



**PRELIMINARY RISK AND VULNERABILITY
ASSESSMENT RESULTS**
(AS OF JANUARY 31, 2020)

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1. Framework of Vulnerability and Risk Assessment

The vulnerability and risk assessment completed as part of South Huron's Climate Change Adaptation Strategy aligns with the Milestones outlined in ICLEI'S Building Adaptive and Resilient Communities (BARC) Program. Milestone 2: Research, extensively outlines vulnerability and risk assessment components and important questions required to complete the assessments.

A total number of 74 impact statements were developed through internal staff and public engagement for the Municipality to consider.

Through committee and staff review of the impact statements and the responses received through the initial public survey, a total of 39 impact statements were carried forward to complete the vulnerability and risk assessments.

2. Vulnerability Assessment Methodology

Vulnerability refers to the susceptibility of service areas within the municipality and the potential harm that may arise from climate change and associated impacts the changes bring.

$$\text{Vulnerability} = \text{Sensitivity} / \text{Adaptive Capacity}$$

The vulnerability assessments provides an analyses of the sensitivity (to what degree will the functionality change) and the adaptive capacity (cost and staff intervention required to recover) to the projected changes in climate for South Huron.

The vulnerability assessment was completed by municipal staff as it relates to services and existing conditions of departments. When the vulnerability assessment was completed, the following key questions were asked:

- What is the level of exposure of the primary department be affected by these changes if they occurred?
- How would the department be affected by these changes if they occurred today?
- Is the department already subject to any existing stress?

2.1 Sensitivity

TABLE 1: SENSITIVITY SCORING

SENSITIVITY SCORING	DEFINITION
S1	Functionality will remain the same
S2	Functionality will likely remain the same
S3	Functionality is likely to become worse
S4	Functionality will become worse
S5	Functionality will become unmanageable

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2.2 Adaptive Capacity

TABLE 2: ADAPTIVE CAPACITY SCORING

ADAPTIVE CAPACITY SCORING	DEFINITION
AC1	Substantial costs and staff intervention (\$\$\$\$\$)
AC2	Significant costs and staff intervention (\$\$\$\$\$)
AC3	Some costs and staff intervention (\$\$\$)
AC4	Slight costs and staff intervention (\$\$)
AC5	Little or no costs and staff intervention (\$)

2.3 Vulnerability Scoring

TABLE 3: VULNERABILITY SCORING

		SENSITIVITY				
		<i>Low</i>				<i>High</i>
		S1	S2	S3	S4	S5
ADAPTIVE CAPACITY	<i>Low</i> AC1	V2	V2	V4	V5	V5
	AC2	V2	V2	V3	V4	V5
	AC3	V2	V2	V3	V4	V4
	AC4	V1	V2	V2	V3	V3
	<i>High</i> AC5	V1	V1	V2	V3	V3

TABLE 4: VULNERABILITY SCORING DEFINITIONS

VULNERABILITY SCORING	DEFINITION
V1	Low Vulnerability
V2	Low-Medium Vulnerability
V3	Medium Vulnerability
V4	Medium - High Vulnerability
V5	High Vulnerability

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3. Risk Assessment Methodology

The purpose of a risk assessment is to prioritize the impacts to determine which impacts should be addressed through action planning (those that pose the greatest risk) and which impacts shouldn't be included in the action planning and should be monitored as the strategy is updated.

$$\text{Risk} = \text{Likelihood} \times \text{Consequence}$$

3.1 Likelihood

Determining the likelihood of an event is determined based on the climate science and current observations.

