



Municipality of the
District of Shelburne

Municipal Climate Change Action Plan

December 2013

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MOTION: MUNICIPAL CLIMATE CHANGE ACTION PLAN

Being duly moved and seconded and as recommended by Committee of the Whole, be it resolved that the Municipality of the District of Shelburne approve the Municipal Climate Change Action Plan staff report, which states that:

- The Municipality of the District of Shelburne adopt the Municipal Climate Change Action Plan as a complementary document to the Integrated Community Sustainability Plan and commit to implementation of the action plan outlined in the document.

-MOTION CARRIED

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December 16, 2013
Date



Chief Administrative Officer
Kirk Cox

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Introduction to the Municipal Climate Change Action Plan

Climate change is a growing concern across Canada and poses a risk to municipalities in Nova Scotia and the infrastructure for which they are responsible. This document has been prepared for the Municipality of the District of Shelburne to complement the Integrated Community Sustainability Plan (ICSP) adopted by Council in February of 2010.

This document deals specifically with adaptation to and mitigation of Climate Change. Adaptation to climate change involves undertaking activities designed to reduce and minimize the harmful consequences of changing climate, as well as leveraging opportunities that climate change may create. Mitigation of climate change involves actions which reduce the human contribution to climate change, specifically the reduction of greenhouse gas emissions.

In the ICSP, Council committed to the following Goals:

Goal 9-1: We have a sound understanding of the potential impacts of climate change on our communities.

Goal 9-2: We have implemented an effective Climate Change Adaptation Strategy that includes anticipatory adaptation principles which have significantly reduced the negative impacts of climate change on our communities.

Goal 9-3: Our residents understand the importance of climate change adaptation and are protected from climate change events by appropriate and effective emergency measures.

The Municipality of the District of Shelburne has been working towards these goals and the adaptation to and mitigation of climate change since 2010 in a number of ways, including the development a Coastal Management Strategy, acquisition of detailed topographic information, and development and implementation of the Eastern Shelburne County Energy Strategy. This document aims to explore and establish a sound understanding of the hazards and impacts associated with climate change in the District of Shelburne as well as to tie together the work done previously in one document in order to ease implementation.

MCCAP Development Process

The MCCAP Development for the Municipality of the District of Shelburne was led by the Sustainable Development Coordinator and advised by a working group comprised of the following:

- EMO Coordinator
- Director of Public Works
- Director of Recreation and Parks
- Southwest Health Community Health Promoter
- Two Council Representatives
- Department of Natural Resources

The MCCAP Working Group was defined its mandate as follows:

Municipal Climate Change Action Plan – MDS Working Group Working Group Mandate May 2012	
Format	• The MDS MCCAP Working Group will be a temporary group formed for the preparation of the MCCAP for the Municipality of the District of Shelburne. Over time, as the planning process unfolds, this group may need to become permanent for the purposes of continued work and implementation.
Role	• Primarily an advisory role to the Sustainable Development Coordinator
Accountability & Reporting	• The Working Group is accountable to Council and the community • Council will be updated quarterly as part of the ICSP Quarterly Report
Collaboration	• The MDS Working Group will collaborate with other Eastern Shelburne County Municipalities as appropriate during the process • At the Action Planning Stage, the MDS Working Group will reach out to other Shelburne County Municipalities to identify areas for collaboration in implementation
Outcome	• The MDS Working Group will aim to develop a Climate Change Action Plan that is effective in communicating the severity of the issues and impacts on our community and in creating structure, opportunities and the political will for action to address the issue.

The first action taken by the group was to design a public consultation process from June 2012 - April 2013 which included outreach in the community at community events, press releases and newsletter articles, information on the municipal web site, posting of maps in community halls and public spaces and a public open house in April 2013. A four-hour outreach program was also delivered to Grade 10 Science students at Shelburne Regional High School. Outreach was also completed with stakeholders identified by the MCCAP working group in the form of interviews, a workshop with the EMO Planning Committee and a scenario planning workshop to evaluate socio-economic adaptive capacity. The results of the stakeholder interviews and the EMO Planning Committee workshop are included as Appendix A. The scenario planning workshop is discussed in more detail in the section titled Socioeconomic Impacts of

Climate Change. Neighbouring municipalities (Town of Shelburne, Town of Lockeport) were also consulted throughout the process and invited to participate in the public outreach activities and stakeholder consultation.

