Appendix D – Control Option Risk and Opportunity Matrix

The CSO Master Plan and implementation program are large and complex, with many risks having both negative and positive effects. The objective of the Risk and Opportunity Matrix is to further describe the significant risks and opportunities that apply for each type of solution used to develop the CSO Master Plan.

The two tables that follow relate to the Risk and Opportunity table included in each of the District Engineering Plans (DEPs). In the DEPs, the table includes an ‘R’ or ‘O’ under the solutions that are applicable within the district. The rows then relate to the various risk components. This appendix supplements the information provided in the DEPs by further describing the risk or opportunity associated with the specific solutions for the district.

		Latent Storage / Flap Gate Control		In-line Storage / Control Gate		Off-line Tank		Off-line Tunnel	
Risk Number	Risk Component	Risk	Opportunity	Risk	Opportunity	Risk	Opportunity	Risk	Opportunity
1	Basement Flooding Protection	Flap gate control introduces the potential for a flap gate to become stuck open or closed. Having a flap gate that does not open will increase the level within the system to the nearest alternate overflow point.	N/A	Control gate fails in upright position resulting in an increased level within the combined sewer system.	N/A	N/A	Off-line tanks provide increased conveyance of wastewater and storage capacity, reducing the risk of basement flooding.	N/A	Off-line tunnels provide increased conveyance of wastewater and storage capacity, reducing the risk of basement flooding.
2	Existing Lift Station	N/A	N/A	Pump modifications may be required to accommodate dewatering rate.	N/A	N/A	N/A	N/A	N/A
3	Flood Pumping Station	N/A	N/A	N/A	N/A	N/A	Existing pumps may be utilized to dewater off-line storage reducing the requirement for additional pumps.	N/A	Existing pumps may be utilized to dewater off-line storage reducing the requirement for additional pumps.
4	Construction Disruption	N/A	N/A	N/A	N/A	Off-line tanks are big, effecting large areas and causing significant impacts to the public upon construction.	N/A	N/A	N/A
5	Implementation Schedule	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	Sewer Condition	The increase use of a pipe for storage may increase pipe failure rate.	N/A	The increase use of a pipe for storage may increase pipe failure rate.	N/A	N/A	N/A	N/A	N/A
7	Sewer Conflicts	Any installation of wet wells and force mains can conflict with existing infrastructure.	N/A	The location of new chambers within the sewer system can conflict with existing infrastructure.	N/A	N/A	N/A	Off-line tunnels are typically large diameter and unless they are placed deep underground, there is a high potential for conflicts with other utilities and sewer infrastructure.	N/A
8	Program Cost	N/A	Capital costs are lowered as the storage arrangement maximizes the use of existing infrastructure.	N/A	Capital costs are lowered as the storage arrangement maximizes the use of existing infrastructure.	Off-line tanks result in a high cost for a marginal benefit.	N/A	N/A	Off-line tunnel storage is cheaper than other types of off-line storages resulting in cost savings.
9	Approvals and Permits	N/A	N/A	N/A	N/A	Projects affecting public / private land uses may not be approved.	N/A	N/A	N/A
10	Land Acquisition	N/A	N/A	N/A	N/A	Off-line tanks are big, covering large areas and appropriate space may be difficult to secure.	N/A	N/A	Can be installed within existing ROWs, which reduces the necessity for new sewer areas
11	Technology Assumptions	Flap gate control is a new technology and has not been used locally.	N/A	In-line storage is a new technology and has not been used locally.	N/A	N/A	N/A	N/A	Local experience is increasing with the growing applications of off-line tunnels.
12	Operations and Maintenance	The addition of flap gate control requires more controls and maintenance to the program.	N/A	The addition of a control gate requires more controls and maintenance to the program.	N/A	The addition of an off-line tank requires more controls and maintenance to the program.	N/A	The addition of an off-line tunnel requires more controls and maintenance to the program.	N/A
13	Volume Capture Performance	N/A	There is increased volume capture with the latent storage and dewatering process.	N/A	There is increased volume capture with the in-line storage and dewatering process.	N/A	There is increased volume capture with the off-line storage and dewatering process.	N/A	There is increased volume capture with the off-line tunnel storage and dewatering process.
14	Treatment	Increased storage causes an increase in solids and screenings that require management.	N/A	Increased storage causes an increase in solids and screenings that require management.	N/A	Increased storage causes an increase in solids and screenings that require management.	N/A	Increased storage causes an increase in solids and screenings that require management.	N/A

