REGION OF PEEL

WASTEWATER CAPACITY IMPROVEMENTS IN CENTRAL MISSISSAUGA

APPENDIX 3-D

Cooksville Creek Evaluation Process

Date:	4/27/2021	File:	718018
To:	Justin Lee, P. Eng., Region of Peel		
From:	GM BluePlan Engineering Ltd.		
Project:	Wastewater Capacity Improvements in Central Mississauga		
Subject:	Cooksville Creek Phase 3 Evaluation Process		

TECHNICAL MEMO

Phase 3 of the Class EA process examines the design concept alternatives in implementing the preferred solution. Having identified the preferred sewer route in Phase 1 and 2, this phase focused on defining where the sewer and shaft sites would be located, what they would look like and how they would be built.

This Technical Memo describes the step by step approach in selecting the preliminary preferred design for the Cooksville Creek section of the proposed solution including selecting the preliminary preferred connection shaft, construction methodology and location of the sewer.

1 STAKEHOLDER CONSULTATION

As part of the MCEA process, GM BluePlan and the Region of Peel continue to consult with key stakeholders. In evaluating the Cooksville Creek design concept alternatives, the following stakeholders have been involved:

- Credit Valley Conservation (CVC)
- City of Mississauga
- Hydro One
- Alectra
- Enbridge

Feedback received from these key stakeholders has been incorporated into the evaluation process.

2 EVALUATION OF CONNECTION SHAFTS AT COOKSVILLE CREEK

Through Phase 1 and 2 of the Class EA, key connections to existing trunk sewers were required along Queensway East including the upstream connection to the existing Trunk Sewer at Hurontario and downstream connection to the existing East Trunk Sewer at Etobicoke Creek. The process to evaluate the shaft sites at Cooksville Creek was carried out as a coordinated assessment whereby detailed shaft site requirements were considered in conjunction with the tunneling requirements for the sewer route and construction methodology.

2.1 DETAILED EVALUATION OF SHAFT ALTERNATIVES

Connecting the proposed new Queensway sewer to the existing Cooksville Creek Trunk Sewer is a key technical requirement to relieve capacity constraints downstream along Lower Cooksville Creek Trunk Sewer and increase flow flexibility within the study area. The existing Cooksville Creek Trunk Sewer was constructed parallel to the Cooksville Creek, running generally from north to south. The sewer facilitates gravity flow of wastewater thus requiring the upstream pipe to be higher than sections downstream. Similarly, for the Queensway sewer to facilitate gravity flow, the upstream connecting pipe starting at Hurontario Street must

be higher than the downstream connection point at Etobicoke Creek. These two slope factors together limit the where the Queensway sewer can connect to the Cooksville Creek sewer and achieve the required slope for gravity operations.

To support the connection to the existing Cooksville Creek Trunk Sewer (Shaft 11), two shaft site alternatives were identified (**Figure 1)**. Error! Reference source not found.The following factors have been considered and are common among both alternatives:

- Provides connection to 900 mm Cooksville Creek Trunk Sewer
- Existing municipal infrastructure located within site
- Existing Enbridge pipeline located adjacent to shaft site
- Construction required within CVC regulation limit / floodplain
- Tunneled construction required for Cooksville Creek crossing
- Bat habitat observed within site
- Overlaps with significant valleylands, woodlands and wildlife habitat
- Does not contain any cultural heritage resources

The detailed evaluation of the two shaft site alternatives is provided in **Table 1** below.

