

Appendix B Detailed Evaluation of Alternatives

B.1. Evaluation for the Short List of Alternatives

B.2. Preferred Solution Preliminary Detailed Cost Estimate

B.1. Evaluation for the Short List of Alternatives

Short List Evaluation			Option 4 - 150 mm Watermain, Fire Hydrants		Option 5 - 50 mm Watermain, Tanker Trucks		Option 6 - Private Servicing, Tanker Trucks	
Category	Criteria	Definition	Rationale	Score	Rationale	Score	Rationale	Score
Technical	Provides a Safe Drinking Water Supply	Provides residents a safe and reliable drinking water supply that meets provincial standards.	- Provides Town water supply via 150 mm watermain - Maintains suitable water supply directly from service connections off the 150 mm watermain - Provides acceptable water quality, pressures, and fire flow	5	- Provides Town water supply via 50 mm watermain - Maintains suitable water supply directly from service connections off the 50 mm watermain - Provides acceptable water quality, pressures, and fire flow via tanker trucks	5	- Provides Town water supply indirectly via bulk water delivery - Resident is responsible for routine water testing and adherence to standards	3
	Supports Fire Protection	Supports a level of fire protection that is considered suitable and achievable by the Town's Fire Department.	- Achieves fire protection using traditional fire hydrants - With 150 mm, modelling indicates entire route can achieve >50 L/s goal for fire flow at all hydrants - Improvement over existing conditions	5	- Achieves fire protection using tanker and pumper trucks with supply from Thunder Bay Road - Access challenges (road) to be improved with turn-around areas	2	- Achieves fire protection using tanker and pumper trucks with supply from Thunder Bay Road - Access challenges (road) to be improved with turn-around areas	2
	Minimizes Operations and Maintenance Risks	Reduces issues related to maintenance requirements, access issues, and water quality management needs.	- Access for operations and maintenance improved with new watermain location - Water quality improved as shown through modelling. New 150 mm creates through flow from east to west - Negligible flushing expected based on modelling, due to "through-flow"	4	- Access for operations and maintenance improved with new watermain location - Water quality improved as shown through modelling. New 50 mm is consumed by natural demand from customers in the area. - Negligible flushing expected due to reduced overall volume of water in the system	4	- No further access or operations and maintenance issues as municipal watermain is removed on Colony Rd, Windmill Pt Ln E/W and Staniland Park Rd - Potential for flushing required at new dead end on Windmill Pt Rd S - Water quality dependent on regular maintenance and filtration coordinated by residents - Access challenges (road) for water deliveries	3
	Minimizes Conflict with Existing Infrastructure	Adheres to relevant requirements for construction and operation within proximity to existing infrastructure, utilities, and private properties.	- New watermain along right of way. Limited conflicts expected with existing infrastructure. - New service connections needed since watermain would be relocated to north side of homes (moderate impact to private properties)	4	- New watermain along right of way. Limited conflicts expected with existing infrastructure. - New service connections needed since watermain would be relocated to north side of homes (moderate impact to private properties)	4	- No new infrastructure along right of way, except for turnaround areas for tanker trucks - New cisterns to be located within each individual private property. Presents potential for various challenges with location due to site constraints (minimum setback requirements between cisterns and septic beds). Location to be evaluated for each property.	2
	Complexity of Implementation	Minimizes risk associated with constructability such as scope, time required construction, feasibility of design, flexibility in project timing and phasing, etc.	- Construction risk can be mitigated through choice of construction methodology - Potential challenges with access to private properties with single access to property - Open cut construction with slower construction schedule to allow for continued access to private property	3	- Construction risk can be mitigated through choice of construction methodology - Potential challenges with access to private properties with single access to property - Trenchless construction will require less open cut construction, but likely still some challenges with continued access to homes for launch pits and staging areas	2	- Construction risk associated with finding appropriate cistern sites for each property - Varied potential challenges with siting cistern locations (sand dunes in some areas, septic locations unknown on property, built up properties have various structures, dense vegetation) - Cisterns may require deep excavation to avoid freezing risks	2
	Ease of Property / Land Acquisition	Minimizes disruption to implementation process due to property and land acquisition requirements (expropriation of land / land purchase, temporary / permanent easements).	- Majority of construction dedicated to private right of way - Some work to be planned within properties, including new service connections - New easements required - Removal/abandonment of existing watermain required	3	- Majority of construction dedicated to private right of way - Some work to be planned within properties, including new service connections - New easements required - Removal/abandonment of existing watermain required	3	- Majority of construction within private properties - Land is required within private property for cistern installation - No expropriation of land / easements required as cistern will become property of the homeowner. - Permitting may need to be completed by the Town for the residents	3
	Total Score			24		20		15
	Weighted Score (30%)			24		20		15

