Winnipeg | Water and Waste
Eaux et déchets

March 30, 2021

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Manitoba Conservation and Climate
Environmental Stewardship Division
Environmental Compliance and Enforcement Branch
1007 Century Street
Winnipeg, MB R3H 0W4

Attention: Kristal Harman, Director

RE: ENVIRONMENT ACT LICENCE NO. 3042

The City of Winnipeg is pleased to submit the enclosed 2020 CSO Annual Report in response to the requirements within the Environment Act Licence No. 3042 submitted to the City of Winnipeg September 4, 2013.

This submission complies with the requirements within Clause 13 of Environment Act Licence No.3042, Clause C of the November 13, 2019 CSO Master Plan approval letter and aligns with the annual report outline submitted on December 23, 2019.

Should you have any questions on this submission, please contact Ms. Michelle Paetkau, P.Eng., at 204-986-4904 or by email at mpaetkau@winnipeg.ca.

Sincerely,

Chris Carroll
Manager of Wastewater Services Division

Attachment

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City of Winnipeg
2020 CSO Annual Report

Environment Act Licence No. 3042
Clause 13

Prepared for

Manitoba Conservation and Climate

March 2021

City of Winnipeg 2020 CSO Annual Report

Client File No:	3205.00
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Water and Waste Department • Service des eaux et des déchets

Executive Summary

In November 2019, Manitoba Conservation and Climate (the Province) approved the City of Winnipeg's (City) Combined Sewer Overflow (CSO) Master Plan (MP). Approval of the CSO Master Plan triggered Clause 13 of Environment Act Licence No.3042 (EA No.3042), which requires the CSO Annual Report to include a progress report on the CSO Master Plan on or before March 31 of the preceding year (See section 2.2).

CSO Master Plan Progress

This is the second report back on progress of the CSO Master Plan and covers the year 2020. It includes costs, budget, schedules, completed work and performance along with 2021 planned contracts and forecasts.

The CSO Master Plan was on schedule and budget for Program Scenario 1 in 2020. To meet the Provincial requested deadline of 2045, the City will need funding support from both the provincial and federal governments by 2023 or earlier. Without the funding support, the CSO Master Plan will move to Program Scenario 3, which is based on City only funding and has a longer implementation timeline.

The upper range of the Class 5 estimate (+100 percent), is used for budgeting purposes, giving a total estimated capital cost of $2.3 billion in 2019 dollars (see section 3.2). In 2020, the City committed 1.3 percent of the total estimated capital cost (approximately $28.7 million). The approximate cumulative committed capital spend of 2019 and 2020 is $52 million.

In 2021, the City's CSO Master Plan budget is $31.61 million with an additional $24,312,691 budget holdover from 2019. These funds have been held over to maintain a committed average budget spend and to be able to award larger strategic contracts like the Ferry Road Contract 6 Rutland Trunk, which is scheduled for 2024 (see sections 4.2.2).

There is a three percent CSO volume reduction in the 2020 sewer network[1] for the 1992 Representative Year. This results in maintaining an increase of CSO volume percent capture to 75 percent (section 4.1). These improvements are the result of completed combined sewer separation works on Ferry Road and Cockburn projects and other model asset representation improvements based primarily on improved data from installed monitoring instrumentation.

Current Year Results

The amount of rainfall and the river levels during rainfall events has the most impact on CSO results and sewer network performance.

There was approximately 20 percent less precipitation in 2020, compared to the 1992 Representative Year. The last eight years have shown an average one percent decrease in total precipitation compared to the 1992 Representative Year (section 5).

[1] 2020 sewer network refers to the hydraulic model that contains the best representation of the existing sewer system at the time it was developed.

The 2020 river level was higher overall than the 1992 and one in five-year average in the recreation season (May -– September). The high river level was attributable to high precipitation during the shoulder season and heavy snow melt. In 2020, there was 46 percent more precipitation during the shoulder season compared to 1992.

2020 had a total number of 1,074 CSO events with an estimated annual sewage discharge of 5,578 ML. The 2020 CSO results, when compared to 2019, show a reduction in number of events and CSO volume (see section 5). In 2020, the CSO instrumented locations were increased from 39 to 42 locations, which improved the accuracy of the reported results. In 2020, 84 percent of the CSO results totals were validated.

Next Steps

As directed in the CSO Master Plan, the City will continue work on sewer district separation projects currently underway. Then the City will prioritize the remaining combined sewer districts where sewer separation is recommended, prior to implementing other control option solutions. The sewer separation component represents 75 percent of the CSO Master Plan total capital budget.

The following capital construction projects make up the bulk of the annual budget spending for 2021 (section 4.5 and Appendix F and G):

- Jefferson East Construction Contract 6 - Main St (Kingsbury Ave to Jefferson Ave)
- Cockburn and Calrossie Construction Contract 6B – South East Jessie,
- Cockburn and Calrossie Construction Contract 7 – Sparling & Harrow South, and
- Cockburn and Calrossie Construction Contract 10B – Harrow North & Stafford.

The City will continue to look for opportunities for greater sewer system optimization, additional storage options that will improve CSO performance progress monitoring and promote further CSO volume reduction. Furthermore, the City will continue regular communication with regulatory bodies and stakeholders throughout the delivery of the CSO Master Plan.

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Acronyms and Abbreviations

CEC	Clean Environment Commission
AACE	American Association of Cost Engineers International
AAF	average annual flow
City	City of Winnipeg
CO	Control Option
CS	combined sewer
CSO	combined sewer overflow
DEP	district engineering plan
EA	Environment Act Licence
EMC	event mean concentrations
GI	green infrastructure
LDS	land drainage sewer
MCC	Manitoba Conversation and Climate
MDS	Manitoba Sustainable Development
NEWPCC	North End Sewage Treatment Plant
No.	Number
NPRI	National Pollutant Release Inventory
O&M	operations and maintenance
POC	pollutants of concern
Province	Government of Manitoba
PWWF	peak wet weather flow
RTC	real time control
SEWPCC	South End Sewage Treatment Plant
SOIS	Sewer Overflow Information System
SRS	storm relief sewer
TP	total phosphorus
TN	total nitrogen
WEWPCC	West End Sewage Treatment Plant
WSER	Wastewater Systems Effluent Regulations
WWF	wet weather flow
WWS	wastewater sewer

1. Purpose

The operation of the City of Winnipeg (City)'s combined sewer overflow system is governed by Environment Act Licence (EA) No. 3042. To comply with Clause 13 of EA No. 3042, the City is required to submit an annual report documenting Combined Sewer Overflow (CSO) Master Plan implementation progress and work planned for the subsequent year by March 31 of each year (referred to throughout this document as the "annual report").

The CSO Annual Report provides an overview of: cost, budget, schedule, performance, CSO volume reduction toward the 85% Capture, current year CSO results, capital improvements, milestones achieved, and the work plan for subsequent year. It also provides an overview of the process used in the evaluation of CSO discharge documented in the CSO results reports, which is mandated by Clause 14 of EA No. 3042.

As part of Clause 14 of EA No. 3042, the City is required to submit an annual CSO results report for the preceding year by February 15 of each year. The annual CSO results report documents the estimated sewage volume discharged to receiving streams from CSO events of the preceding year. It complies with the National Pollutant Release Inventory (NPRI) and Wastewater Systems Effluent Regulations (WSER) annual reporting requirements. Additional CSO results reports requirements pursuant to Clause 14 of the licence include quarterly CSO results and CSO reports triggered by significant rainfall events.

The CSO Annual Report demonstrates the progress made on the CSO Master Plan pursuant to Clause 11 of the licence, to meet the required level of treatment for CSO control, and provides an overview of the process involved to demonstrate compliance with both the Provincial and Federal requirements. It is important to note any reporting outside of the scope of this annual report is not included.

2. Background

Combined sewers are regulated by federal and provincial requirements. On an annual basis, the City submits annual CSO discharge data to NPRI, WSER and the Province to comply with both the federal and provincial regulations.

2.1 Sewer Network

Like many cities in North America, Winnipeg has a combined sewer system. Combined sewers are designed to collect both land drainage (rainwater and snowmelt) and wastewater (sewage from homes and businesses) in the same pipe, and transport both to the sewage treatment plant before being released into the river. In large wet weather events, however, the sewer capacity can be exceeded with excess rainwater, causing the contents of the combined sewers to overflow into the rivers.

2.2 Regulations

In 1999, the Federal Government required reporting on estimated sewerage lost from the sewer network under the Canadian Environmental Protection Act, as part of the NPRI.

In 2012, the Federal Government under WSER mandated the City to keep CSO records from 2013 and provide annual CSO Reporting due February 15 each subsequent year.

In 2013, the Province issued the first Combined Sewer Overflow Licence to the City of Winnipeg, EA No. 3042. It contained 16 clauses (see Appendix A) requiring public education, CSO reporting, interim water quality sampling and analysis, public notification and the development of a CSO Master Plan. The City of Winnipeg's responses to date concerning each of regulatory requirements contained within EA No. 3042 are listed below:

- The Public Education Plan was submitted to the Province in December 2013. This plan outlined a high level schedule for public engagement activities to comply with Clause 9. The Province requested bi-annual report updates; this requirement was completed with the last report dated June 2019.

- The Combined Sewer Overflow Notification Plan was submitted to the Province in April 2014. This plan outlined the significant event, quarterly and annual CSO reporting processes to comply with Clause 14.

- The Interim Monitoring Plan was submitted to the Province in January 2014. This plan outlined the plans to comply with Clause 15 which concluded with the analysis of the samples collected documented in the submission of the December 2015 Preliminary Proposal submission.

- The CSO Public Notification System Plan was submitted to the Province in December 2015. This plan outlined a new notification system to inform the public in the event of an overflow to comply with Clause 10.

- The CSO Master Plan was submitted to the Province on August 28, 2019 (see section 2.3) and was subsequently approved by the Province on November 13, 2019 (see Appendix B). This triggered Clause 13 of EA No.3042, which requires the City to submit an annual report documenting the CSO monitoring progress and results of the preceding year, and work plan for the subsequent year by March 31 of each year. Clause 13 specifically states:

  The Licencee shall, upon approval of the Master Plan submitted pursuant to Clause 11 of this Licence, implement the plan such that progress towards meeting the required level of treatment is demonstrated annually by submission of an annual report, due March 31 of each year for the preceding calendar year. Annual submissions shall include the progress made on the plan

pursuant to Clause 11 including monitoring results and the work plan for the subsequent calendar year.

The Provincial approval letter dated November 13, 2019 contained the following additional requirements:

a) The Licencee shall submit for approval an outline of the content of the annual report as required by Clause 13 of the Licence by December 31, 2019;

b) The Licencee shall, prior to submission of the annual report, submit a monitoring plan for approval;

c) The Licencee shall include in the annual report the monitoring report, the proposed planning for the year ahead, and the milestones achieved;

d) The Licencee shall, from the date of issue of this Letter, collect CSO water samples and model river quality data every 5 years to demonstrate improvements in the river water quality due to implementation of Control Option No. 1. The next river water quality report is due December 31, 2024;

e) The Licencee shall carry out an assessment of the impact of climate change to the performance of the CSO program and shall include the assessment report along with the CSO Master Plan for Control Option No. 2 which is due April 30, 2030; and

f) The Licencee shall, on or before April 30, 2025, submit for approval a report demonstrating that the percent capture performance measure, an alternative to Control Option No. 2 as proposed in the CSO Master Plan dated August 28, 2019, will provide equivalent water quality protection to Control Option No. 2 (i.e., four overflows in a representative year).

The City met with the Province to discuss the proposed outline for the CSO Master Plan annual reports on December 16, 2019. A proposed outline was submitted on December prior to the December 31 deadline.

2.3 CSO Master Plan History

Prior to establishment of the Federal and Provincial regulations summarized in Section 2.2, the City made major investments in wastewater treatment upgrades and focused on the combined sewer approach to eliminate dry weather overflows and protect the river water quality within Winnipeg. Projects that the City has invested in to reliving CSO and protecting basement flooding prior to the Federal and Provincial licensing requirements include:

- In 1937, diversion weirs and interceptor sewer system were put in place to divert combined sewer flows to the North End Sewage Treatment Plant (NEWPCC).
- Since 1960s, municipal regulations were in place to ensure that no new property developments were permitted to be serviced by combined sewers. All new developments must be serviced by a two-pipe system.
- The City also focused on completing infrastructure upgrades to eliminate CSOs to the river and reduce risks of basement flooding such as sewer separation works, sustainable drainage systems, latent storage dewatering stations, and outfall chamber upgrades.

After proclamation of the Environment Act on March 31, 1988, the Province of Manitoba requested the Clean Environment Commission (CEC) hold hearings on protecting Winnipeg's rivers and waterways. In 1992, the hearings concluded with recommendations to the City that a CSO study be commissioned. The CSO Management Strategy study was completed in 2002 and the final report was presented at the CEC public hearings completed in response to a raw sewage spill which occurred at the North End Sewage Treatment Plant (NEWPCC) in 2003. The 2002 CSO study documented the water quality impacts of combined sewers and formulated remedial measures for CSO control.

Following the 2003 CEC hearings, the CEC provided a report with advice and recommendations in August 2003. It was recommended in this report that the required funding to address CSOs in Winnipeg should be shared by the Federal and Provincial Governments in addition to the City. It was recommended the City be directed to complete the CSO work within the next 25 years, monitor CSOs and implement a public notification system. An excerpt from this 2003 CEC report is shown below:

> *The City of Winnipeg should be directed to shorten the timeframe to complete its combined sewer overflow plan from the proposed 50 years to a 20 to 25-year period.*
>
> *The City of Winnipeg should be directed to take immediate action to reduce combined sewer overflows by instrumenting outfalls, adjusting weirs, accelerating combined sewer replacement, advancing the pilot retention project and undertaking other reasonable measures to reduce combined sewer overflows within two years.*

Based on the CEC recommendations, the Province issued EA No. 3042 on September 4, 2013, mandating the development of The City's Combined Sewer Overflow Master Plan.

In response to the Clause 11 Licence requirements the CSO Master Plan Preliminary Proposal was completed on December 18, 2015, recommending an 85% CSO volume capture long term control target. This proposal included plans, costs, evaluation criteria and recommendations for the five different targets to address CSOs. These targets are known as Control Options, and each of the five Control Option studied are listed below:

- Control Option 1: 85 Percent Capture in a Representative Year
- Control Option 2: Four Overflows in a Representative Year
- Control Option 3: Zero Overflows in a Representative Year
- Control Option 4: No More than Four Overflows per Year
- Control Option 5: Complete Sewer Separation

The Province responded to the City on November 24, 2017 with approval to the CSO Master Plan Preliminary Proposal. The letter specifically directed the City to:

- *Submit a Master Plan including detailed engineering plans, proposed monitoring plans, and an implementation schedule for Control Option No. 1 as identified in your CSO Master Plan Preliminary Proposal on or before August 31, 2019 and for Control Option No. 2 as identified in your CSO Master Plan Preliminary Proposal on or before April 30, 2030, and*

- *Implement the CSO Master Plan for Control Option No. 1 by December 31, 2045, unless otherwise approved by the Director.*

On August 28, 2019, the City submitted the CSO Master Plan. The Master Plan included the District Engineering Plans (DEPs), proposed monitoring plans, and an implementation schedule for Control Option No. 1 with potential migration to Control Option No. 2.

Upon receipt of the CSO Master Plan submission, the Province responded to the City with the following requests on November 13, 2019:

- Part 1: complete an outline of the content of the annual report as required by Clause 13 of the Licence by December 31, 2019,
- Part 2: complete a monitoring plan for approval prior to the submission of the annual report, which will include the monitoring report, the proposed planning for the year ahead, and the milestones achieved,
- Part 3: complete a water quality assessment once every 5 years to demonstrate improvements in the river water quality as a result of implementation of Control Option No. 1. The next report is due December 31, 2024,

- Part 4: complete an assessment of the impact of climate change to the performance of the CSO program and an assessment report with the CSO Master Plan for Control Option No. 2, which is to be submitted by April 30, 2030,
- Part 5: complete a report demonstrating that the percent capture performance measure complies with Control Option No. 2, by April 30, 2025, and
- Part 6: implement CSO Master Plan for Control Option No. 1 by December 31, 2045.

The overview of the CSO Master Plan development timeline is illustrated in Figure 1.

