# CSO Master Plan

## Roland District Plan

August 2019

City of Winnipeg

## CSO Master Plan

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# 1. Roland District

## 1.1 District Description

Roland district is located in the northeastern sector of the combined sewer (CS) area along the eastern edge of the Red River and north of the Mission district. The district is bounded by Munroe district to the north, Area 13 and Kildonan Place district (Area 13.1) to the east, the Mission district to the south, and the Hart district to the west. Roland is bounded by Thomas Avenue to the south, Gateway Road to the west, Kent Road and Harbison Avenue East to the north, and Panet Road to the east.

Roland district is located in close proximity to downtown and has many major transportation routes run through the district. The Canadian Pacific Railway Mainline passes through this district. Nairn Avenue is the only regional road in the district.

Roland district is a mix of residential, commercial and manufacturing land use. The residential area is primarily single-family and two-family. The commercial area is located along Nairn Avenue and Panet Road and a manufacturing area is located along Thomas Avenue. The greenspace areas include Montcalm Playground, Chalmers Park, King Edward Park, Hap Hopkinson Memorial Park, and various school parks, playgrounds, and community areas throughout the district. The Canadian National Railways East Yards border the southern district boundary at Thomas Avenue.

## 1.2 Development

A portion of Nairn Avenue is located within the Roland District. This street is identified as a Regional Mixed Use Corridor as part of the OurWinnipeg future development plans. As such, focused intensification along Nairn Avenue is to be promoted in the future.

Nairn Avenue, Thomas Avenue, and a portion of Foster Street within the Roland District have been identified as part of the potential routes for the Eastern Corridor of Winnipeg's Bus Rapid Transit. The work along these streets could result in additional development in the area, which could also present an opportunity to coordinate sewer separation works alongside the transit corridor development, providing further sewer separation within the Roland District. This would reduce the extent of the Control Options listed in this plan required.

## 1.3 Existing Sewer System

Roland district encompasses an area of 204 ha[1] and includes a CS system and a storm relief sewer (SRS) system. There is approximately 3.5 ha (1.7 percent) identified as land drainage sewer (LDS) separated. There are no identifiable separation-ready areas. Approximately 12 ha of the district is classified as greenspace.

The Roland sewer system includes a diversion structure, flood pump station (FPS), CS outfall, and SRS outfall gate chambers. The CS systems drain towards the Roland diversion structure and primary CS outfall, located in the Hart district at the northern end of Archibald Street at the Red River. Approximately 120 m upstream of the Roland outfall, sewage is diverted to the Montcalm sewage Lift Station (LS) located in Mission district, at which point it is pumped into a river crossing pipe and enters the Syndicate district. A single sewer trunk collects flow from most of the district and directs flow to the diversion structure near Archibald Street. The 1625 mm by 2060 mm CS trunk extends from the diversion structure to Gateway Road. Multiple secondary sewers extend form the CS trunk along Gateway Road to the north and Talbot Avenue to the east to service the district.

[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 SRS system includes various interconnections to the CS system. The Roland SRS system also receives the excess CS diverted from the majority of the Munroe SRS system to the north. The Roland SRS connects into a dedicated SRS gate chamber, but utilizes the same Roland primary CS outfall for the SRS system discharge. The gate chamber on the SRS system includes sluice and flap gates to prevent river water from backing up into the SRS system when the Red River levels are particularly high. During runoff events, the SRS system provides relief to the CS system in Roland district and in turn the Munroe district. The SRS system extends throughout the district and has multiple interconnections with the CS system. Catch basins are connected to the CS system, so the SRS provide additional capacity to the CS to main basement flooding protection.

