the sewers, and requiring more frequent cleaning operations. The impacts of the reduced flows in larger CS pipes will be evaluated as part of the sewer separation design for the district.

It is recommended to continue to maintain and operate the flow monitoring instrumentation and assess the results after district separation work has been completed. This will allow the full understanding of the non-separated storm elements (foundation drain connections to the CS system) extent within the Ferry Road district.

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 model for the CSO Master Plan with the control options implemented in the year 2037. A summary of relevant model data is summarized in Table 1-5.

Table 1-5. InfoWorks CS District Model Data

Model Version	Total Area (ha)	Contributing Area (ha)	Population	% Impervious	Control Options Included in Model
2013 Baseline	235	235	6,822	36	N/A
2037 Master Plan – Control Option 1	235	216	6,822	1	SEP

Table 1-5. InfoWorks CS District Model Data

Model Version	Total Area (ha)	Contributing Area (ha)	Population	% Impervious	Control Options Included in Model

Notes:

Total area is based on the model subcatchment boundaries for the district.
SEP = Separation
% = percent

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. While this district is to be separated and as a result Clause 8 of Licence No. 3042 will not be in effect, the wet weather response of the district overall will still need to be assessed.

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 1-6, are for the hydraulic model simulations using the year-round 1992 representative year applied uniformly. 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 1-6. Performance Summary – Control Option 1

Control Option	Preliminary Proposal Annual Overflow Volume (m^3)	Master Plan Annual Overflow Volume (m^3)	Overflow Reduction (m^3)	Number of Overflows	Pass Forward Flow at First Overflow
Baseline (2013)	124,634	136,599	-	22	0.185 m^3/s [b]
Sewer Separation	0 [a]	420	136,179	1	0.171 m^3/s [b]
Separation & Static Weir Height Increase		0	420	0	0.170 m^3/s [c]
Control Option 1	**0**	**0**	**136,599**	**0**	**0.170 m^3/s [c]**

[a] Separation and In-line storage were not simulated independently during the Preliminary Proposal assessment

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

C Pass forward flows assessed with the 5-year design rainfall event

The percent capture performance measure is not included in Table 1-6, as it is applicable to the entre CS system, and not for each district individually. However, the full capture of overflows volumes for the Ferry Road district would represent a 100 percent capture rate on a district level.

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 relevant 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 1-7**Error! Reference source not found.**. The cost estimates are a Class 5 planning level estimate with a level of accuracy range of minus 50 percent to plus 100 percent.

Table 1-7. Cost Estimates – Control Option 1

Control Option	2014 Preliminary Proposal Capital Cost	2019 CSO Master Plan Capital Cost [a]	2019 Annual Operations and Maintenance Cost	2019 Total Operations and Maintenance Cost (Over 35-year period) [a]
Sewer Separation	$195,600,000	$129,360,000 [b]	$77,000	$1,650,000
Subtotal	**$195,600,000**	**$129,360,000**	**$77,000**	**$1,650,000**
Opportunities	N/A	$12,940,000	$8,000	$170,000
District Total	**$195,600,000**	**$142,300,000**	**$85,000**	**$1,820,000**

[a] Ferry Road separation is approximately 30% complete and an adjustment has been included in the CSO Master Plan district capital cost estimate to account for this.

[b] Separation capital costs do not include static weir height raise work recommended.

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 1-8.

Table 1-8. Cost Estimate Tracking Table

Changed Item	Change	Reason	Comments
Control Options	Sewer Separation	Unit Costs were updated. Cost adjusted for percentage of sewer separation completed	
-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 complete separation of the Ferry Road district will achieve the 100 percent capture figure, and no other further work will be required to meet the future performance target. It is recommended to complete post separation modelling to confirm the target is fully achieved.

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 as part of the CSO Master Plan 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 1-9.

Table 1-9. 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	-	-	-	-	O	-	-	-
2	Existing Lift Station	-	-	-	-	-	-	R	-
3	Flood Pumping Station	-	-	-	-	O	-	-	-
4	Construction Disruption	-	-	-	-	R	-	-	-
5	Implementation Schedule	-	-	-	-	R	-	R	-
6	Sewer Condition	-	-	-	-	-	-	-	-
7	Sewer Conflicts	-	-	-	-	R	-	-	-
8	Program Cost	-	-	-	-	R	-	-	-
9	Approvals and Permits	-	-	-	-	-	R	-	-
10	Land Acquisition	-	-	-	-	-	R	-	-
11	Technology Assumptions	-	-	-	-	O	O	O	-
12	Operations and Maintenance	-	-	-	-	R / O	R	O	-
13	Volume Capture Performance	-	-	-	-	-	O	O	-
14	Treatment	-	-	-	-	O	O	O	-

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

1.12 References

Wardrop. 2006. *Ferry Road and Riverbend Combined Sewer Relief Works*. Prepared for the City of Winnipeg Water and Waste Department. November.

N

JAMES ARMSTRONG RICHARDSON INTERNATIONAL AIRPORT

AINSLIE

RIVERBEND

TYLEHURST

CLIFTON

MOORGATE

FERRY ROAD

DOUGLAS PARK

PARKSIDE

STRATHMILLAN

ASSINIBOINE PARK

TUXEDO

ASH

AUBREY

EXISTING WEIR TO BE RAISED

LIFT STATION

CS GATE CHAMBER

ID42 ID43 ID44 ID45 ID46 ID47 ID48 ID49 ID50 ID51 ID52 ID53 ID54 ID72 ID81

Assiniboine River

Truro Creek

Ormand's Creek

0 100 200 Metres

0 1 2 km

LEGEND

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

Inter-System Connection
- CS - WWS

District Boundary Crossing
- CS
- LDS
- WWS

- Force Main
- Street
- Railway
- District Boundary
- Watercourse
- Greenspace

CSO MASTER PLAN PROPOSED SOLUTIONS

- Sewer Separation - Underway
- Sewer Separation - Complete
- Sewer Separation - Ready

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 16
District Overview Map
Sewer District: Ferry Road
City of Winnipeg
Combined Sewer Overflow Master Plan

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