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TO:	CHAIR AND MEMBERS CIVIC WORKS COMMITTEE MEETING ON JULY 18, 2016
FROM:	JOHN BRAAM, P.ENG. MANAGING DIRECTOR, ENVIRONMENTAL & ENGINEERING SERVICES AND CITY ENGINEER
SUBJECT:	BURBROOK TRUNK SEWER COMPLETION TUNNELLING PROJECT

RECOMMENDATION

That, on the recommendation of the Managing Director, Environmental & Engineering Services and City Engineer, the following information report concerning the completion of the Burbrook Trunk Storm Sewer Tunnelling Project **BE RECEIVED** for information.

PREVIOUS REPORTS PERTINENT TO THIS MATTER
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- Civic Works Committee, August 24, 2015, Burbrook Trunk Storm Sewer Project Award
- Civic Works Committee, January 6, 2015, 2015 Burbrook Trunk Storm Sewer Project Initiation
- Environment and Transportation Committee (ETC), August 7, 2007, Appointment of Consulting Engineer Vauxhall Sewershed Review.
- ETC, June 19, 2006, Appointment of Consulting Engineer ES3054: Burbrook Trunk Storm Sewer, Phase III (a).
- ETC, March 23, 2005, Recommendation for Settlement of Burbrook Trunk Sewer Phase III & IV Contract Dispute.
- ETC, March 21, 2005, Update for Burbrook Trunk Sewer Phase III & IV. Board of Control, July 30, 2003, Contract Award Burbrook Trunk Sewer Phase III & IV.

2015 - 19 STRATEGIC PLAN

The following report supports the Strategic Plan through the strategic focus area of *Building a Sustainable City* by managing and improving our water, wastewater and stormwater infrastructure and services.

BACKGROUND

The purpose of this report is to provide Committee and Council with an update of the Burbrook Trunk Storm Sewer Project, two tunnel crossings under CN Rail lands by Microtunnelling.

CONTEXT

We are pleased to report that the Burbrook Trunk Storm Sewer Tunneling project was successfully completed in spring 2016. The original project was halted in 2003 due to a failed crossing attempt and has been dormant ever since. Sanitary and Storm sewer separation projects required to alleviate flooding in the Vauxhall sewershed have not been able to proceed during this time as no outlet was available.

An inspired strategy to overcome a complicated and challenging project was presented and approved by council in January 2015, premised on new advances in tunneling technology. Budget to complete the project was amassed over the years and the project was executed according to the plan with the final of two bores emerging on February 9, 2016.

Completion of this project now opens the door for approximately \$40 Million of upstream work to be invested over the next 10 years to construct Infrastructure Renewal Projects systematically in the immediate area to help alleviate flooding and to bring infrastructure up to today's standards.

DISCUSSION

The Burbrook Trunk Storm Sewer Project is required to reduce basement flooding and allow for separation of storm flows from the existing combined sanitary sewers in the large Vauxhall subsewershed.

This Project involved the construction of approximately 220m of 2500mm internal diameter trunk storm sewer pipe underneath active high-speed operating railways with depths ranging from 5 to 8.5 meters below grade. The storm sewer was constructed and consisted of two tunnel drives connecting existing Burbrook Trunk Storm sewer infrastructure.

The construction of the subject portion of the Burbrook Trunk Storm Sewer was first attempted in 2003 utilizing an open-face tunnel boring machine (TBM) in conjunction with advance dewatering. Shortly after launching the TBM, significant surface settlements were noted and the tunnel was abandoned as a result.

From 2005 to 2012, the city worked with engineering and consulting firms to evaluate other tunneling methods and to analyze the value of sewer separation versus other options. It was ultimately determined that building the new trunk storm sewer via tunneling was still the best course of action and the city set about collecting the funds to allow the project to succeed.

This time around, it was determined that microtunnelling was the best suited tunnel technology for this project. Microtunnel Boring Machine tunneling (MTBM) methods were used to install the trunk storm sewer. MTBM allows for earth and groundwater pressures to be counterbalanced during tunnel mining, reducing the risk of over mining and related ground movements which was a significant consideration in this project



given that tunnelling was to take place below active CN rail lines. An MTBM is a closed face tunneling method. This method provided the necessary components to meet the project objectives and work within the project constraints.

Arrival of the Microtunnel Boring Machine (MTBM)



In January 2015 Council approved the initiation strategy to support new design and construction methods to complete this work. A team of experts was assembled comprising of the consulting engineering firm Hatch Mott MacDonald (HMM), and specialty contractor Ward & Burke to partner and work together to reduce risk, strengthen specifications, methodology and design in order to construct this project on time and on budget. Both firms are world leaders in their fields and are at the forefront of the microtunnelling industry and have received several nationally recognized tunneling awards. It was paramount to the success of the project that the team work together to tailor the design of this project to the required specialized equipment and engineer risk to a minimum noting HMM also developed a risk register matrix for this project in order to protect the City against unexpected impacts.

Microtunnelling provided the lowest overall construction risk and was also the most attractive option to CN Rail from an approval perspective, which thereby also reduced the project schedule risk. The unique partnership between engineer, contractor and owner permitted a streamlined design process and collaboration on design issues which allowed for an accelerated project schedule. Our project was successfully completed to contract specifications and mined along acceptable line and grade.

MTBM breaking through shaft with pipes to follow.



The tender price for the 2015 Burbrook Trunk Storm Sewer Project was \$9,521,970 excluding HST. The project was completed within the approved budget.

The completion of this phase of the Burbrook Trunk Storm Sewer allows for the continuation of approximately \$40 Million worth of Capital reconstruction projects in the Burbrook area. The primary purpose of all these projects is storm and sanitary sewer separation noting all projects have been planned, and coordinated with water and transportation needs where possible.

CONCLUSION

The Burbrook Trunk Storm Sewer Project is required to help protect properties, reduce basement flooding and allow for separation of storm flows from the existing combined sanitary sewers in the large Vauxhall subsewershed.

Tunnelling projects have unique risks and the consequences of failure can be significant. As a result, tunneling projects require a specialized skillset, both on the part of the Engineer and the Contractor.

This project involved the installation of two storm sewer crossings under CN Rail tracks connecting to existing Burbrook Trunk Storm Sewer Infrastructure. Microtunnelling construction was successfully completed to contract specifications earlier this year. A team of experts was assembled comprising of Hatch Mott MacDonald, and Ward and Burke Microtunnelling Ltd. to jointly review and reduce risk, strengthen specifications, methodology and design in order to construct this project on time and under budget, while agreeing and implementing mitigation measures collaboratively.

The project objectives have been met within necessary timelines and the approved budget.

Agenda Item #

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Light at the end of the tunnel.



Acknowledgements

This report was prepared with the assistance of Paul Choma, P.Eng., Environmental Service Engineer, Construction Administration Division.

PREPARED BY:	REVIEWED AND CONCURRED BY:
UGO DECANDIDO, P. ENG. DIVISION MANAGER, CONSTRUCTION ADMINISTRATION	JOHN LUCAS, P. ENG. DIRECTOR, WATER AND WASTEWATER
RECOMMENDED BY:	
JOHN BRAAM, P. ENG. MANAGING DIRECTOR, ENVIRONMENTAL & ENGINEERING SERVICES AND CITY ENGINEER	

pc/ud

Attach:

- c.c. Tom Copeland
- Dave Mounteer
- John Freeman
- Hatch Mott MacDonald
- Ward and Burke Microtunnelling