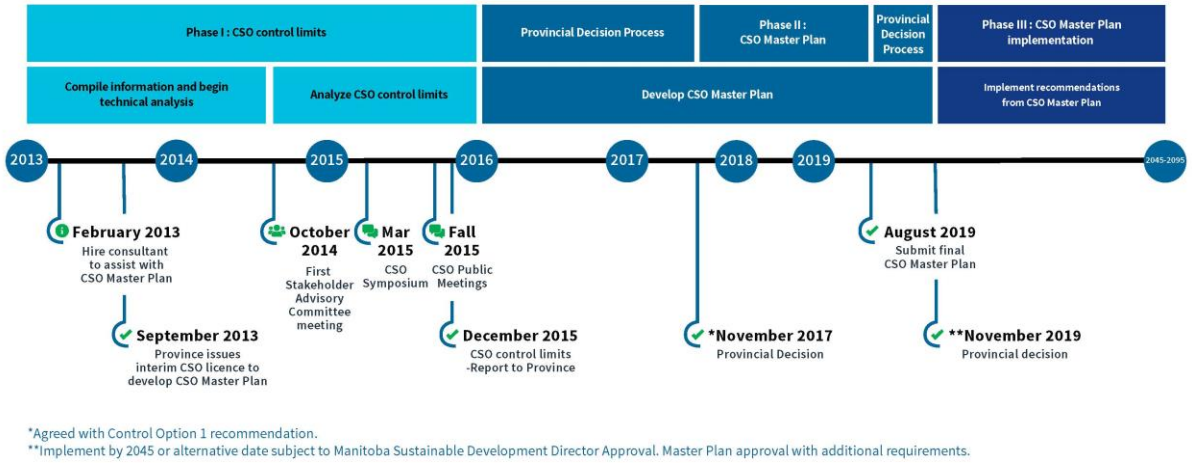


Figure 1 - CSO Master Plan Development Timeline

3. CSO Master Plan Implementation

The CSO Master Plan began its implementation phase upon the receipt of the Provincial approval letter in November 2019. A high level CSO Master Plan Implementation timeline with a number of the future significant milestones is provided in Figure 2.

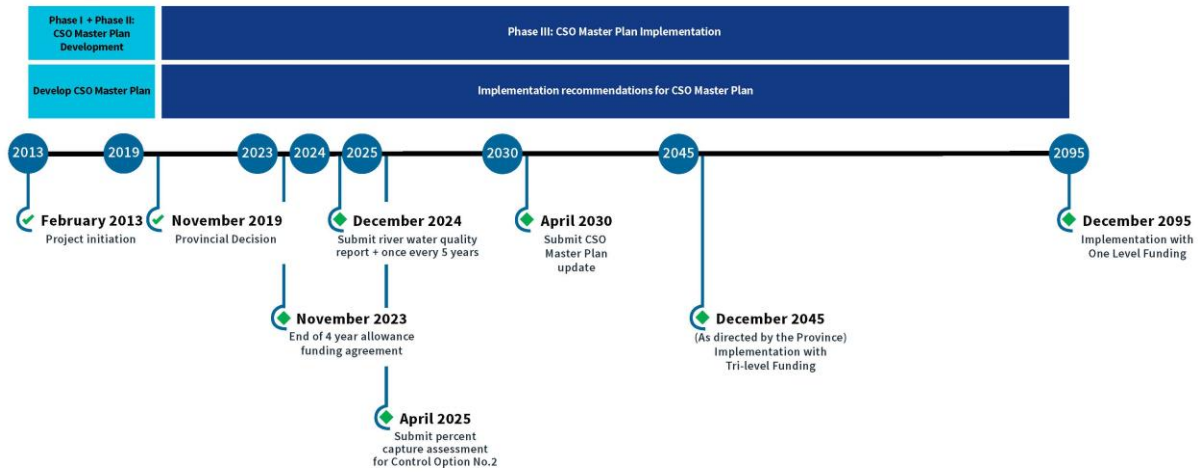


Figure 2 - CSO Master Plan Implementation Timeline

3.1 Master Plan Key Components

The following subsections identify the major considerations in the design of the CSO Master Plan to meet the requirements of EA No. 3042. These considerations will shape the reporting process for implementation of the CSO Master Plan.

3.1.1 Hydraulic Modelling

Monitoring instrumentation and analysis tools are crucial components to the development of the proposed solutions for the CSO Master Plan. At the beginning of the federally mandated CSO reporting period in 2002 no permanent CSO outfall instrumentation was in place. The estimation of percent sewerage volume lost from CSOs was based purely on analytical assumptions up until 2012. With the recommendation from the CEC in 2003, the City invested in CSO event monitoring and volume calculation tools to improve the confidence intervals of CSO estimations. The CSO Monitoring Program commenced in 2009 and by 2013, CSO instruments were successfully installed at 25 locations. Using the available data from the 25 monitored locations, the model estimates of wastewater flows from CSOs were validated.

Due to the difficulties of installing and maintaining instruments in harsh conditions with no local power source, detailed modeling of the combined sewer networks was undertaken to assess the feasibility of estimating the performance of the remaining combined sewer outfalls. An advanced hydraulic and hydrological model was built to represent the existing wastewater collections system. In 2014, the model was calibrated based on temporary instruments at five locations.

This model was further developed as more monitoring data became available. In 2015, the CSO Master Plan Regional Model was completed, which represented each of the CSO districts and outfalls. By 2015, CSO instruments were successfully installed in 14 additional combined sewer outfalls, bringing the total number of outfalls being monitored to 39. The model was then utilized to produce annual CSO results estimation with validation at the 39 permanent CSO instrumented locations.

In 2017, the City created a CSO overflow validation tool to identify and track differences between model estimated and instrumented observed overflows. This information was used to identify instrument maintenance, model maintenance, and areas for operational improvement.

To utilize the hydraulic software's latest and advanced features, the City upgraded the hydraulic model from sewer systems to an integrated catchment modelling platform software. Changes and impact resulted from the software conversion process were documented.

In 2020, CSO instruments were installed in three additional outfall locations. The permanent CSO instrumented locations were increased from 39 to 42 locations of the 76 CSO outfalls.

3.1.2 Design Basis

The technical evaluation of the five proposed control options in the Preliminary Proposal recommended the implementation of Control Option No.1: 85 percent capture in a representative year. This option was the highest ranked of the control options considered in the study, and was later approved by the Province in 2017 for implementation.

3.1.3 Representative Year

The CSO Master Plan adopted the year 1992 as the representative year for annual rainfall intensities and river levels. Based on a detailed review of 53 years of historic rainfall records at the Winnipeg International Airport, it was determined that 1992 would be a suitable rainfall year to representative of typical conditions with respect to accumulated rainfall (i.e. mm per event), number of annual events, and total annual precipitation characteristics. Similar evaluations of the historic river level records were completed and determine 1992 could also be suitable as representative of typical river level conditions in Winnipeg. As such, the 1992 river level trends and rainfall intensities were used in sophisticated numerical modeling to estimate the volume and frequency of CSO events during the recreation season (May through September, inclusive). It was agreed with the Province as part of the CSO Master Plan Preliminary Proposal development that the 1992 would form the representative year, and would be utilized or planning and evaluation of current and future CSO performance.

3.1.4 Baseline Conditions

The CSO Master Plan was developed with the 2013 year as the baseline year. The Preliminary Proposal, existing hydraulic models and other CSO related relevant reports were developed based on this baseline condition.

To ensure a common basis for control system sizing and regulatory compliance that is not affected by the annual variations in precipitation and river levels, the CSO Master Plan adapts the 2013 hydraulic model with 1992 representative year precipitation and river levels as the baseline condition for planning and evaluation of control options.

3.1.5 Planning Projections

The Master Plan accounts for population growth in the design process. Clause 8 of EA No. 3042 requires no increase in frequency or volume of CSO in the existing system due to new and upgraded land development. With the growth in population, the sewage flow is anticipated to increase in the sanitary sewer system with any growth in the combined sewer districts offset with reductions in runoff area.

To demonstrate compliance with the licensing requirements, the City regulates the development process by reviewing and ensuring that the post development peak wet weather flows (PWWF) in the combined sewer districts is equal to or less than the pre-development PWWF. As the City continues to regulate the development process and prohibit the use of combined sewers in new developments, it is anticipated that there would be no impact in the combined sewer systems from new development. CSO Master Plan planning projections account for increase in sewage flow only in the separate sewer areas.

In 2020, the City engaged with the Province and sought Council approval for allowing increases in runoff area for smaller developments (e.g. duplexes) in combined sewer districts to align with OurWinnipeg goals of enabling this type of development as achieving on site clause 8 compliance could be costly. Any increases in runoff area would be offset by CSO Master Plan strategic CSO mitigation projects. The City had Council Approval in 2020. On March 18, 2021, the Province issued a response which the City will review and the details will be included in the 2021 CSO Annual Report.

3.1.6 CSO Control Technologies

Clause 8 of EA No. 3042 requires the use of green technology and innovative practices in the design and operation of all new and upgraded storm and wastewater infrastructures. Both green and grey infrastructures are considered in the CSO Master Plan design. Green infrastructure (GI) refers to the use of natural hydrologic processes to reduce, store, or attenuate surface runoff from entering the combined or land drainage sewer systems. Many of the GI projects also improve water quality of the surface runoff received. Grey infrastructure refers to the conventional infrastructure projects to address sewer system incapacity, such as pipes and storage tanks.

The control technology selection for each of the combined sewer districts was developed through a two-step approach selection process. The first step of the review included the evaluation of the applicability of sewer control option for the district. This evaluation was based on a number of criteria, including compatibility with existing sewer infrastructure, proximity to the primary CSO outfall/interceptor sewers, and estimated hydraulic performance. The initial solution configurations were implemented within the model based on system hydraulics and then locations were verified with GIS in terms of constructability and feasibility.

The second step of process included the refinement of the initial control option selection to achieve the 85 percent capture target in the most cost-effective manner. These refinements included:

- A review and further evaluation of sewer districts with screening operational challenges,
- Incorporation of additional complete or partial sewer separation where cost-effective,
- The addition of sewer system control and/or CS-SRS interconnection adjustments to accommodate additional latent storage,
- Incorporation of additional off-line storage where required to provide the remaining volume capture required to meet Control Option No. 1.

Further details to each of these refinements can be found in Section 3.5.4 of CSO Master Plan Part 2.

3.1.7 Water Quality

As per Clause 15 of EA No. 3042, the City developed an Interim Combined Sewer Overflow Monitoring Plan to aid in the development of the CSO Master Plan. The Interim Plan was a multi-year water quality monitoring program was conducted to collect and update river and CSO water quality data for the development of the CSO Master Plan. The water quality monitoring data was collected in 2014 and 2015. The event mean concentrations (EMC) of the data collected from the 2014 and 2015 water quality monitoring program are provided in Table 1. The EMC of ammonia, nitrate and total phosphorus (TP) were used to determine pollutant loads in the NRPI reports, while total phosphorus (TP) and total nitrogen (TN) and nutrient loading were used as the baseline for the water quality modeling and loading assessments for evaluation of control option alternatives for the CSO Master Plan. The assessment indicated that the CSO discharge quality varied by location and between events but was within expected ranges for combined sewer discharges and there was very little difference in performance among the control option alternatives. Table 2 indicates the number of days the bacteria objective may be exceeded for each alternative. The detailed analysis and results of the CSO Master Plan water quality monitoring work are documented in the Preliminary Proposal.

Table 1 - Pollutants EMC from 2014/2015 Water Quality Monitoring Program

Substance Name	Unit	EMC
[1]Ammonia	mg/L N	5.72
[1]Nitrate-N	mg/L N	0.34
[1,2]Total Phosphorus	mg/L P	2.71
[2]Total Nitrogen	mg/L N	15.25

1 – Parameters used in the NPRI reports
2 –Parameters used in the CSO Master Plan nutrient loading assessments

Table 2 - Potential Plans Bacteria Metrics (CH2MHill et al., 2015)

Plan Alternative	Control Limit	Number of Exceedances (days/year)
-	Baseline	44
1	85% Capture in a representative year	44
2	Four Overflows in a representative year	41
3	Zero Overflows in a representative year	35
4	No More Than Four Overflows per year	39
5	Complete Sewer Separation	42

As per the CSO Master Plan approval letter, the City will continue to work towards implementing Control Option No. 1 while further evaluating the bacteriological water quality improvement identified for Control Option No. 2. A water quality report will be submitted once every 5 years, starting on December 31, 2024. The implications of maintaining a percent capture program on water quality will be evaluated and will be provided in the 2030 Master Plan update submission.

3.1.8 Climate Change

Climate change considerations were accounted for in the planning and development of the CSO Master Plan. As documented in the CSO Master Plan Preliminary Proposal, historic rainfall information (1960 to 2012) was reviewed to understand precipitation trends and the impact climate change may have on the performance of the CSO Master Plan.

Precipitation trends indicate that climate change is linked to less frequent but larger rainfall events. Winnipeg is expected to experience an increase in the frequency of small rainfall events but a consistent trend for larger events. Since the smaller events can be captured in the CSO control system, it is expected that the trend would not be detrimental to the program performance. However, there is a high degree of uncertainty in long-term trends if the frequency of large events increases.

GI has been identified as an opportunity to improve performance levels and provide resiliency to the potential future impacts of climate change. The City will continue to undertake GI pilot projects to evaluate their benefits and long-term performance for future application. An allowance of 10 percent of the total CSO Master Plan capital cost estimates has been included for future GI implementation and to achieve regulatory compliance for Clause 8 of EA No. 3042.

Furthermore, the sewer separation work which has been prioritized will provide the program with climate change resiliency. Any additional runoff generated from climate change impacts on precipitation trends will continue to be directed to the land drainage sewers for the districts which have been separated.

The City will continue to monitor and track weather patterns to assess any impact to the CSO Master Plan and the use of 1992 as the representative year to represent the long term typical conditions in the City of Winnipeg.

3.1.9 Public Engagement

The City established a public engagement program to inform, engage and consult the public on the CSO Master Plan in the first stage of the Master Plan. The public engagement program included multiple public consultation events for the public to provide input. In addition to public consultation events, a Stakeholder Advisory Committee (SAC) was established to provide advice and direction on the study phase.

The general public was engaged through various public presentations and workshops, internet-based tools, including a blog open for public comments, an email Q&A option, a CSO educational video, and media interviews. The information gathered from the public engagement was evaluated and integrated to developing the Preliminary Proposal.

Upon submission of the Preliminary Proposal, the City continued to inform and educate the public on the development of the Master Plan using the internet-based tools. The City optimized the public webpage dedicated to the CSO Master Plan work, by restructuring and updating it to allow more content and the most up-to-date information be made available to the public. The updated website also allows the public to access the information and navigate the website in a more effective and user-friendly manner. A screen capture of the updated City public webpage can be found in Figure 3.

3.1.10 Regulatory Engagement

The City worked closely with the Province to develop the CSO Master Plan. The City met with two different regulatory groups, a regulatory liaison (management) group and a regulatory working group to raise challenges, report on project progress updates, and to promote collaboration with the regulator to ensure successful program delivery.

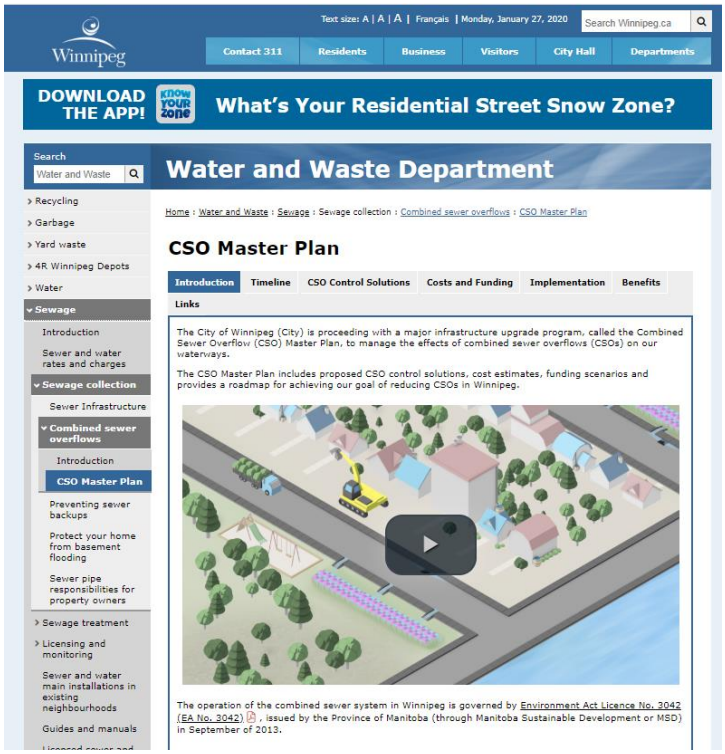


Figure 3 - Screen Capture of the City Webpage

3.1.11 District Engineering Plans

The District Engineering Plans (DEPs) were developed to provide conceptual solutions for the Control Option No. 1 performance target (85 percent capture in a representative year) for each of the 43 combined sewer districts.