During dry weather flow (DWF), the SRS is not required; sanitary sewage flows to the diversion structure and is diverted by the primary weir to a 600 mm interceptor pipe, where it flows by gravity southbound along Archibald Street approximately 225 m to the gate/junction chamber to the Montcalm sewage LS in Mission district to be pumped across the Red River to the Syndicate district, which ties into the Main Street Interceptor, and eventually 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 weir and is discharged to the river. When the river level is high and gravity discharge is not possible, excess flow is pumped by the Roland FPS to the river. Sluice and flap gates are installed within the FPS to prevent back-up of the Red River into the CS system. However not only does the flap gate prevent river water intrusion, but it also prevents gravity discharge from the Roland CS outfall. Under these conditions the excess flow is pumped by the Roland FPS to a point in the Roland CS Outfall downstream of the flap gate and downstream of the SRS gate chamber, where it can be discharged to the river by gravity once more.

There is one (shared CS and SRS) outfall to the Red River as follows:

- ID21 (S-MA40011011) – Roland CS Outfall

### 1.3.1 District-to-District Interconnections

There are several district-to-district interconnections between Roland and the surrounding districts. Each interconnection is shown on Figure 36 and shows locations where gravity flow can cross from one district to another. Each interconnection is listed as follows:

#### 1.3.1.1 Interceptor Connections - Downstream of Primary Weir

**Mission**

- CS flows through a 600 mm CS off-take secondary interceptor pipe south by gravity on Archibald Street from Hart district into Mission district. This is CS intercepted from the Roland district. This CS then flows into the Montcalm CS LS and is pumped via force main river crossing into the Syndicate district.
  - Archibald Street and Mission district boundary invert – 223.56 m (S-MA50018054)

#### 1.3.1.2 District Interconnections

**Hart**

<u>SRS to SRS</u>

- A 2900 mm SRS flows southwest by gravity crossing Elmwood Road from Roland district into Hart district. This trunk connects into the same gate chamber and outfall as the Watt Street SRS; there is no interaction with the Hart system upstream of the gate chamber.
  - Invert at Hart district boundary – 222.27 m (S-MA40011025)

<u>CS to CS</u>

- A 1625 x 2060 mm CS flows west by gravity on Elmwood Road at Watt Street from Roland district into Hart district:
  - Invert at Hart district boundary – 223.52 m (S-MA40011002)

**Munroe**

<u>SRS to SRS</u>

- A 375 mm SRS relieves a 600 mm CS sewer off of Keenleyside Street in Munroe district and flows by gravity south along Keenleyside Street into Roland SRS System:
  - Invert at Munroe district boundary – 226.24 m (S-MA40010345)
- A 2900 mm SRS flows from Munroe district by gravity south along Besant Street and crosses into Roland district SRS system at Molson Street:
  - Invert at Munroe district boundary – 223.31 m (S-MA40007633)
- A 375 mm SRS flows from Munroe district by gravity eastbound on London Street and crosses into the Roland district SRS system:
  - Invert at Roland district boundary – 224.34 m (S-MA40007675)
- A 2900 mm SRS flows from Munroe by gravity south along Gateway Road into the Roland district SRS system:
  - Invert at Roland district boundary – 222.76 m (S-MA40008399)
- A 525 mm SRS flows from Munroe by gravity south along Grey Street to Roland district SRS system:
  - Invert at Munroe district boundary – 224.50 m (S-MA40007593)

**Kildonan Place (Area 13.1)**

<u>CS to CS</u>

- A 450 mm CS flows from Kildonan Place district by gravity west on Talbot Avenue at Panet Road into Roland district:
  - Invert at Roland district boundary – 226.65 m (S-MA40011663)
- A 1050 mm CS flows from Kildonan Place district by gravity west on Regent Avenue West into Roland district:
  - Invert at Roland district boundary – 226.31 m (S-MA70040189)

