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REGION OF PEEL
WASTEWATER CAPACITY IMPROVEMENTS IN CENTRAL MISSISSAUGA
APPENDIX 3-F

Cost Estimates

Cost Estimate Assumptions

The Cost Estimate for the proposed alignments was developed through the most up to date project details in consultation with the Region, along with industry experts.

Total Construction Cost

The construction cost estimate was developed in three major categories: Tunnel/Sewer Construction, Shaft/Manhole Construction and Additional Costs.

For calculating the cost for the tunnel/sewer, a unit cost approach was used, where the length of tunnel drive and pipe construction was estimated on a per metre length basis based on the construction methodology (tunnelled vs. open cut). Each tunnel drive length was calculated, and a cost assigned for that length. To estimate the cost of the shafts and manhole, the depth of each shaft was measured based on the most up to date conceptual design drawings and the shaft / manhole costs were calculated on a per metre depth basis. In addition to the costs for shaft construction and supply/install of manholes, costs were added for chamber/vortex structure construction and supply and installation of control gates, automation and SCADA. The unit costs that were used to develop the construction costs are as follows:

SHAFTS

- Shaft: \$12,500/m inside shaft diameter/m depth to tunnel liner invert

TUNNELING/SEWER CONSTRUCTION

Table 1: Tunnelling (Microtunnelling) Unit Cost

Diameter (mm)	Total Unit Cost (\$/m)
675	\$7,870
750	\$7,870
825	\$7,870
900	\$7,870
975	\$7,870
1050	\$7,870
1200	\$7,870
1350	\$8,530
1500	\$9,190
1650	\$9,850
1800	\$10,510
1950	\$11,310
2100	\$12,490
2250	\$12,490

Table 2: Tunneling (Tunnel Boring Machine) Unit Cost

Diameter (mm)	Total Unit Cost (\$/m)
1050	\$8,800
1200	\$9,540
1350	\$9,900
1500	\$10,640
1650	\$11,370
1800	\$11,370
1950	\$12,100
2100	\$12,470
2250	\$13,200
2400	\$13,940

Table 3: Open Cut (5 m Depth) Unit Cost

Diameter (mm)	Total Unit Cost (\$/m)
300	\$764
375	\$808
450	\$883
525	\$948
600	\$1,217
675	\$1,486
750	\$1,637
825	\$1,755
900	\$2,067
975	\$2,218
1050	\$2,455
1200	\$2,756
1350	\$3,015
1500	\$3,381
1800	\$4,296
2100	\$5,319
2400	\$6,546
3000	\$9,131

Table 4: Open Cut (5-10 m Depth) Unit Cost

Diameter (mm)	Total Unit Cost (\$/m)
300	\$3,209
375	\$3,306
450	\$3,424
525	\$3,532
600	\$3,865
675	\$4,242
750	\$4,447
825	\$4,619
900	\$5,050
975	\$5,233

Region of Peel
Wastewater Capacity Improvements in Central Mississauga
Cost Estimate Assumptions

Diameter	Total Unit Cost
1050	\$5,599
1200	\$5,997
1350	\$6,385
1500	\$6,773
1800	\$7,871
2100	\$9,152
2400	\$10,563
3000	\$13,470
300	\$3,209

Table 5: Manhole Unit Cost

Depth (m)	Diameter (mm)				
	1200	1500	1800	2400	3000
1	\$3,724	\$6,816	\$9,362	\$19,581	\$32,068
2	\$4,816	\$8,145	\$11,041	\$21,267	\$34,706
3	\$5,453	\$10,044	\$13,292	\$26,326	\$42,621
4	\$6,770	\$10,787	\$14,175	\$28,363	\$48,581
5	\$11,435	\$15,241	\$18,629	\$32,817	\$53,035
6	\$12,540	\$16,557	\$19,945	\$34,134	\$54,352
7	\$13,856	\$17,874	\$21,262	\$36,051	\$55,669
8	\$15,174	\$19,190	\$22,578	\$36,767	\$56,986
9	\$16,930	\$20,945	\$24,334	\$38,524	\$58,742
10	\$20,944	\$22,264	\$25,651	\$39,840	\$60,059
11	\$21,522	\$24,685	\$28,315	\$44,024	\$66,835
12	\$23,406	\$26,485	\$30,186	\$46,326	\$69,953
13	\$25,289	\$28,284	\$32,056	\$48,627	\$73,072
14	\$27,172	\$30,084	\$33,927	\$50,928	\$76,190
15	\$29,056	\$31,884	\$35,797	\$53,230	\$79,309
16	\$30,939	\$33,683	\$37,668	\$55,531	\$82,428
17	\$32,822	\$35,483	\$39,539	\$57,832	\$85,546
18	\$34,705	\$37,283	\$41,409	\$60,133	\$88,665
19	\$36,589	\$39,083	\$43,280	\$62,435	\$91,783
20	\$38,472	\$40,882	\$45,150	\$64,736	\$94,902
21	\$40,355	\$42,682	\$47,021	\$67,037	\$98,021
22	\$42,239	\$44,482	\$48,892	\$69,339	\$101,139
23	\$44,122	\$46,281	\$50,762	\$71,640	\$104,258
24	\$46,005	\$48,081	\$52,633	\$73,941	\$107,376
25	\$47,889	\$49,881	\$54,503	\$76,243	\$110,495
26	\$49,772	\$51,680	\$56,374	\$78,544	\$113,614
27	\$51,655	\$53,480	\$58,245	\$80,845	\$116,732
28	\$53,538	\$55,280	\$60,115	\$83,146	\$119,851
29	\$55,422	\$57,080	\$61,986	\$85,448	\$122,969
30	\$57,305	\$58,879	\$63,856	\$87,749	\$126,088

EASEMENTS

Table 6: Land Type Cost

Land Type	Unit Rate (\$/acre)
Low Density	\$600,000
Apartment	\$2,000,000
Industrial	\$850,000
Commercial	\$1,500,000
Permanent Easement Cost = 50% of land cost	
Temporary Easement Cost = 10% of land cost	

Several additional construction items were included in the total construction cost. These Additional Costs were added separately from the base Tunneling/Sewer and Shaft/Manhole Costs. These include gravity sewer tie in, traffic management and creek crossing costs.