The DEPs are ongoing, live documents. Each of the districts will undergo preliminary and detailed levels of design based on the solutions recommended in the DEPs, and will be updated throughout the implementation phase as required. The current version of the DEPs can be found in the CSO Master Plan Part 3B.

3.2 Capital Cost Summary

A conceptual level Class 5 estimate was developed for the CSO Master Plan. A Class 5 estimate is defined by the *American Association of Cost Engineers International,* (AACE) *Cost Estimate Classification System - As Applied In Engineering, Procurement, and Construction for the Process Industries* (AACE, 1997) as having a project definition of zero to two percent to be used in a conceptual study with an expected range of accuracy from -50 percent to +100 percent.

The total capital cost to implement the CSO Master Plan including the 10 percent GI allowance is estimated as $1,150,400,000 in 2019 dollars. Applying the maximum +100 percent of the Class 5 estimating range, the total capital cost for budgeting purposes is estimated to be $2,300,800,000. The capital cost summary is shown in Table 3.

Table 3 - CSO Master Plan Capital Cost Estimate (2019 dollars)

Item	2019 Capital Cost Estimate
Class 5 Estimated Capital Costs	$1,045,800,000
Green Infrastructure Allowance (10%)	$104,600,000
Subtotal – Capital Cost Estimate	**$1,150,400,000**
Class 5 Estimate Range of Accuracy: -50% to +100%	$575,200,000 to +$2,300,800,000
Total Capital Cost for Budgeting Purposes	**$2,300,800,000**

3.3 Funding Scenarios

The current City funding method for the CSO Master Plan is through the Sewer Utility. The sewer rates have been steadily rising to cover the inflation rate and the costs required for assorted water and wastewater infrastructure upgrades. However, to meet the mandated timeframe in EA No. 3042, an aggressive increase in Sewer Utility rates is required and this amount was determined to be unaffordable by utility rate payers. An affordability assessment documented in the Preliminary Proposal suggested that the Master Plan would not be able to meet the licencing requirements based on the current and forecast utility rates without additional external funding support.

Based on the recommendation from the CEC for sharing the cost equally between the Municipal/Provincial/Federal governments, the CSO Master Plan was developed with the following three funding scenarios.

- Scenario 1 – Tri-level funding agreement between the Government of Canada , Manitoba Government and the City of Winnipeg with $30 million per year each (a total capital budget of $90 million dollars per year)
- Scenario 2 – Bi-level funding agreement between the City of Winnipeg and either the Manitoba Government or the Government of Canada at $30 million per year each (a total capital budget of $60 million dollars per year
- Scenario 3 – City-only funding with a total estimated capital budget of $30 million per year.

The funding scenario is based on the following assumptions:

- three percent inflation per year for annual funding and construction costs,
- a four-year initialization period at beginning of program, which includes a two-year allowance for alterations of EA No. 3042 and a two-year allowance for securing Federal and Provincial funding commitments, and
- consistent funding arrangements established throughout the entire implementation period.

The 2019 CSO Master Plan described the funding impacts in detail. The summary of the impact of the three funding scenarios are provided in Table 4.

Table 4 - CSO Master Plan Funding Scenario Evaluation Results (2019 Dollars) (Jacobs, 2019)

Program Scenario	Description	Funding by	Annual Budget	Timeline
Scenario 1	3 Levels of Funding 3 x $30 Million	Tri-level: Government of Canada, Manitoba Government and the City of Winnipeg	$90 Million	27 years (2047)
Scenario 2	2 Levels of Funding 2 x $30 Million	Bi-Level: City of Winnipeg and either the Manitoba Government or the Government of Canada	$60 Million	39 years (2059)
Scenario 3	City Only $30 Million	One Level: City of Winnipeg Only	$30 Million	75 years (2095)

The City require funding from the Federal and Provincial governments to meet the 2045 Provincial deadline due to the scale of the work required as per the intent of the 2003 CEC recommendations. However, any changes to inflation rates or delay to annual funding approvals to the request will result in overall project cost increases and a longer implementation timeline.

The CSO Master Plan is currently on schedule and budget for Program Scenario 1.If no additional funding is provided by the Provincial and Federal Governments by 2023 or earlier the CSO Master Plan will move to the Program Scenario 3 which is based on City only funding and has a longer implementation timeline.

The Program Scenario 1 Capital Budget with 3 percent annual inflation can be seen in see Figure 4 below.

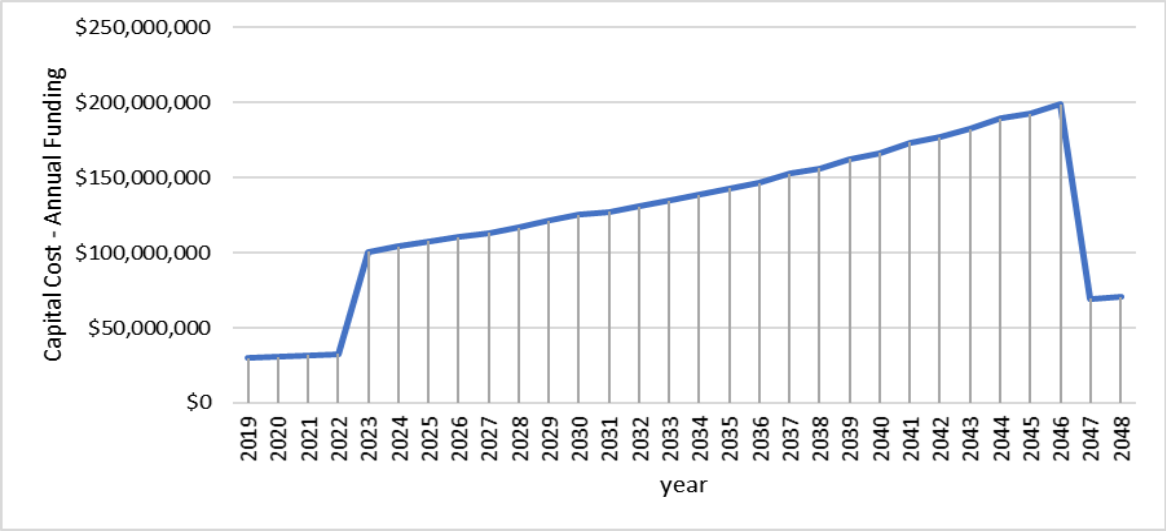


Figure 4 - CSO Master Plan Program Scenario 1 Capital Budget Inflated at 3 Percent Annually

3.4 Design Development of Proposed Projects

The CSO Master Plan and the DEPs have been developed to a conceptual level of detail. The individual project selections and designs are based on the hydraulic model evaluations and high level assessments of constructability. It is expected that the proposed projects identified will change and adapt as further information is collected during the program implementation and individual project design studies. This process is illustrated in Figure 5.



Figure 5 - Key Design Stages in Life of a CSO Project

The City plans to complete a number of additional evaluations based on the details presented in the DEPs to form the basis for further design and construction within each of the sewer districts. Each of the proposed projects will undergo a preliminary and detailed design stage to confirm their constructability. A potential approach to the design process would be for several neighboring sewer districts to the district in question under design to be further refined as a package during the preliminary design phase. Additional detail would be collected and evaluated to fully understand the existing sewer system surrounding each specific district prioritized, and confirm selection of the optimal CSO control technology. This would be followed by detailed design where the parameters of the control technology would be finalized for construction.

Each of the combined sewer districts with the solutions constructed will be monitored to determine the level of performance achieved. This information will be input into the current hydraulic model and applied as part of future design evaluations. CSO volume monitoring and operation and maintenance of sewer systems will continue for the life of the infrastructure.

3.5 Program Implementation Strategy

In addition to the program criteria, an implementation strategy has been defined in the CSO Master Plan documentation to balance, resources, risks and costs of the projects. Additionally, projects were scheduled based on the funding scenario.

Sewer separation work is an ongoing priority for the program implementation for a number of reasons: high cost and in turn additional costs if delayed, multiple benefits and low risk. Cost escalation can have significant impacts to the cost of long-term programs, completing more expensive work upfront reduces the relative impact of cost escalation. Sewer separation reduces basement flooding risk and reduces wet weather runoff to the combined sewer system. It addresses the required CSO reduction targets, while also improving the basement flooding level of service for the area.

There are a number of additional opportunities which require further investigation as part of program implementation, such as GI solutions and floatable management.

GI was assessed separately from the other control options. It was not been included in the base solutions because of unknowns and uncertainty with its application. Each district will require a detailed assessment on potential GI locations and will require the development of policies and design standards with engagement and by-in from residential, commercial and industrial customers to optimize opportunities. It is programmed that the analysis of the main technology evaluations and pilot studies are completed within the first ten years. This will provide confirmation that these proposed options are appropriate and suitable for the Winnipeg sewerage system. GI and sustainable solution should be reviewed as part of every sewer infrastructure project to comply with Clause 8 of EA No.3042. GI projects will provide the necessary performance improvements to meet CSO volume capture targets and will assist with mitigating detrimental impacts from Climate Change. An allowance of 10 percent of the total CSO Master Plan capital cost estimates has been included for future implementation.

The floatables management approach in the CSO Master Plan is based on outfall screening. Screening is not the most effective approach for many of our sewer districts due to many factors including the surrounding environment and the sewer system hydraulics. Floatables management is required for outfalls in which combined sewage is discharged. For districts in which complete sewer separation is to be completed, combined sewage will no longer be discharged from the outfalls in these districts, and floatable management will not be required.

The City has identified an alternative approach to screening to address the floatable management requirements, which is similar to a successful program run by the City of Ottawa. This proposed new approach targets source control as a potential alternative to screening. This is expected to achieve similar or better results while eliminating end-of-pipe screening. The alternative floatables management plan provides a significant opportunity to achieve the intended results, while avoiding the high capital and long-term operations and maintenance (O&M) costs of screening facilities.

Additional sewer storage and mechanical controls solutions are also programed to follow sewer separation work. Sewer network, power, communications, monitoring, and operational infrastructure need to be in place to provide the capability and allow for a detailed understanding of network performance to appropriately size and operate this type of infrastructure.

3.6 Schedule

The schedule is based on funding and the evaluation of the scope of work involved with each of the districts, CSO volume detriment, cost-benefits analysis, and district prioritization. See Appendix C for the district Program Scenario 1 implementation schedule and Figure 6 for the high level schedule which shows for the implementation strategy more clearly.

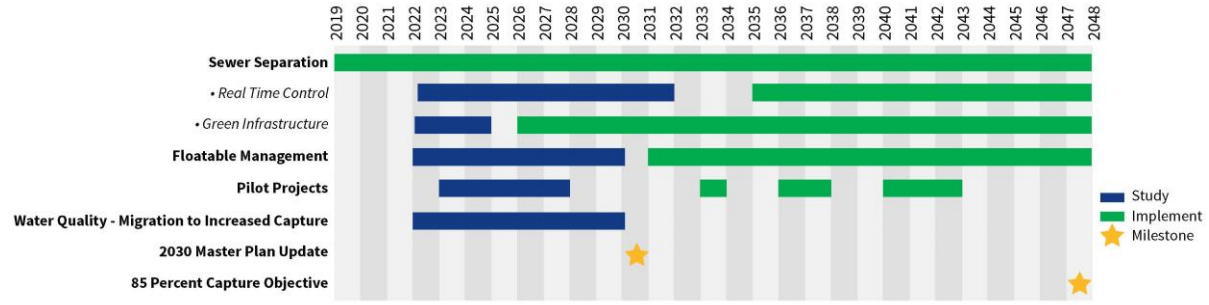


Figure 6 - CSO Master Plan Program Scenario 1 Overview Schedule

3.7 Capital Projects Overview

To achieve 85% CSO volume capture in a Representative Year, sewer separation work is a major component and proposed for 15 districts in total. A breakdown of the cost for each control technology applied in the CSO Master Plan is shown on Figure 7.

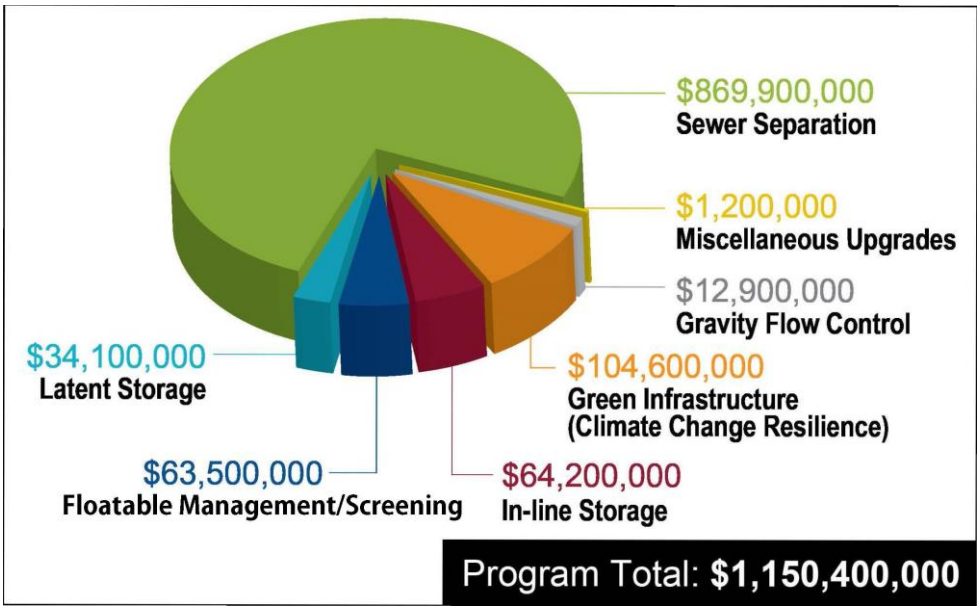


Figure 7 - CSO Master Plan Capital Cost Summary (2019 Dollars)

Figure 8 provides an overview map of the location of the proposed control options in each district.

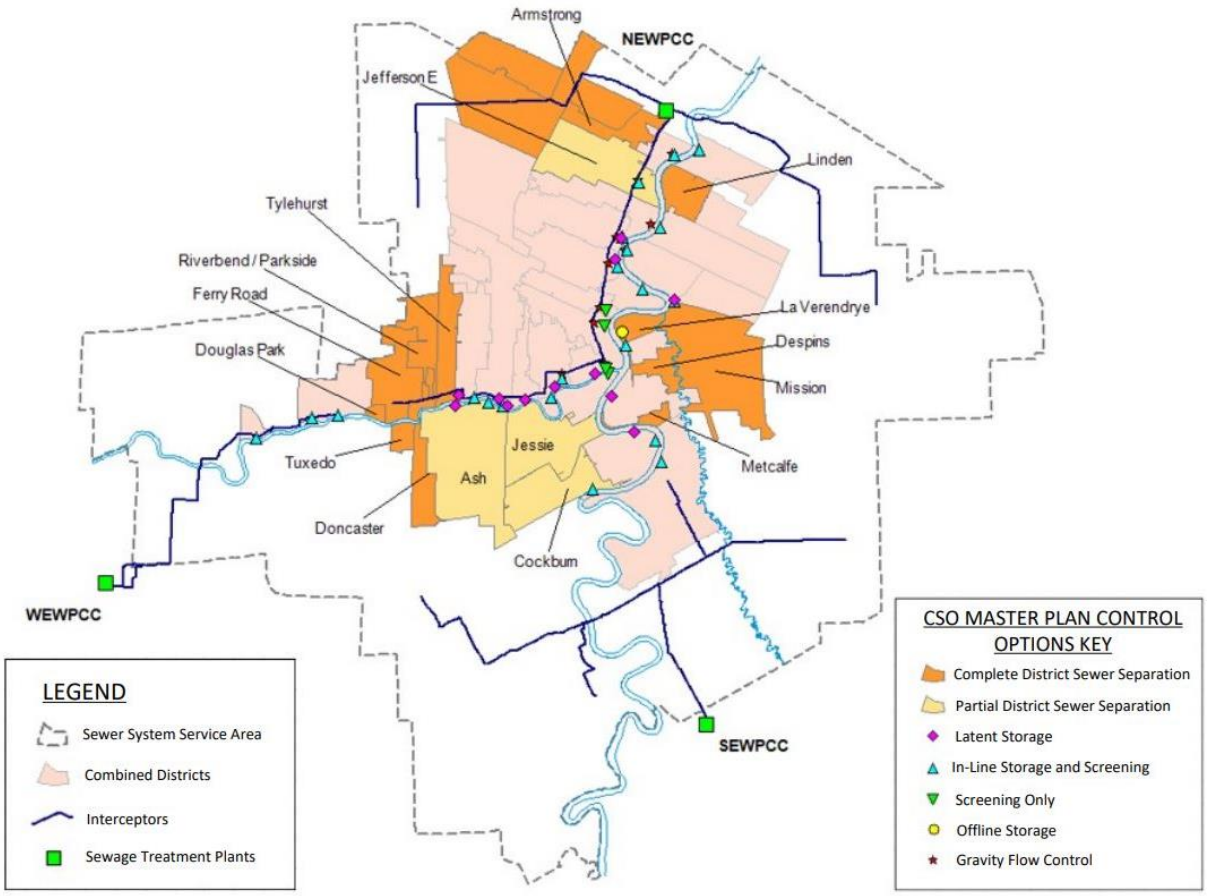


Figure 8 - CSO Master Plan Project Overview Map

3.8 Risks and Opportunities

This section provides an overview of the risks and opportunities identified in the development of the Master Plan.

