Appendix P

Evaluation of Alternative Design Concepts

Kennedy Road EA Study - Evaluation of Alternative Design Concepts

	Criteria for Evaluating Alternatives	Indicators	**Alternative Design Concept 1** Construction of typical 4-lane road with 3.0 m median island.	**Alternative Design Concept 2** Construction of typical 4-lane road with 5.0 m median island.	**Alternative Design Concept 3** Construction of typical 4-lane road with narrow marked median.
A	**Natural Environment**				
1	**Potential impact to vegetation and designated natural features**	- Removal of existing trees and vegetation. - Disturbance to significant woodlands and wetlands. - Opportunities to improve canopy within ROW through Regional street trees.	Potential impact to lands in the Protected Countryside designation of the Greenbelt Plan and within the NHS area as defined by the Greenbelt Plan, located in northern portion of the corridor, north of Elgin Mills Road. Potential impact to the edge of a wooded area located within the central portion of the study area. Impact to vegetation adjacent to the existing road and within the expanded right-of-way. Full form trees can be provided in boulevard.	Potential impact to lands in the Protected Countryside designation of the Greenbelt Plan and within the NHS area as defined by the Greenbelt Plan, located in northern portion of the corridor, north of Elgin Mills Road. Potential impact to the edge of a wooded area located within the central portion of the study area. Impact to vegetation adjacent to the existing road and within the expanded right-of-way. Full form trees can be provided in boulevard. Opportunities to provide additional tree canopy cover from the tree median.	Potential impact to lands in the Protected Countryside designation of the Greenbelt Plan and within the NHS area as defined by the Greenbelt Plan, located in northern portion of the corridor, north of Elgin Mills Road. Potential impact to the edge of a wooded area located within the central portion of the study area. Impact to vegetation adjacent to the existing road and within the expanded right-of-way. Full form trees can be provided in boulevard.
	Rating		Somewhat Preferred	More Preferred	Somewhat Preferred
2	**Potential impact to wildlife**	- Effect on wildlife and habitat. - Changes to habitat connectivity.	A wider corridor may impact general connectivity of wildlife habitat. Impact not anticipated to be significantly greater than existing conditions.	A wider corridor may impact general connectivity of wildlife habitat. Impact not anticipated to be significantly greater than existing conditions.	A wider corridor may impact general connectivity of wildlife habitat. Impact not anticipated to be significantly greater than existing conditions.
	Rating		Somewhat Preferred	Somewhat Preferred	Somewhat Preferred
3	**Potential impact to aquatic habitat**	- Change or removal of existing aquatic habitat.	With appropriate mitigation measures, minimal impact to aquatic habitat in Bruce Creek is anticipated.	With appropriate mitigation measures, minimal impact to aquatic habitat in Bruce Creek is anticipated.	With appropriate mitigation measures, minimal impact to aquatic habitat in Bruce Creek is anticipated.
	Rating		More Preferred	More Preferred	More Preferred
4	**Potential impact to species at risk**	- Effects on SAR habitat.	Potential for indirect impact to Redside Dace habitat (sedimentation) within Bruce Creek, adjacent to the corridor, north of Elgin Mills Road. Impact to potential individual SAR bat habitat trees located within the Study Area corridor. However, potentially preferred habitat for bats located adjacent to the corridor in larger wooded areas will not be impacted. Potential indirect impact to Butternut tree within protection zone.	Potential for indirect impact to Redside Dace habitat (sedimentation) within Bruce Creek, adjacent to the corridor, north of Elgin Mills Road. Impact to potential individual SAR bat habitat trees located within the Study Area corridor. However, potentially preferred habitat for bats located adjacent to the corridor in larger wooded areas will not be impacted. Potential indirect impact to Butternut tree within protection zone.	Potential for indirect impact to Redside Dace habitat (sedimentation) within Bruce Creek, adjacent to the corridor, north of Elgin Mills Road. Impact to potential individual SAR bat habitat trees located within the Study Area corridor. However, potentially preferred habitat for bats located adjacent to the corridor in larger wooded areas will not be impacted. Potential indirect impact to Butternut tree within protection zone.
	Rating		Somewhat Preferred	Somewhat Preferred	Somewhat Preferred

