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## MEMORANDUM



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TO: Giancarlo Radicioni, City of Cambridge  
Moffat Creek Technical Steering Committee

REF. NO.: 37936-60

FROM: Chris Hunter / Dale Paynter / smc/1

DATE: October 29, 2008

C.C.:  

RE: **Review of Supplementary Options - Moffat Creek Trunk Sanitary Sewer**

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### 1.0 INTRODUCTION

This memorandum has been prepared to present Conestoga-Rovers and Associates' (CRA's) evaluation of additional options for the construction of the Moffat Creek Trunk Sanitary Sewer works in the City of Cambridge.

The tender results received in July of 2008 were above the estimates expected and budgets allocated to undertake the works.

### 2.0 DISCUSSIONS WITH TECHNICAL STEERING COMMITTEE

At the Technical Steering Committee meeting of September 23, 2008, several points were discussed on items that may be reduced, deferred or eliminated from the project scope in order to reduce the overall project costs.

The primary conclusions from the meeting of September 23<sup>rd</sup> were to review:

- Possible reduction in the overall amount of trenchless installation;
- Reduction in the associated preparatory surface works involved with trenchless installation;
- Reduction in the requirements for significant access structures;
- Possible open cut installation crossing of Dundas Street (Region); and
- Reduction / deferral of requirements for long term access, including section of new trails.

One of the criteria that was incorporated in all alignment options that have been contemplated and/or presented as far back as the original Environmental Assessment in 1999 was that the trunk sewer would be aligned and constructed completely within the City-owned property limits of the Moffat Creek Valley.

A review of property ownership and parcels in the immediate area shows City property narrowing to a width of less than 15 metres at a point approximately 140 metres east of Franklin Boulevard. This

One point of discussion made by the City was the possibility of easements on private lands, with three properties in particular that back onto Moffat Creek from the north (Franklin Lane street addresses). Any works undertaken within private properties would need to be of trenchless installation.

Also discussed at the September 23<sup>rd</sup> meeting was the possibility of completing the trunk sewer crossing of Dundas Street by open cut rather than by trenchless construction methods. Points that would need to be taken into consideration include duration of road closure, detour requirements, and allowances for 2009 installations related to the Trunk Watermain works on Dundas Street itself.

### 3.0 OPTIONS REVIEWED

**The City's pursuance of property easements along Franklin Lane presents a significant opportunity to optimize an alignment within the Moffat Creek valley, and has allowed further investigation of options that give a much greater possibility of minimizing the environmental impacts of this project.**

Four alternatives that are presented as part of this memorandum focus on the total length, as well as the alignment of trenchless installation, in particular between Franklin Boulevard and Dundas Street (See Figures 1 and 2).

All four options incorporate the following:

- Open cut installation immediately east from Franklin Boulevard (170 metres);
- Trenchless installation, starting to the north of Moffat Creek, crossing between the off-line Pond and wetland to a point immediately north of the Azores walkway (south of Moffat Creek), near to the current MH 4A (210 metres);
- Easement requirements crossing along the rear of the Franklin Lane properties for the above section of trenchless installation;
- Open cut crossing of Moffat Creek to the east of Dundas (MH-7A to MH-59A – 80 metres); and
- Open cut installation within the Greengate Subdivision (260 metres, as tendered).

The specific differences between the four alternatives are as follows:

#### 3.1 Option A - Trenchless Installation - Across Pond Only

- Open Cut installation from Azores Crescent east to Dundas Street, following the present alignment along the south side of Moffat Creek (210 metres); and
- Open Cut installation crossing Dundas Street continuing to the east to the current MH 7A location (120 metres);

### 3.2 Option B - Trenchless Installation - Across Pond plus Azores to Dundas

- Additional trenchless installation (second run) from Azores Crescent east to Dundas Street, following the present alignment along the south side of Moffat Creek (210 metres – a longer distance than in the June Tender); and
- Open Cut installation crossing Dundas Street continuing to the east to the current MH 7A location (120 metres).

