City of Winnipeg
2023 CSO Annual Report

Environment Act Licence No. 3042

Clause 13

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Environment and Climate Change

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City of Winnipeg 2023 CSO Annual Report

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Executive Summary

In November 2019, Manitoba Environment and Climate Change approved the City of Winnipeg's (the City's) Combined Sewer Overflow (CSO) Master Plan as part of the City's Combined Sewer Environment Act License No. 3042. The Licence requires the City to submit an Annual Report that details progress on the CSO Master Plan for the preceding year.

CSO Master Plan Progress

Budget

The CSO Master Plan's estimated capital cost to meet an 85% control target is $1.15 billion in 2019 dollars. The 2023 CSO Capital Budget was $28 million, providing total available funds of over $88 million. Approximately $26.8 million was invested in 2023. A significant amount of the budget is being held over for the large Ferry Road Rutland Trunk contract scheduled for 2024 (see Section 3.3.2). The 2024 budget ask is $47 million totaling in $110 million of available budget with a $109 million forecast spend.

In 2021, City Council recommended a $60 million increase to the CSO Master Plan budget over 4 years from 2024 to 2027 ($15 million a year). In 2022 and 2023, City Council provided direction to work towards the Provincial deadline of 2045, and prepare a City-only funding plan if no funding from other levels of government is secured.

Current Year Results

There is a six percent CSO volume reduction in the 2023 sewer network[1] for the 1992 Representative Year. This allowed for an increase of CSO volume percent capture from 75 to 76 percent (Section 1.3.1). These improvements are the result of completed combined sewer separation works on Ferry Road, Jefferson, and Cockburn projects and other model asset representation improvements based primarily on improved data from installed monitoring instrumentation.

[1] 2023 sewer network refers to the hydraulic model that contains the best representation of the existing sewer system at the time it was developed.

Annual CSO results are primarily impacted by precipitation and river levels.

1. Precipitation

In 2023, there was approximately 13 percent less precipitation for the entire year and 35 percent less precipitation during the recreation season (May – September), when compared to the 1992 Representative Year. Overall, the last eleven years have shown an average one percent decrease in total precipitation compared to the 1992 Representative Year (Section 4).

2. River Level

The 2023 river level was lower overall than the 1-in-5-year average. It was slightly higher than the 1992 Representative Year in the recreation season (May – September). A later than typical spring melt caused a delayed reaction to the spring rise and fall of river levels.

In 2023, there were 1,039 CSO events with an estimated sewage discharge of 5,368 ML. This represents a decrease from 2022 in both the number of CSO events and in overall CSO volume (see Section 4).

Next Steps

As directed in the CSO Master Plan, the City will continue to work on sewer district separation projects currently underway (see Section 3.5). The 2024 planned capital projects include planning, design, and/or construction in Mission, Armstrong, Ferry Road / Riverbend, Cockburn / Calrossie, and Jefferson East.

The City commenced water quality monitoring in 2023 to meet the Provincial December 2024 River Water Quality Report deadline.

The City will continue to explore opportunities for sewer system optimization, green infrastructure (GI), and additional storage options to improve CSO performance monitoring and volume reduction. Furthermore, the City will continue regular communication with regulatory bodies and stakeholders throughout the delivery of the CSO Master Plan. The associated risks and opportunities of the CSO Master Plan are documented in the 2023 CSO Background document (Appendix A).

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Acronyms and Abbreviations

AACE	American Association of Cost Engineers International
AAF	average annual flow
CEC	Clean Environment Commission
City	City of Winnipeg
CO	control option
CS	combined sewer
CSO	combined sewer overflow
DEP	district engineering plan
EA	Environment Act Licence
ECC	Environment and Climate Change
EMC	event mean concentrations
GI	green infrastructure
LDS	land drainage sewer
NEWPCC	North End Sewage Treatment Plant
NPRI	National Pollutant Release Inventory
O&M	operations and maintenance
PLUM	Planning Land Use Model
POC	pollutants of concern
PWWF	peak wet weather flow
P2	Pollution Prevention Plan
RFP	Request for Proposal
RTC	real time control
SEWPCC	South End Sewage Treatment Plant
SFD	single family dwelling
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 City of Winnipeg (City)'s combined sewer system is governed by Environment Act Licence (EA) No. 3042. The Licence requires the City to submit an Annual Report that details progress on the Combined Sewer Overflow (CSO) Master Plan implementation for the preceding year.

The CSO Annual Report provides an overview of the cost, schedule, and performance results of the current combined sewer system. It also provides information on capital improvements for the previous year and work planned for the coming year. The report also provides an overview of the process used to evaluate CSO discharges, as required by Clause 14 of the Licence.

As part of Clause 14, the City must submit an annual CSO Results Report for the preceding year by February 15. The CSO Results Report estimates the sewage volume that was discharged to receiving streams from CSO events that year. It complies with the National Pollutant Release Inventory (NPRI) and Wastewater Systems Effluent Regulations (WSER) annual reporting requirements.

2. Recent Changes & Updates

This section reflects changes and updates to the CSO Master Plan implementation in 2023. Implementation of the CSO Master Plan began in November 2019. The City is required to achieve 85 percent CSO volume capture for the representative year by 2045.

2.1 Sewer Network Changes

There were no major sewer network changes to report from 2023 that affected the CSO program performance. Please refer to Appendix B for the list of ongoing and completed projects of 2023 that the City undertook.

In 2023, hydraulic model maintenance was preformed and increased percent capture to 76 percent. This increase is primarily attributed to Capital improvements represented in the model for the Ferry Road, Jefferson, and Cockburn completed contracts. Refer to Section 3.1 for further information.

2.2 Regulation Update & Changes

The regulation changes in 2023 included the Removal of Requirement to Submit Significant Rainfall Event Notifications, as per a Provincial letter received January 13, 2023. As such, references to Significant Rainfall Event Notifications have been removed from this annual report (Section 6).

A request to address the way development information is being used for the Annual Report was also made as per the Provincial letter received August 1, 2023 (Appendix C). Refer to Section 4.7 for further information.

2.3 Funding Changes

In 2023, the City's Basement Flood Relief and CSO Master Plan Program budget was $28 million. In 2021, City Council recommended a $60 million increase to the CSO Master Plan budget over 4 years from 2024 to 2027 ($15 million a year). In 2022 and 2023, City Council provided direction to review the needed to meet the target capture by the Provincial deadline of 2045. In 2022 and 2023, City Council provided direction to work towards the Provincial deadline of 2045, and prepare a City-only funding plan if no funding from other levels of government is secured. This review was ongoing at the time of writing this report.

2.4 Communications Update

In 2023, the City had a virtual meeting with the Province on May 17, 2023 to provide an overview of the 2022 CSO Annual Report. The meeting minutes are provided in Appendix D.

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. In 2023, the Public Service presented an update to the Standing Policy Committee on Water and Waste, Riverbend Management and the Environment, and Council on the 2022 CSO Annual Report on October 12, 2023.

The City website serves as a public education tool to provide Winnipeg residents with information on the Master Plan and its benefits. In 2024, there are plans to update the CSO Master Plan webpages to align with our latest brand and plain language standards. These updates were initiated in 2023 and include reviews to ensure they are in line with the CSO Master Plan Public Education Plan requirements.

The City will continue to maintain an open and transparent engagement program with the public, including regular updates on the City website.

2.5 Pollution Prevention Plan Update

The City has a Pollution Prevention Program to protect the sewage collection and treatment system, our rivers and lakes, and the environment. In 2023, two additional businesses were added for a total of 603 active businesses now part of the Pollution Prevention Program.

For more information, see the 2023 CSO Background document (Appendix A) or the City's Pollution Prevention Planning Program webpage.

2.6 CSO Program Background Information

Please refer to the 2023 CSO Background document (Appendix A) for a summary of the CSO Master Plan, including other key components that did not have changes or updates in 2023. The City webpage also contains Winnipeg CSO information with links to relevant historical documents.

3. CSO Master Plan Performance

The 2013 Regional Model Baseline Network with the 1992 Representative Year formed the baseline performance level. The CSO Master Plan adopted the year 1992 as the representative year for annual rainfall intensities and river levels. This choice is crucial as it serves as the benchmark for planning and evaluating both current and future CSO performance. By using data from 1992 as a reference point, we can ensure consistency and accuracy in our assessments, aiding in the effective management and mitigation of CSOs. The performance of the current year's model network, which is the most recent representation of the sewer network condition, is tracked and reported against the baseline.

3.1. CSO Volume Performance Tracking

The 2013 baseline hydraulic model represents the model conditions for the 2013 sewer network. The 2023 sewer network is the most current hydraulic model. It provides the best representation of the sewer network condition for 2023. Future updates to the model will be made as construction works are completed and modeling resources allow.

The total CSO volume discharged under the 1992 Representative Year conditions for the current 2023 model network is 4,953 ML, 307 ML less than the 2013 baseline CSO volume. The reduction in CSO volume and the increase in percent capture show that the combined sewer relief projects undertaken in recent years have improved the collections system's overall CSO performance. Table 1 presents the CSO performance of the baseline, current year, and the control target (85 percent capture) under the 1992 Representative Year design event. The total wet weather flow volume captured for the current (2023) year's performance was calculated based on the baseline (2013) dry and wet weather flows in conjunction with the CSO volume from the current year's performance.

Table 1 - 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 (2023) Year's Performance - 2023 Network with 1992 Rep. Year	4,953	7,749	7,624	-	76
Target Performance - CSO Preliminary Proposal 85 Percent Capture with 1992 Rep. Year	2,980	7,749	9,593	2,300	85

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

There was a 6 percent CSO volume reduction in 2023 for the 1992 Representative Year resulting in an increase in the CSO volume percent capture of 76 percent relative to the 2013 baseline year. The improved performance to date is primarily attributed to Capital improvements represented in the model for the Ferry Road, Jefferson, and Cockburn completed contracts (-281ML). Other model maintenance improvements to improve asset representation based on collected data and installed monitoring instrumentation and model accuracy represent the remaining differences. Subsequent model updates will include construction work improvements and network changes or improved data.

3.2. Financial Tracking

The CSO Master Plan developed an overall capital cost in 2019 dollars for each of the combined sewer districts. The total capital cost to implement the CSO Master Plan including the 10 percent green infrastructure (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 the 2023 CSO Background document (Appendix A). 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.

3.2.1 Capital Cost Estimation Tracking

No new City-wide capital cost estimates have been created since the August 2019 submission of the CSO Master Plan.

3.2.2 Capital Cost Estimation Tracking

How the CSO Master Plan is to be funded is under review. This year's budget tracking is based on City only funding. In 2023, the City Council approved $28 million for the CSO Master Plan budget. A three-year window budget of the CSO Master Plan and revised 2023 annual budget is presented in Table 2 below.

Table 2 - CSO Master Plan (2019 Dollar Values) and Revised 2023 Annual Budget Difference

	2023 to 2025 Capital Budget Forecast			
	Year 1	Year 2	Year 3	
	2023	2024	2025	Average
CSO Master Plan Forecast	$33,770,003	$34,783,103	$35,826,596	$34,793,234
Budget Forecast (in 2023 values)	$28,000,000	$47,000,000	$41,500,000	$38,833,333
% Deviation	-17%	+35%	+16%	+12%

The CSO Master Plan 2023 budget ask was $28 million with an additional $59 million budget holdover from 2022. This budget is being held to award the Ferry Road Contract 6, which is scheduled for 2024. Ferry Road Contract 6 is a large strategic tunneling project with a Class 3 estimate over $60 million, which is greater than the available annual budget. See Table 3 below for the 2024 to 2026 capital budget forecast.

Table 3 - 2024 to 2026 Capital Budget Forecast (2023 Dollars)

Budget Source	Budget	2023 Committed Capital Projects To Date	2023 Forecast Capital Projects	% of Annual Budget Committed
2022 (hold over)	$59,636,056			
2023 Budget	$28,000,000	$26,808,134		31%
Total Budget Available in 2023	**$87,636,056**			
2023 (hold over)	$62,547,846			
2024 Budget	$47,000,000		$108,604,053	99%
Total Budget Available in 2024	**$109,547,846**			
2024 (hold over)	$943,793			
2025 Budget	$41,500,000		$37,708,016	89%
Total Budget Available in 2025	**$42,443,793**			
2025 (hold over)	$4,735,777			
2026 Budget	$46,500,000		$34,300,222	67%
Total Budget Available in 2026	**$51,235,777**			

Approximately $26.8 million was invested in 2023. Since 2019, the approximate cumulative committed capital spend is $109 million. Where projects are completed under budget unspent committed funds are returned to the CSO Budget. The CSO Master Plan and 2023 actual and forecast Capital budget with a three-year window are provided in Figure 1.