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Category	Criteria	Definition	Rationale	Score	Rationale	Score	Rationale	Score
Environmental	Minimizes Impact to Environmental and Natural Heritage Features	Limits disruption to existing environmental features, and ensures the preservation and protection of aquatic resources and natural features within the affected environment. Minimizes loss of mature trees and other vegetation. Considers impact to climate change and GHG emissions.	- Several significant features in the Study Area, including Provincially Significant Wetlands as part of Six Mile Creek Wetland Complex, Significant Woodlands, Significant Valleylands and Fish Habitat associated with Six Mile Creek, white-tailed deer wintering area, waterfowl winter concentration area (on the shoreline of Lake Erie) - Open cut construction mainly along road right of way expected to lead to some loss of mature trees / vegetation. - Impacts to be mitigated through construction methodology to avoid impact to natural heritage where possible. - Offsetting for removed trees will be considered - GHG emissions related to construction activities - Six Mile Creek will be tunnelled, with shaft locations outside the floodplain to avoid impacts to this feature	2	- Several significant features in the Study Area, including Provincially Significant Wetlands as part of Six Mile Creek Wetland Complex, Significant Woodlands, Significant Valleylands and Fish Habitat associated with Six Mile Creek, white-tailed deer wintering area, waterfowl winter concentration area (on the shoreline of Lake Erie) - Smaller diameter watermain allows for more trenchless construction; however, number of bends along the route means there will still be launch / receiving shaft locations for drilling (likely outside of the road ROW) and some areas of open cut construction. Expected to lead to loss of mature trees / vegetation - Impacts to be managed through construction methodology to avoid impact to natural heritage where possible - Offsetting for removed trees will be considered - GHG emissions related to construction activities - Six Mile Creek will be tunnelled, with shaft locations outside the floodplain to avoid impacts to this feature	2	- Several significant features in the Study Area, including Provincially Significant Wetlands as part of Six Mile Creek Wetland Complex, Significant Woodlands, Significant Valleylands and Fish Habitat associated with Six Mile Creek, white-tailed deer wintering area, waterfowl winter concentration area (on the shoreline of Lake Erie) - Need for installation of cisterns on every private property will likely lead to some loss of mature trees / vegetation due to limitations in siting cisterns in built up properties with nearby septic tanks/beds - Impacts to be mitigated through siting of cistern locations - GHG emissions related to construction activities; ongoing filling of cisterns has GHG emissions due to bulk water trucks - Installation of cisterns may result in impacts to sand dunes which may require mitigation	3
	Protects Wildlife and Species at Risk (SAR)	Minimizes potential impact to wildlife including SAR within the affected area and construction zone. Implementation should minimize effects on function of habitat (i.e.. Nesting sites, hibernation areas, foraging areas, areas of significant wildlife travel) for locally significant wildlife, including endangered or threatened species.	- Study Area is habitat for endangered and threatened species - Open cut construction has potential for greatest impact to function of habitat for locally significant wildlife. Avoidance of impact is difficult, and impacts will likely require mitigation or offsetting	2	- Study Area is habitat for endangered and threatened species - Trenchless construction provides opportunity to reduce impact to function of habitat for locally significant wildlife, however due to the turns in the alignment, additional shaft location will be required which will likely be outside the road right of way. Avoidance of impact is difficult, and impacts will likely require mitigation or offsetting	2	- Study Area is habitat for endangered and threatened species - Siting of cistern location is specific to each private property and provides opportunity to reduce impact to function of habitat for locally significant wildlife	3
	Total Score			4		4		6
	Weighted Score (30%)			12		12		18