TABLE 5: LIKELIHOOD SCORING

LIKELIHOOD RANKING	IMPACT
Almost Certain (5)	Could occur several times per year
Likely (4)	May arise about once per year
Possible (3)	May arise once in 10 years
Unlikely (2)	May arise once in 10 to 25 years
Rare (1)	Unlikely during the next 25

3.2 Consequence

Within the risk assessment scoring, understanding the consequences for the entire South Huron community by considering social, economic, and environmental factors and providing a score for each ranging from Negligible (1) to Catastrophic (5). Table 6 outlines the factors considered in the risk assessment. Tables 7 (Social), Table 8 (Economic) and Table 9 (Environmental) provide the scoring and definition and each factor.

TABLE 6: RISK CONSEQUENCE CATEGORIES

SOCIAL FACTORS	ECONOMIC FACTORS	ENVIRONMENTAL FACTORS
Public health & safety	Property damage	Air
Displacement	Local economy & growth	Soil & vegetation
Loss of livelihood	Community Livability	Water
Cultural aspects	Public administration	Ecosystem function

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TABLE 7: CONSEQUENCE SCORING FOR SOCIAL FACTORS

CONSEQUENCE RATING	Public Health & Safety	Displacement	Loss of Livelihood	Cultural Aspects
Catastrophic (5)	Catastrophic (5): Large number of fatalities or serious injuries, or permanent illness	Catastrophic (5): Large number of permanent displaced people on a widespread scale	Catastrophic (5): Large Disturbances leading to permanent changes in peoples' normal routines and way of life	Catastrophic (5): Unprecedented loss of cultural identify (traditions/ customs) across the wider community (cancellation of flagship annual event)
Major (4)	Major (4): Isolated instances of fatalities or serious injuries, or long-term illness	Major (4): Isolated instances of permanently displaced people on a widespread scale	Major (4): Large disturbances leading to prolonged changes in people's normal routines and way of life	Major (4): Significant loss of cultural identity (traditions/customs) for multiple social groups
Moderate (3)	Moderate (4): Small number of injuries or cases of illness	Moderate (4): Isolated instances of temporary displaced people on a widespread scale	Moderate (4): Moderate disturbances leading to short-term changes in people's normal routines and way of life	Moderate (4): Moderate impact on cultural identity (traditions/customs)
Minor (2)	Minor (2): Near misses or minor injuries	Minor (2): Isolated instances of temporary displaced people in localized areas	Minor (2): Minor and storm-term changes to people's normal routines and way of life	Minor (2): Minor impact on cultural identity (traditions/customs) for a small number of social groups
Negligible (1)	Negligible (2): Appearance of a threat but no actual harm	Negligible (2): Appearance of a threat but no actual displacement	Negligible (2): No changes to people's normal routine and way of life	Negligible (2): Appearance of a threat but no actual impact on cultural identity (transitions/customs)

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TABLE 8: CONSEQUENCE SCORING FOR ECONOMIC FACTORS

CONSEQUENCE RATING	Property Damage	Local Economy and Growth	Community Livability	Public Administration
Catastrophic (5)	Catastrophic (5): Catastrophic damage and costs incurred by the owner (\$\$\$\$\$)	Catastrophic (5): City-scale decline leading to widespread business failure, loss of employment and hardships	Catastrophic (5): Permanent decline in services, causing the city to be seen as very unattractive, moribund, and unable to support the community	Catastrophic (5): Public administration would fall into decay and cease to be effective
Major (4)	Major (4): Major damage and costs incurred by the owner (\$\$\$\$)	Major (4): City-scale stagnation such that businesses are unable to thrive	Major (4): Widespread and severe decline in services and quality of life within the community	Major (4): Public administration would struggle to remain effective and would be in danger of failing
Moderate (3)	Moderate (4): Moderate damage and costs incurred by the owner (\$\$\$)	Moderate (4): Isolated areas of reduction in economic performance relative to current forecasts	Moderate (4): Isolated but noticeable examples of decline in services	Moderate (4): Public administration would be under severe pressure on several fronts
Minor (2)	Minor (2): Minor damage and costs incurred by the owner (\$\$)	Minor (2): Inconveniences that cause minor shortfall relative to current forecasts	Minor (2): There would be minor areas in which the community is unable to maintain its current services	Minor (2): There would be minor instances of public administration being under more than usual stress
Negligible (1)	Negligible (2): No damage and costs incurred by the owner (\$)	Negligible (2): No real impact to the local economy and growth	Negligible (2): No real pressure on current services	Negligible (2): No real stress on public administration

