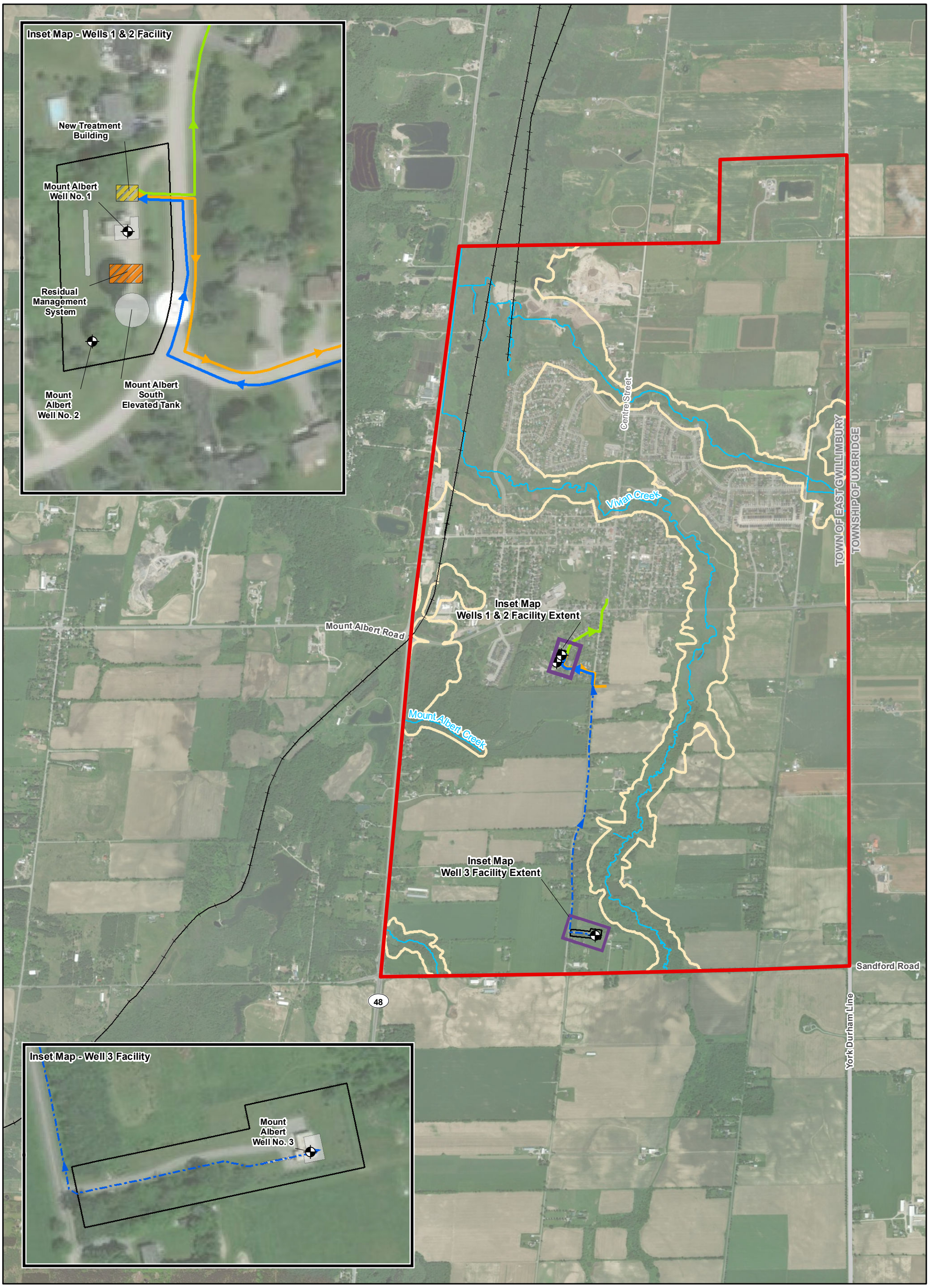
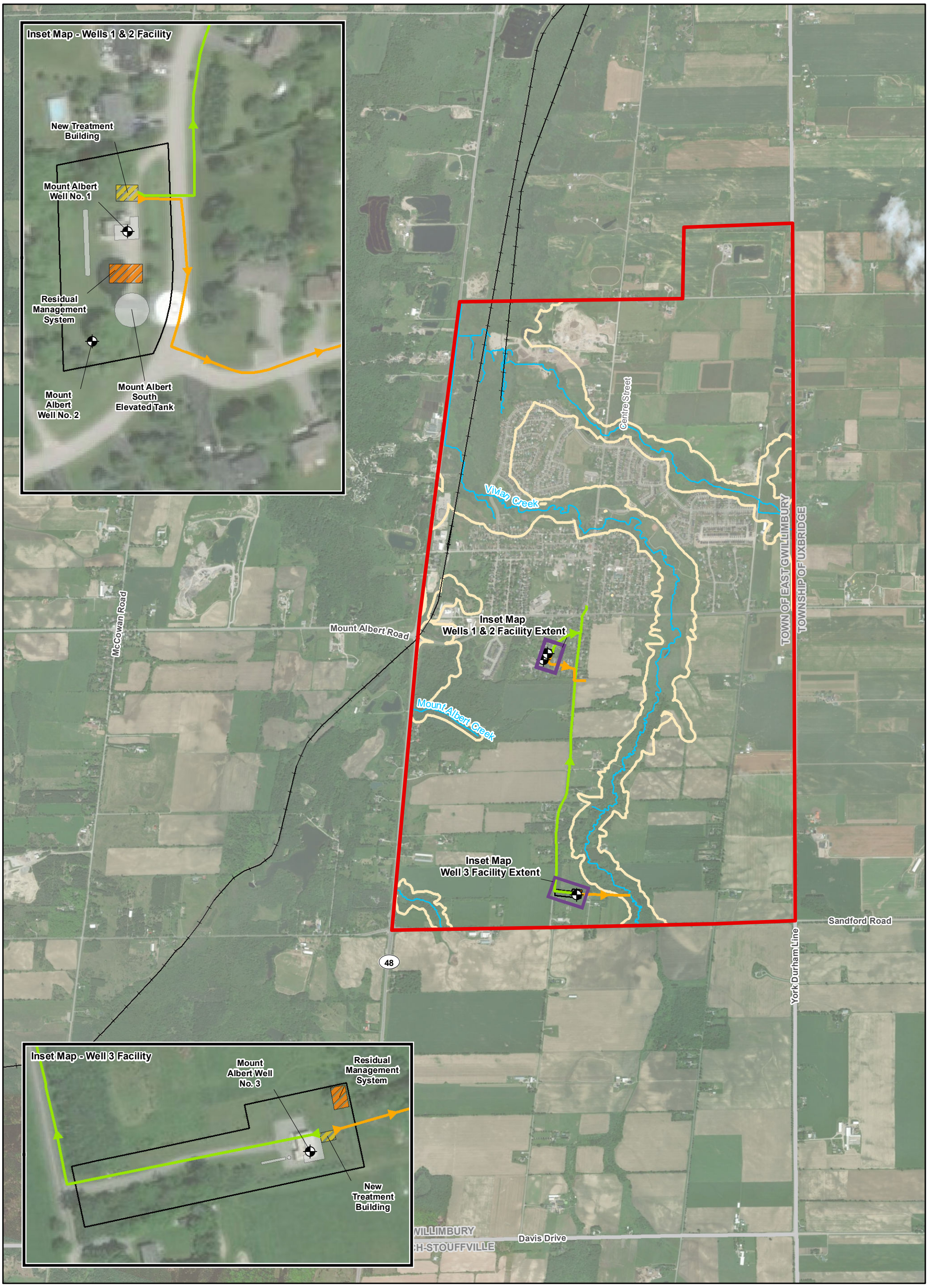


Note:
1. Aerial Source: Vivid-Canada, 2013.

Figure F-1
Alternative A5a Conceptual Site Layout
Technical Memorandum No. 2 Identification and Assessment of Alternative Solutions
Region of York
Mount Albert, Ontario

Jacobs

\\DC1VS01\GISPROJ\Y\YORKREGION\MOUNTALBERTWATERSUPPLY\MAPFILES\TM2\ALTERNATIVE_A5A_CONCEPTUAL_SITE_LAYOUT.MXD VM048279 10/27/2020 8:44:57 AM

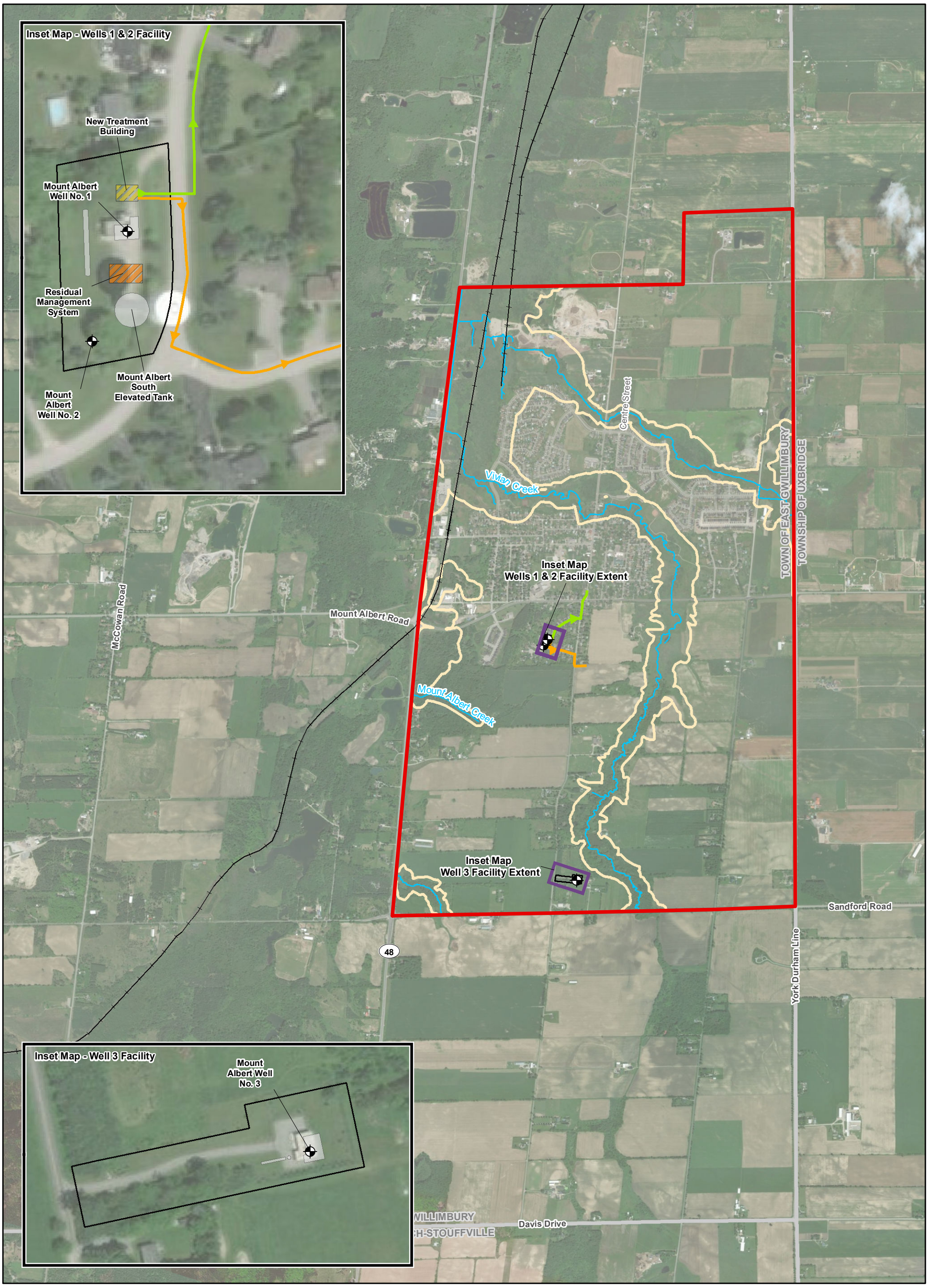


Note:
1. Aerial Source: Vivid-Canada, 2013.

Figure F-2
Alternative A5b Conceptual Site Layout
Technical Memorandum No. 2 Identification and Assessment of Alternative Solutions
Region of York
Mount Albert, Ontario

Jacobs

\\DC1VS01\GISPROJ\Y\YORKREGION\MOUNTALBERTWATERSUPPLY\MAPFILES\TM2\ALTERNATIVE_A5B_CONCEPTUAL_SITE_LAYOUT.MXD VM048279 10/27/2020 8:57:55 AM



Note:
1. Aerial Source: Vivid-Canada, 2013.

Figure F-3
Alternative A6 Conceptual Site Layout
Technical Memorandum No. 2 Identification and Assessment of Alternative Solutions
Region of York
Mount Albert, Ontario

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\\DC1VS01\GISPROJ\Y\YORKREGION\MOUNTALBERTWATERSUPPLY\MAPFILES\TM2\ALTERNATIVE_A6_CONCEPTUAL_SITE_LAYOUT.MXD VM048279 10/27/2020 9:05:34 AM

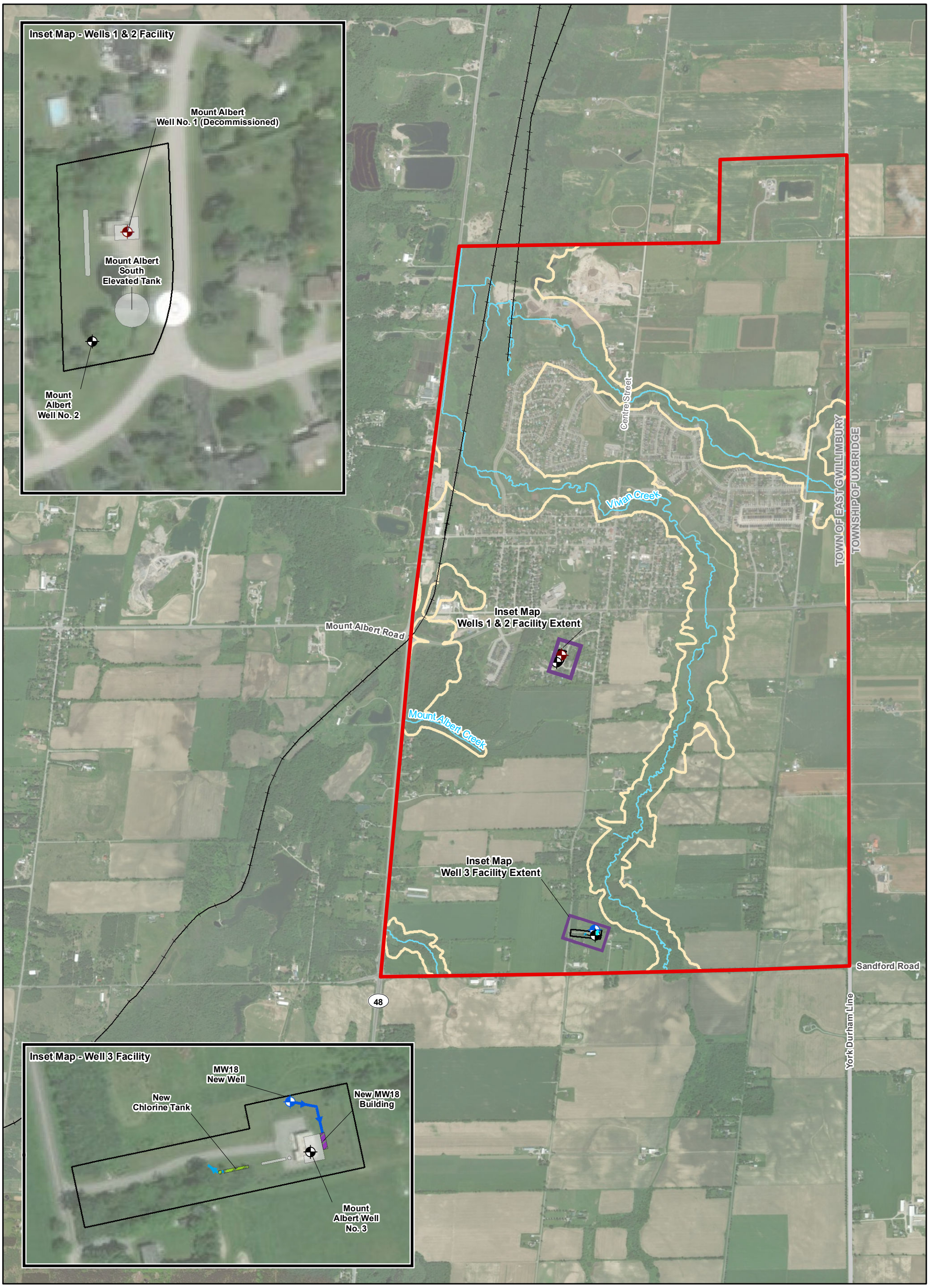

Figure F-4
Alternative A7a Conceptual Site Layout
Technical Memorandum No. 2 Identification and Assessment of Alternative Solutions
Region of York
Mount Albert, Ontario

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\\DC1VS01\GISPROJ\Y\YORKREGION\MOUNTALBERTWATERSUPPLY\MAPFILES\TM2\ALTERNATIVE_A7A_CONCEPTUAL_SITE_LAYOUT.MXD VM048279 10/26/2020 2:12:39 PM

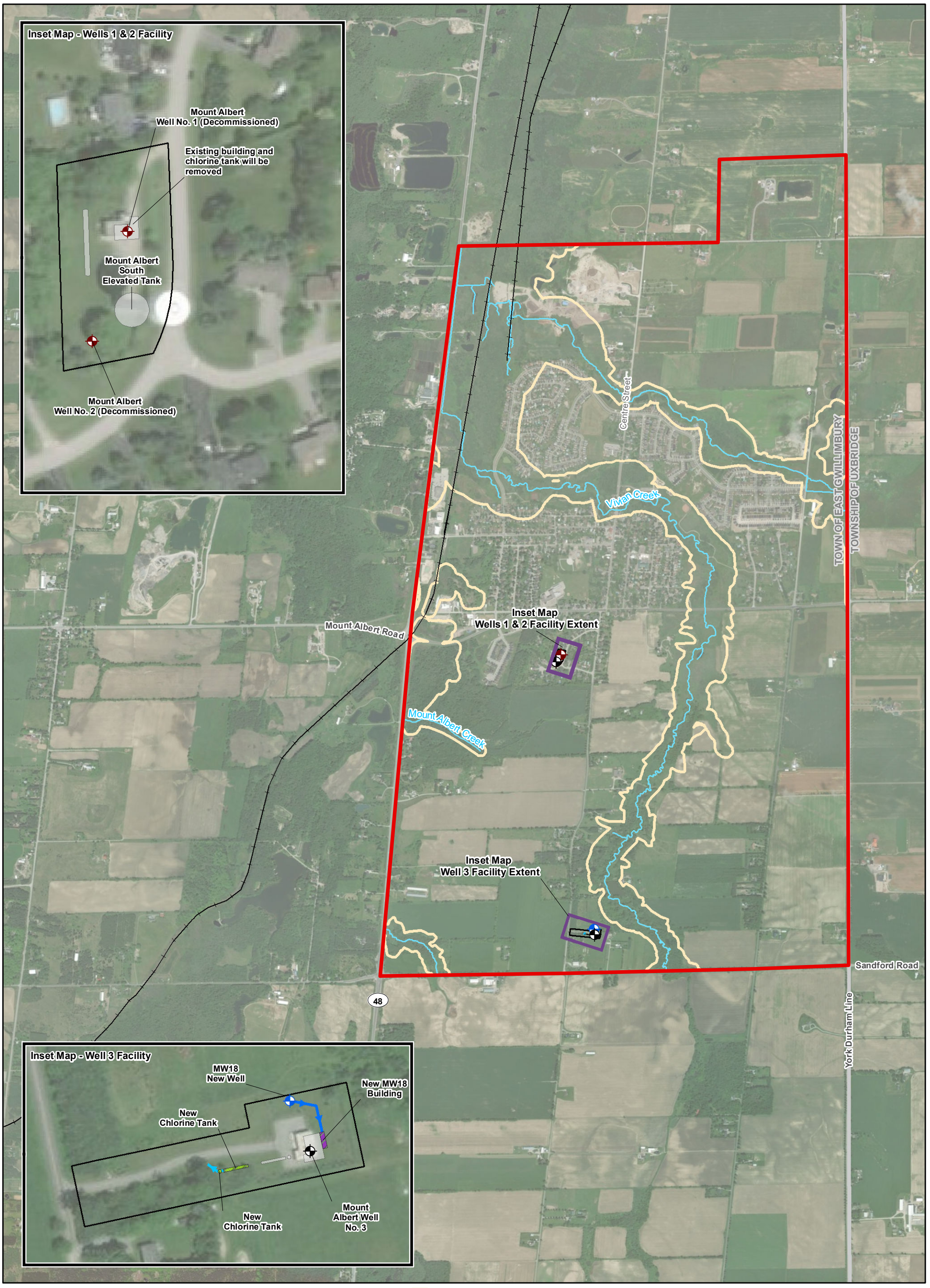

Figure F-5
Alternative A7b Conceptual Site Layout
Technical Memorandum No. 2 Identification and Assessment of Alternative Solutions
Region of York
Mount Albert, Ontario

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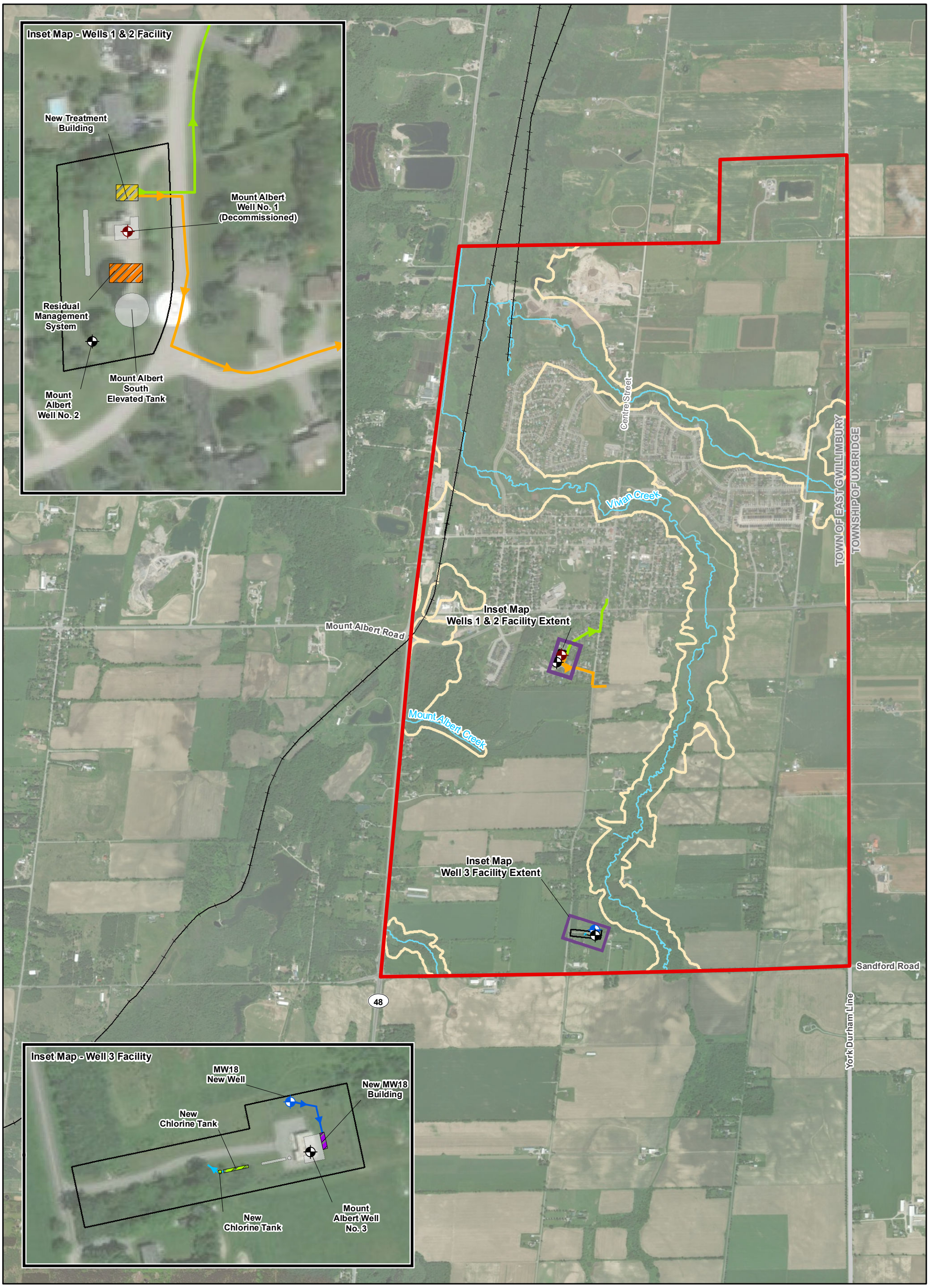
\\DC1VS01\GISPROJ\Y\YORKREGION\MOUNTALBERTWATERSUPPLY\MAPFILES\TM2\ALTERNATIVE_A7B_CONCEPTUAL_SITE_LAYOUT.MXD VM048279 10/26/2020 2:11:56 PM



Note:
1. Aerial Source: Vivid-Canada, 2013.