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

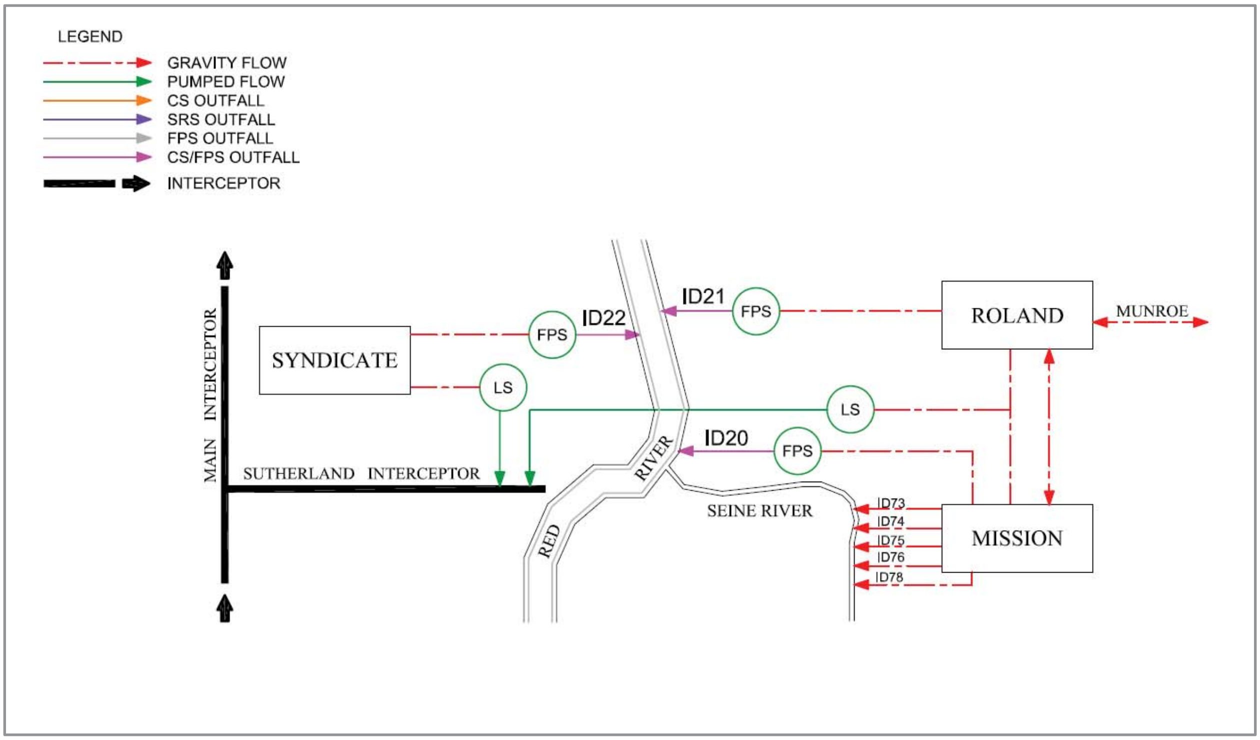



**Figure 1-1. District Interconnection Schematic**

### 1.3.2 Asset Information

The main sewer system features for the district are shown on Figure 36 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 (ID21) | ROLAND_SRS_GC_03.1 | S-MA40011011 | 3700 mm | Red River<br>Invert: 221.39 m |
| Flood Pumping Outfall (ID21) | ROLAND_SRS_GC_03.1 | S-MA40011011 | 3700 mm | Red River<br>Invert: 221.39 m |
| Main Trunk | S-MH40009951.1 | S-MA40011217 | 1625 x 2050 mm | Main CS that flows west across Archibald Street<br>Invert: 223.48 m |
| SRS Outfalls (ID21) | ROLAND_SRS_GC_03.1 | S-MA40011011 | 3700 mm | Red River<br>Invert: 221.39 m |
| SRS Interconnections | N/A | N/A | N/A | 43 SRS - CS |
| Main Trunk Flap Gate | S-TE70026812.2 | S-CG00000732 | 1500 x 2100 mm | Invert: 223.71 m |
| Main Trunk Sluice Gate | S-CG00000733.1 | S-CG00000733 | 1500 x 2100 mm | Invert: 223.61 m |
| Off-Take | S-MH70032213.2 | S-MA50018054 | 600 | Invert: 223.56 |
| Dry Well | N/A | N/A | N/A | |
| Lift Station Total Capacity | N/A | N/A | 0.84 $m^3/s$ + one more pump | 3 x 0.28 $m^3/s$, 1 x N/A |
| ADWF | N/A | N/A | 0.016 $m^3/s$ | |
| Lift Station Force Main | N/A | S-MA70046417 | 600 mm | 2 x 600 mm |