Table 1: Key Evaluation Points for Connection Shaft Alternatives

Alternative	11A. Northeast	Screening	11B. Southeast	Screening
Technical	- Existing Alectra overhead cable and hydro poles adjacent to shaft site - **Site is located in grassed area, improved site suitability and access** - **Allows for a generally north side sewer alignment on Queensway East (reduced road crossings)**	✓	- **Site is located in a heavily treed area; challenging access to site**	×
Environmental	- **Lower impact to trees compared to 11B; grassed area**	✓	- **Major impact to trees compared to 11A; heavily treed area**	×
Social / Cultural	- No archaeological potential (confirmed through Stage 2 Archaeological Assessment) - **Less potential for construction impacts to residents; no front facing houses adjacent to site** - Greater potential to impact sidewalks at this site compared to 11B (multiuse trail and pedestrian bridge)	✓	- Site has archaeological potential (no Stage 2 Archaeological Assessment completed) - **Increased potential for construction impacts to residents; front facing houses adjacent to site** - **Potential impacts to residential road (Camilla Place)** - **Site is located in Camilla Park (City of Mississauga); City preference for 11A** - No potential impacts to multiuse trails at this site	×
Legal	- Site is located on Hydro One/ Infrastructure Ontario owned lands; temporary and permanent easements required - Utility setbacks required	×	- **Site is located on public lands (City of Mississauga); City preference for 11A**	×
Financial	- Higher temporary and permanent easement costs (Hydro One lands) - Lower restoration costs; grassed area	×	- Lower temporary and permanent easement costs (City of Mississauga lands) - Higher restoration costs; heavily treed, natural area	✓
Overall Results	**Preferred Shaft Site**		**Screened Out**	

Alternative 11A is the preliminary preferred shaft site for the Cooksville Creek Trunk Connection.

Figure 1: Shaft Site Alternatives at Etobicoke Creek

2.2 SCOUR HAZARD ASSESSMENT REVIEW

The Region identified two geomorphic assessments completed for Cooksville Creek in 2009 and 2015. The assessment was completed at Cooksville Creek, between Lakeshore Road East and the CN Rail Line. The study estimated an erosion rate of 0.01 m per year, disregarding any mitigation measures to the creek bed or banks. It was concluded that a 2.0 m burial depth was sufficient at the site considering a minimum 100-year planning horizon at that location. Due to the distance from this project's location (Queensway and Cooksville Creek) to the previous assessment location (Lakeshore Road East and Cooksville Creek), it was determined that an additional scour analysis was required at Queensway and Cooksville Creek to calculate a representative pipe burial depth.

A Scour Hazard Assessment was completed by Golder in August 2021 at multiple cross sections including the proposed creek crossing location (**Figure 2**).