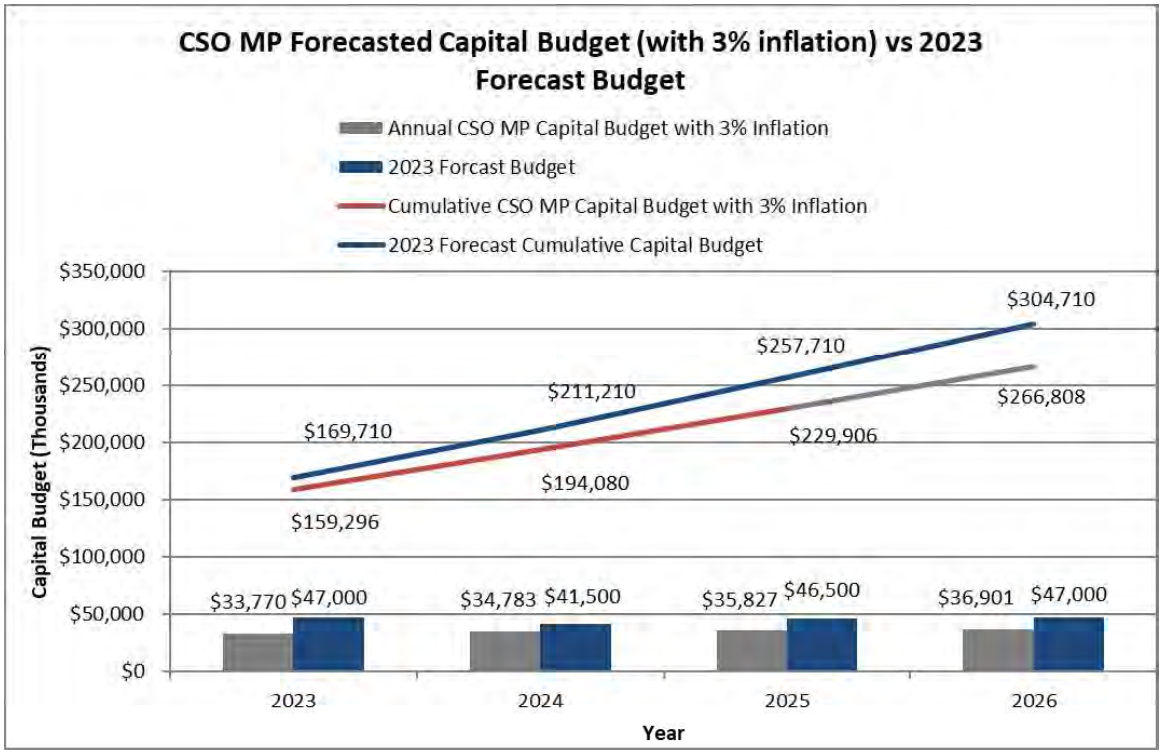


Figure 1 - CSO Master Plan and 2023 Actual and Forecast Capital Budget

3.3. Schedule Tracking

The CSO Master Plan schedule is currently based on City only funding with districts strategically prioritized based on implementation strategy and CSO volume reduction. Council have directed Water and Waste to assess the feasibility of City only funding to meet the 2045 deadline which could change the budget and schedule of the program.

The 2019 CSO Master Plan proposed and actual construction implementation schedule for 2023 and the three year window (2024 to 2026) is illustrated in Appendix E. To reflect the actual CSO Master Plan progress, an updated program schedule estimate, submitted to Council in October 2023, is also included in Appendix E. The revised schedule reflects completed projects, updated schedules for remaining work, and the latest estimates for future tasks. It assumes a sufficient budget is in place to meet the final program deadline.

3.4. Districts Design Status

The design status for each of the combined sewer districts is illustrated in Appendix F. Colored cells represent the design stage status for the specific district as of December 31, 2023.

3.5. Capital Projects Tracking

The list of completed and/or ongoing projects from 2023, with the associated scope, targeted costs, actual cost, and CSO volume reduction, are provided in Appendix B.

The list of forecasted work for 2024 and the corresponding capital project's estimated CSO volume reduction are provided in Appendix G.

3.6. Milestones

The 2023 awarded projects and the 2024 planned projects milestones are summarized in Table 4 and Table 5, respectively. The planned award dates and the actual award dates are compared to demonstrate the project progress.

In addition to the project work, any Provincial and Federal submissions are also considered as milestones. The milestones for the Federal and Provincial submissions are provided in Section 6.

Table 4 - 2023 Past Projects Milestone

2022 Committed Projects	Targeted Award Date	Actual Award Date	Comment
CSO Sewer Relief Projects			
NEWPCC			
Ferry Road / Riverbed Consultant Assignment 5	2023	August-23	Detailed design of Rutland trunk
Jefferson East Construction Contract 9	2023	November-23	Construction of LDS
Hawthorne Construction Contract	2023	June-23	Opportunistic separation
St Johns (Redwood) Construction Contract	2023	January-23	Construction of LDS
Mager Construction Contract 1	2023	August-23	Opportunistic separation
SEWPCC			
Cockburn / Calrossie Construction Contract 9A	2023	June-23	Construction of LDS
Overall System			
River, Stream and Combined Sewer Overflow Discharge Water Quality Monitoring	2023	March-23	Collection and analysis of data to report on the effect the CSO Master Plan has had on water quality
Flow Monitoring Program Instrumentation Supply Ext 2	2023	August-23	
Annual Rainfall Monitoring Program	2023	April 2023	Annual Provision, Installation, Data Hosting and Maintenance for a Rainfall Network Service

Table 5 - 2024 Planned Projects Milestone

2023 Planned Projects	Targeted Award Date	Comment
CSO Sewer Relief Projects		
NEWPCC		
Jefferson East Construction Contract 7B	2024	Construction of LDS
Jefferson East Construction Contract 8A	2024	Construction of LDS
Ferry Road / Riverbed Construction Contract 6A	2024	Construction of Rutland Trunk
Armstrong Consultant Assignment 2	2024	Detailed design
Armstrong Construction Contract 1	2024	Phasing of work follows detailed design (Consultant Assignment 2)
SEWPCC		
Cockburn East Consultant Assignment 1	2024	Preliminary design
Cockburn / Calrossie Construction Contract 9B	2024	Construction of LDS
Cockburn / Calrossie Construction Contract 13	2024	Construction of LDS
Overall System		
Rainfall Monitoring Program	2024	
Laboratory Upgrades	2024	
CSO Percent Capture Assessment	2024	Provincial Requirement
Note: The above status is subject to change pending on available budget and resource.		

3.7. City Investments on CSO Mitigation to Date

The CSO Master Plan investment since 2013 to 2023 is approximately $192 million. The previous year's Annual Report tracked approximately $170 million in infrastructure investment since 2013. The budget for the next six years is forecasted to be $242 million. Past reports are available with information on past project investments.

4. Current Year 2023

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.

The annual precipitation in 2023 was less than the 1992 Representative Year and the previous year, 2022. The year 2023 had approximately 13 percent less rainfall than the 1992 Representative Year and half the rainfall of 2022.

The river levels in 2023 were overall lower than the 1-in-5-year average and lower than the 1992 Representative Year at the beginning of April. After the spring rise in river levels, the 2023 levels fell in June and were then comparable to the 1992 Representative Year from June to September and comparable to the 1-in-5-year average from August to September.

4.1 CSO Results 2023

Based on the approach outlined in Section 4.6, the 2023 results are provided in Table 6. 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 6 - CSO Overview Results 2023

Source of Data	Number of Combined Sewer Outfalls	Number of events	Volume of events (ML)
CSO Instrumentation & Detailed Hydraulic Model	46	731	4,471
Detailed Hydraulic Model	30	195	608
Flood Pumped Data	N/A	113	288
Total	76	1,039	5,368

The total number of CSO events for 2023 was 1,039, which is an average of 14 events per outfall (based on 76 outfalls). The total estimated annual sewage discharged from CSOs for 2023 is 5,368 ML. These values were based on the 46 instrumented locations along with the hydraulic model.

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

In 2023, 89 percent of the CSO result values were validated against observed instrumentation data.

4.2 Rainfall 2023

The 1992 Representative Year and 2023 current year's rainfall events are reviewed and analyzed to understand the impact rainfall events have on CSOs. Table 7 summarizes the amount of precipitation and the number of rainfall events in both 1992 and 2023 based on the single rain gauge at the Forks.

The total amount of rain that fell in 2023 was approximately 13 percent less than the 1992 Representative Year. The 2023 recreation season was 35 percent drier than the 1992 Representative Year. The 2023 shoulder season (January through April and October through December) accounted for 32 percent of the total annual precipitation and was more than two and a half times greater than the precipitation of the shoulder season of the 1992 Representative Year. There were four rainfall events that were greater than 5 mm that were recorded outside of the recreation period.

Table 7 - Single Rain Gauge at the Forks

	1992		2023	
	Annual	Rec Season	Annual	Rec Season
Total precipitation (mm)	478	326	350	212
Estimated rainfall (mm)	362	326	313	212
% deviation from average rainfall			13%	35%
Number of Events ≥5mm	22	20	18	14
% deviation from average			18%	30%

The comparison between the total annual precipitation and the 1992 Representative Year precipitation over the last several years is illustrated in Figure 2.

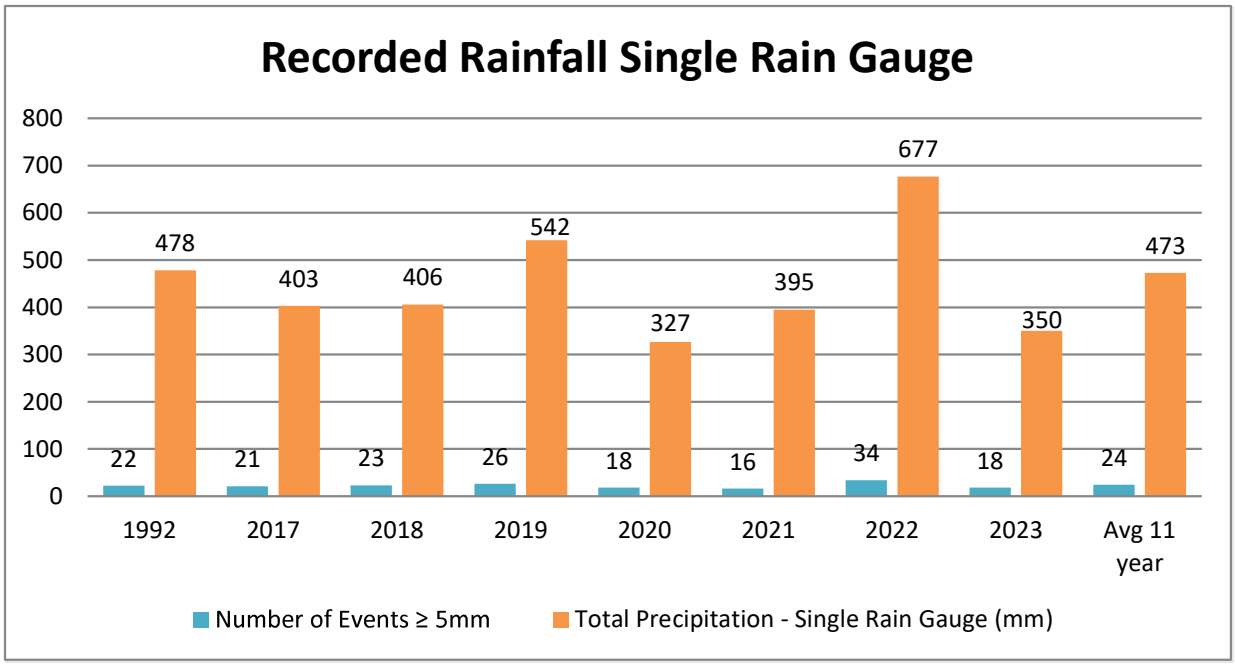


Figure 2 - Total Precipitation Yearly Trend Single Rain Gauge at the Forks

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 1st to September 30th but, weather permitting, can be activated as early as March and turned off as late as November. In 2023, there were 16 rain gauges associated with the combined sewer districts and their data was used from April 1st to October 31st. Two

Environment Canada rain gauges (the Forks and Airport gauges) are within the combined sewer district and were used to supplement data outside for the remaining months of the year.

The average annual rainfall recorded by the City's combined sewer districts' rain gauges was 269 mm. The Ecole Guyot and the Pan Am Pool rain gauge locations were out of service and did not provide reliable data from July 23rd to August 7th and August 8th to September 30th, respectively. Overwise, the missing rain gauge data was minimal and interspersed throughout the recreation season. The missing data from the rain gauges was supplemented with mean rainfall data of the operating City's rain gauges. Overall, 2023 had 98 percent rain gauge coverage for the recreation season.

4.3 River Elevations 2023

The 2023 river levels were overall lower than the 1-in-5-year average. In comparison to 1992 Representative Year River levels, 2023 spring levels were significantly lower until mid-April before rising and returning to slightly higher summer levels in June compared to the typical May. The river levels of 1992, 2023, and the 1-in-5-year event are illustrated in Figure 3.

As discussed in Section 4.2, 2023 had overall less precipitation than the 1992 Representative Year. The low river levels in spring 2023 were attributed to the delayed spring melt. In June, the river level eventually returned to the normal summer water level set by the control at the St. Andrew's Lock and Dam.