The base construction cost is the addition of tunnel/sewer construction, shaft and manhole construction and additional costs. Further to the base construction cost, construction contingency of 30% was added to account for unknown costs that could arise during detailed design and construction.

The total construction cost is the sum of base construction cost plus Construction contingency.

Total Project Cost

Engineering cost of 15% x Base Construction Cost (not including contingency) for Detailed Design and Contract Administration was added. Property Costs were also added to the Total Construction Cost to arrive at the Total Project Cost.

A summary of the construction cost estimate is provided in **Table 7**. The breakdown and details of the construction cost estimate are shown in **Table 8**.

Table 7: Cost Estimate Summary

	Base Construction Cost	Easement Cost	Design /Engineering	Contingency	Total Cost
Burnhamthorpe Road	\$16,105,763	\$331,879	\$2,415,864	\$4,831,729	\$23,685,234
Cawthra Road	\$15,953,337	\$0	\$2,393,000	\$4,786,001	\$23,132,338
Queensway East	\$96,738,344	\$3,141,600	\$14,510,752	\$29,021,503	\$143,412,199
Total					\$190,229,771

Description	Basic Information			Sewer Information							Sewer Cost		
	Manhole /Shaft	Sewer Section	Length	Diameter	Average Ground elevation	Start Elevation	Stop Elevation	Average depth	Open Cut /Tunnel	Construction Method	Unit Cost	Sewer Cost	Shaft Dia.
			(m)	(mm)	(m)	(m)	(m)	(m)	(m)	(O/T)	(\$/m)	(\$)	(m)
Burnhamthorpe Road Cost Estimate													
12 - Shaft construction with a manhole at Central Parkway E and Burnhamthorpe Rd E	MH12										-	-	10
RTC (2 flow control gates) at Burnhamthorpe Rd and Central Pkwy											-	-	
TBM 1500mm Sewer from MH12 to MH12A (Along Burnhamthorpe Rd from Central Parkway E to Cawthra Rd)													
11 - Manhole inside existing 8.5m inside Dia. construction shaft at Burnhamthorpe Rd and Cawthra	MH11										-	-	8.5
Cawthra Road Cost Estimate													
10 - Shaft construction with a manhole that contains an internal vortex drop structure at Dundas St E and Cawthra	MH10										-	-	10
TBM 1500mm sewer from MH10 to MH4 (Along Cawthra from Dundas St to Queensway E)													
RTC at Cawthra and Dundas Street East (two flow gates installed at existing MH2A)											-	-	
Queensway Road Cost Estimate													
RTC at MH6567075 (will need to modify for flow control) at Queensway East and Hurontario Street											-	-	
Connection shaft for the 1500mm sewer with RTC - 2 flow control gates, connect at MH6567075 (Queensway East and Hurontario Street)											-	-	5.642
Microtunnel 1500mm sewer from MH6567075 to MH8A (Along Queensway E from Hurontario St to just past the bridge that crosses Cooksville Creek)													
8A - Shaft construction with a manhole and drop structure (East side of Cooksville Creek past the bridge)	MH8A										-	-	10
MH1 - Manhole construction (connects into 900mm pipe by Cooksville Creek)	MH8B										-	-	
Open cut 900mm sewer from MH1 to MH2 (on East side of Cooksville Creek just North of Queensway E)		MH8B	MH8C	9.2	900	102	97.88	97.85	4.13	O	5m	\$2,067	\$19,019
MH2 - Manhole construction and RTC - 2 flow control gates (connects into 900mm pipe by Cooksville Creek)		MH8C									-	-	
Open cut 900mm sewer from MH2 to Shaft 10A (on East side of Cooksville Creek just North of Queensway E)		MH8C	MH8A	6.6	900	102	97.34	97.24	4.71	O	5m	\$2,067	\$13,644
Open cut 900mm sewer from MH2 to MH3 (on East side of Cooksville Creek just North of Queensway E)		MH8C	MH8D	9.2	900	102	97.85	97.82	4.16	O	5m	\$2,067	\$19,019
MH3 - Manhole construction (East of Cooksville Creek)		MH8D									-	-	
Open cut 900mm sewer from MH3 to MH4 (on East side of Cooksville Creek just North of Queensway E)		MH8D	MH8E	20	900	102	97.82	97.76	4.21	O	5m	\$2,067	\$41,346
MH4 - Manhole construction (East of Cooksville Creek)		MH8E									-	-	
Open cut 900mm sewer from MH4 to existing manhole (possibly 1786813) (on East side of Cooksville Creek just North of Queensway E)		MH8E	Existing	25	900	102	97.76	97.69	4.27	O	5m	\$2,067	\$51,682
Microtunnel 1500mm sewer from MH8A to MH7A (along Queensway E from Cooksville Creek to Cliff Rd)													
7A - Shaft construction with a manhole that includes a external drop structure (at Queensway E and Cliff Rd)		MH8A	MH7A	639.8	1500	106.5	96.02	95.38	10.80	T	Micro	\$9,190	\$5,879,762