3.8.1 Risks

Program Implementation

The factors that may pose a risk to the program implementation are as follows:

- Funding – There is a risk that funding from other levels of government will not be available over the life of the CSO Master Plan. The City will continue its work with the allocated $30 million annual budget.
- Technology – There is a risk that implementation of the green and innovative technologies as per Clause 8 of EA No. 3042 may not perform as expected. Technologies that are proven to be successful in other jurisdictions may not apply the same to Winnipeg due to the environment. The City will undertake research and seek for experience and knowledge from other jurisdictions on the technologies prior to implementation.
- Resource – Market fluctuation and insufficient local resources may pose a risk to a cost increase and a delay in implementation schedule.
- Schedule – There are many sources of risk associated with the planning and execution of the program. Such risks include funding shortages or high bid costs, limitation of engineering and construction service capacity, and extended project approvals.
- Migration to Control Option No. 2 – The change in performance target (from Control Option No. 1 to Control Option No. 2) would increase costs and likely increase the timeline of the Master Plan due to the increase level of effort required for the increased CSO volume reduction.

Climate Change

An increase in extreme weather events is a potential risk to the performance of the CSO Master Plan program. The program is based on a 1992 representative year. Long-term monitoring of rainfall trends will continue during the execution of the Master Plan to monitor any trends.

Basement Flooding

Modification and upgrade of existing infrastructure may pose a risk to basement flooding due to potential system operation issues.

Program Feasibility and Sustainability

Factors to be considered regarding the feasibility and sustainability of the program include: affordability, public impact, construction capacity, services overlap, and control option re-evaluation.

Affordability: The City's finances its capital and operating budgets for the sewer utility on a user-pay basis through sewer rates. To ensure that the rates are affordable to rate payers, the City takes a longer-term view of rates. The rates have steadily been rising for several years and are expected to continue to rise due to wastewater treatment plant upgrade works and replacement and refurbishment of aging infrastructure.

Public Impact: Sewer separation projects are planned throughout the combined sewer system and will encompass large sections of the sewer districts. Each of these will include large programs that will each take several years to complete. This may pose an impact on both the residents and businesses.

Construction Capacity: With the additional construction projects demand, there is a risk that Winnipeg may not be equipped with sufficient local construction industries to undertake the work, posing a potential risk of a schedule delay.

Services Overlap: There are multiple competing infrastructure needs within the City to consider as well as the possibility of additional requirements in the future that cannot be forecast. Coordination with other City services will be required to minimize impacts and identify planning overlaps.

Control Option re-evaluation: As technologies evolve overtime, there is a risk that the selected control option may need to be re-evaluated to validate the best control option available. This implies that there is a possibility of rejection, which may lead to the need for more costly substitutes.

District Engineering Plan Risks

The District Engineering Plan comprises of individual conceptual solution to CSO mitigation for each of the combined sewer districts. Each of the risks and opportunities applicable to the control solutions recommended within each sewer district to meet Control Option No. 1 are documented in the Part 3B – District Engineering Plans of the CSO Master Plan.

Any changes to the control solution could cascade to a reevaluation of risks associated with each of the specific projects.

3.8.2 Opportunities

A number of opportunities to improve the volume percent capture during the program were identified during the development of the CSO Master Plan. The following section describes the main areas that the City could benefit from during the development of the Master Plan.

Green Infrastructure

Clause 8 of EA No. 3042 requires the use of green technology in the design and operation of all new and upgraded infrastructures. In the CSO Master Plan, each of the combined sewer district control solutions contains a GI component. GI technologies will be evaluated to promote additional CSO volume storage and sustainability. A budget of 10 percent of the capital program is included in the CSO Master Plan budget for the implementation of the GI technology.

Floatable Management

Clause 12 of EA No. 3042 requires the Master Plan to demonstrate the prevention of floatable materials in CSO effluent. The Master Plan proposed investigating the use of both screening and the alternative floatable management approach to prevent floatable materials from entering the river.

Real Time Control

Real time control (RTC) provides a method of increasing system performance by improving the operation of the system. With Winnipeg's flat topography and large diameter pipe network, application of RTC becomes very valuable as it can adapt and balance the system for real precipitation events that are spatially and temporally distributed. The incorporation of RTC and monitoring instrumentation will provide an increased understanding of operation and a better control on a real time basis, and an optimization of flows in the system and to the treatment plants.

Stakeholder Collaboration

Working together with other stakeholders including industry groups and the public will provide partnership opportunities that may provide additional benefit to the CSO Master Plan. Furthermore, this will provide an opportunity to further engage, communicate and educate the community on the ongoing work with the program.

Further details associated with both the risks and opportunities of the program can be found in the CSO Master Plan.

4. CSO Master Plan Performance

To track CSO performance the City of Winnipeg first utilizes the 2013 Regional Model Baseline Network performance, specifically with the CSO design event the 1992 Representative Year rainfall with the associated river levels applied. This provides the baseline performance levels, and is in line with the procedure used to evaluate the 2015 CSO Master Plan Preliminary Proposal results. The current year model network is the best representation of the sewer network condition at that time, is then utilized with the same 1992 Representative Year rainfall and river levels. This produces the current performance, and is compared to the baseline performance to estimate the performance improvement and track progress.

4.1 CSO Volume Performance Tracking

To track progress towards meeting the Control Option 1 85% CSO Volume capture for the 1992 Representative Year, the estimated volume and frequency of CSO events for the 2013 Regional Model Baseline Network were compared against the current year 2020 Regional Model Current Network, both with the 1992 representative year design basis.

The 2013 baseline hydraulic model represents the model conditions for the 2013 sewer network used during the Preliminary Proposal. The 2020 current network provides the best representation of the sewer network condition for the current year 2020.

The total CSO volume discharged for the current year is 5,106 ML, which is 154 ML less than the 2013 baseline CSO volume. The reduction in CSO volume and the overall percent capture demonstrate that the combined sewer relief projects that were undertaken of recent years have improved the overall CSO performance of the collections system. Table 5 presents the CSO performance of the baseline, current year and the Preliminary Proposal's control target (85 percent capture) under 1992 design event. The total wet weather flow volume captured for 2020 was calculated based on the baseline's dry and wet weather flows, in conjunction with the 2020 CSO volume.

Table 5 - CSO Master Plan Performance Tracking

Condition	Total CSO Volume (ML)	Total Dry Weather Flow Volume (ML)	Total Wet Weather Flow Volume Captured (ML)	Target Reduction in CSO Volume (ML)	*Percent Capture (%)
Baseline Performance - 2013 Baseline with 1992 Rep. Year	5,260	7,749	7,317	-	74
Current Year's Performance - 2020 Current Network with 1992 Rep. Year	5,106	7,749	7,450	-	75
Target Performance - CSO Preliminary Proposal 85 Percent Capture with 1992 Rep. Year	2,980	7,749	9,593	2,300	85

$$*Percent\ Capture = \frac{(Total\ Dry\ Weather\ Flow\ Volume + Total\ Wet\ Weather\ Flow\ Volume\ Captured)}{(\text{Total CSO Volume} + \text{Total Dry Weather Flow Volume} + \text{Total Wet Weather Flow Volume Captured})}$$

There was a 3% CSO volume reduction in 2020 for the 1992 Representative Year maintaining an increase in the CSO volume percent capture of 75%. The improved performance is primarily attributed to Capital improvements represented in the model for the Ferry Road completed contracts and Cockburn completed contracts (-108ML). Other model maintenance improvements to improve asset representation based on collected data and installed monitoring instrumentation and model accuracy represent the remaining differences. Annual model updates need to be completed prior to final year simulations, there

will always be network changes or improved data that is not available at the time of the updates but will be included in subsequent updates. The Current year network will be the best available representation of the City sewer system and will be constantly improving.

4.2 Financial Tracking

The CSO Master Plan developed an overall capital cost totals in 2019 values for each of the combined sewer districts, which includes a 53 percent makeup on construction cost for engineering, burdens and contingency, and a 10 percent allowance for green infrastructure. The cost is based on a Class 5 level of estimate. The following section provides the financial status of the program. The financial budget is provided based on the current year's actual spend with a three-year window forecast. As preliminary design is completed for a district updated class 3 cost estimates will be prepared and utilized in the financial tracking process.

4.2.1 Capital Cost Estimation Tracking

No new capital cost estimates were created since the August 2019 submission of the CSO Master Plan.

4.2.2 Budget Tracking

The CSO Master Plan is on schedule and budget for Program Scenario 1. If no additional funding is provided by both the Province and Federal Governments by 2023 or earlier, the CSO Master Plan will move to the Program Scenario 3, which is based on City only funding and has a longer implementation timeline.

City funding method for the CSO Master Plan is through the sewer utility. The sewer rates have been steadily rising to cover the inflation rate and the cost required for infrastructure upgrades. However, to meet the mandated timeframe in EA No. 3042, an aggressive unsustainable increase in utility rates would be required and was considered unaffordable for utility rate payers. An affordability assessment documented in the Preliminary Proposal suggested that the Master Plan is unaffordable to be completed in accordance to licensing requirements based on the current and forecast utility rates without additional funding support.

The City requires funding from all three levels of governments to meet the 2045 Provincial deadline due to the scale of the work required as per the intent of the 2003 CEC recommendations. However, any changes to inflation rates or delay to annual City funding approvals will result in overall project cost increases and a longer implementation time.

A three-year window budget of the CSO Master Plan and revised 2020 annual budget is presented in Table 6 below.

Table 6 - CSO Master Plan (2019 dollar values) and Revised 2020 Annual Budget Difference

	Year 1	Year 2	Year 3	
	2021	2022	2023	Average
CSO Master Plan Forecast	$31,831,467	$32,786,411	$33,770,003	$34,783,103
2021 Budget Forecast	$32,000,000	$30,000,000	$28,000,000	$30,000,000
% Deviation	+1%	-9%	-21%	-16%

The City only CSO Master Plan 2020 budget was $30,904,337 with an additional $24,312,961 budget holdover from 2019. The additional budget was held since 2018 to be in a position to be able to award the Jefferson Contract 5, a large strategic tunneling project on Semple Avenue with a Class 3 estimate in excess of the available budget funding in 2018. This contract was not awarded in 2019 but in 2020 due to the complexity of the project. The CSO Master Plan budget under City only funding for 2021 is $32,000,000 with an additional $27,243,213 carried forward to maintain a committed average budget spend and to be able to award larger strategic contracts like the planned Rutland Trunk, which is now been planned for 2024. See Table 7 - 2021 to 2023 Capital Budget Forecast (2020 dollar values).

Table 7 - 2021 to 2023 Capital Budget Forecast (2020 Dollars)

Budget Source	Budget	2020 Committed Capital Projects To Date	2020 Forecast Capital Projects	% of Annual Budget Committed
2019 (hold over)	$24,312,691			
2020 Budget	$31,610,000	$28,679,478		51%
Total Budget Available	**$55,922,691**			
2020 (hold over)	$27,243,213			
2021 Budget	$32,000,000		$32,106,552	56%
Total Budget Available	**$57,136,661**			
2021 (hold over)	$27,136,661			
2022 Budget	$30,000,000		$11,760,000	16%
Total Budget Available	**$73,506,661**			
2022 (hold over)	$45,506,661			
2023 Budget	$28,000,000		$30,170,000	40%
Total Budget Available	**$75,336,661**			

Approximately $23.3 million was invested in 2019, and $28.7 million was invested in 2020. The approximate cumulative committed capital spend for 2019 and 2020 is $52 million. The CSO Master Plan and 2020 actual and forecast annual capital spend with a three-year window are provided in Figure 9.

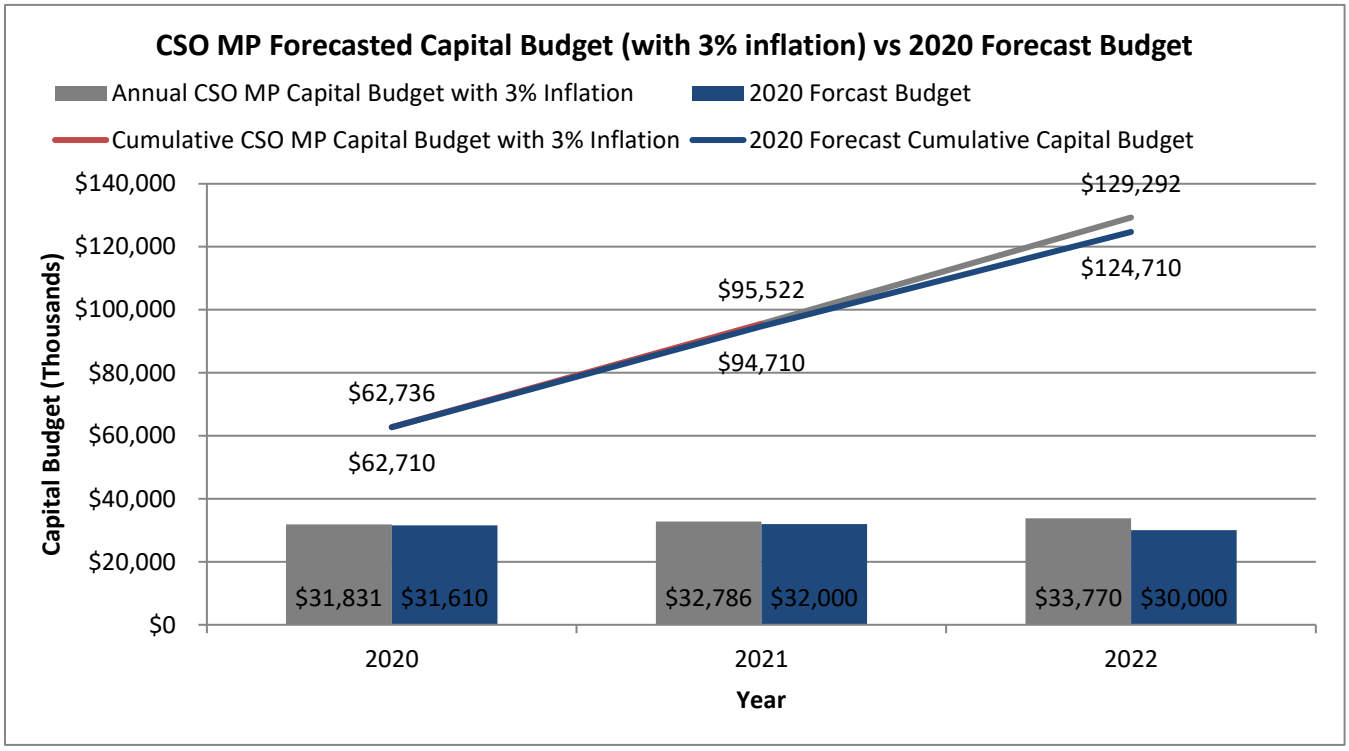


Figure 9 - CSO Master Plan and 2020 Actual and Forecast Capital Budget

4.3 Schedule Tracking

The CSO Master Plan schedule is based on the Program Scenario 1 budget with districts strategically prioritized based on implementation strategy and CSO volume reduction.

The proposed and actual construction implementation schedule for 2020 along with the CSO Master Plan forecast to 2023 (three-year window) is illustrated in Appendix D.

4.4 Districts Design Status

The design status for each of the combined sewer districts is illustrated in Appendix E. Colored cells represent the design stage status for the specific district as of December 31, 2020.

4.5 Capital Projects Tracking

The list of completed and/or ongoing projects of 2020, associated with the scope, targeted costs, actual cost and associated volume reduction are provided in Appendix F.