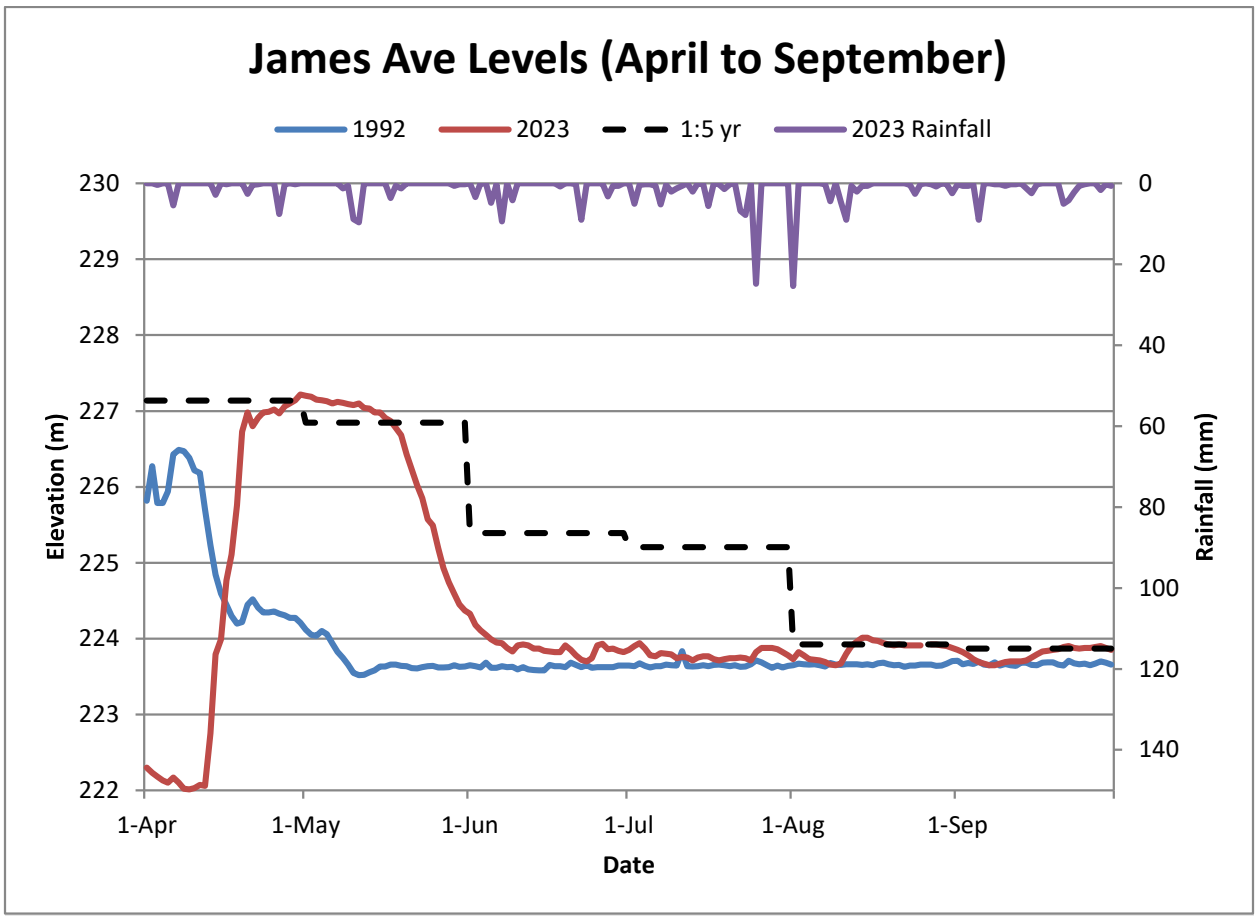


Figure 3 - James Ave River Level Comparison

4.4 Treatment Plant Flows 2023

For 2023, the total citywide treated sewage volume was 91,013 ML which was approximately 25 percent less than 2022 (121,510 ML). The average annual flows (AAF) distributed between the wastewater treatment plants were as follows.

- North End Sewage Treatment Plant (NEWPCC) - 170 ML/day
- South End Sewage Treatment Plant (SEWPCC) - 56 ML/day
- West End Sewage Treatment Plant (WEWPCC) - 23 ML/day

The distribution of the treated sewage volume at each of the sewage treatment plants was similar to 2022 and past years.

- NEWPCC - 61,984 ML (68%)

- SEWPCC - 20,625 ML (23%)
- WEWPCC - 8,404 ML (9%)

In 2023, approximately 6 percent of the total annual citywide sewage was lost due to overflows and 94 percent 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 4,938 ML, 235 ML, and 195 ML, respectively.

4.5 Collections System Operational Observations 2023

Infrastructure and outfall monitoring instruments require regular maintenance.

All outfall monitoring instruments were maintained throughout 2023. Non-functional instruments were either recalibrated, replaced, or are being investigated as part of the maintenance process. The City continues to provide regular maintenance to all monitoring instruments at the CSO outfalls to maintain data quality for CSO Reporting. Record of the 2023 operational observations are documented in the 2023 Annual CSO Results Report, which was submitted to the Province on February 8, 2024.

Additional information related to untreated sewer discharge is documented on the City webpage:

https://legacy.winnipeg.ca/waterandwaste/sewage/service_int2023.stm

4.6 Reporting Process

The 2023 CSO annual reporting process was based on the City Regional Model 2023 network representation. The model was validated using 46 instrumented CSO outfalls.

4.6.1 Hydraulic Model Maintenance

The City model network needs to be continually updated to better represent the current year's performance.

2023 model updates focused primarily on representing the volume reduction benefit of the capital CSO project work undertaken in the Cockburn, Ferry Rd, and Jefferson East project areas. Updates captured sewer separation work completed up to and including 2023. Other updates

include correcting a table referencing error for land use attributes introduced in an earlier software update.

The City will strive to continually work 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, during updates, the model is calibrated based on the instrumented data. The level of discrepancy between the predicted model results and the instrumented data is used to validate the model. Upon completion of the model updates, sensitivity checks are undertaken. All changes associated with model maintenance are documented.

4.6.2 CSO Reporting Limitations

Due to the complexities associated with snowmelt, it is not currently possible to numerically model the CSO events because of snowmelt at the 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 for 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 46 of the 76 CSO locations.

Annual model updates should be completed regularly. 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 constantly improve. The 2023 network is currently the best available representation of the City sewer system.

4.7 Clause 8 Compliance

The purpose of this section is to provide context for estimating the increase in runoff from small scale development approvals compared to the decrease in runoff resulting from sewer separation projects. To comply with the Province's July 8, 2021, June 7, 2022, and August 1, 2023 requests, a separate calculation was developed to estimate increases in runoff volume associated with CSOs caused by small scale developments. Runoff volumes will be used to demonstrate the difference in scale between small development and sewer separation. This exercise is independent of the percent capture performance.

In 2022, we reported 5,039 cumulative property approvals since 2014. In 2023, there were an additional 844 approvals, bringing the cumulative property approvals since 2014 to 5,883. Small scale development approvals represent an estimated increased runoff volume of 5,883 m^3 cumulatively from 2014 to 2023. This estimation is based on a 1 m3 average area runoff volume for one small scale development approval.

The average area runoff volume for a small scale development approval was estimated based on a review of small development approvals. Three development scenarios were reviewed; going from a single-family dwelling (SFD) to two duplexes, going from a SFD to two SFDs, and going from a SFD to two SFDs with secondary suites. For a 5-year design event, the increase in runoff volume for these design scenarios are shown in Appendix H and averages to be 1 m^3 of runoff volume.

The same approach with the 5-year design event was used to determine the decrease in runoff volume as a result of sewer separation projects. In 2022 we reported a cumulative decrease in runoff of 57,000 m^3. In 2023, the runoff volume reduction is 60,972 m^3 as a result of model maintenance updates to reflect sewer separation in the Jefferson East, Cockburn West, and Ferry Road CSDs. We are reporting a cumulative decrease in runoff of 117,972 m^3 and a net runoff volume reduction of 112,089 m^3 when accounting for the cumulative increase from small development runoff. As Table 8 demonstrates, sewer infrastructure improvements far exceed the small scale development detriment estimates.

Table 8 - Cumulative Reduction in Runoff Volume

	Estimated Runoff Volume Increase [m^3] (Small Scale Development)	Estimated Runoff Volume Reduction [m^3] (Sewer Separation*)	Net Runoff Volume Reduction [m^3]
2022 Cumulative Values	5,039	57,000	51,961
2023 Yearly Values	844	60,972	60,128
2023 Cumulative Values	**5,883**	**117,972**	**112,089**

** Values estimated from model maintenance area reductions for completed CSO construction projects and calculated equivalent runoff volume.*

5. Water Quality

The 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 plans to collect CSO water samples and model river quality data to track the river water quality throughout the CSO program.

The water quality monitoring data collected in 2014 and 2015 will be used for the 2023 NPRI reporting and will be continually used until new data becomes available with the next Water Quality Monitoring Plan.

The 2019 CSO Master Plan Provincial Approval Letter required the City to prepare the Water Quality Monitoring Plan and final report by December 31, 2024. The City presented and submitted a Proposed Water Quality Monitoring Plan in 2022. Following input from the Province, the plan was revised and resubmitted in January 2023 and accepted by the Province. The City issued a Request For Proposal in January 2023. Sampling commenced in the 2023 open water season and will continue in 2024.

The City is conducting bi-weekly river and stream water quality monitoring for pollutants of concern (POC), including nutrients, dissolved oxygen, and bacteria. The monitoring data provides an updated characterization of the health of Winnipeg's waterways. These reports are published on the City of Winnipeg webpage:

https://legacy.winnipeg.ca/waterandwaste/sewage/monitoring/RiversSmallStreams.stm.

6. Compliance

This section provides an overview and summary of the City's compliance with the regulatory requirements.

Combined sewers are regulated by several federal and provincial requirements. The City reports on CSO discharge data to NPRI, WSER, and the Province on an annual basis to demonstrate regulatory compliance. Table 9 provides a list of required regulatory deliverables with their associated regulators, deadlines, and submission dates.

Table 9 - Regulatory Submissions

Deliverable	Regulator	Reporting Period	Deliverable Deadline	Submission Date
Federal Submission				
2023 CSO Annual Results	WSER	Jan 1 - Dec 31, 2023	Feb 15, 2024	Feb 12, 2024
2023 NPRI CSO Annual Report	Canadian Environmental Protection Act, 1999	Jan 1 - Dec 31, 2023	June 1, 2024	N/A
Provincial Submission				
2023 CSO Annual Results	EA No. 3042 Clause 14	Jan 1 - Dec 31, 2023	Feb 15, 2024	Feb 8, 2024
2023 CSO Annual Report	EA No. 3042 Clause 13	Jan 1 - Dec 31, 2023	March 31, 2024	March 28, 2024
CSO Quarterly Results	EA No. 3042 Clause 14	Every Quarter	15th of May, Aug and Nov of the reporting year	May 9, Aug 3, and Nov 7 of 2023

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 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 2023 CSO Annual Results were validated, completed, and submitted to both the Provincial and Federal governments on February 8, 2024 and February 12, 2024, 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 2023 Quarterly CSO Results deliverables were completed and submitted to the Province on May 9, 2023, August 3, 2023, and November 7, 2023, in accordance with the mandated deadlines.

CSO Master Plan Submissions

Additional submissions related to the CSO Master Plan development and implementation is provided in Table 10. This table provides a list of submission milestones pursuant to EA No. 3042.

Table 10 - 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
River Water Quality Report	31-Dec-29	TBD
CSO Master Plan Update	30-April-30	TBD
River Water Quality Report	31-Dec-34	TBD
River Water Quality Report	31-Dec-39	TBD
River Water Quality Report	31-Dec-44	TBD
CSO Master Plan Implementation	31-Dec-45	TBD

The City has demonstrated compliance with EA No. 3042 and all CSO Federal reporting requirements.

7. Risks and Opportunities

There are many risks and opportunities associated with the CSO Master Plan due to the complexity of the project that need to be tracked and managed. See the 2023 CSO Background document (Appendix A) for further risks associated with the CSO Master Plan.

7.1 Risks

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

The district engineering plans (DEPs) comprise individual conceptual solutions to CSO mitigation for each combined sewer district. Each of the risks and opportunities applicable to the control solutions recommended within each sewer district to meet Control Option No. 1 (85 percent capture) are documented in Part 3B – District Engineering Plans of the CSO Master Plan.

Risks are also tracked on a project-by-project basis. Any changes to the control solution could lead to a reevaluation of risks associated with each of the specific projects.

7.1.1 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 five years. The resources and funding needed to meet this requirement were not included in the CSO Master Plan.
- In 2021, the City proposed a strategic approach to remove the Clause 8 requirements for smaller developments in combined sewer areas. Any increases in CSO volume associated with these developments is to be mitigated by the CSO Master Plan improvements. The cost to offset any increase in discharges to combined sewer to ensure future

control targets are met have not yet been included in the CSO Master Plan.

- Additional City resources are required to deliver the CSO Master Plan and for compliance with EA No. 3042 and associated Provincial correspondence requirements.
- There is a risk the local construction industry will take time to increase the number of experienced consultants and contractors to meet the needs of a significantly increased CSO budget.
- There is a risk of increased delivery costs and the risk of lower quality work with expanding the scale of the program quickly over a short timeline.

7.2 Opportunities

Several 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.

7.2.1 Green Infrastructure

Implementation of green infrastructure (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.

Additional GI opportunities are being reviewed in the Armstrong Preliminary Design Project.

North East Exchange District Engineering Study

The City undertook a pilot study in 2017 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 completed post construction flow monitoring in 2022 to evaluate performance.

The 2022 flow monitoring data showed a delay in runoff response from the catchment aligned with expected performance. Future monitoring will be undertaken to understand how the solution performs.

7.2.2 Floatable Management

Clause 12 of EA No. 3042 requires the CSO Master Plan to demonstrate the prevention of floatable materials in CSO effluent. The CSO Master Plan includes the proposed use of end of pipe screening to the primary CSO outfall in each combined sewer (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 CSO 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.

7.2.3 Real Time Control

The incorporation of real time control (RTC) and monitoring instrumentation will provide an increased understanding of operation and 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 anticipated to take place in the coming years as per the CSO Master Plan's schedule.

8. 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 be kept at City of Winnipeg Water and Waste offices at 1199 Pacific Avenue.

9. Next Steps

The next steps are to implement the control technologies recommended as per the CSO Master Plan.