### 3.3 Option C - Trenchless Installation Across Pond through to East Side of Dundas

- Trenchless installation (one run) starting to the north of Moffat Creek, crossing between the off-line Pond and wetland to a point immediately north of the Azores walkway, continuing crossing Dundas Street below the existing box culvert, with the trenchless section terminating near the east shoulder of Dundas Street (465 metres); and
- Open Cut installation from the east shoulder of Dundas Street continuing to the east to the current MH 7A location (85 metres).

### 3.4 Option D - Trenchless Installation Across Pond, Dundas and East Wetland

- Trenchless installation (one run) starting to the north of Moffat Creek, crossing between the off-line Pond and wetland to a point immediately north of the Azores walkway, continuing crossing Dundas Street below the existing box culvert, terminating near the current location of current MH 7A (total length 550 metres);

Table 1 presents a numerical comparison of the installation and/or final components of these four options.

## 4.0 ASSESSMENT OF OPTIONS

The following is a point-by-point summary of the advantages and constraints of each alternative.

Additional environmental factors from the tender package (both positive and negative) are shown in *italic*.

### 4.1 Advantages and Constraints Common to All Four Options

#### Common Advantages

- Staging/Sending Area B East of Franklin to now be NORTH of Moffat Creek
- *Eliminates two of seven Manholes - 1A and 3A*
- *Eliminates Staging Only Area at Franklin*
- *Eliminates two of three Staging/Sending Areas*
- *Eliminates three of four Receiving Areas - one remaining at Azores*
- *No Construction Grade Bridge over Creek required near Franklin Boulevard*
- *No Activity required South of Moffat Creek between Franklin and Azores*

**Common Constraints**

- *Alignment near to Off-Line Pond Area*
- *Acquisition of Property Easements(s)*
- *Open Cut requirements for Dundas Street to install MH in right-of-way - Reduced lanes versus full closure*
- *Deferring completion of Trails as per City Official Plan*

**4.2 Option A - Trenchless Installation Across Pond Only****Additional Advantages**

- *One directional installation (six in original tender - three set-ups, two directions)*
- *Reduced overall length of trenchless installation to 25% of tendered quantity*
- *No construction or maintenance access required from Azores*

**Additional Constraints**

- *Full Maintenance Access required along Creek - Azores to Dundas*
- *Retaining Walls along Maintenance Access - Azores to Dundas*
- *Additional efforts for Restoration (Tree and other vegetative cover) - Azores to Dundas*
- *Moving operation for dewatering controls - Azores to Dundas*
- *Very Narrow working limits for Open Cut - Azores to Dundas*
- *Steep and high slopes along alignment / Need for shoring - Azores to Dundas*

**4.3 Option B - Trenchless Installation Across Pond, plus Azores to Dundas****Additional Advantages**

- *Two directional installations (six in original tender - three set-ups, two directions)*
- *Reduced overall length of trenchless installation to 55% of tendered quantity*
- *No surface activity or access along Moffat Creek between Azores and Dundas*

**Additional Constraints**

- *Staging/Sending Area still required on West Side of Dundas*
- *Construction and Maintenance access will need to remain at Azores (as per Tender)*

**4.4 Option C - Trenchless Installation Across Pond through to East Side of Dundas****Additional Advantages**

- *One directional installation (six in original tender - three set-ups, two directions)*

- Eliminates four manholes from original tender
- *No surface activity or access required between Azores and Dundas*
- *No construction or maintenance access required from Azores*

#### **Additional Constraints**

- Length/Accuracy of Single Directional Drill
- Maintenance requirements and efforts for single run of trunk sewer

#### **4.5 Option D - Trenchless Installation Across Pond, Dundas and East Wetland**

#### **Additional Advantages**

- One directional installation (six in original tender – three set-ups, two directions)
- Eliminates four manholes from original tender
- *No surface activity or access required between Azores and Dundas*
- *No surface activity crossing Wetland immediately east of Dundas*
- *No construction or maintenance access required from Azores*

#### **Additional Constraints**

- Longest Trenchless Installation / Accuracy of Single Directional Drill
- Maintenance requirements and efforts for single run of trunk sewer

#### **5.0 ENVIRONMENTAL CONSIDERATIONS**

Since the initiation of the EA Addendum nearly four years ago, the approach taken by the City and CRA has been to investigate alternative methodologies along the Preferred Alignment, with the primary goal to reduce the footprint and environmental impact of this project on the Moffat Creek Valley.