The list of forecasted work for 2021 is provided in Appendix G.

The capital project's estimated CSO volume reduction values that were not determined at the time of the 2019 CSO Annual Report submission are now included in the above appendices.

4.6 Milestones

The 2020 awarded contracts and the 2021 planned contracts milestones are summarized in Table 8 and Table 9, respectively. The planned award dates and the actual award dates are compared to demonstrate the project progress. Based on the existing progress and the implementation schedule from the CSO Master Plan, all current projects are concluded to be on schedule.

In addition to the contract work, any Provincial submissions are also considered as milestones. The milestones for the Provincial submissions are provided in Section 10 Compliance.

Table 8 - 2020 Past Contracts Milestone

2020 Committed Contract	Targeted Award Date	Actual Award Date	Comment
CSO Sewer Relief Projects			
NEWPCC			
Ferry Road / Riverbend Construction Contract 7B	2020	Jul-20	Broke into three contracts for construction staging
Ferry Road / Riverbend Construction Contract 7C	2020	Oct-20	Broke into three contracts for construction staging
Jefferson East Construction Contract 5	2020	May-20	-
SEWPCC			
Cockburn / Calrossie Consultant Assignment 4	2022	Dec-20	Brought forward, work is proceeding quicker than planned
Cockburn / Calrossie Construction Contract 6A	2020	Jun-20	Broke into two contracts for construction staging
Cockburn / Calrossie Construction Contract 10A	2020	Jun-20	-
CSO Monitoring Program			
Rainfall Monitoring Program - Web Based Data Management and Analysis Service	2020	Jun-20	-
Rainfall Monitoring Program - Operation and Maintenance of Equipment	2020	Apr-20	-

Table 9 - 2021 Planned Contracts Milestone

2021 Planned Contract	Targeted Completion Date	Comment
CSO Sewer Relief Projects		
NEWPCC		
Jefferson East Consulting Assignment 3	2024	-
Jefferson East Construction Contract 6	2022	-
Ferry Road / Riverbed Consultant Assignment 5	2022	-
Armstrong Consultant Assignment - Preliminary Design	2023	-
SEWPCC		
Cockburn / Calrossie Construction Contract 6B	2022	Broken into two contracts 6A (awarded in 2020) and 6B (brought forward to 2021)
Cockburn / Calrossie Construction Contract 7	2021	-
Cockburn / Calrossie Construction Contract 10B	2022	Broken into two contracts 10A (awarded in 2020) and 10B
CSO Monitoring Program		
Flow Monitoring Program Instrumentation Purchase	2021	-
Rainfall Monitoring Program	2021	-
Real Time Control - Feasibility Study	2032	Multi-year study to ensure sufficient data is collected to accommodate work required
Note: The above status is subject to change pending on available budget and resource.		

4.7 City Investments On CSO Mitigation To Date

The CSO Master Plan project was initiated in 2013 and to date the City has invested over $140.4 million in infrastructure and system upgrades with another $180 million forecast for investment over the next six years. The following list includes the type and value of investment implemented since the EA No. 3042 was issued in 2013. Note some project investment precede 2013 which is identified but not included in the 2013 to date investment total.

- CSO Master Plan study and development - $5.4 million
- Interceptor Monitoring - $1.0 million
- District Flow Monitoring - $2.5 million
- Sewer Instrumentation - $0.5 million
- InfoWorks ICMLive - $0.4 million
- Sewer Relief Work including design services - $116.4 million ($16.2 million previous investment)
    - Cockburn / Calrossie / Jessie - $68.9 million LDS separation ($4.4 million previous investment)
    - Ferry Road / Riverbend / Parkside / Douglas Park - $22.1 million LDS separation including the elimination of one CSO outfall in Douglas Park ($6.6 million previous investment)
    - Jefferson - $25.4 million LDS separation ($5.2 million previous investment)
- Latent Storage Dewatering Stations - $6.35 million (outside of annual program budget)
    - Bannatyne – McDermot SRS - $2.5 million
    - River – Fort Rouge SRS - $2.5 million

    - Assiniboine – Donald SRS – $1.35 million
- Sewer Cleaning
    - Mission - $0.9 million
- Green Infrastructure
    - Bannatyne – North East Exchange Sustainable Drainage System - $0.5 million

Additional work has been completed outside of the CS area and under different sewer improvement budgets that also benefits the long term goals of the CSO Master Plan. This work has included:

- Upgrading the Northeast Interceptor river crossing ($11 million capital budget) to include an additional siphon crossing
- Installation of a relief sewer in the separate sewer district surrounding the Transcona neighborhood ($10.6 million)
    - Elimination of 20 cross-connections between the WWS and LDS systems.

5. Current Year 2020

The City reports annually on CSO events and volumes estimates. The amount of rainfall and the level of the river during rainfall events have the most impact on CSO results and sewer network performance.

2020 was a relative dry year in comparison to the 1992 Representative Year. There was approximately 20% less rainfall in 2020 than in the representative year. All 2020 rainfall events were either equal to or less than a 1 in 2 year return period. The last eight years have shown an average 1% decrease in total rainfall compared to the 1992 Representative Year.

The 2020 river levels were overall lower than the 1 in 5 year average river levels, and higher than the 1992 representative years river levels.

In comparison to the 2019 CSO Results, the 2020 CSO Results show a reduction in the number of events and CSO volume. In total, 84% of the CSO results values were validated against observed instrumentation data.

5.1 CSO Results 2020

Based on the approach outlined in section 5.6, the 2020 results are provided in Table 10. The location and event volumes are submitted federally and provincially every year on or before February 15 for the proceeding reporting year. The results are also made public on the City webpage by July 31 for the proceeding reporting year.

Table 10 - CSO Overview Results 2020

Source of Data	Number of Combined Sewer Outfalls	Number of events	Volume of events (ML)
CSO Instrumentation & Detailed Hydraulic Model	42	551	4,072
Detailed Hydraulic Model	34	372	910
Flood Pumped Data	N/A	151	596
Total	76	1,074	5,578

The number of CSO events for 2020 in total was 1,074, which is an average of 14 events based on 76 outfalls. The total estimated annual sewage discharged from CSOs for 2020 is 5,578 ML.

There are currently 41 flood pump locations. This number includes temporary flood pumps which are installed in specific locations where required based on river levels.

5.2 Rainfall 2020

The 1992 representative year and 2020 current year's rainfall events are reviewed and analyzed to understand the impact rainfall events have on CSOs. Table 11 summarizes the amount of precipitation and the number of rainfall events in both 1992 and 2020 based on the single rain gauge at the Forks.

The total amount of rain that fell in 2020 was approximately 20% less than in 1992. The 2020 recreation season was 28% drier than in 1992. The 2020 shoulder seasons (January through April and October through December) accounted for 19% of the total annual precipitation, which is 46% wetter than the shoulder seasons in 1992. Two rainfall events greater than 5 mm was recorded outside of the recreation period.

Table 11 - Single Rain Gauge at the Forks

	1992		2020	
	Annual	Rec Season	Annual	Rec Season
Total precipitation (mm)	478	326	327	236
Estimated rainfall (mm)	362	326	289	236
% deviation from average rainfall			-20%	-28%
Number of Events ≥5mm	22	20	18	16
% deviation from average			-18%	-20%

The comparison between the total annual precipitation and the 1992 precipitation year over the last several years is illustrated in Figure 10 - Total Precipitation Yearly Trend Single Rain Gauge.

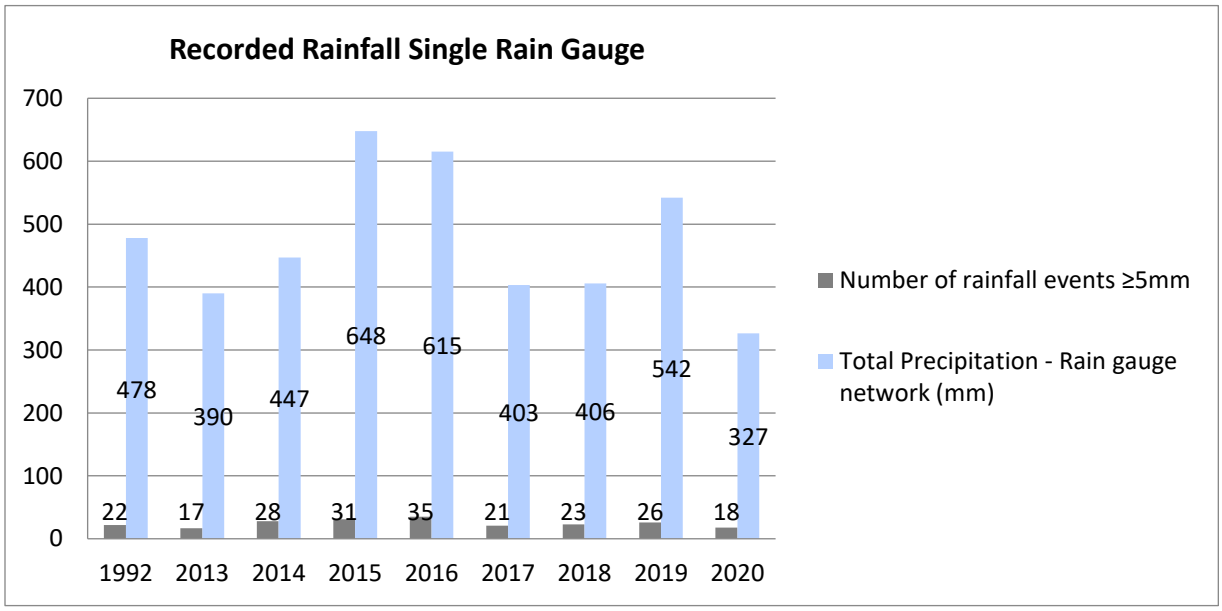


Figure 10 - Total Precipitation Yearly Trend Single Rain Gauge

To capture the spatial variation of the rainfall and further improve CSO event, duration and volume estimation, the City uses its network of 36 rain gauges.

Instruments are typically operational from May 1 to Sept 30, weather permitting they can be activated as early as March and turned off as late as November. In 2020, there were 16 rain gauges associated with the combined sewer districts. Two Environment Canada rain gauges (the Forks and Airport gauges) are within the combined sewer district and were used to supplement data outside for remaining months of the year.

The average annual rainfall recorded by the City's combined sewer districts' rain gauges was 303 mm. Due to COVID-19 pandemic restrictions, they were unable to be maintained by out-of-province contractors. The lack of maintenance is attributed to the Riverbend and Bernie Wolfe rain gauges going offline from March 1 to October 31, and from June 28 to October 31, respectively. The missing data from these two rain gauges were supplemented with the average rainfall of the remaining 14 gauges. Overall, 2020 had 91% of rain gauges coverage for the recreation season.

5.3 River Elevations 2020

River levels in the recreation season of 2020 overall were lower than the 1 in 5 year average summer river level but were higher than the 1992 representative year river levels. The river levels of 1992, 2020 and the 1 in 5 year event are illustrated in Figure 11.

As discussed in section 5.2, 2020 had less precipitation during the recreation season but higher precipitation during the shoulder seasons than in 1992. The river level peaks in April and May, the later mid-summer and end of summer, and the end of August are results of spring melt, increased precipitation in the preceding time period, and a later seasonal snow melt, respectively. The spring and summer of 2020 had a long period of high river levels. This is a result of inflows from high sources of rainfall and runoffs, and river ingress into the sewer system. Rainfall events occurring during peak river levels, and river ingress into the sewer system caused an increase in the trigger and activation of flood pump stations, and in river levels. Overall, the river levels in the recreation season in 2020 were as expected.

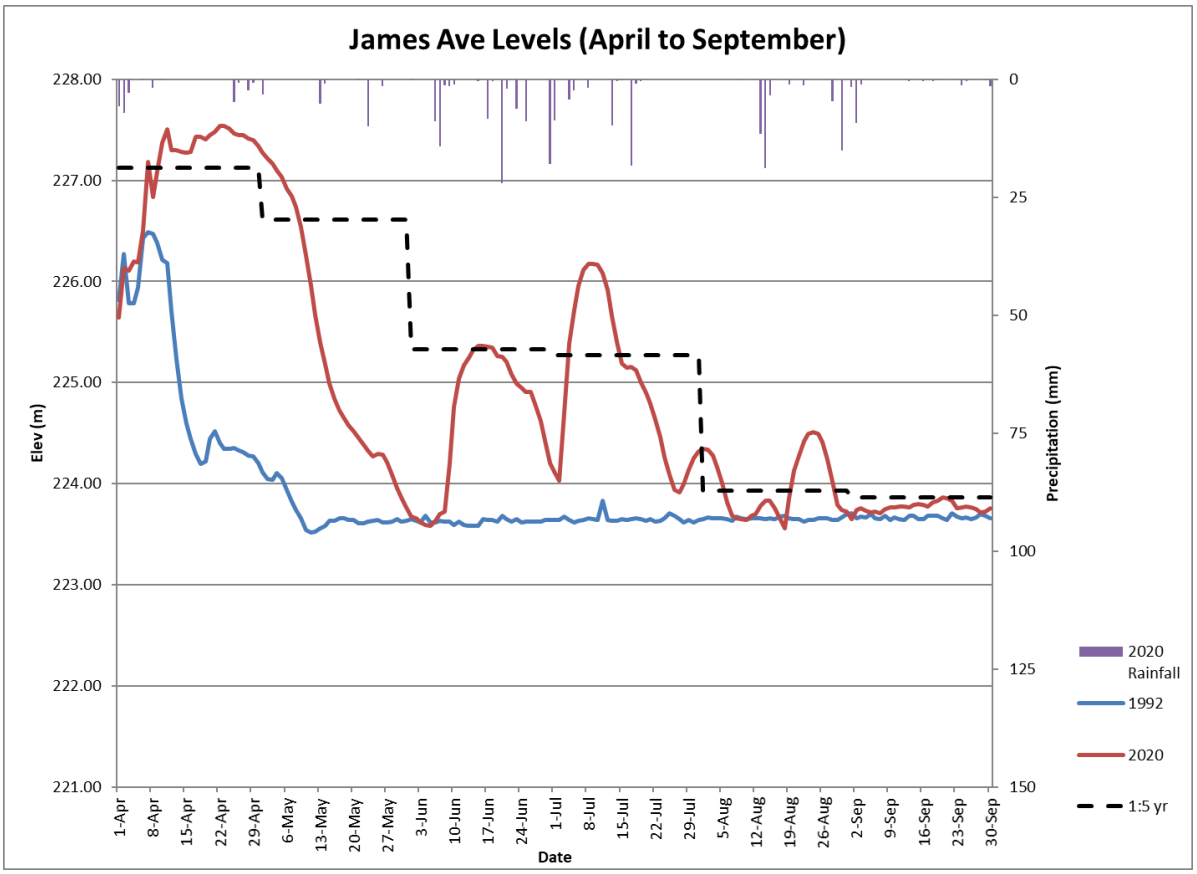


Figure 11 - James Ave River Level Comparison

5.4 Treatment Plant Flows 2020

For 2020, the total citywide treated sewage volume was 86,749 ML which was approximately 15% less than 2019 (102,151 ML). The average annual flows (AAF) distributed between the wastewater treatment plants were as follows:

- North End Sewage Treatment Plant (NEWPCC) 161 ML/day
- South End Sewage Treatment Plant (SEWPCC) 54 ML/day
- West End Sewage Treatment Plant (WEWPCC) 22 ML/day

The distribution of the treated sewage volume at each of the sewage treatment plants was similar to 2019 and past years.

- NEWPCC - 58,878 ML (68%)
- SEWPCC - 19,741 ML (23%)
- WEWPCC – 8,130 ML (9%)

In 2020, approximately 6% of the total annual citywide sewage was lost due to overflows; correspondingly, 94% of the annual sewage flow was captured and sent to sewage treatment plants. The estimated sewage lost from the individual NEWPCC, SEWPCC and WEWPCC collection systems was 5,265 ML (9%), 266 ML (1%) and 46 ML (0.6%) respectively.

5.5 Collections System Operational Issues 2020

Operational issues are reported as part of the Annual CSO Results Report required on or before February 15 of the proceeding reporting year. The record of the 2020 maintenance comments were documented and submitted to the Province on February 11, 2021.

In summary:

- A leak from the Baltimore force main which crosses St Vital Bridge was discovered on August 10, 2018. The pumping arrangement was modified to ensure only single pump operation in November 2018. On July 12, 2019, a temporary bypass pipe was put in place for emergency repair. The City is continually inspecting the temporary bypass pipe for leakages, and working towards a permanent solution to rehabilitate or replace the force main.
- One of two force mains servicing the Jessie Lift Station was found collapsed in March 2019, and was later replaced.
- There was a power outage at the Olive Lift Station between 12PM to 2PM on January 29, 2020

The City continues to provide regular maintenance to all monitoring instruments at the CS outfalls. Non-functional instruments are either recalibrated or replaced as part of the maintenance process.