**Table 1-1. Sewer District Existing Asset Information**

| Asset | Asset ID (Model) | Asset ID (GIS) | Characteristics | Comments |
|---|---|---|---|---|
| | | S-MA70046432 | | |
| Flood Pump Station Total Capacity | N/A | N/A | 1.70 $m^3/s$ | 2 x 0.85 $m^3/s$ |
| Pass Forward Flow – First Overflow | N/A | N/A | 0.473 $m^3/s$ | |

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 | Roland – 223.70 |
| 2 | Trunk Invert at Off-Take | 223.56 |
| 3 | Top of Weir | 223.98 |
| 4 | Relief Outfall Invert at Flap Gate (S-MA40011231) | 222.11 |
| 5 | Low Relief Interconnection (S-MA70024476) | 224.50 |
| 6 | Sewer District Interconnection (Hart) | 222.42 |
| 7 | Low Basement | 229.06 |
| 8 | Flood Protection Level | 229.34 |

[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 Roland was the *Munroe, Roland, Hart Combined Sewer Study* (Wardrop Engineering Consultants, 1985). The study's purpose was to develop sewer relief options to reduce surcharge level and relieve basement flooding. 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 Roland Combined Sewer District was included as part of this program. Instruments installed at each of the thirty nine 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 |
|---|---|---|---|---|---|
| 36 – Roland | 1985 | Future Work | 2013 | Study Complete | N/A |

Source: Report *Munroe, Roland, Hart Combined Sewer Study*, 1985

## 1.5 Ongoing Investment Work

There is ongoing maintenance and calibration of permanent instruments installed within the primary outfall within the Roland 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 Roland sewer district are listed in Table 1-4. The proposed CSO control projects will include latent storage, in-line storage via control gate, and floatable management via screening. Program opportunitiess 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 | Storage / Transport Tunnel | Sewer Separation | Green Infrastructure | Real Time Control | Floatable Management |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 85 Percent Capture in a Representative Year | ✓ | - | - | ✓ | ✓ | - | - | - | ✓ | ✓ | ✓ |

Notes:

- = not included
✓ = included

The existing CS and SRS systems are suitable for use as in-line and latent storage. These control options will take advantage of the existing CS and SRS pipe networks for additional storage volume.

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. A screen will be installed on the Roland primary CS outfall.

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.

### 1.6.1 Latent Storage

Latent storage is proposed as a control option for the Roland district. There is one SRS system that shares the outfall with the main Roland CS outfall. The SRS system connects to the CS outfall pipe upstream of the SRS gate chamber with flap gate protection, and will provide additional storage. The latent storage level in the system is controlled by the river level, and the resulting backpressure of the river level on the SRS gate chamber flap gate, as explained in Part 3C.  The SRS for the Roland district receives all the diverted CS flow from Roland as well as most of the SRS flow from Munroe to the north. The latent storage design criteria are identified in Table 1-5. The storage volumes indicated in Table 1-5 are based on the continuous NSWL river level conditions over the course of the 1992 representative year.