All of the Steering Committee member agencies have been included during the investigations for, and preparation of the Addendum Report in 2005 and 2006.

The alignment and methodology and features included in the June Tender were derived to optimize and address the concerns and issues of all of the Committee agencies.

The City of Cambridge maintains that the final product will be undertaken maximizing efforts and methodology (ies) that will reduce impacts to, and possibly provide opportunities to improve valley conditions. As identified in the EA Addendum, Cambridge City Council allocated \$250,000 to this project specifically for additional environmental enhancements.

As stated earlier, the City's pursuance of property easements along Franklin would allow refinement of the June Tender package, giving a much greater opportunity to minimize the environmental impacts of this trunk sewer and provide a greater level of certainty to potential constructors of these works.

## 6.0 COST ASSESSMENT

In order to estimate the construction value of each of the above options, it was first necessary to refine each alternative scope by transferring, clarifying or eliminating line items identified in the original Schedule C - Form of Tender.

For example, installations of specific reaches were transferred from Trenchless Installation to Open Cut. Reaches that are now identified as open cut require an increase in clearing, preparation, local dewatering, siltation protection and permanent maintenance access. Where staging or receiving areas were eliminated, the associated preparation, excavation, replacement and restoration were also removed.

CRA then consolidated the costs of the six tenders received in June for each line item, and determined minimum, maximum, average and mean values for all unit and lump sum rates for each item.

Values used in this assessment are either at or slightly above the larger of the average or mean values calculated, in an effort to create representative cost estimates, to identify the potential savings.

All current estimates have also deferred installation of pedestrian-only walkways and boardwalks. For comparison purposes, these items have also been removed from the Low Tenderer's submission shown here.

Miscellaneous and Additional Provisional Items quantities were not altered in this assessment.

Note that the Contingency Line Item has been revised from a Lump Sum to 10% of the sub-total of all other Sections.

### 6.1 Assessment by Task and Location

Table 2 presents a summary of the Tender plus the four options, presented in the same by task format as the Tender. The minimum, maximum, average, and mean Tender values are from the tender section totals, rather than a total of line by line calculations.

Table 3 presents a summary for the Low Tenderer and the four options, presented in format by location of each section of the works.

Specific numbers in these tables confirm:

- The total costs of the works are most directly affected by the total length of trenchless installation to be completed, Option D being slightly higher than both Options B and C.
- Overall dewatering costs are reduced by decreasing the number of sending and/or receiving pits, but vary between options due to the total length of trenchless installation, in the cases of Options C and D;
- Site Preparation costs are reduced by eliminating Staging and Receiving Areas, the Bridge Crossing near Franklin, and maintenance accesses, specifically in the case of Option C and D;
- Surface restoration costs are reduced for Options B, C and D; and

- The Dundas Crossing costs include preparation and access requirements, not required with Options C and D. MH6A will be installed by Open Cut in all options.

Line-by-line breakdown of these tables is available on request.

## **7.0 ADDITIONAL ENVIRONMENTAL EFFORTS**

The City of Cambridge has proposed the retention of an independent firm to oversee the environmental compliance of the Construction Phase of the works.

The role and mandate of this reviewer will be to ensure that all protections and methodologies used meet the requirements of the Regulations in place and of the Contract itself.

The Technical Steering Committee will be asked to provide input to and approval for the duties and reporting obligations for this overseer.

## **8.0 CLOSING**

We trust that this assessment provides the City of Cambridge and the Technical Steering Committee with sufficient background to continue with further evaluation of options in the implementation of the Moffat Creek works.

If there are additional questions, please contact our office.