5.6 Reporting Process

The 2020 CSO annual reporting process was based on the City Regional Model current 2020 network representation, with CSO result validation at 42 permanent CSO instrumented locations.

5.6.1 Hydraulic Model Maintenance

The City model network is continually being updated to better represent the current year's performance. The City is continually working on updating the hydraulic model based on available information, including past studies, field surveys and record drawings, to reflect on any past and recent sewer infrastructure upgrades. To ensure that the network is representative of its expected performance, the model is calibrated based on the instrumented data and the review of the level of discrepancy between the predicted model results and the instrumented data. Upon completion of the model update, sensitivity checks are undertaken. All changes associated with model maintenance are documented.

5.6.2 CSO Reporting Limitations

Due to the complexities associated with snowmelt, it is not currently possible to numerically model the CSO events as a result of snow melt at our un-instrumented locations, therefore CSO analyses of un-instrumented locations is limited to CSO overflows caused by rainfall.

The foregoing calculations of CSO volumes are estimates based on hydraulic model representation of the sewer network based on best available information. The field observed data also has limitations. The estimating process is an engineering estimating process which meets Federal guidance for appropriate

estimation and includes processes for addressing assumptions to ensure continuous improvement. Model results for the current year are based on observed rainfall data, and annual results are validated based on overflow detection instrumentation installed at the 42 of the 76 CSO locations.

Annual model updates need to be completed prior to final year simulations. There will always be network changes or improved data that is not available at the time of the current update but will be included in subsequent updates. The Current year network will be the best available representation of the City sewer system and will be constantly improving.

6. Water Quality

A water quality objective of the CSO Master Plan is to reduce bacterial loadings to the Red and Assiniboine Rivers by reducing the volume of CSOs discharged. The City is working towards a plan to collect CSO water samples and model river quality data to demonstrate improvements in the river water quality as a result of implementation of Control Option No. 1, per request by the 2019 CSO Master Plan Provincial approval letter.

The water quality monitoring event mean concentration data collected in 2014 and 2015 as described in Section 3.1.7 will be used for the 2020 NPRI reporting, and will be continually used until new data becomes available. The City will plan for future targeted river and stream water quality monitoring and will provide the river water quality monitoring report by December 31, 2024.

In addition to the targeted river and stream event water quality monitoring plan, the City is conducting bi-weekly river and stream water quality monitoring for the water quality pollutants of concern (POC), including nutrients, dissolved oxygen and bacteria. In 2020, monitoring was undertaken at 11 locations along the Red and Assiniboine rivers and at eight locations on selected small streams. The monitoring data provides an updated characterization of the health of Winnipeg's waterways. The water quality monitoring reports are published on the City of Winnipeg webpage, https://winnipeg.ca/waterandwaste/sewage/monitoring/RiversSmallStreams.stm. The water quality sampling will continue during the execution of the CSO Master Plan.

7. Climate Change

Changes to local precipitation patterns may affect the relative performance of our CSO Master Plan as an increase in duration and/or intensity of rainfall events could lead to an increase in the volume of overflows and the number of overflow events.

To provide resilience to the impacts of climate change, the CSO Master Plan incorporates the use of green infrastructure (GI) and real time control (RTC) to improve the performance levels. Combined sewer separation work will be prioritized to reduce CSOs from entering rivers and GI will be used to provide the necessary additional performance improvements to mitigate any detrimental impacts from changing precipitation trends. The City has included an allowance of 10 percent of the total CSO Master Plan capital cost estimated for the GI implementation to provide climate change resiliency while meeting compliance with Clause 8 of EA No. 3042.

The City will continue to monitor and track weather patterns to asses any impact to the CSO Master Plan, including the continued use of 1992 as the representative year. The assessment of the impact of climate change on the performance of the CSO program will be provided in the 2030 CSO Master Plan update.

8. Pollution Prevention Plan

The City has a Pollution Prevention Program. Completion of a Pollution Prevention (P2) Plan is part of a comprehensive plan to protect the sewage collection and treatment system, our rivers and lakes, and the environment. This is a process that shifts the focus from municipal wastewater treatment to the control of pollutants at the source by:

- avoiding the use of pollutants wherever possible,
- reducing the amount of pollutants that reach the wastewater system, if avoiding is not possible, and
- eliminating pollutants wherever possible by replacing products with more environmentally friendly products.

In 2020, 600 active businesses were part of the Pollution Prevention Program. Businesses that are a part of the Program are required to submit a pollution prevent plan outlining the source of the pollutants and measures to prevent, eliminate or reduce the discharge of those pollutions to the wastewater and/or land drainage system. The City performed inspections, collected samples, provided reviews and approval of the Plans to ensure proper measures are in place to protect the environment.

The City of Winnipeg Sewer By-Law is to protect public safety, the environment and the City infrastructure by setting and regulating sewage discharge limit into the sewer systems and natural water courses.

For further information, refer to the following webpages:

- Winnipeg Pollution Prevention Plan webpage:
  http://www.winnipeg.ca/waterandwaste/sewage/pollutionPrevention/default.stm
- Winnipeg Sewer By-Law webpage:
  https://winnipeg.ca/waterandwaste/sewage/projects/sewerBy-law/default.stm#tab-background

In addition to the Pollution Prevention Program, the City is continually working toward reducing the number of CSOs through:

- Data improvement
- System understanding
- Opportunistic separation
- System optimizations
- Implementing the CSO Master Plan

For further information on the Winnipeg CSO Master Plan, refer to the project development page:

https://wwdengage.winnipeg.ca/cso-mp/

9. Communications

Maintaining an open engagement with stakeholders is essential to the success of the CSO Master Plan. The City will continue to engage with public and the Provincial regulator on progress of the CSO Master Plan execution.

9.1 Public Engagement

The City maintains regular communication with the public during the execution of the CSO Master Plan and will continue as the CSO Master Plan progresses. Prior to the implementation of the sewer relief work, construction notices are issued to residents and property owners to inform them on the background and planned construction work in their neighbourhood.

All City Council and committee meetings are available for viewing on the City website to inform the public of the progress of CSO management work in the city. In 2020, the Public Service presented a report to the Standing Policy Committee on Water and Waste, Riverbend Management and the Environment, and Council on the green infrastructure provision in the CSO Master Plan.

The City is developing a CSO Master Plan Communication Plan to continually maintain a consistent open and transparent engagement program with the public. The CSO Master Plan Communication Plan will include regular updates on the City website.

9.1.1 Public Education

The City website contains important information relating to the CSO Master Plan. The website serves as a public education tool to provide Winnipeg residents information on the Master Plan and its benefits. Animated videos and plain language descriptions illustrate and clearly describe the operation of our complex combined sewer systems. The City website also contains information about CSO relief projects and the annual CSO discharge results.

9.1.2 Public Notification System

The City introduced a public notification system called the Sewer Overflow Information System (SOIS) in 2004 to notify the public on the likelihood of overflows as a result of the recommendation from the 2003 Clean Environment Commission hearings. This system provides an indication of the likelihood of overflows into the Red and Assiniboine Rivers based on readings of high-water sensors in the sewers at various overflow locations along with the City's rivers and other monitoring indicators.

In 2013, the City was requested to develop a plan to accommodate a new, enhanced public notification system that will provide a near real-time indication of CSO notifications with overflow occurrences and duration by December 31, 2015 to comply with Clause 10 of EA No. 3042. The CSO Public Notification System Plan, describing the development and implementation plan of the enhanced public notification system, was submitted to the Province on December 15, 2015, and was later approved.

The enhanced public notification system is currently undergoing the development phase of the project to ensure its reliability and accuracy of the CSO notification predictions. It is linked with the current year's hydraulic model for the City of Winnipeg CS system, along with rainfall and outfall instrumentation data at each of the 42 primary outfalls. The development phase of the project will continue in the upcoming recreation season.

9.2 Regulatory Engagement

In 2020, the City had a virtual meeting with the province on May 25, 2020 to provide an overview of the 2019 CSO Annual Report. The meeting minutes are provided in Appendix H.

9.3 Other Agencies/Initiatives

Undertaking major sewer infrastructure upgrades in an interconnected sewer network is complex as changes in flow and capacity of one area of the system impacts other areas. During the execution of the CSO Master Plan, it is important to consider all ongoing initiatives. The following section describes the ongoing initiatives that must be considered while delivering the CSO Master Plan. Projects related to green infrastructure projects can be found in Section 11.2.1 Green Infrastructure.

OurWinnipeg

OurWinnipeg is an ongoing development plan that guides growth and change for the city to accommodate future residential growth in a sustainable manner. With the population increase, the treatment and conveyance capacity are also expected to increase. There is a demand for major sewer infrastructure upgrades to service future population growth. While OurWinnipeg is a separate project from the CSO Master Plan, any planning and development of OurWinnipeg must comply with the provincial licensing requirements, especially with Clause 8 of EA. No. 3042, which prohibits any increase in volume or frequency of CSOs in the existing combined sewer districts.

10. Compliance

This section provides an overview and summary on how the City is in compliance with the regulatory requirements.

As discussed in Section 2, combined sewers are regulated by a number of federal and provincial requirements. The City reports on CSO discharge data to NPRI, WSER and the Province on an annual basis to demonstrate the regulatory compliance. Table 12 provides a list of required regulatory deliverables with their associated regulators, deadlines and submission dates.

Table 12 - Regulatory Submissions

Deliverable	Regulator	Reporting Period	Deliverable Deadline	Submission Date
Federal Submission				
2020 CSO Annual Results	WSER	Jan 1 - Dec 31, 2020	15-Feb-21	12-Feb-21
2020 NPRI CSO Annual Report	Canadian Environmental Protection Act, 1999	Jan 1 - Dec 31, 2020	1-Jun-21	N/A
Provincial Submission				
2020 CSO Annual Results	EA No. 3042 Clause 14	Jan 1 - Dec 31, 2020	15-Feb-21	11-Feb-21
2020 CSO Annual Report	EA No. 3042 Clause 13	Jan 1 - Dec 31, 2020	31-Mar-21	30-Mar-21
CSO Quarterly Results	EA No. 3042 Clause 14	Every Quarter	15th of May, Aug and Nov of the reporting year	May-12, Aug-13, Nov-10 of 2020
Significant CSO Event Reporting	EA No. 3042 Clause 14	Event Dependent - Rainfall Events > 1:10 year	Within 10-days of the event	N/A

Annual CSO Result Submissions

In compliance with both WSER and Clause 14 of EA No. 3042, the City is required to submit the Federal and Provincial CSO Annual Result submission that consist of CSO outfall data from both the instrumented and non-instrumented locations on or before February 15 for the subsequent year. The non-instrumented locations are supplemented with hydraulic modeling data and rainfall estimations to improve confidence in results.

The 2020 CSO Annual Results were validated, completed and submitted to both the Province and the Federal on February 11 and February 12, respectively.

In addition to the Federal and Provincial CSO annual results submission, additional annual submissions include the CSO Annual Report and the NPRI CSO Annual Report, which are due on or before March 31 and June 1 of the preceding year.

Quarterly CSO Result Submissions

The Quarterly CSO Results Reports consist of event, volume and duration estimation data based on the instrumented outfall sites. The results are not validated and are submitted 45 days after the end of the quarterly reporting period as per Clause 14 of EA No. 3042.

The three 2020 Quarterly CSO Results deliverables were completed and submitted to the Province on May 12, 2020, August 13, 2020 and November 10, 2020, in accordance with the mandated deadline.

Significant Event Report Submissions

In addition to the annual and quarterly CSO results submissions, the City is mandated to report on any significant CSO events that are greater than 1:10 year rainfall event. In 2020, there were not any significant CSO events, hence none was reported.

CSO Master Plan Submissions

Additional submissions related to the CSO Master Plan development and implementation is provided in Table 13. This table provides a list of submission milestones pursuant to EA No. 3042.

Table 13 - CSO Master Plan Submission Milestone

Deliverable	Original Targeted Date	Actual Completion Date
Public Education Plan	31-Dec-13	9-Dec-13
Interim Monitoring Plan	31-Jan-14	28-Apr-14
CSO Public Notification Plan	31-Dec-15	15-Dec-15
CSO Preliminary Proposal	31-Dec-15	17-Dec-15
CSO Master Plan	31-Aug-19	28-Aug-19
River Water Quality Report	31-Dec-24	TBD
Percent Capture Assessment for Control Option No. 2	30-April-25	TBD
CSO Master Plan Update	30-April-30	TBD
CSO Master Plan Implementation	31-Dec-45	TBD

The City demonstrates compliance with EA No. 3042 and all CSO federal regulatory requirements.

11. Risks and Opportunities

There are a number of risks associated with the CSO Master Plan due to the complexity of the project that need to be tracked and managed (see section 3.8 for a high level summary). At the same time, there are a number of opportunities to improve and enhance the wastewater collections system.

11.1 Risks

The CSO Master Plan documents a number of program implementation risks, which can affect the budget, capital costs, feasibility and schedule.

The District Engineering Plans comprise of individual conceptual solutions to CSO mitigation for each of the combined sewer districts. Each of the risks and opportunities applicable to the control solutions recommended within each sewer district to meet Control Option No. 1 are documented in the Part 3B – District Engineering Plans of the CSO Master Plan.

Any changes to the control solution could cascade to a reevaluation of risks associated with each of the specific projects.

11.1.1 Risks Tracking

As part of the Master Plan, initially identified risks as well as new risks that arise will need to be managed. Some significant recent risks which are being tracked and will need to be assessed with regards to their impact on the CSO Master Plan are identified below:

- The November 2019 CSO Master Plan acceptance letter issued by the Province included a requirement for water quality monitoring every 5 years. The resources and funding needed to meet this requirement were not included in the CSO Master Plan.
- The 2020 City proposed approach to approving smaller developments in combined sewer areas will increase the volume runoff area to be reduced to meet future control targets and cost estimates have not been included in the CSO Master Plan.

11.2 Opportunities

A number of opportunities to improve the volume percent capture during the program were identified during the development of the CSO Master Plan. The following section describes the main areas that the City could benefit from in the coming years in the implementation phase of the program.

11.2.1 Green Infrastructure

Implementation of GI technologies in the design and operation of all new and upgraded infrastructure could promote long term sustainability in CSO volume reduction performance. A budget of 10 percent of the capital program is included in the CSO Master Plan budget for the GI implementation.

The GI pilot projects that have been undertaken to date include the North East Exchange District Engineering Study and aspects of the Cockburn Sewer Separation Project. Pre and post flow monitoring will take place to determine the suitability and performance of GI in Winnipeg's cold climate and heavy clay soils to confirm its benefits to the collections system.

North East Exchange District Engineering Study

The City undertook a pilot study using a soil retention green technology, Strata cells, for the reconstruction of John Hirsh Place in the North East exchange district. Past studies have demonstrated that Strata cells promote tree growth and reduce loading on combined sewers. To demonstrate tangible benefits from the study, the City undertook flow monitoring prior to construction and will complete the post construction flow monitoring to evaluate the environmental benefits.

11.2.2 Floatable Management

Clause 12 of EA No. 3042 requires the Master Plan to demonstrate the prevention of floatable materials in CSO effluent. As described in section 3.8.2, the CSO Master Plan includes the use of end of pipe screening to the primary CS outfall in each CS district where it was determined to be hydraulically feasible and where complete sewer separation of the district was not recommended. In addition to the traditional approach to floatables management, the Master Plan has identified an alternative approach to eliminate the floatables where the floatables will be captured at the surface runoff level before it enters the sewer system.

There are high capital costs, long-term O&M costs and other risks associated with screen facilities. This alternative floatable management approach will undergo a trial to determine its feasibility as an opportunity for addressing the floatable management requirements at a lower life cycle cost compared to screen facilities currently being recommended. The assessment of the alternative floatables management approach will lead to a better understanding of system floatables and determine the most efficient long term approach to managing floatables. An allowance has been included in the cost estimates to pilot this alternative floatables management approach. The floatable management task is anticipated to begin in 2022 as per the schedule of the CSO Master Plan.

11.2.3 Real Time Control

The incorporation of RTC and monitoring instrumentation will provide an increased understanding of operation and a better control on a real time basis, and the optimization of flows in the system and to the treatment plants. This will also provide opportunities to enhance the public notification system. A feasibility study of the requirements for RTC incorporation is planned for 2021 which will be ahead of the CSO Master Plan schedule.