**Table 1-5. Latent Storage Conceptual Design Criteria**

| Item | Elevation/Dimension | Comment |
|---|---|---|
| Invert Elevation | Watt – 222.11 m | Flap Gate invert |
| NSWL | 223.07 m | |
| Trunk Diameter | 2900 mm | |
| Design Depth in Trunk | 1600 mm | |
| Maximum Storage Volume | 5200 $m^3$ | |
| Force Main | 225 mm | |
| Flap Gate Control | N/A | |
| Lift Station | Yes | |
| Nominal Dewatering Rate | 0.075 $m^3/s$ | Based on 24-hour emptying requirement |
| RTC Operational Rate | TBD | Future RTC/dewatering assessment required |

Notes:

NSWL = normal summer water level
RTC = real time control

The addition of a pump and force main that connects back to the CS system will be required for the latent storage arrangement. A conceptual layout for the pump station and force main is shown on Figure 36-01. The pump station will be located north of the existing FPS in the adjacent parking lot near Archibald Street to avoid disruption to existing sewers or neighboring roads. The latent force main will pump east to the nearby 1625 by 2060 mm trunk sewer on Archibald Street and into the manhole (S-MH40009951) on the east curb on Archibald Street. The pump station will operate to dewater the SRS system in preparation for the next runoff event, the requirement for the system to be ready for the next event within a 24-hour period after completion of the previous event.

Figure 36 identifies the extent of the SRS system within Roland 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.

The river level will keep the SRS flap gate closed and system level maintained at the NSWL. This level utilizes 55 percent of the SRS pipe height. As part of the evaluation, the latent storage volume was completed using the continuous NSWL river conditions. It was found that additional flap gate control will not be required to meet the Control Option 1 85% capture target. In situations where non modelled assessments are to be completed, the actual river levels will be both lower and higher than the NSWL level at various points throughout an annual year. Where the level is below NSWL, the latent volume will be less than predicted during the MP assessment, while conversely when the level is above the NSWL, the latent volume will be more than predicted. The continuous assessment is seen as a conservative approach since the majority of the representative year rainfall events occur when the river levels are higher than the NSWL.

As described in the standard details in Part 3C wet well sizing for the latent storage pump station 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.

### 1.6.2 In-Line Storage

In-line storage has been proposed as a CSO control for Roland district. The 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 and provide additional hydraulic head for screening operations. The existing Montcalm sewage LS will provide the dewatering for the in-line storage.

A standard design was assumed for the control gate, as described in Part 3C. 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 is listed in Table 1-6.

**Table 1-6. In-Line Storage Conceptual Design Criteria**

| Item | Elevation/Dimension | Comment |
|---|---|---|
| Invert Elevation | 223.48 m | Downstream invert of lowest pipe at diversion chamber |
| Trunk Diameter | 1625 x 2060 mm | |
| Gate Height | 0.65 m | Gate height based on half trunk diameter assumption (flood assessment included) |
| Top of Gate Elevation | 224.63 m | |
| Bypass Weir Height | 224.53 m | |
| Maximum Storage Volume | 1,151 $m^3$ | |
| Nominal Dewatering Rate | 0.443 $m^3/s$ | Based on minimum pass forward rate for gravity discharge district (Montcalm LSPS located downstream) |
| RTC Operational Rate | TBC | Future RTC / dewatering |

Note:
TBC = to be confirmed
RTC – Real Time Control

The proposed control gate will cause combined sewage to back-up within the collection system to the extent shown on Figure 36. . 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 the 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 the flow overtops the bypass weir and is screened prior to discharging to the river. If the system level continues to rise, it will reach the critical level where the control 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 below 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 gravity discharge will continue with its current operation while the control gate is in either position, will all DWF being diverted to the Montcalm Pumping Station.

Figure 36-01 provides an overview of the conceptual location and configuration of the control gate and screening chambers. The proposed control gate will be installed in a new chamber within the existing trunk sewer alignment near the FPS. The dimensions of a new chamber to provide an allowance for a side weir for floatables control are 5.0 m in length and 3.0 m in width to accommodate the gate, with an allowance for a longitudinal overflow weir. The chamber will be located immediately east of the FPS, within the local street and minor disruptions to the Archibald Street traffic would be noted during the potential construction period. The existing sewer configuration may have to be modified to allow the installation of the in-line gate and screening chambers. The physical requirements for the off-take and station sizing for a modification to pumping capacity have not been considered in detail, but they will be required in the future as part of an RTC program or FPS rehabilitation or replacement project.