TABLE 9: CONSEQUENCE SCORING FOR ENVIRONMENTAL FACTORS

CONSEQUENCE RATING	Air	Water	Soil and Vegetation	Ecosystem Function
Catastrophic (5)	Catastrophic (5): Very frequent periods of reduced air quality	Catastrophic (5): Irreversible, widespread reduction in water quality/quantity	Catastrophic (5): Irreversible, widespread impacts to soil or vegetation	Catastrophic (5): Major and widespread loss of ecological functions and irrecoverable damage
Major (4)	Major (4): Considerable increase in periods of reduced air quality in the medium term	Major (4): Major, widespread reduction in water quality/quantity in the short/medium term	Major (4): Major, widespread impacts on soil or vegetation in the short/medium term	Major (4): Severe and widespread loss of ecological functions and damage that could be reversed with intensive efforts
Moderate (3)	Moderate (4): Moderate increase in periods of reduced air quality in the short/medium term	Moderate (4): Moderate, widespread reduction in water quality/quantity in the short/ medium term	Moderate (4): Moderate widespread impacts on soil or vegetation in the short/ medium term	Moderate (4): Isolated but moderate instances of damage to the ecosystem that could be reversed
Minor (2)	Minor (2): Minor increase in periods of reduced air quality in the short term	Minor (2): Minor, localized reduction in water quality/quantity in the short term	Minor (2): Minor, localized impacts on soil or vegetation in the short term	Minor (2): Isolated but minor instances of damage to the ecosystem that could be reversed
Negligible (1)	Negligible (2): Appearance of a threat but no real impact to air quality	Negligible (2): Appearance of threat but no real reduction in water quality/quantity	Negligible (2): Appearance of threat but no real impacts on soil vegetation	Negligible (2): Appearance of a threat but no real damage to the ecosystem and its function

3.3 Risk Assessment Scoring Spectrum

TABLE 10: SPECTRUM SCORING FOR SOCIAL, ENVIRONMENTAL, AND ECONOMIC RISK SCORES

Very Low 5 – 16	Low 17 – 28	Medium-Low 29 – 40	Medium 41 – 52	Medium – High 53 – 64	High 65 – 76	Very-High 77 – 88	Extreme 89 – 100
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TABLE 11: SPECTRUM SCORING FOR OVERALL RISK SCORE

Very Low 15 – 50	Low 51 – 86	Medium-Low 87 – 122	Medium 123 – 158	Medium – High 159 – 194	High 195 – 230	Very-High 231 – 266	Extreme 267 – 300
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4. Summary of Risk and Vulnerability Assessment Preliminary Results

The results from the risk and vulnerability assessments represent the perceptions and expert opinions of all members of the Climate Change Adaptation Advisory Committee and the municipal staff who participated in the scoring workshops. The impacts carried forward to the action planning are those in which have been determined that they pose the greatest threat to South Huron.

Table 12 and Table 13 provide summaries of the number of impacts that fall within the overall risk and vulnerability assessment scores.

TABLE 12: SUMMARY OF OVERALL RISK ASSESSMENT SCORE

Overall Risk Score	Number of Impacts
Medium-High	4
Medium	20
Medium-Low	13
Low	2

TABLE 13: SUMMARY OF OVERALL RISK ASSESSMENT SCORE
(TBD once all vulnerability scores are assigned)

Overall Vulnerability Score	Number of Impacts
High Vulnerability	
Medium - High Vulnerability	
Medium Vulnerability	
Low - Medium Vulnerability	
Low Vulnerability	

The overall score was utilized using quantitative results, however, qualitative feedback obtained through discussions with committee members, staff and the general public and are included within Table 13 (Preliminary Risk and Vulnerability Assessment results). These impacts, although may score low in the assessments, are important to consider alongside the overall score in the action planning phase to given their expressed importance. In cases where an impact may be scored low, the qualitative comments may be considered with greater weighing given the identification of importance through other consultation means.

