

Appendix D

Scenario Workbook Description

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Programming Workbook

This appendix should be read in conjunction with the figures included in Appendix E from the scenario workbook for each of the three funding scenarios. The scenario workbook was developed to evaluate different funding scenarios for the CSO Master Plan program. It includes capital and O&M cost estimates for each of the projects proposed in the CSO Master Plan. It includes a series of worksheets that are used in combination to lay out the overall program. Each of the worksheets used as part of the program Scenario Workbook tool have been included in Appendix E.

Each worksheet includes the 41 sewer districts with primary outfalls and each sewer district has four rows associated with the different types of control options. The rows list the possible groups of control options for each district, as follows:

- 1) Sewer Separation (either partial or complete);
- 2) In-line and latent storage;
- 3) Off-line tank or tunnel storage, and
- 4) Totals for the preceding three control options.

Each Worksheet contained within the workbooks is described further as follows:

1) *Figure 1: Project Schedule:*

The worksheet this figure is based on is strictly a planning tool for simplifying project sequencing and viewing the schedule at a high level. Numbers are entered for specific years of the program on each row where a control option has been identified. The worksheet fills in a colour for the active years and totals the numbers entered for each row for subsequent use in calculating annual budgets.

The worksheet requires that the last year be entered with a value of “0.5” and is displayed in red. This recognizes that the scale of the project activity for the specific control option recommended at this point should ramp down and extend beyond a one-year duration. In signifying the end of the project, it also triggers the beginning of CSO benefits, and the additional annual operating and maintenance (O&M) costs associated with the control option.

For all other years in which the project is sequenced to occur, there are variations in the value assigned ranging from “0.6” or lower to “2.0” and higher. These variations allow for slightly more or slightly less funding to be applied to specific projects, in order to maximum the annual budget funding available. Ideally, with no budget funding restrictions, the capital costs associated with each control option would be evenly divided over the years it is to be constructed, resulting a value of “1” applied to each year. However, in order to maximize the funding available for each year, some projects may be slightly scaled back, or other projects may be slightly increased in scale, based on the remaining costs associated with the project, and the remaining budget for that year available. This results in the differing values assigned to the specific years in which the project is underway. This directly impacts the portion of the total capital costs for the control option allocated to that specific year.

This worksheet can be used in the future as a planning tool to assess project changes or changes to the sequencing of projects. The years that the different control solutions are started and finished can be altered, and its impact on the annual budgeted program costs estimated.

2) *Figure 2: Annual Budgeted Project Costs (With 100% Estimating Allowance):*

The budget table worksheet that this figure is based on allocating the capital budget estimates into required yearly budgeted amounts, in proportion to the values set on the project scheduling

worksheet. For example, if the numbers “1” is entered for several years then the total capital budgets allocated to that control option is split equally between all the years with a “1” entry.

The capital NPV in column “o” totals the NPV of the budgeted capital costs to be expended each year based on the project schedule, in terms of 2019 dollar values.

The budget sum in column “p” totals the annual budgeted capital costs escalated to the year of expenditure.

The table extends to the year 2100 to allow for a comprehensive analysis of both capital and O&M costs for all of the funding scenarios under evaluation for the CSO program.

The columns used in the budget table worksheet have been alphabetically labelled above the column titles. Each of these columns within the budget table worksheet are explained in further detail below.

a) Project Details:

- i. Column “a” indicates the percentage of the area of each combined sewer district which would need to be separated to achieve complete sewer separation, called the Balance of Area Separation, based on 2019 estimates. For example a combined district which is completely separated as of 2019, would have a 0 percent Balance of Area Separation.
- ii. Columns “b” to “d” identify whether in-line storage via control gate construction, latent storage, (both standard latent storage and upgraded latent storage solutions requiring flap gate control or additional SRS interconnection construction) and off-line screening facilities have been recommended for that specific district to meet Control Option 1.
- iii. Columns “e” to “g” lists the capital cost estimates in terms of 2019 dollar values for each of the control options recommended for the specific district.
- iv. Column “h” lists the total capital cost estimate for each of the control options recommended for the specific district, in terms of 2019 dollar values.

b) Additional Operations and Maintenance Cost Budget

- i. Column “i” lists the estimated average annual additional operations and maintenance costs for the control options recommended for a specific district, in terms of 2019 dollar values. This provides a relative estimate of the future impact the control options recommended for that district will have on operations staff work in the future.
- ii. Column “j” lists the NPV of cumulative total of all additional annual operation and maintenance costs for the control options recommended for a specific district, in terms of 2019 dollar values. O&M costs accrue from the year control option is considered complete, based on the project schedule, and continues to the end 2100.
- iii. Column “k” lists the totals additional annual operation and maintenance costs for the control options recommended for a specific district, escalated to the year of expenditure.

c) Capital Cost Budget

- i. Column “l” lists the total capital cost estimate in terms of 2019 dollar values for the control options recommended for the specific district. This capital cost estimate includes 53 percent markup. The components of this markup percentage are detailed in Section 3.6.4 of the Part 2 Technical Report.
- ii. Column “m” lists the estimating allowance applied to the capital cost estimate for the control options recommended for the specific district, at the rate identified in the header. The estimating allowance accounts for estimating uncertainty and has been applied as 100 percent. The reasoning for this allowance is detailed in Section 3.6.6 of the Part 2 Technical Report.
- iii. Column “n” calculates the total capital cost for the control options recommended for the specific district, with the 100% estimating allowance added to the capital cost estimate.

d) *Program Budget Summary*

- i. Column “o” calculates the total NPV of the capital costs for each of the control options recommended for the specific district. This NPV is in terms of 2019 dollar values, based on the specific years the capital costs are incurred as per the project schedule worksheet.
- ii. Column “p” calculates the total capital costs for each control option recommended for the specific district, in terms of the year of expenditure. This accounts for the proposed construction date based on the project schedule worksheet.

