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# CSO Master Plan

## Aubrey District Plan

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City of Winnipeg

JACOBS

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# 1. Aubrey District

## 1.1 District Description

Aubrey district is in the central portion of the combined sewer (CS) area north of the Assiniboine River. As a district, Aubrey has a unique configuration due to the northern section of Aubrey extending into Clifton district and separating Aubrey district. It is approximately bounded by the Canadian Pacific Railway (CPR) Winnipeg Yards to the north; Erin Street, Minto Street, and Goulding Street to the west; the Assiniboine River to the south; and Burnell Street and Arlington Street to the east. The section of Aubrey district that divides Clifton district is bordered by McCrossen Street to the west, Dublin Avenue and Notre Dame Avenue to the north, and Clifton Street to the east.

The land use within Aubrey district is distributed between primarily industrial and residential areas, as well as commercial businesses located along Portage Avenue and McPhillips Street. The northern area of Aubrey is primarily heavy manufacturing with the CPR Weston Shops and Yards, and the Pacific Industrial lands. The central and southern sections of Aubrey district include residential land consisting of single- and two-family homes and apartment buildings distributed throughout the district. The area of Notre Dame Avenue has mostly been developed as light and heavy industrial. Commercial corridors are located along the various east-west streets in the southern sections of Aubrey, including Ellice Avenue, Wellington Avenue, and Sargent Avenue, among others.

Many major transportation routes pass through the district: McPhillips Street, Logan Avenue, Notre Dame Avenue, Wall Street, Ellice Avenue, and Portage Avenue

Greenspace is limited in the Aubrey district, with small parks located within the residential areas. These parks include Stanley Knowles Park and Sargent Park. Notable non-residential buildings in the Aubrey district include the CPR Winnipeg Yard that spans the northern section, the Royal Canadian Mounted Police Winnipeg Office, and the McPhillips Station Casino.

## 1.2 Development

A portion of Portage Avenue is located within the Aubrey 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

Aubrey district encompasses an area of approximately 537 ha[1] based on the GIS district boundary data. This includes an area of approximately 17 ha (3 percent of the district area) that is considered separation ready and approximately 16 ha (3 percent of the district area) of greenspace. There is no completed separation in the district.

The CS system includes a flood pump station (FPS), a CS lift station (LS) system and two independent storm relief sewer (SRS) systems. Four outfalls are in the district including one CS, one FPS and two SRS.

The CS system flows to the Aubrey outfall, located at the southern end of Aubrey Street. A single 2800 mm CS trunk sewer collects flow from most of the district. This trunk extends north along Aubrey Street to Portage Avenue. The section of the district north of Notre Dame Avenue is serviced by a 700 mm CS on Logan Avenue that connects to a 900 mm by 1200 mm egg-shaped CS on McPhillips Street. This, in turn,

[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.

flows to a 1675 mm by 2150 mm egg-shaped trunk on Lipton Street that increases in size as it flows south and into a 2050 mm by 2650 mm egg-shaped trunk on Aubrey Street which connects into the 2800 trunk sewer and towards the Aubrey outfall. This Lipton/Aubrey trunk sewer also receives combined sewage from the southern section of the district. Sewers along major roads such as Portage Avenue, Ellice Avenue, St Matthews Avenue, Sargent Avenue, Wellington Avenue, Notre Dame Avenue, and McPhillips Street act as collector pipes and feed into the Aubrey and Lipton Streets trunk sewers. A separate 300 mm CS, which collects sewage from Palmerston Avenue, connects to the trunk at the Aubrey outfall immediately upstream of the primary weir.

During dry weather flow (DWF), flow is diverted by the primary weir to the Aubrey CS LS and pumped to the interceptor sewer on Wolseley Avenue which flows by gravity to the NEWPCC for treatment. The Aubrey district receives the intercepted combined sewage flow from the Ash CS district, via a force main river crossing across the Assiniboine River. The flow from Ash CS lift station (LS) connects to the interceptor on Wolseley upstream of the Aubrey interceptor connection.

During wet weather flow (WWF), any flow that exceeds the diversion capacity overtops the primary weir and is discharged to the Assiniboine river. Sluice and flap gates are installed on the Aubrey CS outfall to prevent back-up of the Assiniboine River into the CS system under high river levels in the Assiniboine River. When the Assiniboine River levels are high during WWF events however, no gravity discharge is possible due to the flap gate installed on the CS outfall. Under these high river level conditions, the excess flow is pumped by the FPS, where it is routed to the dedicated FPS outfall to the river. The FPS outfall does not have a flap gate or sluice gate installed.

During WWF events as well, the SRS systems provide relief to the CS system in the Aubrey district. The SRS systems extend throughout Aubrey and have multiple interconnections with the CS system. Most catch basins are still connected to the CS system, so no partial separation has been completed. Combined sewage relieved from the CS system and entering the SRS system is routed to one of two SRS trunk sewers. The first SRS trunk sewer collecting SRS from the western portion of the district is located along Aubrey Street and is drained by gravity through the Aubrey SRS outfall to the Assiniboine River. The second SRS trunk sewer collecting SRS from the eastern portion of the district is located along McPhillips Street/Burnell Street/Lenore Street and flows by gravity through Ruby SRS outfall to the Assiniboine River.

The four outfalls to the Assiniboine River (one CS, two SRSs, and one FPS) are as follows:

- ID57 (S-MA70017579) – Aubrey CS Outfall
- ID82 (S-MA70017556) – Aubrey FPS Outfall
- ID56 (S-MA70017585) – Ruby SRS Outfall
- ID58 (S-MA70022480) – Aubrey SRS Outfall

### 1.3.1 District-to-District Interconnections

There are several district-to-district interconnections between Aubrey and the surrounding districts. Each interconnection is shown on Figure 05 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 Connection – Downstream of Primary Weir

**Cornish**

- The 1200mm Main Interceptor, a gravity sewer discharges into the Cornish district from the Aubrey district and carries sewage to the NEWPCC for treatment:
  - Invert at the manhole S-MH20008231 in Portage Avenue. This gravity pipe flows through multiple districts, including Aubrey, and on to the NEWPCC.