It should be noted that it is not uncommon for impacts identified for Ontario municipalities to rank more modestly. Generally, extreme and very high scoring risks (i.e. catastrophic and irreparable damages) are typically not experienced within developed areas within Canada and are absent from the impacts identified for South Huron.

Table 14 (below) shows the Preliminary Risk and Vulnerability Assessment results, sorted by the overall risk assessment score (from greatest to least).

Risk and Vulnerability Assessments – Preliminary Results (as of January 31, 2020)
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TABLE 14: PRELIMINARY RISK AND VULNERABILITY ASSESSMENT RESULTS
 (AS OF JANUARY 31, 2020)

Impact ID	Climate Category	Climatic Threat	Impact Statement	RISK ASSESSMENT					VULNERABILITY ASSESSMENT	COMMENTS
				Likelihood	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	OVERALL RISK SCORE (/300)	OVERALL VULNERABILITY SCORE	
53	Extreme Weather Event	Increase in frequency of extreme weather events	Increased number of displaced residents from their homes due to extreme weather events, leading to an increase usage of the Emergency Operations Centre (Town Hall), request for service, coordination and communications from municipal staff.	4	54 (Medium-High)	72 (High)	54.5 (Medium-High)	180.5 (Medium-High)		
42	Extreme Weather Event	Heavy localized flooding events	Overwhelming of sanitary sewers resulting in the potential back up of sewage into basements, particularly in low lying areas.	3	65 (High)	65.5 (High)	38 (Medium-Low)	168.5 (Medium-High)		
61	Extreme Weather Event	Increase in frequency of extreme weather events	Increased liability, public and health and safety hazards and risks, private property damage, dangerous conditions that may impact the entire municipality.	5	59 (Medium-High)	58.5 (Medium-High)	43.5 (Medium)	161 (Medium-High)	V2	<ul style="list-style-type: none"> Impact statement is unspecific to assign an accurate risk and vulnerability score to. Majority of the impact statements contents fits within other more specific impacts.
68	Extreme Weather Event	Increased frequency and duration of drought	Increased risk of fire during dry conditions resulting in an increase in fire related calls and increase in the total number of calls for fire department during dry periods.	5	57 (Medium-High)	53 (Medium-High)	48 (Medium)	158 (Medium-High)		
16	Temperature	Increase in Very Hot Days (over 30°C)	Reduced air quality that may cause heat street or respiratory illnesses lead to an increased in request for service and staff time to accommodate demand for outdoor cooling facilities (pools, tree covered areas, splash pads) and indoor facilities.	4	51 (Medium)	50.5 (Medium)	53 (Medium-High)	154.5 (Medium)	V3	

