TO:	**CHAIR AND MEMBERS CIVIC WORKS COMMITTEE MEETING ON AUGUST 11, 2020**
FROM:	**KELLY SCHERR, P.ENG., MBA, FEC MANAGING DIRECTOR ENVIRONMENTAL & ENGINEERING SERVICES AND CITY ENGINEER**
SUBJECT:	**MUD CREEK REMEDIATION – PHASE 1A TUNNEL CONTRACT AWARD AND CONSULTANT CONTRACT INCREASE**

RECOMMENDATION

That, on the recommendation of the Managing Director Environmental & Engineering Services and City Engineer, the following actions **BE TAKEN** with respect to the award of contract for the Mud Creek Remediation – Phase 1a Tunnel Construction project and additional Consultant contract increase:

(a) The bid submitted by Ward and Burke Microtunnelling, at its tendered price of $7,488,280.00, including contingency, excluding HST, **BE ACCEPTED**; it being noted that the bid submitted by Ward and Burke Microtunnelling, was the lowest of two bids received from the two pre-qualified contractors;

(b) The engineering fees for CH2M Hill Canada Limited Consulting **BE INCREASED** to recognize the additional scope of work during design and to authorize the resident inspection and contract administration for the said project in accordance with the estimates, on file, to an upset amount of $920,501, excluding HST, from $1,130,497 to a total of $2,050,998, in accordance with Section 15.2 (g) of the Procurement of Goods and Services Policy;

(c) The allowance of the mandated Canadian National Railway (CN) flagging personnel during the construction of the Mud Creek Remediation Phase 1a per the anticipated CN flagging requirements **BE APPROVED** for the Mud Creek Remediation project, with an estimated fee of $281,632, excluding HST;

(d) the financing for this project **BE APPROVED** as set out in the Sources of Financing Report attached hereto as Appendix ‘A’;

(e) the Civic Administration **BE AUTHORIZED** to undertake all the administrative acts that are necessary in connection with this project;

(f) the approval given herein **BE CONDITIONAL** upon the Corporation entering into a formal contract or issuing a purchase order for the material to be supplied and the work to be done relating to this project (Tender No. RFT20-79); and

(g) the Mayor and City Clerk **BE AUTHORIZED** to execute any contract or other documents, if required, to give effect to these recommendations.

PREVIOUS REPORTS PERTINENT TO THIS MATTER

Civic Works Committee – August 25, 2014 – Mud Creek Municipal Class Environmental Assessment

Civic Works Committee – January 6, 2015 – 2015 Burbrook Trunk Storm Sewer Project Initiation

Civic Works Committee – November 3, 2015 – Appointment of Consulting Engineers for Design and Construction of Stormwater Management Facilities

Civic Works Committee – October 4, 2016 – Mud Creek Municipal Class Environmental Assessment Study – Status Update and Scope Change

Civic Works Committee – June 7, 2017 – Mud Creek Subwatershed Schedule B Municipal Class Environmental Assessment Notice of Completion

Civic Works Committee – January 9, 2018 - Appointment of Consulting Engineer Mud Creek Flood Reduction and Rehabilitation Phase 1 Detailed Design

2019 – 2023 STRATEGIC PLAN

The following report supports the 2019 – 2023 Strategic Plan through the strategic focus areas of Building a Sustainable City including:

- Building infrastructure to support future development and protect the environment; and
- Protect and enhance waterways, wetlands and natural

BACKGROUND

Purpose

This report recommends the construction contract award to Ward and Burke Microtunnelling and the appointment of CH2M HILL Canada Limited Consulting for the contract administration in order to complete construction of Phase 1a of the Mud Creek Flood Reduction and Rehabilitation tunneling project.

Context

The Mud Creek subwatershed is located within a highly urbanized area of west London. Mud Creek has been highly altered with channel realignments to accommodate agriculture and development over the past 100 years. The area has a history of frequent flooding overtopping Oxford Street at Proudfoot Lane and private properties as well as regulatory flooding of 54 hectares of land designated for infill and intensification development.