Figure F-6
Alternative A7c Conceptual Site Layout
Technical Memorandum No. 2 Identification and Assessment of Alternative Solutions
Region of York
Mount Albert, Ontario

Jacobs

\\DC1VS01\GISPROJ\Y\YORKREGION\MOUNTALBERTWATERSUPPLY\MAPFILES\TM2\ALTERNATIVE_A7C_CONCEPTUAL_SITE_LAYOUT.MXD VM048279 10/26/2020 2:38:27 PM

Appendix G. Detailed Whole Life Cost of Alternative Solutions

A4: Continue Sequestration at both Facilities and Optimize Operation and Maintenance of Existing Infrastructure

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Silicate dosing system improvement at Wells 1 & 2 Facility	$ 80,000	$ -	$ -	$ -	$ 80,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 80,000**
Silicate dosing system improvement at Well 3 Facility	$ 200,000	$ -	$ -	$ 200,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 200,000**
Design & Construction Administration (20%)	$ 56,000	$ 9,333	$ 18,667	$ 20,000	$ 8,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 56,000**
Contingency (30%)	$ 102,000	$ 3,000	$ 6,000	$ 66,000	$ 27,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 102,000**
York Region Project Management (5%)	$ 24,000	$ 1,000	$ 2,000	$ 15,000	$ 6,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 24,000**
HST (1.76%)	$ 11,000	$ 1,000	$ 1,000	$ 6,000	$ 3,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 11,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 473,000**	**$ 14,333**	**$ 27,667**	**$ 307,000**	**$ 124,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 473,000**
Operation & Maintenance Expenditures[3]																						
Sodium Silicate for Sequestration	$ 115,200	$ 5,300	$ 5,500	$ 5,700	$ 5,800	$ 6,000	$ 6,100	$ 6,100	$ 6,000	$ 5,900	$ 5,800	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	**$ 115,200**
Clean and inspection of chlorine contact chambers	$ 1,200,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	**$ 1,200,000**
Clean and inspection of North ET	$ 400,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	**$ 400,000**
Unidirectional flushing program	$ 768,000	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	**$ 768,000**
Swabbing program	$ 352,000	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	**$ 352,000**
Tailored Monitoring Program for the distribution system	$ 1,000,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	**$ 1,000,000**
TOTAL O&M COSTS (Undiscounted)	**$ 3,835,200**	**$ 191,300**	**$ 191,500**	**$ 191,700**	**$ 191,800**	**$ 192,000**	**$ 192,100**	**$ 192,100**	**$ 192,000**	**$ 191,900**	**$ 191,800**	**$ 191,700**	**$ 191,700**	**$ 191,700**	**$ 191,700**	**$ 191,700**	**$ 191,700**	**$ 191,700**	**$ 191,700**	**$ 191,700**	**$ 191,700**	**$ 3,835,200**
Net Present Value																						
Capital Investment (Discounted)	$ 453,938	$ 14,333	$ 27,140	$ 295,416	$ 117,048	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 453,938**
Operation & Maintenance Expenditures (Discounted)	$ 3,214,485	$ 191,300	$ 187,852	$ 184,467	$ 181,047	$ 177,784	$ 174,489	$ 171,165	$ 167,817	$ 164,535	$ 161,317	$ 158,162	$ 155,149	$ 152,194	$ 149,295	$ 146,451	$ 143,662	$ 140,925	$ 138,241	$ 135,608	$ 133,025	**$ 3,214,485**
TOTAL WHOLE LIFE COST	**$ 3,668,423**	**$ 205,633**	**$ 214,992**	**$ 479,883**	**$ 298,096**	**$ 177,784**	**$ 174,489**	**$ 171,165**	**$ 167,817**	**$ 164,535**	**$ 161,317**	**$ 158,162**	**$ 155,149**	**$ 152,194**	**$ 149,295**	**$ 146,451**	**$ 143,662**	**$ 140,925**	**$ 138,241**	**$ 135,608**	**$ 133,025**	**$ 3,668,423**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2024.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

4) Considering heavy accumulation of deposits in the distribution system.

A5: Provide Iron and Manganese Removal Technology for All Wells
A5a: Centralized Removal Technology at Wells 1 & 2 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Raw Watermain	$ 455,000	$ -	$ -	$ -	$ 455,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 455,000**
New Treatment Building at Wells 1 & 2 Facility	$ 2,250,000	$ -	$ -	$ -	$ 1,125,000	$ 1,125,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 2,250,000**
Design & Construction Administration (20%)	$ 542,000	$ 45,167	$ 180,667	$ 45,167	$ 158,000	$ 113,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 542,000**
Contingency (30%)	$ 977,000	$ 14,000	$ 55,000	$ 14,000	$ 522,000	$ 372,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 977,000**
York Region Project Management (5%)	$ 212,000	$ 3,000	$ 12,000	$ 3,000	$ 113,000	$ 81,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 212,000**
HST (1.76%)	$ 81,000	$ 2,000	$ 5,000	$ 2,000	$ 42,000	$ 30,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 81,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 4,517,000**	**$ 64,167**	**$ 252,667**	**$ 64,167**	**$ 2,415,000**	**$ 1,721,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 4,517,000**
Operation & Maintenance Expenditures[3]																						
Sodium Silicate for Sequestration	$ 32,800	$ 5,300	$ 5,500	$ 5,700	$ 5,800	$ 6,000	$ 3,000	$ 1,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 32,800**
Chlorine Gas for Oxidation	$ 30,300	$ -	$ -	$ -	$ -	$ -	$ 2,100	$ 2,100	$ 2,100	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	**$ 30,300**
Additional O&M Labour	$ 624,000	$ -	$ -	$ -	$ -	$ -	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	**$ 624,000**
New Building Power Consumption	$ 49,500	$ -	$ -	$ -	$ -	$ -	$ 3,300	$ 3,300	$ 3,300	$ 3,300	$ 3,300	$ 3,300	$ 3,300	$ 3,300	$ 3,300	$ 3,300	$ 3,300	$ 3,300	$ 3,300	$ 3,300	$ 3,300	**$ 49,500**
Clean and inspection of chlorine contact chambers	$ 480,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	**$ 480,000**
Clean and inspection of North ET	$ 160,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	**$ 160,000**
Unidirectional flushing program of raw water transmission main	$ 36,000	$ -	$ -	$ -	$ -	$ -	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400	**$ 36,000**
Swabbing program of raw water transmission main	$ 16,500	$ -	$ -	$ -	$ -	$ -	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	**$ 16,500**
Unidirectional flushing program of distribution system	$ 307,200	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	**$ 307,200**
Swabbing program of distribution system	$ 154,000	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	**$ 154,000**
Tailored Monitoring Program for the distribution system	$ 325,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	**$ 325,000**
Net Present Value																						
Capital Investment (Discounted)	$ 4,246,953	$ 64,167	$ 247,854	$ 61,746	$ 2,279,612	$ 1,593,575	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 4,246,953**
Operation & Maintenance Expenditures (Discounted)	$ 1,924,358	$ 191,300	$ 187,852	$ 184,467	$ 181,047	$ 177,784	$ 78,642	$ 75,808	$ 73,053	$ 71,576	$ 70,212	$ 68,875	$ 67,563	$ 66,276	$ 65,014	$ 63,775	$ 62,561	$ 61,369	$ 60,200	$ 59,053	$ 57,929	**$ 1,924,358**
TOTAL WHOLE LIFE COST	**$ 6,171,311**	**$ 255,467**	**$ 435,706**	**$ 246,212**	**$ 2,460,659**	**$ 1,771,359**	**$ 78,642**	**$ 75,808**	**$ 73,053**	**$ 71,576**	**$ 70,212**	**$ 68,875**	**$ 67,563**	**$ 66,276**	**$ 65,014**	**$ 63,775**	**$ 62,561**	**$ 61,369**	**$ 60,200**	**$ 59,053**	**$ 57,929**	**$ 6,171,311**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2025.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

4) Considering heavy low accumulation of deposits in the raw water transmission main.

5) Considering low accumulation of deposits in the distribution system.

A5: Provide Iron and Manganese Removal Technology for All Wells
A5b: Decentralized Removal Technology at both Facilities

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
New Treatment Building at Wells 1 & 2 Facility	$ 2,250,000	$ -	$ -	$ -	$ 1,125,000	$ 1,125,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 2,250,000**
New Treatment Building at Well 3 Facility	$ 1,950,000	$ -	$ -	$ -	$ -	$ 975,000	$ 975,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,950,000**
Design & Construction Administration (20%)	$ 841,000	$ 70,000	$ 280,000	$ 70,000	$ 113,000	$ 210,000	$ 98,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 841,000**
Contingency (30%)	$ 1,513,000	$ 21,000	$ 84,000	$ 21,000	$ 372,000	$ 693,000	$ 322,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,513,000**
York Region Project Management (5%)	$ 331,000	$ 5,000	$ 19,000	$ 5,000	$ 81,000	$ 151,000	$ 70,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 331,000**
HST (1.76%)	$ 123,000	$ 2,000	$ 7,000	$ 2,000	$ 30,000	$ 56,000	$ 26,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 123,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 7,008,000**	**$ 98,000**	**$ 390,000**	**$ 98,000**	**$ 1,721,000**	**$ 3,210,000**	**$ 1,491,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ 7,008,000
Operation & Maintenance Expenditures[3]																						
Sodium Silicate for Sequestration	$ 32,800	$ 5,300	$ 5,500	$ 5,700	$ 5,800	$ 6,000	$ 3,000	$ 1,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 32,800**
Chlorine Gas for Oxidation	$ 30,300	$ -	$ -	$ -	$ -	$ -	$ 2,100	$ 2,100	$ 2,100	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	**$ 30,300**
Additional O&M Labour	$ 936,000	$ -	$ -	$ -	$ -	$ -	$ 62,400	$ 62,400	$ 62,400	$ 62,400	$ 62,400	$ 62,400	$ 62,400	$ 62,400	$ 62,400	$ 62,400	$ 62,400	$ 62,400	$ 62,400	$ 62,400	$ 62,400	**$ 936,000**
New Building Power Consumption	$ 58,500	$ -	$ -	$ -	$ -	$ -	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	**$ 58,500**
Clean and inspection of chlorine contact chambers	$ 480,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	**$ 480,000**
Clean and inspection of North ET	$ 160,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	**$ 160,000**
Unidirectional flushing program	$ 307,200	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	$ 7,680	**$ 307,200**
Swabbing program	$ 154,000	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	$ 4,400	**$ 154,000**
Tailored Monitoring Program for the distribution system	$ 325,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	**$ 325,000**
TOTAL O&M COSTS (Undiscounted)	**$ 2,483,800**	**$ 191,300**	**$ 191,500**	**$ 191,700**	**$ 191,800**	**$ 192,000**	**$ 104,480**	**$ 102,980**	**$ 101,480**	**$ 101,380**	**$ 101,380**	**$ 101,380**	**$ 101,380**	**$ 101,380**	**$ 101,380**	**$ 101,380**	**$ 101,380**	**$ 101,380**	**$ 101,380**	**$ 101,380**	**$ 101,380**	$ 2,483,800
Net Present Value																						
Capital Investment (Discounted)	$ 6,526,028	$ 98,000	$ 382,571	$ 94,302	$ 1,624,518	$ 2,972,328	$ 1,354,307	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 6,526,028**
Operation & Maintenance Expenditures (Discounted)	$ 2,138,261	$ 191,300	$ 187,852	$ 184,467	$ 181,047	$ 177,784	$ 94,901	$ 91,757	$ 88,698	$ 86,923	$ 85,268	$ 83,643	$ 82,050	$ 80,487	$ 78,954	$ 77,450	$ 75,975	$ 74,528	$ 73,108	$ 71,716	$ 70,350	**$ 2,138,261**
TOTAL WHOLE LIFE COST	**$ 8,664,288**	**$ 289,300**	**$ 570,424**	**$ 278,769**	**$ 1,805,566**	**$ 3,150,112**	**$ 1,449,209**	**$ 91,757**	**$ 88,698**	**$ 86,923**	**$ 85,268**	**$ 83,643**	**$ 82,050**	**$ 80,487**	**$ 78,954**	**$ 77,450**	**$ 75,975**	**$ 74,528**	**$ 73,108**	**$ 71,716**	**$ 70,350**	$ 8,664,288

Notes:
1) Prices are 2019/2020 based, in CAD.
2) Implementation timeline between 2021 to 2026.
3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.
4) Considering low accumulation of deposits in the distribution system.

A6: Provide Iron and Manganese Removal Technology at Wells 1&2 Facility and Continue Sequestration at Well 3 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Silicate dosing system improvement at Well 3 Facility	$ 200,000	$ -	$ -	$ 200,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 200,000**
New Treatment Building at Wells 1 & 2 Facility	$ 2,250,000	$ -	$ -	$ -	$ 1,125,000	$ 1,125,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 2,250,000**
Design & Construction Administration (20%)	$ 491,000	$ 40,833	$ 163,333	$ 60,833	$ 113,000	$ 113,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 491,000**
Contingency (30%)	$ 885,000	$ 13,000	$ 49,000	$ 79,000	$ 372,000	$ 372,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 885,000**
York Region Project Management (5%)	$ 193,000	$ 3,000	$ 11,000	$ 17,000	$ 81,000	$ 81,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 193,000**
HST (1.76%)	$ 73,000	$ 2,000	$ 4,000	$ 7,000	$ 30,000	$ 30,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 73,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 4,092,000**	**$ 58,833**	**$ 227,333**	**$ 363,833**	**$ 1,721,000**	**$ 1,721,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 4,092,000**
Operation & Maintenance Expenditures[3]																						
Sodium Silicate for Sequestration	$ 59,300	$ 5,300	$ 5,500	$ 5,700	$ 5,800	$ 6,000	$ 4,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 1,900	$ 1,900	$ 1,900	$ 1,900	$ 1,900	$ 1,900	$ 1,900	$ 1,900	$ 1,900	$ 1,900	**$ 59,300**
Chlorine Gas for Oxidation	$ 30,300	$ -	$ -	$ -	$ -	$ -	$ 2,100	$ 2,100	$ 2,100	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	**$ 30,300**
Additional O&M Labour	$ 624,000	$ -	$ -	$ -	$ -	$ -	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	**$ 624,000**
New Building Power Consumption	$ 33,000	$ -	$ -	$ -	$ -	$ -	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$ 2,200	**$ 33,000**
Clean and inspection of chlorine contact chambers	$ 750,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	**$ 750,000**
Clean and inspection of North ET	$ 250,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	**$ 250,000**
Unidirectional flushing program	$ 480,000	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	**$ 480,000**
Swabbing program	$ 220,000	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	**$ 220,000**
Tailored Monitoring Program for the distribution system	$ 550,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	**$ 550,000**
TOTAL O&M COSTS (Undiscounted)	**$ 2,996,600**	**$ 191,300**	**$ 191,500**	**$ 191,700**	**$ 191,800**	**$ 192,000**	**$ 137,900**	**$ 135,900**	**$ 135,900**	**$ 135,800**	**$ 135,800**	**$ 135,700**	**$ 135,700**	**$ 135,700**	**$ 135,700**	**$ 135,700**	**$ 135,700**	**$ 135,700**	**$ 135,700**	**$ 135,700**	**$ 135,700**	**$ 2,996,600**
Net Present Value																						
Capital Investment (Discounted)	$ 3,850,035	$ 58,833	$ 223,003	$ 350,105	$ 1,624,518	$ 1,593,575	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 3,850,035**
Operation & Maintenance Expenditures (Discounted)	$ 2,546,574	$ 191,300	$ 187,852	$ 184,467	$ 181,047	$ 177,784	$ 125,258	$ 121,090	$ 118,783	$ 116,435	$ 114,217	$ 111,959	$ 109,826	$ 107,735	$ 105,682	$ 103,669	$ 101,695	$ 99,758	$ 97,858	$ 95,994	$ 94,165	**$ 2,546,574**
TOTAL WHOLE LIFE COST	**$ 6,396,609**	**$ 250,133**	**$ 410,856**	**$ 534,572**	**$ 1,805,566**	**$ 1,771,359**	**$ 125,258**	**$ 121,090**	**$ 118,783**	**$ 116,435**	**$ 114,217**	**$ 111,959**	**$ 109,826**	**$ 107,735**	**$ 105,682**	**$ 103,669**	**$ 101,695**	**$ 99,758**	**$ 97,858**	**$ 95,994**	**$ 94,165**	**$ 6,396,609**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2025.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

4) Considering moderate accumulation of deposits in the distribution system.

A7: Connect Well MW-18 to Mount Albert Water Supply System
A7a: Replace Well 1 with Well MW18 and Continue Sequestration for all Wells

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Well MW18 hydrogeological study	$ 400,000	$ -	$ 400,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 400,000**
Silicate dosing system improvement at Wells 1 & 2 Facility	$ 80,000	$ -	$ -	$ 80,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 80,000**
New MW18 well pump and pumping house at Well 3 Facility	$ 800,000	$ -	$ -	$ -	$ 800,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 800,000**
Silicate dosing system improvement at Well 3 Facility	$ 200,000	$ -	$ -	$ -	$ 200,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 200,000**
Chlorine dosing system and contact tank expansion at Well 3 Facility	$ 700,000	$ -	$ -	$ -	$ 700,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 700,000**
Decommissioning of Well 1	$ 100,000	$ -	$ -	$ -	$ -	$ 100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 100,000**
Design & Construction Administration (20%)	$ 376,000	$ 31,333	$ 125,333	$ 39,333	$ 170,000	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 376,000**
Contingency (30%)	$ 798,000	$ 10,000	$ 158,000	$ 36,000	$ 561,000	$ 33,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 798,000**
York Region Project Management (5%)	$ 176,000	$ 3,000	$ 35,000	$ 8,000	$ 122,000	$ 8,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 176,000**
HST (1.76%)	$ 65,000	$ 1,000	$ 13,000	$ 3,000	$ 45,000	$ 3,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 65,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 3,695,000**	**$ 45,333**	**$ 731,333**	**$ 166,333**	**$ 2,598,000**	**$ 154,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 3,695,000**
Operation & Maintenance Expenditures[3]																						
Sodium Silicate for Sequestration	$ 115,200	$ 5,300	$ 5,500	$ 5,700	$ 5,800	$ 6,000	$ 6,100	$ 6,100	$ 6,000	$ 5,900	$ 5,800	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	**$ 115,200**
New Building Power Consumption	$ 28,800	$ -	$ -	$ -	$ -	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	**$ 28,800**
Clean and inspection of chlorine contact chambers	$ 720,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	**$ 720,000**
Clean and inspection of North ET	$ 240,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	**$ 240,000**
Unidirectional flushing program	$ 460,800	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	**$ 460,800**
Swabbing program	$ 211,200	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	**$ 211,200**
Tailored Monitoring Program for the distribution system	$ 520,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	**$ 520,000**
TOTAL O&M COSTS (Undiscounted)	**$ 2,296,000**	**$ 191,300**	**$ 191,500**	**$ 191,700**	**$ 191,800**	**$ 95,800**	**$ 95,900**	**$ 95,900**	**$ 95,800**	**$ 95,700**	**$ 95,600**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 2,296,000**
Net Present Value																						
Capital Investment (Discounted)	$ 3,517,744	$ 45,333	$ 717,403	$ 160,057	$ 2,452,353	$ 142,598	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 3,517,744**
Operation & Maintenance Expenditures (Discounted)	$ 1,975,827	$ 191,300	$ 187,852	$ 184,467	$ 181,047	$ 88,707	$ 87,108	$ 85,449	$ 83,734	$ 82,053	$ 80,406	$ 78,792	$ 77,291	$ 75,819	$ 74,375	$ 72,958	$ 71,569	$ 70,205	$ 68,868	$ 67,556	$ 66,270	**$ 1,975,827**
TOTAL WHOLE LIFE COST	**$ 5,493,571**	**$ 236,633**	**$ 905,256**	**$ 344,524**	**$ 2,633,400**	**$ 231,305**	**$ 87,108**	**$ 85,449**	**$ 83,734**	**$ 82,053**	**$ 80,406**	**$ 78,792**	**$ 77,291**	**$ 75,819**	**$ 74,375**	**$ 72,958**	**$ 71,569**	**$ 70,205**	**$ 68,868**	**$ 67,556**	**$ 66,270**	**$ 5,493,571**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2025.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

4) Considering moderate accumulation of deposits in the distribution system.

A7: Connect Well MW-18 to Mount Albert Water Supply System
A7b: Replace Wells 1 and 2 with Well MW18, re-rate Wells 3 and MW18, and continue sequestration

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Well MW18 and Well 3 hydrogeological study	$ 800,000	$ -	$ 800,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 800,000**
New MW18 well pump and pumping house at Well 3 Facility	$ 800,000	$ -	$ -	$ 400,000	$ 400,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 800,000**
Well 3 upgrades, including well reconstruction and new pump	$ 700,000	$ -	$ -	$ 350,000	$ 350,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 700,000**
Silicate dosing system improvement at Well 3 Facility	$ 200,000	$ -	$ -	$ 100,000	$ 100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 200,000**
Chlorine dosing system and contact tank expansion at Well 3 Facility	$ 700,000	$ -	$ -	$ 350,000	$ 350,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 700,000**
Decommissioning of Wells 1 & 2 Facility	$ 500,000	$ -	$ -	$ -	$ -	$ 500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 500,000**
Design & Construction Administration (20%)	$ 580,000	$ 48,333	$ 193,333	$ 168,333	$ 120,000	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 580,000**
Contingency (30%)	$ 1,285,000	$ 15,000	$ 298,000	$ 411,000	$ 396,000	$ 165,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,285,000**
York Region Project Management (5%)	$ 280,000	$ 4,000	$ 65,000	$ 89,000	$ 86,000	$ 36,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 280,000**
HST (1.76%)	$ 105,000	$ 2,000	$ 24,000	$ 33,000	$ 32,000	$ 14,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 105,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 5,950,000**	**$ 69,333**	**$ 1,380,333**	**$ 1,901,333**	**$ 1,834,000**	**$ 765,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 5,950,000**
Operation & Maintenance Expenditures[3]																						
Sodium Silicate for Sequestration	$ 115,200	$ 5,300	$ 5,500	$ 5,700	$ 5,800	$ 6,000	$ 6,100	$ 6,100	$ 6,000	$ 5,900	$ 5,800	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	$ 5,700	**$ 115,200**
New Building Power Consumption	$ 28,800	$ -	$ -	$ -	$ -	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800	**$ 28,800**
Clean and inspection of chlorine contact chambers	$ 720,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	**$ 720,000**
Clean and inspection of North ET	$ 240,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	**$ 240,000**
Unidirectional flushing program	$ 460,800	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	**$ 460,800**
Swabbing program	$ 211,200	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	**$ 211,200**
Tailored Monitoring Program for the distribution system	$ 520,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	**$ 520,000**
TOTAL O&M COSTS (Undiscounted)	**$ 2,296,000**	**$ 191,300**	**$ 191,500**	**$ 191,700**	**$ 191,800**	**$ 95,800**	**$ 95,900**	**$ 95,900**	**$ 95,800**	**$ 95,700**	**$ 95,600**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 95,500**	**$ 2,296,000**
Net Present Value																						
Capital Investment (Discounted)	$ 5,692,508	$ 69,333	$ 1,354,041	$ 1,829,591	$ 1,731,184	$ 708,359	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 5,692,508**
Operation & Maintenance Expenditures (Discounted)	$ 1,975,827	$ 191,300	$ 187,852	$ 184,467	$ 181,047	$ 88,707	$ 87,108	$ 85,449	$ 83,734	$ 82,053	$ 80,406	$ 78,792	$ 77,291	$ 75,819	$ 74,375	$ 72,958	$ 71,569	$ 70,205	$ 68,868	$ 67,556	$ 66,270	**$ 1,975,827**
TOTAL WHOLE LIFE COST	**$ 7,668,335**	**$ 260,633**	**$ 1,541,894**	**$ 2,014,058**	**$ 1,912,231**	**$ 797,065**	**$ 87,108**	**$ 85,449**	**$ 83,734**	**$ 82,053**	**$ 80,406**	**$ 78,792**	**$ 77,291**	**$ 75,819**	**$ 74,375**	**$ 72,958**	**$ 71,569**	**$ 70,205**	**$ 68,868**	**$ 67,556**	**$ 66,270**	**$ 7,668,335**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2025.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

4) Considering moderate accumulation of deposits in the distribution system.