#### 1.3.1.2 Interceptor Connection – Upstream of Primary Weir

**Ash**

- Dual 300 mm force main river crossing carries flow from the Ash LS across the Assiniboine River to the Aubrey district Man interceptor pipe and on to the North End Sewage Treatment Plant (NEWPCC) for treatment.
    - o Aubrey district south of Wolseley Avenue invert each force main pipe = 230.64 m (S-MH70006432)

**Clifton**

- A 1050mm Main Interceptor sewer discharges via gravity into the Aubrey district from the Clifton district and carries sewage to the NEWPCC for treatment:
    - Portage Avenue – 226.68 m (S-TE70008265)

#### 1.3.1.3 District Interconnections

**Clifton**

<u>CS to CS</u>

- High Point Manholes (flow is directed into both districts from these manholes):
    - Midland Street – 230.72 m (S-MH20010625)
    - Notre Dame Street – 230.28 m (S-MH20010674)
    - Wall Street (near Wall Street East) – 229.04 m (S-MH20009426) (also to SRS)
    - Wolseley Avenue – 230.22 m (S-MH70039558)
    - Pacific Avenue West and Quelch Street – 228.87 m (S-MH20011789)
    - Alexander Avenue and Quelch Street – 228.57 m (S-MH20010968)
    - Portage Avenue and Clifton Street – 227.24 m (S-MH20010003)
- A 750mm bifurcation pipe directs excess flow from the Clifton district to the Aubrey district at the intersection of Roy Avenue and Cecil Street :
    - Cecil Street – 227.88 m (S-MH20010899)
- A 750 mm bifurcation pips from Aubrey flows southbound on Quelch Street and excess flows connect to the CS system south in the Clifton district on Logan Avenue:
    - Logan Avenue – 227.03 m (S-MH20010965)

<u>CS to SRS</u>

- High Point Manhole(s):
    - Minto Street – 227.56 m (S-MH20008769)
    - Goulding Street – 229.9 m (S-MH20008710)
    - Goulding Street – 229.53 m (S-MH20008700)
    - Wolseley Avenue and Basswood Place – 229.65 m (S-MH70005332)
- A 450 mm SRS overflow pipe connects from the Aubrey district to the SRS system in Clifton district at Keewatin Street and Alexander Avenue:
    - Alexander Avenue –228.27 m (S-MH20011401)

- A 300 mm SRS overflow pipe connects into the SRS system in Clifton district to reduce sewage back-up of the CS network in Aubrey on Pacific Avenue West:
  - Pacific Avenue West – 227.84 m (S-MH20011392)
- A 300 mm diversion pipe provides relief to the CS on Sprague Street and flows from a high point manhole into the Clifton district flowing eastbound on Wolseley Avenue:
  - Wolseley Avenue –229.42 m (S-MH20010522)

<u>SRS to CS</u>

- A 600 mm SRS overflow pipe from Aubrey's CS system flows into Clifton district on Notre Dame Avenue near Clifton Street North:
  - Notre Dame Avenue – 227.91 m (S-MH20011679)
- A 375 mm SRS overflow pipe from Aubrey's CS system flows into Clifton district on Logan Avenue near Wiens Street and connects to the SRS along Logan Avenue:
  - Logan Avenue – 228.83 m (S-MH20011446)

<u>SRS to SRS</u>

- A 2700 mm SRS trunk conveys flow by gravity southbound on Midland Street from Aubrey district into Clifton district to Clifton's SRS outfall:
  - Midland Street– 225.53 m (S-TE20003059)
- A 2250 mm SRS trunk flows by gravity from northern Clifton into Aubrey district at the intersection of Notre Dame Avenue and Flint Street. It also connects to a SRS coming eastbound from Aubrey and then it connects the SRS that flows south on Midland Street:
  - Flint Street and Notre Dame Avenue –225.68 m (S-MH20011539)
- A 1650 mm SRS flows by gravity from northern Clifton collecting overflow from the CS system, into Aubrey district on Notre Dame Avenue. It then connects the SRS that flows south on Midland Street:
  - Notre Dame Avenue –227.22 m (S-MH20010742)
- A 1350 mm SRS flows by gravity from the Aubrey district into Clifton district along Quelch Street at Logan Avenue:
  - Logan Avenue – 226.91 m (S-MH20010964)
- A 1,350 mm SRS pipe flows by gravity from the Aubrey district into Clifton along Worth Street:
  - Worth Street – 226.94 m (S-TE20003936)

<u>WWS to CS</u>

- A 250 mm WWS pipe flows westbound from the Aubrey district on Pacific Avenue into the Clifton CS system:
  - Pacific Avenue – 227.92 m (S-MH20011757)

**Alexander**

<u>CS to CS</u>

- A 200 mm CS servicing a small area of Aubrey district flows by gravity to connect with the 750 mm CS that connects to the Alexander CS system in Alexander district at the corner of Alexander Avenue and Xante Street:
  - Alexander Avenue and Xante Street Invert at District Boundary – 228.41 m (S-MA20019569)
- High Point Manholes (flow is directed into both districts from these manholes):

- Henry Avenue and Tecumseh Street – 228.95 m References Alexander District, 229.96 m References Aubrey District (S-MH20017866)
- Logan Avenue and Trinity Street – 228.77 m References Alexander District, 226.94 m References Aubrey District (S-MH20017639)
- Pacific Avenue and Arlington Street – 229.3 m (S-MH20017548)
- Elgin Avenue and Arlington Street – 229.49 m (S-MH20017513)