Just east of Wonderland Road and north of Riverside Drive, there is a single 1750 mm diameter culvert located under a Canadian National (CN) Railway embankment that is approximately 20 meters in height. The Mud Creek East Branch Stormwater Servicing Municipal Class Environmental Assessment (Mud Creek EA) (CH2M Hill, 2017) identified this culvert as the primary bottleneck in the system. The EA also identified that the creek corridor was aptly named “Mud Creek” as it was found to be stagnant, full of sediment and could no longer support aquatic life due to low oxygen levels. The Mud Creek EA recommended to increase capacity of this culvert and to lower the elevation of the main channel by roughly two meters, all to reduce flood frequency and water elevations upstream and enhance the natural environment in the long term.

DISCUSSION

The Phase 1a tunneling project is the first component of the Mud Creek channel rehabilitation works that includes increasing capacity through the existing culvert under the CN Rail and channel reconstruction of the Mud Creek channel system from the Canadian Pacific (CP) Rail to the Thames River. Increasing the capacity of the culvert

and channel system will provide a significant reduction in the frequency of flooding currently experienced on Oxford Street and private properties, open up 54 hectares for mixed use development, as well as provide environmental and habitat enhancements throughout the Mud Creek corridor. Statistically, the Oxford Street culvert currently floods every 1 in 1.2 years. Ministry of Transportation standards dictate that a 1 in 50 year design model event should not overtop arterial roads. The current approved budget for the Mud Creek Flood Reduction and Rehabilitation project is $16.4M.

Proposed Phase 1a Works

During detailed design, the consultant recommended two twin culverts (or tunnels) that are 2.4 meters in diameter to improve the flow conveyance through the CN Rail embankment. The recommendation for two culverts resulted from the preferred methodology of trenchless construction. Specifically, a microtunnelling method was selected in consideration of onsite soil conditions, size of the culvert(s) required, and availability of equipment in Ontario to construct the works.

The new twin tunnels (culverts) and future channel works will be able to convey more flow under the CN Rail to the Thames River, thus alleviating the bottleneck and flooding of lands upstream. In addition, the increase in flow through the culverts will improve the water quality of the Mud Creek, which is essentially stagnant under current conditions. It was determined during the EA that the creek had limited ability to support aquatic life due to lack of available oxygen in the creek. The Environmental Impact Study (EIS) completed during the EA process identified appropriate mitigation and compensation measures to ensure that the recommended construction project will create a sustainable channel to support a healthier ecosystem in the long-term.

Tree Removals

To prepare for the channel construction project, there was significant tree removal completed along the channel corridor in the spring of 2020 to facilitate access to the tunneling site. The EIS identified compensation for this tree removal including reconstruction of a larger channel using natural environmental design principles, ecological habitat enhancements (e.g. wetland pockets), removal of invasive plant species (e.g. buckthorn) and tree replacement with native species at a ratio of 3:1. The proposed Phase 1a is limited to the construction of the tunnels only, therefore, the compensation for the tree loss will be completed during the channel reconstruction components of this project.

Risk Assessment

Trenchless installation of the proposed large diameter twin culverts through the CN embankment is a higher risk construction activity. In 2004, the City experienced a trenchless project failure during the Burbrook storm sewer tunneling project. In that case, an excessive settlement of the CN rail tracks was attributed to the tunneling methodology that had been implemented at that time, namely the use of an open face Tunnel Boring Machine (TBM). In 2015, the Burbrook tunnel was successfully constructed by Ward and Burke Microtunnelling using microtunneling methodology.

The Mud Creek Geotechnical Baseline Report (GBR) revealed predominantly the presence of saturated silts and heaving sands, which are similar conditions to the saturated sandy and gravel soils that were found at the Burbook tunnel. Similarly, a microtunnelling methodology was recommended to successfully install the tunnels and prevent settlement of the CN rail embankment. Microtunnelling is the latest and most advanced trenchless construction technology. The main advantage of the microtunnel boring machine (MTBM) is that it is a sealed system that can be controlled in saturated soil conditions. The MTBM also has the lowest probability of settlement and highest accuracy in comparison to pipe ramming or auger boring. Therefore, the risk of

settlement that occurred at the Burbrook storm sewer tunneling project is considered mitigated for this project.