A7: Connect Well MW-18 to Mount Albert Water Supply System
A7c: Replace Well 1 with Well MW18, Continue Sequestration at Well 3 Facility, and provide iron and manganese removal technology at Wells 1&2 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Well MW18 hydrogeological study	$ 400,000	$ -	$ 400,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 400,000**
New Treatment Building at Wells 1 & 2 Facility	$ 2,250,000	$ -	$ -	$ 1,125,000	$ 1,125,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 2,250,000**
New MW18 well pump and pumping house at Well 3 Facility	$ 800,000	$ -	$ -	$ -	$ -	$ 400,000	$ 400,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 800,000**
Silicate dosing system improvement at Well 3 Facility	$ 200,000	$ -	$ -	$ -	$ -	$ 100,000	$ 100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 200,000**
Chlorine dosing system and contact tank expansion at Well 3 Facility	$ 700,000	$ -	$ -	$ -	$ -	$ 350,000	$ 350,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 700,000**
Decommissioning of Well 1	$ 100,000	$ -	$ -	$ -	$ -	$ -	$ 100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 100,000**
Design & Construction Administration (20%)	$ 811,000	$ 67,500	$ 270,000	$ 180,500	$ 113,000	$ 85,000	$ 95,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 811,000**
Contingency (30%)	$ 1,581,000	$ 21,000	$ 201,000	$ 392,000	$ 372,000	$ 281,000	$ 314,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,581,000**
York Region Project Management (5%)	$ 344,000	$ 5,000	$ 44,000	$ 85,000	$ 81,000	$ 61,000	$ 68,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 344,000**
HST (1.76%)	$ 130,000	$ 2,000	$ 17,000	$ 32,000	$ 30,000	$ 23,000	$ 26,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 130,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 7,316,000**	**$ 95,500**	**$ 932,000**	**$ 1,814,500**	**$ 1,721,000**	**$ 1,300,000**	**$ 1,453,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 7,316,000**
Operation & Maintenance Expenditures[3]																						
Sodium Silicate for Sequestration	$ 83,625	$ 5,300	$ 5,500	$ 5,700	$ 5,800	$ 4,950	$ 2,475	$ 4,100	$ 4,000	$ 3,900	$ 3,900	$ 3,800	$ 3,800	$ 3,800	$ 3,800	$ 3,800	$ 3,800	$ 3,800	$ 3,800	$ 3,800	$ 3,800	**$ 83,625**
Chlorine Gas for Oxidation	$ 16,400	$ -	$ -	$ -	$ -	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	**$ 16,400**
Additional O&M Labour	$ 665,600	$ -	$ -	$ -	$ -	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	**$ 665,600**
New Building Power Consumption	$ 62,400	$ -	$ -	$ -	$ -	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	**$ 62,400**
Clean and inspection of chlorine contact chambers	$ 720,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	**$ 720,000**
Clean and inspection of North ET	$ 240,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	**$ 240,000**
Unidirectional flushing program	$ 460,800	$ 38,400	$ 38,400	$ 38,400	$ 38,400	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	$ 19,200	**$ 460,800**
Swabbing program	$ 211,200	$ 17,600	$ 17,600	$ 17,600	$ 17,600	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	**$ 211,200**
Tailored Monitoring Program for the distribution system	$ 520,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	**$ 520,000**
TOTAL O&M COSTS (Undiscounted)	**$ 2,980,025**	**$ 191,300**	**$ 191,500**	**$ 191,700**	**$ 191,800**	**$ 139,550**	**$ 137,075**	**$ 138,700**	**$ 138,600**	**$ 138,400**	**$ 138,400**	**$ 138,300**	**$ 138,300**	**$ 138,300**	**$ 138,300**	**$ 138,300**	**$ 138,300**	**$ 138,300**	**$ 138,300**	**$ 138,300**	**$ 138,300**	**$ 2,980,025**
Net Present Value																						
Capital Investment (Discounted)	$ 6,903,838	$ 95,500	$ 914,248	$ 1,746,035	$ 1,624,518	$ 1,203,747	$ 1,319,791	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 6,903,838**
Operation & Maintenance Expenditures (Discounted)	$ 2,526,232	$ 191,300	$ 187,852	$ 184,467	$ 181,047	$ 129,218	$ 124,508	$ 123,585	$ 121,143	$ 118,664	$ 116,404	$ 114,104	$ 111,931	$ 109,799	$ 107,707	$ 105,656	$ 103,643	$ 101,669	$ 99,733	$ 97,833	$ 95,969	**$ 2,526,232**
TOTAL WHOLE LIFE COST	**$ 9,430,070**	**$ 286,800**	**$ 1,102,100**	**$ 1,930,501**	**$ 1,805,566**	**$ 1,332,964**	**$ 1,444,299**	**$ 123,585**	**$ 121,143**	**$ 118,664**	**$ 116,404**	**$ 114,104**	**$ 111,931**	**$ 109,799**	**$ 107,707**	**$ 105,656**	**$ 103,643**	**$ 101,669**	**$ 99,733**	**$ 97,833**	**$ 95,969**	**$ 9,430,070**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2026.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

4) Considering moderate accumulation of deposits in the distribution system.

R1: Direct connection to sewer collection system
A5a: Centralized Removal Technology at Wells 1 & 2 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Onsite residual management system at Wells 1 & 2 Facility	$ 450,000	$ -	$ -	$ -	$ 225,000	$ 225,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 450,000**
Connection to sewer collection system from Wells 1 & 2 Facility	$ 270,000	$ -	$ -	$ -	$ 135,000	$ 135,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 270,000**
Design & Construction Administration (20%)	$ 144,000	$ 12,000	$ 48,000	$ 12,000	$ 36,000	$ 36,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 144,000**
Contingency (30%)	$ 261,000	$ 4,000	$ 15,000	$ 4,000	$ 119,000	$ 119,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 261,000**
York Region Project Management (5%)	$ 58,000	$ 1,000	$ 4,000	$ 1,000	$ 26,000	$ 26,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 58,000**
HST (1.76%)	$ 24,000	$ 1,000	$ 2,000	$ 1,000	$ 10,000	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 24,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 1,207,000**	**$ 18,000**	**$ 69,000**	**$ 18,000**	**$ 551,000**	**$ 551,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ 1,207,000
Operation & Maintenance Expenditures[3]																						
Sewer Discharge	$ 1,022,400	$ -	$ -	$ -	$ -	$ -	$ 72,000	$ 71,000	$ 70,100	$ 69,100	$ 68,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	**$ 1,022,400**
Additional O&M Labour	$ 156,000	$ -	$ -	$ -	$ -	$ -	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	**$ 156,000**
TOTAL O&M COSTS (Undiscounted)	**$ 1,178,400**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 82,400**	**$ 81,400**	**$ 80,500**	**$ 79,500**	**$ 78,600**	**$ 77,600**	**$ 77,600**	**$ 77,600**	**$ 77,600**	**$ 77,600**	**$ 77,600**	**$ 77,600**	**$ 77,600**	**$ 77,600**	**$ 77,600**	$ 1,178,400
Net Present Value																						
Capital Investment (Discounted)	$ 1,133,320	$ 18,000	$ 67,686	$ 17,321	$ 520,110	$ 510,203	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,133,320**
Operation & Maintenance Expenditures (Discounted)	$ 940,063	$ -	$ -	$ -	$ -	$ -	$ 74,846	$ 72,529	$ 70,361	$ 68,163	$ 66,108	$ 64,024	$ 62,804	$ 61,608	$ 60,434	$ 59,283	$ 58,154	$ 57,046	$ 55,960	$ 54,894	$ 53,848	**$ 940,063**
TOTAL WHOLE LIFE COST	**$ 2,073,383**	**$ 18,000**	**$ 67,686**	**$ 17,321**	**$ 520,110**	**$ 510,203**	**$ 74,846**	**$ 72,529**	**$ 70,361**	**$ 68,163**	**$ 66,108**	**$ 64,024**	**$ 62,804**	**$ 61,608**	**$ 60,434**	**$ 59,283**	**$ 58,154**	**$ 57,046**	**$ 55,960**	**$ 54,894**	**$ 53,848**	$ 2,073,383

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2025.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

R1: Direct connection to sewer collection system
A5b: Decentralized Removal Technology at both Facilities

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Onsite residual management system at Wells 1 & 2 Facility	$ 450,000	$ -	$ -	$ -	$ 225,000	$ 225,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 450,000**
Connection to sewer collection system from Wells 1 & 2 Facility	$ 270,000	$ -	$ -	$ -	$ 135,000	$ 135,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 270,000**
Onsite residual management system at Well 3 Facility	$ 400,000	$ -	$ -	$ -	$ -	$ 200,000	$ 200,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 400,000**
Connection to sewer collection system from at Well 3 Facility	$ 1,105,000	$ -	$ -	$ -	$ -	$ 552,500	$ 552,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,105,000**
Design & Construction Administration (20%)	$ 447,000	$ 37,167	$ 148,667	$ 37,167	$ 36,000	$ 112,000	$ 76,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 447,000**
Contingency (30%)	$ 805,000	$ 12,000	$ 45,000	$ 12,000	$ 119,000	$ 368,000	$ 249,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 805,000**
York Region Project Management (5%)	$ 176,000	$ 3,000	$ 10,000	$ 3,000	$ 26,000	$ 80,000	$ 54,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 176,000**
HST (1.76%)	$ 66,000	$ 1,000	$ 4,000	$ 1,000	$ 10,000	$ 30,000	$ 20,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 66,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 3,719,000**	**$ 53,167**	**$ 207,667**	**$ 53,167**	**$ 551,000**	**$ 1,702,500**	**$ 1,151,500**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 3,719,000**
Operation & Maintenance Expenditures[3]																						
Sewer Discharge	$ 1,022,400	$ -	$ -	$ -	$ -	$ -	$ 72,000	$ 71,000	$ 70,100	$ 69,100	$ 68,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	$ 67,200	**$ 1,022,400**
Additional O&M Labour	$ 312,000	$ -	$ -	$ -	$ -	$ -	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	**$ 312,000**
TOTAL O&M COSTS (Undiscounted)	**$ 1,334,400**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 92,800**	**$ 91,800**	**$ 90,900**	**$ 89,900**	**$ 89,000**	**$ 88,000**	**$ 88,000**	**$ 88,000**	**$ 88,000**	**$ 88,000**	**$ 88,000**	**$ 88,000**	**$ 88,000**	**$ 88,000**	**$ 88,000**	**$ 1,334,400**
Net Present Value																						
Capital Investment (Discounted)	$ 3,450,526	$ 53,167	$ 203,711	$ 51,161	$ 520,110	$ 1,576,445	$ 1,045,932	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 3,450,526**
Operation & Maintenance Expenditures (Discounted)	$ 1,064,342	$ -	$ -	$ -	$ -	$ -	$ 84,292	$ 81,796	$ 79,451	$ 77,080	$ 74,855	$ 72,604	$ 71,221	$ 69,865	$ 68,534	$ 67,229	$ 65,948	$ 64,692	$ 63,460	$ 62,251	$ 61,065	**$ 1,064,342**
TOTAL WHOLE LIFE COST	**$ 4,514,868**	**$ 53,167**	**$ 203,711**	**$ 51,161**	**$ 520,110**	**$ 1,576,445**	**$ 1,130,225**	**$ 81,796**	**$ 79,451**	**$ 77,080**	**$ 74,855**	**$ 72,604**	**$ 71,221**	**$ 69,865**	**$ 68,534**	**$ 67,229**	**$ 65,948**	**$ 64,692**	**$ 63,460**	**$ 62,251**	**$ 61,065**	**$ 4,514,868**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2026.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

R1: Direct connection to sewer collection system
A6: Provide Iron and Manganese Removal Technology at Wells 1&2 Facility and Continue Sequestration at Well 3 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Onsite residual management system at Wells 1 & 2 Facility	$ 450,000	$ -	$ -	$ -	$ 225,000	$ 225,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 450,000**
Connection to sewer collection system from Wells 1 & 2 Facility	$ 270,000	$ -	$ -	$ -	$ 135,000	$ 135,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 270,000**
Design & Construction Administration (20%)	$ 144,000	$ 12,000	$ 48,000	$ 12,000	$ 36,000	$ 36,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 144,000**
Contingency (30%)	$ 261,000	$ 4,000	$ 15,000	$ 4,000	$ 119,000	$ 119,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 261,000**
York Region Project Management (5%)	$ 58,000	$ 1,000	$ 4,000	$ 1,000	$ 26,000	$ 26,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 58,000**
HST (1.76%)	$ 24,000	$ 1,000	$ 2,000	$ 1,000	$ 10,000	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 24,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 1,207,000**	**$ 18,000**	**$ 69,000**	**$ 18,000**	**$ 551,000**	**$ 551,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ 1,207,000
Operation & Maintenance Expenditures[3]																						
Sewer Discharge	$ 681,700	$ -	$ -	$ -	$ -	$ -	$ 48,000	$ 47,400	$ 46,700	$ 46,100	$ 45,500	$ 44,800	$ 44,800	$ 44,800	$ 44,800	$ 44,800	$ 44,800	$ 44,800	$ 44,800	$ 44,800	$ 44,800	**$ 681,700**
Additional O&M Labour	$ 156,000	$ -	$ -	$ -	$ -	$ -	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	**$ 156,000**
TOTAL O&M COSTS (Undiscounted)	**$ 837,700**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 58,400**	**$ 57,800**	**$ 57,100**	**$ 56,500**	**$ 55,900**	**$ 55,200**	**$ 55,200**	**$ 55,200**	**$ 55,200**	**$ 55,200**	**$ 55,200**	**$ 55,200**	**$ 55,200**	**$ 55,200**	**$ 55,200**	$ 837,700
Net Present Value																						
Capital Investment (Discounted)	$ 1,133,320	$ 18,000	$ 67,686	$ 17,321	$ 520,110	$ 510,203	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,133,320**
Operation & Maintenance Expenditures (Discounted)	$ 668,222	$ -	$ -	$ -	$ -	$ -	$ 53,046	$ 51,501	$ 49,908	$ 48,443	$ 47,016	$ 45,543	$ 44,675	$ 43,824	$ 42,989	$ 42,171	$ 41,367	$ 40,579	$ 39,806	$ 39,048	$ 38,304	**$ 668,222**
TOTAL WHOLE LIFE COST	**$ 1,801,542**	**$ 18,000**	**$ 67,686**	**$ 17,321**	**$ 520,110**	**$ 510,203**	**$ 53,046**	**$ 51,501**	**$ 49,908**	**$ 48,443**	**$ 47,016**	**$ 45,543**	**$ 44,675**	**$ 43,824**	**$ 42,989**	**$ 42,171**	**$ 41,367**	**$ 40,579**	**$ 39,806**	**$ 39,048**	**$ 38,304**	**$ 1,801,542**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2025.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

R1: Direct connection to sewer collection system
A7c: Replace Well 1 with Well MW18, Continue Sequestration at Well 3 Facility, and provide iron and manganese removal technology at Wells 1&2 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Onsite residual management system at Wells 1 & 2 Facility	$ 450,000	$ -	$ -	$ 225,000	$ 225,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 450,000**
Connection to sewer collection system from Wells 1 & 2 Facility	$ 270,000	$ -	$ -	$ 135,000	$ 135,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 270,000**
Design & Construction Administration (20%)	$ 144,000	$ 12,000	$ 48,000	$ 48,000	$ 36,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 144,000**
Contingency (30%)	$ 261,000	$ 4,000	$ 15,000	$ 123,000	$ 119,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 261,000**
York Region Project Management (5%)	$ 58,000	$ 1,000	$ 4,000	$ 27,000	$ 26,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 58,000**
HST (1.76%)	$ 23,000	$ 1,000	$ 2,000	$ 10,000	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 23,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 1,206,000**	**$ 18,000**	**$ 69,000**	**$ 568,000**	**$ 551,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ 1,206,000
Operation & Maintenance Expenditures[3]																						
Sewer Discharge	$ 364,400	$ -	$ -	$ -	$ -	$ 23,400	$ 24,000	$ 23,700	$ 23,400	$ 23,100	$ 22,800	$ 22,400	$ 22,400	$ 22,400	$ 22,400	$ 22,400	$ 22,400	$ 22,400	$ 22,400	$ 22,400	$ 22,400	**$ 364,400**
Additional O&M Labour	$ 166,400	$ -	$ -	$ -	$ -	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	$ 10,400	**$ 166,400**
TOTAL O&M COSTS (Undiscounted)	**$ 530,800**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 33,800**	**$ 34,400**	**$ 34,100**	**$ 33,800**	**$ 33,500**	**$ 33,200**	**$ 32,800**	**$ 32,800**	**$ 32,800**	**$ 32,800**	**$ 32,800**	**$ 32,800**	**$ 32,800**	**$ 32,800**	**$ 32,800**	**$ 32,800**	$ 530,800
Net Present Value																						
Capital Investment (Discounted)	$ 1,152,364	$ 18,000	$ 67,686	$ 546,568	$ 520,110	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,152,364**
Operation & Maintenance Expenditures (Discounted)	$ 427,677	$ -	$ -	$ -	$ -	$ 31,297	$ 31,246	$ 30,384	$ 29,543	$ 28,723	$ 27,923	$ 27,062	$ 26,546	$ 26,040	$ 25,544	$ 25,058	$ 24,581	$ 24,112	$ 23,653	$ 23,203	$ 22,761	**$ 427,677**
TOTAL WHOLE LIFE COST	**$ 1,580,040**	**$ 18,000**	**$ 67,686**	**$ 546,568**	**$ 520,110**	**$ 31,297**	**$ 31,246**	**$ 30,384**	**$ 29,543**	**$ 28,723**	**$ 27,923**	**$ 27,062**	**$ 26,546**	**$ 26,040**	**$ 25,544**	**$ 25,058**	**$ 24,581**	**$ 24,112**	**$ 23,653**	**$ 23,203**	**$ 22,761**	$ 1,580,040

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2024.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system
A5a: Centralized Removal Technology at Wells 1 & 2 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Onsite residual management system at Wells 1 & 2 Facility	$ 1,130,000	$ -	$ -	$ -	$ 565,000	$ 565,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,130,000**
Connection to Vivian Creek from Wells 1 & 2 Facility	$ 280,000	$ -	$ -	$ -	$ 140,000	$ 140,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 280,000**
Connection to sewer collection system from Wells 1 & 2 Facility	$ 270,000	$ -	$ -	$ -	$ 135,000	$ 135,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 270,000**
Design & Construction Administration (20%)	$ 336,000	$ 28,000	$ 112,000	$ 28,000	$ 84,000	$ 84,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 336,000**
Contingency (30%)	$ 608,000	$ 9,000	$ 34,000	$ 9,000	$ 278,000	$ 278,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 608,000**
York Region Project Management (5%)	$ 134,000	$ 2,000	$ 8,000	$ 2,000	$ 61,000	$ 61,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 134,000**
HST (1.76%)	$ 51,000	$ 1,000	$ 3,000	$ 1,000	$ 23,000	$ 23,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 51,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 2,809,000**	**$ 40,000**	**$ 157,000**	**$ 40,000**	**$ 1,286,000**	**$ 1,286,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,809,000**
Operation & Maintenance Expenditures[3]																						
Dechlorination	$ 88,200	$ -	$ -	$ -	$ -	$ -	$ 6,200	$ 6,100	$ 6,000	$ 6,000	$ 5,900	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	**$ 88,200**
Sewer Discharge	$ 103,300	$ -	$ -	$ -	$ -	$ -	$ 7,200	$ 7,100	$ 7,100	$ 7,000	$ 6,900	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	**$ 103,300**
Additional O&M Labour	$ 312,000	$ -	$ -	$ -	$ -	$ -	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	**$ 312,000**
TOTAL O&M COSTS (Undiscounted)	**$ 503,500**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 34,200**	**$ 34,000**	**$ 33,900**	**$ 33,800**	**$ 33,600**	**$ 33,400**	**$ 33,400**	**$ 33,400**	**$ 33,400**	**$ 33,400**	**$ 33,400**	**$ 33,400**	**$ 33,400**	**$ 33,400**	**$ 33,400**	**$ 503,500**
Net Present Value																						
Capital Investment (Discounted)	$ 2,637,188	$ 40,000	$ 154,010	$ 38,491	$ 1,213,905	$ 1,190,783	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 2,637,188**
Operation & Maintenance Expenditures (Discounted)	$ 401,336	$ -	$ -	$ -	$ -	$ -	$ 31,065	$ 30,295	$ 29,630	$ 28,980	$ 28,260	$ 27,557	$ 27,032	$ 26,517	$ 26,012	$ 25,516	$ 25,030	$ 24,553	$ 24,086	$ 23,627	$ 23,177	**$ 401,336**
TOTAL WHOLE LIFE COST	**$ 3,038,525**	**$ 40,000**	**$ 154,010**	**$ 38,491**	**$ 1,213,905**	**$ 1,190,783**	**$ 31,065**	**$ 30,295**	**$ 29,630**	**$ 28,980**	**$ 28,260**	**$ 27,557**	**$ 27,032**	**$ 26,517**	**$ 26,012**	**$ 25,516**	**$ 25,030**	**$ 24,553**	**$ 24,086**	**$ 23,627**	**$ 23,177**	**$ 3,038,525**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2025.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system
A5b: Decentralized Removal Technology at both Facilities

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Onsite residual management system at Wells 1 & 2 Facility	$ 1,130,000	$ -	$ -	$ -	$ 565,000	$ 565,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,130,000**
Connection to Vivian Creek from Wells 1 & 2 Facility	$ 280,000	$ -	$ -	$ -	$ 140,000	$ 140,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 280,000**
Connection to sewer collection system from Wells 1 & 2 Facility	$ 270,000	$ -	$ -	$ -	$ 135,000	$ 135,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 270,000**
Onsite residual management system at Well 3 Facility	$ 1,080,000	$ -	$ -	$ -	$ -	$ 540,000	$ 540,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,080,000**
Connection to Vivian Creek from at Well 3 Facility	$ 290,000	$ -	$ -	$ -	$ -	$ 145,000	$ 145,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 290,000**
Connection to sewer collection system from at Well 3 Facility	$ 1,105,000	$ -	$ -	$ -	$ -	$ 552,500	$ 552,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,105,000**
Design & Construction Administration (20%)	$ 832,000	$ 69,333	$ 277,333	$ 69,333	$ 84,000	$ 208,000	$ 124,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 832,000**
Contingency (30%)	$ 1,499,000	$ 21,000	$ 84,000	$ 21,000	$ 278,000	$ 686,000	$ 409,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,499,000**
York Region Project Management (5%)	$ 328,000	$ 5,000	$ 19,000	$ 5,000	$ 61,000	$ 149,000	$ 89,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 328,000**
HST (1.76%)	$ 122,000	$ 2,000	$ 7,000	$ 2,000	$ 23,000	$ 55,000	$ 33,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 122,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 6,936,000**	**$ 97,333**	**$ 387,333**	**$ 97,333**	**$ 1,286,000**	**$ 3,175,500**	**$ 1,892,500**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 6,936,000**
Operation & Maintenance Expenditures[3]																						
Dechlorination	$ 88,200	$ -	$ -	$ -	$ -	$ -	$ 6,200	$ 6,100	$ 6,000	$ 6,000	$ 5,900	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	**$ 88,200**
Sewer Discharge	$ 103,300	$ -	$ -	$ -	$ -	$ -	$ 7,200	$ 7,100	$ 7,100	$ 7,000	$ 6,900	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	**$ 103,300**
Additional O&M Labour	$ 624,000	$ -	$ -	$ -	$ -	$ -	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	**$ 624,000**
TOTAL O&M COSTS (Undiscounted)	**$ 815,500**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 55,000**	**$ 54,800**	**$ 54,700**	**$ 54,600**	**$ 54,400**	**$ 54,200**	**$ 54,200**	**$ 54,200**	**$ 54,200**	**$ 54,200**	**$ 54,200**	**$ 54,200**	**$ 54,200**	**$ 54,200**	**$ 54,200**	**$ 815,500**
Net Present Value																						
Capital Investment (Discounted)	$ 6,444,236	$ 97,333	$ 379,956	$ 93,661	$ 1,213,905	$ 2,940,382	$ 1,718,999	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 6,444,236**
Operation & Maintenance Expenditures (Discounted)	$ 649,894	$ -	$ -	$ -	$ -	$ -	$ 49,958	$ 48,828	$ 47,810	$ 46,814	$ 45,754	$ 44,718	$ 43,866	$ 43,030	$ 42,211	$ 41,407	$ 40,618	$ 39,844	$ 39,085	$ 38,341	$ 37,611	**$ 649,894**
TOTAL WHOLE LIFE COST	**$ 7,094,130**	**$ 97,333**	**$ 379,956**	**$ 93,661**	**$ 1,213,905**	**$ 2,940,382**	**$ 1,768,956**	**$ 48,828**	**$ 47,810**	**$ 46,814**	**$ 45,754**	**$ 44,718**	**$ 43,866**	**$ 43,030**	**$ 42,211**	**$ 41,407**	**$ 40,618**	**$ 39,844**	**$ 39,085**	**$ 38,341**	**$ 37,611**	**$ 7,094,130**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2026.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system
A6: Provide Iron and Manganese Removal Technology at Wells 1&2 Facility and Continue Sequestration at Well 3 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Onsite residual management system at Wells 1 & 2 Facility	$ 1,130,000	$ -	$ -	$ -	$ 565,000	$ 565,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,130,000**
Connection to Vivian Creek from Wells 1 & 2 Facility	$ 280,000	$ -	$ -	$ -	$ 140,000	$ 140,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 280,000**
Connection to sewer collection system from Wells 1 & 2 Facility	$ 270,000	$ -	$ -	$ -	$ 135,000	$ 135,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 270,000**
Design & Construction Administration (20%)	$ 336,000	$ 28,000	$ 112,000	$ 28,000	$ 84,000	$ 84,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 336,000**
Contingency (30%)	$ 608,000	$ 9,000	$ 34,000	$ 9,000	$ 278,000	$ 278,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 608,000**
York Region Project Management (5%)	$ 134,000	$ 2,000	$ 8,000	$ 2,000	$ 61,000	$ 61,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 134,000**
HST (1.76%)	$ 51,000	$ 1,000	$ 3,000	$ 1,000	$ 23,000	$ 23,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 51,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 2,809,000**	**$ 40,000**	**$ 157,000**	**$ 40,000**	**$ 1,286,000**	**$ 1,286,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,809,000**
Operation & Maintenance Expenditures[3]																						
Dechlorination	$ 59,200	$ -	$ -	$ -	$ -	$ -	$ 4,200	$ 4,100	$ 4,000	$ 4,000	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	**$ 59,200**
Sewer Discharge	$ 68,600	$ -	$ -	$ -	$ -	$ -	$ 4,800	$ 4,800	$ 4,700	$ 4,700	$ 4,600	$ 4,500	$ 4,500	$ 4,500	$ 4,500	$ 4,500	$ 4,500	$ 4,500	$ 4,500	$ 4,500	$ 4,500	**$ 68,600**
Additional O&M Labour	$ 312,000	$ -	$ -	$ -	$ -	$ -	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	**$ 312,000**
TOTAL O&M COSTS (Undiscounted)	**$ 439,800**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 29,800**	**$ 29,700**	**$ 29,500**	**$ 29,500**	**$ 29,300**	**$ 29,200**	**$ 29,200**	**$ 29,200**	**$ 29,200**	**$ 29,200**	**$ 29,200**	**$ 29,200**	**$ 29,200**	**$ 29,200**	**$ 29,200**	**$ 439,800**
Net Present Value																						
Capital Investment (Discounted)	$ 2,637,188	$ 40,000	$ 154,010	$ 38,491	$ 1,213,905	$ 1,190,783	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 2,637,188**
Operation & Maintenance Expenditures (Discounted)	$ 350,531	$ -	$ -	$ -	$ -	$ -	$ 27,068	$ 26,463	$ 25,784	$ 25,293	$ 24,643	$ 24,091	$ 23,633	$ 23,182	$ 22,741	$ 22,308	$ 21,883	$ 21,466	$ 21,057	$ 20,656	$ 20,263	**$ 350,531**
TOTAL WHOLE LIFE COST	**$ 2,987,720**	**$ 40,000**	**$ 154,010**	**$ 38,491**	**$ 1,213,905**	**$ 1,190,783**	**$ 27,068**	**$ 26,463**	**$ 25,784**	**$ 25,293**	**$ 24,643**	**$ 24,091**	**$ 23,633**	**$ 23,182**	**$ 22,741**	**$ 22,308**	**$ 21,883**	**$ 21,466**	**$ 21,057**	**$ 20,656**	**$ 20,263**	**$ 2,987,720**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2025.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system
A7c: Replace Well 1 with Well MW18, Continue Sequestration at Well 3 Facility, and provide iron and manganese removal technology at Wells 1&2 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Onsite residual management system at Wells 1 & 2 Facility	$ 1,080,000	$ -	$ -	$ 540,000	$ 540,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,080,000**
Connection to Vivian Creek from Wells 1 & 2 Facility	$ 280,000	$ -	$ -	$ 140,000	$ 140,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 280,000**
Connection to sewer collection system from Wells 1 & 2 Facility	$ 270,000	$ -	$ -	$ 135,000	$ 135,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 270,000**
Design & Construction Administration (20%)	$ 327,000	$ 27,167	$ 108,667	$ 109,167	$ 82,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 327,000**
Contingency (30%)	$ 590,000	$ 9,000	$ 33,000	$ 278,000	$ 270,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 590,000**
York Region Project Management (5%)	$ 130,000	$ 2,000	$ 8,000	$ 61,000	$ 59,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 130,000**
HST (1.76%)	$ 49,000	$ 1,000	$ 3,000	$ 23,000	$ 22,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 49,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 2,726,000**	**$ 39,167**	**$ 152,667**	**$ 1,286,167**	**$ 1,248,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,726,000**
Operation & Maintenance Expenditures[3]																						
Dechlorination	$ 32,200	$ -	$ -	$ -	$ -	$ 2,000	$ 2,100	$ 2,100	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	**$ 32,200**
Sewer Discharge	$ 37,300	$ -	$ -	$ -	$ -	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,300	$ 2,300	$ 2,300	$ 2,300	$ 2,300	$ 2,300	$ 2,300	$ 2,300	$ 2,300	$ 2,300	$ 2,300	**$ 37,300**
Additional O&M Labour	$ 332,800	$ -	$ -	$ -	$ -	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	**$ 332,800**
TOTAL O&M COSTS (Undiscounted)	**$ 402,300**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 25,200**	**$ 25,300**	**$ 25,300**	**$ 25,200**	**$ 25,200**	**$ 25,100**	**$ 25,100**	**$ 25,100**	**$ 25,100**	**$ 25,100**	**$ 25,100**	**$ 25,100**	**$ 25,100**	**$ 25,100**	**$ 25,100**	**$ 25,100**	**$ 402,300**
Net Present Value																						
Capital Investment (Discounted)	$ 2,604,597	$ 39,167	$ 149,759	$ 1,237,636	$ 1,178,035	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 2,604,597**
Operation & Maintenance Expenditures (Discounted)	$ 323,810	$ -	$ -	$ -	$ -	$ 23,334	$ 22,981	$ 22,543	$ 22,026	$ 21,606	$ 21,111	$ 20,709	$ 20,314	$ 19,927	$ 19,548	$ 19,175	$ 18,810	$ 18,452	$ 18,100	$ 17,756	$ 17,417	**$ 323,810**
TOTAL WHOLE LIFE COST	**$ 2,928,407**	**$ 39,167**	**$ 149,759**	**$ 1,237,636**	**$ 1,178,035**	**$ 23,334**	**$ 22,981**	**$ 22,543**	**$ 22,026**	**$ 21,606**	**$ 21,111**	**$ 20,709**	**$ 20,314**	**$ 19,927**	**$ 19,548**	**$ 19,175**	**$ 18,810**	**$ 18,452**	**$ 18,100**	**$ 17,756**	**$ 17,417**	**$ 2,928,407**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2024.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