**TABLE 1**  
**SUMMARY OF FEATURES AND QUANTITIES**  
**MOFFAT CREEK TRUNK SANITARY SEWER**  
**CITY OF CAMBRIDGE**

	AS TENDERED	OPTION A	OPTION B	OPTION C	OPTION D
		ACROSS POND ONLY	ACROSS POND, PLUS AZORES TO DUNDAS	ACROSS POND THROUGH TO EAST OF DUNDAS	ACROSS POND, DUNDAS AND EAST WETLAND
Trenchless Installation (m)	770	210	420	465	550
Open Cut Installation (m)	400	935	725	675	590
Manholes Required (outside Greengate)	7	5	5	3	3
Property Easement Required	No	Yes	Yes	Yes	Yes
Access from Azores	Yes	No	Yes	No	No
Staging Only Areas	1	0	0	0	0
Staging/Sending Areas Required	3	1	2	1	1
Receiving Areas Required	4	1	1	1	1
Construction Bridge	Yes	No	No	No	No
Dewatering and Sedimentation Setup (each)	6	3	3	2	2
Maintenance Access (m)	485	450	380	220	220
Retaining Walls (m)	160	230	160	0	0
Pedestrian Paths or Boardwalks (m)	360	55	55	55	55

**TABLE 2  
TENDER SUMMARY BY TASK  
MOFFAT CREEK TRUNK SANITARY SEWER  
CITY OF CAMBRIDGE**

	TENDER RESULTS				OPTION A	OPTION B	OPTION C	OPTION D
	MIN	MAX	AVERAGE	MEAN	ACROSS POND ONLY	ACROSS POND PLUS AZORES TO DUNDAS	ACROSS POND THROUGH TO EAST OF DUNDAS	ACROSS POND, DUNDAS AND EAST WETLAND
<i>I</i> SITE PREPARATION	\$ 560,323	\$ 2,147,689	\$ 1,099,273	\$ 937,221	\$ 554,810	\$ 418,110	\$ 229,280	\$ 235,780
<i>II</i> DEWATERING	\$ 198,600	\$ 1,773,000	\$ 866,003	\$ 902,604	\$ 675,000	\$ 895,000	\$ 785,000	\$ 775,000
<i>III</i> SANITARY SEWER CONSTRUCTION	\$ 5,107,304	\$ 11,226,000	\$ 8,215,491	\$ 8,260,100	\$ 3,624,000	\$ 5,194,000	\$ 5,429,000	\$ 6,034,000
<i>IV</i> TRAIL CONSTRUCTION AND RESTORATION *	\$ 342,592	\$ 883,580	\$ 661,620	\$ 652,992	\$ 425,615	\$ 412,315	\$ 212,665	\$ 251,980
<i>V</i> MISCELLANEOUS	\$ 49,080	\$ 153,400	\$ 90,569	\$ 74,700	\$ 140,000	\$ 140,000	\$ 140,000	\$ 140,000
<i>VI</i> ADDITIONAL PROVISIONAL ITEMS *	\$ 73,648	\$ 1,078,865	\$ 354,299	\$ 241,230	\$ 327,500	\$ 327,500	\$ 327,500	\$ 327,500
<i>VII</i> CONTINGENCY **	\$ 350,000	\$ 350,000	\$ 350,000	\$ 350,000	\$ 574,693	\$ 738,693	\$ 712,345	\$ 776,426
<b>SUB-TOTAL</b>	<b>\$ 8,411,530</b>	<b>\$ 16,543,217</b>	<b>\$ 11,637,254</b>	<b>\$ 10,822,858</b>	<b>\$ 6,321,618</b>	<b>\$ 8,125,618</b>	<b>\$ 7,835,790</b>	<b>\$ 8,540,686</b>
5% G.S.T.	\$ 420,577	\$ 827,161	\$ 581,863	\$ 541,143	\$ 316,081	\$ 406,281	\$ 391,789	\$ 427,034
<b>TOTAL</b>	<b>\$ 8,832,107</b>	<b>\$ 17,370,378</b>	<b>\$ 12,219,116</b>	<b>\$ 11,364,001</b>	<b>\$ 6,637,698</b>	<b>\$ 8,531,898</b>	<b>\$ 8,227,579</b>	<b>\$ 8,967,720</b>