The nominal rate for dewatering is already set as the existing pipe capacity as the district is a gravity discharge district, although impacted by the downstream Montcalm sewage LS. Any future considerations, for RTC improvements, would be completed with spatial rainfall and the interactions of the Montcalm sewage LS and the Mission district, which also drains to the Montcalm sewage LS.

### 1.6.3 Floatables Management

Floatables management will require installation of a screening system to capture floatable materials. The off-line screens would be proposed while still maintaining the current level of basement flooding protection.

The type and size of screens depend on the LS and the hydraulic head available for operation. A standard design was assumed for screening and is described in Part 3C. The design criteria for screening with gate control implemented, are listed in Table 1-7.

**Table 1-7. Floatables Management Conceptual Design Criteria**

| Item | Elevation/Dimension/Rate | Comment |
|---|---|---|
| Top of Gate | 224.63 m | |
| Bypass Weir Crest | 224.53 m | |
| NSWL | 223.70 m | |
| Maximum Screen Head | 0.93 m | |
| Peak Screening Rate | 0.35 $m^3/s$ | |
| Screen Size | 1.5 m x 1.0 m | Modelled Screen Dimensions |

The proposed side overflow bypass weir and screening chamber will be located adjacent to the proposed control gate and existing CS trunk sewer, as shown on Figure 36-01. The screens will operate with the control gate in its raised position. A side bypass weir upstream of the gate will direct the overflow to the screens located in the 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 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 3.0 m in length and 2.3 m in width. The existing sewer configuration may have to be modified to accommodate the new chamber. The chamber will be located immediately east of the FPS, within the local street and minor disruptions to the Archibald Street traffic would be noted during the potential construction period.

### 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 applicable GI controls.

Roland has been classified as a medium GI potential district. Roland district is a mix of residential, commercial and industrial. This district would be an ideal location for cisterns/rain barrels, and rain garden bioretention within the residential areas. Commercial areas are suitable to green roofs and parking lot areas are ideal for paved porous pavement. Bioswales may be suitable to the industrial areas.

#### 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 latent storage would take advantage of the SRS infrastructure already in place, therefore, minimal additional maintenance will need to be anticipated. The proposed latent LSPS will require regular maintenance that would depend on the frequency of operation. The flap control gate will require maintenance inspection for continued assurance that the flap gate would open during WWF events.

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. 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 1-8.

**Table 1-8. InfoWorks CS District Model Data**

| Model Version | Total Area (ha) | Contributing Area (ha) | Population | % Impervious | Control Options Included in Model |
|---|---|---|---|---|---|
| 2013 Baseline | 287 | 287 | 5,318 | 48 | N/A |
| 2037 Master Plan – Control Option 1 | 287 | 287 | 5,318 | 48 | IS, Lat St, SC |

Notes:

Lat St = Latent Storage
IS = In-line Storage
SC = Screening

**Table 1-8. InfoWorks CS District Model Data**

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

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 1-9 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 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. Table 1-9 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 1-9. 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) | 301,845 | 299,396 | - | 20 | 0.401 $m^3/s$ |
| In-Line Storage | 301,103 | 290,998 | 8,398 | 18 | 0.479 $m^3/s$ |
| In-Line & Latent Storage | N/A [a] | 181,108 | 109,890 | 14 | 0.479 $m^3/s$ |
| **Control Option 1** | **301,103** | **181,108** | **118,288** | **14** | **0.479 $m^3/s$** |

[a] Latent storage was not simulated during the Preliminary Proposal assessment

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

The percent capture performance measure is not included in Table 1-9, 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. 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 **Error! Reference source not found.**. The cost estimates are a Class 5 planning level estimates with a level of accuracy of minus 50 percent to plus 100 percent.