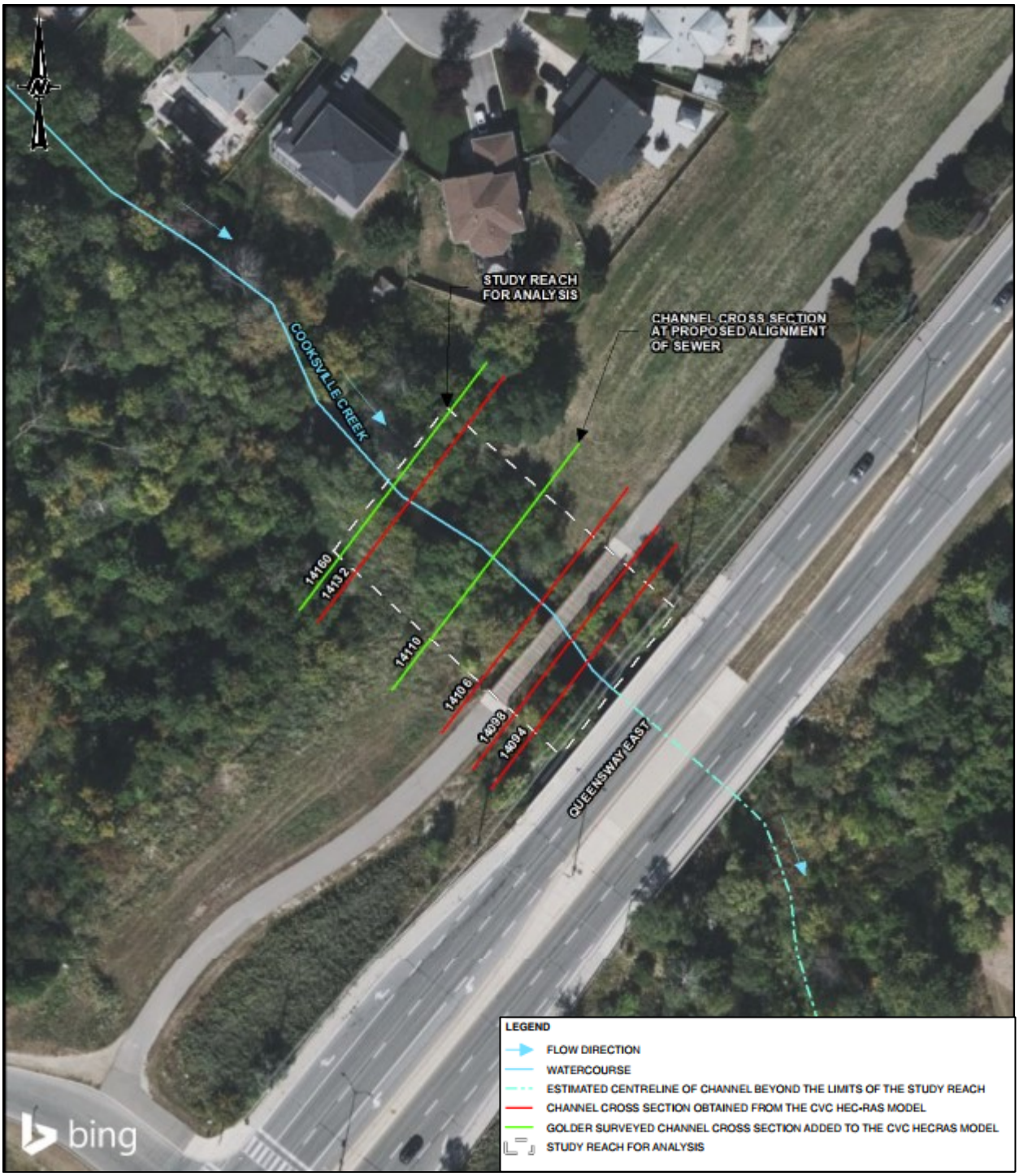

Figure 2: Assessed Cross Sections at Cooksville Creek

The report recommended a minimum required burial depth of 2.3 m based on the Blench Method for general scour (most conservative). And a belt width allowance of approximately 19.2 m (setback distance of 4.8 m from top of bank on either side of channel) to account for the existing configuration of the channel (**Figure 3**). The full report is attached. The burial depth of the proposed pipe is fixed due to the upstream (Queensway

and Hurontario) and downstream points (Etobicoke Creek and Sherway). Although the burial depth of the proposed pipe is similar to the recommended scour burial depth, mitigation measures have been recommended to further protect the sewer from scour including:

- Rip rap or river stone at the bed or banks of the channel in the immediate vicinity of the crossing to provide local erosion protection and armouring
- Installation of small rock weir or riffle at a location immediately downstream of the channel crossing to reduce channel velocities and shear stresses in the immediate vicinity of the crossing location.