In addition to selection of trenchless methodology, the consultant prepared a full risk register to identify all possible risks and mitigate these risks to the greatest extent possible. The highest risks identified include the following construction risks:

Potential Risk	Impact	Mitigation Action
Ground around shafts can't support heavy equipment for construction, such as cranes, etc.	Ground failure can result in injury due to equipment overturn, health and safety concerns and/or schedule delays if damage is incurred.	Provide detailed description of ground conditions to be expected and contractual language and in the Geotechnical Baseline Report that the ground assessment for the proposed equipment and any improvements necessary are the responsibility of the Contractor, this is means and methods.
Boulder size and concentrations that stop Micro Tunneling Machine.	Schedule and cost impacts. Removal of boulder(s) will be required at the face of the tunnel. The Micro Tunneling Machine will need to allow access through the tunnel for boulder removal. Dewatering may be required.	Conduct a prequalification of contractors. Include provision for boulder size and quantity in the Subsurface Baseline Conditions Specification based on historical information and field investigations in order to incorporate cost for removing boulders within the tunnel.

Please see Appendix ‘C’ for a summary of the risk register.

Contractor Selection

The recommended methodology by the engineering consultant is microtunnelling. This type of work is highly specialized and there are a limited number of contractors in Ontario who are capable of completing this work. One of the best ways identified to mitigate risk in this project was to ensure the appropriate contractor was hired to build the works. As such, the City undertook a prequalification process to ensure a contractor with the appropriate equipment and level of experience would be involved in the tender process. There were two contractors who submitted to the prequalification process and both of these contractors were determined to have the necessary experience to complete the proposed twin tunnels. The two contractors were invited to submit a bid during the construction tender process.

Tender Summary

The tender for construction of the Mud Creek Remediation Tunnel Construction (Phase 1a) project closed on July 24, 2020. Both pre-qualified contractors submitted tender prices as listed below, including an $800,000 contingency, excluding HST.

Contractor		Tender Price Submitted
1.	CRS Tunnelling Inc.	$16,199,871.00
2.	Ward & Burke Microtunnelling LTD.	$7,488,280.00

All tenders have been checked by the Environmental and Engineering Services Department and the City's consultant, CH2M HILL Canada Limited.

The tender estimate just prior to tender opening was $6,849,108 including contingency, excluding HST. The low tender is approximately 9% above the estimate indicating a reasonable project value in the current construction environment.

Consulting fees

Increase to Detailed Design Fees

There were several unanticipated delays and changes during this project that prolonged the duration of the design (from 1 year to 2 years) and increased the number of revisions submitted to the City and the UTRCA for review. During this project, there was considerable effort expended by the consulting team, in consultation with the UTRCA, to complete modelling that could be used to define the 250-year Regulatory Floodplain. The UTRCA changed a crucial design elevation related to the Thames River floodplain midway through the modelling effort. This critical elevation change created a one-year delay and ongoing revisions to reports and modelling to support the proposed design updates. Ultimately, the UTRCA approved the tunnel project for Phase 1a; however, the 250-year floodplain remains unresolved for the development lands to proceed in Mud Creek. The limits of the Regulatory Floodplain will need to be addressed by the City in continued dialog with the UTRCA during the detailed design of Phase 2 or by individual landowners at the time of submission of development applications. The City has requested UTRCA to engage with the public and the City during the update process since there may be significant implications to land uses or land values wherever the floodplain increases.

Another increase in the project complexity was the decision to construct two smaller culverts rather than the one large culvert contemplated in the Mud Creek EA. This decision was based on a detailed assessment of the soil conditions, a constructability and a cost analysis. The change triggered revisions to the modelling efforts to incorporate the twin tunnels. The microtunnelling required additional engagement and due diligence steps with CN Rail. All of this was beyond the original anticipated scope and timeline.

Given these additional project complexities, it is recommended that the consultant detailed design assignment be increased by $301,414, from $1,130,497 to $1,431,911 to recognize the additional scope of work required to complete the design and tender of this project.