7C - Manhole construction and RTC - flow gate at Queensway E and Cliff Rd		MH7A									-	-	10
7C - Manhole construction and RTC - flow gate at Queensway E and Cliff Rd		MH7C									-	-	
Open cut 300mm sewer from MH7C to MH8B along Queensway E		MH7C	MH7B	66.5	300	107.3	103.2	102.54	4.43	O	5m	\$764	\$50,837
7B - Manhole construction at Queensway E and Cliff Rd		MH7B									-	-	
Open cut 300mm sewer from MH7B to MH7A along Queensway E		MH7B	MH7A	5	300	107.3	102.48	102.44	4.84	O	5m	\$764	\$3,822
Microtunnel 1500mm sewer from MH7A to MH6A (along Queensway E from Cliff Rd to Hensall St)													
6D - Manhole construction with RTC - flow gate at West of Hensall St and Queensway East		MH7A	MH6A	449.6	1500	106.5	95.38	94.93	11.35	T	Micro	\$9,190	\$4,131,824
Open cut 300mm sewer from MH6D to MH6B (along Queensway E to Hensall St)		MH6D	MH6B	90.42	300	106	102.4	101.93	3.83	O	5m	\$764	\$69,123
6B - Manhole construction with a drop structure at Hensall St and Queensway E		MH6B									-	-	
6C - Manhole construction with RTC - flow gate at Hensall St and Queensway E		MH6C									-	-	
Open cut 300mm sewer from MH6C to MH6B (at Hensall St and Queensway E)		MH6C	MH6B	35.71	300	106.3	103.5	103.32	2.89	O	5m	\$764	\$27,299
Open cut 300mm sewer from MH6B to MH6A (at Hensall St and Queensway E)		MH6B	MH6A	10	300	106.2	101.87	101.74	4.40	O	5m	\$764	\$7,645
6A - Shaft construction with a manhole that includes a drop structure and RTC control (at Hensall St and Queensway E)		MH6A									-	-	10
Microtunnel 1500mm sewer from MH6A to MH5A (along Queensway E from Hensall St to Tedlo St)													
5A - Shaft construction with a manhole that includes an external drop structure at Queensway E and Tedlo St		MH6A	MH5A	186.1	1500	106.75	94.93	94.84	11.87	T	Micro	\$9,190	\$1,710,259
5D - Manhole construction with RTC - flow control gate at Queensway E and Tedlo St		MH5A									-	-	10
Open cut 300mm sewer from MH5D to MH5C (at Queensway East and Tedlo St)		MH5D	MH5C	50.1	300	108	104.6	104.1	3.65	O	5m	\$764	\$38,300
5C - Manhole construction at Queensway E and Tedlo St		MH5C									-	-	
Open cut 300mm sewer from MH5C to MH5B (at Queensway East and Tedlo St)		MH5C	MH5B	45.7	300	107.9	104.04	103.58	4.09	O	5m	\$764	\$34,936
5B - Manhole construction at Queensway E and Tedlo St		MH5B									-	-	
Open cut 300mm sewer from MH5B to MH5A (at Queensway East and Tedlo St)		MH5B	MH5A	5	300	107.75	103.52	103.48	4.25	O	5m	\$764	\$3,822
Microtunnel 1500mm sewer from MH5A to MH4 (along Queensway East from Tedlo to Cawthra)													
4 - Shaft construction with a manhole at Queensway East and Cawthra		MH5A	MH4	524.3	1500	108.75	94.84	94.58	14.04	T	Micro	\$9,190	\$4,818,317
TBM 1800mm sewer from MH4 to MH3A (along Queensway East from Cawthra to Dixie Rd)													
Potentially contaminated groundwater containment, treatment, disposal		MH4	MH3A	2083.2	1800	110	94.28	92.22	16.75	T	TBM	\$11,370	\$23,685,984
3A - Shaft construction with a manhole and internal vortex drop structure at Queensway East and Dixie Rd		MH3A									-	-	10
3B - Manhole construction with RTC - flow control gate at Queensway East and Dixie Rd		MH3B									-	-	
Open cut 900mm sewer from MH3B to MH3A (crosses Dixie Road, just South of Queensway East)		MH3B	MH3A	30	900	111.65	107.53	106.50	4.64	O	5m	\$2,067	\$62,019
TBM 1800mm sewer from MH3A to MH2A (along Queensway East from Dixie Rd to Greenhurst Ave)													
2A - Manhole construction at Queensway and Greenhurst Ave (Shaft already accounted for in MH2B)		MH3A	MH2A	855.1	1800	111.8	92.22	91.34	20.02	T	TBM	\$11,370	\$9,722,487
2B - Shaft construction with a manhole construction at Queensway and Greenhurst Ave		MH2A									-	-	
TBM 1800mm sewer from MH2B to Shaft 1 (West Side) (along Etobicoke Creek from Queensway East to Sherway Dr)													
Connection shaft (42.1 degree bend, fully restrained) right before Etobicoke Creek crossing		MH2B	Shaft 1 (West)	312.6	1800	104	91.21	90.89	12.95	T	TBM	\$11,370	\$3,554,262
Open cut 1800mm sewer from Shaft 1 (West Side) to MH1A to cross Etobicoke creek		Shaft 1 (West)	MH1A	75.47	1800	94.5	90.89	90.81	3.65	O	5m	\$4,296	\$324,227
1A - Shaft construction with a manhole construction at Sherway Dr and Etobicoke Creek		MH1A									-	-	10