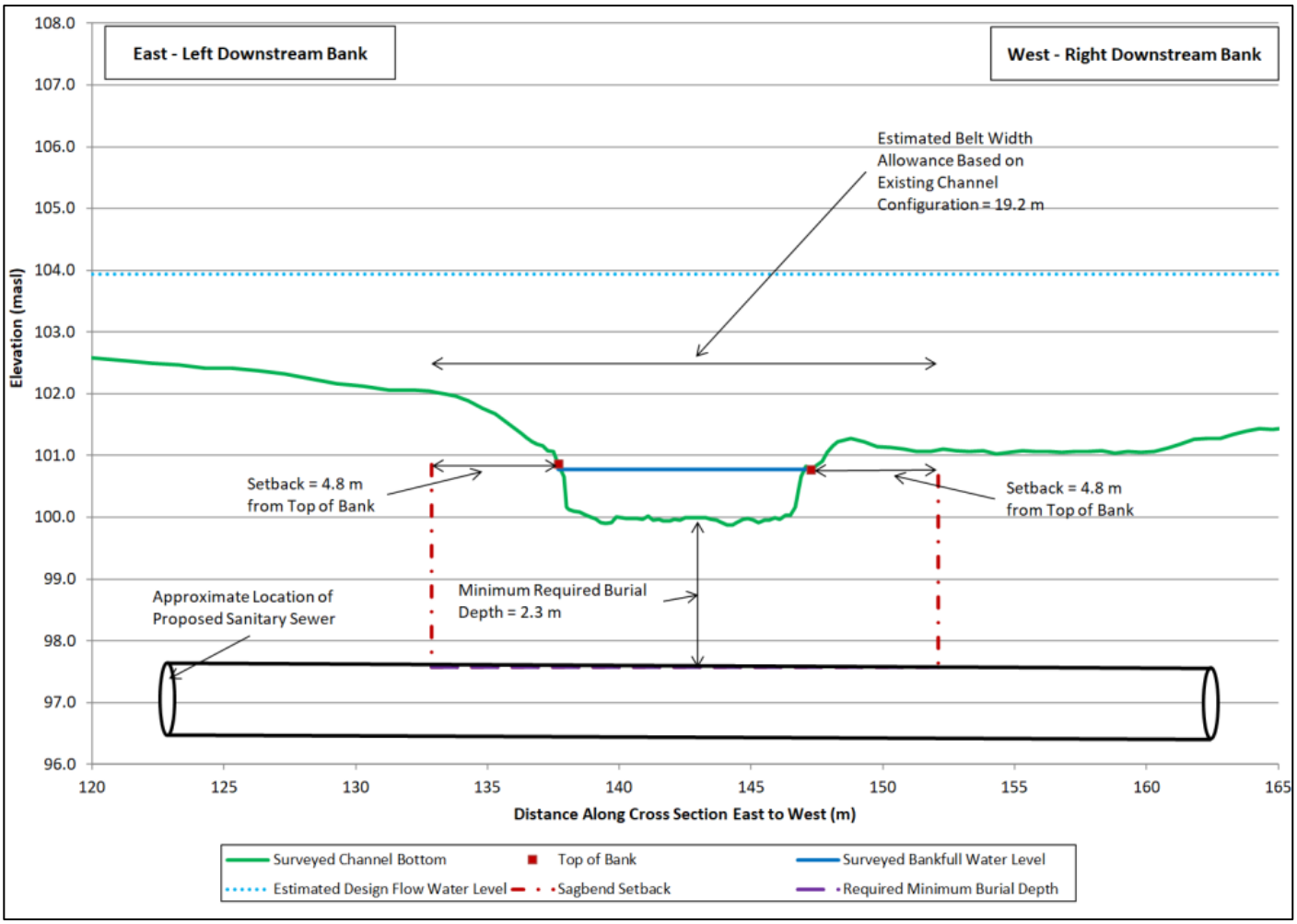

Figure 3:Cross Section for the Proposed Sewer Alignment Creek Crossing

3 CONSTRUCTION METHODOLOGY AT COOKSVILLE CREEK

There are a number of alternative construction methodologies identified for the preliminary preferred design concept.

The project team considered three construction methodologies to construct the gravity sewer:

a. **Tunnel Boring Machine (TBM)** uses specialized boring equipment to excavate beneath the surface of the road right of way and to install the sewer pipe. In contrast to micro-tunneling, use of a TBM

produces a larger tunnel diameter, operates at greater depths, and can accommodate longer tunnel driving lengths (that result in fewer shafts required). A TBM is suited for boring in various soil and rock strata, favouring straight alignments which minimize turns.

b. **Micro-tunneling** uses drilling technology to install underground sewer pipes. In comparison to tunnel boring machines, micro-tunneling accommodates smaller diameter tunnels, operates at shallower depths, and requires an increased number of access shafts.
c. **Open Cut Construction** requires a trench to be dug in the road right of way and the sewer pipe installed in the trench. Unlike tunnel boring machines and micro-tunneling which operate underground, open cut construction can result in significant community and traffic impacts as it causes surface disruption.

The construction methodologies consider sewer length, depth, environmental features, crossings and minimum burial depths, existing sanitary connection point, required diameter of the sewer and existing site conditions. Since the burial depth of the proposed pipe is similar to the recommended scour depth, tunnelling construction can be used to cross the creek.