The purpose of the outreach and public consultation was both to inform and educate the public about the anticipated impacts and hazards associated with climate change, and to gather data from the public and stakeholders about how those impacts and hazards could affect community infrastructure, as well as any social, economic or environmental impacts. Anecdotal evidence of historical impacts of climate change was collected, as well as geographic information about where impacts have been observed. This information was reviewed by the MCCAP working group and integrated into this planning document.

Climate Change Issues and Hazards

The anticipated changes in the climate through 2080 in the Municipality of the District of Shelburne are summarized in Table 1 below. Anticipated changes in sea level are summarized in Table 2. No data were specifically available for the Municipality, but the closest available scenario data from Liverpool, NS were used for the preparation of this plan, as recommended by the Nova Scotia Climate Change Directorate.

Table 1. Climate Change and Sea Level Rise Scenario Data - Liverpool, NS

Climate Change and Sea-Level Rise Scenario Data - Liverpool, NS								
Parameter	Seasonality	Historical 1980's	Projected 2020's	Projected 2050's	Projected 2080's	Trend	% Change	Seasonal Notes
Temperature, C	Annual	7.4	8.5	9.8	11.0	Increase		Winter warming the most
	Winter	-3.2	-1.9	-0.5	1.0			
	Spring	5.3	6.4	7.5	8.6			
	Summer	18.0	19.1	20.3	21.4			
	Autumn	9.4	10.5	11.7	13.0			
Precipitation, mm	Annual	1646.7	1691.9	1705.9	1756.5	Increase	7%	Greatest increase in precipitation in winter
	Winter	502.3	526.7	539.3	568.7	Increase	13%	
	Spring	424.1	438.2	444.5	461.9	Increase	9%	
	Summer	287.2	292.0	291.1	291.5	Increase	1%	
	Autumn	433.0	438.3	437.6	447.5	Increase	3%	
Heating Degree Days		4017.2	3679.6	3321.7	2975.0	Decrease	-26%	Warmer temperatures should reduce heating requirements.
Cooling Degree Days		153.0	220.0	313.9	425.1	Increase	178%	Warmer temperatures may increase cooling demand.
Hot Days (Tmax > 30)		6.2	11.8	20.4	29.9	Increase		
Very Hot Days (Tmax > 35)		0.0	0.5	1.1	2.6	Increase		
Cold Days (Tmax < -10)		2.5	1.5	0.7	0.2	Decrease		
Very Cold Days (Tmax < -20)		0.0	0.0	0.0	0.0	Decrease		
Growing Degree Days >5		1915.9	2150.8	2432.0	2743.8	Increase	43%	Substantial increase, should affect choice in varieties of perennials and agricultural opportunities
Growing Degree Days >10		1001.6	1169.0	1371.6	1594.6	Increase	59%	
Growing Season Length (Days)		182.4	196.8	213.6	229.1	Increase	26%	1 - 2 months longer growing season by 2100
Corn Heat Units		2610.0	2904.6	3257.0	3586.6	Increase	37%	
Corn Season Length (Days)		148.7	158.8	171.3	179.0	Increase	20%	
Freeze Free Season (Days)		184.8	211.7	231.9	249.4	Increase	35%	
Days with rain		139.0	148.1	151.4	153.7	Increase	11%	More rain in winter, snow days turning to rain days
Days with snow		25.0	45.9	37.9	30.9	Increase	24%	
Freeze-Thaw Cycles	Annual	109.8	99.2	83.8	70.2	Decrease	-36%	Increased precipitation
	Winter	48.8	48.7	46.5	43.9		-10%	
	Spring	37.3	32.3	24.4	18.1		-51%	
	Summer	0.1	0.1	0.0	0.0		-100%	
	Autumn	23.6	18.1	13.0	8.3		-65%	
Water Surplus (mm)		1356.2	1132.6	1098.0	1112.9	Decrease	-18%	
Water Deficit (mm)		39.0	46.8	56.0	66.3	Increase	70%	Higher temperatures, more evaporation, summer deficits.
Change in Intensity Short Period Rainfall (%)		0.0	5.0	9.0	16.0	Increase		