5	**Potential impact to water resources and drainage**	- Decreased/increased infiltration. - Effects on floodplains. - Disruption of natural drainage. - Increased sedimentation to watercourses due to construction activities. - Impact to aquifers and groundwater (considering mitigation provided by LID facilities). - Fluvial geomorphological impacts.	Provides moderate capacity for LID treatment within the boulevards, which will provide moderate reduction of impacts. Mitigation includes ability for maintaining area for infiltration.	Less capacity for LID treatment within the boulevards, capacity for LID to mitigate impacts is reduced.	Provides a wider boulevard with opportunity for increased LID treatment capacity and greater reduction of impacts. Mitigation includes ability for maintaining area for infiltration.
	Rating		Somewhat Preferred	Less Preferred	More Preferred
6	**Potential climate change impact and resilience**	- Impact to carbon sinks (impact to wetland/vegetation removal). - Snow accumulation. - Potential for greenhouse gas emissions. - Resilience or vulnerability. - Change in air quality.	Moderate capacity to mitigate climate change impacts. Space is available for LID treatment within the road cross-section providing stormwater detention and treatment to support climate resiliency. Vegetation clearing associated with a wider road footprint is not anticipated to significantly impact the availability of carbon sinks. Vegetation removal will be somewhat off-set by opportunity to include a vegetated median and vegetated area adjacent to the road surface between the curb and active transportation facilities. Increase in traffic over time may result in an increase in associated greenhouse gas emissions over existing conditions. Additional lanes are anticipated to reduce traffic congestion/delay. Provision of active transportation option is anticipated to reduce traffic congestion.	Less space is available for LID treatment within the road cross-section to provide stormwater detention and treatment in support of climate resiliency. Vegetation clearing associated with a wider road footprint is not anticipated to significantly impact the availability of carbon sinks. Opportunity to include a wider vegetated median and a vegetated area adjacent to the road surface between the curb and active transportation facilities will help to off-set impact of vegetation removal. Increase in traffic over time may result in an increase in associated greenhouse gas emissions over existing conditions. Additional lanes are anticipated to reduce traffic congestion/delay. Provision of active transportation option is anticipated to reduce traffic congestion.	Moderate capacity to mitigate climate change impacts. Space is available for LID treatment within the road cross-section, providing stormwater detention and treatment to support climate resiliency. Vegetation clearing associated with a wider road footprint is not anticipated to significantly impact the availability of carbon sinks. Vegetation removal will be somewhat off-set by opportunity to include a wider vegetated area adjacent to the road surface between the curb and active transportation facilities. Increase in traffic over time may result in an increase in associated greenhouse gas emissions over existing conditions. Additional lanes are anticipated to reduce traffic congestion/delay. Provision of active transportation option is anticipated to reduce traffic congestion.
	Rating		Somewhat Preferred	Somewhat Preferred	Somewhat Preferred
7	**Potential impact from contaminated sites**	- Level of contamination risk based on Contamination Overview Study.	Potential for contaminated soil and groundwater in areas of expanded right-of-way as a result of adjacent property activities. Further assessment may be required.	Potential for contaminated soil and groundwater in areas of expanded right-of-way as a result of adjacent property activities. Futher assessment may be required.	Potential for contaminated soil and groundwater in areas of expanded right-of-way as a result of adjacent property activities. Further assessment may be required.
	Rating		Somewhat Preferred	Somewhat Preferred	Somewhat Preferred
Summary Natural Environment			**Somewhat Preferred**	**Somewhat Preferred**	**Somewhat Preferred**