R3: On-site treatment with supernatant discharged to Vivian Creek and sludge to hauled off-site
A5a: Centralized Removal Technology at Wells 1 & 2 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Onsite residual management system at Wells 1 & 2 Facility	$ 1,100,000	$ -	$ -	$ -	$ 550,000	$ 550,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,100,000**
Connection to Vivian Creek from Wells 1 & 2 Facility	$ 280,000	$ -	$ -	$ -	$ 140,000	$ 140,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 280,000**
Design & Construction Administration (20%)	$ 276,000	$ 23,000	$ 92,000	$ 23,000	$ 69,000	$ 69,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 276,000**
Contingency (30%)	$ 498,000	$ 7,000	$ 28,000	$ 7,000	$ 228,000	$ 228,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 498,000**
York Region Project Management (5%)	$ 110,000	$ 2,000	$ 6,000	$ 2,000	$ 50,000	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 110,000**
HST (1.76%)	$ 43,000	$ 1,000	$ 3,000	$ 1,000	$ 19,000	$ 19,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 43,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 2,307,000**	**$ 33,000**	**$ 129,000**	**$ 33,000**	**$ 1,056,000**	**$ 1,056,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ 2,307,000
Operation & Maintenance Expenditures[3]																						
Dechlorination	$ 88,200	$ -	$ -	$ -	$ -	$ -	$ 6,200	$ 6,100	$ 6,000	$ 6,000	$ 5,900	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	**$ 88,200**
Sludge Hauling	$ 1,101,300	$ -	$ -	$ -	$ -	$ -	$ 77,500	$ 76,500	$ 75,500	$ 74,400	$ 73,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	**$ 1,101,300**
Additional O&M Labour	$ 312,000	$ -	$ -	$ -	$ -	$ -	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	**$ 312,000**
TOTAL O&M COSTS (Undiscounted)	**$ 1,501,500**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 104,500**	**$ 103,400**	**$ 102,300**	**$ 101,200**	**$ 100,100**	**$ 99,000**	**$ 99,000**	**$ 99,000**	**$ 99,000**	**$ 99,000**	**$ 99,000**	**$ 99,000**	**$ 99,000**	**$ 99,000**	**$ 99,000**	$ 1,501,500
Net Present Value																						
Capital Investment (Discounted)	$ 2,165,910	$ 33,000	$ 126,543	$ 31,755	$ 996,799	$ 977,813	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 2,165,910**
Operation & Maintenance Expenditures (Discounted)	$ 1,197,653	$ -	$ -	$ -	$ -	$ -	$ 94,920	$ 92,131	$ 89,415	$ 86,769	$ 84,191	$ 81,680	$ 80,124	$ 78,598	$ 77,101	$ 75,632	$ 74,191	$ 72,778	$ 71,392	$ 70,032	$ 68,698	**$ 1,197,653**
TOTAL WHOLE LIFE COST	**$ 3,363,562**	**$ 33,000**	**$ 126,543**	**$ 31,755**	**$ 996,799**	**$ 977,813**	**$ 94,920**	**$ 92,131**	**$ 89,415**	**$ 86,769**	**$ 84,191**	**$ 81,680**	**$ 80,124**	**$ 78,598**	**$ 77,101**	**$ 75,632**	**$ 74,191**	**$ 72,778**	**$ 71,392**	**$ 70,032**	**$ 68,698**	$ 3,363,562

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2025.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

R3: On-site treatment with supernatant discharged to Vivian Creek and sludge to hauled off-site
A5a: Centralized Removal Technology at Wells 1 & 2 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Onsite residual management system at Wells 1 & 2 Facility	$ 1,100,000	$ -	$ -	$ -	$ 550,000	$ 550,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,100,000**
Connection to Vivian Creek from Wells 1 & 2 Facility	$ 280,000	$ -	$ -	$ -	$ 140,000	$ 140,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 280,000**
Onsite residual management system at Well 3 Facility	$ 1,020,000	$ -	$ -	$ -	$ -	$ 510,000	$ 510,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,020,000**
Connection to Vivian Creek from at Well 3 Facility	$ 290,000	$ -	$ -	$ -	$ -	$ 145,000	$ 145,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 290,000**
Design & Construction Administration (20%)	$ 539,000	$ 44,833	$ 179,333	$ 44,833	$ 69,000	$ 135,000	$ 66,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 539,000**
Contingency (30%)	$ 971,000	$ 14,000	$ 54,000	$ 14,000	$ 228,000	$ 444,000	$ 217,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 971,000**
York Region Project Management (5%)	$ 212,000	$ 3,000	$ 12,000	$ 3,000	$ 50,000	$ 97,000	$ 47,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 212,000**
HST (1.76%)	$ 82,000	$ 2,000	$ 5,000	$ 2,000	$ 19,000	$ 36,000	$ 18,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 82,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 4,494,000**	**$ 63,833**	**$ 250,333**	**$ 63,833**	**$ 1,056,000**	**$ 2,057,000**	**$ 1,003,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 4,494,000**
Operation & Maintenance Expenditures[3]																						
Dechlorination	$ 88,200	$ -	$ -	$ -	$ -	$ -	$ 6,200	$ 6,100	$ 6,000	$ 6,000	$ 5,900	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	$ 5,800	**$ 88,200**
Sludge Hauling	$ 1,101,300	$ -	$ -	$ -	$ -	$ -	$ 77,500	$ 76,500	$ 75,500	$ 74,400	$ 73,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	$ 72,400	**$ 1,101,300**
Additional O&M Labour	$ 624,000	$ -	$ -	$ -	$ -	$ -	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	$ 41,600	**$ 624,000**
TOTAL O&M COSTS (Undiscounted)	**$ 1,813,500**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 125,300**	**$ 124,200**	**$ 123,100**	**$ 122,000**	**$ 120,900**	**$ 119,800**	**$ 119,800**	**$ 119,800**	**$ 119,800**	**$ 119,800**	**$ 119,800**	**$ 119,800**	**$ 119,800**	**$ 119,800**	**$ 119,800**	**$ 1,813,500**
Net Present Value																						
Capital Investment (Discounted)	$ 4,183,366	$ 63,833	$ 245,565	$ 61,425	$ 996,799	$ 1,904,697	$ 911,047	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 4,183,366**
Operation & Maintenance Expenditures (Discounted)	$ 1,446,211	$ -	$ -	$ -	$ -	$ -	$ 113,813	$ 110,665	$ 107,595	$ 104,603	$ 101,685	$ 98,841	$ 96,958	$ 95,111	$ 93,300	$ 91,522	$ 89,779	$ 88,069	$ 86,392	$ 84,746	$ 83,132	**$ 1,446,211**
TOTAL WHOLE LIFE COST	**$ 5,629,577**	**$ 63,833**	**$ 245,565**	**$ 61,425**	**$ 996,799**	**$ 1,904,697**	**$ 1,024,859**	**$ 110,665**	**$ 107,595**	**$ 104,603**	**$ 101,685**	**$ 98,841**	**$ 96,958**	**$ 95,111**	**$ 93,300**	**$ 91,522**	**$ 89,779**	**$ 88,069**	**$ 86,392**	**$ 84,746**	**$ 83,132**	**$ 5,629,577**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2026.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

R3: On-site treatment with supernatant discharged to Vivian Creek and sludge to hauled off-site
A6: Provide Iron and Manganese Removal Technology at Wells 1&2 Facility and Continue Sequestration at Well 3 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Onsite residual management system at Wells 1 & 2 Facility	$ 1,100,000	$ -	$ -	$ -	$ 550,000	$ 550,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,100,000**
Connection to Vivian Creek from Wells 1 & 2 Facility	$ 280,000	$ -	$ -	$ -	$ 140,000	$ 140,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 280,000**
Design & Construction Administration (20%)	$ 276,000	$ 23,000	$ 92,000	$ 23,000	$ 69,000	$ 69,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 276,000**
Contingency (30%)	$ 498,000	$ 7,000	$ 28,000	$ 7,000	$ 228,000	$ 228,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 498,000**
York Region Project Management (5%)	$ 110,000	$ 2,000	$ 6,000	$ 2,000	$ 50,000	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 110,000**
HST (1.76%)	$ 43,000	$ 1,000	$ 3,000	$ 1,000	$ 19,000	$ 19,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 43,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 2,307,000**	**$ 33,000**	**$ 129,000**	**$ 33,000**	**$ 1,056,000**	**$ 1,056,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ 2,307,000
Operation & Maintenance Expenditures[3]																						
Dechlorination	$ 59,200	$ -	$ -	$ -	$ -	$ -	$ 4,200	$ 4,100	$ 4,000	$ 4,000	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	$ 3,900	**$ 59,200**
Sludge Hauling	$ 734,600	$ -	$ -	$ -	$ -	$ -	$ 51,700	$ 51,000	$ 50,300	$ 49,600	$ 49,000	$ 48,300	$ 48,300	$ 48,300	$ 48,300	$ 48,300	$ 48,300	$ 48,300	$ 48,300	$ 48,300	$ 48,300	**$ 734,600**
TOTAL O&M COSTS (Undiscounted)	**$ 1,105,800**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 76,700**	**$ 75,900**	**$ 75,100**	**$ 74,400**	**$ 73,700**	**$ 73,000**	**$ 73,000**	**$ 73,000**	**$ 73,000**	**$ 73,000**	**$ 73,000**	**$ 73,000**	**$ 73,000**	**$ 73,000**	**$ 73,000**	$ 1,105,800
Net Present Value																						
Capital Investment (Discounted)	$ 2,165,910	$ 33,000	$ 126,543	$ 31,755	$ 996,799	$ 977,813	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 2,165,910**
Operation & Maintenance Expenditures (Discounted)	$ 881,912	$ -	$ -	$ -	$ -	$ -	$ 69,668	$ 67,628	$ 65,641	$ 63,791	$ 61,987	$ 60,229	$ 59,081	$ 57,956	$ 56,852	$ 55,769	$ 54,707	$ 53,665	$ 52,643	$ 51,640	$ 50,656	**$ 881,912**
TOTAL WHOLE LIFE COST	**$ 3,047,822**	**$ 33,000**	**$ 126,543**	**$ 31,755**	**$ 996,799**	**$ 977,813**	**$ 69,668**	**$ 67,628**	**$ 65,641**	**$ 63,791**	**$ 61,987**	**$ 60,229**	**$ 59,081**	**$ 57,956**	**$ 56,852**	**$ 55,769**	**$ 54,707**	**$ 53,665**	**$ 52,643**	**$ 51,640**	**$ 50,656**	$ 3,047,822

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2025.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

R3: On-site treatment with supernatant discharged to Vivian Creek and sludge to hauled off-site
A7c: Replace Well 1 with Well MW18, Continue Sequestration at Well 3 Facility, and provide iron and manganese removal technology at Wells 1&2 Facility

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Onsite residual management system at Wells 1 & 2 Facility	$ 1,020,000	$ -	$ -	$ 510,000	$ 510,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,020,000
Connection to Vivian Creek from Wells 1 & 2 Facility	$ 280,000	$ -	$ -	$ 140,000	$ 140,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 280,000
Design & Construction Administration (20%)	$ 260,000	$ 21,667	$ 86,667	$ 86,667	$ 65,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 260,000
Contingency (30%)	$ 469,000	$ 7,000	$ 26,000	$ 221,000	$ 215,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 469,000
York Region Project Management (5%)	$ 103,000	$ 2,000	$ 6,000	$ 48,000	$ 47,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 103,000
HST (1.76%)	$ 40,000	$ 1,000	$ 3,000	$ 18,000	$ 18,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 40,000
TOTAL CAPITAL COSTS (Undiscounted)	**$ 2,172,000**	**$ 31,667**	**$ 121,667**	**$ 1,023,667**	**$ 995,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,172,000**
Operation & Maintenance Expenditures[3]																						
Dechlorination	$ 32,200	$ -	$ -	$ -	$ -	$ 2,000	$ 2,100	$ 2,100	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 32,200
Sludge Hauling	$ 393,100	$ -	$ -	$ -	$ -	$ 25,200	$ 25,900	$ 25,500	$ 25,200	$ 24,800	$ 24,500	$ 24,200	$ 24,200	$ 24,200	$ 24,200	$ 24,200	$ 24,200	$ 24,200	$ 24,200	$ 24,200	$ 24,200	$ 393,100
Additional O&M Labour	$ 332,800	$ -	$ -	$ -	$ -	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 20,800	$ 332,800
TOTAL O&M COSTS (Undiscounted)	**$ 758,100**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 48,000**	**$ 48,800**	**$ 48,400**	**$ 48,000**	**$ 47,600**	**$ 47,300**	**$ 47,000**	**$ 47,000**	**$ 47,000**	**$ 47,000**	**$ 47,000**	**$ 47,000**	**$ 47,000**	**$ 47,000**	**$ 47,000**	**$ 47,000**	**$ 758,100**
Net Present Value																						
Capital Investment (Discounted)	$ 2,075,276	$ 31,667	$ 119,349	$ 985,041	$ 939,219	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,075,276
Operation & Maintenance Expenditures (Discounted)	$ 610,615	$ -	$ -	$ -	$ -	$ 44,446	$ 44,326	$ 43,125	$ 41,954	$ 40,812	$ 39,783	$ 38,777	$ 38,039	$ 37,314	$ 36,603	$ 35,906	$ 35,222	$ 34,551	$ 33,893	$ 33,248	$ 32,614	$ 610,615
TOTAL WHOLE LIFE COST	**$ 2,685,891**	**$ 31,667**	**$ 119,349**	**$ 985,041**	**$ 939,219**	**$ 44,446**	**$ 44,326**	**$ 43,125**	**$ 41,954**	**$ 40,812**	**$ 39,783**	**$ 38,777**	**$ 38,039**	**$ 37,314**	**$ 36,603**	**$ 35,906**	**$ 35,222**	**$ 34,551**	**$ 33,893**	**$ 33,248**	**$ 32,614**	**$ 2,685,891**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2024.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

B2: Rehabilitation of Mount Albert South Elevated Tank and Return it to Service

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
South ET Rehabilitation	$ 550,000	$ -	$ -	$ 550,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 550,000**
Design & Construction Administration (20%)	$ 110,000	$ 27,500	$ 27,500	$ 55,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 110,000**
Contingency (30%)	$ 200,000	$ 9,000	$ 9,000	$ 182,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 200,000**
York Region Project Management (5%)	$ 44,000	$ 2,000	$ 2,000	$ 40,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 44,000**
HST (1.76%)	$ 17,000	$ 1,000	$ 1,000	$ 15,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 17,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 921,000**	**$ 39,500**	**$ 39,500**	**$ 842,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	$ 921,000
Operation & Maintenance Expenditures[3]																						
Clean and inspection of South ET[4]	$ 170,000	$ -	$ -	$ -	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	**$ 170,000**
TOTAL O&M COSTS (Undiscounted)	**$ 170,000**	**$ -**	**$ -**	**$ -**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	**$ 10,000**	$ 170,000
Net Present Value																						
Capital Investment (Discounted)	$ 888,477	$ 39,500	$ 38,748	$ 810,229	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 888,477**
Operation & Maintenance Expenditures (Discounted)	$ 138,198	$ -	$ -	$ -	$ 9,439	$ 9,260	$ 9,083	$ 8,910	$ 8,740	$ 8,574	$ 8,411	$ 8,250	$ 8,093	$ 7,939	$ 7,788	$ 7,640	$ 7,494	$ 7,351	$ 7,211	$ 7,074	$ 6,939	**$ 138,198**
TOTAL WHOLE LIFE COST	**$ 1,026,675**	**$ 39,500**	**$ 38,748**	**$ 810,229**	**$ 9,439**	**$ 9,260**	**$ 9,083**	**$ 8,910**	**$ 8,740**	**$ 8,574**	**$ 8,411**	**$ 8,250**	**$ 8,093**	**$ 7,939**	**$ 7,788**	**$ 7,640**	**$ 7,494**	**$ 7,351**	**$ 7,211**	**$ 7,074**	**$ 6,939**	$ 1,026,675

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2023.

3) Additional O&M costs produced by the alternative, including chemicals, electricity and labour.

4) Considering moderate accumulation of deposits in the distribution system, which means cleaning every 2 years.

B3: Operate the Distribution System in Pressure Mode

Interest rate	*5.0%*
Inflation rate	*3.0%*

Component	Preliminary Cost[1]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTAL
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	J	2034	2035	2036	2037	2038	2039	2040	
Capital Investment[2]																						
Improvements to Facilitate Pressure Mode Operation	$ 150,000	$ -	$ -	$ 150,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 150,000**
Design & Construction Administration (20%)	$ 30,000	$ 7,500	$ 7,500	$ 15,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 30,000**
Contingency (30%)	$ 56,000	$ 3,000	$ 3,000	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 56,000**
York Region Project Management (5%)	$ 13,000	$ 1,000	$ 1,000	$ 11,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 13,000**
HST (1.76%)	$ 6,000	$ 1,000	$ 1,000	$ 4,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 6,000**
TOTAL CAPITAL COSTS (Undiscounted)	**$ 255,000**	**$ 12,500**	**$ 12,500**	**$ 230,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 255,000**
Operation & Maintenance Expenditures[3]																						
Wasted Water	$ 115,600	$ -	$ -	$ -	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	$ 6,800	**$ 115,600**
TOTAL O&M COSTS (Undiscounted)	**$ 115,600**	**$ -**	**$ -**	**$ -**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 6,800**	**$ 115,600**
Net Present Value																						
Capital Investment (Discounted)	$ 246,083	$ 12,500	$ 12,262	$ 221,322	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 246,083**
Operation & Maintenance Expenditures (Discounted)	$ 93,975	$ -	$ -	$ -	$ 6,419	$ 6,297	$ 6,177	$ 6,059	$ 5,944	$ 5,830	$ 5,719	$ 5,610	$ 5,503	$ 5,399	$ 5,296	$ 5,195	$ 5,096	$ 4,999	$ 4,904	$ 4,810	$ 4,719	**$ 93,975**
TOTAL WHOLE LIFE COST	**$ 340,058**	**$ 12,500**	**$ 12,262**	**$ 221,322**	**$ 6,419**	**$ 6,297**	**$ 6,177**	**$ 6,059**	**$ 5,944**	**$ 5,830**	**$ 5,719**	**$ 5,610**	**$ 5,503**	**$ 5,399**	**$ 5,296**	**$ 5,195**	**$ 5,096**	**$ 4,999**	**$ 4,904**	**$ 4,810**	**$ 4,719**	**$ 340,058**

Notes:

1) Prices are 2019/2020 based, in CAD.

2) Implementation timeline between 2021 to 2023.

3) Additional O&M costs produced by the alternative, including York Region 2020 water rate.

4) Considering moderate accumulation of deposits in the distribution system, which means cleaning of North ET every 2 years, and 9 L/s of water wasted for 8 h/day during 15 days of North ET out of service.