**Table 1-10. 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 | N/A [a] | $2,790,000 | $82,000 | $1,780,000 |

| | | | | |
|---|---|---|---|---|
| In-Line Storage | N/A [b] | $2,540,000 [c] | $40,000 | $850,000 |
| Screening | | $1,990,000 [d] | $31,000 | $660,000 |
| **Subtotal** | **N/A** | **$7,320,000** | **$153,000** | **$3,290,000** |
| Opportunities | N/A | $730,000 | $15,000 | $330,000 |
| **District Total** | **N/A [b]** | **$8,050,000** | **$168,000** | **$3,620,000** |

[a] Latent Storage not included in the Preliminary Proposal

[b] Solution development as refinement to Preliminary Proposal costs. Revised costs for these items of work found to be $7,410,000 in 2014 dollars.

[c] Costs associated with any revision to existing off-take, as required, to accommodate the control gate location and allow the intercepted CS flow to reach the existing gravity interceptor are not included

[d] Cost for bespoke screening return/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 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 1-11.

**Table 1-11. Cost Estimate Tracking Table**

| Changed Item | Change | Reason | Comments |
|---|---|---|---|
| Control Options | In-line Storage Control Gate | A control gate was not included in the initial preliminary estimate | Added to Master Plan |
| | Screening | Screening was not included in the initial Preliminary Proposal | Added for the Master Plan. |
| | Latent Storage | Latent Storage was not included in the Preliminary Proposal | Added for the MP to further reduce overflows. |

| | | | |
|---|---|---|---|
| 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 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 1-12 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 Roland district would be classified as a high potential for implementation of complete sewer separation as the only feasible approach to achieve the 98 percent capture future performance target in the representative year. The non-separation measures recommended as part of this district engineering plan to meet Control Option 1, specifically in-line storage and floatables management via off-line screening, are therefore at risk of becoming redundant and unnecessary when the measures to achieve future performance targets are pursued. As a result, these measures should not be pursued until the requirements to meet future performance targets are more defined. 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. This will be with the understanding that while initial 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. Focused use of green infrastructure, and reliance on said green infrastructure as well can provide volume capture benefits and could be utilized to meet future performance targets.

**Table 1-12. Upgrade to 98 Percent Capture in a Representative Year Summary**

| Upgrade Option | Viable Migration Options |
|---|---|
| 98 Percent Capture in a Representative Year | • Sewer Separation<br>• Increased use of GI |

The control options selected for the Roland district have been aligned for the 85 percent capture performance target based on the system wide basis. The expandability of this district to meet the 98 percent capture would not align with the proposed options for the 85 percent capture target. The future higher level of percent capture indicates that complete sewer separation would be applicable in this district.

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 1-13.