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Impact ID	Climate Category	Climatic Threat	Impact Statement	RISK ASSESSMENT					VULNERABILITY ASSESSMENT	COMMENTS
				Likelihood	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	OVERALL RISK SCORE (/300)	OVERALL VULNERABILITY SCORE	
15	Temperature	Increase in Very Hot Days (over 30°C)	Reduced air quality that may cause heat stress or respiratory illnesses resulting in increased health and safety risk to the public, especially vulnerable populations.	4	50.5 (Medium)	46 (Medium)	57.5 (Medium-High)	154 (Medium)	V1	<ul style="list-style-type: none"> This impact would cause increase traffic and inquiries at Town Hall
41	Extreme Weather Event	Heavy localized flooding events	Overloading of older sanitary sewers (in particular, where inflow and infiltration of stormwater/groundwater into sanitary sewers), resulting in the potential for untreated sewage overflow by-passing secondary treatment allowing contaminants and infectious organisms entering into the receiving waterbody.	3	41 (Medium)	53 (Medium-High)	58 (Medium-High)	152 (Medium)		
38	Extreme Weather Event	Increased frequency and duration of heatwaves	Increased health and safety risk to vulnerable populations resulting in an increase in service requests, access to cooling facility resulting in increased request for service and staff time and coordination, potentially outside of regular working hours.	4	50 (Medium)	51 (Medium)	47 (Medium)	148 (Medium)	V3	<ul style="list-style-type: none"> Impact will bring an increase in public contacting the Municipality about options (i.e. cooling center location) Once an action (program) is in place and procedures are established, the vulnerability score would be significantly lowered (V1).
73	Extreme Weather Event	Continued occurrence of extreme cold events	Increased health and safety risk (thermoregulation, frostbite) to vulnerable populations resulting in an increase in the need for community cold alerts, service requests, and access to warming facility resulting in increased request for service and staff time and coordination, potentially outside of regular working hours.	5	52.5 (Medium)	48.5 (Medium)	46.5 (Medium)	148 (Medium)	V3	<ul style="list-style-type: none"> Impact will bring an increase in public contacting the Municipality about options (i.e. out of cold program) Once an action (program) is in place and procedures are established, the vulnerability score would be significantly lowered.

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				RISK ASSESSMENT					VULNERABILITY ASSESSMENT	COMMENTS
Impact ID	Climate Category	Climatic Threat	Impact Statement	Likelihood	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	OVERALL RISK SCORE (/300)	OVERALL VULNERABILITY SCORE	
22	Temperature	Increase in Very Hot Days (over 30°C)	Reduced air quality that may cause heat stress or respiratory illnesses resulting in increased health and safety risk to municipal volunteer fire fighters working during periods of very hot days requiring appropriate working hours, cooling aids and relief mechanisms.	4	46.5 (Medium)	48 (Medium)	49 (Medium)	144 (Medium)	V4	
54	Extreme Weather Event	Increase in frequency of extreme weather events	Increased demand for essential services and disaster recovery costs resulting in an increase in staff time and financial cost to the municipality.	4	44 (Medium)	62 (Medium-High)	37 (Medium-Low)	143 (Medium)	V3	<ul style="list-style-type: none"> This impact is dependent on type of extreme weather however it would trigger impact related to overload of staff in responding to essential services and recovery costs.
56	Extreme Weather Event	Increase in frequency of extreme weather events	Increase in occurrences of power outages, transportation disruptions, and public health and safety situations resulting in an increased demand for emergency services, communications, coordination and resources.	4	57.5 (Medium-High)	48.5 (Medium)	36.5 (Medium-Low)	143 (Medium)		<ul style="list-style-type: none"> Impact statement is unspecific to assign an accurate risk and vulnerability score to.
4	Temperature	Increased Annual Temperature	Changes in timing of spring and winter melts, potentially when ground is frozen and saturated resulting in surcharge and runoff from rapid snowmelts resulting in the potential of overburdening of the municipal stormwater system and risk of flooding leading to damage to municipal infrastructure.	5	43.5 (Medium)	52 (Medium)	46.5 (Medium)	142 (Medium)	V2	