Short List Evaluation			Option 4 - 150 mm Watermain, Fire Hydrants		Option 5 - 50 mm Watermain, Tanker Trucks		Option 6 - Private Servicing, Tanker Trucks	
Category	Criteria	Definition	Rationale	Score	Rationale	Score	Rationale	Score
Social / Cultural	Manages and Minimizes Construction (Short-term) Impacts	Limits disruption to Indigenous Communities and their lands as well as residents caused by construction works, including creation of noise / dust / vibrations, impact to traffic flow, limited access to properties (temporary), etc.	- Construction primarily along narrow right of way with single in/out access. Limited access to private properties during construction - Longer construction length (6-8 months) to ensure continued access to private properties during construction - New service lines to customers required with some impact within private property boundary - Long-term aesthetics have minimal impact to residents - Potential disruption in accessing traditional lands for hunting, fishing and gathering purposes	3	- Construction primarily along narrow right of way with single in/out access. Potential for limited access to private properties during construction - Moderate construction length (4-6 months) to ensure continued access to private properties during construction - New service lines to customers required with some impact within private property boundary - Access road improvements required to help support turnaround points for tanker trucks - Long-term aesthetics have minimal impact to residents - Potential disruption in accessing traditional lands for hunting, fishing and gathering purposes	3	- Construction is within private property. Scheduling can mitigate impact to each property owner - Access road improvements required to help support turnaround points for tanker trucks - Difficult constructability - Potential for increased difficulty in coordinating works for all individual properties	1
	Manages and Minimizes Long-term Impacts to Indigenous Communities and Residents	Minimizes long-term impacts to Indigenous Communities and their land as well as existing and / or future residents including service disruption, traffic, aesthetics, and landscaping. Limits / mitigates impacts on internal plumbing service.	- Residents heavily supportive of maintaining fire protection via hydrants - Residents supportive of maintaining Town water supply - Long-term aesthetics have minimal impact to residents - Potential impacts to landscapes and features that are culturally and naturally significant to Indigenous Communities, however impacts can be mitigated - Six Mile Creek will be tunnelled, with shaft locations outside the floodplain to avoid impacts to this feature	3	- Residents generally not supportive of removing hydrants; perceived as less advantageous for home insurance and property value - Residents supportive of maintaining Town water supply - Potential impacts to landscapes and features that are culturally and naturally significant to Indigenous Communities, however impacts can be mitigated - Six Mile Creek will be tunnelled, with shaft locations outside the floodplain to avoid impacts to this feature	3	- Residents generally not supportive of removing hydrants; perceived as less advantageous for home insurance and property value - Cistern on property has potential to impact landscaping depending on location - New plumbing required, with some impacts to property	2
	Protects Archaeological and Cultural Heritage Features	Limits potential impacts to areas previously determined to have high archeological potential, moderate / unknown archeological potential, or low / no archeological potential; limits potential impacts to a structure, property, district, feature, or landscape that has been previously identified to be of cultural heritage value or interest; limits potential impacts to Indigenous Peoples, including areas of cultural significance.	- Study Area exhibits archaeological potential - Stage 2 archeological assessment is required, however works will mainly be located within the road (previously disturbed land) - Open cut construction presents the largest risk to archaeological features - No known built heritage resources or cultural heritage landscapes are present in the Study Area - Areas of potential heritage sensitivity include: a tributary to Six Mile Creek, the historical location of the windmill/gristmill on the shoreline, and the northeastern corner of the study area where early residential structures may be present. Avoidance of these areas will eliminate potential impact and requirement to complete field survey - Study Area is in an archaeologically sensitive area, which has potential for significant impact to Indigenous Peoples if artifacts are present - Mitigation and offsetting likely required for any vegetation that is removed during construction - Six Mile Creek will be tunnelled, with shaft locations outside the floodplain to avoid impacts to this feature	2	- Study Area exhibits archaeological potential - Stage 2 archeological assessment is required for shaft locations outside the road - Potential impact can be mitigated by trenchless construction - No known built heritage resources or cultural heritage landscapes are present in the Study Area - Areas of potential heritage sensitivity include: a tributary to Six Mile Creek, the historical location of the windmill/gristmill on the shoreline, and the northeastern corner of the study area where early residential structures may be present. Avoidance of these areas will eliminate potential impact and requirement to complete field survey - Study Area is in an archaeologically sensitive area, which has potential for significant impact to Indigenous Peoples if artifacts are present - Potential impact can be avoided by trenchless construction. Mitigation and offsetting of impact may also be employed - Six Mile Creek will be tunnelled, with shaft locations outside the floodplain to avoid impacts to this feature	2	- Study Area exhibits archaeological potential - Stage 2 archeological assessment is required - No known built heritage resources or cultural heritage landscapes are present in the Study Area - Areas of potential heritage sensitivity include: a tributary to Six Mile Creek, the historical location of the windmill/gristmill on the shoreline, and the northeastern corner of the study area where early residential structures may be present. Avoidance of these areas will eliminate potential impact and requirement to complete field survey - Study Area is in an archaeologically sensitive area, which has potential for significant impact to Indigenous Peoples if artifacts are present - Mitigation and offsetting may be required for any vegetation that is removed during construction	2
	Total Score			8		8		5
	Weighted Score (20%)			10.666667		10.666667		6.666667