Source: W. Richards Climate Consulting, August 2011

Table 2. Extreme Total Sea Level Scenarios - Liverpool, NS

Return Period	Exceedence Probability	Residual	Level 2000	Level 2025	Level 2055	Level 2085	Level 2100
Total Sea Level Rise (m)				0.15 ± 0.03	0.43 ± 0.15	0.83 ± 0.36	1.06 ± 0.48
Extreme TSL (10 year return)	10%	0.71 ± 0.20	3.01 ± 0.20	3.16 ± 0.23	3.44 ± 0.35	3.84 ± 0.56	4.07 ± 0.68
Extreme TSL (25 year return)	4%	0.81 ± 0.20	3.11 ± 0.20	3.26 ± 0.23	3.54 ± 0.35	3.94 ± 0.56	4.17 ± 0.68
Extreme TSL (50 year return)	2%	0.88 ± 0.20	3.18 ± 0.20	3.33 ± 0.23	3.61 ± 0.35	4.01 ± 0.56	4.24 ± 0.68
Extreme TSL (100 year return)	1%	0.95 ± 0.20	3.25 ± 0.20	3.40 ± 0.23	3.68 ± 0.35	4.08 ± 0.56	4.31 ± 0.68

Based on the above anticipated changes in climate, the MCCAP working group reviewed historical climate hazards and how they affected the community, and the community's historical capacity to respond. The group also discussed rated the severity, frequency and area affected by the hazard both in terms of historical experience and future potential. These results were also presented to the public and discussed and refined at the workshop held as part of the March 2013 EMO Planning Meeting. Table 3 on the following page summarizes the Climate Hazards and Impacts including both past experiences and future potential.

Overall the results of this analysis indicate that the climate hazards of greatest concern within the Municipality are related to sea level rise and storm surge (coastal flooding), increasing summer temperatures (drought and wildfires) and increased precipitation (inland flooding). The severity of these impacts is expected to increase as the climate changes. A more detailed discussion of each of these is included below.

Coastal Flooding and Erosion

Coastal flooding is currently an event-based hazard resulting from the coincidence of storm surge and high tide, and in some instances and locations, river flooding. As the climate changes in future, this hazard is likely to increase in frequency and severity as a result of predicted increases in sea level, continued geological subsidence (sinking) of Nova Scotia (which has been ongoing since the end of the last ice age) and increased frequency and severity of storms.

Table 2 above describes Extreme Total Sea Level for Liverpool (Richards & Daigle, 2012). The scenarios include four different return periods or exceedance probabilities from 2000 to 2100. These water level scenarios are referenced to Chart Datum (the vertical reference plane for nautical charts) which uses the lowest normal tide as the zero point. In order to use these water level scenarios with the available topographic information, the water level scenarios need to be corrected. An offset of 0.80 m (District of Lunenburg) was used, giving an Extreme Total Sea Level of 3.51 +/- 0.68 m in 2100 with a 1% exceedance probability.

In order to assess the risk posed to municipal and community infrastructure, the 5 m contour was selected based on available topographic information to delineate the risk of coastal flooding. Infrastructure located below the 5 m contour is considered to be at risk of coastal flooding in the long term. The maps included in Appendix B indicate coastal flooding risk and illustrate significant private and community infrastructure may be at risk for coastal flooding. The potential for coastal flooding impacts will need to be considered in emergency planning for the area. Specific affected locations are discussed in more detail with reference to the maps in Appendix B in the following section.

Geological information was also reviewed in order to better understand the risk of coastal erosion, however, it was determined that erosion risk needs to be determined at the individual property level.