12. Record Keeping and Documentation

In compliance with Clause 16 of EA No.3042, the City will comply with sampling record requirements, requirements for summaries of laboratory analytical results of grab samples and CSO event and location records. The City will make records available to an Environment Officer upon request and, within three months of the end of each year (or earlier as directed with regards to the CSO Annual results), the City will post the results on the public webpage as required by Clause 10 of the Licence.

In compliance with subsection 46(8) of The Canadian Environmental Protection Act, City of Winnipeg Water and Waste will retain copies of all information on which reports are based, including any calculations, measurements and other related data, for a minimum period of three years. This information will currently be kept at City of Winnipeg Water and Waste offices 1199 Pacific Avenue.

13. Next Steps

The next steps are to implement the control technologies recommended as per the CSO Master Plan. Sewer separation will be prioritized, and represents 75% of the CSO Master Plan total capital budget.

The 2021 planned capital construction projects, preliminary design and other planned work are provided in Table 9.

The City will continue to maintain regular communication with regulatory bodies and the public on the progress of the CSO Master Plan performance while working towards implementing the public notification system per Clause 10 of EA No. 3042.

14. References

CH2M HILL Canada Ltd, XCG Consultants Ltd, Dillon Consulting. 2015. *CSO Master Plan Preliminary Report.* Prepared for: City of Winnipeg, Water and Waste Department. Winnipeg, Manitoba. December 2015.

City of Winnipeg. 2021. *2020 CSO Annual Results Report*. City of Winnipeg. Water and Water Department. February 11, 2021.

Jacobs Engineering Group. 2019. *CSO Master Plan.* Prepared for: City of Winnipeg, Water and Waste Department. Winnipeg, Manitoba. August 2019.

Manitoba Conservation and Water Stewardship (MCWS). 2013. *Environment Act Licence No. 3042.* Client File No.: 3205.00. September 4, 2013.

Wardrop Engineering Inc. (Wardrop), TetrES Consultants Inc., CH2M Hill Canada and EM Services Inc. 2002. *Combined Sewer Overflow Management Study* (2002 CSO Study). Final Report. Prepared for: City of Winnipeg, Water and Waste Department. November 2002.

Appendix A – Manitoba Conservation and Climate - Environmental Licence No. 3042

THE ENVIRONMENT ACT
LOI SUR L'ENVIRONNEMENT

LICENCE

Manitoba

Licence No. / Licence n° **3042**

Issue Date / Date de délivrance **September 4, 2013**

In accordance with *The Environment Act* (C.C.S.M. c. E125) /
Conformément à *la Loi sur l'environnement* (C.P.L.M. c. E125)

Pursuant to Section 11 / Conformément au Paragraphe 11

THIS LICENCE IS ISSUED TO: / CETTE LICENCE EST DONNÉE À :

CITY OF WINNIPEG;
"the Licencee"

for the operation of the Development being the combined sewers and overflow structures located within the City of Winnipeg with discharge of wastewater into the Assiniboine River and Red River and associated tributaries, and subject to the following specifications, limits, terms and conditions:

DEFINITIONS

In this Licence,

"accredited laboratory" means an analytical facility accredited by the Standard Council of Canada (SCC), or accredited by another accrediting agency recognized by Manitoba Conservation to be equivalent to the SCC, or be able to demonstrate, upon request, that it has the quality assurance/quality control (QA/QC) procedures in place equivalent to accreditation based on the international standard ISO/IEC 17025, or otherwise approved by the Director;

"approved" means approved by the Director in writing;

"average dry weather flow" means the average daily volume of wastewater entering the combined sewer system in dry weather;

"combined sewer system" means a wastewater collection system which conveys wastewaters (domestic, commercial and industrial wastewaters) and stormwater runoff through a single-pipe system to a sewage treatment plant or treatment works;

"combined sewer overflow (CSO)" means a discharge to the environment from a combined sewer system;

"Director" means an employee so designated pursuant to *The Environment Act*;

"effluent" means treated wastewater flowing or pumped out of the combined sewer system;

"enhanced primary treatment" means wastewater treatment that utilizes a chemical coagulant/flocculant to remove suspended matter and soluble organic matter;

"Environment Officer" means an employee so appointed pursuant to *The Environment Act*;

"Escherichia coli (E. coli) " means the species of bacteria in the fecal coliform group found in large numbers in the gastrointestinal tract and feces of warm-blooded animals and man, whose presence is considered indicative of fresh fecal contamination, and is used as an indicator organism for the presence of less easily detected pathogenic bacteria;

"fecal coliform" means aerobic and facultative, Gram-negative, nonspore-forming, rod-shaped bacteria capable of growth at 44.5° C, and associated with fecal matter of warm-blooded animals;

"five-day biochemical oxygen demand (BOD_5)" means that part of the oxygen demand usually associated with biochemical oxidation of organic matter within five days at a temperature of 20° C;

"floatable material" means items such as, but not limited to, plastics and other floating debris (e.g., oil, grease, toilet paper, and sanitary items);

"grab sample" means a quantity of wastewater taken at a given place and time;

"MPN Index" means the most probable number of coliform organisms in a given volume of wastewater which, in accordance with statistical theory, would yield the observed test result with the greatest frequency;

"overflow event" means an event that occurs when there is one or more CSOs from a combined sewer system, resulting from a precipitation event. An intervening time of 24 hours or greater separating a CSO from the last prior CSO at the same location is considered to separate one overflow event from another;

"overflow point" means a point of a wastewater collection system via which wastewater may be deposited in water or a place and beyond which its owner or operator no longer exercises control over the quality of wastewater;

"percent capture" means the volume of wet weather flow treated in comparison to the volume of wet weather flow collected on a percentage basis;

"real time" means the actual time at which an event occurs;

"sewershed" means the area drained by a particular network of sewers;

"Standard Methods for the Examination of Water and Wastewater" means the most recent edition of Standard Methods for the Examination of Water and Wastewater, published jointly by the American Public Health Association, the American Waterworks Association and the Water Environment Association;

"wastewater" means the spent or used water from domestic, industrial and commercial sources that contains dissolved and suspended matter;

"wastewater collection system" means the sewer and pumping system used for the collection and conveyance of domestic, commercial and industrial wastewater;

"wet weather flow" means the combined flow resulting from:

i) wastewater;
ii) infiltration and inflows from foundation drains or other drains resulting from rainfall or snowmelt; and
iii) stormwater runoff generated by either rainfall or snowmelt that enters the combined sewer system; and

"wet weather period" means the spring thaw period and any period of precipitation capable of generating inflow to a combined sewer system that exceeds the capability of the system to convey wet weather flows to a sewage treatment plant.

GENERAL TERMS AND CONDITIONS

This Section of the Licence contains requirements intended to provide guidance to the Licencee in implementing practices to ensure that the environment is maintained in such a manner as to sustain a high quality of life, including social and economic development, recreation and leisure for present and future Manitobans.

Compliance with Licence

1. The Licencee shall direct all wastewater generated within the City of Winnipeg to sewage treatment plants operating under the authority of an Environment Act Licence or discharge wastewater to receiving waters in accordance with this Licence.

Future Sampling

2. In addition to any of the limits, terms and conditions specified in this Licence, the Licencee shall, upon the request of the Director:

a) sample, monitor, analyze and/or investigate specific areas of concern regarding any segment, component or aspect of pollutant storage, containment, treatment, handling, disposal or emission systems, for such pollutants or ambient quality, aquatic toxicity, leachate characteristics and discharge or emission rates, for such duration and at such frequencies as may be specified;
b) determine the environmental impact associated with the release of any pollutant(s) from the Development; or
c) provide the Director, within such time as may be specified, with such reports, drawings, specifications, analytical data, descriptions of sampling and analytical procedures being used, bioassay data, flow rate measurements and such other information as may from time to time be requested.

Sampling Methods

3. The Licencee shall, unless otherwise specified in this Licence:
a) carry out all preservations and analyses on liquid samples in accordance with the methods prescribed in "Standard Methods for the Examination of Water and Wastewater" or in accordance with an equivalent analytical methodology approved by the Director;
b) have all analytical determinations undertaken by an accredited laboratory; and
c) report the results to the Director, in writing or in a format acceptable to the Director, within 60 days of the samples being taken, or within another timeframe acceptable to the Director.

Equipment Breakdown

4. The Licencee shall, in the case of physical or mechanical equipment breakdown or process upset where such breakdown or process upset results or may result in the release of a pollutant in an amount or concentration, or at a level or rate of release, that causes or may cause a significant adverse effect, immediately report the event by calling 204-944-4888 (toll-free 1-855-944-4888). The report shall indicate the nature of the event, the time and estimated duration of the event and the reason for the event.

5. The Licencee shall, following the reporting of an event pursuant to Clause 4,
a) identify the repairs required to the mechanical equipment;
b) undertake all repairs to minimize unauthorized discharges of a pollutant;
c) complete the repairs in accordance with any written instructions of the Director; and
d) submit a report to the Director about the causes of breakdown and measures taken, within one week of the repairs being done.

Reporting Format

6. The Licencee shall submit all information required to be provided to the Director under this Licence, in writing, in such form (including number of copies), and of such content

as may be required by the Director, and each submission shall be clearly labeled with the Licence Number and Client File Number associated with this Licence.

SPECIFICATIONS, LIMITS, TERMS AND CONDITIONS

Avoid CSOs

7. The Licencee shall operate the combined sewer system and wastewater collection system such that there are no combined sewer overflows except during wet weather periods.

New or Upgraded Developments

8. The Licencee shall not increase the frequency or volume of combined sewer overflows in any sewershed due to new and upgraded land development activities and shall use green technology and innovative practices in the design and operation of all new and upgraded storm and wastewater infrastructures.

Public Education Plan

9. The Licencee shall, on or before December 31, 2013, submit to the Director, a public education program plan documenting how information on combined sewer overflows will be made available to the public.

Public Notification System

10. The Licencee shall, on or before December 31, 2015, submit to the Director for approval, a plan regarding the development and implementation of an internet-based public notification system for all discharges from combined sewer overflow points, including an assessment of making this notification available on a real time basis.

CSO Master Plan

11. The Licencee shall, on or before December 31, 2015, submit a preliminary proposal for approval by the Director, pursuant to Section 14(3) of *The Environment Act*, for the combined sewer overflow system.

    The plan proposed above would consist of an evaluation of a minimum of the following CSO control alternatives:

    - A maximum of four overflow events per year;
    - zero combined sewer overflows; and
    - a minimum of 85 percent capture of wet weather flow from the combined sewer system and the reduction of combined sewer overflows to a maximum of four overflow events per year.

The Licencee shall, on or before December 31, 2017, file a final Master Plan, including the detailed engineering plans, proposed monitoring plan, and implementation schedule for the approved design identified in the preliminary plan above. The Master Plan is to be filed for approval by the Director. The Licencee shall implement the plan by December 31, 2030, unless otherwise approved by the Director.

Effluent Quality Limits

12. The Licencee shall demonstrate, in the Master Plan submitted pursuant to Clause 11, the prevention of floatable materials, and that the quality of the CSO effluent will be equivalent to that specified for primary treatment to 85% or more of the wastewater collected in the CSO system during wet weather periods. The following effluent quality limits summarize what is expected from primary treatment:
    a) five day biochemical oxygen demand (BOD5) not to exceed 50 mg/l;
    b) total suspended solids not to exceed 50 mg/l;
    c) total phosphorus not to exceed 1 mg/l; and
    d) E. coli not to exceed 1000 per 100 ml.

Annual Progress Reporting

13. The Licencee shall, upon approval of the Master Plan submitted pursuant to Clause 11 of this Licence, implement the plan such that progress towards meeting the required level of treatment is demonstrated annually by submission of an annual report, due March 31 of each year for the preceding calendar year. Annual submissions shall include the progress made on the plan pursuant to Clause 11 including monitoring results and the work plan for the subsequent calendar year.

MONITORING AND REPORTING

Reporting

14. The Licencee shall, prior to December 31, 2013, develop a notification plan acceptable to the Director for each overflow event.

Interim Monitoring

15. The Licencee shall by January 31, 2014 submit a plan to the Director for approval of an interim combined sewer overflow monitoring program for implementation between May 1, 2014 and the date upon which the final master plan is approved by the Director. The plan shall identify locations to be sampled, rationale for these locations, and sampling frequency. The plan also shall identify constituents to be monitored including, but not limited to:
    a) organic content as indicated by the five-day biochemical oxygen demand (BOD_5) and expressed as milligrams per litre;

b) total suspended solids as expressed as milligrams per litre;
c) total phosphorus content as expressed as milligrams per litre;
d) total nitrogen content as expressed as milligrams per litre;
e) total ammonia content as expressed as milligrams per liter;
f) pH; and
g) *E*.coli content as indicated by the MPN index and expressed as MPN per 100 millilitres of sample.

Record Keeping

16. The Licencee shall:
    a) during each year maintain records of:
        i) grab sample dates and locations;
        ii) summaries of laboratory analytical results of the grab samples; and
        iii) combined sewer overflow dates;
    b) make the records being maintained pursuant to sub-Clause 16 a) of this Licence available to an Environment Officer upon request and, within three months of the end of each year, post the results on the public notification site required by Clause 10 of this Licence.

REVIEW AND REVOCATION

A. If, in the opinion of the Director, the Licencee has exceeded or is exceeding or has or is failing to meet the specifications, limits, terms, or conditions set out in this Licence, the Director may, temporarily or permanently, revoke this Licence.

B. If, in the opinion of the Director, new evidence warrants a change in the specifications, limits, terms or conditions of this Licence, the Director may require the filing of a new proposal pursuant to Section 11 of *The Environment Act*.

"original signed by"

Tracey Braun, M.Sc.
Director
Environment Act

Client File No.: 3205.00

Appendix B – 2019 CSO Master Plan Provincial Approval Letter

Manitoba
Conservation and Climate
Environmental Stewardship Division
Environmental Approvals Branch
1007 Century Street, Winnipeg Manitoba R3H 0W4
T 204 945-8321 **F** 204-945-5229
www.gov.mb.ca/sd/

File No. 3205.10
Environment Act Licence No. 3042

November 13, 2019

Chris Carroll, P.Eng., MBA
Manager of Wastewater Services Division
110-1199 Pacific Avenue
Winnipeg Manitoba R3E 3S8
Email: ccarroll@winnipeg.ca

Dear Chris Carroll:

Thank you for your submission of the Combined Sewer Overflow (CSO) Master Plan dated August 28, 2019 that sets out the roadmap for implementing a long term program in order to meet the control target objective of 85 percent capture in the Representative Year as required by Clause 11 of Environment Act Licence No. 3042 (Licence).

The November 24, 2017 approval letter required the City to submit, for approval, a Master Plan including detailed engineering plans, proposed monitoring plans, and an implementation schedule for Control Option No. 1 (i.e., 85% capture in a representative year) as identified in the CSO Master Plan Preliminary Proposal on or before August 31, 2019 and for Control Option No. 2 (i.e., four overflows in a representative year) as identified in the CSO Master Plan Preliminary Proposal on or before April 30, 2030.

Upon review of the CSO Master Plan, I hereby approve the implementation of the CSO Master Plan with the following conditions:

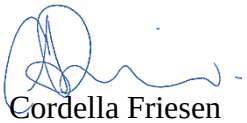
a) The Licencee shall submit for approval an outline of the content of the annual report as required by Clause 13 of the Licence by December 31, 2019;
b) The Licencee shall, prior to submission of the annual report, submit a monitoring plan for approval;
c) The Licencee shall include in the annual report the monitoring report, the proposed planning for the year ahead, and the milestones achieved;
d) The Licencee shall, from the date of issue of this Letter, collect CSO water samples and model river quality data every 5 years to demonstrate improvements in the river water quality due to implementation of Control Option No. 1. The next river water quality report is due December 31, 2024;
e) The Licencee shall carry out an assessment of the impact of climate change to the performance of the CSO program and shall include the assessment report along with the CSO Master Plan for Control Option No. 2 which is due April 30, 2030; and
f) The Licencee shall, on or before April 30, 2025, submit for approval a report demonstrating that the percent capture performance measure, an alternative to Control Option No. 2 as proposed in the CSO Master Plan dated August 28, 2019,

will provide equivalent water quality protection to Control Option No. 2 (i.e., four overflows in a representative year).

The City of Winnipeg shall implement the CSO Master Plan for Control Option No. 1 by December 31, 2045, unless otherwise approved by the Director.

Should you have any questions regarding the foregoing, please contact Asit Dey, Environment Engineer, at (204) 945-2614 or by email at asit.dey@gov.mb.ca.