<u>LDS to SRS</u>

- A 375 mm LDS services surface runoff from portion of Alexander district, and flows from Aubrey SRS by gravity westbound along Alexander Avenue and connects to the SRS system in the Aubrey district at the corner of Alexander Avenue and Xante Street:
  - Xante Street and Alexander Avenue Invert at District Boundary – 224.94 m (S-MA70062373)

**Bannatyne**

<u>CS to CS</u>

- A 300 mm CS pipe acts as overflow at Winnipeg Avenue and Arlington Street to relief CS system in Aubrey district, and then flows by gravity northbound along Arlington Street into the CS System in the Bannatyne District:
  - Winnipeg Avenue and Arlington Street CS Overflow Invert into 300 mm CS – 228.91 m (S-MH20016213)
- High point manhole:
  - William Avenue and Arlington Street – 229.77 m (S-MH20017498)
  - Bannatyne Avenue and Lark Street – 229.10 m (S-MH20016063)
  - McDermot Avenue and Arlington Street – 229.46 m (S-MH20016155)
  - Notre Dame Avenue and Arlington Street – 229.43 m (S-MH20016156)

<u>SRS to CS</u>

- A 1200 mm SRS relieving several blocks from Bannatyne district CS system flows by gravity southbound on Arlington Street into a manhole at Arlington Street and Winnipeg Avenue that connects with the Aubrey CS system.
  - Winnipeg Avenue and Arlington Street Invert at District Boundary – 226.63 m (S-MA70062569)

<u>SRS to SRS</u>

- A 300 mm SRS overflow pipe diverts flow from Aubrey district CS system at Notre Dame Avenue and Arlington Street, and then flows by gravity to connect into the 1350 mm SRS along Notre Dame Avenue and flows into Bannatyne district SRS system.
  - Notre Dame Avenue and Arlington SRS Overflow Invert into 300 SRS – 229.92 m (S-MH20016162)
- A 250 mm SRS overflow pipe diverts flow from Aubrey district CS system at high point CS manhole at Notre Dame Avenue and Arlington Street, and then flows by gravity to connect into the 1350 mm SRS along Notre Dame Avenue and flows into Bannatyne district SRS system.
  - Notre Dame Avenue and Arlington SRS Overflow Invert into 300 SRS – 229.53 m (S-MH20016156)
- A 1350 mm SRS overflow pipe diverts flow from Aubrey district CS system at Winnipeg Avenue and Arlington Street, and then flows by gravity to connect into the 1350 mm SRS along Notre Dame Avenue and flows into Bannatyne district SRS system.

  - Winnipeg Avenue and Arlington SRS Overflow (Top of Overflow Weir) Into 1350 mm SRS – 228.12 m (S-MH70028506)
- A 300 mm SRS overflow pipe diverts flow from Aubrey district CS system at Notre Dame Avenue and Home Street, and then flows by gravity northbound along Home Street and flows into Bannatyne district SRS system.
  - Notre Dame Avenue and Home Street SRS Overflow Invert (Top of Overflow Weir) Into 300 mm SRS – 229.44 m (S-MH20016212)
- A 375 mm SRS overflow pipe diverts flow from Aubrey District CS system at Winnipeg Avenue near Tecumseh Street, and then flows eastbound on Winnipeg Avenue into the SRS system in the Bannatyne district.
  - Winnipeg Avenue and Tecumseh Street SRS Overflow (Top of Overflow Weir) Into 375 mm SRS – 228.99 m (S-MH70028288)

**Cornish**

<u>CS to CS</u>

- The 1200 mm Interceptor pipe along Wolseley flows by gravity carrying intercepted CS from the Cornish district and crosses into the Aubrey district on Wolseley Avenue:
  - Wolseley Avenue Interceptor Invert at District Boundary - 226.21 m (S-MA20013757)
- The 1200 mm Main Interceptor pipe along Wolseley flows by gravity carrying intercepted CS from the Douglas Park, Ferry Road, Riverbend, Parkside, Tylehurst, and Clifton districts and crosses into the Aubrey district on Wolseley Avenue:
  - Main Interceptor Along Wolseley Invert at District Boundary - 226.18 m (S-MA20013779)
- High Point Manholes (flow is directed into both districts from these manholes):
  - Portage Avenue and Burnell Street – 229.09 m (S-MH20013779)

<u>SRS to SRS</u>

- A 600 mm SRS divert flow from Aubrey CS System, and then flows by gravity eastbound on Wellington Avenue into the SRS System in the Cornish district:
  - Wellington Avenue and Home Street 600 mm SRS Overflow Invert – 227.55 m (S-MH20016115)

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.