Description	Shaft and Manhole Information											Shaft and Manhole Cost		
	Ground Elevation	Shaft/MH Elevation	Depth	Manhole Depth (Adjusted)	Lowest Pipe Invert	Adjusted Depth	# of incoming pipes	# of outgoing pipes	Pipe Dia.	MH Dia.	Chamber /drop structure	Shaft Unit Cost	MH unit Cost	Chamber
	(m)	(m)	(m)	(m)	(m)	(m)			(mm)	(mm)	(Y/N)	(\$/m ²)	(\$)	(\$)
Burnhamthorpe Road Cost Estimate														
12 - Shaft construction with a manhole at Central Parkway E and Burnhamthorpe Rd E	137.8	122	15.8	16	122.25	17.05	1	2	1500	3000	N	\$12,500	\$82,428	-
RTC (2 flow control gates) at Burnhamthorpe Rd and Central Pkwy												-	-	-
TBM 1500mm Sewer from MH12 to MH12A (Along Burnhamthorpe Rd from Central Parkway E to Cawthra Rd)														
11 - Manhole inside existing 8.5m inside Dia. construction shaft at Burnhamthorpe Rd and Cawthra	143.5	120.7	22.8	23	120.87	24.13	2	1	1500	3000	N	\$12,500	\$104,258	-
Cawthra Road Cost Estimate														
10 - Shaft construction with a manhole that contains an internal vortex drop structure at Dundas St E and Cawthra	128	106.5	21.5	22	106.91	22.59	1	1	1500	2400	Y	\$12,500	\$69,339	\$2,000,000
TBM 1500mm sewer from MH10 to MH4 (Along Cawthra from Dundas St to Queensway E)														
RTC at Cawthra and Dundas Street East (two flow gates installed at existing MH2A)												-	-	-
Queensway Road Cost Estimate														
RTC at MH6567075 (will need to modify for flow control) at Queensway East and Hurontario Street														
Connection shaft for the 1500mm sewer with RTC - 2 flow control gates, connect at MH6567075 (Queensway East and Hurontario Street)	105.9	96.2	9.7	10	96.35	11.05	-	-	-	-	N	\$12,500	\$0	-
Microtunnel 1500mm sewer from MH6567075 to MH8A (Along Queensway E from Hurontario St to just past the bridge that crosses Cooksville Creek)														
8A - Shaft construction with a manhole and drop structure (East side of Cooksville Creek past the bridge)	102.15	95.6	6.55	7	96.02	7.63	2	1	1500	3000	Y	\$12,500	\$55,669	\$2,000,000
MH1 - Manhole construction (connects into 900mm pipe by Cooksville Creek)	101.75	97.5	4.25	4			0	1	900	1500	N	-	\$10,787	-
Open cut 900mm sewer from MH1 to MH2 (on East side of Cooksville Creek just North of Queensway E)												-	-	-
MH2 - Manhole construction and RTC - 2 flow control gates (connects into 900mm pipe by Cooksville Creek)	102.15	97	5.15	5			1	1	900	1500	N	-	\$15,241	-
Open cut 900mm sewer from MH2 to Shaft 10A (on East side of Cooksville Creek just North of Queensway E)												-	-	-
Open cut 900mm sewer from MH2 to MH3 (on East side of Cooksville Creek just North of Queensway E)												-	-	-
MH3 - Manhole construction (East of Cooksville Creek)	102.15	97	5.15	5			1	1	900	1500	N	-	\$15,241	-
Open cut 900mm sewer from MH3 to MH4 (on East side of Cooksville Creek just North of Queensway E)												-	-	-
MH4 - Manhole construction (East of Cooksville Creek)	102.15	97	5.15	5			1	1	900	1500	N	-	\$15,241	-
Open cut 900mm sewer from MH4 to existing manhole (possibly 1786813) (on East side of Cooksville Creek just North of Queensway E)												-	-	-
Microtunnel 1500mm sewer from MH8A to MH7A (along Queensway E from Cooksville Creek to Cliff Rd)														
7A - Shaft construction with a manhole that includes a external drop structure (at Queensway E and Cliff Rd)	108	95	13	13	95.38	14.12	2	1	1500	3000	Y	\$12,500	\$73,072	\$2,000,000
7C - Manhole construction and RTC - flow gate at Queensway E and Cliff Rd	107.6	103	4.6	5			2	1	300	1200	N	-	\$11,435	-
Open cut 300mm sewer from MH7C to MH8B along Queensway E												-	-	-
7B - Manhole construction at Queensway E and Cliff Rd	108	102.15	5.85	6			1	1	300	1200	N	-	\$12,540	-
Open cut 300mm sewer from MH7B to MH7A along Queensway E												-	-	-
Microtunnel 1500mm sewer from MH7A to MH6A (along Queensway E from Cliff Rd to Hensall St)														
6D - Manhole construction with RTC - flow gate at West of Hensall St and Queensway East	106.7	102	4.7	5			2	1	300	1200	N	-	\$11,435	-
Open cut 300mm sewer from MH6D to MH6B (along Queensway E to Hensall St)												-	-	-
6B - Manhole construction with a drop structure at Hensall St and Queensway E	107.1	101.5	5.6	6			2	1	300	1200	Y	-	\$12,540	\$2,000,000
6C - Manhole construction with RTC - flow gate at Hensall St and Queensway E	106.75	103.2	3.55	4			2	1	300	1200	N	-	\$6,770	-
Open cut 300mm sewer from MH6C to MH6B (at Hensall St and Queensway E)												-	-	-
Open cut 300mm sewer from MH6B to MH6A (at Hensall St and Queensway E)												-	-	-
6A - Shaft construction with a manhole that includes a drop structure and RTC control (at Hensall St and Queensway E)	107.1	94.55	12.55	13	94.93	13.67	2	1	15000	3000	Y	\$12,500	\$73,072	\$2,000,000
Microtunnel 1500mm sewer from MH6A to MH5A (along Queensway E from Hensall St to Tedlo St)														
5A - Shaft construction with a manhole that includes an external drop structure at Queensway E and Tedlo St	107.75	94.45	13.3	13	94.84	14.41	2	1	1500	3000	Y	\$12,500	\$73,072	\$2,000,000
5D - Manhole construction with RTC - flow control gate at Queensway E and Tedlo St	108.2	104.25	3.95	4			2	1	300	1200	N	-	\$6,770	-
Open cut 300mm sewer from MH5D to MH5C (at Queensway East and Tedlo St)												-	-	-
5C - Manhole construction at Queensway E and Tedlo St	107.9	103.7	4.2	4			1	1	300	1200	N	-	\$6,770	-
Open cut 300mm sewer from MH5C to MH5B (at Queensway East and Tedlo St)												-	-	-
5B - Manhole construction at Queensway E and Tedlo St	107.75	103.2	4.55	5			1	1	300	1200	N	-	\$11,435	-
Open cut 300mm sewer from MH5B to MH5A (at Queensway East and Tedlo St)												-	-	-
Microtunnel 1500mm sewer from MH5A to MH4 (along Queensway East from Tedlo to Cawthra)														
4 - Shaft construction with a manhole at Queensway East and Cawthra	110.15	93.8	16.35	16	94.28	17.37	2	1	1500	3000	N	\$12,500	\$82,428	-
TBM 1800mm sewer from MH4 to MH3A (along Queensway East from Cawthra to Dixie Rd)														
Potentially contaminated groundwater containment, treatment, disposal												-	-	-
3A - Shaft construction with a manhole and internal vortex drop structure at Queensway East and Dixie Rd	112	91.8	20.2	20	92.22	21.28	2	1	1800	3000	Y	\$12,500	\$94,902	\$2,000,000
3B - Manhole construction with RTC - flow control gate at Queensway East and Dixie Rd	111.65	106.8	4.85	5			1	1	900	1800	N	-	\$18,629	-
Open cut 900mm sewer from MH3B to MH3A (crosses Dixie Road, just South of Queensway East)												-	-	-
TBM 1800mm sewer from MH3A to MH2A (along Queensway East from Dixie Rd to Greenhurst Ave)														
2A - Manhole construction at Queensway and Greenhurst Ave (Shaft already accounted for in MH2B)	112.6	90.8	21.8	22			1	1	1800	3000	N	-	\$101,139	-
2B - Shaft construction with a manhole construction at Queensway and Greenhurst Ave	113	90.8	22.2	22	91.21	23.29	1	1	1800	3000	N	\$12,500	\$101,139	-
TBM 1800mm sewer from MH2B to Shaft 1 (West Side) (along Etobicoke Creek from Queensway East to Sherway Dr)														
Connection shaft (42.1 degree bend, fully restrained) right before Etobicoke Creek crossing	97.5	90.5	7	7	90.89	8.11	1	1			N	\$12,500	-	-
Open cut 1800mm sewer from Shaft 1 (West Side) to MH1A to cross Etobicoke creek														
1A - Shaft construction with a manhole construction at Sherway Dr and Etobicoke Creek	97.2	90.45	6.75	7	90.81	7.89	2	1	1800	3000	N	\$12,500	\$55,669	-