	Criteria for Evaluating Alternatives	Indicators	Alternative Design Concept 1	Alternative Design Concept 2	Alternative Design Concept 3
B	**Socio-Cultural Environment**				
1	**Potential impact to heritage resources**	- Potential to impact cultural heritage features. - Potential to impact archaeological resources.	There are sixteen features of cultural heritage value within the Study Area. An impact assessment will be required to confirm impacts as a result of the road widening. There are lands within the study area corridor that have potential for archaeological resources and will require further Archaeological Assessment if impacted. The Pingle Farm Cemetery located at 10225 Kennedy Road is within the Study Area limits. The portion of the Study Area within the legal limits of the Pingle Farm Cemetery must be avoided by project designs.	There are sixteen features of cultural heritage value within the Study Area. An impact assessment will be required to confirm impacts as a result of the road widening. There are lands within the study area corridor that have potential for archaeological resources and will require further Archaeological Assessment if impacted. The Pingle Farm Cemetery located at 10225 Kennedy Road is within the Study Area limits. The portion of the Study Area within the legal limits of the Pingle Farm Cemetery must be avoided by project designs.	There are sixteen features of cultural heritage value within the Study Area. An impact assessment will be required to confirm impacts as a result of the road widening. There are lands within the study area corridor that have potential for archaeological resources and will require further Archaeological Assessment if impacted. The Pingle Farm Cemetery located at 10225 Kennedy Road is within the Study Area limits. The portion of the Study Area within the legal limits of the Pingle Farm Cemetery must be avoided by project designs.
	Rating		More Preferred	More Preferred	More Preferred
2	**Nuisance impacts**	- Perceivable changes to existing noise levels. - Visual impacts/aesthetics. - Temporary disruption to residents during construction.	Perceived increase in noise levels. No significant increases to traffic noise are expected as a result of the project. Construction will result in a temporary disruption to residents.	Perceived increase in noise levels. No significant increases to traffic noise are expected as a result of the project. Construction will result in a temporary disruption to residents.	Perceived increase in noise levels. No significant increases to traffic noise are expected as a result of the project. Construction will result in a temporary disruption to residents.
	Rating		Somewhat Preferred	Somewhat Preferred	Somewhat Preferred
3	**Land acquisition needs/Impacts to driveway access**	- Financial and social effects of relocation or removal of homes or businesses. - Change in use or layout due to property loss. - Temporary changes to driveway access during construction.	Potential for land acquisition to accommodate road improvements within future road right-of-way from non-participating landowners to adjacent developments.	Potential for land acquisition to accommodate road improvements within future road right-of-way from non-participating landowners to adjacent developments.	Potential for land acquisition to accommodate road improvements within future road right-of-way from non-participating landowners to adjacent developments.
	Rating		More Preferred	More Preferred	More Preferred
4	**Conformity to municipal and agency policy**	- Ability to conform to federal, provincial, and local policy.	Conforms to municipal policy of road network connectivity. Conforms to intention of connectivity of active transportation network. Possible impact to fish and fish habitat through sediment mobilization. DFO review is required. Road improvements within the TRCA regulated limit will require permits. SAR permits may be required if potential impacts to Redside Dace habitat can't be avoided. The project will need to consider protection of natural features.	Conforms to municipal policy of road network connectivity. Conforms to intention of connectivity of active transportation network. Possible impact to fish and fish habitat through sediment mobilization. DFO review is required. Road improvements within the TRCA regulated limit will require permits. SAR permits may be required if potential impacts to Redside Dace habitat can't be avoided. The project will need to consider protection of natural features.	Conforms to municipal policy of road network connectivity. Conforms to intention of connectivity of active transportation network. Possible impact to fish and fish habitat through sediment mobilization. DFO review is required. Road improvements within the TRCA regulated limit will require permits. SAR permits may be required if potential impacts to Redside Dace habitat can't be avoided. The project will need to consider protection of natural features.
	Rating		More Preferred	More Preferred	More Preferred

5	**Connectivity**	- Ability of the Alternative to increase connectivity by facilitating transit service and active transportation along the corridor. - Ability of Alternatives to create pedestrian and cyclist friendly environment.	Provides increased connectivity by protecting for future transit service and integrating active transportation facilities within the boulevards. A moderate setback from traffic provides a comfortable pedestrian environment. Tree canopy from street trees provides shade to create pedestrian and cyclist friendly environment.	Provides increased connectivity by protecting for future transit service and integrating active transportation facilities within the boulevards. The smallest setback from traffic provides the least comfortable pedestrian environment. Tree canopy from street trees provides shade to create pedestrian and cyclist friendly environment.	Provides increased connectivity by protecting for future transit service and integrating active transportation facilities within the boulevards. The greatest setback from traffic provides the most comfortable pedestrian environment. Tree canopy from street trees provides shade to create pedestrian and cyclist friendly environment.
	Rating		Somewhat Preferred	Less Preferred	More Preferred
Summary Socio-Cultural Environment			**More Preferred**	**Somewhat Preferred**	**More Preferred**