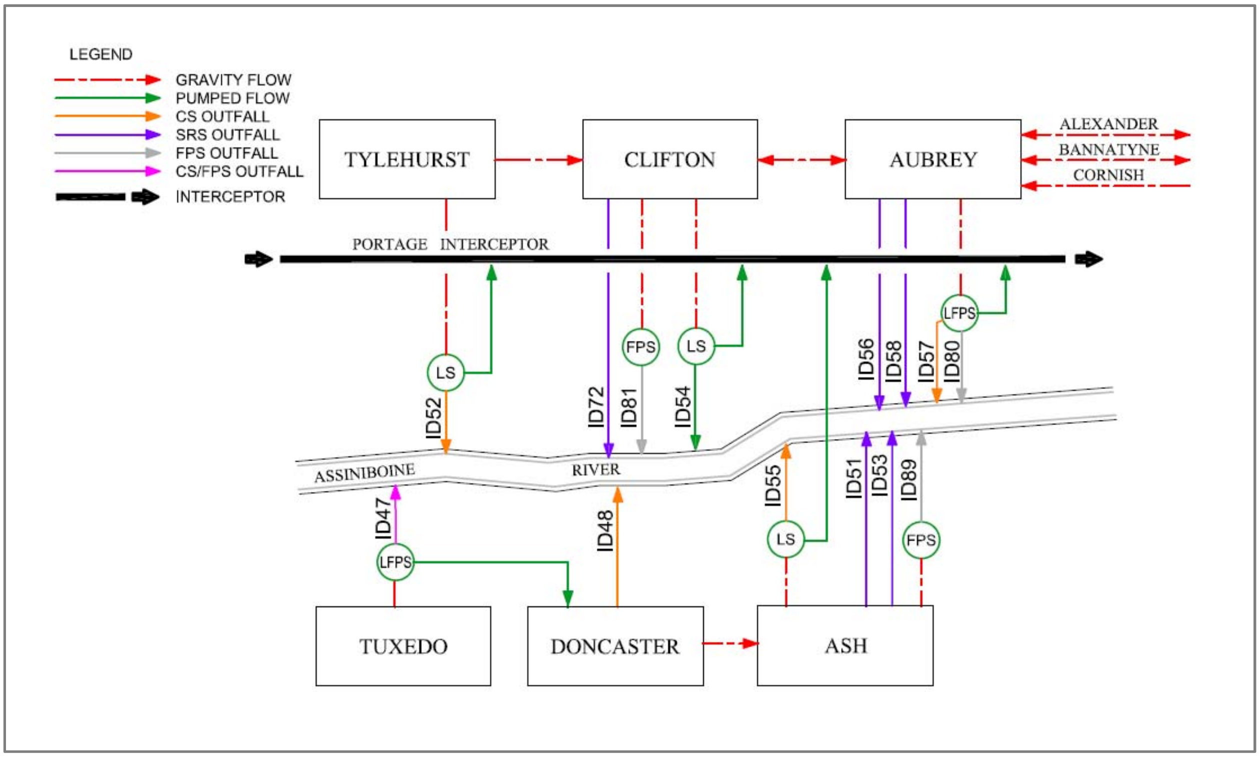



**Figure 1-1. District Interconnection Schematic**

### 1.3.2 Asset Information

The main sewer system features for the district are shown on Figure 05 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-MH70006676.1 | S-MA70017579 | 2850 mm | Assiniboine River<br>Invert: 221.00 m |
| Flood Pumping Outfall (ID82) | S-AC70008105.1 | S-MA70017556 | 2100 mm | Assiniboine River<br>Invert: 224.81 m |
| Other Overflows | N/A | N/A | N/A | |
| Main Sewer Trunk | S-MH20012470.1 | S-MA20013760 | 2800 mm | Circular<br>Invert: 223.32 m |
| SRS Outfalls (ID56 & ID58) | S-CO70008120.1<br>S-CO70010647.1 | S-MA70017585<br>S-MA70022480 | 2890 mm<br>2700 mm | Invert: 221.00 m<br>Invert: 221.15 m |
| SRS Interconnections | N/A | N/A | N/A | 101 SRS – CS |
| Main Trunk Flap Gate | S-TE70008067 Weir.1 | S-CG00000724 | 2100 mm | Invert: 224.00 m |
| Main Trunk Sluice Gate | AUBREY_GC.1 | S-CG00000725 | 1500 x 1500 mm | Invert: 223.61 m |
| Off-Take | S-TE70008067.2 | S-MA70017460 | 600 mm | Circular<br>Invert: 223.32 m |
| Dry Well | N/A | N/A | N/A | No dry well in lift station design. |
| Lift Station Total Capacity | N/A | N/A | 0.44 $m^3/s$ | 1 x 0.235 $m^3/s$<br>1 x 0.205 $m^3/s$ |

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

| Asset | Asset ID (Model) | Asset ID (GIS) | Characteristics | Comments |
|---|---|---|---|---|
| Lift Station ADWF | N/A | N/A | 0.054 $m^3/s$ | |
| Lift Station Force Main | S-TE70008096.1 | S-MA70017546 | 600 mm | Invert: 229.17 m |
| Flood Pump Station Total Capacity | N/A | N/A | 5.24 $m^3/s$ | 3 x 1.42 $m^3/s$<br>1 x 0.98 $m^3/s$ |
| Pass Forward Flow – First Overflow | N/A | N/A | 0.225 $m^3/s$ | |

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 | Aubrey – 223.85<br>Ruby – 223.85<br>Aubrey – 223.85 |
| 2 | Trunk Invert at Off-Take | 223.32 |
| 3 | Top of Weir | 224.48 |
| 4 | Relief Outfall Invert at Flap Gate | Ruby – 221.46<br>Aubrey – 221.18 |
| 5 | Low Relief Interconnection (S-MH20010140) | 225.88 |
| 6 | Sewer District Interconnection (Alexander) | 224.94 |
| 7 | Low Basement | 230.59 |
| 8 | Flood Protection Level (Aubrey) | 230.22 |

[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 Aubrey was the 1986 Basement Flood Relief study (Girling, 1986). No other work has been completed or evaluated 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 Aubrey 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 | Expected Completion |
|---|---|---|---|---|---|
| 5 – Aubrey | 1986 | Future Work | 2013 | Study Complete | N/A |

## 1.5 Ongoing Investment Work

The proposal for the replacement of the existing positive gates and gate chamber located on both SRS outfall pipes has been planned. A Request for Proposals (RFP) was issued in 2016 (Bid Opp. 125-2016), which required the replacement of the positive gate housed with individual buried chamber structures located on the Ruby SRS and the Aubrey SRS pipe. Two new gate chamber structures will have a new positive gate (with electric actuator) and flap gate installed within each structure. These will be located along the west property alignment of 980 Palmerston (Robert Steen Community Centre) for the Ruby SRS outfall and on Aubrey Street on the south side of Palmerston Avenue for the Aubrey SRS outfall.