Description	Total Cost	Quantity	RTC Cost		Additional Costs	Land Information			Land Cost			Construction Sub-Total	Design /Engineering	Contingency
			RTC Unit Cost (including gates and controls)	Total Cost		Temporary Easement	Permanent Easement	Land Type	Land Unit Cost Temporary Easement	Land Unit Cost Permanent Easement	Land Cost			
			(\$/unit)	(\$)		(Acre)	(Acre)		(\$/Acre)	(\$/Acre)	(\$)			
Burnhamthorpe Road Cost Estimate														
12 - Shaft construction with a manhole at Central Parkway E and Burnhamthorpe Rd E	\$2,213,678		-	-			0.31	Commercial	\$150,000	\$750,000	\$232,570	\$2,446,247	\$366,937	\$733,874
RTC (2 flow control gates) at Burnhamthorpe Rd and Central Pkwy	-	2	\$100,000	\$200,000					\$0	\$0	\$0	\$200,000	\$30,000	\$60,000
TBM 1500mm Sewer from MH12 to MH12A (Along Burnhamthorpe Rd from Central Parkway E to Cawthra Rd)														
11 - Manhole inside existing 8.5m inside Dia. construction shaft at Burnhamthorpe Rd and Cawthra	\$2,668,070		-	-		0.66		Commercial	\$150,000	\$750,000	\$99,309	\$2,767,379	\$415,107	\$830,214
Cawthra Road Cost Estimate														
10 - Shaft construction with a manhole that contains an internal vortex drop structure at Dundas St E and Cawthra	\$4,893,089		-	-					\$0	\$0	\$0	\$4,893,089	\$733,963	\$1,467,927
TBM 1500mm sewer from MH10 to MH4 (Along Cawthra from Dundas St to Queensway E)														
RTC at Cawthra and Dundas Street East (two flow gates installed at existing MH2A)	-	2	\$100,000	\$200,000					\$0	\$0	\$0	\$200,000	\$30,000	\$60,000
Queensway Road Cost Estimate														
RTC at MH6567075 (will need to modify for flow control) at Queensway East and Hurontario Street	-		-	-	\$ 200,000				\$0	\$0	\$0	\$200,000	\$30,000	\$60,000
Connection shaft for the 1500mm sewer with RTC - 2 flow control gates, connect at MH6567075 (Queensway East and Hurontario Street)	\$779,301	2	\$100,000	\$200,000		0.31		Commercial	\$150,000	\$750,000	\$46,181	\$1,025,482	\$153,822	\$307,645
Microtunnel 1500mm sewer from MH6567075 to MH8A (Along Queensway E from Hurontario St to just past the bridge that crosses Cooksville Creek)														
8A - Shaft construction with a manhole and drop structure (East side of Cooksville Creek past the bridge)	\$3,009,419		-	-		0.58	1.31	Commercial	\$150,000	\$750,000	\$1,067,917	\$4,077,336	\$611,600	\$1,223,201
MH1 - Manhole construction (connects into 900mm pipe by Cooksville Creek)	\$10,787		-	-	\$ 250,000				\$0	\$0	\$0	\$260,787	\$39,118	\$78,236
Open cut 900mm sewer from MH1 to MH2 (on East side of Cooksville Creek just North of Queensway E)	-		-	-					\$0	\$0	\$0	\$19,019	\$2,853	\$5,706
MH2 - Manhole construction and RTC - 2 flow control gates (connects into 900mm pipe by Cooksville Creek)	\$15,241	2	\$100,000	\$200,000					\$0	\$0	\$0	\$215,241	\$32,286	\$64,572
Open cut 900mm sewer from MH2 to Shaft 10A (on East side of Cooksville Creek just North of Queensway E)	-		-	-					\$0	\$0	\$0	\$13,644	\$2,047	\$4,093
Open cut 900mm sewer from MH2 to MH3 (on East side of Cooksville Creek just North of Queensway E)	-		-	-					\$0	\$0	\$0	\$19,019	\$2,853	\$5,706
MH3 - Manhole construction (East of Cooksville Creek)	\$15,241		-	-					\$0	\$0	\$0	\$15,241	\$2,286	\$4,572
Open cut 900mm sewer from MH3 to MH4 (on East side of Cooksville Creek just North of Queensway E)	-		-	-					\$0	\$0	\$0	\$41,346	\$6,202	\$12,404
MH4 - Manhole construction (East of Cooksville Creek)	\$15,241		-	-					\$0	\$0	\$0	\$15,241	\$2,286	\$4,572
Open cut 900mm sewer from MH4 to existing manhole (possibly 1786813) (on East side of Cooksville Creek just North of Queensway E)	-		-	-	\$ 250,000				\$0	\$0	\$0	\$301,682	\$45,252	\$90,505
Microtunnel 1500mm sewer from MH8A to MH7A (along Queensway E from Cooksville Creek to Cliff Rd)														
7A - Shaft construction with a manhole that includes a external drop structure (at Queensway E and Cliff Rd)	\$3,838,072		-	-		0.55	0.31	Commercial	\$150,000	\$750,000	\$311,740	\$4,149,812	\$622,472	\$1,244,944
7C - Manhole construction and RTC - flow gate at Queensway E and Cliff Rd	\$11,435	1	\$100,000	\$100,000	\$ 100,000				\$0	\$0	\$0	\$211,435	\$31,715	\$63,430
Open cut 300mm sewer from MH7C to MH8B along Queensway E	-		-	-					\$0	\$0	\$0	\$50,837	\$7,626	\$15,251
7B - Manhole construction at Queensway E and Cliff Rd	\$12,540		-	-					\$0	\$0	\$0	\$12,540	\$1,881	\$3,762