	Criteria for Evaluating Alternatives	Indicators	Alternative Design Concept 1	Alternative Design Concept 2	Alternative Design Concept 3
C	**Engineering Environment**				
1	**Level of service/traffic congestion**	- Anticipated intersection traffic and delays at intersections in 2041.	Alternative will prevent and minimize traffic and delays at intersections in 2041.	Alternative will prevent and minimize traffic and delays at intersections in 2041.	Alternative will prevent and minimize traffic and delays at intersections in 2041.
	Rating		Most Preferred	Most Preferred	Most Preferred
2	**Speed management**	- Ability of Alternative to facilitate speed management along corridor.	Provides moderate speed management along the corridor. Narrower roads with less lateral clearance generally contribute to more cautious driving and slower speeds. Alternative 1 will be more constrained than Alternative 2 but less constrained than Alternative 3.	Provides the least ability for speed management. Narrower roads with less lateral clearance generally contribute to more cautious driving and slower speeds. Alternative 2 with the largest median will be a less constrained space with inside lanes bordered by a median separating from opposing traffic.	Provides optimal speed management along the corridor. Narrower roads with less lateral clearance generally contributes to more cautious driving and slower speeds. Alternative 3 with limited marked median will be a more constrained space with inside lanes immediately adjacent to opposing traffic.
	Rating		More Preferred	Somewhat Preferred	Most Preferred
3	**Traffic safety**	- Effects on layout or operations of intersections and roadways. - Ability address roadside safety requirements. - Roadway alignment implications on positive guidance.	Adequate separation of north-bound and south-bound traffic. Roadside safety requirements will be met.	Provides consistent alignment and positive guidance throughout the corridor. Roadside safety requirements will be met.	Limited marked median can provide some separation between north-bound and south-bound traffic. Roadside safety requirements will be met.
	Rating		More Preferred	Most Preferred	Somewhat Preferred
4	**Design constraints**	- Professional opinion on the design limitations and restrictions. - Conformance to York Region Streetscaping Policy and Design Elements (e.g., Median design, boulevards, lane widths, landscaping). - Conformance to York Region's Street Tree and Horticultural Design Guidelines (e.g., offset and spacing for street trees, minimum planting width for median).	No anticipated design limitations or restrictions. Conforms to Region Streetscaping Policy and Design Elements. Conforms to Region's Street Tree and Horticultural Design Guidelines. Centre median can result in constraints to access for emergency services vehicles.	No anticipated design limitations or restrictions. Conforms to Region Streetscaping Policy and Design Elements. Conforms to Region's Street Tree and Horticultural Design Guidelines. Centre median can result in constraints to access for emergency services vehicles.	No anticipated design limitations or restrictions. Conforms to Region Streetscaping Policy and Design Elements. Conforms to Region's Street Tree and Horticultural Design Guidelines.
	Rating		More Preferred	More Preferred	Most Preferred
5	**Utility impacts**	- Effects on utilities (e.g., relocations).	Utilities impacts will be similar for all alternatives.	Utilities impacts will be similar for all alternatives.	Utilities impacts will be similar for all alternatives.
	Rating		Somewhat Preferred	Somewhat Preferred	Somewhat Preferred

6	**Constructability**	- Professional opinion on the ease and efficiency of construction of the project, including ease of construction staging and relative construction traffic management. - Disruption to municipal services during construction (snow removal, garbage pick-up). - Levels of disruption to road users (automobiles and cyclists) due to construction.	With median, construction staging and traffic management are relatively more complex than Alternative 3.	With median, construction staging and traffic management are relatively more complex than Alternative 3.	With limited marked median, construction staging and traffic management are relatively less complex than other alternatives.
	Rating		Somewhat Preferred	Somewhat Preferred	More Preferred
Summary Engineering Environment			**More Preferred**	**More Preferred**	**More Preferred**