The 2024 planned capital construction projects, preliminary design, and other planned work are provided in Table 5. A summary of the 2024 planned capital projects includes:

- Planning and design of control technologies in Armstrong, Jefferson East, Ferry Road, Cockburn, Mission, and Roland districts
- Construction in Ferry Road, Jefferson East, Cockburn, and Armstong districts
- River, Stream, and CSO Discharge Water Quality Monitoring, and
- Execution of the Rainfall Monitoring Program

The City will continue to explore opportunities to further promote CSO volume reduction and maintain regular communication with regulatory bodies and the public on the progress of the CSO Master Plan performance.

10. References

AACE International. 1997. Cost Estimate Classification System – As Applied In Engineering, Procurement, and Construction for the Process Industries. AACE International Recommended Practice No. 18R-97. (pg. 3-46).

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.

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Appendix A – 2023 CSO Background

City of Winnipeg
2023 CSO Background

Environment Act Licence No. 3042

Clause 13

Prepared for

Environment and Climate Change

March 2024

City of Winnipeg CSO Background

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Acronyms and Abbreviations

AACE	American Association of Cost Engineers International
AAF	average annual flow
CEC	Clean Environment Commission
City	City of Winnipeg
CO	control option
CS	combined sewer
CSO	combined sewer overflow
DEP	district engineering plan
EA	Environment Act Licence
ECC	Environment and Climate Change
EMC	event mean concentrations
GI	green infrastructure
LDS	land drainage sewer
NEWPCC	North End Sewage Treatment Plant
No.	Number
NPRI	National Pollutant Release Inventory
O&M	operations and maintenance
PLUM	Planning Land Use Model
POC	pollutants of concern
PWWF	peak wet weather flow
P2	Pollution Prevention Plan
RFP	Request for Proposal
RTC	real time control
SEWPCC	South End Sewage Treatment Plant
SFD	single family dwelling
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 Background Information document provides an overview of the key considerations and historic reported changes of the CSO Master Plan. The information within this document is specific to the background information regarding the CSO annual report. For details about the changes and updates that have occurred for a particular year, refer to the corresponding year's annual report.

2. Combined Sewer Overflows

Combined sewer systems are sewers that are designed to collect both land drainage (rainwater and snowmelt) and wastewater (sewage from homes and businesses) in the same pipe. Most of the time, combined sewer systems transport all of the land drainage and wastewater to a sewage treatment plant, where it is treated and then discharged to the river. However, during periods of heavy rainfall or snowmelt, the additional volume in combined sewers systems can exceed the capacity of the sewer system. During these occasions, combined sewer systems are designed to overflow and discharge the excess volumes directly to the river without reaching the sewage treatment plant. These overflows, called combined sewer overflows (CSOs), contain not only land drainage, but also wastewater and debris.

Historically, combined sewers discharged directly to rivers. In the 1930s, diversion weirs were put in place to divert flows to the North End sewage treatment plant. The outfalls were retained to offer a level of protection against large wet weather events that could overload the system and result in basement flooding.

Combined sewers carry all of the wastewater flow to the sewage treatment plants during dry weather conditions. During periods of heavy rainfall or snowmelt, there is the potential for basement flooding due to high volumes of land drainage entering the sewer system. CSOs protect basements from flooding by relieving excess flow to the river.

About a third of the City's sewer system contains combined sewers. Typically, they were built before the 1960s and serve older areas of the city. Every time there is a CSO, there is a temporary discharge to the river of bacteria, floating debris, and organic material (nutrients). By reducing CSOs, we can do our part to help protect the health of our rivers and lakes.

3. Regulations

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.

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 4) 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.

On July 8, 2021, the Province requested the estimated increase and decrease in CSO volume as a result of small scale developments and infrastructure developments on the overall combined sewer system be documented in the annual report, see Appendix C. Refer to section 5.5 for further information.

4. CSO Master Plan History

Prior to establishment of the Federal and Provincial regulations summarized in Section 3, 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 .

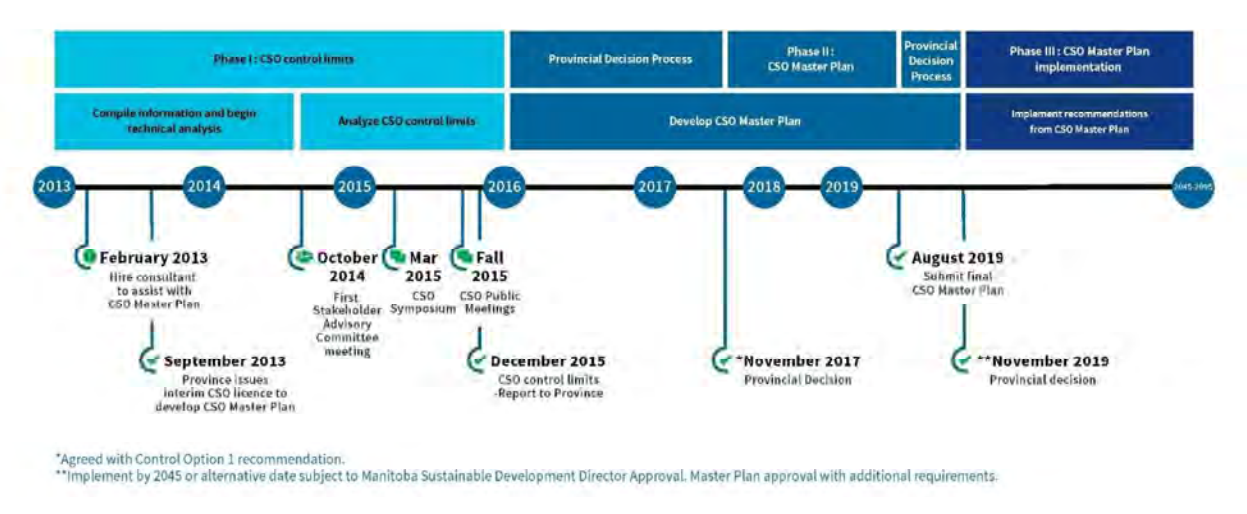


Figure 1 - CSO Master Plan Development Timeline

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

5. 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.

5.1. 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 estimate 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 what the model estimated and the observed instrumented

overflows. This information was used to identify instrument maintenance, model maintenance, and areas for operational improvement.

In 2019, the City upgraded the hydraulic model from sewer systems to an integrated catchment modelling platform software to utilize the hydraulic software's latest and advanced features. Changes and impacts resulting from the software conversion process were documented.

In 2020 and 2021, CSO instruments were installed in three additional outfall locations each year. In 2022, one additional outfall location was monitored. The permanent CSO instrumented locations increased from 39 to 46 locations of the total 76 CSO outfalls.

5.2. Design Basis

The Preliminary Proposal recommended the 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.

5.3. 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 the year 1992 would be a suitable rainfall year to be 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 determined that the year 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 year 1992 would form the representative year and would be utilized for planning and evaluation of current and future CSO performance.

5.4. 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 the 1992 Representative Year precipitation and river levels as the baseline condition for planning and evaluation of control options.

5.5. 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. Increases in wastewater from growth in population located within a combined sewer district is generally required to be offset with reductions in runoff area.

To demonstrate compliance with the licensing requirements, the City regulates the development process generally by requiring 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 was anticipated that there would be no impact in the combined sewer systems from new development. The CSO Master Plan projections account for an increase in sewage flow only in the separate sewer areas.

In 2020, the City started to use the CSO Master Plan to meet Clause 8 for small developments (e.g. single family and two family) by removing additional flows in the combined sewer areas. Strategic CSO mitigation projects from the CSO Master Plan will be used to offset any additional flows that may come from the small scale developments.

This aligns with the goals of OurWinnipeg and the Complete Communities Direction Strategy by enabling population growth in the intensification target area without costly on-site land drainage management. On July 8, 2021, the Province

requested that the City report on the estimated increase in volume of CSOs caused by small scale developments and the estimated decrease in volume as a result of infrastructure development on the overall combined sewer system on an annual basis. On June 7, 2022 and August 1, 2023, the Province requested a revision on how the estimated volumes are presented.

5.6. 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 infrastructure. Both green and grey infrastructure 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 and selection process. The first step of the review included an 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. Locations were verified with the City's GIS database, in terms of constructability and feasibility.

The second step of the 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.

5.7. 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 that 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 TP, 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, 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 be 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 City presented a proposed water quality monitoring plan to meet the 2024 requirements which was accepted by the Province in January 2023. See the accepted Water Quality Monitoring Plan.

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.

5.8. 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 precipitation information (1960 to 2012) was reviewed to understand precipitation trends and the impact climate change may have on the precipitation trends over time.

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 CSO 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 CSO 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, prioritizing sewer separation work 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.

5.9. 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.

5.9.1. 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 into 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.



Figure 3 - Screen Capture of the City Webpage

5.9.2. 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.

5.9.3. 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 indicated 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 would 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 was in the development phase between 2017 and 2021 to test it for reliability and accuracy of the CSO notification predictions. It is linked to the most current hydraulic model for the City of Winnipeg CS system, along with rainfall and outfall instrumentation data at each of the 46 of the 76 combined sewer outfalls. The City engaged with the Province in May 2022 and launched the enhanced public notification system in July 2022. The City of Winnipeg CSO Public Notification Tool notifies the public when a CSO is occurring and estimates its duration in near real-time. Further information related to the tool is available on the City of Winnipeg website:

https://legacy.winnipeg.ca/waterandwaste/sewage/csoNotification.stm.

5.10. Regulatory Engagement

The City worked closely with the Province to develop the CSO Master Plan. During the development phase of the 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.

5.11. 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.

6. 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**

7. 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 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 each contributing $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 with each contributing $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 requires 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 originally stated that if no additional funding was provided by the Provincial and Federal Governments by 2023 or earlier, the CSO Master Plan would move to the Program Scenario 3 which is based on City only funding and has a longer implementation timeline. The City is reviewing the budget needed so that the target capture can be met by the Provincial deadline of 2045.

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

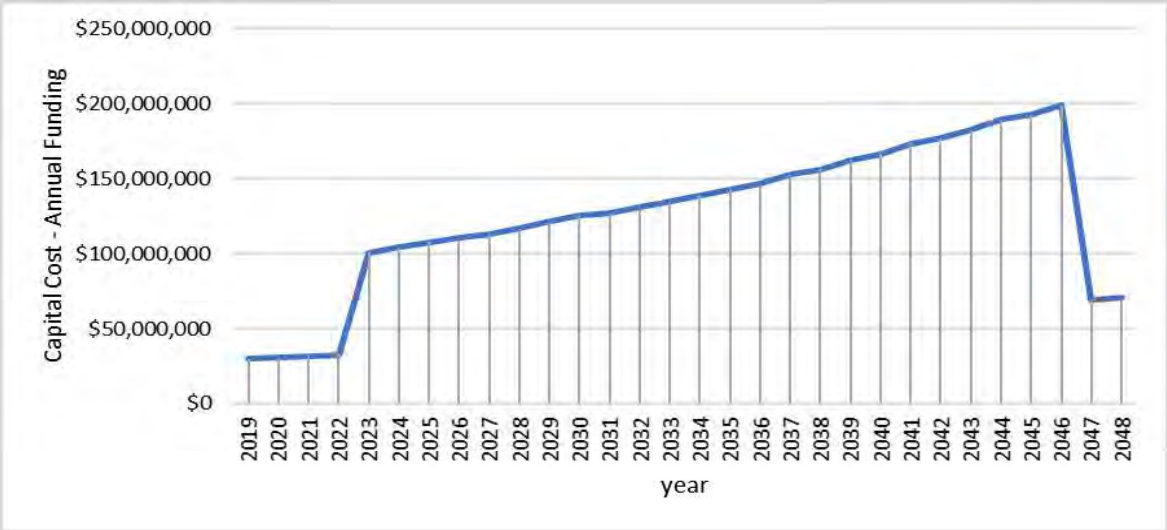


Figure 4 - CSO Master Plan Program Scenario 1 Capital Budget Inflated at Three Percent Annually

8. Design Development of Proposed Projects

The CSO Master Plan and the DEPs were 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.

9. 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 due to the high benefits and low risks. As cost escalation can have significant impacts to the cost of long-term programs, completing more expensive work upfront can reduce 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 buy-in from residential, commercial, and industrial customers to optimize opportunities. The analysis of the main technology evaluations and pilot studies are scheduled to be 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 solutions 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 of GI solutions.

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 scheduled to follow sewer separation work. In order to appropriately size and operate this type of infrastructure, sewer network, power, communications, monitoring, and operational infrastructure need to be in place to allow for a detailed understanding of network performance.

10. 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 D for the district Program Scenario 1 implementation schedule and Figure 6 for the high-level schedule which shows for the implementation strategy more clearly. Further details on the implementation can be found in the Master Plan (section 7) and within the annual report for updated information.