Open cut 300mm sewer from MH7B to MH7A along Queensway E	-		-	-					\$0	\$0	\$0	\$3,822	\$573	\$1,147
Microtunnel 1500mm sewer from MH7A to MH6A (along Queensway E from Cliff Rd to Hensall St)														
6D - Manhole construction with RTC - flow gate at West of Hensall St and Queensway East	\$11,435	1	\$100,000	\$100,000	\$ 100,000				\$0	\$0	\$0	\$211,435	\$31,715	\$63,430
Open cut 300mm sewer from MH6D to MH6B (along Queensway E to Hensall St)	-		-	-					\$0	\$0	\$0	\$69,123	\$10,368	\$20,737
6B - Manhole construction with a drop structure at Hensall St and Queensway E	\$2,012,540		-	-					\$0	\$0	\$0	\$2,012,540	\$301,881	\$603,762
6C - Manhole construction with RTC - flow gate at Hensall St and Queensway E	\$6,770	1	\$100,000	\$100,000	\$ 100,000				\$0	\$0	\$0	\$206,770	\$31,015	\$62,031
Open cut 300mm sewer from MH6C to MH6B (at Hensall St and Queensway E)	-		-	-					\$0	\$0	\$0	\$27,299	\$4,095	\$8,190
Open cut 300mm sewer from MH6B to MH6A (at Hensall St and Queensway E)	-		-	-					\$0	\$0	\$0	\$7,645	\$1,147	\$2,293
6A - Shaft construction with a manhole that includes a drop structure and RTC control (at Hensall St and Queensway E)	\$3,781,822		-	-		0.50	0.60	Commercial	\$150,000	\$750,000	\$528,207	\$4,310,029	\$646,504	\$1,293,009
Microtunnel 1500mm sewer from MH6A to MH5A (along Queensway E from Hensall St to Tedlo St)														
5A - Shaft construction with a manhole that includes an external drop structure at Queensway E and Tedlo St	\$3,874,322		-	-		0.21	0.59	Commercial	\$150,000	\$750,000	\$476,894	\$4,351,216	\$652,682	\$1,305,365
5D - Manhole construction with RTC - flow control gate at Queensway E and Tedlo St	\$6,770	1	\$100,000	\$100,000	\$ 100,000				\$0	\$0	\$0	\$206,770	\$31,015	\$62,031
Open cut 300mm sewer from MH5D to MH5C (at Queensway East and Tedlo St)	-		-	-					\$0	\$0	\$0	\$38,300	\$5,745	\$11,490
5C - Manhole construction at Queensway E and Tedlo St	\$6,770		-	-					\$0	\$0	\$0	\$6,770	\$1,015	\$2,031
Open cut 300mm sewer from MH5C to MH5B (at Queensway East and Tedlo St)	-		-	-					\$0	\$0	\$0	\$34,936	\$5,240	\$10,481
5B - Manhole construction at Queensway E and Tedlo St	\$11,435		-	-					\$0	\$0	\$0	\$11,435	\$1,715	\$3,430
Open cut 300mm sewer from MH5B to MH5A (at Queensway East and Tedlo St)	-		-	-					\$0	\$0	\$0	\$3,822	\$573	\$1,147
Microtunnel 1500mm sewer from MH5A to MH4 (along Queensway East from Tedlo to Cawthra)														
4 - Shaft construction with a manhole at Queensway East and Cawthra	\$2,253,678		-	-		0.17	0.10	Commercial	\$150,000	\$750,000	\$102,856	\$2,356,533	\$353,480	\$706,960
TBM 1800mm sewer from MH4 to MH3A (along Queensway East from Cawthra to Dixie Rd)														
Potentially contaminated groundwater containment, treatment, disposal	-		-	-	\$ 200,000				\$0	\$0	\$0	\$200,000	\$30,000	\$60,000
3A - Shaft construction with a manhole and internal vortex drop structure at Queensway East and Dixie Rd	\$4,754,902		-	-					\$0	\$0	\$0	\$4,754,902	\$713,235	\$1,426,471
3B - Manhole construction with RTC - flow control gate at Queensway East and Dixie Rd	\$18,629	1	\$100,000	\$100,000	\$ 250,000				\$0	\$0	\$0	\$368,629	\$55,294	\$110,589
Open cut 900mm sewer from MH3B to MH3A (crosses Dixie Road, just South of Queensway East)	-		-	-	\$ 250,000				\$0	\$0	\$0	\$312,019	\$46,803	\$93,606
TBM 1800mm sewer from MH3A to MH2A (along Queensway East from Dixie Rd to Greenhurst Ave)														
2A - Manhole construction at Queensway and Greenhurst Ave (Shaft already accounted for in MH2B)	\$101,139		-	-					\$0	\$0	\$0	\$101,139	\$15,171	\$30,342
2B - Shaft construction with a manhole construction at Queensway and Greenhurst Ave	\$3,012,389		-	-		0.93	0.09	Low Density	\$60,000	\$300,000	\$83,082	\$3,095,472	\$464,321	\$928,641
TBM 1800mm sewer from MH2B to Shaft 1 (West Side) (along Etobicoke Creek from Queensway East to Sherway Dr)														
Connection shaft (42.1 degree bend, fully restrained) right before Etobicoke Creek crossing	\$1,013,750		-	-					\$0	\$0	\$0	\$1,013,750	\$152,063	\$304,125
Open cut 1800mm sewer from Shaft 1 (West Side) to MH1A to cross Etobicoke creek														
1A - Shaft construction with a manhole construction at Sherway Dr and Etobicoke Creek	\$1,041,919		-	-	\$ 2,000,000	2.14	1.32	Low Density	\$60,000	\$300,000	\$524,723	\$2,848,950	\$427,342	\$854,685