\* Additional Trees under PROVISIONAL ITEMS during Tendering have now been included under RESTORATION

\*\* CONTINGENCY during Tendering was a Lump Sum - now changed to 10% of Total of Sections I through IV

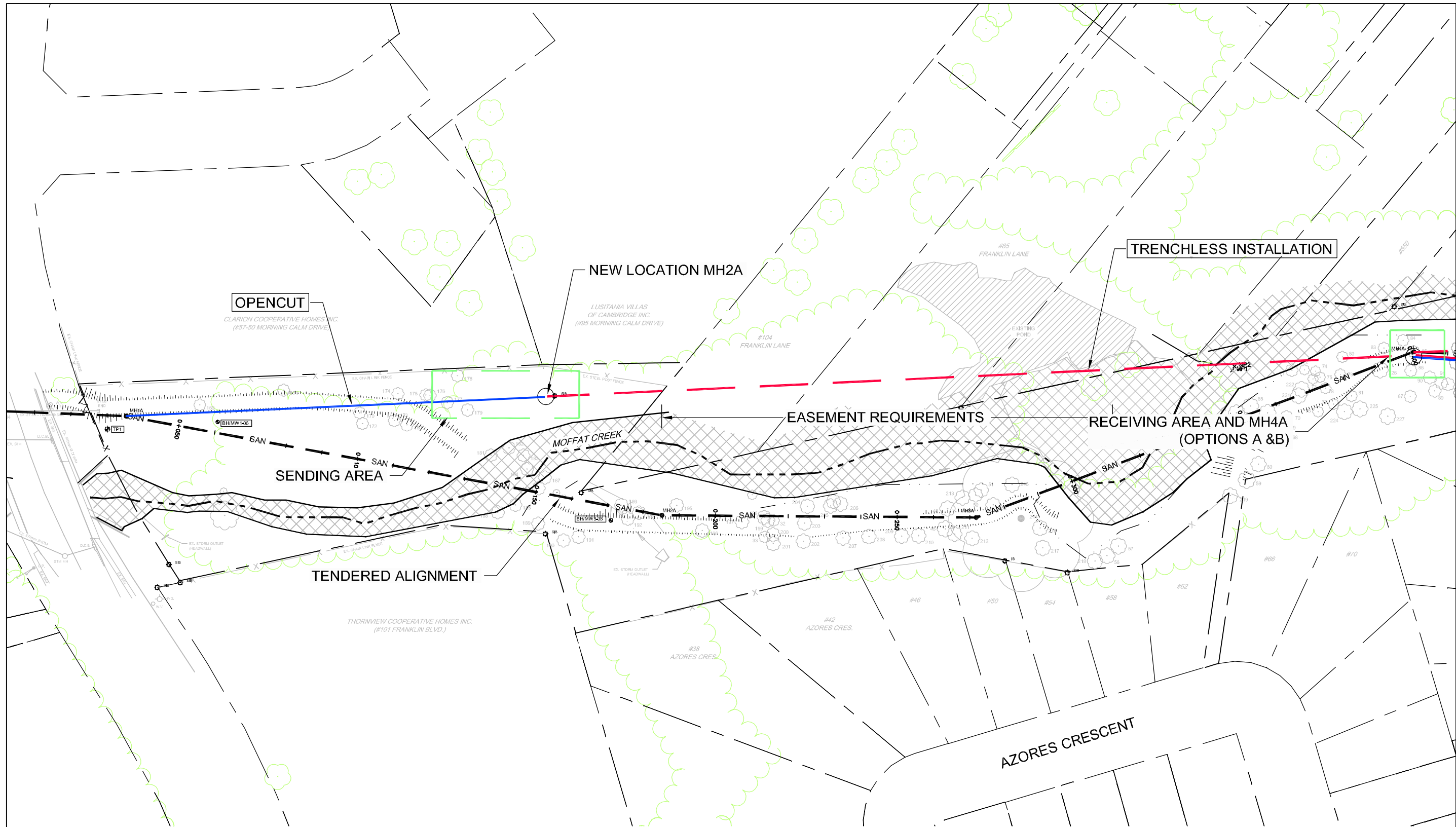
**TABLE 3  
POST TENDER OPTIONS - LIMIT OF TRENCHLESS CONSTRUCTION  
MOFFAT CREEK TRUNK SANITARY SEWER  
CITY OF CAMBRIDGE**