Drought and Wildfires

Increased temperatures and extended periods of dry weather in summer may increase the risk of wildfires and may significantly impact the availability of groundwater.

Wildfires are a hazard that has impacted areas of the Municipality in the past, particularly inland areas. The Nova Scotia Department of Natural Resources is the primary agency responsible for response to wildfires, but in the event of evacuation of homes or shutdown of transportation routes, there would be involvement from the Municipality and EMO.

Availability of groundwater is a potential future hazard during the summer months in all areas of the Municipality. Almost all municipal residents rely on well water to provide their potable water needs. Many of these wells are dug wells, with water availability directly impacted by groundwater levels. In fact, there are approximately 2100 private wells in Shelburne County, one-third of which are shallow dug wells (compared with 5% for the rest of Nova Scotia). Long term climate forecasts predict a 70% increase in the water deficit (Richards and Daigle, 2012), a primary indicator of drought.

Historically, local fire departments have refilled dry wells, or residents have relied on their neighbours' wells when theirs has gone dry. The Municipality of the District of Shelburne is not responsible for public drinking water, but although no specific municipal response is required to this potential issue, the municipality may play a role in increasing private water supply management awareness for residents and businesses.

Increased Precipitation and Inland Flooding

Inland flooding typically occurs due to periods of prolonged heavy precipitation, where the amount of precipitation exceeds the amount of water that can be readily absorbed by the watershed. With a 16% increase in the intensity short period rainfall predicted by the 2080's (Richards & Daigle, 2012) inland flash flooding may become an even greater potential hazard in the Municipality. Historically significant rainfall events have damaged road and bridge infrastructure, isolated small numbers of residents and required evacuation. Some indication of areas susceptible to inland flooding are shown on the map of Ohio in Appendix B, where inland flooding impacts have been recorded in the past. The Depth to the Water table shown on the map is an indication of drainage, with 0 - 0.10 m indicating poor drainage, particularly when in communication with bodies of water. This map shows little built infrastructure at significant risk but there are several areas where roads and transportation routes may be impacted.