Short List Evaluation			Option 4 - 150 mm Watermain, Fire Hydrants		Option 5 - 50 mm Watermain, Tanker Trucks		Option 6 - Private Servicing, Tanker Trucks	
Category	Criteria	Definition	Rationale	Score	Rationale	Score	Rationale	Score
Financial	Minimizes Capital Cost	Minimizes the capital cost	- Approximate cost to Town is \$3.8M - Cost estimate more than 40% higher than Option 6 - Consideration for costs related to approvals, permitting, compensation and mitigation	3	- Approximate cost to Town is \$6.6M - Cost estimate more than 2x the estimate for Option 6, and 2x the estimate for Option 4 due to increased shaft locations and tunnelling of alignment - Consideration for costs related to approvals, permitting, compensation and mitigation	2	- Lowest capital cost - Assuming \$20,000-30,000 per property for each cistern installation including cistern delivery, excavation and basic landscaping to pre-existing condition, and installation of internal pump and pressure system - Approximate cost to Town is \$3.5M	3
	Minimizes Operations & Maintenance Costs	Minimizes operations and maintenances costs	- Low operations and maintenance cost for the Town. Flushing not expected; non-revenue water reduced	4	- Low operations and maintenance cost for the Town. Flushing not expected; non-revenue water reduced	4	- Operations and maintenance costs are responsibility of homeowner, with no cost to the Town - No flushing; non-revenue water reduced - Loss of revenue from base water rates (~\$26k annual lost revenue) - Meter replacement not required (every 10-12 years)	4
	Total Score			7		6		7
	Weighted Score (20%)			14		12		14
	Total Score			60.7		54.7		53.7
	Rank			1		2		3

B.2. Preferred Solution Preliminary Detailed Cost Estimate

Town of Fort Erie
Beachfront Water Servicing Strategy in the Area of Colony Rd, Windmill Point Ln E/W and Staniland Park Rd
Preliminary Detailed Cost Estimate

Preferred Solution (Option 4) - Open-Cut Watermain Construction						
Item No.	Description	Quantity	Unit	Unit Price	Total Amount	Quantity/Cost Basis
A General Items						
A-1	General Items (Incl. Bonding, Preconstruction Survey, Site Office, Construction Layout, Erosion and Sediment Control Measures, Traffic Control, Etc.)	1	LS	\$ 225,000	\$ 225,000	Estimated as Approx. 10% of Sections B, and C
Sub-Total - A - General Items					\$ 225,000	
B Road Restoration						
B-1	Removals (Asphalt and road base over open-cut installation)	1	LS	\$ 100,000	\$ 100,000	Based on similar previous project
B-2	40mm Thick HL3-HS Asphalt	200	tonne	\$ 250	\$ 50,000	Based on the trench restoration and the standard pavement structure for Town of Fort Erie
B-3	50mm Thick HL8-HS Asphalt	200	tonne	\$ 250	\$ 50,000	Based on the trench restoration and the standard pavement structure for Town of Fort Erie
B-4	450mm Thick Granular Material	1,500	tonne	\$ 50	\$ 75,000	Based on the trench restoration and the standard pavement structure for Town of Fort Erie. 25% allowance included for excess granular used based on previous NPSCD Detailed Design Estimates.
Sub-Total - B - Road Restoration					\$ 275,000	
C Watermain						
C-1	Granular Backfill	4,800	tonne	\$ 50	\$ 240,000	Granular material is required to backfill the proposed watermain trench under the existing road.
C-2	Supply and Install 150mm dia. Watermain	2750	m	\$ 400	\$ 1,100,000	Based on previous detailed design projects for open-cut watermain installation.
C-3	Proposed Hydrant Installation (Open-Cut)	17	each	\$ 7,500	\$ 127,500	Hydrant set includes anchor tee and valve and is expected to be installed via open cut with typical spacing of 150m for residential areas.
C-4	Proposed Service Installation (Open-Cut)	84	each	\$ 2,000	\$ 168,000	Proposed water service connections are expected to be installed up to a maximum of 10 m.
C-5	Trenchless crossing of Six Mile Creek including the construction of launching and receiving shafts and the supply and installation of 150mm ID fusible watermain	1	LS	\$ 300,000	\$ 300,000	Crossing Six Mile Creek requires approximately 50m of trenchless construction. Jack and Bore or HDD are ideal trenchless methods for this crossing.
Sub-Total - C - Watermain					\$ 1,935,500	
Sub-Total Construction (Sections A + B + C)					\$ 2,435,500	
	Engineering Costs (12% Total for Engineering and Construction Phases)	1	LS	\$ 295,000	\$ 295,000	Based on on recent projects
Sub-Total - Construction + Engineering					\$ 2,730,500	
	40% Contingency (For Class 4 Cost Estimate)	1	LS	\$ 1,095,000	\$ 1,095,000	
Total Project Budget Cost					\$ 3,825,500	
Expected Accuracy Range		<i>High Range (+30%)</i>		\$	4,980,000	Expected accuracy range based on the accuracy range for AACE Class 4 cost estimates. (L: -10% to 20%, H: +20% to +30%);
		<i>Mid Range (+10%)</i>		\$	4,200,000	
		<i>Low Range (-10%)</i>		\$	3,440,000	