		OPTION A	OPTION B	OPTION C	OPTION D
LOW TENDERER		ACROSS POND ONLY	ACROSS POND PLUS AZORES TO DUNDAS	ACROSS POND THROUGH TO EAST OF DUNDAS	ACROSS POND, DUNDAS, AND EAST WETLAND
<b>A</b>	<b>FRANKLIN BOULEVARD TO NORTH OF MOFFAT CREEK</b>	TUNNEL 1 \$ 1,929,875	Open Cut \$ 794,050	Open Cut \$ 894,050	Open Cut \$ 994,050
<b>B</b>	<b>NORTH OF MOFFAT CREEK TO AZORES CRESCENT</b>	TUNNELS 2 & 3 \$ 2,398,875	TUNNEL \$ 1,907,000	TUNNEL 1 \$ 1,927,800	TUNNEL \$ 4,951,200
<b>C</b>	<b>AZORES CRESCENT TO DUNDAS STREET</b>	TUNNEL 4 \$ 1,497,067	Open Cut \$ 950,900	TUNNEL 2 \$ 2,359,100	
<b>D</b>	<b>CROSSING DUNDAS STREET *</b>	TUNNEL 5 \$ 2,003,489	Open Cut \$ 734,935	Open Cut \$ 868,935	\$ 487,680
<b>E</b>	<b>CROSSING MOFFAT CREEK</b>	TUNNEL 6 \$ 714,612	Open Cut \$ 222,680	Open Cut \$ 222,680	Open Cut \$ 246,830
<b>F</b>	<b>GREENGATE SUBDIVISION</b>	Open Cut \$ 451,857	Open Cut \$ 591,000	Open Cut \$ 591,000	Open Cut \$ 591,000
<b>G</b>	<b>SITE MOBILIZATION</b>	\$ 71,700	\$ 140,000	\$ 140,000	\$ 140,000
<b>H</b>	<b>PROVISIONAL ITEMS</b>	\$ 404,626	\$ 406,360	\$ 383,360	\$ 353,500
<b>J</b>	<b>CONTINGENCY **</b>	\$ 350,000	\$ 574,693	\$ 738,693	\$ 776,426
	<b>SUB-TOTAL</b>	<b>\$ 9,822,100</b>	<b>\$ 6,321,618</b>	<b>\$ 8,125,618</b>	<b>\$ 7,835,790</b>
	5% G.S.T.	\$ 491,105	\$ 316,081	\$ 406,281	\$ 391,789
	<b>TOTAL</b>	<b>\$10,313,205</b>	<b>\$ 6,637,698</b>	<b>\$ 8,531,898</b>	<b>\$ 8,227,579</b>

**TRAIL-ONLY COMPONENTS (Boardwalks, Fabric, Screenings, Stone and Wood Chip) EXCLUDED FROM LOW TENDERER AND ALL OPTIONS**