	Criteria for Evaluating Alternatives	Indicators	Alternative Design Concept 1	Alternative Design Concept 2	Alternative Design Concept 3
D	**Financial Factors**				
1	**Estimated capital costs**	- Cost of the materials for road construction. - Cost of the installation of irrigation system for tree planting.	Capital costs are relatively lower than Alternative 2 due to narrower median.	Capital costs are relatively higher than other alternatives due to wider median and installation of irrigation system for tree planting.	Capital costs are relatively lower than Alternative 2 as there is a limited marked median.
	Rating		More Preferred	Somewhat Preferred	Most Preferred
2	**Estimated operation and maintenance costs**	- Costs associated with typical operation and maintenance of the road. - Increased operation and maintenance costs associated due to planted median (tree or shrub).	Operation and maintenance costs are relatively lower than Alternative 2 due to the narrower median and only shrub planting.	Operation and maintenance costs are relatively higher than other alternative due wider median, tree planting and irrigation system.	Operation and maintenance costs are relatively lower than Alternative 1 and 2 as there is a limited marked median, no vegetation.
	Rating		More Preferred	Somewhat Preferred	Most Preferred
3	**Property acquisition costs**	- Costs associated with private property requirements, including easements, land purchases, restoration of private lands.	Potential for land acquisition costs to accommodate road improvements within future road right-of-way from non-participating landowners to adjacent developments.	Potential for land acquisition costs to accommodate road improvements within future road right-of-way from non-participating landowners to adjacent developments.	Potential for land acquisition costs to accommodate road improvements within future road right-of-way from non-participating landowners to adjacent developments.
	Rating		More Preferred	More Preferred	More Preferred
Summary Financial Factors			**More Preferred**	**Somewhat Preferred**	**Most Preferred**

Criteria for Evaluating Alternatives	Alternative Design Concept 1	Alternative Design Concept 2	Alternative Design Concept 3
Overall Summary	**More Preferred**	**Least Preferred**	**Most Preferred**

Kennedy Road EA Study - Evaluation of Low Impact Development Options

Criteria for Evaluating Alternatives	Indicators	Option 1: Box Trench Design	Option 2: Vegetated / Bio Swale Design	Option 3: Bioretention and Rain Garden Design - provides partial infiltration	Option 4: Infiltration trenches and soak-aways	Option 5: Underground storage tanks
A Natural Environment						
1 Ecological benefit	- provision of pollinator food resource and habitat. - adaptation to variable temperature and moisture conditions. - ability to reduce local air temperature. - ability to improve local air quality. - enhance urban biodiversity.	- planted with salt, water and pollution tolerant native flowering species. - vegetation has ability to reduce local air temperature and improve local air quality in vicinity of LID. - urban biodiversity is enhanced by species planted in LID.	- planted with salt, water and pollution tolerant native flowering species. - vegetation has ability to reduce local air temperature and improve local air quality in vicinity of LID. - urban biodiversity is enhanced by species planted in LID.	- planted with salt, water and pollution tolerant native flowering species. - vegetation has ability to reduce local air temperature and improve local air quality in vicinity of LID. - urban biodiversity is enhanced by species planted in LID.	- no planting opportunities. - no reduction of local air temperatures and air quality. - no enhancements to urban biodiversity.	- no planting opportunities. - no reduction of local air temperatures and air quality. - no enhancements to urban biodiversity.
Rating		Most Preferred	Most Preferred	Most Preferred	Least Preferred	Least Preferred
2 Soil Permeability	- compatibility (partial or complete) with existing soil permeability conditions.	- reliant on insitu sub-soil condition for infiltration.	- reliant on insitu sub-soil condition for infiltration.	- reliant on insitu sub-soil condition for infiltration.	- reliant on insitu sub-soil condition for infiltration.	- no reliance on insitu sub-soil condition for infiltration.
Rating		Somewhat Preferred	Somewhat Preferred	Somewhat Preferred	Somewhat Preferred	Most Preferred