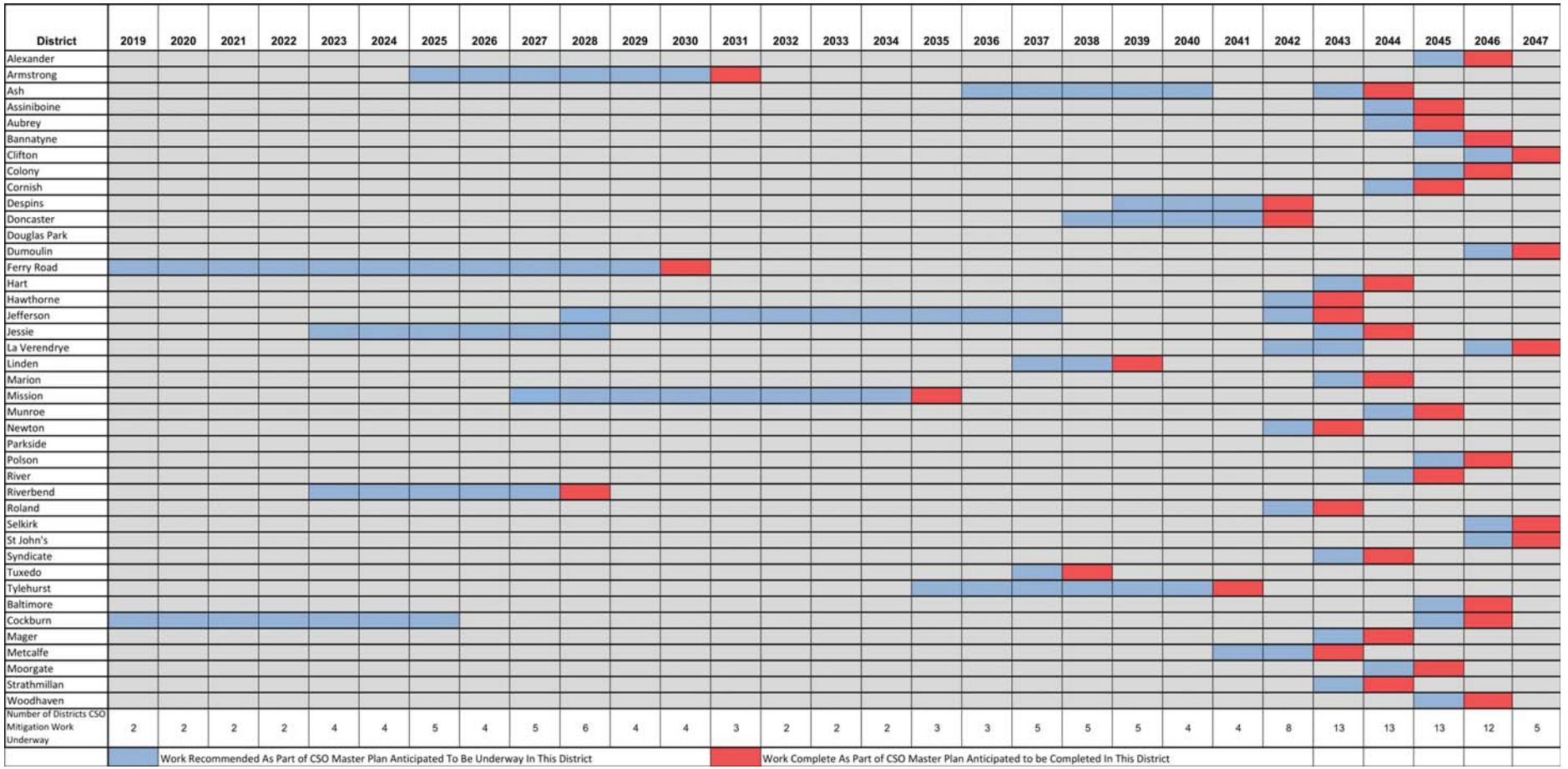
Yours sincerely,



Cordella Friesen
Director
The Environment Act

c: Duane Griffin/Patrick Coote, City of Winnipeg
Shannon Kohler/Yvonne Hawryliuk/Nada Suresh, Conservation and Climate
Public registries

Appendix C – District Program Scenario 1 Implementation Schedule



CSO Master Plan Program Scenario 1 Sewer District Based Implementation Schedule (Jacobs, 2019)

Appendix D - CSO Master Plan Program Scenario 3 Tracked Against Actual Implementation Schedule 3 Year Window

CSO Master Plan (MP) and Actual Implementation Schedule						
		Current Year	Forecasted Schedule			
District	Schedule Type	2020	2021	2022	2023	≥2024
Ferry Road	MP					
	Actual					
Jefferson East	MP					
	Actual					
Jessie	MP					
	Actual					
Riverbend	MP					
	Actual					
Cockburn	MP					
	Actual					
	Work Recommended to be Underway as per CSO Master Plan					
	Actual status as per 2020 Year End Evaluation					

Appendix E - District Plans Design Status

	Completion Progress			
CS Districts	**Conceptual Design**	**Preliminary Design**	**Detailed Design**	**Construction**
Woodhaven				
Strathmillan				
Moorgate				
Douglas Park				
Ferry Road				
Tuxedo				
Doncaster				
Parkside				
Riverbend				
Tylehurst				
Clifton				
Ash				
Aubrey				
Cornish				
Colony				
River				
Assiniboine				
Cockburn				
Baltimore				
Metcalfe				
Mager				
Jessie				
Marion				
Despins				
Dumoulin				
La Verendrye				
Bannatyne				
Alexander				
Mission				
Roland				
Syndicate				
Selkirk				
Hart				
St John's				
Polson				
Munroe				
Jefferson E				
Jefferson W				
Linden				
Newton				
Armstrong				
Hawthorne				

Progress update as of December 31, 2020.
The coloured cells represent the amount of work that has been completed.

Appendix F – 2020 Ongoing / Completed Capital Contracts

Project Name	District	Contract #	Project Type	Description	Class of Estimate	Baseline Budget	Committed Cost	Targeted Completion Date	Actual Completion Date	Volume Reduction (m3)	Comment
NEWPCC											
Ferry Road & Riverbend - Consultant Assignment 4	Ferry Road / Riverbend	439-2010	Sewer Separation	Phase 4 Works include preliminary design, geotechnical investigation, public engagement, detailed design, contract administration and post construction services for construction Contracts #6 and 7 for the Ferry Road and Riverbend Combined Sewer Relief Works	N/A	$1,700,000	$1,719,708	2020	TBD	N/A	Delay caused by constraints related to outfall construction and river levels
Ferry Road & Riverbend Combined Sewer Relief - Construction Contract 7A	Ferry Road / Riverbend	840-2019	Sewer Separation	Construction of a new land drainage trunk sewer along Douglas Park Road and Assiniboine Avenue from Ferry Road and Riveroaks Drive, along with new land drainage lateral sewers for city streets extending approximately one block north of Assiniboine Avenue, by a trenchless tunnel method to minimize above ground disruption and impact to local residents and the public at large.	Class 3	$3,000,000	$2,677,186	2020	TBD	10,900	Delay caused by constraints related to outfall construction and river levels
Ferry Road & Riverbend Combined Sewer Relief - Construction Contract 7B	Ferry Road / Riverbend	386-2020	Sewer Separation	Construction of new land drainage sewers along Roseberry Street, Parkview Street and Riveroaks Drive from Portage Avenue to Assiniboine Avenue by a trenchless tunnel method to minimize above ground disruption and impact to local residents and the public at large.	Class 3	$2,000,000	$1,935,485	2020	TBD	17,300	Broke into three contracts for construction staging
Ferry Road & Riverbend Combined Sewer Relief - Construction Contract 7C	Ferry Road / Riverbend	572-2020	Sewer Separation	Construction of land drainage sewer on Ferry Road from Portage Avenue to Assiniboine Avenue and construction of Outfall at Bourkevalle Park.	Class 3	$2,000,000	$1,974,404	2020	TBD	15,500	Broke into three contracts for construction staging
Jefferson East - Design - Consultant Assignment 2	Jefferson East	440-2010	Sewer Separation	Professional Consulting Services for Detailed Design and Contract Administrator construction Contract #5 – Construction of approximately 1.5 km of 1800mm 2100mm Land Drainage Trunk Sewer on Semple Ave. from Scotia St. to the CPR Winnipeg Beach Line; and prioritization and scheduling of all future work for the Jefferson East Combined Sewer District.	Class 3	$2,500,000	$2,649,717	2021	TBD	N/A	Ongoing
Jefferson East Combined Sewer Relief Construction Contract 5	Jefferson East	1045-2019B	Sewer Separation	Construction of a new land drainage system trunk along Semple Avenue from Scotia Street to the McKenzie Street by a trenchless tunnel method to minimize above ground disruption and impact to local residents and the public at large.	Class 3	$23,000,000	$17,473,416	2021	TBD	14,342	Ongoing
SEWPCC											
Cockburn Combined Sewer Relief - Consultant Assignment 4	Cockburn / Calrossie	441-2010	Sewer Separation	Development of alternative conceptual design separation services for Professional Consulting Services Detailed Design and Contract Administration Services Cockburn and Calrossie Combined Sewer Relief Works	Class 3	$1,000,000	$1,002,185	2022	TBD	N/A	Ongoing
Cockburn Combined Sewer Relief - Construction Contract 5	Cockburn / Calrossie	1067-2018 B	Sewer Separation	Construction of a new land drainage trunk sewer along Taylor Avenue from the intersection of Pembina Highway and Wentworth Street to Wilton Street by a trenchless tunnel method to minimize above ground disruption and impact to local residents and the public at large.	Class 3	$12,000,000	$11,152,527	2020	2020	3,774	-
Cockburn Combined Sewer Relief - Construction Contract 6A	Cockburn / Calrossie	211-2020	Sewer Separation	New land drainage sewers will be installed in the area between Carter Avenue, Pembina Highway and Stafford Street. The sewers will be installed using a trenchless tunnel method to minimize above ground disruption and impact to local residents and the public at large.	Class 3	$6,000,000	$4,782,706	2021	TBD	6,504	Ongoing
Cockburn Combined Sewer Relief - Construction Contract 10A	Cockburn / Calrossie	166-2020	Sewer Separation	New land drainage sewers will be installed along Stafford Street from Carter Avenue to Pembina Highway. The sewers will be installed using a trenchless tunnel method to minimize above ground disruption and impact to local residents and the public at large.	Class 3	$2,500,000	$1,526,094	2021	TBD	1,901	Ongoing
Cockburn Combined Sewer Relief - Construction Contract 12	Cockburn / Calrossie	354-2019	Sewer Separation	Construction of a new land drainage trunk sewer along Grant Avenue from Guelph Street to approximately Cambridge Street by a trenchless tunnel method to minimize above ground disruption and impact to local residents and the public at large.	Class 3	$6,000,000	$4,213,647	2020	2020	9,739	-
Overall System											
Rainfall Monitoring Program - Web Based Data Management and Analysis Service	N/A	87-2017	Rainfall Monitoring Program	Web based data management and analysis service for rainfall monitoring network	N/A	$20,000	$13,867	2021	TBD	N/A	Ongoing
Rainfall Monitoring Program - Supply, Installation and Operation	N/A	86-2017	Rainfall Monitoring Program	Operation and maintenance of rainfall equipment for Rainfall Monitoring Program	N/A	$70,000	$66,534	2021	TBD	N/A	Ongoing

	Unvalidated value
	Committed costs are subject to change as projects progress

Appendix G - 2021 Planned Capital Contracts

2021 Planned Capital Contracts

Project Name	District	Project Type	Class of Estimate	Forecasted Budget	Volume Reduction (m3)
NEWPCC					
Ferry Road / Riverbend Consulting Assignment 3	Ferry Road / Riverbend	Sewer Separation	Class 3	$1,000,000	N/A
Jefferson East Consulting Assignment 3	Jefferson East	Sewer Separation	Class 3	$2,500,000	N/A
Jefferson East Construction Contract 6 - *Main St (Kingsbury Ave to Jefferson Ave)* *Kingsbury Ave, Aikens St, Burrin Ave, Kilbride Ave, Belmont Ave, Hartford Ave*	Jefferson East	Sewer Separation	Class 3	$5,000,000	32,385
Armstrong Consultant Assignment - Preliminary Design	Armstrong	Sewer Separation	Class 3	$3,000,000	N/A
SEWPCC					
Cockburn / Calrossie Construction Contract 6B - *South East Jessie Wentworth St, Weatherdon Ave, Carter Ave, Grant Ave*	Cockburn / Calrossie	Sewer Separation	Class 3	$9,000,000	4,385
Cockburn / Calrossie Construction Contract 7 - *Sparling & Harrow South Sparling Ave, Harrow S*	Cockburn / Calrossie	Sewer Separation	Class 3	$3,275,400	9,813
Cockburn / Calrossie Construction Contract 10B - *Harrow North & Stafford Harrow St, Jackson Ave, Ebby Ave, Hector Ave, Weatherdon Ave*	Cockburn / Calrossie	Sewer Separation	Class 3	$6,000,000	
Overall System					
Phase 3 CSO Monitoring Program – Instrumentation, Maintenance, and Reporting	N/A	Temporary Flow Monitoring Program	Class 3	$250,000	N/A
Rainfall Monitoring Program – Operation and Maintenance	N/A	Rainfall Monitoring Program	N/A	$85,000	N/A
Real Time Control – Feasibility Study	N/A	Feasibility Study – Consulting Services	Class 5	$2,000,000	N/A
Note: The statuses of the planned contracts are subject to change pending on available budget and resource.					
Unvalidated value					

Appendix H – 2020 Record of Meeting Minutes

Minutes for 2019 CSO Reporting Milestone Meeting

Meeting Date:	May 25, 2020	**File No(s):** S-734 020-17-08-11-0N, 020-17-08-11-00 **Client File No.:** 3205.00
Date Issued:	May 28, 2020	
Time:	1:00 PM to 2:00 PM	
Location:	GoTo Meeting Conference Call	

ATTENDEES LIST:

Manitoba Conservation and Climate:	Asit Dey, Julie Froese, Joy Kennedy, Nada Suresh, Peter Crocker, Shannon Kohler, Siobhan Burland-Ross		
City of Winnipeg:	Duane Griffin, Florence Lee, Patrick Coote		
Recorded by:	Florence Lee	**Start:** 1:00 PM	**Adjourn:** 2:15PM

Item no.:	Discussion:	Action by:
1.0	Introduction	**Info**
2.0	Truth and Reconciliation Acknowledgement	**Info**
3.0	2019 Annual CSO Results presentation by Patrick Coote ▪ Background ▪ CSO Master Plan Implementation ▪ CSO Master Plan Performance ▪ 2019 Annual CSO Results Summary ▪ 2019 Results Analysis ▪ Operational Issues ▪ Status of Reporting ▪ Questions	**Info**
4.0	A follow-up meeting will be booked to go over an outline response to the Monitoring Plan requirements.	**City**
5.0	JK - The pump volume that discharges into the river appears to be insignificant comparing to the total volume of the CSO events. What percentage of the total volume of events is recognized as the pump volume in 2019?	**Info**

	• The recorded pump volume is estimated based on the size of the pumps and observed on/off data. There are no instruments in place to measure the pump volume. The reported values are conservative. With a mag meter, the estimated pump volume would likely be reduced. • Less than 1% of the total reported CSO volume is the pump volume in 2019.	
6.0	SK – In reference to rainfall data, has the City made modification to their plan to advance rainfall tracking based on historic collected data or trend? Has the City considered how the potential severe rainfall events may impact the planning process and how it may delay the targeted timeline? • The City is prioritizing sewer separation work as a control solution. By separating the combined sewer systems, larger rainfall events will no longer impact CSOs in a separated district. In addition to sewer separation work, implementation of GI will be considered and incorporated on a district level providing a level of redundancy to the impacts of climate change.	**Info**
7.0	SBR – Commented on the figures and how they were helpful to demonstrate progress and how the City is staying on targets. • The City welcomes feedback on the presentation. There are additional sections from the report that are not included in the presentation to maintain a reasonable timeline of the presentation. If there are sections from the annual report that the Province would like to be included or removed in future presentations, please let us know.	**Info**
8.0	SRB - Will the presentation be circulated? • The presentation along with the meeting minutes will be circulated.	**City**

The next meeting will be in May 2021.

Please report errors or omissions in the above minutes to:
Florence Lee (204) 986-6428 or by e-mail at FLee@winnipeg.ca within two weeks from distribution date, otherwise it will be assumed these minutes are accurate and accepted.