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Impact ID	Climate Category	Climatic Threat	Impact Statement	RISK ASSESSMENT					VULNERABILITY ASSESSMENT	COMMENTS
				Likelihood	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	OVERALL RISK SCORE (/300)	OVERALL VULNERABILITY SCORE	
47	Extreme Weather Event	Heavy localized flooding events	Increased stress on bridges/culverts, potential for road washouts, erosion and transportation disruptions requiring an increase in emergency service requests and staff time to monitor, repair/replace damages, financial cost to the municipality and increased management required during the response period.	5	40.5 (Medium)	58.5 (Medium-High)	37.5 (Medium-Low)	137 (Medium)	V5	<ul style="list-style-type: none"> This impact is already a concern for municipal staff and has already occurred to some degree
48	Extreme Weather Event	Heavy localized flooding events	Increased damage to private property due to flooding resulting in an increase in number of residents contacting the municipality, specifically directed to the Building Department requesting information on flooding and assistance to address the situation.	4	41.5 (Medium)	50.5 (Medium)	44 (Medium)	136 (Medium)	V4	<ul style="list-style-type: none"> This impact is already a concern for municipal staff and has already occurred to some degree Site grading is becoming more of an issue and will only get worse with increase in heavy localized flooding events Particular concern from staff is grading of infill lots
35	Precipitation	Increased Winter Precipitation	Increased hazardous road and walking conditions resulting in an increased use of salt and/or sand on roadways, sidewalks and in parking lots resulting in increase in staff time to monitor, increased corrosion to equipment and facilities, and greater impact on water quality within the municipality.	5	45.5 (Medium)	49 (Medium)	39 (Medium-Low)	134 (Medium)	V5	<ul style="list-style-type: none"> This impact is already a concern for municipal staff and has already occurred to some degree
12	Temperature	Increase in Very Hot Days (over 30°C)	Reduced air quality that may cause heat stress or respiratory illnesses resulting in increased health and safety risk and demand for municipal outdoor workers to have appropriate working hours, cooling aids, personal protective gear and spaces for relief.	4	46 (Medium)	39.5 (Medium-Low)	45.5 (Medium)	131 (Medium)		

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				RISK ASSESSMENT					VULNERABILITY ASSESSMENT	COMMENTS
Impact ID	Climate Category	Climatic Threat	Impact Statement	Likelihood	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	OVERALL RISK SCORE (/300)	OVERALL VULNERABILITY SCORE	
44	Extreme Weather Event	Heavy localized flooding events	Increase in erosion rates, sediment release and surface runoff within riparian areas and unstable transition to low lying areas, resulting in an increased risk of pollutants from the landscape, increase in bank destabilization, loss of habitat and overall impact on water quality.	5	36 (Medium-Low)	44 (Medium)	51 (Medium)	131 (Medium)	V4	
3	Temperature	Increased Annual Temperature / Increase in Winter Temperatures	Extended growing seasons and increased survival rates for pests resulting in the potential for an increase presence and impacts (damage or loss) from invasive species to tree and vegetation within municipally owned property.	3	38.5 (Medium-Low)	41.5 (Medium)	50 (Medium)	130 (Medium)	V3	
65	Extreme Weather Event	Increased frequency and duration of drought / Increased Summer Temperatures	Reduced quality of outdoor municipal facilities (sports fields, parks, natural areas and trails, cemetery) and lawns, gardens and drought in-tolerant trees and vegetation requiring an increase in municipal water usage, request for service, and maintenance and monitoring of the quality of spaces and potential removal of distressed species.	5	29 (Medium-Low)	44.5 (Medium)	56.5 (Medium-High)	130 (Medium)	V3	
2	Temperature	Increased Annual Temperature	Increased reproduction rates and range of vectors (e.g. West Nile Virus, Lyme Disease) resulting in an increased risk of exposure to vector-borne diseases for municipal outdoor workers.	4	42.5 (Medium)	40.5 (Medium-Low)	46.5 (Medium)	130 (Medium)		