Appendix H. Detailed Comparative Evaluation

Comparative Criteria	Comparative Sub-Criteria	Description	Main Considerations for Each Criterion	Alternative A4: Continue Sequestration at Wells 1&2 Facility and Well 3 Facility, and Upgrade Systems to Optimize Operations and Maintenance	Alternative A5: Provide Iron and Manganese Removal Technology for All Wells					
					Sub-option A5a: Centralized Removal Technology at Wells 1 & 2 Facility			Sub-option A5b: Decentralized Removal Technology at both Facilities		
					Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site	Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site
Natural Environment	Aquatic Vegetation and Wildlife	Potential impact on local aquatic species and habitats, aquatic species at risk and locally significant aquatic species	Presence of aquatic species potentially affected temporarily and/or permanently Area of temporary or permanent loss of aquatic feature	No anticipated impacts on aquatic vegetation and wildlife and no loss of aquatic feature as works are undertaken within existing buildings	No anticipated impacts on aquatic vegetation and wildlife during construction or loss of aquatic feature as works are undertaken within existing properties and along existing roads and streets without waterbody crossing No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on aquatic vegetation and species	Negligible anticipated impacts on aquatic vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing, with supernatant discharge via stormwater system Enhanced residuals on-site treatment may be required to avoid long-term impacts on aquatic vegetation and species with the discharge of supernatant of on-site treatment to Vivian Creek No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on aquatic vegetation and species	Negligible anticipated impacts on aquatic vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing, with supernatant discharge via stormwater system Enhanced residuals on-site treatment may be required to avoid long-term impacts on aquatic vegetation and species with the discharge of supernatant of on-site treatment to Vivian Creek No anticipated impacts on Duffin Creek WPCP effluent discharge and negligible associated long-term impacts on aquatic vegetation and species	No anticipated impacts on aquatic vegetation and wildlife during construction or loss of aquatic feature as works are undertaken within existing properties and along existing roads and streets without waterbody crossing No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on aquatic vegetation and species	Significant anticipated impacts on aquatic vegetation and wildlife during construction of the Well 3 Facility outfall, mitigation measures to be developed to offset the impact through the wetland area Enhanced residuals on-site treatment may be required to avoid long-term impacts on aquatic vegetation and species with the discharge of supernatant of on-site treatment to Vivian Creek No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on aquatic vegetation and species	Significant anticipated impacts on aquatic vegetation and wildlife during construction of the Well 3 Facility outfall, mitigation measures to be developed to offset the impact through the wetland area Enhanced residuals on-site treatment may be required to avoid long-term impacts on aquatic vegetation and species with the discharge of supernatant of on-site treatment to Vivian Creek No anticipated impacts on Duffin Creek WPCP effluent discharge and negligible associated long-term impacts on aquatic vegetation and species
				Most Preferred	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Most Preferred**	**Least Preferred**	**Least Preferred**
Natural Environment	Terrestrial Vegetation and Wildlife	Potential impact on local terrestrial species and habitats, designated areas, species at risk and locally significant species	Presence of terrestrial species potentially affected temporarily and/or permanently Area of temporary or permanent loss of terrestrial feature	No anticipated impacts on terrestrial vegetation and wildlife and no loss of terrestrial feature as works are undertaken within existing buildings	No anticipated impacts on terrestrial vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets Minor permanent loss of potential habitat due to construction of new building (50 m^2) No impact to designated natural areas	No anticipated impacts on terrestrial vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets Minor permanent loss of potential habitat due to construction of new building (50 m^2) No impact to designated natural areas	No anticipated impacts on terrestrial vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets Minor permanent loss of potential habitat due to construction of new building (50 m^2) No impact to designated natural areas	No anticipated impacts on terrestrial vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets Minor permanent loss of potential habitat due to construction of new building (90 m^2) Works at Well 3 Facility and related to Well 3 Facility sewer connection partially within Greenbelt natural heritage system	Significant anticipated impacts on terrestrial vegetation and wildlife during construction of the Well 3 Facility outfall, mitigation measures to be developed to offset the impact through the area Minor permanent loss of potential habitat due to construction of new building (90 m^2) Works at Well 3 Facility and related to Well 3 Facility sewer connection and outfall partially within Greenbelt natural heritage system	Significant anticipated impacts on terrestrial vegetation and wildlife during construction of the Well 3 Facility outfall, mitigation measures to be developed to offset the impact through the area Minor permanent loss of potential habitat due to construction of new building (90 m^2) Works at Well 3 Facility and related to Well 3 Facility outfall partially within Greenbelt natural heritage system
				Most Preferred	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Least Preferred**	**Least Preferred**
Natural Environment	Surface water	Potential impact on the quantity and quality of surface water	Temporarily and/or permanently changes in quantity and quality of surface water bodies, such as wetlands and streams Discharge of wastewater to local water receiving bodies	No anticipated additional impacts on surface water bodies as works are undertaken within existing buildings No anticipated wastewater discharge	No anticipated impacts on surface water during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on surface water	Negligible anticipated impacts on surface water during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing, with supernatant discharge via stormwater system Enhanced residuals on-site treatment may be required to avoid long-term impacts on Vivian Creek water quality No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on surface water	Negligible anticipated impacts on surface water during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing, with supernatant discharge via stormwater system Enhanced residuals on-site treatment may be required to avoid long-term impacts on Vivian Creek water quality No anticipated impacts on Duffin Creek WPCP effluent discharge and negligible associated long-term impacts on surface water	No anticipated impacts on surface water during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on surface water	Significant anticipated impacts on wetland during construction of the Well 3 Facility outfall, mitigation measures to be developed to offset the impact through the wetland area Enhanced residuals on-site treatment may be required to avoid long-term impacts on Vivian Creek water quality No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on surface water	Significant anticipated impacts on wetland during construction of the Well 3 Facility outfall, mitigation measures to be developed to offset the impact through the wetland area Enhanced residuals on-site treatment may be required to avoid long-term impacts on Vivian Creek water quality No anticipated impacts on Duffin Creek WPCP effluent discharge and negligible associated long-term impacts on surface water
				Most Preferred	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Most Preferred**	**Least Preferred**	**Least Preferred**
Natural Environment	Groundwater	Potential impact on the quantity and quality of groundwater	Temporarily and/or permanently changes in groundwater takings quantity and/or location Threats to source water protection area Impact on private wells users	No anticipated additional groundwater pumping rates from TAC aquifer No threats to sources of drinking water identified No anticipated impact on private well users during construction due to dewatering since no groundwater taking requirements	Additional groundwater pumping from TAC aquifer for backwashing (5.3%), but no anticipated impact since within PTTW No threats to sources of drinking water identified Negligible or no impact on private well users during construction due to dewatering since groundwater table is below anticipated excavation	Additional groundwater pumping from TAC aquifer for backwashing (5.3%), but no anticipated impact since within PTTW No threats to sources of drinking water identified Negligible or no impact on private well users during construction due to dewatering since groundwater table is below anticipated excavation	Additional groundwater pumping from TAC aquifer for backwashing (5.3%), but no anticipated impact since within PTTW No threats to sources of drinking water identified Negligible or no impact on private well users during construction due to dewatering since groundwater table is below anticipated excavation	Additional groundwater pumping from TAC aquifer for backwashing (6.7%), but no anticipated impact since within PTTW No threats to sources of drinking water identified Negligible or no impact on private well users during construction due to dewatering since groundwater table is below anticipated excavation	Additional groundwater pumping from TAC aquifer for backwashing (6.7%), but no anticipated impact since within PTTW No threats to sources of drinking water identified Minor impact on private well users due to dewatering during construction of the Well 3 Facility outfall	Additional groundwater pumping from TAC aquifer for backwashing (6.7%), but no anticipated impact since within PTTW No threats to sources of drinking water identified Minor impact on private well users due to dewatering during construction of the Well 3 Facility outfall
				Most Preferred	**Most Preferred**	**Most Preferred**	**Most Preferred**	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**
Natural Environment	Soil and Geology	Geology, hydrogeology, contamination considerations	Potential contamination, erosion, impact on soil permeability	No anticipated impacts due soil contamination, erosion or modification of soil permeability as works are undertaken within existing buildings	Construction on Well 1 & 2 Facility have to be carefully managed due to steepness of bank in the northwest of the property Minor increase of impervious area due construction of new building and underground tankage (54 m^2)	Construction on Well 1 & 2 Facility have to be carefully managed due to steepness of bank in the northwest of the property Potential erosion of Vivian Creek bank with discharge of supernatant to Vivian Creek Minor increase of impervious area due construction of new building and underground tankage (70 m^2)	Construction on Well 1 & 2 Facility have to be carefully managed due to steepness of bank in the northwest of the property Potential erosion of Vivian Creek bank with discharge of supernatant to Vivian Creek Minor increase of impervious area due construction of new building and underground tankage (83 m^2)	Construction on Well 1 & 2 Facility have to be carefully managed due to steepness of bank in the northwest of the property Minor increase of impervious area due construction of new building and underground tankage (108 m^2)	Construction on Well 1 & 2 Facility have to be carefully managed due to steepness of bank in the northwest of the property Potential erosion of Vivian Creek bank with discharge of supernatant to Vivian Creek Minor increase of impervious area due construction of new building and underground tankage (126 m^2)	Construction on Well 1 & 2 Facility have to be carefully managed due to steepness of bank in the northwest of the property Potential erosion of Vivian Creek bank with discharge of supernatant to Vivian Creek Minor increase of impervious area due construction of new building and underground tankage (150 m^2)
				Most Preferred	**Moderately Preferred**	**Least Preferred**	**Least Preferred**	**Moderately Preferred**	**Least Preferred**	**Least Preferred**

Comparative Criteria	Alternative A6: Provide Iron and Manganese Removal Technology at Wells 1&2 Facility and Continue Sequestration at Well 3 Facility			Alternative A7: Connect Well MW 18 to Mount Albert Water Supply System				
				Sub-option A7a: Replace Well 1 with Well MW18 and continue sequestration at both facilities	Sub-option A7b: Replace Wells 1 and 2 with Well MW18, re-rate Wells 3 and MW18, and continue sequestration	Sub-option A7c: Replace Well 1 with Well MW18, continue sequestration at Well 3 Facility, and provide iron and manganese removal technology at Wells 1 & 2 Facility		
	Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site			Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site
Natural Environment	No anticipated impacts on aquatic vegetation and wildlife during construction or loss of aquatic feature as works are undertaken within existing properties and along existing roads and streets without waterbody crossing No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on aquatic vegetation and species	Negligible anticipated impacts on aquatic vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing, with supernatant discharge via stormwater system Enhanced residuals on-site treatment may be required to avoid long-term impacts on aquatic vegetation and species with the discharge of supernatant of on-site treatment to Vivian Creek No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on aquatic vegetation and species	Negligible anticipated impacts on aquatic vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing, with supernatant discharge via stormwater system Enhanced residuals on-site treatment may be required to avoid long-term impacts on aquatic vegetation and species with the discharge of supernatant of on-site treatment to Vivian Creek No anticipated impacts on Duffin Creek WPCP effluent discharge and negligible associated long-term impacts on aquatic vegetation and species	No anticipated impacts on aquatic vegetation and wildlife during construction or loss of aquatic feature as works are undertaken within existing properties	No anticipated impacts on aquatic vegetation and wildlife during construction or loss of aquatic feature as works are undertaken within existing properties	No anticipated impacts on aquatic vegetation and wildlife during construction or loss of aquatic feature as works are undertaken within existing properties and along existing roads and streets without waterbody crossing No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on aquatic vegetation and species	Negligible anticipated impacts on aquatic vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing, with supernatant discharge via stormwater system Enhanced residuals on-site treatment may be required to avoid long-term impacts on aquatic vegetation and species with the discharge of supernatant of on-site treatment to Vivian Creek No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on aquatic vegetation and species	Negligible anticipated impacts on aquatic vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing, with supernatant discharge via stormwater system Enhanced residuals on-site treatment may be required to avoid long-term impacts on aquatic vegetation and species with the discharge of supernatant of on-site treatment to Vivian Creek No anticipated impacts on Duffin Creek WPCP effluent discharge and negligible associated long-term impacts on aquatic vegetation and species
	Most Preferred	**Moderately Preferred**	**Moderately Preferred**	**Most Preferred**	**Most Preferred**	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**
Natural Environment	No anticipated impacts on terrestrial vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets Minor permanent loss of potential habitat due to construction of new building (50 m^2) No impact to designated natural areas	No anticipated impacts on terrestrial vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets Minor permanent loss of potential habitat due to construction of new building (50 m^2) No impact to designated natural areas	No anticipated impacts on terrestrial vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets Minor permanent loss of potential habitat due to construction of new building (50 m^2) No impact to designated natural areas	No anticipated impacts on terrestrial vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets Minor permanent loss of potential habitat due to construction of new building (40 m^2) Works at Well 3 Facility partially within Greenbelt natural heritage system	No anticipated impacts on terrestrial vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets Minor permanent loss of potential habitat due to construction of new building (40 m^2) Works at Well 3 Facility partially within Greenbelt natural heritage system	No anticipated impacts on terrestrial vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets Minor permanent loss of potential habitat due to construction of new building (90 m^2) Works at Well 3 Facility partially within Greenbelt natural heritage system	No anticipated impacts on terrestrial vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets Minor permanent loss of potential habitat due to construction of new building (90 m^2) Works at Well 3 Facility partially within Greenbelt natural heritage system	No anticipated impacts on terrestrial vegetation and wildlife during construction as works are undertaken within existing properties and along existing roads and streets Minor permanent loss of potential habitat due to construction of new building (90 m^2) Works at Well 3 Facility partially within Greenbelt natural heritage system
	Moderately Preferred	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**
Natural Environment	No anticipated impacts on surface water during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on surface water	Negligible anticipated impacts on surface water during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing, with supernatant discharge via stormwater system Enhanced residuals on-site treatment may be required to avoid long-term impacts on Vivian Creek water quality No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on surface water	Negligible anticipated impacts on surface water during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing, with supernatant discharge via stormwater system Enhanced residuals on-site treatment required to avoid long-term impacts on Vivian Creek water quality No anticipated impacts on Duffin Creek WPCP effluent discharge and negligible associated long-term impacts on surface water	No anticipated impacts on surface water during construction as works are undertaken within existing properties without waterbody crossing	No anticipated impacts on surface water during construction as works are undertaken within existing properties without waterbody crossing	No anticipated impacts on surface water during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on surface water	Negligible anticipated impacts on surface water during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing, with supernatant discharge via stormwater system Enhanced residuals on-site treatment may be required to avoid long-term impacts on Vivian Creek water quality No anticipated impacts on Mt. Albert WRRF effluent discharge and negligible associated long-term impacts on surface water	Negligible anticipated impacts on surface water during construction as works are undertaken within existing properties and along existing roads and streets without waterbody crossing, with supernatant discharge via stormwater system Enhanced residuals on-site treatment may be required to avoid long-term impacts on Vivian Creek water quality No anticipated impacts on Duffin Creek WPCP effluent discharge and negligible associated long-term impacts on surface water
	Most Preferred	**Moderately Preferred**	**Moderately Preferred**	**Most Preferred**	**Most Preferred**	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**
Natural Environment	Additional groundwater pumping from TAC aquifer for backwashing (5.3%), but no anticipated impact since within PTTW No threats to sources of drinking water identified Negligible or no impact on private well users during construction due to dewatering since groundwater table is below anticipated excavation	Additional groundwater pumping from TAC aquifer for backwashing (5.3%), but no anticipated impact since within PTTW No threats to sources of drinking water identified Negligible or no impact on private well users during construction due to dewatering since groundwater table is below anticipated excavation	Additional groundwater pumping from TAC aquifer for backwashing (5.3%), but no anticipated impact since within PTTW No threats to sources of drinking water identified Negligible or no impact on private well users during construction due to dewatering since groundwater table is below anticipated excavation	No anticipated additional groundwater pumping rates from TAC aquifer Zone of influence may change with new well pumping and potentially impact well users No threats to sources of drinking water identified Negligible or no impact on private well users during construction due to dewatering since groundwater table is below anticipated excavation	Modification of PTTW required to re-rate Well 3, but off-set by decommissioning of Wells 1 and 2 and no additional groundwater pumping rates from TAC aquifer Zone of influence may change with new well pumping and potentially impact well users No threats to sources of drinking water identified Negligible or no impact on private well users during construction due to dewatering since	Additional groundwater pumping from TAC aquifer for backwashing (4.3%), but no anticipated impact since within PTTW No threats to sources of drinking water identified Zone of influence may change with new well pumping and potentially impact well users Negligible or no impact on private well users during construction due to	Additional groundwater pumping from TAC aquifer for backwashing (4.3%), but no anticipated impact since within PTTW Zone of influence may change with new well pumping and potentially impact well users No threats to sources of drinking water identified Negligible or no impact on private well users during construction due to dewatering since groundwater table is below anticipated	Additional groundwater pumping from TAC aquifer for backwashing (4.3%), but no anticipated impact since within PTTW Zone of influence may change with new well pumping and potentially impact well users No threats to sources of drinking water identified Negligible or no impact on private well users during construction due to dewatering since groundwater table is below anticipated
	Most Preferred	**Most Preferred**	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**
Natural Environment	Construction on Well 1 & 2 Facility have to be carefully managed due to steepness of bank in the northwest of the property Minor increase of impervious area due construction of new building and underground tankage (54 m^2)	Construction on Well 1 & 2 Facility have to be carefully managed due to steepness of bank in the northwest of the property Potential erosion of Vivian Creek bank with discharge of supernatant to Vivian Creek Minor increase of impervious area due construction of new building and underground tankage (70 m^2)	Construction on Well 1 & 2 Facility have to be carefully managed due to steepness of bank in the northwest of the property Potential erosion of Vivian Creek bank with discharge of supernatant to Vivian Creek Minor increase of impervious area due construction of new building and underground tankage (83 m^2)	No anticipated erosion impacts as works are undertaken within existing buildings Minor increase of impervious area due construction of new building (40 m^2)	No anticipated erosion impacts as works are undertaken within existing buildings and Well 3 Facility Minor increase of impervious area due construction of new building (40 m^2)	Construction on Well 1 & 2 Facility have to be carefully managed due to steepness of bank in the northwest of the property Minor increase of impervious area due construction of new building and underground tankage (94 m^2)	Construction on Well 1 & 2 Facility have to be carefully managed due to steepness of bank in the northwest of the property Potential erosion of Vivian Creek bank with discharge of supernatant to Vivian Creek Minor increase of impervious area due construction of new building and underground tankage (110 m^2)	Construction on Well 1 & 2 Facility have to be carefully managed due to steepness of bank in the northwest of the property Potential erosion of Vivian Creek bank with discharge of supernatant to Vivian Creek Minor increase of impervious area due construction of new building and underground tankage (123 m^2)
	Moderately Preferred	**Least Preferred**	**Least Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Least Preferred**	**Least Preferred**

Comparative Evaluation of Alternative Solutions to Improve Water Quality

Comparative Criteria	Comparative Sub-Criteria	Description	Main Considerations for Each Criterion	Alternative A4: Continue Sequestration at Wells 1&2 Facility and Well 3 Facility, and Upgrade Systems to Optimize Operations and Maintenance	Alternative A5: Provide Iron and Manganese Removal Technology for All Wells					
					Sub-option A5a: Centralized Removal Technology at Wells 1 & 2 Facility			Sub-option A5b: Decentralized Removal Technology at both Facilities		
					Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site	Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site
Socio-cultural Environment	Archaeological Sites	Potential impact on registered/known archaeological features during construction or ongoing operations	Disruption of potential archeological resources	No anticipated impacts on archeological features as works are undertaken within existing buildings	Preliminary layout of new treatment building and residual management system can avoid the areas with archeological potential (Map 11 of Stage 1 AA)	Preliminary layout of new treatment building and residual management system can avoid the areas with archeological potential (Map 11 of Stage 1 AA)	Preliminary layout of new treatment building and residual management system can avoid the areas with archeological potential (Map 11 of Stage 1 AA)	Preliminary layout of new treatment building and residual management system can avoid the areas with archeological potential (Maps 11 and 16 of Stage 1 AA)	Preliminary layout of new treatment building and residual management system can avoid the areas with archeological potential, but Stage 2 archeological assessment required along outfall to Vivian Creek (Maps 11, 16 and 17 of Stage 1 AA)	Preliminary layout of new treatment building and residual management system can avoid the areas with archeological potential, but Stage 2 archeological assessment required along outfall to Vivian Creek (Maps 11, 16 and 17 of Stage 1 AA)
				Most Preferred	**Most Preferred**	**Most Preferred**	**Most Preferred**	**Most Preferred**	**Least Preferred**	**Least Preferred**
Socio-cultural Environment	Cultural/Heritage Features	Potential impact on known cultural landscapes and built heritage features during construction or ongoing operations	Removal of area from cultural/heritage landscape	No anticipated impacts on cultural and heritage features as works are undertaken within existing buildings	Planned works near the Mount Albert Wesleyan Methodist Pioneer Cemetery and Birchard Family Burying Ground, but within the right of way and no Stage 3 archeological assessment provided the connection to sewer system in Center Street can be limited to the west side of the street, where the potential of unmarked burials is low.	Planned works near the Mount Albert Wesleyan Methodist Pioneer Cemetery and Birchard Family Burying Ground, but within the right of way and no Stage 3 archeological assessment provided the connection to sewer system in Center Street can be limited to the west side of the street, where the potential of unmarked burials is low.	No anticipated impacts on cultural and heritage features as works are undertaken within existing properties and disturbed areas with no potential	Planned works near the Mount Albert Wesleyan Methodist Pioneer Cemetery and Birchard Family Burying Ground, but within the right of way and no Stage 3 archeological assessment provided the connection to sewer system in Center Street can be limited to the west side of the street, where the potential of unmarked burials is low.	Planned works near the Mount Albert Wesleyan Methodist Pioneer Cemetery and Birchard Family Burying Ground, but within the right of way and no Stage 3 archeological assessment provided the connection to sewer system in Center Street can be limited to the west side of the street, where the potential of unmarked burials is low.	No anticipated impacts on cultural and heritage features as works are undertaken within existing properties and disturbed areas with no potential
				Most Preferred	**Moderately Preferred**	**Moderately Preferred**	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Most Preferred**
Socio-cultural Environment	Impacts During Construction	Potential construction impacts due to noise, dust, odour or traffic	Effect of noise, vibration and dust on existing residences and agricultural land within the vicinity of Wells 1 & 2 Facility and Well 3 Facility and along Centre Road due to construction of new building, new yard piping, watermains or forcemain Temporary disruption of traffic Temporary disruption of existing utilities	Minor anticipated impacts on existing residences and agricultural land as works are undertaken within existing buildings No anticipated disruption of traffic or existing utilities	Moderate anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties and along existing roads and streets Moderate anticipated temporary disruption of traffic and existing utilities during construction of watermain and forcemain	Moderate anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties and along existing roads and streets Moderate anticipated temporary disruption of traffic and existing utilities during construction of watermain and forcemain	Moderate anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties and along existing roads and streets Moderate anticipated temporary disruption of traffic and existing utilities during construction of watermain and forcemain	Moderate anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties and along existing roads and streets Moderate anticipated temporary disruption of traffic and existing utilities during construction of forcemain	Moderate anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties and along existing roads and streets Moderate anticipated temporary disruption of traffic and existing utilities during construction of forcemain	Moderate anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties and along existing roads and streets Moderate anticipated temporary disruption of traffic and existing utilities during construction of forcemain
				Most Preferred	**Least Preferred**	**Least Preferred**	**Least Preferred**	**Least Preferred**	**Least Preferred**	**Least Preferred**
Socio-cultural Environment	Long-Term Community Impact	Long-term impact on local community and business including land-use compatibility	Water quality impact on private fixtures and Point-of-Use (POU) softeners/filters Long-term impact on traffic, noise, vibration and dust on existing residences and agricultural land within the vicinity of Wells 1 & 2 Facility and Well 3 Facility Expansion of Wellhead Protection Area Change to approved land use designation Effect on active agricultural operations Ability to provide fire flow during North ET maintenance	Potential for heavy iron and manganese deposition continues resulting in customer complaints due to staining of fixtures and fouling of POU devices which may contribute to low pressures No anticipated long-term impact on existing residences and agricultural land No anticipated changes on land use designation, wellhead protection area or agricultural operations	Significant reduction of POU softeners fouling and fixtures staining by iron and manganese with removal technology No anticipated long-term impact on existing residences and agricultural land No anticipated changes on land use designation, wellhead protection area or agricultural operations	Significant reduction of POU softeners fouling and fixtures staining by iron and manganese with removal technology No anticipated long-term impact on existing residences and agricultural land No anticipated changes on land use designation, wellhead protection area or agricultural operations	Significant reduction of POU softeners fouling and fixtures staining by iron and manganese with removal technology Additional traffic, noise, dust and GHG emissions due to sludge haulage No anticipated changes on land use designation, wellhead protection area or agricultural operations	Significant reduction of POU softeners fouling and fixtures staining by iron and manganese with removal technology No anticipated long-term impact on existing residences and agricultural land No anticipated changes on land use designation, wellhead protection area or agricultural operations	Significant reduction of POU softeners fouling and fixtures staining by iron and manganese with removal technology Minor anticipated long-term impact on existing residences and agricultural land since construction of an outfall through the privately owned property No anticipated changes on land use designation, wellhead protection area or agricultural operations	Significant reduction of POU softeners fouling and fixtures staining by iron and manganese with removal technology Additional traffic, noise, dust and GHG emissions due to sludge haulage Minor anticipated long-term impact on existing residences and agricultural land since construction of an outfall through the privately owned property No anticipated changes on land use designation, wellhead protection area or agricultural operations
				Least Preferred	**Most Preferred**	**Most Preferred**	**Moderately Preferred**	**Most Preferred**	**Most Preferred**	**Moderately Preferred**
Socio-cultural Environment	Planning Policy Compliance	Compliance with Local and Regional Planning Policies	Growth Plan for the Greater Golden Horseshoe (2019) Greenbelt Plan (2017) Oak Ridges Moraine Conservation Plan (2017) Lake Simcoe Protection Plan (2008) York Region Official Plan (2010) and Its Amendments 2016 Water and Wastewater Master Plan Update York Region Energy Conservation and Demand Management Plan (2019) York Region By-Law No. 2011-56 (quantity and quality, including iron, manganese, sulphate and sodium) Town of East Gwillimbury Official Plan (2010) and Its 2018 Consolidation East Gwillimbury Water & Wastewater Master Plan (2009)	Compliance with Provincial, Regional and Local Policies as works are undertaken within existing buildings and no discharge to sewer or stormwater system	Compliance with Provincial, Regional and Local Policies Works are undertaken within existing properties and along existing roads and streets; and not within Greenbelt natural heritage system, ORM natural core areas or LSRCA designated areas Residuals are within By-Law No. 2011-56 sewer discharge limits, except for manganese	Compliance with most of Provincial, Regional and Local Policies Works are undertaken within existing properties and along existing roads and streets; and not within Greenbelt natural heritage system, ORM natural core areas or LSRCA designated areas Sludge residuals are within By-Law No. 2011-56 sewer discharge limits, except for manganese, relaxation of this parameter required Supernatant are within By-Law No. 2011-56 stormwater discharge limits, except for manganese	Compliance with Provincial, Regional and Local Policies Works are undertaken within existing properties and along existing roads and streets; and not within Greenbelt natural heritage system, ORM natural core areas or LSRCA designated areas Supernatant are within By-Law No. 2011-56 stormwater discharge limits, except for manganese, except for manganese	Compliance with most Provincial, Regional and Local Policies Works at Well 3 Facility and related to Well 3 Facility sewer connection partially within Greenbelt natural heritage system Other works are undertaken within existing properties, along existing roads and streets, and agricultural land; and not within Greenbelt natural heritage system, ORM natural core areas or LSRCA designated areas Works at Well 3 Facility partially within Greenbelt natural heritage area Residuals are within By-Law No. 2011-56 sewer discharge limits, except for manganese	Compliance with most of Provincial, Regional and Local Policies Works at Well 3 Facility and related to Well 3 Facility sewer connection and outfall partially within Greenbelt natural heritage system Construction of the Well 3 Facility outfall within LSRCA regulated area Other works are undertaken within existing properties, along existing roads and streets, and agricultural land; and not within Greenbelt natural heritage system, ORM natural core areas or LSRCA designated areas Sludge residuals are within By-Law No. 2011-56 sewer discharge limits, except for manganese, relaxation of this parameter required Supernatant are within By-Law No. 2011-56 stormwater discharge limits, except for manganese	Compliance with most of Provincial, Regional and Local Policies Works at Well 3 Facility and related to Well 3 Facility outfall partially within Greenbelt natural heritage system Construction of the Well 3 Facility outfall within LSRCA regulated area and Greenbelt Natural Heritage System Other works are undertaken within existing properties, along existing roads and streets, and agricultural land; and not within Greenbelt natural heritage area, ORM natural core areas or LSRCA designated areas Supernatant are within By-Law No. 2011-56 stormwater discharge limits, except for manganese
				Most Preferred	**Most Preferred**	**Moderately Preferred**	**Most Preferred**	**Moderately Preferred**	**Least Preferred**	**Least Preferred**