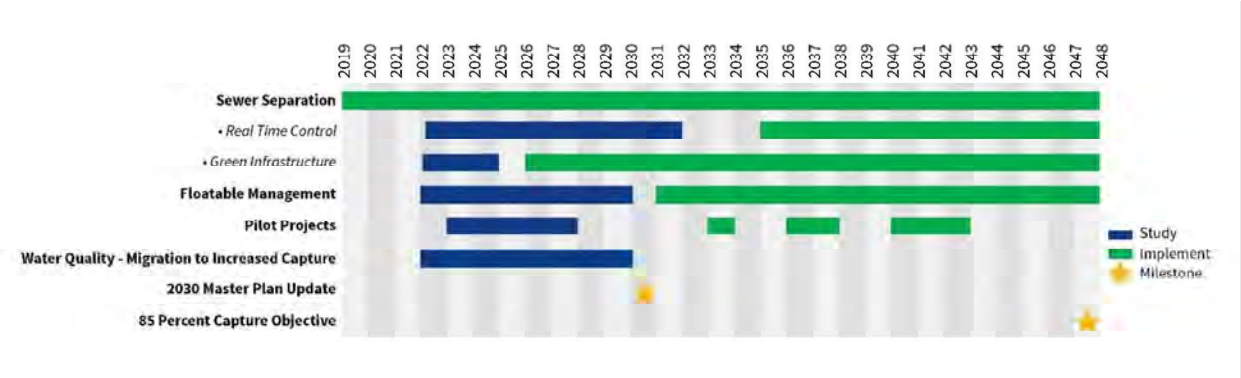


Figure 6 - CSO Master Plan Program Scenario 1 Overview Schedule

11. Capital Projects Overview

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

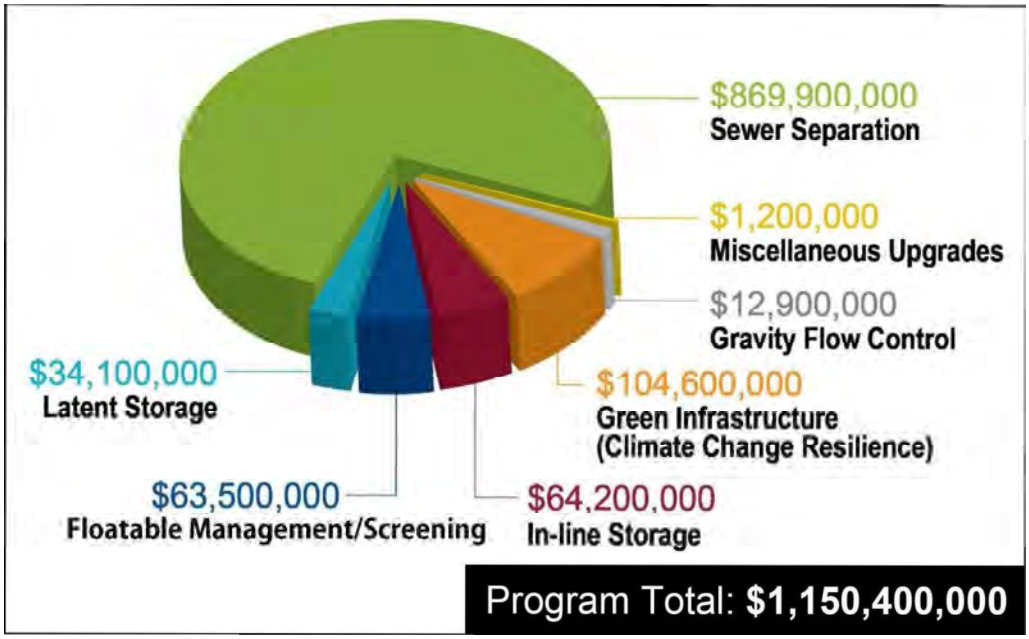


Figure 7 - CSO Master Plan Capital Cost Summary (2019 Dollars)

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

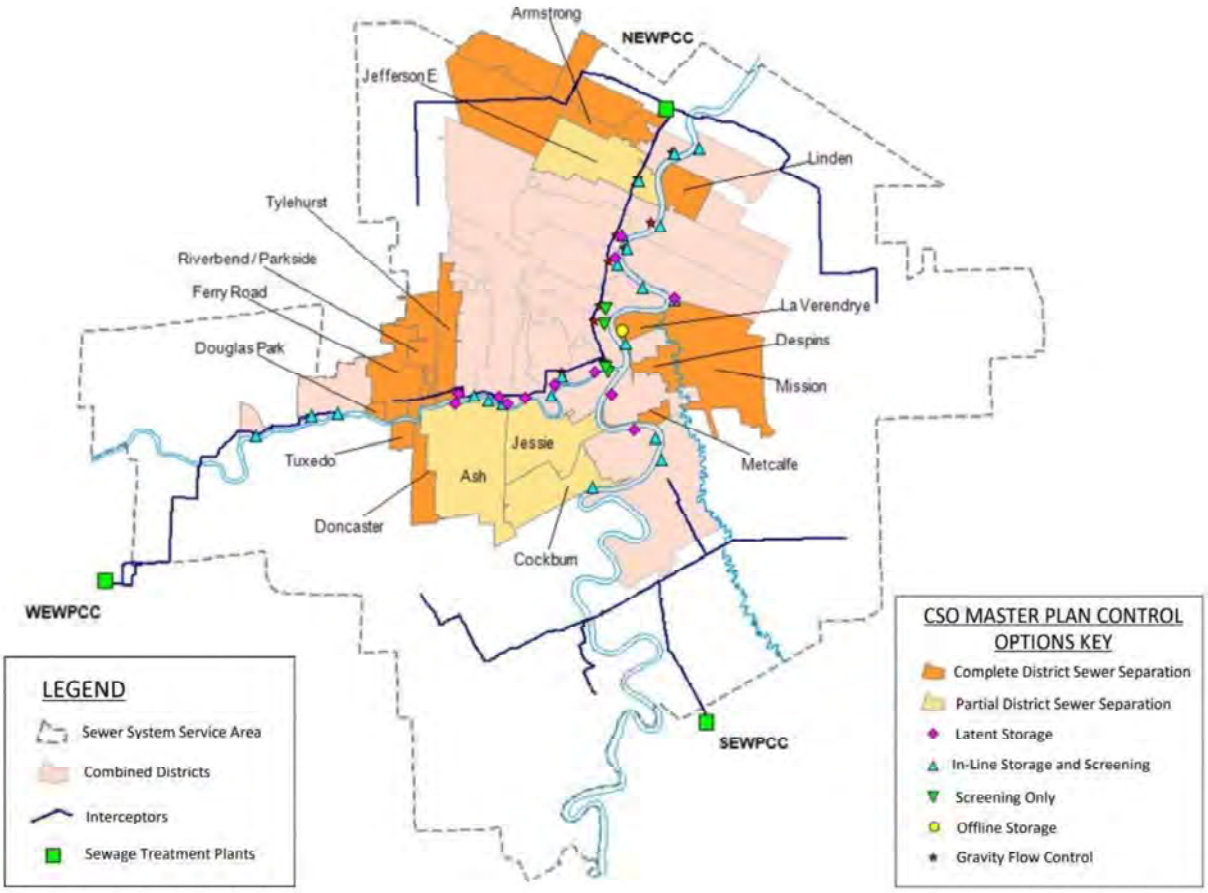


Figure 8 - CSO Master Plan Project Overview Map

12. Risks and Opportunities

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

12.1. Risks

Program Implementation

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 available allocated 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 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 the 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, City resources, 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.

City Resources: City resources will need to increase to achieve the new requirements and implement all components of the CSO Master Plan.

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 over time, 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 is comprised 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.

12.2. 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.

13. Other 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 are considered while delivering the CSO Master Plan.

13.1. OurWinnipeg

The OurWinnipeg 2045 Development Plan is the City's 25-year development plan that provides the vision, goals, and policies to increase the quality of life for all residents. It guides growth and change for the City to accommodate future residential growth in a sustainable manner. To support the successful delivery of the vision, Complete Communities 2.0 was developed.

The Complete Communities 2.0 is a direction strategy of OurWinnipeg. It is a city-wide secondary plan that guides growth, development, and land use in Winnipeg. With the population increase, the treatment and conveyance demand are also expected to increase. There is a demand for more capacity to service future population growth. The CSO Master Plan incorporates a 35-year design horizon into the design and planning of sewer infrastructure. It uses the City's Planning and Land Use Model (PLUM) forecast data to account for future development and population growth.

13.2. Pollution Prevention Plan and Sewer By-Law

The City has a Pollution Prevention Program 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
- Eliminating pollutants wherever possible by replacing products with more environmentally friendly products

Businesses that are a part of the Pollution Prevention Program are required to submit a Pollution Prevention (P2) 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 will perform inspections, collect samples, provide reviews, and approvals of the P2 Plans to ensure proper measures are in place to protect the environment.

The purpose of the City of Winnipeg Sewer By-Law is to protect public safety, the environment, and the City infrastructure by setting and regulating sewage discharge limits 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

14. References

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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.

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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 – 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:

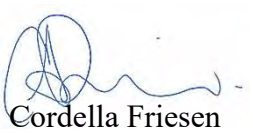
a) The Licencee shall submit for approval an outline of the content of the annual report as required by Clause 13 of the Licence by December 31, 2019;
b) The Licencee shall, prior to submission of the annual report, submit a monitoring plan for approval;
c) The Licencee shall include in the annual report 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 – Clause 8 Provincial Approval Letters

Winnipeg | Water and Waste
Eaux et déchets

April 19, 2020

Client File No.: 3205.00
Our File Nos S-734, S-734(A) EMS
020-17-08-11-00
020-17-08-11-0N

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

Attention: Yvonne Hawryliuk, MSc - Provincial Manager

RE: ENVIRONMENT ACT LICENCE NO. 3042 CLAUSE 8

This letter is in response to your March 18, 2021 letter requesting the City of Winnipeg (City) provide additional information that demonstrates compliance with Clause 8. Specifically, an estimated volume that small scale developments have increased to the combined sewer system and the estimated volume offset through various technology or infrastructure developments.

The City is providing this information below for the overall combined sewer shed.

It is estimated that a small scale development within a combined sewer district will increase the volume to the combined sewer system by approximately $1m^3$ for a 5 year rainfall event. A review of small scale developments since 2014 in combined sewer districts has been conducted and it has been determined that approximately 2800 have been accepted. From 2014 to 2020, small scale developments have increased the volume to the combined sewer system by approximately $2{,}800m^3$ for a 5 year rainfall event.

It is estimated that the sewer separation work completed up to 2020 in the Cockburn Calrossie combined sewer district has decreased the volume of land drainage to the combined sewer system by approximately $57{,}000m^3$ for a 5 year rainfall event.

This information will be submitted on an annual basis starting with the 2021 CSO Annual Report.

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

Sincerely,

M Paetkau

Michelle Paetkau, P. Eng.
Acting Branch Head for Wastewater Planning and Project Delivery

WASTEWATER SERVICES DIVISION
109-1199 Pacific Avenue, Winnipeg, Manitoba R3E 3S8
DIVISION DES EAUX USÉES
1199, avenue Pacific, Porte 109, Winnipeg (Manitoba) R3E 3S8

T. | Tél. : 204-986-7550
F. | Fax : 204-986-7193
winnipeg.ca



Tim Shanks, M. Eng., P. Eng.
Acting Manager of Engineering Services Division

MP/dr

c: Siobhan Burland Ross, M. Eng., P. Eng., Manitoba Conservation and Climate (email)
M.L. Geer, CPA, CA, Water and Waste Department (email)
T. Shanks, M. Eng., P. Eng., Water and Waste Department (email)
R. Grosselle, Water and Waste Department (email)
M. Paetkau, Water and Waste Department (email)
C. Carroll, Water and Waste Department (email)

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www.manitoba.ca

August 28, 2020

Client File: 3205.00
Licence No: 3042

Michelle Paetkau, P. Eng
Acting Branch Head
Wastewater Planning and Project Delivery
110-1199 Pacific Avenue
Winnipeg MB R3E 3S8
Email: mpaetkau@winnipeg.ca

Dear Michelle Paetkau:

RE: Combined Sewage Overflow (CSO) Environment Act Licence 3042
Application of Clause 8

This letter is in follow up to the meeting of February 27, 2020 between Manitoba Conservation and Climate and the Water and Waste Department, regarding the interpretation and application of Clause 8 of Environment Act Licence 3042.

It was agreed upon at the above meeting that the City of Winnipeg would provide Conservation and Climate with a document outlining the strategies and measures the City of Winnipeg will implement to comply with the requirements of Clause 8, namely that there be no increase in the frequency or volume of combined sewer overflows due to development. Conservation and Climate is yet to receive this document. Please submit to Environmental Compliance and Enforcement by September 30, 2020.

In addition, CC has received concerns from the public about how this clause is being applied in the Glenwood neighbourhood. In order to address the concerns and determine compliance, CC is requiring that the City of Winnipeg demonstrate how Clause 8 is being applied within that sewershed by providing supporting documents by September 11, 2020.

If you have any questions, please contact Julie Froese, Environment Officer, Environmental Compliance and Enforcement Branch at Julie.Froese@gov.mb.ca, or 204-945-7104.

Yours sincerely,

Yvonne Hawryliuk
Provincial Manager, Environmental Compliance and Enforcement

c: P. Coote, Water and Waste Department, City of Winnipeg
S. Burland Ross/ A. Dey, Environmental Approvals Branch
P. Crocker/ N. Suresh/ J. Froese, Environmental Compliance and Enforcement Branch

Winnipeg | Water and Waste
Eaux et déchets

December 21, 2020

Client File No.: 3205.00
Our File Nos S-734, S-734(A) EMS
020-17-08-11-00
020-17-08-11-0N

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

Attention: Yvonne Hawryliuk, Provincial Manager, Environmental Compliance and Enforcement

RE: ENVIRONMENT ACT LICENCE NO. 3042 CLAUSE 8

This letter is in response to your August 28, 2020 letter regarding the City of Winnipeg's (City) implementation strategies and measures to comply with Environment Act Licence No. 3042 Clause 8.