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Impact ID	Climate Category	Climatic Threat	Impact Statement	Likelihood	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	OVERALL RISK SCORE (/300)	OVERALL VULNERABILITY SCORE	
55	Extreme Weather Event	Increase in frequency of extreme weather events	Increased damage and/or decreased service life of municipal infrastructure (buildings, underground services, roads, bridges/culverts), public spaces requiring the potential closure of municipal facilities, increase request for service, staff time to repair/replace infrastructure and financial cost to the municipality.	5	41 (Medium)	57 (Medium-High)	31.5 (Medium-Low)	130 (Medium)	V5	
29	Temperature	Increased in Freeze-thaw cycles in January and February	Increased underground movement causing potential damage to municipal infrastructure (buildings, underground services, roads, sidewalks, cemetery) resulting in increase in request for service and staff time to monitoring and repair/replace, increased costs and integration into asset management planning.	5	40 (Medium-Low)	54 (Medium-High)	33 (Medium-Low)	127 (Medium)	V4	
32	Precipitation	Increased Spring Precipitation / Increased in Heavy Precipitation Days (20mm)	Inundated municipal outdoor facilities (sports fields, parks, natural areas and trails, cemetery, Port Blake day-use area) preventing municipal staff from maintaining these spaces leading to temporary disruptions in using these spaces, increased demand for alternative spaces and potential revenue loss (where applicable).	5	33 (Medium-Low)	49 (Medium)	40.5 (Medium-Low)	123 (Medium)	V2	<ul style="list-style-type: none"> This impact is already a concern for municipal staff and has already occurred to some degree

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				RISK ASSESSMENT					VULNERABILITY ASSESSMENT	COMMENTS
Impact ID	Climate Category	Climatic Threat	Impact Statement	Likelihood	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	OVERALL RISK SCORE (/300)	OVERALL VULNERABILITY SCORE	
71	Extreme Weather Event	Continued occurrence of extreme cold events	Increased risk of deep freeze to municipal infrastructure causing deficiencies resulting in an increased immediate request for service, staff time to repair/replace the damaged infrastructure and cost to the municipality.	4	34 (Medium-Low)	49 (Medium)	38 (Medium-Low)	121 (Medium-Low)	V4	
14	Temperature	Increase in Very Hot Days (over 30°C)	Increased damage to hard surfaces (roads, sidewalks) resulting in an increase in request for service and staff time to repair/replace, increased costs and integration into asset management planning.	5	38 (Medium-Low)	42.5 (Medium)	37.5 (Medium-Low)	118 (Medium-Low)	V4	
59	Extreme Weather Event	Increase in frequency of extreme weather events	Increased power outages and electrical surges, resulting in the inability for municipal staff to utilize phones and computers, process work orders, provide communications to the entire municipality and access information for coordinated effort during extreme weather events.	4	39 (Medium-Low)	50.5 (Medium)	27.5 (Low)	117 (Medium-Low)	V4	<ul style="list-style-type: none"> • This impact already occurs to some extent for short periods of time and the municipality can handle it • The concern would be if it was more long term (> 3 days) • Impact on long term scale would trigger impacts to staffing (working hours, responsibilities) and routine procedures (i.e. communications)
37	Precipitation	Increased Winter Precipitation	Increased outdoor maintenance from precipitation falling as snow or rain requiring more staff time to monitor and operate, equipment requirements and cost to the municipality.	5	36 (Medium-Low)	40 (Medium-Low)	39.5 (Medium-Low)	116 (Medium-Low)	V5	
58	Extreme Weather Event	Increase in frequency of extreme weather events	Increased power outages and electrical surges, resulting in service disruptions for the entire municipality.	4	40 (Medium-Low)	48.5 (Medium)	26.5 (Low)	115 (Medium-Low)	V1	<ul style="list-style-type: none"> • This impact already occurs to some extent for short periods of time and it appears the community can handle short term power outages • The concern would be if it was more long term(> 3 days)