Within each structure, there will also be provision for a permanently installed submersible pipe, located on the upstream side of the positive gate with discharge piping to the adjacent combined sewer. These have been developed by the City and have been issued as Bid Opportunities 865-2018 (Aubrey SRS) and 798-2016 (Ruby SRS).

There is ongoing maintenance and calibration of permanent instruments installed within the primary outfall within the Aubrey 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 CSO Control Option 1 – 85 Percent Capture in a Representative Year for the Aubrey district are listed in Table 1-4. The proposed CSO control options will include in-line storage via control gate, latent storage 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

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 pipe network for additional storage volume. Existing DWF from the collection system will remain the same, and overall district operations will remain the same. Additional CS to SRS interconnections are proposed to allow the WWF flows to enter both SRS systems to maximize the potential existing latent storage volumes. The full interaction between the district's CS and SRS system are recommended to be fully confirmed to validate these additional interconnections.

All primary overflow locations are to be screened under the current CSO control plan. Installation of a control gate will be required for the screen operation, and additionally it will provide the mechanism for capture of the in-line storage.

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 Latent Storage

Latent storage is a suitable control option for Aubrey district. The latent storage level is controlled by the river level and the resulting backpressure of the river level on the Ruby and Aubrey SRS outfall flap gates, as explained in Part 3C. The storage volumes indicated in Table 1-5are based on the river level conditions with the NSWL during the 1992 representative year at each specific outfall location. The latent storage design criteria are identified in Table 1-5.

As part of the initial evaluation, the hydraulic model indicated that no excess CS from the CS system would enter the Aubrey SRS system under the 1992 representative year conditions. This was the first of such occurrences when modelling potentially latent storage solutions. The Aubrey SRS however includes two independent, extensive SRS systems with dedicated outfalls, and therefore provides the opportunity to store large amounts of the wet weather flow received. This would further reduce the burden on the in-line storage utilizing the Aubrey CS system. that will each provide additional storage volume. In situations such as this, the typical latent storage upgrade of providing mechanical flap gate control will not provide sufficient performance improvements. The issue is primarily due to insufficient flows entering the SRS system.

The performance was found to be greatly improved by introducing additional CS-SRS interconnections to divert excess flow from the CS system into the SRS systems under the majority of 1992 representative year conditions. Therefore, to ensure that the potential volume capture available from these existing latent storage systems was optimized, additional interconnections between the CS system and both SRS were also proposed. The proposed interconnection locations were selected in order to divert flow from directly upstream of the CS LS, and can seen on Figure 05-01 and Figure 05-02. The first interconnection to divert excess CS into the Aubrey SRS system connects from manhole S-MH20012470 and ties immediately upstream of the Aubrey SRS outfall gate chamber. The second interconnection to tie into the Ruby SRS system would also connect from manhole S-MH20012470 in the CS system and then tie immediately upstream of the Ruby SRS outfall gate chamber. The existing CS sewer pipe at the point of these proposed interconnections will have the largest flow within the Aubrey district and will ensure that the SRS systems would receive flow volume to optimize the use of the available latent storage. An investigation into the model assumptions and existing upstream CS to SRS interconnections will be necessary to confirm the extent of these new downstream interconnections and the volume of WWF entering both SRS systems.

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

| Item | Elevation/Dimension | Comment |
|---|---|---|
| Invert Elevation | Ruby – 221.46 m<br>Aubrey – 221.18 m | Flap Gate inverts |
| NSWL | Ruby – 223.85 m<br>Aubrey – 223.851 m | |
| Trunk Diameter | Ruby – 2700 mm<br>Aubrey – 2890 mm | |
| Design Depth in Trunk | Ruby – 2390 mm<br>Aubrey – 2671 mm | |
| Maximum Storage Volume | Ruby – 8,877 $m^3$<br>Aubrey – 7,969 $m^3$ | Total Storage: 16,846 $m^3$ |

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

| Item | Elevation/Dimension | Comment |
|---|---|---|
| Force Main Diameter | Ruby – 225 mm<br>Aubrey – 225 mm | |
| Flap Gate Control | Ruby – N/A<br>Aubrey – N/A | |
| Lift Station | Ruby – Yes<br>Aubrey – Yes | |
| Nominal Dewatering Rate | Ruby – 0.075 $m^3/s$<br>Aubrey – 0.075 $m^3/s$ | Based on 24-hour emptying requirement |
| RTC Operational Rate | Ruby – TBC<br>Aubrey – TBC | Future RTC/ dewatering assessment. Possibly based on 2 times nominal rate |

Notes:

NSWL = normal summer water level

RTC = Real Time Control

The addition of the two latent storage pump stations (LSPS) and force mains that connect back to the CS system are necessary for the latent storage to be emptied after each storm event. A conceptual layout for each LSPS and force main location is shown on Figure 05-01 and Figure 05-02. These layouts are based on the work undertaken by the City as part of Bid Opportunities for the Aubrey and Ruby SRS gate chamber work.

The Aubrey SRS LSPS, shown on Figure 05-01, would be located upstream of the existing SRS gate chamber close to the proposed CS screening and control gate. The force main will connect back to the main CS system upstream of the Aubrey LS. An interconnection between the CS and SRS system is proposed to ensure the full SRS latent storage is utilized. A 225 mm pipe would achieve this interconnection.

