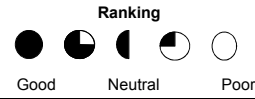


**WATERLOO SANITARY MASTER PLAN
VOLUME 1**

APPENDIX C

DETAILED EVALUATION OF ALTERNATIVES

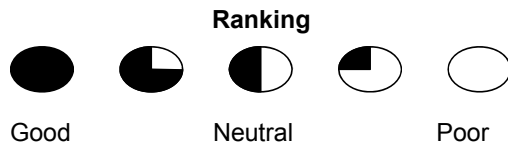
Table C1: Detailed Evaluation of Alternatives for Private Servicing Categories



Ranking			Servicing Alternative					
			1. Within Wellhead Protection Areas		2. Outside Wellhead Protection Areas		3. Industrial/Commercial Properties	
			1A	1B	2A	2B	3A	3B
Category	Criteria	Weight	Do Nothing	Municipal Servicing	Do Nothing	Municipal Servicing	Do Nothing	Municipal Servicing
Technical	Hydraulic Improvements	1						
	Operations and Maintenance	1						
	System Resiliency	1						
Ease of Implementation	Constructability	1						
	Regulatory Considerations	1	-	-	-	-	-	-
Social	Impact for Surrounding Residents	1						
System Suitability	Consistency with Planned Upgrades	1						
	Consistency with Operating Strategies	1						
Environment/Sustainability	Carbon Footprint	1						
	Impact on Terrestrial/Aquatic Systems	1						
Financial	Capital Cost	1						
	Operating and Maintenance Cost	1						
Total Score			5 1/2	6	5 1/2	5 3/4	5 1/2	6 1/4

Comments		Servicing Alternative					
		1. Within Wellhead Protection Areas		2. Outside Wellhead Protection Areas		3. Industrial/Commercial Properties	
		1A	1B	2A	2B	3A	3B
Category	Criteria	Do Nothing	Municipal Servicing	Do Nothing	Municipal Servicing	Do Nothing	Municipal Servicing
Technical	Hydraulic Improvements	Poor	Improvement	Poor	Improvement	Poor	Improvement
	Operations and Maintenance	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
	System Resiliency	Poor - limited resiliency	Increased resiliency	Poor - limited resiliency	Increased resiliency	Poor - limited resiliency	Increased resiliency
Ease of Implementation	Constructability	Neutral - no change	Neutral - site specific	Neutral - no change	Neutral - site specific	Neutral - no change	Neutral - site specific
	Regulatory Considerations	N/A	N/A	N/A	N/A	N/A	N/A
Social	Impact for Surrounding Residents	Good - no impact to residents, however, do not receive improved municipal service	Upfront cost and construction can be expected to result in resistance from impacted residents	Good - no impact to residents, however, do not receive improved municipal service	Upfront cost and construction can be expected to result in resistance from impacted residents	Good - no impact to residents, however, do not receive improved municipal service	Upfront cost and construction can be expected to result in resistance from impacted residents
System Suitability	Consistency with Planned Upgrades	Neutral - site specific	Neutral - site specific	Neutral - site specific	Neutral - site specific	Neutral - site specific	Neutral - site specific
	Consistency with Operating Strategies	Neutral - site specific	Neutral - site specific	Neutral - site specific	Neutral - site specific	Neutral - site specific	Neutral - site specific
Environment/Sustainability	Carbon Footprint	Poor - regular septage pumping/trucking results in GHG emissions	Neutral - site specific. Reduced septage pumping/trucking reduces GHG emissions if gravity sewer connection is possible. Addition of SPS may increase or be the same as existing GHG emissions	Poor - regular septage pumping/trucking results in GHG emissions	Neutral - site specific. Reduced septage pumping/trucking reduces GHG emissions if gravity sewer connection is possible. Addition of SPS may increase or be the same as existing GHG emissions	Poor - regular septage pumping/trucking results in GHG emissions	Good - site is located in close proximity to supporting natural feature.
	Impact on Terrestrial/Aquatic Systems	Poor - current state represents an increased risk for sewage spills and leaks to the environment	Reduced impact - reduces chances for septage spill/overflow in environmentally protected area. Spills could impact water supply	Poor - current state represents an increased risk for sewage spills and leaks to the environment	Reduced impact - reduces chances for septage spill/overflow in the environment.	Poor - current state represents an increased risk for sewage spills and leaks to the environment	Reduced impact - reduces chances for septage spill/ overflow into the environment
Financial	Capital Cost	Good - no current costs to the City, responsibility of property owners	Poor - high initial capital investment of new infrastructure and large number of sites in this category. Cost sharing with properties possible	Good - no current costs to the City, responsibility of property owners	Poor - high initial capital investment of new infrastructure and large number of sites in this category. Cost sharing with properties possible	Good - no current costs to the City, responsibility of property owners	good - site is located in close proximity municipal servicing. Cost sharing with properties possible
	Operating and Maintenance Cost	Good - no current costs to the City, responsibility of property owners	Poor - additional infrastructure will have costs over lifetime, whether pipes or SPS at large number of sites in this category	Good - no current costs to the City, responsibility of property owners	Poor - additional infrastructure will have costs over lifetime, whether pipes or SPS at large number of sites	Good - no current costs to the City, responsibility of property owners	neutral - additional infrastructure will have costs over lifetime, whether pipes or SPS, but limited infrastructure required