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70	Extreme Weather Event	Continued occurrence of extreme cold events	Increased risk of deep freeze to municipal underground water service causing breakage or freezing resulting in an increased immediate request for service, staff time to repair/replace the damaged services and cost to the municipality.	4	31.5 (Medium-Low)	50.5 (Medium)	32.5 (Medium-Low)	115 (Medium-Low)		
57	Extreme Weather Event	Increase in frequency of extreme weather events	Increased damage to urban trees, parks, and trails resulting in closures, increased request for service and staff time and cost to the municipality to identify and remove hazard trees.	5	37 (Medium-Low)	42 (Medium)	34.5 (Medium-Low)	114 (Medium-Low)	V1	
66	Extreme Weather Event	Increased frequency and duration of drought	Reduced quality of municipal and private property lawn/gardens, and drought intolerant trees and vegetation resulting in an increase in demand for municipal water.	5	25 (Medium-Low)	41 (Medium)	42.5 (Medium)	109 (Medium-Low)	V1	
20	Temperature	Increase in Very Hot Days (over 30°C) / Increased in Freeze-thaw cycles in January and February	Increased stress on trees and natural areas resulting in an increase in municipal water demand and staff time to ensure the health and success of trees, increase in request for service and staff time to monitor and remove hazard trees on municipally-owned property.	5	28 (Low)	39.5 (Medium-Low)	37.5 (Medium-Low)	105 (Medium-Low)		

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				RISK ASSESSMENT					VULNERABILITY ASSESSMENT	COMMENTS
Impact ID	Climate Category	Climatic Threat	Impact Statement	Likelihood	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	OVERALL RISK SCORE (/300)	OVERALL VULNERABILITY SCORE	
43	Extreme Weather Event	Heavy localized flooding events	Overflow by-pass resulting in an increase in call outs to Municipal staff due to emergency alarms, service calls and mandatory reporting to agencies (i.e. Ministry of Environment, Conservation and Parks).	3	25 (Low)	40 (Medium-Low)	38 (Medium-Low)	103 (Medium-Low)		
51	Extreme Weather Event	Increase in frequency of extreme weather events	Increased extensive damaged to private property resulting in an increase in requests for permits (with the potential for quick turnarounds requested) resulting in an increase in staff time to consult and prepare required documentation to issue permits.	4	28.5 (Low)	47 (Medium)	26 (Low)	102 (Medium-Low)	V3	<ul style="list-style-type: none"> This impact is dependent on the type of structure (i.e. residential, agricultural, etc.) however the impact on the municipality regardless of type of structure is similar
21	Temperature	Increase in Very Hot Days (over 30°C)	Increased bacteria growth and dissipation of chlorine within municipally-owned water storage facilities resulting in increased staff monitoring and changes to the amount/type of chemicals (chlorine) required within the system to ensure drinking water standards are adhered to.	4	29 (Medium-Low)	37 (Medium-Low)	30 (Medium-Low)	96 (Medium-Low)		
64	Extreme Weather Event	Increase in frequency of extreme weather events	Increase in repairs/replacements addressed under tender bids during times of overload to municipal staff resulting in increased cost and project management time to the municipality.	4	23.5 (Low)	49.5 (Medium)	22.5 (Low)	96 (Medium-Low)	V2	

Risk and Vulnerability Assessments – Preliminary Results (as of January 31, 2020)
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				RISK ASSESSMENT					VULNERABILITY ASSESSMENT		
Impact ID	Climate Category	Climatic Threat	Impact Statement	Likelihood	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	OVERALL RISK SCORE (/300)	OVERALL VULNERABILTIY SCORE	COMMENTS	
74	Extreme Weather Event	Continued occurrence of extreme cold events	Increased health and safety risk (thermoregulation, frostbite) and demand for municipal outdoor workers to have appropriate working hours, warming aids, personal protective gear and spaces for relief.	5	22 (Low)	28 (Low)	23 (Low)	79 (Low)			
8	Temperature	Increased Summer Temperature s	Increased summer energy usage for municipally-owned facilities leading to increased utility costs for the municipality.	4	23 (Low)	33.5 (Medium-Low)	22 (Low)	79 (Low)	V2	<ul style="list-style-type: none"> This impact is already a concern for municipal staff and has already occurred to some degree 	