The Ruby SRS LSPS, shown on Figure 05-02, is proposed be located to the north of the Ruby gate chamber within the grounds of the Robert Steen Community Centre at the corner of Palmerston Avenue and Ruby Street. The force main will connect to the 300 mm CS at the manhole at the junction of Ruby Street and Palmerston Avenue (pipe capacity stated as 105 litres per second [L/s] and latent pumps at 75 L/s within Bid Opportunity 798-2016). If during the more detailed assessment it is noted that the pipe section is inadequate, the force main would connect to the next manhole downstream at the southern end of Lipton Street on Palmerston Avenue. Minor disruption to the access to the Robert Steen Community Centre is envisaged; the parallel streets of Lipton Street and Lenore Street will allow access to all locations during construction. An interconnection from the main CS system to the SRS pipe system is required to fully utilize the latent storage within the Ruby SRS system. A new 225 mm pipe would be constructed, connecting the main CS trunk in Aubrey Street to SRS pipe in Palmerston Avenue. Normal disruption along Palmerston Avenue would be encountered with trenchless pipe installation construction work. The presence of groundwater in close proximity to the river bank in this area has encountered in the past. All latent storage associated construction work will require an Ground Water Management Plan to be undertaken.

Both LSPSs will operate to empty the SRS after filling from a runoff event in preparation for the next runoff event. The Ruby SRS and Aubrey SRS outfalls will be upgraded with flap and sluice gates as part of a separate project. A single chamber will house the sluice gate, flap gate, and submersible wet well chamber.

The evaluation of the latent storage volume was completed using the continuous NSWL river conditions, and it was found that additional flap gate control will not be required to meet Control Option 1. In situations where non modelled assessments are to be completed, the actual river levels will be both lower and higher than the 1992 representative year NSWL level at various points throughout the 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.

### 1.6.3 In-line Storage

In-line storage has been proposed as a CSO control for Aubrey 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 to provide an overall higher volume capture and will provide additional hydraulic head for screening operations.

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 are listed in Table 1-6.

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

| Item | Elevation/Dimension | Comment |
|---|---|---|
| Invert Elevation | 223.32 m | Downstream invert of pipe at weir |
| Trunk Diameter | 2800 mm | |
| Gate Height | 1.43 m | Gate height based on half trunk diameter assumption |
| Top of Gate Elevation | 224.85 m | |
| Maximum Storage Volume | 2,080 $m^3$ | |
| Nominal Dewatering Rate | 0.440 $m^3/s$ | Based on existing CS LS pump rate |
| RTC Operational Rate | TBC | Future RTC/dewatering assessment to be undertaken |

The proposed control gate will cause combined sewage to back-up within the collection system to the extent shown on Figure 05. 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 above the bypass weir crest and proceeds above 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 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 Aubrey CS LS will continue with its current operation while the control gate is in either position, with all DWF being diverted to the CS LS and pumped to the North Main Interceptor pipe on Wolseley Avenue. The CS LS will further dewater the in-line storage provided during a WWF event as downstream capacity becomes available.

Figure 05-01 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 be located north of the Aubrey 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 3.5 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 chamber. This will allow CS flows captured by the proposed control gate to be diverted to the Aubrey 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 work required for the control gate construction is located within a residential street with minor disruptions expected.

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. This future RTC 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 actual impact of the future RTC/dewatering arrangement will be necessary to review the downstream impacts.

### 1.6.4 Floatables Management

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

The type and size of screens depend on the specific station configuration 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 an in-line control gate implemented, are listed in Table 1-7.

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

| Item | Elevation/Dimension/Rate | Comment |
|---|---|---|
| Top of Gate | 224.85 m | |
| Bypass Weir Crest | 224.75 m | |
| NSWL | 223.85 m | |
| Maximum Screen Head | 0.9 m | |
| Peak Screening Rate | 0.85 $m^3/s$ | |
| 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 existing combined trunk sewer, as shown on Figure 05-01. The screens will operate once levels within the sewer surpassed the bypass weir elevation. A side bypass weir upstream of the gate will direct the initial 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 may include screenings pumps with a discharge returning the screened material back to the interceptor and on to the NEWPCC for removal. The provision of screening pumps is dependent on final level assessment within the existing infrastructure and the Aubrey trunk has potential for gravity screenings return to occur. This will be confirmed during future assessment stage.

The dimensions for the screen chamber to accommodate influent from the side bypass weir, the screen area, and the routing of discharge downstream of the gate are 6 m in length and 2.5 m in width.. The screening chamber is expected to be located within a residential street with minor disruptions expected.

### 1.6.5 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.

Aubrey has been classified as a medium GI potential district. Land use in Aubrey is mostly single-family residential with smaller areas of commercial and industrial land use. This means the district would be an ideal location for bioswales, permeable paved roadways, cisterns/rain barrels, and rain gardens. The industrial areas in the north end of the district would be an ideal location for green roofs.

### 1.6.6 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 CS LS which will require more frequent and longer duration pump run times. Lower velocities in the CS trunks may create additional debris deposition and require more frequent cleaning. Additional system monitoring, and level controls will be installed which will require regular scheduled maintenance.

The latent storage will take advantage of the SRS infrastructure already in place or under construction; therefore, minimal additional maintenance will need to be anticipated. The proposed latent LSPS at both locations will require regular maintenance that will depend on the frequency of operation. Operational issues have been experienced in the past with large inflow and infiltration flow occurring within the SRS surrounding the Ruby SRS outfall specifically. The proposed latent LSPS may address this issue and remove the additional O&M currently associated with this location.

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 would be directed from the main outfall 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 would 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. Additional maintenance for the pumps will be required at regular intervals in line with typical lift station maintenance and after significant screening events.

## 1.8 Performance Estimate

### 1.8.1 InfoWorks Model

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 of 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 1-8.