The proposed size of the sewer is 1500 mm from Hurontario Street to Cawthra Road. The depth of the sewer was driven by the need to achieve a gravity sewer between the required upstream and downstream connection points in the existing wastewater system.

Due to the construction complexity at the Cooksville Creek connection point and consultation with CVC, three design alternatives were reviewed. A combination of tunneling and open cut construction was considered. This construction methodology will require further refinement, a commitment to further supporting investigations, permitting and approvals and appropriate remediation to be determined during detailed design in coordination with Review Agencies.

4 EVALUATION OF DESIGN CONCEPT ALTERNATIVES AT COOKSVILLE CREEK

The decision-making for the design concept at Cooksville Creek shaft time worked simultaneously with the evaluation of the Queensway East alignment alternatives which identified the road right away as the preferred alignment.

All design concept alternatives require crossing of the Cooksville Creek with similar creek cover. Having completed the Scour Hazard Assessment, it was established that the new pipe would have approximately 2.3 m of cover between top of pipe and the existing creek bed. Since the pipe burial depth is deep enough to allow a safe tunnelled construction under the creek, open cut construction to cross the creek was screened out to avoid significant environmental impacts.

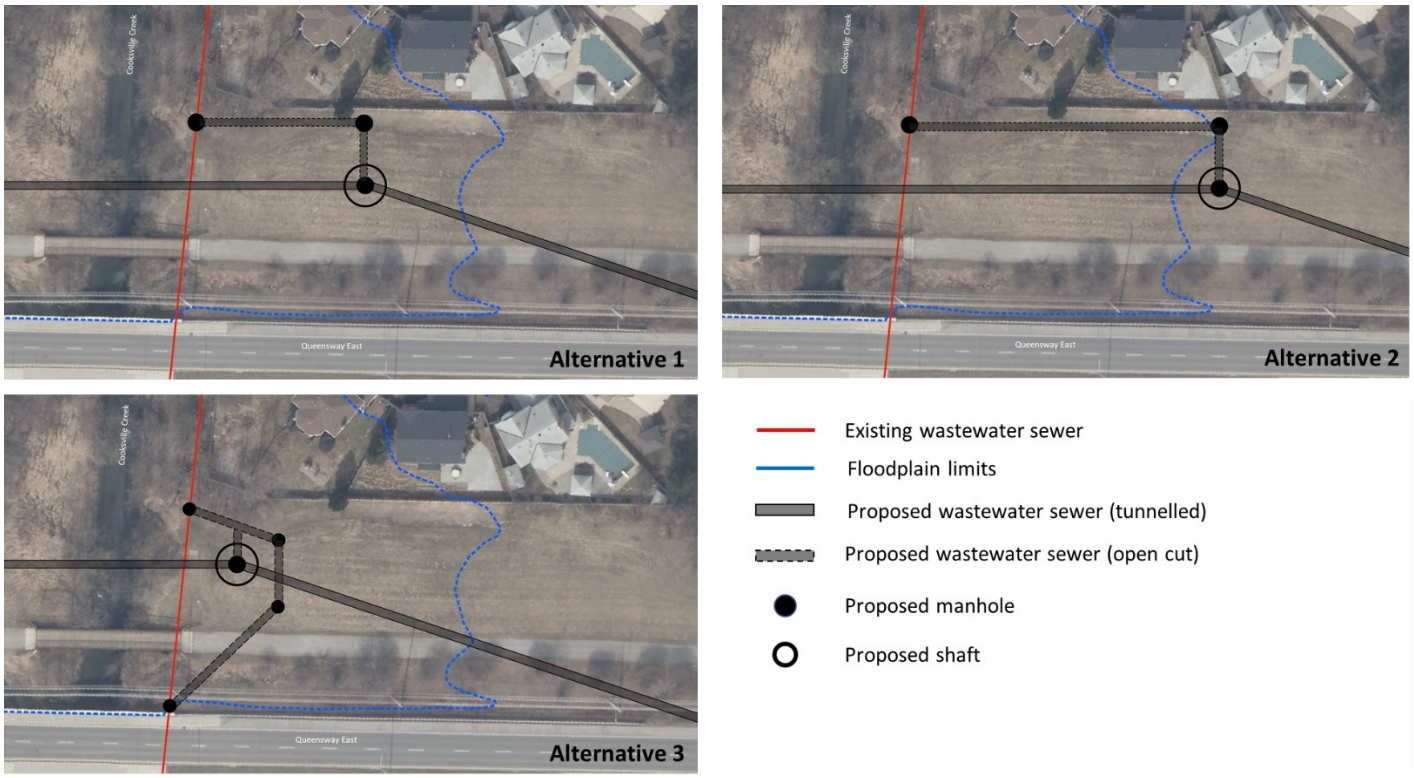

Figure 4: Cooksville Creek Design Concept Alternatives

Table 2: Screening Results for Cooksville Creek Design Concept Alternatives

Alt.	Description	Evaluation	Screening Results
1. Shaft located within floodplain	• Open cut construction from shaft site to existing Cooksville Creek Trunk Sewer • Tunnel 1500 mm pipe under Cooksville Creek towards Hurontario • Control structure within floodplain • No bypass pumping	• Within floodplain; high impact of flooding during construction and larger excavation required • High construction risk; shallow clearance between proposed pipe and existing pipe • High risk of impacting existing 900 mm trunk sewer; required downsize of 1500 mm pipe • Two new manholes required within floodplain; however, risk can be mitigated by sealed manhole covers	✘
2. Shaft located outside floodplain	• Open cut construction from shaft to existing Cooksville Creek Trunk Sewer • Tunnel 1500 mm pipe under Cooksville Creek towards Hurontario • Control structure within floodplain • Bypass pumping outside of floodplain	• Outside of floodplain; lower impact of flooding during construction • Increase construction risk; shallow clearance between proposed pipe and existing pipe • Risk of impacting existing 900 mm trunk sewer; potential need to downsize 1500 mm pipe • Increased surface disturbance; increased length of open cut from existing pipe to shaft	✘