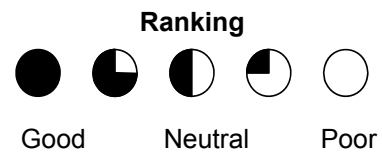
Table C2: Detailed Evaluation of Maple Hill Trunk Alternatives



Ranking		Alternative			
		Maple Hill Trunk Capacity			
		4A	4B	4C	4D
Category	Criteria	Do Nothing	Twin Sewer Section	Replace Sewer Section	Divert Flow
Technical	Hydraulic Improvements				
	Operations and Maintenance				
	System Resiliency				
Ease of Implementation	Constructability				
	Regulatory Considerations				
Social	Impact for Surrounding Residents				
System Suitability	Consistency with Planned Upgrades				
	Consistency with Operating Strategies				
Environment/ Sustainability	Carbon Footprint				
	Impact on Terrestrial/ Aquatic Systems				
Financial	Capital Cost				
	Operating and Maintenance Cost				
Total Score		6	6 3/4	7 1/4	8 1/4

Comment		Alternative			
		Maple Hill Trunk Capacity			
		4A	4B	4C	4D
Category	Criteria	Do Nothing		Replace Sewer Section	Divert Flow
Technical	Hydraulic Improvements	poor - continued capacity constraint	good - address hydraulic constraint	good - address hydraulic constraint	good - address hydraulic constraint temporarily
	Operations and Maintenance	poor - risk of surcharging, additional maintenance	neutral - no change	neutral - no change	neutral - no change
	System Resiliency	poor - capacity constraint identified under wet weather	good - improved resiliency under wet weather conditions	good - improved resiliency under wet weather conditions	good - improved resiliency under wet weather conditions
Ease of Implementation	Constructability	good - no construction required	poorer - easement width may not permit construction	poor - requires bypass pumping	good - reconfigure one manhole, required bypass pumping
	Regulatory Considerations	neutral - no change	poor - easement boundaries may be limitation	neutral - no change	neutral - no change
Social	Impact for Surrounding Residents	neutral - no change; no nearby residents	neutral - no change	neutral - no change	neutral - no change
System Suitability	Consistency with Planned Upgrades	poor - capacity constraint identified	good - addresses capacity constraint	good - addresses capacity constraint	good - addresses capacity constraint
	Consistency with Operating Strategies	poor - capacity constraint identified	good - no changes to operations	good - no changes to operations	neutral - alters existing operating strategy, but not negative
Environment/ Sustainability	Carbon Footprint	good - use of existing infrastructure	poor - additional pipe section	poor - replace pipe section	good - use of existing infrastructure
	Impact on Terrestrial/ Aquatic Systems	poor - increased risk of spills to environment	good - reduces risk of spills to the environment; same footprint	good - reduces risk of spills to the environment; same footprint	good - no construction through easement, near creek
Financial	Capital Cost	good - no capital cost	poor - capital cost of twinned section, no bypass pumping	poor - capital cost of replacement and bypass pumping	good - capital cost includes manhole reconfiguration and bypass pump
	Operating and Maintenance Cost	neutral - no change	neutral - no change	neutral - no change	neutral - no significant change

Table C3: Detailed Evaluation of Downstream Frobisher SPS Alternatives

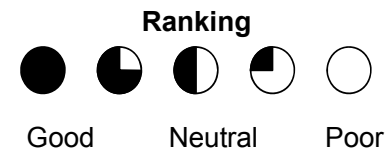


Ranking		Alternative		
		Downstream of Frobisher SPS		
		5A	5B	5C
Category	Criteria	Do Nothing	Twin Sewer	Replace Sewer Section
Technical	Hydraulic Improvements			
	Operations and Maintenance			
	System Resiliency			
Ease of Implementation	Constructability			
	Regulatory Considerations	-	-	-
Social	Impact for Surrounding Residents			
System Suitability	Consistency with Planned Upgrades			
	Consistency with Operating Strategies			
Environment/Sustainability	Carbon Footprint			
	Impact on Terrestrial/Aquatic Systems			
Financial	Capital Cost			
	Operating and Maintenance Cost			
Total Score		5	5 3/4	6 3/4

*when would you want to twin vs just replace section of pipe?