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

| Model Version | Total Area (ha) | Contributing Area (ha) | Population | % Impervious | Control Options Added To Model |
|---|---|---|---|---|---|
| 2013 Baseline | 445 | 443 | 16,875 | 36 | N/A |
| 2037 Master Plan – Control Option 1 | 445 | 443 | 16,875 | 36 | IS, Lat St, SC |

Notes:

IS = In-line Storage

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

| Model Version | Total Area (ha) | Contributing Area (ha) | Population | % Impervious | Control Options Added To Model |
|---|---|---|---|---|---|

Lat St = Latent Storage
SC = Screening

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 number 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. Performance Summary – Control Option 1**

| Control Option | Preliminary Proposal Annual Overflow Volume ($m^3$) | Master Plan Overflow Reduction ($m^3$) | Overflow Reduction ($m^3$) | Number Overflows | Pass Forward Flow at First Overflow [b] |
|---|---|---|---|---|---|
| Baseline (2013) | 260,852 | 141,643 | - | 27 | 0.484 $m^3/s$ |
| In-Line Storage | 246,277 [a] | 120,521 | 21,122 | 27 | 0.484 $m^3/s$ |
| In-Line + Latent Storage | | 120,521 | 0 | 27 | 0.542 $m^3/s$ |
| In-Line + Latent Storage with additional interconnections | N/A | 81,709 | 38,812 | 14 | 0.542 $m^3/s$ |
| **Control Option 1** | **246,277** | **81,709** | **59,934** | **14** | **0.542 $m^3/s$** |

[a] Latent and In-line Storage were not simulated independently 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

Cost estimates were prepared during the development of the Preliminary Proposal and have been updated for the CSO Master Plan. The CSO Master Plan cost estimates have been prepared for each control option with overall program costs summarized and described in Section 3.4 of Part 3A. The cost estimate for each control option relevant to the district as determined in the Preliminary Proposal and updated for the CSO Master Plan are identified in Table 1-10. The cost estimates are Class 5 planning level estimates with a level of accuracy of minus 50 to plus 100 percent.

**Table 1-10. 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) |
|---|---|---|---|---|
| Latent Storage | $3,500,000 | $5,560,000 [b] | $172,000 | $3,710,000 |
| In-Line Storage | - [a] | $2,920,000 [c] | $46,000 | $990,000 |
| Screening | | $2,840,000 [d] | $51,000 | $1,100,000 |
| **Subtotal** | **$3,500,000** | **$11,470,000** | **$270,000** | **$5,800,000** |
| Opportunities | N/A | $1,150,000 | $27,000 | $580,000 |
| **District Total** | **$3,500,000** | **$12,620,000** | **$297,000** | **$6,380,000** |

[a] Solution developed as refinement to Preliminary Proposal work following submission of Preliminary Proposal costs. Costs for this item of work found to be $3,980,000 in 2014 dollars

[b] Latent Storage capital cost includes the chambers, sluice and flap gate construction that has been assigned to Bid Opps 789-2016 (Ruby SRS) and 865-2018 (Aubrey SRS) work. Future capital cost will only include the latent pumps and force mains as well as the additional CS to SRS interconnection pipework. Cost for these items taken to reduce to $480,000 in 2019 dollars.

[c] 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.

[d] 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:

- 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 on 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 | Latent Storage | Latent storage work currently underway by City of Winnipeg. | Original capital costs updated. |
| | Control Gate | A control gate was not included in the Preliminary Proposal estimate | Added for the MP to further reduce overflows |
| | Screening | Screening was not included in the Preliminary Proposal estimate | Added in conjunction with the Control Gate |
| | Latent Interconnections | Added as part of Master Plan | Based on modelling performance optimization. |
| 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 Costs | The lifecycle costs have been adjusted to 35 years | City of Winnipeg Asset Management approach | |
| Cost escalation from 2014 to 2019 | Capital Costs have been inflated to 2019 values based on an assumed value of 3 percent per for construction inflation. | Preliminary Proposal estimates were based on 2014-dollar values. | |

## 1.10 Meeting Future Performance Targets

The regulatory process requires consideration for upgrading Control Option 1 to another higher-level performance target. For the purposes of this CSO Master Plan, the future performance target is 98 percent capture for the representative year measured on a system-wide basis. This target will permit the number of overflows and percent capture to vary by district to meet 98 percent capture, Table 1-12 provides a description of how the regulatory target adjustment could be met by building off proposed work identified in Control Option 1.

Overall the Aubrey district would be classified as a low 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. Increased volume capture from the latent storage arrangements already constructed as part of meeting Control Option 1 could be achieved by construction of flap gate control mechanisms. This would allow excess flow to be stored in the SRS system even under low river level conditions. Further increases in the control gate height, and in term level of volume capture could also be potentially completed in this district to meet future performance targets. Off-line storage elements such as an underground tank or storage tunnel with associated dewatering pump infrastructure could also be utilized to provide additional volume capture. Finally focused use of green infrastructure, and reliance on said green infrastructure to provide volume capture benefits 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 | • Increased use of GI<br>• Increased use of latent storage (flap gate control)<br>• Increased use of in-line storage<br>• Off-line Storage (Tunnel/tank) |

The control options selected for the Aubrey 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 be through the potential additional development of the latent storage, via flap gate control. This would require the detailed investigation and performance of the interconnections between the CS and two SRS systems with this district.

The cost for upgrading to 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 1-13.