Comparative Evaluation of Alternative Solutions to Improve Water Quality

Comparative Criteria	Alternative A6: Provide Iron and Manganese Removal Technology at Wells 1&2 Facility and Continue Sequestration at Well 3 Facility			Alternative A7: Connect Well MW 18 to Mount Albert Water Supply System				
				Sub-option A7a: Replace Well 1 with Well MW18 and continue sequestration at both facilities	Sub-option A7b: Replace Wells 1 and 2 with Well MW18, re-rate Wells 3 and MW18, and continue sequestration	Sub-option A7c: Replace Well 1 with Well MW18, continue sequestration at Well 3 Facility, and provide iron and manganese removal technology at Wells 1 & 2 Facility		
	Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site			Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site
Socio-cultural Environment	Preliminary layout of new treatment building and residual management system can avoid the areas with archeological potential (Map 11 of Stage 1 AA)	Preliminary layout of new treatment building and residual management system can avoid the areas with archeological potential (Map 11 of Stage 1 AA)	Preliminary layout of new treatment building and residual management system can avoid the areas with archeological potential (Map 11 of Stage 1 AA)	Preliminary layout of new building and chlorine contact tank can avoid the areas with archeological potential (Map 16 of Stage 1 AA)	Preliminary layout of new building and chlorine contact tank can avoid the areas with archeological potential (Map 16 of Stage 1 AA)	Preliminary layout of new buildings, residual management system and chlorine contact tank can avoid the areas with archeological potential (Maps 11 and 16 of Stage 1 AA)	Preliminary layout of new buildings, residual management system and chlorine contact tank can avoid the areas with archeological potential (Maps 11 and 16 of Stage 1 AA)	Preliminary layout of new buildings, residual management system and chlorine contact tank can avoid the areas with archeological potential (Maps 11 and 16 of Stage 1 AA)
	Most Preferred	Most Preferred	Most Preferred	Most Preferred	Most Preferred	Most Preferred	Most Preferred	Most Preferred
Socio-cultural Environment	Planned works near the Mount Albert Wesleyan Methodist Pioneer Cemetery and Birchard Family Burying Ground, but within the right of way and no Stage 3 archeological assessment provided the connection to sewer system in Center Street can be limited to the west side of the street, where the potential of unmarked burials is low.	Planned works near the Mount Albert Wesleyan Methodist Pioneer Cemetery and Birchard Family Burying Ground, but within the right of way and no Stage 3 archeological assessment provided the connection to sewer system in Center Street can be limited to the west side of the street, where the potential of unmarked burials is low.	No anticipated impacts on cultural and heritage features as works are undertaken within existing buildings and disturbed areas with no potential	No anticipated impacts on cultural and heritage features as works are undertaken within existing properties and disturbed areas with no potential	No anticipated impacts on cultural and heritage features as works are undertaken within existing properties and disturbed areas with no potential	Planned works near the Mount Albert Wesleyan Methodist Pioneer Cemetery and Birchard Family Burying Ground, but within the right of way and no Stage 3 archeological assessment provided the connection to sewer system in Center Street can be limited to the west side of the street, where the potential of unmarked burials is low.	Planned works near the Mount Albert Wesleyan Methodist Pioneer Cemetery and Birchard Family Burying Ground, but within the right of way and no Stage 3 archeological assessment provided the connection to sewer system in Center Street can be limited to the west side of the street, where the potential of unmarked burials is low.	No anticipated impacts on cultural and heritage features as works are undertaken within existing properties and disturbed areas with no potential
	Moderately Preferred	Moderately Preferred	Most Preferred	Most Preferred	Most Preferred	Moderately Preferred	Moderately Preferred	Most Preferred
Socio-cultural Environment	Moderate anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties and along existing roads and streets Moderate anticipated temporary disruption of traffic and existing utilities during construction of forcemain	Moderate anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties and along existing roads and streets Moderate anticipated temporary disruption of traffic and existing utilities during construction of forcemain	Moderate anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties and along existing roads and streets Moderate anticipated temporary disruption of traffic and existing utilities during construction of forcemain	Minor anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties No anticipated disruption of traffic or existing utilities	Minor anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties No anticipated disruption of traffic or existing utilities	Moderate anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties and along existing roads and streets Moderate anticipated temporary disruption of traffic and existing utilities during construction of forcemain	Moderate anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties and along existing roads and streets Moderate anticipated temporary disruption of traffic and existing utilities during construction of forcemain	Moderate anticipated impacts on existing residences and agricultural land as works are undertaken within existing properties and along existing roads and streets Moderate anticipated temporary disruption of traffic and existing utilities during construction of forcemain
	Least Preferred	Least Preferred	Least Preferred	Moderately Preferred	Moderately Preferred	Least Preferred	Least Preferred	Least Preferred
Socio-cultural Environment	Potential for moderate iron and manganese deposition continues resulting in customer complaints due to staining of fixtures and fouling of POU devices which may contribute to low pressures No anticipated long-term impact on existing residences and agricultural land No anticipated changes on land use designation, wellhead protection area or agricultural operations	Potential for moderate iron and manganese deposition continues resulting in customer complaints due to staining of fixtures and fouling of POU devices which may contribute to low pressures No anticipated long-term impact on existing residences and agricultural land No anticipated changes on land use designation, wellhead protection area or agricultural operations	Potential for moderate iron and manganese deposition continues resulting in customer complaints due to staining of fixtures and fouling of POU devices which may contribute to low pressures Additional traffic, noise, dust and GHG emissions due to sludge haulage No anticipated changes on land use designation, wellhead protection area or agricultural operations	Potential for moderate iron and manganese deposition continues resulting in customer complaints due to staining of fixtures and fouling of POU devices which may contribute to low pressures No anticipated long-term impact on existing residences and agricultural land No anticipated changes on land use designation, wellhead protection area or agricultural operations	Potential for moderate iron and manganese deposition continues resulting in customer complaints due to staining of fixtures and fouling of POU devices which may contribute to low pressures No anticipated long-term impact on existing residences and agricultural land No anticipated changes on land use designation, wellhead protection area or agricultural operations	Potential for moderate iron and manganese deposition continues resulting in customer complaints due to staining of fixtures and fouling of POU devices which may contribute to low pressures No anticipated long-term impact on existing residences and agricultural land No anticipated changes on land use designation, wellhead protection area or agricultural operations	Potential for moderate iron and manganese deposition continues resulting in customer complaints due to staining of fixtures and fouling of POU devices which may contribute to low pressures No anticipated long-term impact on existing residences and agricultural land No anticipated changes on land use designation, wellhead protection area or agricultural operations	Potential for moderate iron and manganese deposition continues resulting in customer complaints due to staining of fixtures and fouling of POU devices which may contribute to low pressures Additional traffic, noise, dust and GHG emissions due to sludge haulage No anticipated changes on land use designation, wellhead protection area or agricultural operations
	Moderately Preferred	Moderately Preferred	Least Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred	Least Preferred
Socio-cultural Environment	Compliance with Provincial, Regional and Local Policies Works are undertaken within existing properties and along existing roads and streets; and not within Greenbelt natural heritage system, ORM natural core areas or LSRCA designated areas Residuals are within By-Law No. 2011-56 sewer discharge limits, except for manganese	Compliance with most of Provincial, Regional and Local Policies Works are undertaken within existing properties and along existing roads and streets; and not within Greenbelt natural heritage system, ORM natural core areas or LSRCA designated areas Sludge residuals are within By-Law No. 2011-56 sewer discharge limits, except for manganese, relaxation of this parameter required Supernatant are within By-Law No. 2011-56 stormwater discharge limits, except for manganese	Compliance with Provincial, Regional and Local Policies Works are undertaken within existing properties and along existing roads and streets; and not within Greenbelt natural heritage system, ORM natural core areas or LSRCA designated areas Supernatant are within By-Law No. 2011-56 stormwater discharge limits, except for manganese	Compliance with most Provincial, Regional and Local Policies as works are undertaken within existing facilities and no discharge to sewer or stormwater system Works at Well 3 Facility partially within Greenbelt natural heritage system	Compliance with most Provincial, Regional and Local Policies as works are undertaken within existing facilities and no discharge to sewer or stormwater system Works at Well 3 Facility partially within Greenbelt natural heritage system	Compliance with most Provincial, Regional and Local Policies Works at Well 3 Facility partially within Greenbelt natural heritage system Other works are undertaken within existing properties and along existing roads and streets; and not within Greenbelt natural heritage system, ORM natural core areas or LSRCA designated areas Residuals are within By-Law No. 2011-56 sewer discharge limits, except for manganese	Compliance with most of Provincial, Regional and Local Policies Works at Well 3 Facility partially within Greenbelt natural heritage system Other works are undertaken within existing properties and along existing roads and streets; and not within Greenbelt natural heritage system, ORM natural core areas or LSRCA designated areas Sludge residuals are within By-Law No. 2011-56 sewer discharge limits, except for manganese, relaxation of this parameter required Supernatant are within By-Law No. 2011-56 stormwater discharge limits, except for manganese	Compliance with most Provincial, Regional and Local Policies Works at Well 3 Facility partially within Greenbelt natural heritage system Other works are undertaken within existing properties and along existing roads and streets; and not within Greenbelt natural heritage system, ORM natural core areas or LSRCA designated areas Supernatant are within By-Law No. 2011-56 stormwater discharge limits, except for manganese
	Most Preferred	Moderately Preferred	Most Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred

Comparative Evaluation of Alternative Solutions to Improve Water Quality

Comparative Criteria	Comparative Sub-Criteria	Description	Main Considerations for Each Criterion	Alternative A4: Continue Sequestration at Wells 1&2 Facility and Well 3 Facility, and Upgrade Systems to Optimize Operations and Maintenance	Alternative A5: Provide Iron and Manganese Removal Technology for All Wells					
					Sub-option A5a: Centralized Removal Technology at Wells 1 & 2 Facility			Sub-option A5b: Decentralized Removal Technology at both Facilities		
					Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site	Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site
Technical Considerations	Ease of Implementation	Ease of implementation in terms of available space, accessibility, new infrastructure, constructability, easements, and land acquisition needs	Implementation in phases Construction complexity Effect on available space at each facility Construction on Region owned property or Right of Way (ROW) Need of property acquisition	Improvements can be staged to impact one facility at time No effect on available space at each facility and no need of property acquisition as works are undertaken within existing buildings	Improvements can be staged to impact one facility at time Construction of new building and equalization tank reduces significantly the available space at Wells 1 & 2 Facility (110 m^2 additional footprint) No need for property acquisition as works can be accommodated within existing properties and ROW	Improvements can be staged to impact one facility at time Construction of new building and residual on-site treatment reduces significantly the available space at Wells 1 & 2 Facility (150 m^2 additional footprint) No need for property acquisition as works can be accommodated within existing properties and ROW	Improvements can be staged to impact one facility at time Construction of new building, residual on-site treatment and sludge holding tank reduces significantly the available space at Wells 1 & 2 Facility (180 m^2 additional footprint) No need for property acquisition as works can be accommodated within existing properties and ROW	Improvements can be staged to impact one facility at time Construction of new building and equalization tank reduces significantly the available space at both facilities (110 m^2 additional footprint at Wells 1& 2 Facility and 100 m^2 at Well 3 Facility) No need for property acquisition as works can be accommodated within existing properties and ROW.	Improvements can be staged to impact one facility at time Construction of new building and residual on-site treatment reduces significantly the available space at both facilities (150 m^2 additional footprint at Wells 1& 2 Facility and 135 m^2 at Well 3 Facility) Construction of the Well 3 Facility outfall requires new ROW Other works can be accommodated within existing properties and ROW	Improvements can be staged to impact one facility at time Construction of new building and residual on-site treatment reduces significantly the available space at both facilities (180 m^2 additional footprint at Wells 1& 2 Facility and 150 m^2 at Well 3 Facility) Construction of the Well 3 Facility outfall requires new ROW Other works can be accommodated within existing properties and ROW
				Most Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred	Least Preferred	Least Preferred
Technical Considerations	System Redundancy	Improvement in redundancy of supply/service	Infrastructure/equipment available (duty/standby) Longevity of supply (potential decline of well capacity/efficiency) Feasibility of contact tank and storage tank maintenance	System has sufficient firm capacity (4.99 ML/d) if Well 1 with elevated manganese levels is kept in service even with considerable decline of wells capacity Facilities with duty and standby equipment Facilities can be taken off-line individually for contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance	System has sufficient firm capacity (4.91 ML/d) even with considerable decline of wells capacity Facilities with duty and standby equipment As all water supply is routed through a single contact tank, system to be operated from storage during contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance	System has sufficient firm capacity (4.91 ML/d) even with considerable decline of wells capacity Facilities with duty and standby equipment As all water supply is routed though a single contact tank, system to be operated from storage during contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance	System has sufficient firm capacity (4.91 ML/d) even with considerable decline of wells capacity Facilities with duty and standby equipment As all water supply is routed though a single contact tank, system to be operated from storage during contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance	System has sufficient firm capacity (4.89 ML/d) even with considerable decline of wells capacity Facilities with duty and standby equipment Facilities can be taken off-line individually for contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance	System has sufficient firm capacity (4.89 ML/d) even with considerable decline of wells capacity Facilities with duty and standby equipment Facilities can be taken off-line individually for contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance	System has sufficient firm capacity (4.89 ML/d) even with considerable decline of wells capacity Facilities with duty and standby equipment Facilities can be taken off-line individually for contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance
				Least Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred	Most Preferred	Most Preferred	Most Preferred
Technical Considerations	Reliability of Supply/Service	Ability to provide reliable/continuous service	Sequestration effectiveness Number of customer complaints (water quality and pressure) Capability to manage pressure issues (hydraulic grade) Ability of residual management system to consistently achieve effluent limits and reduce impact on surface water	Wells 1 and 2 raw water quality exceeds the recommended targets for effective sequestration Potential compounding influence of hardness, alkalinity and phosphate Significant potential that dosing improvements will not improve treatment to degree required Potential for heavy deposition in distribution system and continued customer concerns Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Wells 1 and 2 when North ET water level is low Residual management not required	Addition of removal technology easily meets the aesthetic objectives and treatment goals Low deposition in distribution system and considerable reduction of customer concerns without extensive operation and maintenance Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Wells 1 and 2 when North ET water level is low Residual management discharge treated by Mt. Albert WRRF	Addition of removal technology easily meets the aesthetic objectives and treatment goals Low deposition in distribution system and considerable reduction of customer concerns without extensive operation and maintenance Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Wells 1 and 2 when North ET water level is low Residual Effluent limits to minimize the impacts to Vivian Creek probably may not be achieved with gravity settling tanks alone and enhanced on-site treatment of the residuals may be required	Addition of removal technology easily meets the aesthetic objectives and treatment goals Low deposition in distribution system and considerable reduction of customer concerns without extensive operation and maintenance Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Wells 1 and 2 when North ET water level is low Effluent limits to minimize the impacts to Vivian Creek probably may not be achieved with gravity settling tanks alone and enhanced on-site treatment of the residuals may be required	Addition of removal technology easily meets the aesthetic objectives and treatment goals Low deposition in distribution system and considerable reduction of customer concerns without extensive operation and maintenance Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Wells 1 and 2 when North ET water level is low Residual management discharge treated by Mt. Albert WRRF	Addition of removal technology easily meets the aesthetic objectives and treatment goals Low deposition in distribution system and considerable reduction of customer concerns without extensive operation and maintenance Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Wells 1 and 2 when North ET water level is low Effluent limits to minimize the impacts to Vivian Creek probably may not be achieved with gravity settling tanks alone and enhanced on-site treatment of the residuals may be required	Addition of removal technology easily meets the aesthetic objectives and treatment goals Low deposition in distribution system and considerable reduction of customer concerns without extensive operation and maintenance Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Wells 1 and 2 when North ET water level is low Effluent limits to minimize the impacts to Vivian Creek probably may not be achieved with gravity settling tanks alone and enhanced on-site treatment of the residuals may be required
				Least Preferred	Most Preferred	Moderately Preferred	Moderately Preferred	Most Preferred	Moderately Preferred	Moderately Preferred

Comparative Evaluation of Alternative Solutions to Improve Water Quality

Comparative Criteria	Alternative A6: Provide Iron and Manganese Removal Technology at Wells 1&2 Facility and Continue Sequestration at Well 3 Facility			Alternative A7: Connect Well MW 18 to Mount Albert Water Supply System				
				Sub-option A7a: Replace Well 1 with Well MW18 and continue sequestration at both facilities	Sub-option A7b: Replace Wells 1 and 2 with Well MW18, re-rate Wells 3 and MW18, and continue sequestration	Sub-option A7c: Replace Well 1 with Well MW18, continue sequestration at Well 3 Facility, and provide iron and manganese removal technology at Wells 1 & 2 Facility		
	Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site			Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site
Technical Considerations	Improvements can be staged to impact one facility at time Construction of new building and equalization tank reduces significantly the available space at Wells 1 & 2 Facility (110 m^2 additional footprint) No need for property acquisition as works can be accommodated within existing properties and ROW	Improvements can be staged to impact one facility at time Construction of new building and residual on-site treatment reduces significantly the available space at Wells 1 & 2 Facility (150 m^2 additional footprint) No need for property acquisition as works can be accommodated within existing properties and ROW	Improvements can be staged to impact one facility at time Construction of new building, residual on-site treatment and sludge holding tank reduces significantly the available space at Wells 1 & 2 Facility (180 m^2 additional footprint) No need for property acquisition as works can be accommodated within existing properties and ROW	Improvements can be staged to impact one facility at time Significant reduction of available space at Well 3 Facility (40 m^2 additional footprint) No need of property acquisition as works are undertaken within existing Wells 1 & 2 Facility building and existing Well 3 Facility	Improvements can be staged to impact one facility at time Significant reduction of available space at Well 3 Facility (40 m^2 additional footprint), but Wells 1 & 2 Facility becomes completely available No need of property acquisition as works are undertaken within existing Wells 1 & 2 Facility and existing Well 3 Facility	Improvements can be staged to impact one facility at time Construction of new building and equalization tank at Wells 1 & 2 Facility (110 m^2 additional footprint) and new building at Well 3 Facility (40 m^2 additional footprint) reduces significantly the available space No need for property acquisition as works can be accommodated within existing properties and ROW	Improvements can be staged to impact one facility at time Construction of new building and residual on-site treatment at Wells 1 & 2 Facility (150 m^2 additional footprint) and new building at Well 3 Facility (40 m^2 additional footprint) reduces significantly the available space No need for property acquisition as works can be accommodated within existing properties and ROW	Improvements can be staged to impact one facility at time Construction of new building, residual on-site treatment and sludge holding tank at Wells 1 & 2 Facility (180 m^2 additional footprint) and new building at Well 3 Facility (40 m^2 additional footprint) reduces significantly the available space No need for property acquisition as works can be accommodated within existing properties and ROW
	Moderately Preferred	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**
Technical Considerations	System has sufficient firm capacity (4.91 ML/d) even with considerable decline of wells capacity Facilities with duty and standby equipment Facilities can be taken off-line individually for contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance	System has sufficient firm capacity (4.91 ML/d) even with considerable decline of wells capacity Facilities with duty and standby equipment Facilities can be taken off-line individually for contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance	System has sufficient firm capacity (4.91 ML/d) even with considerable decline of wells capacity Facilities with duty and standby equipment Facilities can be taken off-line individually for contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance	System has sufficient firm capacity (4.99 ML/d) even with considerable decline of wells capacity Additional hydrogeological study required to confirm Well MW18 capacity Facilities with duty and standby equipment Facilities can be taken off-line individually for contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance	System has no sufficient firm capacity (3.4 ML/d) in case wells capacity declines Additional hydrogeological study required to confirm Wells 3 and MW18 capacities Facilities with duty and standby equipment Reliance on single transmission main Contact tanks at Well 3 Facility can be taken off-line individually for maintenance, but the firm capacity will be reduced Requires pressure operation of wells to allow for storage tank maintenance	System has sufficient firm capacity (4.93 ML/d) even with considerable decline of wells capacity Additional hydrogeological study required to confirm Well MW18 capacity Unknown if heavy iron precipitate plugging and biofouling observed in Well 3 would also present at MW18 and impact future capacity Facilities with duty and standby equipment Facilities can be taken off-line individually for contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance	System has sufficient firm capacity (4.93 ML/d) even with considerable decline of wells capacity Additional hydrogeological study required to confirm Well MW18 capacity Unknown if heavy iron precipitate plugging and biofouling observed in Well 3 would also present at MW18 and impact future capacity Facilities with duty and standby equipment Facilities can be taken off-line individually for contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance	System has sufficient firm capacity (4.93 ML/d) even with considerable decline of wells capacity Additional hydrogeological study required to confirm Well MW18 capacity Facilities with duty and standby equipment Facilities can be taken off-line individually for contact tank maintenance Requires pressure operation of wells to allow for storage tank maintenance
	Most Preferred	**Most Preferred**	**Most Preferred**	**Most Preferred**	**Moderately Preferred**	**Most Preferred**	**Most Preferred**	**Most Preferred**
Technical Considerations	Well 3 raw water quality is comparatively better, but the interference of the identified factors of hardness, alkalinity and potentially phosphate on the treatment process cannot be easily avoided so the potential of water quality issues remains Blending of water treated water from different processes may contribute to deposition in the distribution system Potential for moderate deposition in distribution system and continued customer concerns Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Wells 1 and 2 when North ET water level is low Residual management discharge treated by Mt. Albert WRRF	Well 3 raw water quality is comparatively better, but the interference of the identified factors of hardness, alkalinity and potentially phosphate on the treatment process cannot be easily avoided so the potential of water quality issues remains Blending of water treated water from different processes may contribute to deposition in the distribution system Potential for moderate deposition in distribution system and continued customer concerns Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Wells 1 and 2 when North ET water level is low Effluent limits to minimize the impacts to Vivian Creek probably may not be achieved with gravity settling tanks alone and enhanced on-site treatment of the residuals may be required	Well 3 raw water quality is comparatively better, but the interference of the identified factors of hardness, alkalinity and potentially phosphate on the treatment process cannot be easily avoided so the potential of water quality issues remains Blending of water treated water from different processes may contribute to deposition in the distribution system Potential for moderate deposition in distribution system and continued customer concerns Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Wells 1 and 2 when North ET water level is low Effluent limits to minimize the impacts to Vivian Creek probably may not be achieved with gravity settling tanks alone and enhanced on-site treatment of the residuals may be required	Well 2 raw water quality exceeds the recommended targets for effective sequestration, and Wells 3 and MW18 raw water quality within the recommended targets for effective sequestration Potential compounding influence of hardness, alkalinity and phosphate Unknown if dosing improvements will improve treatment to degree required Potential for moderate deposition in distribution system and continued customer concerns Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Well 2 when North ET water level is low Residual management not required	Wells 3 and MW18 raw water quality within the recommended targets for effective sequestration, but potential compounding influence of hardness, alkalinity and phosphate Unknown if dosing improvements will improve treatment to degree required Potential for moderate deposition in distribution system and continued customer concerns Without supply coming from Wells 1 & 2 Facility, low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by maintaining North ET water level high Residual management not required	Addition of removal technology easily meets the aesthetic objectives and treatment goals at Wells 1&2 Facility Wells 3 and MW18 raw water quality within the recommended targets for effective sequestration Potential compounding influence of hardness, alkalinity and phosphate Blending of treated water from different processes may disturb the metals' stability Unknown if dosing improvements will improve treatment to degree required Potential for moderate deposition in distribution system and continued customer concerns Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Well 2 when North ET water level is low Residual management discharge treated by Mt. Albert WRRF	Addition of removal technology easily meets the aesthetic objectives and treatment goals at Wells 1&2 Facility Wells 3 and MW18 raw water quality within the recommended targets for effective sequestration Potential compounding influence of hardness, alkalinity and phosphate Blending of treated water from different processes may disturb the metals' stability Unknown if dosing improvements will improve treatment to degree required Potential for moderate deposition in distribution system and continued customer concerns Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Well 2 when North ET water level is low Effluent limits to minimize the impacts to Vivian Creek probably may not be achieved with gravity settling tanks alone and enhanced	Addition of removal technology easily meets the aesthetic objectives and treatment goals at Wells 1&2 Facility Wells 3 and MW18 raw water quality within the recommended targets for effective sequestration Potential compounding influence of hardness, alkalinity and phosphate Blending of treated water from different processes may disturb the metals' stability Unknown if dosing improvements will improve treatment to degree required Potential for moderate deposition in distribution system and continued customer concerns Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Well 2 when North ET water level is low Effluent limits to minimize the impacts to Vivian Creek probably may not be achieved with gravity settling tanks alone and
	Moderately Preferred	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**