Description	Total	Summarized Scope	Length	Cost
	(\$)			
Burnhamthorpe Road Cost Estimate				
12 - Shaft construction with a manhole at Central Parkway E and Burnhamthorpe Rd E	\$3,779,628	Compound, Shaft, Controls - Burn/C Pkwy		\$ 4,100,000
RTC (2 flow control gates) at Burnhamthorpe Rd and Central Pkwy	\$290,000			
TBM 1500mm Sewer from MH12 to MH12A (Along Burnhamthorpe Rd from Central Parkway E to Cawthra Rd)				
11 - Manhole inside existing 8.5m inside Dia. construction shaft at Burnhamthorpe Rd and Cawthra	\$15,503,597	Burnhamthorpe from C Pkwy to Cawthra	1,005	\$ 15,500,000
	\$4,112,009	Compound - Burn / Cawthra		\$ 4,100,000
Cawthra Road Cost Estimate				
10 - Shaft construction with a manhole that contains an internal vortex drop structure at Dundas St E and Cawthra	\$7,094,978	Compound, Shaft, Controls - Cawthra / Dundas		\$ 7,384,978
TBM 1500mm sewer from MH10 to MH4 (Along Cawthra from Dundas St to Queensway E)				
RTC at Cawthra and Dundas Street East (two flow gates installed at existing MH2A)	\$15,747,360	Cawthra from Dundas to Queensway	1,021	\$ 15,700,000
	\$290,000			
Queensway Road Cost Estimate				
RTC at MH6567075 (will need to modify for flow control) at Queensway East and Hurontario Street	\$290,000	Compound, Shaft, Controls - Queensway/Hurontario		\$ 1,800,000
Connection shaft for the 1500mm sewer with RTC - 2 flow control gates, connect at MH6567075 (Queensway East and Hurontario Street)	\$1,533,129			
Microtunnel 1500mm sewer from MH6567075 to MH8A (Along Queensway E from Hurontario St to just past the bridge that crosses Cooksville Creek)				
8A - Shaft construction with a manhole and drop structure (East side of Cooksville Creek past the bridge)	\$4,366,766	1500 MTBM - Hurontario to Cooksville	328	\$ 4,400,000
MH1 - Manhole construction (connects into 900mm pipe by Cooksville Creek)	\$6,980,054	Compound, Shaft, Controls, Linear Bypass		\$ 8,300,000
Open cut 900mm sewer from MH1 to MH2 (on East side of Cooksville Creek just North of Queensway E)	\$378,141			
MH2 - Manhole construction and RTC - 2 flow control gates (connects into 900mm pipe by Cooksville Creek)	\$27,578			
Open cut 900mm sewer from MH2 to Shaft 10A (on East side of Cooksville Creek just North of Queensway E)	\$312,099			
Open cut 900mm sewer from MH2 to MH3 (on East side of Cooksville Creek just North of Queensway E)	\$19,784			
MH3 - Manhole construction (East of Cooksville Creek)	\$27,578			
Open cut 900mm sewer from MH3 to MH4 (on East side of Cooksville Creek just North of Queensway E)	\$22,099			
MH4 - Manhole construction (East of Cooksville Creek)	\$59,952			
Open cut 900mm sewer from MH4 to existing manhole (possibly 1786813) (on East side of Cooksville Creek just North of Queensway E)	\$22,099			
Open cut 900mm sewer from MH4 to existing manhole (possibly 1786813) (on East side of Cooksville Creek just North of Queensway E)	\$437,440			
Microtunnel 1500mm sewer from MH8A to MH7A (along Queensway E from Cooksville Creek to Cliff Rd)				
7A - Shaft construction with a manhole that includes a external drop structure (at Queensway E and Cliff Rd)	\$8,525,655	1500 MTBM - Cooksville to Cliff	640	\$ 8,500,000
7C - Manhole construction and RTC - flow gate at Queensway E and Cliff Rd	\$6,328,968	Compound, Shaft, Controls, Open Cut Local Connection		\$ 6,700,000
Open cut 300mm sewer from MH7C to MH8B along Queensway E	\$306,580			
7B - Manhole construction at Queensway E and Cliff Rd	\$73,714			
Open cut 300mm sewer from MH7B to MH7A along Queensway E	\$18,183			
6A - Manhole construction at Queensway E and Cliff Rd	\$5,542			
Microtunnel 1500mm sewer from MH7A to MH6A (along Queensway E from Cliff Rd to Hensall St)				
6D - Manhole construction with RTC - flow gate at West of Hensall St and Queensway East	\$5,991,145	1500 MTBM - Cliff to Hensall	450	\$ 6,000,000
Open cut 300mm sewer from MH6D to MH6B (along Queensway E to Hensall St)	\$306,580	Compound, Shaft, Controls, Open Cut Local Connection		\$ 10,500,000
6B - Manhole construction with a drop structure at Hensall St and Queensway E	\$100,229			
6C - Manhole construction with RTC - flow gate at Hensall St and Queensway E	\$2,918,183			