The City recommends using the Combined Sewer Overflow Master Plan (CSO Master Plan) to meet Clause 8 by removing wastewater and/or land drainage contributions from the combined sewer system from multiple areas of the City in order to offset any additional wastewater and/or land drainage contributions from small scale developments. This applies for the following small scale developments in combined sewer districts:

- New single-family dwellings which are replacing older, smaller homes built prior to 1990
    - Homes built prior to 1990 have weeping tiles connected to the sewer service pipe
- New two-family dwellings which are replacing older, smaller homes built prior to 1990
    - Homes built prior to 1990 have weeping tiles connected to the sewer service pipe
- Residential, commercial and industrial interior renovations/small additions
- New single-family and two-family dwellings on vacant land
- Lot splits, with new small scale development, where the original single-family or two-family dwelling remains

The current City of Winnipeg Sewer Bylaw 106/2018 does not require the restriction of a land drainage discharge rate for a single-family or two-family property on a lot with an area of less than 1,000 square metres (Part 9 Section 64(2)).

Increases in wastewater and/or land drainage contributions from the small scale developments identified above are proposed to be offset by sewer separation works in the CSO Master Plan. As previously stated, the City is currently constructing sewer separation works in the Cockburn Calrossie combined sewer district which will reduce combined sewer overflow volume by approximately 183,000 m3. The incremental contributions from the identified small scale

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developments is small and may not be measurable on a single development basis but will grow as this type of development continues.

If the CSO Master Plan is not utilized as a strategic approach to meet Clause 8 requirements, then property owners of these smaller developments will need to accommodate on-site land drainage management to meet Clause 8. On-site land drainage management may limit development and the City's desire to densify older neighbourhoods by adding complexity to the proposed development (e.g. underground storage tank or catch basin leads with above ground storage) and maintenance for the prospective owners.

Larger scale developments in combined sewer districts will continue to comply with Clause 8 via land drainage discharge restrictions in order to offset increased wastewater contributions.

Regarding public engagement, the Department provided information to a representative of the Glenwood Neighbourhood Association via email. There were no registered delegations at the City's Standing Policy Committee on Water and Waste, Riverbank Management, and the Environment meeting on December 1, 2020. The Department is not aware of any other residential enquiries.

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

Sincerely,



Michelle Paetkau, P. Eng.
Acting Branch Head for Wastewater Planning and Project Delivery



Geoff Patton, P. Eng.
Manager of Engineering Services Division

MP/dr

c: Siobhan Burland Ross, M. Eng., P. Eng., Manitoba Conservation and Climate (email)
M.L. Geer, CPA, CA, Water and Waste Department (email)
G.K. Patton, P. Eng., Water and Waste Department (email)
R. Grosselle, Water and Waste Department (email)
M. Paetkau, Water and Waste Department (email)
Chris Carroll, Water and Waste Department (email)

Manitoba
Conservation and Climate
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March 18, 2021

File No.: 3205.00
Licence No.: 3042

Michelle Paetkau, P. Eng., Acting Branch Head
Wastewater Planning and Project Delivery
110-1199 Pacific Avenue
Winnipeg MB R3E 3S8
Email: mpaetkau@winnipeg.ca

Dear Michelle Paetkau:

RE: Combined Sewage Overflow (CSO) Environment Act Licence 3042
Application of Clause 8

Manitoba Conservation and Climate, Environmental Compliance and Enforcement Branch acknowledges the receipt of your letter, dated December 21, 2020 in response to Manitoba Conservation and Climate's letter dated August 28, 2020 on the above subject.

Manitoba Conservation and Climate has reviewed the information provided and has determined to fully assess compliance with Clause 8 that additional information is required. Specifically, an estimated volume that developments have increased flows to CSO and the estimated volume offset through various technology or infrastructure developments is required. Manitoba Conservation and Climate is requesting that the above information be provided by April 19, 2021. The information can be provided by sewer district, or for the overall sewershed.

Going forward, this information will be required to be submitted on an annual basis. CSO Annual report outline was initially approved on January 17, 2020. This approval is hereby amended to include the above requested information starting within the 2021 CSO Annual report.

If you have any questions, please contact Julie Froese, Environment Officer, Environmental Compliance and Enforcement Branch at Julie.Froese@gov.mb.ca, or 204-945-7104.

Yours sincerely,

Kristal Harman
Director, Environmental Compliance and Enforcement

c: Geoff Patton, P. Eng., Manager of Engineering Services Division
P. Coote, Water and Waste Department, City of Winnipeg
S. Burland Ross/ A. Dey, Environmental Approvals Branch
N. Suresh/J. Froese, Environmental Compliance and Enforcement Branch

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File No.: 3205.10

July 8, 2021

Michelle Paetkau, P. Eng.
Acting Branch Head
Wastewater Planning and Project Delivery
110-1199 Pacific Avenue
Winnipeg MB R3E 3S8
Email: mpaetkau@winnipeg.ca

Dear Michelle Paetkau:

This will acknowledge receipt of your letter dated April 19, 2021, in response to our March 18, 2021, letter requesting clarification on your December 21, 2020, submission.

Conservation and Climate has reviewed all the information provided on the estimated increase in volume of Combined Sewer Overflows caused by infill developments and the estimated decrease in volume as a result of infrastructure development on the overall Combined Sewer system, and has determined it satisfies the intent set out in Clause 8 of Environment Act Licence No. 3042. Future compliance with respect to Clause 8 will be assessed through our review of the information provided in the Combined Sewer Overflow (CSO) Annual Reports, starting with 2021 as requested in our March 18, 2021 letter.

As per your letter dated December 21, 2020, the City's strategy to meet Clause 8 provides offsets by sewer separation projects being completed under the CSO Master Plan for the following: increases in wastewater and/or land drainage contributions from new single and two family dwellings replacing older homes; renovations and small additions for residential, industrial, and commercial properties; and new homes on vacant land and lot splits with small scale development where the existing building remains. Further, you have also stated that larger scale developments in combined sewer districts will continue to comply with Clause 8 via land drainage discharges restriction in order to offset increased wastewater contributions.

In addition, Conservation and Climate wishes to confirm that the proposed strategy regarding small development compliance with Clause 8 applies to the overall combined sewer district for the purpose of interpretation of the above Environment Act Licence. It should be noted that the city and Conservation and Climate are of the same understanding regarding the interpretation of 'sewershed' as the overall combined sewer district and using the CSO Master Plan to achieve the Clause 8 requirements as per the deliberations at the recent CSO Milestone meeting held on May 10, 2021. The City should continue to review developments on a case by case basis to enforce compliance with Clause 8 at the broad sewershed level, the CSO Master Plan and other City standards (e.g. Sewer-By-Law, Basement Flood Relief, etc.) as required.

If you have any questions, please contact Yvonne Hawryliuk, Provincial Manager, Environmental Compliance and Enforcement Branch, at Yvonne.Hawryliuk@gov.mb.ca or 204-945-5305.

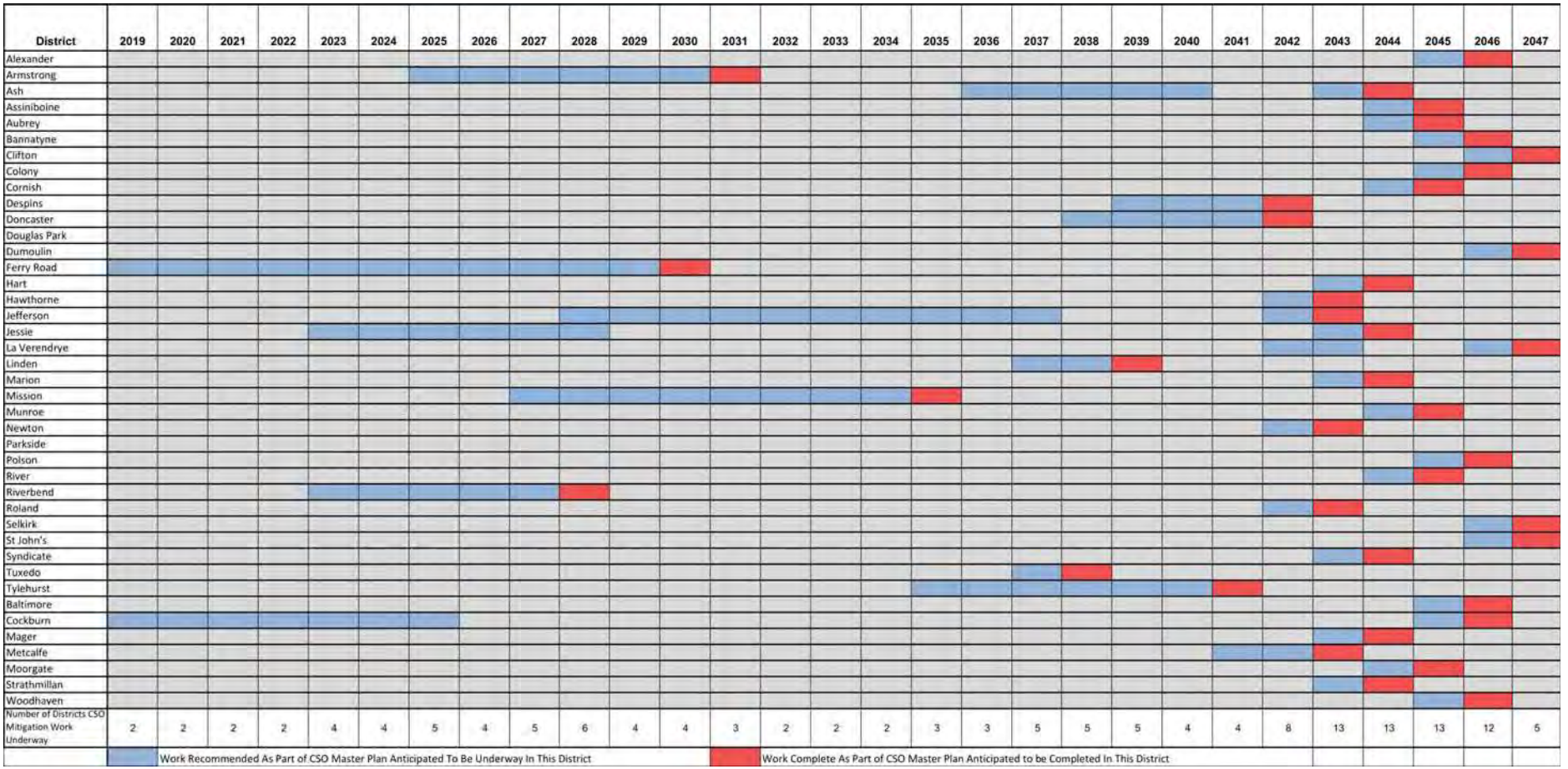
Sincerely,



Kristal Harman, Director
Environmental Compliance and Enforcement

c: Y. Hawryliuk/N. Suresh/J. Froese, Environmental Compliance and Enforcement Branch
L. Pyles/S. Burland Ross/ B. Assefa, Environmental Approvals Branch
G. Patton, P. Eng., Manager of Engineering Services Division
M.L. Geer, CPA, CA, Water and Waste Department
R. Grosselle, Water and Waste Department
C. Carroll, Water and Waste Department
P. Coote, Water and Waste Department, City of Winnipeg

Appendix D – District Program Scenario 1 Implementation Schedule



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

Appendix B – 2024 Ongoing / Completed Capital Projects

2024 Ongoing / Completed Capital Projects

Project Name	District	Contract #	Project Type	Description	Class of Estimate	Baseline Budget	Committed Cost	Targeted Completion Date	Actual Completion Date	Volume Reduction (m3)	Comments
NEWPCC											
Ferry Road / Riverbend - Consultant Assignment 5	Ferry Road / Riverbend	439-2010	Sewer Separation	Consulting Services for completing Preliminary for the district and undertaking Detailed Design and Contract Administrator construction contracts	Class 3	$2,500,000	$2,750,000	2030	TBD	N/A	Ongoing
Jefferson East - Consultant Assignment 3	Jefferson East	440-2010	Sewer Separation	Professional Consulting Services for Detailed Design and Contract Administrator construction Contracts #6 to #10 for the Jefferson East Combined Sewer District.	Class 3	$2,500,000	$3,500,000	2025	TBD	N/A	Ongoing
Jefferson East - Construction Contract 6B	Jefferson East	863-2021	Sewer Separation	Sewer separation and land drainage connection from Salter to Main Street at Burrin Avenue, Belmont Avenue, Hartford Avenue and Perth Avenue, and from Burrin Avenue to Hartford Avenue at Aikins Street	Class 3	$3,000,000	$2,100,000	2023	TBD	32,385 between C6A and C6B	Ongoing
Jefferson East - Construction Contract 7A	Jefferson East	556-2022	Sewer Separation	Connection and constructions of land drainage sewers on Salter Street from Semple Avenue to Jefferson Avenue, and on Kilbride Avenue, Belmont Avenue, Hartford Avenue and Perth Avenue from Powers Street to Aikins Street	Class 3	$5,000,000	$4,400,000	2023	TBD	13,879	Ongoing C7 has been separated into C7A and C7B
Jefferson East - Construction Contract 9	Jefferson East	332-2023	Sewer Separation	Construction of land drainage sewers on McGregor Street from Partridge Avenue to Semple Avenue. Forest Avenue, Royal, Kingsbury , Burrin Avenue from CNR Railway to Andrews Street	Class 3	$3,000,000	$3,500,000	2025	TBD	12,619	Ongoing
Armstrong - Consultant Assignment 1	Armstrong	943-2020	Sewer Separation	Professional Consulting Services for Armstrong Combined Sewer District Preliminary Design	Class 3	$3,000,000	$1,500,000	2023	TBD	N/A	Ongoing
Hawthorne - Consulting Assignment 1	Hawthorne	802-2022	Basement Flood Relief	Professional Consulting Services for McLeod Creek Drainage Improvements	Class 3	$1,000,000	$425,000	2023	TBD	N/A	Ongoing