Criteria for Evaluating Alternatives	Indicators	Option 1: Box Trench Design	Option 2: Vegetated / Bio Swale Design	Option 3: Bioretention and Rain Garden Design - provides partial infiltration	Option 4: Infiltration trenches and soak-aways	Option 5: Underground storage tanks
3 Impacts to groundwater	- provides sufficient separation between infiltration surface (absorption media) and groundwater level. - compatibility (partial or complete) with existing groundwater levels. - ability to remove pollutants (e.g. salt, oil) from water runoff.	- feature extends from surface to below-ground resulting in moderate separation from groundwater level. - vegetation plantings can provide nutrient uptake and filtering of pollutants from runoff. - capacity to reduce volume of events up to the 25 mm storm, which cumulatively are responsible for majority of annual pollutant load. - this LID can be used in combination with an adjacent Silva Cell system (for tree planting separate from the LID) to increase contaminant reduction through filtering particulate, biotic activity, and tree uptake.	- feature extends from surface to below-ground resulting in moderate separation from groundwater level. - vegetation plantings can provide nutrient uptake and filtering of pollutants from runoff. - capacity to reduce volume of events up to the 25 mm storm, which cumulatively are responsible for majority of annual pollutant load. - this LID can be used in combination with an adjacent Silva Cell system (for tree planting separate from the LID) to increase contaminant reduction through filtering particulate, biotic activity, and tree uptake. - media is thinner than in Option 1 and Option 3 and as such has less potential to capture contaminants.	- feature extends from surface to below-ground resulting in moderate separation from groundwater level. - vegetation plantings can provide nutrient uptake and filtering of pollutants from runoff. - capacity to reduce volume of events up to the 25 mm storm, which cumulatively are responsible for majority of annual pollutant load. - this LID can be used in combination with an adjacent Silva Cell system (for tree planting separate from the LID) to increase contaminant reduction through filtering particulate, biotic activity, and tree uptake.	- top of features is below the surface, and extends further below-ground resulting in less separation from groundwater level. - no planting opportunities to provide nutrient uptake and filtering of pollutants from runoff. - this LID can be used in combination with an adjacent Silva Cell system (for tree planting separate from the LID) to increase contaminant reduction through filtering particulate, biotic activity, and tree uptake.	- deepest feature resulting in least separation from groundwater level. - no planting opportunities, however quality control isolator row can be incorporated into the storage design to remove pollutants. - capacity to reduce volume of events up to the 25 mm storm, which cumulatively are responsible for majority of annual pollutant load. - this LID can be used in combination with an adjacent Silva Cell system (for tree planting separate from the LID) to increase contaminant reduction through filtering particulate, biotic activity, and tree uptake.
Rating		Most Preferred	More Preferred	Most Preferred	Less Preferred	Somewhat Preferred
Summary Natural Environment		**More Preferred**	**More Preferred**	**More Preferred**	**Less Preferred**	**Somewhat Preferred**

Criteria for Evaluating Alternatives	Indicators	Option 1: Box Trench Design	Option 2: Vegetated / Bio Swale Design	Option 3: Bioretention and Rain Garden Design - provides partial infiltration	Option 4: Infiltration trenches and soak-aways	Option 5: Underground storage tanks
B Socio-Cultural Environment						
1 Aesthetics	- potential to enhance aesthetics of road corridor. - provision of year-round seasonal interest.	- a well defined space with flowering plants to enhance the streetscape aesthetics with a mix of perennial and woody species. - provides three-season plantings that enhance seasonal interest in area.	- a less defined space with flowering plants to enhance the streetscape aesthetics with perennial species. - provides three-season plantings that enhance seasonal interest in area.	- a less defined space with flowering plants to enhance the streetscape aesthetics with perennial and woody species. - provides three-season plantings that enhance seasonal interest in area.	- Minimal opportunity to enhance aesthetics of road corridor as LID is only marginally visible and has no planting opportunities. - does not provide seasonal interest.	- No opportunity to enhance aesthetics of the road corridor as LID is not visible. - does not provide seasonal interest.
Rating		Most Preferred	More Preferred	More Preferred	Less Preferred	Least Preferred
2 Education Opportunities	- potential to educate public about stormwater management.	- good opportunities to educate public on function and benefits of LID to support stormwater management as LID is very visible and there is adequate space for educational information boards onsite.	- good opportunities to educate public on function and benefits of LID to support stormwater management as LID is very visible; although space for educational information boards onsite is more limited than other options.	- good opportunities to educate public on function and benefits of LID to support stormwater management as LID is very visible and there is adequate space for educational information boards onsite.	- -marginal visibility of LID limits educational opportunities.	- no educational opportunities.
Rating		Most Preferred	More Preferred	Most Preferred	Less Preferred	Least Preferred
Summary Socio-Cultural Environment		**Most Preferred**	**More Preferred**	**Most Preferred**	**Less Preferred**	**Least Preferred**