Open cut 300mm sewer from MH6C to MH6B (at Hensall St and Queensway E)	\$299,816			
Open cut 300mm sewer from MH6C to MH6B (at Hensall St and Queensway E)	\$39,584			
Open cut 300mm sewer from MH6B to MH6A (at Hensall St and Queensway E)	\$11,085			
6A - Shaft construction with a manhole that includes a drop structure and RTC control (at Hensall St and Queensway E)	\$6,777,749			
Microtunnel 1500mm sewer from MH6A to MH5A (along Queensway E from Hensall St to Tedlo St)				
5A - Shaft construction with a manhole that includes an external drop structure at Queensway E and Tedlo St	\$2,479,876	1500 MTBM - Hensall to Tedlo	186	\$ 2,500,000
5D - Manhole construction with RTC - flow control gate at Queensway E and Tedlo St	\$6,786,158	Compound, Shaft, Controls, Open Cut Local Connection		\$ 7,200,000
Open cut 300mm sewer from MH5D to MH5C (at Queensway East and Tedlo St)	\$299,816			
5C - Manhole construction at Queensway E and Tedlo St	\$55,535			
Open cut 300mm sewer from MH5C to MH5B (at Queensway East and Tedlo St)	\$9,816			
5B - Manhole construction at Queensway E and Tedlo St	\$50,658			
Open cut 300mm sewer from MH5B to MH5A (at Queensway East and Tedlo St)	\$16,580			
Open cut 300mm sewer from MH5B to MH5A (at Queensway East and Tedlo St)	\$5,542			
Microtunnel 1500mm sewer from MH5A to MH4 (along Queensway East from Tedlo to Cawthra)				
4 - Shaft construction with a manhole at Queensway East and Cawthra	\$6,986,560	1500 MTBM - Tedlo to Cawthra	524	\$ 7,000,000
	\$3,519,829	Compound, Shaft		\$ 3,500,000
TBM 1800mm sewer from MH4 to MH3A (along Queensway East from Cawthra to Dixie Rd)				
Potentially contaminated groundwater containment, treatment, disposal	\$34,344,677	1800 TBM - Cawthra to Dixie	2,083	\$ 34,300,000
	\$290,000			
3A - Shaft construction with a manhole and internal vortex drop structure at Queensway East and Dixie Rd	\$6,894,608	Compound, Shaft, Controls, Trunk Connection		\$ 7,900,000
3B - Manhole construction with RTC - flow control gate at Queensway East and Dixie Rd	\$534,512			
Open cut 900mm sewer from MH3B to MH3A (crosses Dixie Road, just South of Queensway East)	\$452,427			
TBM 1800mm sewer from MH3A to MH2A (along Queensway East from Dixie Rd to Greenhurst Ave)				
2A - Manhole construction at Queensway and Greenhurst Ave (Shaft already accounted for in MH2B)	\$14,097,606	1800 TBM - Dixie to Greenhurst (Queensway)	855	\$ 14,100,000
	\$146,652	Compound, Shaft		\$ 4,700,000
2B - Shaft construction with a manhole construction at Queensway and Greenhurst Ave	\$4,571,516			
TBM 1800mm sewer from MH2B to Shaft 1 (West Side) (along Etobicoke Creek from Queensway East to Sherway Dr)				
Connection shaft (42.1 degree bend, fully restrained) right before Etobicoke Creek crossing	\$5,153,680	1800 TBM - Queensway to West side of Creek	313	\$ 5,200,000
	\$1,469,938	Extraction Shaft		\$ 1,500,000
Open cut 1800mm sewer from Shaft 1 (West Side) to MH1A to cross Etobicoke creek				
1A - Shaft construction with a manhole construction at Sherway Dr and Etobicoke Creek	\$4,655,700	Open Cut Creek Crossing	75	\$ 4,700,000
	\$4,410,782	Compound, Shaft		\$ 4,400,000

Operation and Maintenance

As part of the cost analysis undertaken in this EA, the operation and maintenance (O&M) costs for the sewer were also estimated. To account for ongoing maintenance activities of the sewer and related infrastructure such as the vortex chambers, gates and instrumentation for operation of the gates, annual cost of 0.2% of the base construction cost was assumed. Additionally, 1% of the base construction cost was assumed to be required every 10 years to account for major maintenance and repairs. Finally, 0.25% of the base construction cost per year to account for full cost replacement consistent with the Region's Asset Management principles.

In total, the O&M along with asset management cost is estimated to be approximately 1.45% of the construction cost per year.

Table 9: Operation and Maintenance Costs

Land Type	% of Base Construction	Total Cost
Ongoing Maintenance (per year)	0.20%	\$257,595
Major Maintenance and Repairs (every 10 years)	1.00%	\$1,287,974
Full Cost Replacement (per year)	0.25%	\$321,994