Project Name	District	Contract #	Project Type	Description	Class of Estimate	Baseline Budget	Committed Cost	Targeted Completion Date	Actual Completion Date	Volume Reduction (m3)	Comments
Hawthorne - Construction Contract 1	Hawthorne	350-2023	Sewer Separation	McLeod Creek Drainage Improvements, combined sewer separation is also being completed along Kildonan Drive and Irving Place	Class 3	$4,000,000	$5,300,000	2024	TBD	TBD	Ongoing
St Johns (Redwood) Consultant Assignment 1	St John's	528-2021	Sewer Separation	Professional Consulting Services for 2022 Redwood Reconstruction Project	Class 3	$80,000	$78,000	2023	TBD	N/A	Ongoing
St Johns (Redwood) Construction Contract 1	St John's	453-2022	Sewer Separation	New LDS Redwood Ave to Salter Street and Redwood Ave to Charles Street	Class 3	$700,000	$1,100,000	2025	TBD	N/A	Ongoing
Mager Construction Contract 1	Mager	BO 541-2022	Sewer Separation	Extending a land drainage sewer along Des Meurons St, Guay Av and the back lane of Guay Av/Fifth Av. Installing new catch basins along the back lane of Guay Av/Fifth Av	Class 3	$294,675	$280,000	2024	TBD	N/A	Ongoing
SEWPCC											
Cockburn / Calrossie - Consultant Assignment 5 / Over Expenditure	Cockburn / Calrossie	441-2010	Sewer Separation	Professional Consulting Services for Detailed Design and Dontract Administration Services for Phase 5 of the Cockburn and Calrossie Combined Sewer Relief Works	Class 3	$2,100,000	$2,200,000	2025	TBD	N/A	Ongoing
Cockburn / Calrossie - Construction Contract 6B	Cockburn / Calrossie	212-2020	Sewer Separation	Sewer separation and new land drainage system will be installed at Carter Avenue and Weatherdon Avenuebetween Stafford Street and Pembina Highway, Wentworth Street, Lilac Street and Arbuthnot Street	Class 3	$9,000,000	$5,300,000	2022	TBD	4,385	Ongoing
Cockburn / Calrossie - Construction Contract 7	Cockburn / Calrossie	537-2021	Sewer Separation	Sewer separation and new land drainage system will be installed at Harrow Street, Grant Avenue, Weatherdon Avenue, Carter Avenue, Hector Avenue, Ebby Avenue, Harrow Street E, and Sparling Avenue	Class 3	$8,500,000	$6,900,000	2022	TBD	9,813	Ongoing
Cockburn / Calrossie - Construction Contract 9a	Cockburn / Calrossie	104-2023	Sewer Separation	Construction of land drainage sewers on Taylor Avenue from Wilton Street to Poseidon Bay	Class 3	$9,000,000	$12,899,240	2025	TBD	13,542 between C9A and C9B	Ongoing

Project Name	District	Contract #	Project Type	Description	Class of Estimate	Baseline Budget	Committed Cost	Targeted Completion Date	Actual Completion Date	Volume Reduction (m3)	Comments
Overall System											
River, Stream and Combined Sewer Overflow Discharge Water Quality Monitoring	N/A	949-2022	Water Quality Monitoring	River, Stream & CSO Discharge WQ Monitoring	Class 3	$1,300,000	$900,000	2024	TBD	N/A	Ongoing
Flow Monitoring Program Instrumentation Supply	N/A	817-2019 Ext 1	Flow Monitoring Program	Supply and delivery of wireless portable area velocity sewer flow meters from Aug 1, 2021 to July 31, 2023	N/A	$80,000	$76,000	2023	TBD	N/A	Ongoing
Flow Monitoring Program Instrumentation Supply	N/A	817-2019 Ext 2	Flow Monitoring Program	Supply and delivery of wireless portable area velocity sewer flow meters from Aug 1, 2021 to July 31, 2024	N/A	$125,000	$214,000	2023	TBD	N/A	Ongoing
Rainfall Monitoring Program – Annual Provision, Installation, Data Hosting and Maintenance	N/A	910-2021 Ext 1	Rainfall Monitoring Program	Provision, Installation, Data Hosting and Maintenance for a Rainfall Network Service from May 1, 2023 to March 31, 2024	Class 3	$77,678	$96,000	N/A	N/A	N/A	Annual

Estimated values

Committed costs are subject to change as projects progress

Note:

1) All costs are rounded to the nearest relevant whole number
2) The table includes the list of projects that were either in progress or completed in the year of 2023. The list of historic projects is referenced in the past CSO Annual Reports.

Appendix C – Provincial Letter on Previous Year's Annual Report

Manitoba
Environment and Climate
Environmental Compliance and Enforcement
Box 36, 14 Fultz Blvd.
Winnipeg MB R3Y 0L6
T 204-945-71
ECEBranch@gov.mb.ca

Client File: 3205.10

August 1, 2023

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:

RE: Combined Sewer Overflow (CSO) 2022 Annual Report

Environment and Climate reviewed the 2022 Combined Sewer Overflow (CSO) Annual Report, dated March 31, 2023, which was submitted as per the requirements of Clause 13 of Environment Act Licence No. 3042.

The department has noted the following during the review:

1. CSO percent capture remained at 75% in 2022.
2. A Request for Proposal (RFP) was issued in January 2023 for the proposed water quality monitoring and sampling that will occur in the 2023 open water season.
3. Increased the number of CSO instrumented locations from 45 to 46.
4. There is a significant increase in 2022 for both the number of CSO events and overall CSO volume. There were 2,046 CSO events with an estimated sewage discharge of 27,524ML.
5. Seven CSO-related projects were awarded in 2022 according to Table 8.
6. Four sewer separation-related capital projects were completed on Ferry Road, Jefferson East, and Cockburn Sewer Districts. There were seven ongoing sewer separation projects.
7. Ten capital projects on sewer separation and basement flood relief are planned to be awarded in 2023 according to Table 9. It is also noted that Table 9 is erroneously titled “2022 Planned Project Milestones” instead of “2023 Planned Projects Milestones”.
8. Sewer separation and new land drainage sewers were installed along Main Street between Kingsbury Avenue and Jefferson Avenue. According to sewer separation projects in progress, the Jefferson East sewer separation project will result in an estimated 46,264m^3 and Cockburn/Calrossie sewer separation project will result in an estimated 14,198m^3 in volume reduction, once they are completed.

…2

9. In 2022, there was an estimated cumulative increase of 1,140m^3 of Combined Sewer volume resulting from small-scale developments. However, no details were provided on the impacts of large-scale developments.
10. Based on completed sewer separation work as outlined in Table 16, the net effect of the cumulative reduction in Combined Sewer volume since 2014 is now 51,936m^3 down from 53,076m^3 last year as the cumulative increase of 1,140m^3 of Combined Sewer volume resulting from small-scale developments is deducted. However, it is noted according to Table 17, this same volume is again deducted from CSO volume reduction gained from sewer separation work in progress for this component too.
11. It is noted that projects used to offset increases in CSO volumes due to developments to comply with clause 8 requirements are also included in the overall percent capture calculations within the report. These projects must be excluded from the overall percent capture calculation.
12. The web-based Public Notification system provides up-to-date information on current and forecasted CSO events. It was available to the public July 2022.
13. In 2022, additional Green Infrastructure project opportunities were reviewed in the Armstrong Preliminary Design report.
14. The report indicates that the project requires funding support from both provincial and federal governments by 2023 to comply with the 2045 deadline. However, the report does not state whether funding requests were made to provincial and federal governments. The City of Winnipeg is responsible for securing the necessary funding and to comply with the 2045 deadline.

Projects used to offset increases in CSO volumes due to new developments in order to comply with clause 8 requirements cannot be included in the overall percent capture calculations. Double counting must be avoided.

The CSO annual report is intended to demonstrate the progress made over the preceding year. The 2022 report was more focused on the progress made in the reporting year than previous reports. It is Environment and Climate's expectation that future submissions of annual reports will continue to be drafted to provide highlights of the progress made in the previous year.

If you have any questions, please contact Sonja Bridges, A/Regional Supervisor at 204-918-4271, or by email: Sonja.Bridges@gov.mb.ca

Yours sincerely,



Yvonne Hawryliuk
A/Director

c. Michael A. Jack, CAO, City of Winnipeg
Cynthia Wiebe, Renee Grosselle, Susan Lambert, Michelle Paetkau, Water & Waste Department, City of Winnipeg
Nicole Armstrong, Joy Kennedy, Water Science & Watershed Management
Agnes Wittmann, Siobhan Burland Ross, Rob Boswick, Environmental Approvals Branch
Nada Suresh, Sonja Bridges, Environmental Compliance and Enforcement Branch
Public Registry

Appendix D – Previous Year's Record of Meeting Minutes

Meeting Minutes

2022 Annual CSO Report Milestone Meeting

Date of Meeting:	May 5, 2023	**Time of Meeting:**	2:00 PM
Meeting Location:	Microsoft Teams	**Minutes Issued:**	May 17, 2023

Meeting Type/Purpose: 2022 Annual Combined Sewer Overflow (CSO) Report Presentation to the Province

Project File No.: S-734

Chairperson: Patrick Coote

Recorder: Selina Leung

Attendees

Name & Intials	Title	Organization
Eshetu Beshada (EB)	Senior Environmental Engineer	MB Environment & Climate | Environmental Approvals
Robert Boswick (BW)	Senior Environmental Engineer	MB Environment & Climate | Environmental Approvals
Sonja Bridges (SB)	Acting Regional Supervisor	MB Environment & Climate | Environment Compliance & Enforcement
Julie Froese (JF)	Environment Officer	MB Environment & Climate | Environment Compliance & Enforcement
Joy Kennedy (JK)	Water Quality Specialist	MB Environment & Climate - Water Science & Watershed Management
Kaitlin Sawisky (KS)	Environment Officer	MB Environment & Climate | Environment Compliance & Enforcement
Nada Suresh (NS)	Acting Provincial Manager	MB Environment & Climate | Environment Compliance & Enforcement
Patrick Coote (PTC)	Senior Project Engineer	City of Winnipeg | Water & Waste | Engineering Division
Florence Lee (FL)	Project Engineer	City of Winnipeg | Water & Waste | Engineering Division
Selina Leung (SML)	Engineer Designate	City of Winnipeg | Water & Waste | Engineering Division
Jennilee Marcial (JKM)	Administrative Assistant	City of Winnipeg | Water & Waste | Engineering Division
Michelle Paetkau (MP)	Acting Wastewater Planning and Project Delivery Branch Head	City of Winnipeg | Water & Waste | Engineering Division
Cynthia Wiebe (CW)	Manager of Engineering	City of Winnipeg | Water & Waste | Engineering Division

Regrets

Name	Title	Organization
Bereket Assefa (BA)	Senior Environmental Engineer	MB Environment & Climate | Environmental Approvals
Yvonne Hawryliuk (YH)	Acting Director	MB Environment & Climate | Environment Compliance & Enforcement

Meeting Minutes

2022 Annual CSO Report Milestone Meeting

Kelly-Anne Richmond (KAR)	Manager, Water Quality Management	MB Environment & Climate | Water Science & Watershed Management
Siobhan BurlandRoss (SBR)	Engineering Manager, Industrial & Wastewater	MB Environment & Climate | Environmental Approvals

Item	Description	Action By

City of Winnipeg Treaty Acknowledgement:

I would like to acknowledge that we are in Treaty One Territory, the home and traditional lands of the Anishinaabe (Ojibwe), Ininew (Cree), and Dakota peoples, and in the National Homeland of the Red River Métis. Our drinking water comes from Shoal Lake 40 First Nation, in Treaty Three Territory.