3) *Figure 3: Annual Additional Operations And Maintenance (O&M) Costs:*

The worksheet that this figure is based on shows the allocation the estimated additional operations and maintenance costs for each year of the program, based on the project schedule worksheet. The worksheet details are updated automatically populated by entering the value “0.5” in the project scheduling worksheet. This “0.5” confirms that the control option is fully constructed and from that point forward will incur additional operations and maintenance costs. The additional operation and maintenance value allocated to each year is calculated from the annual average additional figure in terms of 2019 dollar values from column “i”, factored for inflation based on the year the costs are incurred. The operations and maintenance costs are then extended to the year 2100.

The columns used in the O&M Table worksheet have been alphabetically labelled above the column titles. Each of these columns within the worksheet are explained in further detail below.

a) *Project Details:*

- i. Column “a” indicates the percentage of the area of each combined sewer district which would need to be separated to achieve complete sewer separation, called the Balance of Area Separation, based on 2019 estimates. For example a combined district which is completely separated as of 2019, would have a 0 percent Balance of Area Separation.
- ii. Columns “b” to “d” identify whether in-line storage via control gate construction, latent storage, (both standard latent storage and upgraded latent storage solutions requiring flap gate control or additional SRS interconnection construction) and off-line screening facilities have been recommended for that specific district to meet Control Option 1.
- iii. Columns “e” to “g” lists the capital cost estimates in terms of 2019 dollar values for each of the control options recommended for the specific district.
- iv. Column “h” lists the total capital cost estimate for each of the control options recommended for the specific district, in terms of 2019 dollar values.

b) *Additional Operations and Maintenance Cost Budget*

- i. Column “i” lists the estimated average annual additional operations and maintenance costs for the control options recommended for a specific district, in terms of 2019 dollar values. This provides a relative estimate of the future impact the control options recommended for that district will have on operations staff work in the future.
- ii. Column “j” lists the NPV of cumulative total of all additional annual operation and maintenance costs for the control options recommended for a specific district, in terms of 2019 dollar values. O&M costs accrue from the year control option is considered complete, based on the project schedule, and continues to the end 2100.
- iii. Column “k” lists the totals additional annual operation and maintenance costs for the control options recommended for a specific district, escalated to the year of expenditure.

c) *Capital Cost Budget*

- i. Column “l” lists the total capital cost estimate in terms of 2019 dollar values for the control options recommended for the specific district. This capital cost estimate includes 53 percent markup. The components of this markup percentage are detailed in Section 3.6.4 of the Part 2 Technical Report.

- ii. Column “m” lists the estimating allowance applied to the capital cost estimate for the control options recommended for the specific district, at the rate identified in the header. The estimating allowance accounts for estimating uncertainty and has been applied as 100 percent. The reasoning for this allowance is detailed in Section 3.6.6 of the Part 2 Technical Report.
- iii. Column “n” calculates the total capital cost for the control options recommended for the specific district, with the 100% estimating allowance added to the capital cost estimate.

d) *Program Budget Summary*

- i. Column “o” calculates the the total NPV of the additional operation and maintenance costs for each of the control options recommended for the specific district. This NPV is in terms of 2019 dollar values, based on the specific years the operation and maintenance costs are incurred as per the project schedule worksheet.
- ii. Column “p” calculates the total additional operation and maintenance costs for each control option recommended for the specific district, in terms of the year of expenditure. This accounts for the proposed completion date based on the project schedule worksheet.

4) *Figure 4: Annual Modelled Project Performance:*

The worksheet that this figure is based on documents the specific performance details for each completed project listed in column “f” in terms of annual reduction of CSO in m³. The annual performance improvement values in the main table are entered automatically based on the project scheduling worksheet.

a) *Project Details:*

- i. Column “a” indicates the percentage of the area of each combined sewer district which would need to be separated to achieve complete sewer separation, called the Balance of Area Separation, based on 2019 estimates. For example a combined district which is completely separated as of 2019, would have a 0 percent Balance of Area Separation.
- ii. Columns “b” to “d” identify whether in-line storage via control gate construction, latent storage, (both standard latent storage and upgraded latent storage solutions requiring flap gate control or additional SRS interconnection construction) and off-line screening facilities have been recommended for that specific district to meet Control Option 1.

b) *Performance:*

- i. Column “e” lists the updated baseline CSO volume reported from the 2018 revised baseline hydraulic model for the specific district. This is evaluated using the 1992 representative year rainfall conditions and normal summer water level river conditions. This represents the CSO overflow performance of the specific district prior to any of the control options recommended in the CSO Master Plan being implemented.
- ii. Column “f” lists the annual CSO volume reduction performance reported from the 2018 revised baseline hydraulic model, based on the completion of each of the control options recommended for the specific district. This is evaluated using the 1992 representative year rainfall conditions and normal summer water level river conditions. Each of the control option reductions is attributed after the full installation of the district control option.
- iii. The columns following column “f” show the specific annual CSO reductions as each control solution is implemented, as per the project schedule worksheet. The cumulative annual CSO reductions are multiple control options recommended are complete is shown in the row titled “SUBTOTAL” at the bottom of the figure. Below this is the “Total CSO Volume As Control Options Are Implemented”. This tracks the cumulative reduction in the baseline CSO volume for the City of Winnipeg as each control option is implemented.