Criteria for Evaluating Alternatives	Indicators	Option 1: Box Trench Design	Option 2: Vegetated / Bio Swale Design	Option 3: Bioretention and Rain Garden Design - provides partial infiltration	Option 4: Infiltration trenches and soak-aways	Option 5: Underground storage tanks
C Technical Factors						
1 Quality control	- ability to meet quality control criteria. - ability to contribute to quality control along with other treatment train options.	- planted vegetation media offers pretreatment filtration of undissolved solids. Primary filtration by engineered soil and absorption media. - runoff enters via street storm sewer, which could easily allow for upstream treatment features such as oil/grit separators, catch basin inserts, etc.	- planted vegetation media offers pretreatment filtration of undissolved solids. Primary filtration by engineered soil and absorption media. - runoff enters via overland flow/curb cuts, which does not easily allow for upstream treatment features.	- planted vegetation media offers pretreatment filtration of undissolved solids. Primary filtration by engineered soil and absorption media. - runoff enters via overland flow/curb cuts, which does not easily allow for upstream treatment features.	- grass/sod surface offers pretreatment filtration before infiltrating engineered trenches and soak-aways. - runoff can enter or discharge via street storm sewer, which could easily allow for upstream or downstream treatment features such as oil/grit separators, catch basin inserts, etc.	- quality control can be incorporated into the storage design, less effective than filtration. - runoff can enter or discharge via street storm sewer, which could easily allow for upstream or downstream treatment features such as oil/grit separators, catch basin inserts, etc.
Rating		Most Preferred	More Preferred	More Preferred	More Preferred	Somewhat Preferred
2 Quantity control	- ability to control peak flows.	- gravel storage layer provides some storage volume. - discharges only through infiltration, not suitable for control of higher peak flows.	- gravel storage layer provides some storage volume. - discharges only through infiltration, not suitable for control of higher peak flows.	- gravel storage layer provides some storage volume. - discharges only through infiltration, not suitable for control of higher peak flows.	- stone void area provides moderate storage volume. - can discharge to street storm sewer, suitable for control of higher peak flows.	- large void space provides most storage volume. - can discharge to street storm sewer, suitable for control of higher peak flows.
Rating		Somewhat Preferred	Somewhat Preferred	Somewhat Preferred	More Preferred	Most Preferred
3 Erosion control	- volumetric retention capacity.	- gravel storage layer provides some storage volume.	- gravel storage layer provides some storage volume.	- gravel storage layer provides some storage volume.	- stone void area provides moderate storage volume.	- large void space provides most storage volume.
Rating		Somewhat Preferred	Somewhat Preferred	Somewhat Preferred	More Preferred	Most Preferred
4 Maintenance requirements	- ease and frequency of maintenance.	- a well defined footprint will improve lifecycle and performance maintenance. Vegetation and filter media add to maintenance frequency and duration.	- less defined footprint and may hinder maintenance of adjacent grass and/or planting. Vegetation and filter media add to maintenance frequency and duration.	- less defined footprint and may hinder maintenance of adjacent grass and/or planting. Vegetation and filter media add to maintenance frequency and duration.	- less defined footprint and may hinder maintenance of adjacent grass and/or planting. Lack of vegetation and filter media reduce maintenance frequency and duration.	- a well defined footprint to facilitate lifecycle and performance maintenance; however, excavations for extensive repair may impact adjacent spaces.
Rating		More Preferred	Somewhat Preferred	Somewhat Preferred	Somewhat Preferred	Less Preferred

Criteria for Evaluating Alternatives	Indicators	Option 1: Box Trench Design	Option 2: Vegetated / Bio Swale Design	Option 3: Bioretention and Rain Garden Design - provides partial infiltration	Option 4: Infiltration trenches and soak-aways	Option 5: Underground storage tanks
5 Surface footprint	- size of surface footprint. - ability to accommodate surface footprint.	- surface footprint is lower relative to Option 2 and 3 due to well defined box trench. - linear, narrow footprint can be easily accommodated in boulevard.	- requires highest surface area relative to other options. - linear, but wider footprint not easily accommodated in boulevard.	- surface footprint is lower relative to Option 2, but somewhat higher than Option 1 since overall footprint of LID is less defined than Option 1. - linear footprint, wider than Option 1, narrower than Option 2. Footprint can be accommodated in boulevard.	- minimal surface footprint required compared to other options. - linear, narrow footprint can be easily accommodated in boulevard.	- minimal surface footprint impacts.
Rating		More Preferred	Less Preferred	Somewhat Preferred	Most Preferred	Most Preferred
Summary Technical Factors		**More Preferred**	**Somewhat Preferred**	**Somewhat Preferred**	**More Preferred**	**More Preferred**