Comment		Alternative		
		Downstream of Frobisher SPS		
		5A	5B	5C
Category	Criteria	Do Nothing	Twin Sewer	Replace Sewer Section
Technical	Hydraulic Improvements	poor - continued capacity constraint	good - address hydraulic constraint	good - address hydraulic constraint
	Operations and Maintenance	poor - risk of surcharging	neutral - no change	good - removed old pipe from system
	System Resiliency	poor - capacity constraint identified under wet weather	good - address hydraulic constraint	good - address hydraulic constraint
Ease of Implementation	Constructability	good - no construction required	neutral - no change	neutral - less disruptive, less risk of utility conflicts
	Regulatory Considerations	N/A	N/A	N/A
Social	Impact for Surrounding Residents	poor - may result in increase basement flooding	poorer - disruption to traffic	poorer - disruption to traffic
System Suitability	Consistency with Planned Upgrades	poor - capacity constraint identified	good - addresses capacity constraint	good - addresses capacity constraint
	Consistency with Operating Strategies	poor - capacity constraint identified	good - no changes to operations	good - no changes to operations
Environment/Sustainability	Carbon Footprint	good - use of existing infrastructure	poorer - adding additional pipe	poorer - replace pipe section
	Impact on Terrestrial/Aquatic Systems	poor - increased risk of spills to environment	good - reduces risk of spills to the environment; same footprint	good - reduces risk of spills to the environment; same footprint
Financial	Capital Cost	good - no capital cost	poor - capital cost of twinned sewer	poor - capital cost of replacement
	Operating and Maintenance Cost	neutral - no change	poor - additional pipe to maintain	neutral - no change

Table C4: Detailed Evaluation of Lower Forwell Alternatives



Ranking		Alternative		
		Lower Forwell Trunk		
		6A	6B	6C
Category	Criteria	Do Nothing	Twin Sewer	Replace Sewer Section
Technical	Hydraulic Improvements			
	Operations and Maintenance			
	System Resiliency			
Ease of Implementation	Constructability			
	Regulatory Considerations			
Social	Impact for Surrounding Residents			
System Suitability	Consistency with Planned Upgrades			
	Consistency with Operating Strategies			
Environment/ Sustainability	Carbon Footprint			
	Impact on Terrestrial/ Aquatic Systems			
Financial	Capital Cost			
	Operating and Maintenance Cost			
Total Score		7 1/4	5 1/4	6

Comment		Alternative		
		Lower Forwell Trunk		
		6A	6B	6C
Category	Criteria	Do Nothing	Twin Sewer	Replace Sewer Section
Technical	Hydraulic Improvements	poor - continued capacity constraint; necessary for growth	good - address hydraulic constraint	good - Opportunity to increase slope
	Operations and Maintenance	poor - risk of surcharge	neutral - no change	good - removed old pipe from system
	System Resiliency	poor - capacity constraint identified under wet weather	good - address hydraulic constraint	good - address hydraulic constraint
Ease of Implementation	Constructability	good - no construction required	neutral - no change	neutral - less disruptive, less risk of utility conflicts
	Regulatory Considerations	Neutral	poor - environmentally sensitive area	poor - environmentally sensitive area
Social	Impact for Surrounding Residents	good - low risk of basement flooding	poorer - may impact use of trails	poorer - may impact use of trails
System Suitability	Consistency with Planned Upgrades	poor - capacity constraint identified	good - addresses capacity constraint	good - addresses capacity constraint
	Consistency with Operating Strategies	poor - capacity constraint identified	good - no changes to operations	good - no changes to operations
Environment/ Sustainability	Carbon Footprint	neutral - use of existing infrastructure	poorer - adding additional pipe	poorer - replace pipe section
	Impact on Terrestrial/ Aquatic Systems	good - low risk of spills to environment, no construction required	poor - environmentally sensitive area	poor - environmentally sensitive area
Financial	Capital Cost	good - no capital cost	poor - capital cost of twinned sewer	poor - capital cost of replacement
	Operating and Maintenance Cost	neutral - no change	poor - additional pipe to maintain	neutral - no change