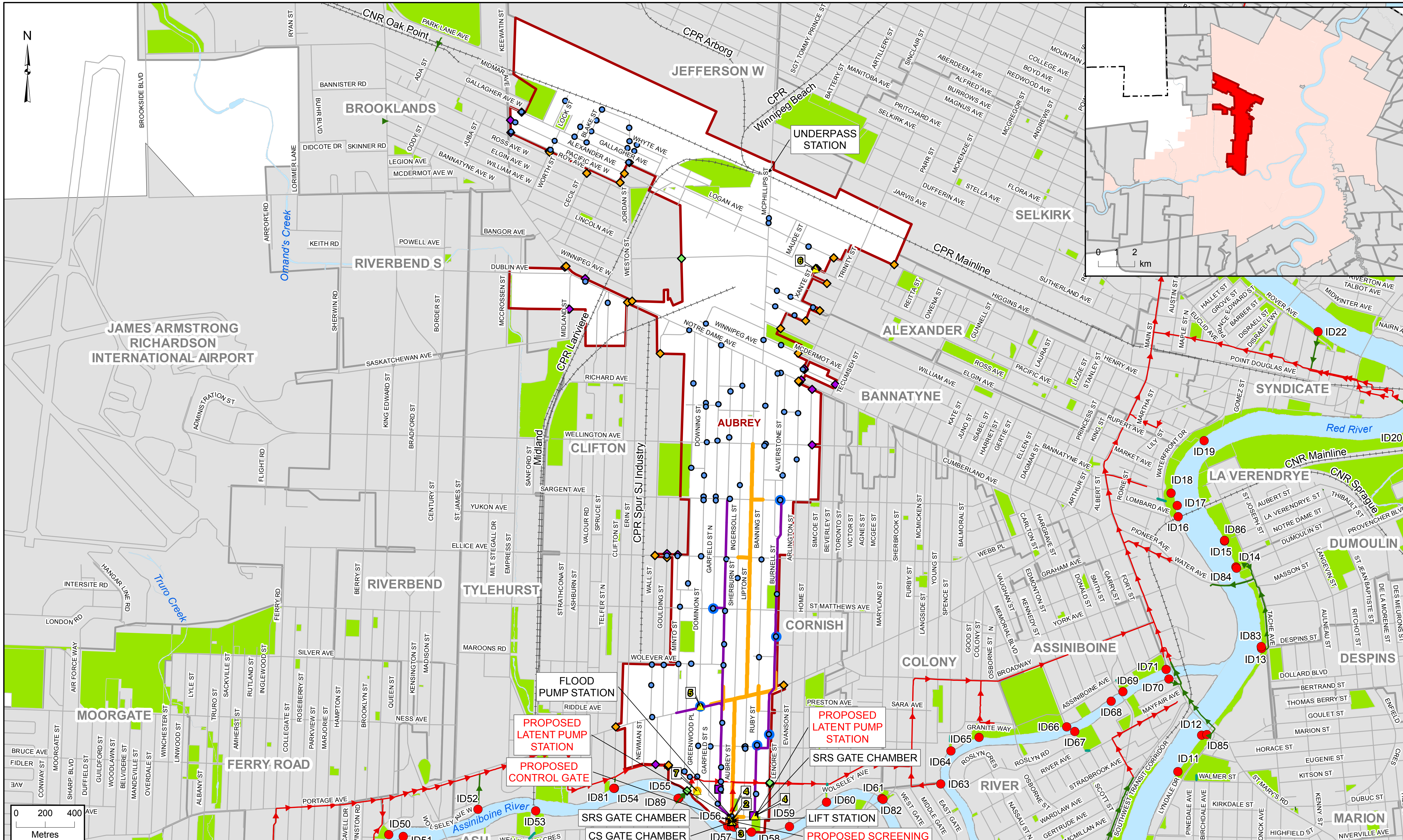
**Table 1-13. Control Option 1 Significant Risks and Opportunities**

| 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

Girling, R.M. 1986. *Basement Flooding Relief Program Review – 1986.*




## LEGEND

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

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

District Boundary Crossing
- CS
- SRS
- WWS

- Interceptor Sewer
- Force Main
- Street
- Railway

- District Boundary
- Watercourse
- Greenspace

## CSO MASTER PLAN PROPOSED SOLUTIONS

- Proposed Control Gate
- Proposed SRS Latent Storage Pump
- Latent Storage Limit
- Extent of In-line Storage
- Latent Force Main

ALL PROPOSED SOLUTIONS SHOWN IN RED TEXT

JACOBS

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

Winnipeg

**THE CITY OF WINNIPEG**
**WATER AND WASTE DEPARTMENT**

**FIGURE 05**
**District Overview Map**
**Sewer District: Aubrey**
City of Winnipeg
*Combined Sewer Overflow Master Plan*

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## LEGEND

| | | | | |
|---|---|---|---|---|
| Primary Weir | Flap Gate | Sewer By Type | Control Structure Type | Pump Station Type |
| Critical Elevation | Sluice Gate | CS | Gate Chamber | Flood Pump Station |
| CSO Outfall | Pump Location | SRS | | Lift Station |
| Manhole | | WWS | | |

**CSO MASTER PLAN**
**PROPOSED SOLUTIONS**

- Proposed Latent Force Main
- CS-SRS Interconnection
- Control Gate
- Gate Chamber
- 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 05-01**
**Control Gate and Screening - Latent SRS Control**
**Sewer District: Aubrey**
City of Winnipeg
*Combined Sewer Overflow Master Plan*

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## LEGEND

| | | | | |
|---|---|---|---|---|
| Primary Weir | Flap Gate | Sewer By Type | Control Structure Type | Pump Station Type |
| Critical Elevation | Sluice Gate | CS | Gate Chamber | Flood Pump Station |
| CSO Outfall | Pump Location | SRS | | Lift Station |
| Manhole | | WWS | | |

**CSO MASTER PLAN**
**PROPOSED SOLUTIONS**

| | |
|---|---|
| Proposed Latent Force Main | Gate Chamber |
| CS-SRS Interconnection | Screening |
| Control Gate | 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 05-02**
**Latent SRS Control**
**Sewer District: Aubrey**
City of Winnipeg
*Combined Sewer Overflow Master Plan*

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