Contract Administration Fees

The contract administration of this project is more complex than standard projects. In addition to full-time supervision, this project will require frequent coordination with the CN Rail as well as around the clock, 24-hour work for an anticipated period of 5 weeks during the microtunnelling construction. The review of shop drawings, environmental

and geotechnical monitoring of the CN embankment will be required throughout the duration of construction. CH2M HILL and Matrix Solutions have submitted a thorough contract administration plan to the City that considers all of the necessary steps to ensure a successful project.

In accordance with Section 15.2(e) of the Procurement of Goods and Services Policy, Civic Administration is recommending that CH2M HILL Canada Limited be authorized to carry out the Construction Administration of the Phase 1a Mud Creek works for the amount of $619,087.

CN Rail Flagging Requirements

In accordance with the Canadian Nation Railway (CN) agreement with the City, it is mandated that CN flagging personnel be present at all times when work progresses within the CN right-of-way, unless otherwise approved by CN. A conservative estimate of $281,632 (excluding HST) has been identified for this project.

Financial Implications

The majority of this project is funded by Development Charges as the project will open up 54 hectares of land that is designated for Rapid Transit Corridor and Neighbourhood growth. The current approved budget for the two phases of the Mud Creek project is approximately $16.4M.

The tender cost for Phase 1a represents approximately nearly 50% of the total budget. The consultant has estimated that approximately $7M-$8M will be required to construct Phase 1b and Phase 2, which may trigger an increase to the budget. However, this will be confirmed during detailed design of Phase 2. A consultant appointment for Phase 2 is anticipated for this project in Q4 2020.

Next Steps

The construction timing for the future phases of the project are provided below:

- Phase 1b – Natural stream work from Wonderland Road to tie into new CN Rail culverts;
    - Construction start date Q2 – 2021
- Phase 2 – Natural channel reconstruction from upstream of CN Rail culvert to new Oxford Street culvert (including Oxford Street culvert replacement);
    - Construction start date Q2 – 2022
- Phase 3 – Natural channel reconstruction from Oxford Street to CP Rail
    - Developer led in accordance with an approved Subdivision Agreement and timing of the Growth Management Implementation Strategy (GMIS).

A figure highlighting the major components of the overall improvements is included as Appendix ‘B’ “Location Map”.

CONCLUSIONS

The Mud Creek Flood Remediation Phase 1a includes construction of two 2.4-meter diameter tunnels under a 20-meter high CN Rail embankment using trenchless microtunnelling technologies. CH2M HILL Canada Limited has identified the risks associated with this project through completion of a Risk Register wherein risks were identified and mitigated to the extent practical. One of the largest risks to mitigate in this project involves ensuring a qualified contractor is involved in constructing the works. This risk was mitigated through a prequalification process whereby two contractors with appropriate equipment and experience were selected to bid on this project.

At this time, it is recommended that Ward and Burke Microtunnelling be awarded the construction contract and CH2M HILL Canada Limited be appointed the contract administration for the construction of the Mud Creek Flood Reduction and Rehabilitation Phase 1a tunneling project in the respective amounts identified above. It is also recommended that the consultant detailed design assignment be increased to recognize the additional scope of work required to design and tender this project. Additionally, this reports recommends approval for fees associated with mandated flagging by CN Rail since it forms a significant component of the tunneling project costs.

SUBMITTED BY:	**REVIEWED AND CONCURRED BY:**
SHAWNA CHAMBERS, P. ENG., DPA **DIVISION MANAGER** **STORMWATER ENGINEERING**	**SCOTT MATHERS, MPA, P. ENG.** **DIRECTOR, WATER AND** **WASTEWATER**

RECOMMENDED BY:
KELLY SCHERR, P. ENG., FEC **MANAGING DIRECTOR,** **ENVIRONMENTAL & ENGINEERING** **SERVICES & CITY ENGINEER**

July 31, 2020

Attach: Appendix ‘A’ – Sources of Financing
Appendix ‘B’ – Location Map
Appendix ‘C’ – Risk Register

Cc. John Freeman, Manager, Purchasing and Supply
Gary McDonald, Budget Analyst
Tom Mahood, CH2M HILL Canada Limited
Alan Dunbar, City of London
Jason Davies, City of London
Chris Ginty, City of London