Risk Number	Risk Component	Sewer Separation		Green Infrastructure		Real Time Control		Floatable Management	
		Risk	Opportunity	Risk	Opportunity	Risk	Opportunity	Risk	Opportunity
1	Basement Flooding Protection	N/A	Reduces the risk of basement flooding by separating wastewater from stormwater sewers. Less flow in the sewer directly connected to homes reduces the potential for surcharging.	N/A	N/A	N/A	N/A	N/A	N/A
2	Existing Lift Station	N/A	N/A	N/A	N/A	Pump modifications may be required to meet dewatering rate.	N/A	N/A	N/A
3	Flood Pumping Station	N/A	Sewer flows are reduced from stormwater being removed / separated and the need for pumping stations may be reduced or eliminated.	N/A	N/A	N/A	N/A	N/A	N/A
4	Construction Disruption	Sewer separation occurs throughout the whole district with widespread construction impacts on the existing transportation network.	N/A	Green Infrastructure has the potential to impact large areas.	N/A	N/A	N/A	N/A	N/A
5	Implementation Schedule	Due to the magnitude and scope of this solution, design and construction to fully implement separation can take significant amount of time.	N/A	N/A	Green Infrastructure can be implemented over a short-term period.	A long term implementation plan may be required and planned for to incorporate a global RTC scheme.	N/A	N/A	N/A
6	Sewer Condition	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7	Sewer Conflicts	Installation may be difficult where a existing infrastructure is present.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8	Program Cost	Due to the magnitude of sewer separation, this solution results in a high initial capital cost.	N/A	N/A	Cost of Green Infrastructure may be much less than other types of infrastructure.	N/A	N/A	N/A	Alternative Floatable Management could eliminate screening and screen chambers, reducing the program costs.
9	Approvals and Permits	N/A	N/A	Projects affecting public / private land uses may not be approved	N/A	N/A	N/A	N/A	N/A
10	Land Acquisition	N/A	N/A	A large area of land is required for some technologies.	N/A	N/A	N/A	N/A	N/A
11	Technology Assumptions	N/A	Sewer separation implements common practices utilizing local experience. Challenges and approaches to sewer separation projects in Winnipeg well understood.	N/A	Green Infrastructure can utilize experiences in other metropolitan cities to draw upon.	Real Time Control is a new technology and has not been used locally.	System optimization provided by Real Time Control can improve operations of other technologies dramatically.	N/A	N/A
12	Operations and Maintenance	The additional pipe network may require an increase in maintenance.	Sewer separation can potentially eliminate requirement for use of flood pumping stations or lift stations. This removes the O&M requirements for this existing infrastructure.	Green Infrastructure implements various solutions as new infrastructure, which will require an increase in O&M requirements in order to perform as expected.	N/A	N/A		Floatable management implements screens which will require an increase in O&M requirements.	N/A
13	Volume Capture Performance	N/A	N/A	N/A	There is potential for a higher level of capture.	N/A	There is potential for a higher level of capture.	N/A	N/A
14	Treatment	N/A	Sewer separation causes a reduction of flow to WPCC, possibly increasing treatment capacity.	N/A	Flow is optimized to the WPCCs.	N/A	Flow is optimized to the WPCCs.	An increase in solids and screenings as a result of screen installation will require management for appropriate removal and treatment.	N/A