Criteria for Evaluating Alternatives		Indicators	Option 1: Box Trench Design	Option 2: Vegetated / Bio Swale Design	Option 3: Bioretention and Rain Garden Design - provides partial infiltration	Option 4: Infiltration trenches and soak-aways	Option 5: Underground storage tanks
D	**Financial Factors**						
1	**Estimated capital costs**	- Relative cost of the materials for LID construction.	$ 25,000.00 per 100m.sq. Drainage Area	$ 11,000.00 per 100m.sq. Drainage Area	$ 23,000.00 per 100m.sq. Drainage Area	$ 24,000.00 per 100m.sq. Drainage Area	$ 14,000.00 per 100m.sq. Drainage Area
	Rating		Somewhat Preferred	Most Preferred	Somewhat Preferred	Somewhat Preferred	More Preferred
2	**Estimated maintenance costs**	- Relative costs associated with typical maintenance of the LIDs (includes monitoring, inspection, material and parts replacement).	Average Annual Maintenance Cost: 50 Years Evaluation Period: $140.00 per 100m.sq. Drainage Area	Average Annual Maintenance Cost: 50 Years Evaluation Period: $90.00 per 100m.sq. Drainage Area	Average Annual Maintenance Cost: 50 Years Evaluation Period: $140.00 per 100m.sq. Drainage Area	Average Annual Maintenance Cost: 50 Years Evaluation Period: $1,600.00 per 100m.sq. Drainage Area	Average Annual Maintenance Cost: 50 Years Evaluation Period: $33.00 per 100m.sq. Drainage Area
	Rating		Somewhat Preferred	More Preferred	Somewhat Preferred	Less Preferred	Most Preferred
3	**Life-cycle costs and savings**	- Relative comparison of life-cycle costs and savings of each option.	Present Value Life Cycle Cost for 50 Years Evaluation Period: $27,000.00 per 100m.sq. Drainage Area	Present Value Life Cycle Cost for 50 Years Evaluation Period: $14,000.00 per 100m.sq. Drainage Area	Present Value Life Cycle Cost for 50 Years Evaluation Period: $27,000.00 per 100m.sq. Drainage Area	Present Value Life Cycle Cost for 50 Years Evaluation Period: $75,000.00 per 100m.sq. Drainage Area	Present Value Life Cycle Cost for 50 Years Evaluation Period: $14,000.00 per 100m.sq. Drainage Area
	Rating		More Preferred	Most Preferred	More Preferred	Less Preferred	Most Preferred
Summary Financial Factors			**Somewhat Preferred**	**Most Preferred**	**Somewhat Preferred**	**Less Preferred**	**Most Preferred**

Criteria for Evaluating Alternatives	Option 1: Box Trench Design	Option 2: Vegetated / Bio Swale Design	Option 3: Bioretention and Rain Garden Design	Option 4: Infiltration trenches and soak-aways	Option 5: Underground storage tanks
Overall Summary	**Most Preferred**	**Most Preferred**	**More Preferred**	**Least Preferred**	**Somewhat Preferred**
RECOMMENDATION	**Option 1: Box Trench Design will be carried forward as the preferred LID concept for Kennedy Road.** Although ranked the same as Option 2 overall, Option 1 is preferred over Option 2 as it can achieve a greater degree of pollutant removal, which will reduce impacts to groundwater. In areas with higher groundwater table, Option 2 will be considered as a viable preferred LID concept to Option 1.	Although ranked the same as Option 1 overall, Option 2 cannot achieve the same degree of pollutant removal as Option 1. However, since Option 2 does not require the same design depth as Option 1. **Option 2 will be considered as a viable preferred LID concept for areas with higher groundwater table**.			