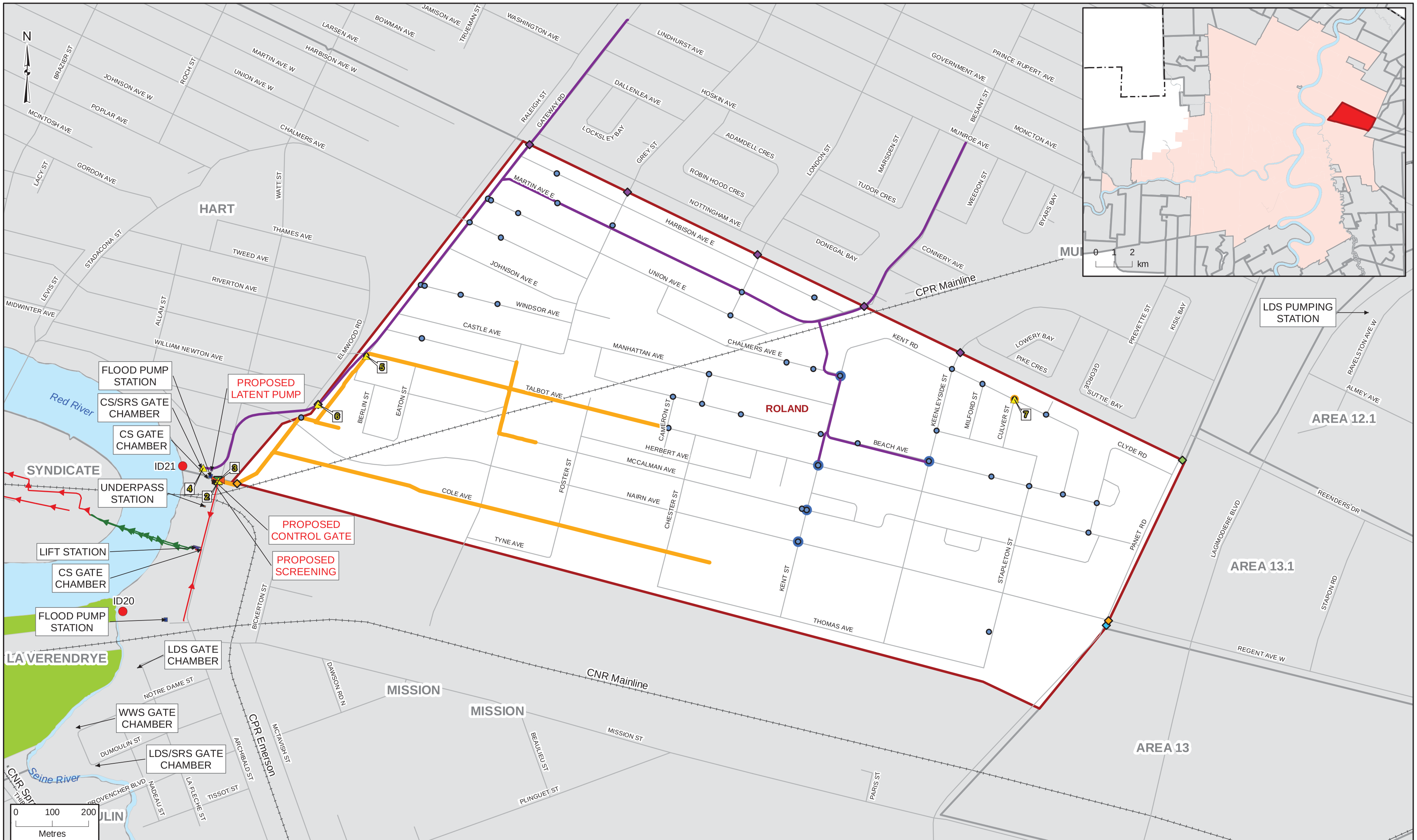
**Table 1-13. Control Option 1 Significant Risks and Opportunities**

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

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

## 1.12 References

Wardrop Engineering Consultants. 1985. *Munroe, Roland, Hart Combined Sewer Relief Study.* Prepared for the City of Winnipeg, Waterworks, Waster and Disposal Department. June.




LEGEND

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

CSO MASTER PLAN PROPOSED SOLUTIONS

- Proposed Control Gate
- Latent Storage Limit
- Extent of In-line Storage

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 36**
**District Overview Map**
**Sewer District: Roland**
City of Winnipeg
*Combined Sewer Overflow Master Plan*

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LEGEND

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

Sewer By Type
- CS
- SRS

Control Structure Type
- Gate Chamber

Pump Station Type
- Flood Pump Station

CSO MASTER PLAN
PROPOSED SOLUTIONS
- Proposed Latent Force Main
- Control Gate
- Screening
- Latent Pump

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 36-01**
**Control Gate, Screening, and Latent Pump**
**Sewer District: Roland**
City of Winnipeg
*Combined Sewer Overflow Master Plan*

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