Comparative Evaluation of Alternative Solutions to Improve Water Quality

Comparative Criteria	Comparative Sub-Criteria	Description	Main Considerations for Each Criterion	Alternative A4: Continue Sequestration at Wells 1&2 Facility and Well 3 Facility, and Upgrade Systems to Optimize Operations and Maintenance	Alternative A5: Provide Iron and Manganese Removal Technology for All Wells					
					Sub-option A5a: Centralized Removal Technology at Wells 1 & 2 Facility			Sub-option A5b: Decentralized Removal Technology at both Facilities		
					Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site	Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site
Technical Considerations	Operations	Requirement for additional and new Operations resources at regional and municipal level. The complexity and operability of new assets.	Addition of removal technology and residual management, along with the need for specialized operation staff Ability to maximize operational flexibility Distribution system monitoring program to track sequestration Operational water usage (cleaning distribution system, backwashing)	Significant focused operation efforts to monitor the sequestration effectiveness and distribution water quality and respond to unforeseen circumstances No anticipated changes on the current system classification (Water distribution and supply sub-system Class II) Operational flexibility maximized with two facilities in operation Minor operational water usage for cleaning tanks and distribution system (1.2% of annual production)	Additional operation effort required for iron and manganese removal technology at Wells 1 & 2 Facility, but the proposed technology is reliable and easy to operate Additional operation effort required for residual management system, but low complexity (equalization tank and pumping) Monitoring efforts of the distribution system improved significantly Anticipated changes on the current system classification from Class II to Class II Operational flexibility can be maximized by maintaining sequestration and chlorination systems at Well 3 Facility Reduced operational water usage for cleaning and flushing; however, additional supply required for backwashing (5.6% of annual production)	Additional operation effort required for iron and manganese removal technology at Wells 1 & 2 Facility, but the proposed technology is reliable and easy to operate Additional operation effort required for residual management system, but moderate complexity (on-site treatment and pumping) Monitoring efforts of the distribution system improved significantly Anticipated changes on the current system classification from Class II to Class III Operational flexibility can be maximized by maintaining sequestration and chlorination systems at Well 3 Facility Reduced operational water usage for cleaning and flushing; however, additional supply required for backwashing (5.6% of annual production)	Additional operation effort required for iron and manganese removal technology at Wells 1 & 2 Facility, but the proposed technology is reliable and easy to operate Additional operation effort required for residual management system, but moderate complexity (on-site treatment. sludge holding tank, pumping) Monitoring efforts of the distribution system improved significantly Anticipated changes on the current system classification from Class II to Class III Operational flexibility can be maximized by maintaining sequestration and chlorination systems at Well 3 Facility Reduced operational water usage for cleaning and flushing; however, additional supply required for backwashing (5.6% of annual production)	Additional operation effort required for iron and manganese removal technology at both facilities, but the proposed technology is reliable and easy to operate Additional operation effort required for residual management system, but low complexity (equalization tank and pumping) Monitoring efforts of the distribution system improved significantly Anticipated changes on the current system classification from Class II to Class III Operational flexibility maximized with two facilities in operation Reduced operational water usage for cleaning and flushing; however, additional supply required for backwashing (6.9% of annual production)	Additional operation effort required for iron and manganese removal technology at both facilities, but the proposed technology is reliable and easy to operate Additional operation effort required for residual management system, but moderate complexity (on-site treatment and pumping) Monitoring efforts of the distribution system improved significantly Anticipated changes on the current system classification from Class II to Class III Operational flexibility maximized with two facilities in operation Reduced operational water usage for cleaning and flushing; however, additional supply required for backwashing (6.9% of annual production)	Additional operation effort required for iron and manganese removal technology at both facilities, but the proposed technology is reliable and easy to operate Additional operation effort required for residual management system, but moderate complexity (on-site treatment. sludge holding tank, pumping) Monitoring efforts of the distribution system improved significantly Anticipated changes on the current system classification from Class II to Class III Operational flexibility maximized with two facilities in operation Reduced operational water usage for cleaning and flushing; however, additional supply required for backwashing (6.9% of annual production)
				Least Preferred	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**
Technical Considerations	Maintenance	Requirement for additional and new Maintenance resources at regional and municipal level. The complexity and maintainability of new assets.	Contact tank and storage cleaning frequency Raw watermain and distribution system cleaning frequency Addition of removal technology and residual management, along with the need for specialized maintenance staff	Increased maintenance of the chlorine contact chambers, North ET and the distribution system (annual tanks cleaning, annual UFD, swabbing every 5 years of distribution system) No additional equipment requiring additional maintenance effort	Improves maintenance requirements for the chlorine contact chambers, North ET and the distribution system (cleaning tanks every 5 years, UDF every 5 years and swabbing every 20 years of distribution system) Additional maintenance effort required for raw watermain (annual UDF and swabbing every 5 years) Additional maintenance effort required for iron and manganese removal technology and residual management system	Improves maintenance requirements for the chlorine contact chambers, North ET and the distribution system (cleaning tanks every 5 years, UDF every 5 years and swabbing every 20 years of distribution system)Additional maintenance effort required for raw watermain (annual UDF and swabbing every 5 years) Additional maintenance effort required for iron and manganese removal technology and residual management system (on-site treatment and pumping) at Wells 1 & 2	Improves maintenance requirements for the chlorine contact chambers, North ET and the distribution system (cleaning tanks every 5 years, UDF every 5 years and swabbing every 20 years of distribution system) Additional maintenance effort required for iron and manganese removal technology and residual management system (on-site treatment. sludge holding tank, pumping) at Wells 1 & 2 Facility	Improves maintenance requirements for the chlorine contact chambers, North ET and the distribution system (cleaning tanks every 5 years, UDF every 5 years and swabbing every 20 years of distribution system) Additional maintenance effort required for iron and manganese removal technology and residual management system (equalization tank and pumping) at both facilities	Improves maintenance requirements for the chlorine contact chambers, North ET and the distribution system (cleaning tanks every 5 years, UDF every 5 years and swabbing every 20 years of distribution system) Additional maintenance effort required for iron and manganese removal technology and residual management system (on-site treatment and pumping) at both facilities	Improves maintenance requirements for the chlorine contact chambers, North ET and the distribution system (cleaning tanks every 5 years, UDF every 5 years and swabbing every 20 years of distribution system) Additional maintenance effort required for iron and manganese removal technology and residual management system (on-site treatment. sludge holding tank, pumping) at both facilities
				Least Preferred	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**
Technical Considerations	Alignment with Other Infrastructure	Potential impacts on functions or performance of other infrastructure, such as wastewater, conveyance, transportation and utilities projects	Impact on Mt. Albert WRRF and SPS Connection to sanitary system Repurpose of transmission main Sustainable use of existing infrastructure (One Water Approach) Conflict with other existing or planned infrastructure, systems, or services	No impact on Mt. Albert WRRF and SPS No connection to sanitary system or repurpose of transmission main required Sustainable use of existing infrastructure as works are undertaken within existing facilities Conflict with other infrastructure project not identified at this moment	Minor impact of removal technology residuals on Mt. Albert WRRF (up 4.6% in flow, 0.04% in BOD, 0.02% in TKN and 1.7% in dry solids of the design capacity, and anticipated the required iron and manganese levels prior UV reactors can be easily maintained) Minor impact on Mt. Albert SPS and sewer collection system capacity with possibility of BWs to be performed off-peak hours, but interlock with SPS required to avoid surcharging and coordination with Town of East-Gwillimbury required Maximizes sustainable use of existing infrastructure as works are undertaken within existing facilities, the existing transmission main is repurposed, and the infrastructure expansion includes the short extension (350 m) of raw watermain and the connection with sanitary system (400 m) Conflict with other infrastructure project not identified at this moment	Minor impact of removal technology residuals on Mt. Albert WRRF (up 0.5% in flow, 0.004% in BOD, 0.002% in TKN and 1.5% in dry solids of the design capacity, and anticipated the required iron and manganese levels prior UV reactors can be easily maintained) Negligeable impact on Mt. Albert SPS and sewer collection system capacity, but interlock with SPS required to avoid surcharging and coordination with Town of East-Gwillimbury required Minor impact on stormwater system, but coordination with Town of East-Gwillimbury required Maximizes sustainable use of existing infrastructure as works are undertaken within existing facilities, the existing transmission main is repurposed, and the infrastructure expansion includes the short extension (350 m) of raw watermain, connection with sanitary system (400 m) and discharge to stormwater system (420 m) Conflict with other infrastructure project not	No impact on Mt. Albert WRRF and SPS and negligible impact on Duffin Creek WPCP Minor impact on stormwater system, but coordination with Town of East-Gwillimbury required Maximizes sustainable use of existing infrastructure as works are undertaken within existing facilities, the existing transmission main is repurposed, and the infrastructure expansion includes the short extension (350 m) of raw watermain and discharge to stormwater system (420 m) Conflict with other infrastructure project not identified at this moment	Minor impact of removal technology residuals on Mt. Albert SPSWRRF (up 4.6% in flow, 0.04% in BOD, 0.02% in TKN and 1.7% in dry solids of the design capacity, and anticipated the required iron and manganese levels prior UV reactors can be easily maintained) Minor impact on Mt. Albert SPS and sewer collection system capacity with possibility of BWs to be performed off-peak hours, but interlock with SPS required to avoid surcharging and coordination with Town of East-Gwillimbury required Maximizes sustainable use of existing infrastructure as works are undertaken within existing facilities and the infrastructure expansion includes the connection with sanitary system (2,400 m) Conflict with other infrastructure project not identified at this moment	Minor impact of removal technology residuals to Mt. Albert SPS and WRRF (up 0.5% in flow, 0.004% in BOD, 0.002% in TKN and 1.5% in dry solids of the design capacity, and anticipated the required iron and manganese levels prior UV reactors can be easily maintained) Negligeable impact on Mt. Albert SPS and sewer collection system capacity, but interlock with SPS required to avoid surcharging and coordination with Town of East-Gwillimbury required Minor impact on stormwater system, but coordination with Town of East-Gwillimbury required Maximizes sustainable use of existing infrastructure as works are undertaken within existing facilities and the infrastructure expansion includes the connection with sanitary system (2,400 m), discharge to stormwater system (420 m) and discharge to Vivian Creek (400 m) Conflict with other infrastructure project not identified at this moment	No impact on Mt. Albert WRRF and SPS and negligible impact on Duffin Creek WPCP Minor impact on stormwater system, but coordination with Town of East-Gwillimbury required Maximizes sustainable use of existing infrastructure as works are undertaken within existing facilities and the infrastructure expansion includes the discharge to stormwater system (420 m) and discharge to Vivian Creek (400 m) Conflict with other infrastructure project not identified at this moment
				Most Preferred	**Least Preferred**	**Least Preferred**	**Moderately Preferred**	**Least Preferred**	**Least Preferred**	**Moderately Preferred**

Comparative Evaluation of Alternative Solutions to Improve Water Quality

Comparative Criteria	Alternative A6: Provide Iron and Manganese Removal Technology at Wells 1&2 Facility and Continue Sequestration at Well 3 Facility			Alternative A7: Connect Well MW 18 to Mount Albert Water Supply System				
				Sub-option A7a: Replace Well 1 with Well MW18 and continue sequestration at both facilities	Sub-option A7b: Replace Wells 1 and 2 with Well MW18, re-rate Wells 3 and MW18, and continue sequestration	Sub-option A7c: Replace Well 1 with Well MW18, continue sequestration at Well 3 Facility, and provide iron and manganese removal technology at Wells 1 & 2 Facility		
	Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site			Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site
Technical Considerations	Additional operation effort required for iron and manganese removal technology at Wells 1 & 2 Facility, but the proposed technology is reliable and easy to operate Additional operation effort required for residual management system, but low complexity (equalization tank and pumping) Significant focused operation efforts to monitor the sequestration effectiveness and distribution water quality and respond to unforeseen circumstances Anticipated changes on the current system classification from Class II to Class III Operational flexibility maximized with two facilities in operation Reduced operational water usage for cleaning and flushing; however, additional supply required for backwashing (5.6% of annual production)	Additional operation effort required for iron and manganese removal technology at Wells 1 & 2 Facility, but the proposed technology is reliable and easy to operate Additional operation effort required for residual management system, but moderate complexity (on-site treatment and pumping) Significant focused operation efforts to monitor the sequestration effectiveness and distribution water quality and respond to unforeseen circumstances Anticipated changes on the current system classification from Class II to Class III Operational flexibility maximized with two facilities in operation Reduced operational water usage for cleaning and flushing; however, +M35:O35additional supply required for backwashing (5.6% of annual production)	Additional operation effort required for iron and manganese removal technology at Wells 1 & 2 Facility, but the proposed technology is reliable and easy to operate Additional operation effort required for residual management system, but moderate complexity (on-site treatment. sludge holding tank, pumping) Significant focused operation efforts to monitor the sequestration effectiveness and distribution water quality and respond to unforeseen circumstances Anticipated changes on the current system classification from Class II to Class III Operational flexibility maximized with two facilities in operation Reduced operational water usage for cleaning and flushing; however, additional supply required for backwashing (5.6% of annual production)	Significant focused operation efforts to monitor the sequestration effectiveness and distribution water quality and respond to unforeseen circumstances No anticipated changes on the current system classification (Water distribution and supply sub-system Class II) Operational flexibility maximized with two facilities in operation Minor operational water usage for cleaning tanks and distribution system (0.6% of annual production)	Significant focused operation efforts to monitor the sequestration effectiveness and distribution water quality and respond to unforeseen circumstances No anticipated changes on the current system classification (Water distribution and supply sub-system Class II) Operational flexibility reduced with one facility in operation Minor operational water usage for cleaning tanks and distribution system (0.6% of annual production)	Additional operation effort required for iron and manganese removal technology at Wells 1 & 2 Facility, but the proposed technology is reliable and easy to operate Additional operation effort required for residual management system, but low complexity (equalization tank and pumping) Significant focused operation efforts to monitor the sequestration effectiveness and distribution water quality and respond to unforeseen circumstances Anticipated changes on the current system classification from Class II to Class III Operational flexibility maximized with two facilities in operation Reduced operational water usage for cleaning and flushing; however, additional supply required for backwashing (4.9% of annual production)	Additional operation effort required for iron and manganese removal technology at Wells 1 & 2 Facility, but the proposed technology is reliable and easy to operate Additional operation effort required for residual management system, but moderate complexity (on-site treatment and pumping) Significant focused operation efforts to monitor the sequestration effectiveness and distribution water quality and respond to unforeseen circumstances Anticipated changes on the current system classification from Class II to Class III Operational flexibility maximized with two facilities in operation Reduced operational water usage for cleaning and flushing; however, additional supply required for backwashing (4.9% of annual production)	Additional operation effort required for iron and manganese removal technology at Wells 1 & 2 Facility, but the proposed technology is reliable and easy to operate Additional operation effort required for residual management system, but moderate complexity (on-site treatment. sludge holding tank, pumping) Significant focused operation efforts to monitor the sequestration effectiveness and distribution water quality and respond to unforeseen circumstances Anticipated changes on the current system classification from Class II to Class III Operational flexibility maximized with two facilities in operation Reduced operational water usage for cleaning and flushing; however, additional supply required for backwashing (4.9% of annual production)
	Least Preferred	**Least Preferred**	**Least Preferred**	**Least Preferred**	**Least Preferred**	**Least Preferred**	**Least Preferred**	**Least Preferred**
Technical Considerations	Increased maintenance of the chlorine contact chambers, North ET and the distribution system (cleaning of tanks every 2 years, UDF every 2 years and swabbing every 10 years of distribution system) Additional maintenance effort required for iron and manganese removal technology and residual management system (equalization tank and pumping) at Wells 1 & 2 Facility	Increased maintenance of the chlorine contact chambers, North ET and the distribution system (cleaning of tanks every 2 years, UDF every 2 years and swabbing every 10 years of distribution system) Additional maintenance effort required for iron and manganese removal technology and residual management system (on-site treatment and pumping) at Wells 1 & 2 Facility	Increased maintenance of the chlorine contact chambers, North ET and the distribution system (cleaning of tanks every 2 years, UDF every 2 years and swabbing every 10 years of distribution system) Additional maintenance effort required for iron and manganese removal technology and residual management system (on-site treatment. sludge holding tank, pumping) at Wells 1 & 2 Facility	Increased maintenance of the chlorine contact chambers, North ET and the distribution system (cleaning of tanks every 2 years, UDF every 2 years and swabbing every 10 years of distribution system) No additional equipment requiring additional maintenance effort	Increased maintenance of the chlorine contact chambers, North ET and the distribution system (cleaning of tanks every 2 years, UDF every 2 years and swabbing every 10 years of distribution system) No additional equipment requiring additional maintenance effort	Increased maintenance of the chlorine contact chambers, North ET and the distribution system (cleaning of tanks every 2 years, UDF every 2 years and swabbing every 10 years of distribution system) Additional maintenance effort required for iron and manganese removal technology and residual management system (equalization tank and pumping) at Wells 1 & 2 Facility	Increased maintenance of the chlorine contact chambers, North ET and the distribution system (cleaning of tanks every 2 years, UDF every 2 years and swabbing every 10 years of distribution system) Additional maintenance effort required for iron and manganese removal technology and residual management system (on-site treatment and pumping) at Wells 1 & 2 Facility	Increased maintenance of the chlorine contact chambers, North ET and the distribution system (cleaning of tanks every 2 years, UDF every 2 years and swabbing every 10 years of distribution system) Additional maintenance effort required for iron and manganese removal technology and residual management system (on-site treatment. sludge holding tank, pumping) at Wells 1 & 2 Facility
	Moderately Preferred	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**
Technical Considerations	Minor impact of removal technology residuals to Mt. Albert SPS and WRRF (up 4.6% in flow, 0.04% in BOD, 0.02% in TKN and 1.7% in dry solids of the design capacity, and anticipated the required iron and manganese levels prior UV reactors can be easily maintained) Minor impact on Mt. Albert SPS and sewer collection system capacity with possibility of BWs to be performed off-peak hours, but interlock with SPS required to avoid surcharging and coordination with Town of East-Gwillimbury required No repurpose of transmission main required Maximizes sustainable use of existing infrastructure as works are undertaken within existing facilities and the infrastructure expansion includes the connection with sanitary system (400 m) Conflict with other infrastructure project not identified at this moment	Minor impact of removal technology residuals to Mt. Albert SPS and WRRF (up 0.5% in flow, 0.004% in BOD, 0.002% in TKN and 1.5% in dry solids of the design capacity, and anticipated the required iron and manganese levels prior UV reactors can be easily maintained) Negligeable impact on Mt. Albert SPS and sewer collection system capacity, but interlock with SPS required to avoid surcharging and coordination with Town of East-Gwillimbury required Minor impact on stormwater system, but coordination with Town of East-Gwillimbury required Maximizes sustainable use of existing infrastructure as works are undertaken within existing facilities and the infrastructure expansion the connection with sanitary system (400 m) and discharge to stormwater system (420 m) Conflict with other infrastructure project not identified at this moment	No impact on Mt. Albert WRRF and SPS and negligible impact on Duffin Creek WPCP Minor impact on stormwater system, but coordination with Town of East-Gwillimbury required Maximizes sustainable use of existing infrastructure as works are undertaken within existing facilities and the infrastructure expansion includes the discharge to stormwater system (420 m) Conflict with other infrastructure project not identified at this moment	No impact on Mt. Albert WRRF and SPS No connection to sanitary system or repurpose of transmission main required Minimizes sustainable use of existing infrastructure as Well 1 is reported to have sufficient capability to operate throughout planning period, remaining life of this asset would be lost if replaced with MW18 Conflict with other infrastructure project not identified at this moment	No impact on Mt. Albert WRRF and SPS No connection to sanitary system or repurpose of transmission main required Minimizes sustainable use of existing infrastructure as Wells 1 and 2 reported to have sufficient capability to operate throughout planning period, remaining life of this asset would be lost if replaced with MW18 Conflict with other infrastructure project not identified at this moment	Minor impact of removal technology residuals on Mt. Albert WRRF (up 4.6% in flow, 0.04% in BOD, 0.02% in TKN and 1.7% in dry solids of the design capacity, and anticipated the required iron and manganese levels prior UV reactors can be easily maintained) Minor impact on Mt. Albert SPS and sewer collection system capacity with possibility of BWs to be performed off-peak hours, but interlock with SPS required to avoid surcharging and coordination with Town of East-Gwillimbury required Maximizes sustainable use of existing infrastructure as works are undertaken within existing facilities and the infrastructure expansion includes the development of a new well, the decommissioning of Well 1 and the connection with sanitary system (400 m) Conflict with other infrastructure project not identified at this moment	Minor impact of removal technology residuals to Mt. Albert WRRF (up 0.5% in flow, 0.004% in BOD, 0.002% in TKN and 1.5% in dry solids of the design capacity, and anticipated the required iron and manganese levels prior UV reactors can be easily maintained) Negligeable impact on Mt. Albert SPS and sewer collection system capacity, but interlock with SPS required to avoid surcharging and coordination with Town of East-Gwillimbury required Minor impact on stormwater system, but coordination with Town of East-Gwillimbury required Maximizes sustainable use of existing infrastructure as works are undertaken within existing facilities and the infrastructure expansion includes the development of a new well, the decommissioning of Well 1, the connection with sanitary system (400 m) and discharge to stormwater system (420 m) Conflict with other infrastructure project not identified at this moment	No impact on Mt. Albert WRRF and SPS and negligible impact on Duffin Creek WPCP Minor impact on stormwater system, but coordination with Town of East-Gwillimbury required Maximizes sustainable use of existing infrastructure as works are undertaken within existing facilities and the infrastructure expansion includes the development of a new well, the decommissioning of Well 1 and discharge to stormwater system (420 m) Conflict with other infrastructure project not identified at this moment
	Least Preferred	**Least Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Least Preferred**	**Least Preferred**	**Least Preferred**	**Moderately Preferred**