1.0	Introduction & Presentation	Action By
1.1	2022 Annual CSO Report Presentation was provided to MB Environment & Climate. The presentation is attached to these meeting minutes.	PTC/FL

2.0	Report Questions	Action By
2.1	Clause 8: JF inquired if the City could provide more information on Clause 8. MP advised that the report tables are public facing and could be improved by using plain language. CW advised that technical language can be provided in an appendix so that plain language can be used in the body of the report.	City
2.2	Table 16: JF expressed that the column “Yearly Decrease in Combined Sewer Volume” may be misinterpreted by the public as it states there is no decrease and asked if the results were due to modelling work not being completed over the past year. MP/PTC advised that it is a combination of no modelling work completed in 2022 and the completed contracts not resulting in volume reduction.	N/A
2.3	Table 17: NS inquired why there was no volume reduction in 2022 for the “Cumulative Decrease in Combined Sewer Volume” column. MP explained that work is done on larger sewer trunks first and volume reductions are not apparent until smaller connections connected to the larger sewer trunks are in service. Slide 36 of the presentation “Progress to date” visually shows the lag seen in volume reduction due to the nature of this sewer work. NS and RB suggested to include a footnote or a column about added benefits which would show that work was still completed in the reporting year.	City
2.4	Data for Tables 16 & 17: MP advised that the City uses validated and unvalidated and asked the Province if there was a preference for the type of data used for Tables 16 & 17. This may make information clearer to the reader. The Province will discuss and advise.	Province

2.0	Report Questions	Action By
2.5	Green Infrastructure (GI): JF asked if the City could provide more information on the progress of GI. PTC explained that there was not a large amount of construction work completed in 2022. However, GI opportunities were reviewed using an opportunity matrix and the feasibility of the 3 proposed GIs located along Leila and McGregor. The GI plans for these locations will be included in the Preliminary Design for Armstrong and will be followed throughout the project. MP advised that despite the lack of construction there was a significant amount of planning work completed. Follow-up flow monitoring work was completed for strata cells in the Northeast exchange that were previously installed so that data over time could be analyzed to understand the effect of this GI. There are potential plans to install strata cells on Broadway which is in a CSO district but this work is budgeted from Federal funding.	N/A

3.0	Presentation Questions	Action By
3.1	Slide 35 “Comparing actual vs 1992 Design Year” Value Boxes: JK inquired what the values in the boxes on slide 35 represented and which lines the values are supposed to be dropping down from. FL advised the values represent the volume reduction required to go from the Representative Year Performance - Maintained Model value (green line) to the targeted values. The CSO MP 85% Volume Target Reduction (dotted purple line) would be a 2,130 ML reduction from the Representative Year Performance – Maintained Model (green line). The CSO MP Overflow Equivalent Volume Target Reduction (dotted black line) would be a 4,650 ML reduction from the Representative Year Performance – Maintained Model (green line).	N/A
3.2	Slide 35 “Comparing actual vs 1992 Design Year” Difference between Actual Performance and Targets: JK asked if the difference between the Actual Performance (red line) and the Targets (dotted purple and black lines) could be provided and suggested to include them in next year’s presentation. FL advised that the actual performance cannot be compared directly against the targets as the targets are based on the inputs from the 1992 Representative Year whereas the actual performance is based on annual conditions which vary from year to year. CW advised that the City could provide this value but it would be a point-in-time value and would vary every year. PTC explained that the City consistently compares the 1992 Design Year performance to the Target reductions because comparing to the actual year’s performance would be too variable to consistently compare due to the environmental differences that occur each year. It is worth noting that the current year modeling values are conservative.	City
3.3	Slide 39 “Water Quality Monitoring”: City seeking Provincial agreement and approval for proposed on-site measurement of pH. City will follow up with the Province on this request	City

4.0	City Inquiries to the Province	Action By
4.1	Quarterly CSO Reporting: PTC asked if the Province could review if quarterly reporting is still necessary now that the Public Notification tool is live and providing overflow information. Raw data that is provided in the quarterly report gets further validated for the annual report. NS advised that the Province would review and provide clarification on if quarterly reporting will continue to be required.	Province
4.2	Administrative Assistant Provincial Contacts: JKM asked if she could be connected with administrative assistants from the Province to correspond with to ensure the City receives up-	City

4.0	City Inquiries to the Province	Action By
	to-date information regarding any position/role changes. NS requested that an email be sent so that the contact information could be provided.	

Meeting adjourned at: 3: 15 PM

Report any errors or omissions in the meeting minutes within **3 business days** to Jennilee Marcial by e-mail at jmarcial@winnipeg.ca, otherwise these minutes are considered accurate and accepted.

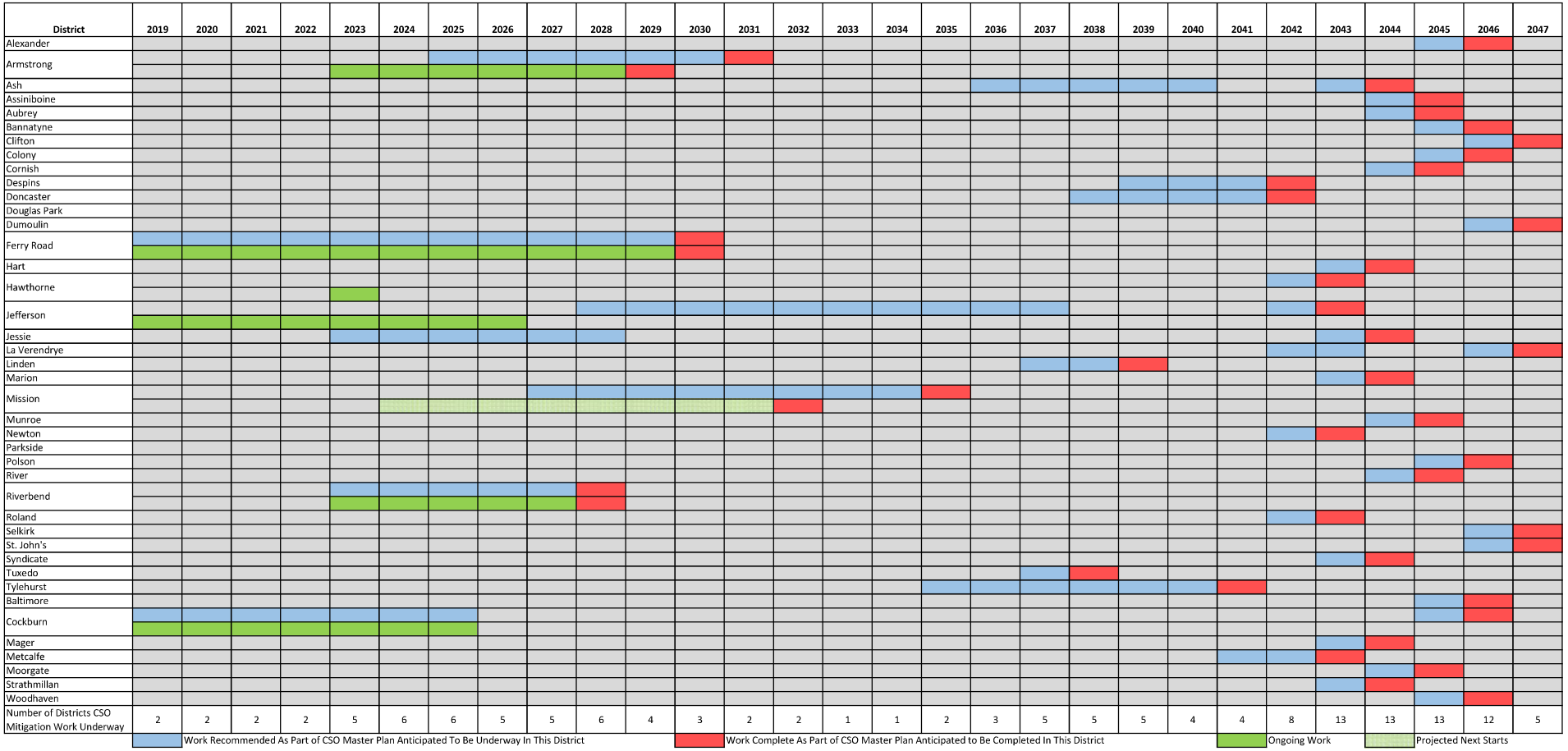
Attachment(s):
- 2022 CSO Annual Report Overview PowerPoint Presentation

Distribution

- Attendees
- Regrets

Appendix E - CSO Master Plan Program Tracking

2019 CSO Master Plan and Actual Implementation Schedule					
		Current Year	Forecasted Schedule		
District	Schedule Type	2023	2024	2025	2026
Ferry Road	MP				
	Actual				
Cockburn	MP				
	Actual				
Jefferson East	MP				
	Actual				
Armstrong	MP				
	Actual				
Hawthorne	MP				
	Actual				
St John's	MP				
	Actual				
	Construction implementation to be underw ay as per CSO Master Plan				
	Actual status as per 2023 Year End Evaluation and actual forcasted				



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

*Updated to reflect ongoing and project work as per Fall 2023

Appendix F - District Plans Design Status

District Plans Design Status

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

	Completion Progress			
Baltimore				
Syndicate				
Newton				
Alexander				
Woodhaven				
Cornish				
Selkirk				
Polson				

Progress update as of December 31, 2023

The shaded cells represent the amount of work that has been completed.

Appendix G - 2024 Planned Capital Projects

2024 Planned Capital Projects

Project Name	District	Project Type	Class of Estimate	Forecasted Budget	Volume Reduction (m3)
NEWPCC					
Ferry Road / Riverbend - Construction Contract 6A Rutland Trunk - Rutland St (Assiniboine River to Silver Ave)	Ferry Road / Riverbend	Sewer Separation	Class 3	$65,700,000	TBD
Jefferson East Construction Contract 7B - Royal Avenue - Aikens St - Semple Ave - Andrews Street	Jefferson East	Sewer Separation	Class 3	$3,200,000	TBD
Jefferson East Construction Contract 8A - Construction of land drainage sewers on Andrews Street from Semple Avenue to Perth Avenue. Kilbride, Belmont, Hartford Avenue from McGregor Street to Powers Street.	Jefferson East	Sewer Separation	Class 3	$2,500,000	9,143
Armstrong - Consultant Assignment 2 - Detailed Design	Armstrong	Sewer Separation	Class 3	$3,000,000	N/A
Armstrong - Construction Contract 1	Armstrong	Sewer Separation	Class 3	$21,000,000	TBD
SEWPCC					
Cockburn / Calrossie - Construction Contract 9b - land drainage sewers on Poseidon Bay from Taylor Avenue to Grant Avenue	Cockburn / Calrossie	Sewer Separation	Class 3	$2,800,000	13,542 between C9A and C9B
Cockburn / Calrossie - Construction Contract 13 - Hector Ave, Hector Bay W, Hector Bay, Nathaniel St	Cockburn	Sewer Separation	Class 3	$5,600,000	4,387
Cockburn East - Consultant Assignment 1	Cockburn	Sewer Separation	Class 3	$2,700,000	N/A
Overall System					
Rainfall Monitoring Program – Operation and Maintenance	N/A	Rainfall Monitoring Program	Class 3	$130,000	N/A
Laboratory Upgrades	N/A	Stratigic Infrastructure	Class 3	$2,000,000	N/A
CSO Percent capture Assessment	N/A	Study	Class 5	$2,500,000	N/A
Note: The status of the planned contracts is subject to change pending available budget and resources.					
	Estimated values				

Appendix H – Small Scale Development Runoff Estimate Tables

Pre and Post Development Land Drainage Runoff Flow Estimate Example 1 for Two Duplexes

SFD to 2 duplexes						
Lot	**"C"-value**	**Existing**	**Post Lot 2**	**Post Lot 1**	**Post Total**	**Increase**
Total Area		557 m^2	279 m^2	279 m^2	557 m^2	
Building and Paved Area	0.9	180 m^2	120 m^2	140 m^2	260 m^2	
Gravel Area	0.5	0 m^2	0 m^2	0 m^2	0 m^2	
Pervious Area	0.1	377 m^2	159 m^2	139 m^2	297 m^2	
Weighted C-value		0.36	0.44	0.50	0.47	
Storage		21.7 m3			22.4 m3	0.7 m3
Q_{stm}		**6.1 L/s**	**3.8 L/s**	**4.3 L/s**	**8.0 L/s**	**32.07%**

Note: Q uses t_c of 10 min and intesity of 109.5 mm/hr

Note: Storage is for a 5 year event

Pre and Post Development Land Drainage Runoff Flow Estimate Example 2 for Two Duplexes

SFD to 2 duplexes						
Lot	**"C"-value**	**Existing**	**Post Lot 2**	**Post Lot 1**	**Post Total**	**Increase**
Total Area		557 m^2	279 m^2	279 m^2	557 m^2	
Building and Paved Area	0.9	130 m^2	150 m^2	150 m^2	300 m^2	
Gravel Area	0.5	0 m^2	0 m^2	0 m^2	0 m^2	
Pervious Area	0.1	427 m^2	129 m^2	129 m^2	257 m^2	
Weighted C-value		0.29	0.53	0.53	0.53	
Storage		21.3 m3			22.8 m3	1.5 m3
Q_{stm}		**4.9 L/s**	**4.5 L/s**	**4.5 L/s**	**9.0 L/s**	**85.18%**

Note: Q uses t_c of 10 min and intesity of 109.5 mm/hr

Note: Storage is for a 5 year event

Pre and Post development Land Drainage Runoff Flow Estimate Example for Two SFDs

SFD to 2 SFD						
Lot	**"C"-value**	**Existing**	**Post Lot 2**	**Post Lot 1**	**Post Total**	**Increase**
Total Area		474 m^2	238 m^2	238 m^2	475 m^2	
Building and Paved Area	0.9	151 m^2	130 m^2	130 m^2	260 m^2	
Gravel Area	0.5	0 m^2	0 m^2	0 m^2		
Pervious Area	0.1	323 m^2	108 m^2	108 m^2	215 m^2	
Weighted C-value		0.35	0.54	0.54	0.54	
Storage		18.5 m3			19.5 m3	1.0 m3
Q_{stm}		**5.1 L/s**	**3.9 L/s**	**3.9 L/s**	**7.8 L/s**	**51.94%**

Note: Q uses t_c of 10 min and intensity of 109.5 mm/hr

Note: Storage is for a 5 year event

Pre and Post Development Land Drainage Runoff Flow Estimate Example for Two SFDs with Secondary Suites

SFD to 2 SFD w/ Secondary Suites						
Lot	**"C"-value**	**Existing**	**Post Lot 2**	**Post Lot 1**	**Post Total**	**Increase**
Total Area		557 m^2	280 m^2	280 m^2	559 m^2	
Building and Paved Area	0.9	200 m^2	138 m^2	138 m^2	276 m^2	
Gravel Area	0.5	0 m^2	0 m^2	0 m^2	0 m^2	
Pervious Area	0.1	357 m^2	142 m^2	142 m^2	283 m^2	
Weighted C-value		0.39	0.49	0.49	0.5	
Storage		21.9 m3			22.6 m3	0.7 m3
Q_{stm}		**6.6 L/s**	**4.2 L/s**	**4.2 L/s**	**8.4 L/s**	**28.27%**

Note: Q uses t_c of 10 min and intensity of 109.5 mm/hr

Note: Storage is for a 5 year event