\* CROSSING DUNDAS STREET INCLUDES INCLUDE STAGING, SET-UP, AND DEWATERING COSTS FROM EAST SIDE

\*\* CONTINGENCY FOR ALL OPTIONS UPDATED TO 10% OF TOTAL OF SECTIONS A THROUGH H

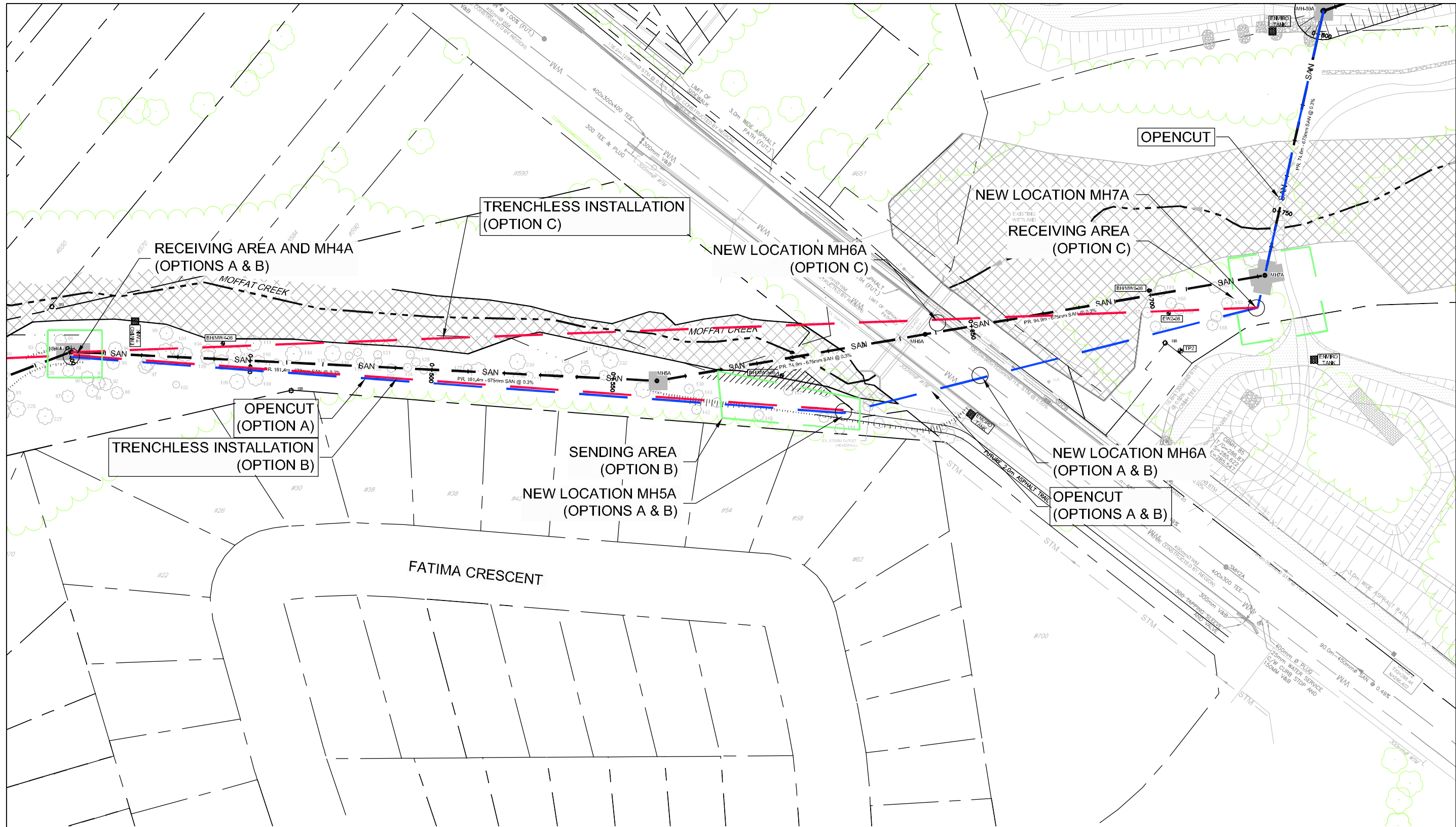


**FIGURE 1**

**ALIGNMENT OPTIONS  
FRANKLIN BLVD. TO AZORES CRESCENT  
MOFFAT CREEK SANITARY TRUNK SEWER  
Cambridge, Ontario**

- OPEN CUT INSTALLATION
- TRENCHLESS INSTALLATION





— — OPEN CUT INSTALLATION  
— — TRENCHLESS INSTALLATION

**FIGURE 2**  
**ALIGNMENT OPTIONS**  
**AZORES CRESCENT TO DUNDAS STREET**  
**MOFFAT CREEK SANITARY TRUNK SEWER**  
*Cambridge, Ontario*