Comparative Evaluation of Alternative Solutions to Improve Water Quality

Comparative Criteria	Comparative Sub-Criteria	Description	Main Considerations for Each Criterion	Alternative A4: Continue Sequestration at Wells 1&2 Facility and Well 3 Facility, and Upgrade Systems to Optimize Operations and Maintenance	Alternative A5: Provide Iron and Manganese Removal Technology for All Wells					
					Sub-option A5a: Centralized Removal Technology at Wells 1 & 2 Facility			Sub-option A5b: Decentralized Removal Technology at both Facilities		
					Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site	Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site
Technical Considerations	Flexibility	Flexibility in being able to meet future demands/expansion requirements; or future regulatory requirements	Ability to accommodate potential future development beyond current planning Ability to accommodate future removal technology Ability to comply with Health Canada Manganese and Enteric Virus Guidelines Ability to comply with MECP ToR: Determination of Minimum Treatment for Municipal Residential Drinking Water Systems using Subsurface Raw Water Supplies	Can accommodate potential future development as firm capacity exceeds projected Maximum Day Demand (MDD) if Well 1 is kept in service, and can accommodate the connection of new well at Well 3 Facility Should the system upgrades not address water quality issues, then removal technology could be installed at a later date Challenge to accommodate Health Canada Manganese Guidelines with Well 1 in service and heavy deposition in the distribution system Can accommodate Health Canada Enteric Virus Guidelines by adjusting the minimum free chlorine residual High probability to accommodate upcoming MECP ToR as wells are confirmed non-GUDI	Can accommodate potential future development as firm capacity exceeds projected MDD, and can accommodate the connection of new well at Well 3 Facility Can easily accommodate Health Canada Manganese Guidelines Can accommodate Health Canada Enteric Virus Guidelines by adjusting the minimum free chlorine residual High probability to accommodate upcoming MECP ToR as wells are confirmed non-GUDI	Can accommodate potential future development as firm capacity exceeds projected MDD, and can accommodate the connection of new well at Well 3 Facility Can easily accommodate Health Canada Manganese Guidelines Can accommodate Health Canada Enteric Virus Guidelines by adjusting the minimum free chlorine residual High probability to accommodate upcoming MECP ToR as wells are confirmed non-GUDI	Can accommodate potential future development as firm capacity exceeds projected MDD, and can accommodate the connection of new well at Well 3 Facility Can easily accommodate Health Canada Manganese Guidelines Can accommodate Health Canada Enteric Virus Guidelines by adjusting the minimum free chlorine residual High probability to accommodate upcoming MECP ToR as wells are confirmed non-GUDI	Can accommodate potential future development as firm capacity exceeds projected MDD, and can accommodate the connection of new well at Well 3 if planned during design Can easily accommodate Health Canada Manganese Guidelines Can accommodate Health Canada Enteric Virus Guidelines by adjusting the minimum free chlorine residual High probability to accommodate upcoming MECP ToR as wells are confirmed non-GUDI	Can accommodate potential future development as firm capacity exceeds projected MDD, and can accommodate the connection of new well at Well 3 if planned during design Can easily accommodate Health Canada Manganese Guidelines Can accommodate Health Canada Enteric Virus Guidelines by adjusting the minimum free chlorine residual High probability to accommodate upcoming MECP ToR as wells are confirmed non-GUDI	Can accommodate potential future development as firm capacity exceeds projected MDD, and can accommodate the connection of new well at Well 3 if planned during design Can easily accommodate Health Canada Manganese Guidelines Can accommodate Health Canada Enteric Virus Guidelines by adjusting the minimum free chlorine residual High probability to accommodate upcoming MECP ToR as wells are confirmed non-GUDI
				Least Preferred	**Most Preferred**	**Most Preferred**	**Most Preferred**	**Most Preferred**	**Most Preferred**	**Most Preferred**
Technical Considerations	Permits and Approvals	Ease of receiving permits and approvals, including the agency approvals necessary	MECP PTTW for Well addition or re-rating MECP DWTP/DWWP for addition of removal technology, including effluent discharge requirements MECP Amended Source Water Protection Plan Approval EASR - Construction dewatering LSRCA Permit under the Conservation Authorities Act and O.Reg.179/06 MECP/LSRCA ECA Review - Stormwater DFO Fisheries Act - Project review	No modification of PTTW Amendment of DWWP/MDWL to include modification of sodium silicate dosing systems	No modification of PTTW Amendment of DWWP/MDWL to include modification of sodium silicate dosing systems, removal technology and residual management system EASR for dewatering during construction not anticipated since groundwater table is below anticipated excavation	No modification of PTTW Amendment of DWWP/MDWL to include modification of sodium silicate dosing systems, removal technology and residual management system, including effluent discharge requirements, which requires additional data collection, assimilative capacity study and pre-consultation MECP/LSRCA ECA Review of Stormwater System EASR for dewatering during construction not anticipated since groundwater table is below anticipated excavation	No modification of PTTW Amendment of DWWP/MDWL to include modification of sodium silicate dosing systems, removal technology and residual management system, including effluent discharge requirements, which requires additional data collection, assimilative capacity study and pre-consultation MECP/LSRCA ECA Review of Stormwater System EASR for dewatering during construction not anticipated since groundwater table is below anticipated excavation	No modification of PTTW Amendment of DWWP/MDWL to include modification of sodium silicate dosing systems, removal technology and residual management system EASR for dewatering during construction not anticipated since groundwater table is below anticipated excavation	No modification of PTTW Amendment of DWWP/MDWL to include modification of sodium silicate dosing systems, removal technology and residual management system, including effluent discharge requirements, which requires additional data collection, assimilative capacity study and pre-consultation MECP/LSRCA ECA Review of Stormwater System LSRCA permit for works on regulated area Project Review by DFO EASR for dewatering during construction of the Well 3 Facility outfall	No modification of PTTW Amendment of DWWP/MDWL to include modification of sodium silicate dosing systems, removal technology and residual management system, including effluent discharge requirements, which requires additional data collection, assimilative capacity study and pre-consultation MECP/LSRCA ECA Review of Stormwater System LSRCA permit for works on regulated area Project Review by DFO EASR for dewatering during construction of the Well 3 Facility outfall
				Most Preferred	**Moderately Preferred**	**Least Preferred**	**Least Preferred**	**Moderately Preferred**	**Least Preferred**	**Least Preferred**
Economic Evaluation	Life Cycle Costs	Net Present Value Whole Life Cost	Initial capital investment, including engineering and construction costs. Commissioning of the asset and services, including testing, vesting and fit-out costs. Operational expenditure incurred throughout the life of the asset, including labour, power and consumables and asset monitoring. Asset decommissioning, disposal and revenue received through the disposal of	$ 453,938	$ 5,380,273	$ 6,884,142	$ 6,412,863	$ 9,976,553	$ 12,970,263	$ 10,709,394
				$ 3,214,485	$ 2,864,421	$ 2,325,694	$ 3,122,010	$ 3,202,603	$ 2,788,155	$ 3,584,472
				$ 3,668,423	$ 8,244,694	$ 9,209,836	$ 9,534,873	$ 13,179,157	$ 15,758,418	$ 14,293,865
				Most Preferred	**Moderately Preferred**	**Moderately Preferred**	**Moderately Preferred**	**Least Preferred**	**Least Preferred**	**Least Preferred**
			Total Score	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!

Comparative Evaluation of Alternative Solutions to Improve Water Quality

Comparative Criteria	Alternative A6: Provide Iron and Manganese Removal Technology at Wells 1&2 Facility and Continue Sequestration at Well 3 Facility			Alternative A7: Connect Well MW 18 to Mount Albert Water Supply System				
				Sub-option A7a: Replace Well 1 with Well MW18 and continue sequestration at both facilities	Sub-option A7b: Replace Wells 1 and 2 with Well MW18, re-rate Wells 3 and MW18, and continue sequestration	Sub-option A7c: Replace Well 1 with Well MW18, continue sequestration at Well 3 Facility, and provide iron and manganese removal technology at Wells 1 & 2 Facility		
	Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site			Alternative R1: Direct connection to sewer collection system	Alternative R2: On-site treatment with supernatant discharged to Vivian Creek and sludge discharged to sewer collection system	Alternative R3: On-site treatment with supernatant discharged to Vivian Creek and sludge hauled off-site
Technical Considerations	Can accommodate potential future development as firm capacity exceeds projected MDD, and can accommodate the connection of new well at Well 3 Facility Should the system upgrades not address water quality issues, then removal technology could be installed at a later date at Well 3 Facility if planned during design Challenge to accommodate Health Canada Manganese Guidelines with moderate deposition in the distribution system Can accommodate Health Canada Enteric Virus Guidelines by adjusting the minimum free chlorine residual High probability to accommodate upcoming MECP ToR as wells are confirmed non-GUDI	Can accommodate potential future development as firm capacity exceeds projected MDD, and can accommodate the connection of new well at Well 3 Facility Should the system upgrades not address water quality issues, then removal technology could be installed at a later date at Well 3 Facility if planned during design Challenge to accommodate Health Canada Manganese Guidelines with moderate deposition in the distribution system Can accommodate Health Canada Enteric Virus Guidelines by adjusting the minimum free chlorine residual High probability to accommodate upcoming MECP ToR as wells are confirmed non-GUDI	Can accommodate potential future development as firm capacity exceeds projected MDD, and can accommodate the connection of new well at Well 3 Facility Should the system upgrades not address water quality issues, then removal technology could be installed at a later date at Well 3 Facility if planned during design Challenge to accommodate Health Canada Manganese Guidelines with moderate deposition in the distribution system Can accommodate Health Canada Enteric Virus Guidelines by adjusting the minimum free chlorine residual High probability to accommodate upcoming MECP ToR as wells are confirmed non-GUDI	Can accommodate potential future development as firm capacity exceeds projected MDD Should the system upgrades not address water quality issues, then removal technology could be installed at a later date at all wells if planned during design Challenge to accommodate Health Canada Manganese Guidelines with moderate deposition in the distribution system Can accommodate Health Canada Enteric Virus Guidelines with the extension of chlorine contact tank and by adjusting the minimum free chlorine residual Probability to accommodate upcoming MECP ToR as existing wells are confirmed non-GUDI, but it may require reassessment since no historical data for new well	Cannot accommodate potential future development as firm capacity is the same as the projected MDD Should the system upgrades not address water quality issues, then removal technology could be installed at a later date at Well 3 Facility if planned during design Challenge to accommodate Health Canada Manganese Guidelines with moderate deposition in the distribution system Can accommodate Health Canada Enteric Virus Guidelines with the extension of chlorine contact tank and by adjusting the minimum free chlorine residual Probability to accommodate upcoming MECP ToR as existing wells are confirmed non-GUDI, but it requires probationary period of increased monitoring since no historical data for new well	Can accommodate potential future development as firm capacity exceeds projected MDD Should the system upgrades not address water quality issues, then removal technology could be installed at a later date at Well 3 Facility if planned during design Challenge to accommodate Health Canada Manganese Guidelines with moderate deposition in the distribution system Can accommodate Health Canada Enteric Virus Guidelines with the extension of chlorine contact tank and by adjusting the minimum free chlorine residual Probability to accommodate upcoming MECP ToR as existing wells are confirmed non-GUDI, but it may require reassessment since no historical data for new well	Can accommodate potential future development as firm capacity exceeds projected MDD Should the system upgrades not address water quality issues, then removal technology could be installed at a later date at Well 3 Facility if planned during design Challenge to accommodate Health Canada Manganese Guidelines with moderate deposition in the distribution system Can accommodate Health Canada Enteric Virus Guidelines with the extension of chlorine contact tank and by adjusting the minimum free chlorine residual Probability to accommodate upcoming MECP ToR as existing wells are confirmed non-GUDI, but it may require reassessment since no historical data for new well	Can accommodate potential future development as firm capacity exceeds projected MDD Should the system upgrades not address water quality issues, then removal technology could be installed at a later date at Well 3 Facility if planned during design Challenge to accommodate Health Canada Manganese Guidelines with moderate deposition in the distribution system Can accommodate Health Canada Enteric Virus Guidelines with the extension of chlorine contact tank and by adjusting the minimum free chlorine residual Probability to accommodate upcoming MECP ToR as existing wells are confirmed non-GUDI, but it may require reassessment since no historical data for new well
	Moderately Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred	Least Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred
Technical Considerations	No modification of PTTW Amendment of DWWP/MDWL to include modification of sodium silicate dosing systems, removal technology and residual management system EASR for dewatering during construction not anticipated since groundwater table is below anticipated excavation	No modification of PTTW Amendment of DWWP/MDWL to include modification of sodium silicate dosing systems, removal technology and residual management system, including effluent discharge requirements, which requires additional data collection, assimilative capacity study and pre-consultation MECP/LSRCA ECA Review of Stormwater System EASR for dewatering during construction not anticipated since groundwater table is below anticipated excavation	No modification of PTTW Amendment of DWWP/MDWL to include modification of sodium silicate dosing systems, removal technology and residual management system ECA for discharge to Vivian Creek, which requires additional data collection, assimilative capacity study and pre-consultation LSRCA ECA Review EASR for dewatering during construction not anticipated since groundwater table is below anticipated excavation	Amendment of PTTW to include Well MW18, which requires hydrogeological study and temporary PTTW Amendment of DWWP/MDWL to include of modification of chemical systems, new well, extension of chlorine contact tank EASR for dewatering during construction not anticipated since groundwater table is below anticipated excavation	Amendment of PTTW to include Well MW18 and re-rate Well 3, which requires hydrogeological study and temporary PTTW Amendment of DWWP/MDWL to include modification of chemical systems, new well, extension of chlorine contact tank, and modify Well 3 capacity EASR for dewatering during construction not anticipated since groundwater table is below anticipated excavation	Amendment of PTTW to include Well MW18, which requires hydrogeological study and temporary PTTW Amendment of DWWP/MDWL to include of chemical systems, new well, extension of chlorine contact tank, removal technology and residual management system EASR for dewatering during construction not anticipated since groundwater table is below anticipated excavation	Amendment of PTTW to include Well MW18, which requires hydrogeological study and temporary PTTW Amendment of DWWP/MDWL to include modification of chemical systems, new well, extension of chlorine contact tank, removal technology and residual management systemAmendment of DWWP/MDWL to include modification of sodium silicate dosing systems, removal technology and residual management system, including effluent discharge requirements, which requires additional data collection, assimilative capacity study and pre-consultation MECP Amended Source Water Protection Plan Approval EASR for dewatering during construction not anticipated since groundwater table is below anticipated excavation	Amendment of PTTW to include Well MW18, which requires hydrogeological study and temporary PTTW Amendment of DWWP/MDWL to include modification of chemical systems, new well, extension of chlorine contact tank, removal technology and residual management systemAmendment of DWWP/MDWL to include modification of sodium silicate dosing systems, removal technology and residual management system, including effluent discharge requirements, which requires additional data collection, assimilative capacity study and pre-consultation MECP Amended Source Water Protection Plan Approval EASR for dewatering during construction not anticipated since groundwater table is below anticipated excavation
	Moderately Preferred	Least Preferred	Least Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred	Least Preferred	Least Preferred
Economic Evaluation	$ 4,983,355	$ 6,487,224	$ 6,015,945	$ 3,517,744	$ 5,692,508	$ 8,056,202	$ 9,508,436	$ 8,979,114
	$ 3,214,796	$ 2,897,105	$ 3,428,486	$ 1,975,827	$ 1,975,827	$ 2,953,908	$ 2,850,042	$ 3,136,847
	$ 8,198,151	$ 9,384,329	$ 9,444,431	$ 5,493,571	$ 7,668,335	$ 11,010,111	$ 12,358,477	$ 12,115,961
	Moderately Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred	Moderately Preferred	Least Preferred	Least Preferred	Least Preferred
	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!

Comparative Criteria	Comparative Sub-Criteria	Description	Main Considerations for Each Criterion	B2: Rehabilitation of Mount Albert South Elevated Tank and Return it to Service	B3: Operate the Distribution System in Pressure Mode
Natural Environment	Aquatic Vegetation and Wildlife	Potential impact on local aquatic species and habitats, aquatic species at risk and locally significant aquatic species	Presence of aquatic species potentially affected temporarily and/or permanently Area of temporary or permanent loss of aquatic feature	No anticipated impacts on aquatic vegetation and wildlife and no loss of aquatic feature as works are undertaken within existing infrastructure	No anticipated impacts on aquatic vegetation and wildlife and no loss of aquatic feature as works are undertaken within existing infrastructure
				Most Preferred	**Most Preferred**
Natural Environment	Terrestrial Vegetation and Wildlife	Potential impact on local terrestrial species and habitats, designated areas, species at risk and locally significant species	Presence of terrestrial species potentially affected temporarily and/or permanently Area of temporary or permanent loss of terrestrial feature	No anticipated impacts on terrestrial vegetation and wildlife and no loss of terrestrial feature as works are undertaken within existing infrastructure	No anticipated impacts on terrestrial vegetation and wildlife and no loss of terrestrial feature as works are undertaken within existing infrastructure
				Most Preferred	**Most Preferred**
Natural Environment	Surface water	Potential impact on the quantity and quality of surface water	Temporarily and/or permanently changes in quantity and quality of surface water bodies, such as wetlands and streams Discharge of wastewater to local water receiving bodies	No anticipated impacts on surface water bodies as works are undertaken within existing infrastructure No anticipated wastewater discharge	No anticipated impacts on surface water bodies during construction as works are undertaken within existing infrastructure Significant operational water usage to avoid overpressurization during pressure mode operation and low demand periods expected to happen every 1 to 5 years depending on the level of iron and manganese deposition in the distribution system and storage
				Most Preferred	**Moderately Preferred**
Natural Environment	Groundwater	Potential impact on the quantity and quality of groundwater	Temporarily and/or permanently changes in groundwater takings quantity and/or location Threats to source water protection area Impact on private wells users	No anticipated changes on groundwater pumping rates and private well users during construction due to dewatering as works are undertaken within existing infrastructure	No anticipated changes on groundwater pumping rates and private well users during construction due to dewatering as works are undertaken within existing infrastructure
				Most Preferred	**Most Preferred**
Natural Environment	Soil and Geology	Geology, hydrogeology, contamination considerations	Potential contamination, erosion, impact on soil permeability	No anticipated impacts due soil contamination, erosion or modification of soil permeability as works are undertaken within existing infrastructure	No anticipated impacts due soil contamination and modification of soil permeability as works are undertaken within existing infrastructure Discharge of excess of water during pressure mode operation and low demand periods could cause localized erosion if the Stormwater system is overloaded
				Most Preferred	**Moderately Preferred**
Socio-cultural Environment	Archaeological Sites	Potential impact on registered/known archaeological features during construction or ongoing operations	Disruption of potential archeological resources	No anticipated impacts on archeological features as works are undertaken within existing infrastructure	No anticipated impacts on archeological features as works are undertaken within existing infrastructure
				Most Preferred	**Most Preferred**
Socio-cultural Environment	Cultural/Heritage Features	Potential impact on known cultural landscapes and built heritage features during construction or ongoing operations	Removal of area from cultural/heritage landscape	No anticipated impacts on cultural and heritage features as works are undertaken within existing infrastructure	No anticipated impacts on cultural and heritage features as works are undertaken within existing infrastructure
				Most Preferred	**Most Preferred**
Socio-cultural Environment	Impacts During Construction	Potential construction impacts due to noise, dust, odour or traffic	Effect of noise, vibration and dust on existing residences and agricultural land within the vicinity of Wells 1 & 2 Facility and Well 3 Facility and along Centre Road due to construction of new building, new yard piping, watermains or forcemain Temporary disruption of traffic Temporary disruption of existing utilities	Minor anticipated impacts on existing residences near Wells 1 & 2 Facility during the rehabilitation of South ET Minor anticipated disruption of traffic or existing utilities during the rehabilitation of South ET	No anticipated impacts on existing residences and agricultural land as works are undertaken within existing infrastructure No anticipated disruption of traffic or existing utilities
				Moderately Preferred	**Most Preferred**
Socio-cultural Environment	Long-Term Community Impact	Long-term impact on local community and business including land-use compatibility	Water quality impact on private fixtures and Point-of-Use (POU) softeners/filters Long-term impact on traffic, noise, vibration and dust on existing residences and agricultural land within the vicinity of Wells 1 & 2 Facility and Well 3 Facility Expansion of Wellhead Protection Area Change to approved land use designation Effect on active agricultural operations Ability to provide fire flow during North ET maintenance	No fire storage available and fire flow could not be adequately supplied when North ET is off-service, requiring the implementation of Fire Contingency plan.	No fire storage available and fire flow could not be adequately supplied when North ET is off-service, requiring the implementation of Fire Contingency plan
				Moderately Preferred	**Moderately Preferred**
Socio-cultural Environment	Planning Policy Compliance	Compliance with Local and Regional Planning Policies	Growth Plan for the Greater Golden Horseshoe (2019) Greenbelt Plan (2017) Oak Ridges Moraine Conservation Plan (2017) Lake Simcoe Protection Plan (2008) York Region Official Plan (2010) and Its Amendments 2016 Water and Wastewater Master Plan Update York Region Energy Conservation and Demand Management Plan (2019) York Region By-Law No. 2011-56 (quantity and quality, including iron, manganese, sulphate and sodium) Town of East Gwillimbury Official Plan (2010) and Its 2018 Consolidation East Gwillimbury Water & Wastewater Master Plan (2009)	Compliance with Provincial, Regional and Local Policies as works are undertaken within existing infrastructure and no water is wasted	Compliance with most Provincial, Regional and Local Policies as works are undertaken within existing infrastructure, as discharge of excess of water during pressure mode operation and low demand periods
				Most Preferred	**Moderately Preferred**
Technical Considerations	Ease of Implementation	Ease of implementation in terms of available space, accessibility, new infrastructure, constructability, easements, and land acquisition needs	Implementation in phases Construction complexity Effect on available space at each facility Construction on Region owned property or Right of Way (ROW) Need of property acquisition	South ET roof requires structural rehabilitation, and considering the tank age, it is possible the proposed repairs will not be sufficient to restore the South ET roof structural integrity No effect on available space at each facility and no need of property acquisition as works are undertaken within existing infrastructure	Hydraulic analysis and field testing required to validated the best strategy to bleed off the excess of water and confirm available fire flow during pressure-mode operation No effect on available space at each facility and no need of property acquisition as works are undertaken within existing infrastructure
				Least Preferred	**Moderately Preferred**

Comparative Evaluation of Alternative Solutions to Improve Feasibility of Storage Maintenance

Comparative Criteria	Comparative Sub-Criteria	Description	Main Considerations for Each Criterion	B2: Rehabilitation of Mount Albert South Elevated Tank and Return it to Service	B3: Operate the Distribution System in Pressure Mode
Technical Considerations	System Redundancy	Improvement in redundancy of supply/service	Infrastructure/equipment available (duty/standby) Longevity of supply (potential decline of well capacity/efficiency) Feasibility of contact tank and storage tank maintenance	Provides some redundancy of storage for emergency events, such as prolonged power loss, watermain breaks, during the maintenance of North ET	Storage volume for emergency events, such as prolonged power loss, watermain breaks, will not be available during the maintenance of North ET
				Most Preferred	**Least Preferred**
Technical Considerations	Reliability of Supply/Service	Ability to provide reliable/continuous service	Sequestration effectiveness Number of customer complaints (water quality and pressure) Capability to manage pressure issues (hydraulic grade) Ability of residual management system to consistently achieve effluent limits and reduce impact on surface water	Returning the South ET to service will considerably increase the water age in the distribution system, which may contribute to water quality issues related to chlorine residual decay South ET in service benefit areas with low pressure in the distribution network near the Wells 1 & 2 Facility Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Wells 1 and 2 when North ET water level is low	Operation in pressure mode benefit areas with low pressure in the distribution network near the Wells 1 & 2 Facility Low pressure areas modelled in vicinity of Well 1 & 2 Facility can be mitigated by prioritizing operation of Wells 1 and 2 when North ET water level is low
				Least Preferred	**Most Preferred**
Technical Considerations	Operations	Requirement for additional and new Operations resources at regional and municipal level. The complexity and operability of new assets.	Addition of removal technology and residual management, along with the need for specialized operation staff Ability to maximize operational flexibility Distribution system monitoring program to track sequestration Operational water usage (cleaning distribution system, backwashing)	Minor operational water usage for cleaning South ET Operational flexibility maximized	During the maintenance period, additional efforts required to modify operation and increase the demand in the system, either through community communication programs to increase water usage during low flow periods or by discharging excess flows through the system Significant operational water usage to avoid overpressurization during pressure mode operation and low demand periods expected to happen every 1 to 5 years depending on the level of iron and manganese deposition in the distribution system and storage Operational flexibility reduced
				Most Preferred	**Least Preferred**
Technical Considerations	Maintenance	Requirement for additional and new Maintenance resources at regional and municipal level. The complexity and maintainability of new assets.	Contact tank and storage cleaning frequency Raw watermain and distribution system cleaning frequency Addition of removal technology and residual management, along with the need for specialized maintenance staff	Additional maintenance effort required for maintain South ET	Minor additional equipment requiring additional maintenance effort
				Least Preferred	**Most Preferred**
Technical Considerations	Alignment with Other Infrastructure	Potential impacts on functions or performance of other infrastructure, such as wastewater, conveyance, transportation and utilities projects	Impact on Mt. Albert WRRF and SPS Connection to sanitary system Repurpose of transmission main Sustainable use of existing infrastructure (One Water Approach) Conflict with other existing or planned infrastructure, systems, or services	No impact on Mt. Albert WRRF and SPS No connection to sanitary system or repurpose of transmission main required Sustainable use of existing infrastructure as works are undertaken within existing infrastructure Conflict with other infrastructure project not identified at this moment	No impact on Mt. Albert WRRF and SPS No connection to sanitary system or repurpose of transmission main required Sustainable use of existing infrastructure as works are undertaken within existing infrastructure Conflict with other infrastructure project not identified at this moment
				Most Preferred	**Most Preferred**
Technical Considerations	Flexibility	Flexibility in being able to meet future demands/expansion requirements; or future regulatory requirements	Ability to accommodate potential future development beyond current planning Ability to accommodate future removal technology Ability to comply with Health Canada Manganese and Enteric Virus Guidelines Ability to comply with MECP ToR: Determination of Minimum Treatment for Municipal Residential Drinking Water Systems using Subsurface Raw Water Supplies	Can accommodate potential future development as storage capacity is increased Increase the water age in the distribution system with the return of South ET to service, which may contribute to water quality issues related to chlorine residual decay	Can accommodate potential future development, and with increase of demand, less water is wasted
				Least Preferred	**Moderately Preferred**
Technical Considerations	Permits and Approvals	Ease of receiving permits and approvals, including the agency approvals necessary	MECP PTTW for Well addition or re-rating MECP DWTP/DWWP for addition of removal technology, including effluent discharge requirements MECP Amended Source Water Protection Plan Approval EASR - Construction dewatering LSRCA Permit under the Conservation Authorities Act and O.Reg.179/06 MECP/LSRCA ECA Review - Stormwater DFO Fisheries Act - Project review	Requires maximum permitted taking flow condition to be temporarily waived during North ET maintenance in the event of a fire	Requires maximum permitted taking flow condition to be temporarily waived during North ET maintenance in the event of a fire
				Moderately Preferred	**Moderately Preferred**
Economic Evaluation	Life Cycle Costs	Net Present Value Whole Life Cost	Initial capital investment, including engineering and construction costs. Commissioning of the asset and services, including testing, vesting and fit-out costs. Operational expenditure incurred throughout the life of the asset, including labour, power and consumables and asset monitoring. Asset decommissioning, disposal and revenue received through the disposal of assets.	$ 888,477	$ 246,083
				$ 138,198	$ 93,975
				$ 1,026,675	$ 340,058
				Least Preferred	**Most Preferred**