Alt.	Description	Evaluation	Screening Results
		• Bypass pumping required for longer duration; increase risk of failure • Only one manhole required within floodplain; risk can be mitigated by sealed manhole covers	
3. Shaft located within floodplain with permanent bypass sewer	• Abandon section of existing 900 mm Cooksville Creek Trunk Sewer and install new 900 mm sanitary pipe at 0.3% slope adjacent to existing pipe • Open cut construction for new section of 900 mm pipe and connection to proposed 1500 pipe • Tunnel 1500 mm pipe under Cooksville Creek towards Hurontario • Control structure within floodplain • Bypass pumping within floodplain	• Within floodplain; higher impact of flooding during construction and larger excavation required • Minimized construction risk; no tunneling under/in close proximity to existing active 900 mm Trunk Sewer • Allows the safe installation of a 1500 mm pipe; no downsize required due to position of existing trunk sewer • Minimized potential impacts to natural features; minimize length of sewage bypass pumping within the floodplain • Minimal bypass pumping required; decrease risk of failure • New infrastructure; lower risk of impacting existing 900 mm trunk sewer • Control structure within floodplain has improved access within open area • Five new manholes required within floodplain; however, can be mitigated by sealed manhole covers	✓

Design concept alternative 3 was selected as the preferred design because:

- Installation of a 1500 mm pipe; no pipe downsizes required to avoid conflict with existing 900 mm pipe
- Installation of new 900 mm Cooksville Creek sanitary pipe minimizes construction risk – no tunnelling under or in proximity to the existing active 900 mm trunk sewer
- Decreased time needed for bypass pumping within the floodplain minimizes potential impacts to natural features.
- Control structure within floodplain has improved access within open area.

5 PRELIMINARY RECOMMENDATIONS

The preliminary preferred solution includes:

- Selection of Site 11A as the Cooksville Creek connection point
- Selection of design concept alternative 3:
    - Open cut construction to connect to existing Cooksville Creek Tunk Sewer
    - Tunnelled construction to cross Cooksville Creek with approximately 2.3 m creek cover
    - Rerouting of the existing Cooksville Creek Sewer section
    - Scour hazard mitigation measures proposed infrastructure