Climate Hazard	Table 3. Climate Hazards and Impacts - Past Experiences and Future Potential									
	Past Experiences	Future Potential	Severe	Moderate	Minor	Often	Frequency Sometimes	Rarely	Large	Area Affected Medium Small
Sea level Rise	Have noticed changes in the last 5-10 years, seems higher. Notice near older homes in particular. Goes hand in hand with storm surge. Dock street may be under water. Past impacts of sea level rise limited but will exacerbate storm surge. Will also impact natural habitat.	Estimated to be 0.94 m in Nova Scotia including subsidence by 2100. Gradual issue that requires planning for adaptation, mainly for private residents.		O	X			XO		XO
Storm Surge	Actual damage - Lockport causeway and sea wall \$900,000. Has been fixed many times before. Worst when storm surge happens at lunar high tide and high tide. Worst of any storm will be on coming tide. Campers on Louishead beach in danger. Effects can be localized. Goes hand in hand with hurricanes. Wharf & infrastructure damage possible. Acutely vulnerable areas in East Green Harbour, Jordan Bay, Cranes Point Road, Beaches (Roseway, Round Bay, Louishead).	May happen more frequently if storms are more frequent. Exacerbated by sea level rise. It is an 'event based' problem now and will continue to be so.		XO				XO		XO
Erosion	Primarily coastal erosion, severe in some areas (e.g. Pleasant Point, Stephen's Road). Has impacted natural habitat. Three homes in West Green Harbour area fall into the ocean. Fish shacks have fallen in the ocean due to erosion.	Increasing severity as sea level rises.		O	X		XO			XO
Flooding	2010 - highest ever level of Roseway River. Largely farming communities so homes usually not at risk. Roads closed, bridges closed, people isolated, no transportation or access for emergency vehicles. Homes damaged. Once had to rescue people with boat in Birchtown - heavy rain coinciding with high tide. Clyde river also flooded. Shelburne mail floods regularly. Primary impact is limited transportation. Only one house would be impacted by the Roseway River Dam. Possible ice jams on bridges over Jordan, Sable and Clyde Rivers. Should look into DNR policies on dams.	May increase in severity.		O	X		XO			XO
Drought	Wells drying up. Pressure on Lake Rodney (Town water supply). Low lake levels impact recreation. Affects on natural habitat. Health impacts of reduced quality and quantity of water. Never had to open a cooling station. When wells run dry people buy water or use neighbour's water temporarily.	If agriculture industry grows, could be more severe impact. In future may need cooling stations as part of EMO.		O	X			XO		XO
Forest Fires	Indian Fields - 1960's. April 26, 1997 - Woods Harbour, Welstown, Jordan Ferry, Granite Village, all on the same day. Strong winds contributed. Have lost power, houses, damage to property. Should look into DNR policy on fighting forest fires vs. allowing them to burn.	In future could be more severe and more frequent.	XO	O	X		O	X	O	X
Hurricanes/Wind/Tornadoes	Groundhog Day - 1976. Damage can be catastrophic. Statistically we are past due. Wharves have been damaged, disappeared. Shelburne Harbour Yacht Club fell in the ocean. Barrington/Lockport causeways have been damaged/impacted.	Possibly more frequent? Related to storm surge. Response will be the same.	XO					XO	XO	
Lightning Storms	Power outages, livestock/pets killed, STP lift station over voltage (recently). Rec programs cancelled on or around water, fires, infrastructure damage. Ground potential rise can also cause damage to infrastructure as a result of lightning in areas where single phase distribution is present. NSP can mitigate risk.	No change anticipated.		XO				XO		XO
Extreme cold/frost	Rare, minor, no known impacts.	Probably less likely in future.			XO			XO		XO
Snow & Ice Storms	4x4 club ran hospital shift changes, twice a Province wide state of emergency was declared. Primary impact is on transportation. Ice storms also affect infrastructures. Have had storms where power is out for several days.	Probably less likely in future.		XO				XO		XO

x = past experiences
o = future potential

Affected Locations

Following the climate hazard and impact analysis, more detail was developed on the locations of past impacts, and possible locations for future impacts. Maps of the different areas of the Municipality showing areas of observed coastal impacts, observed inland impacts and potential future impacts along with significant community infrastructure were developed in consultation with the MCCAP working group. These maps are included as Appendix B to this document and were further refined through the community outreach activities described in the MCCAP Development Process.

The maps indicate specific locations where coastal and inland flooding have occurred in the past, as well as potential areas where storm surge and sea level rise may result in future impacts. Also included in Appendix B are maps excerpted from the Shelburne County East Emergency Measures Organization (SCEEMO) Plan identifying areas where Transportation infrastructure is at risk (including critical bridges), the location of Telecommunications Infrastructure, Nova Scotia Power Distribution Infrastructure, and Areas at Risk of Tidal Inundation. No municipal infrastructure is located in areas vulnerable to these impacts, however the potential impacts may be summarized by location as follows:

Ohio Area

Historical impacts in the Ohio area have been limited to inland flooding of the Roseway River. Areas where inland flooding has impacted roads and access for residents to their property are indicated on the map included Appendix B. No community or municipal infrastructure is at risk in the Ohio area, although there is potential risk to private property.

Potential future impacts in the Ohio area are anticipated to be an increase in inland flooding severity and frequency and an increased risk of wildfires.

Clyde River / Ingomar

Historically the Clyde River area has seen both inland and coastal flooding. Inland flooding in adjacent to the Clyde River has caused damage to private property. Coastal flooding related to storm surge has temporarily impacted road access to private residences in two locations along the coast. Proximity to the coast does pose some risk of coastal flooding to community fire halls in Northeast Harbour and Ingomar, but no historical impacts have been reported.

Potential future impacts in the Clyde River/Ingomar area are anticipated to be increased inland flooding severity and frequency, and increased coastal flooding severity and frequency.

Lockeport Area

The area surrounding the Town of Lockeport has historically seen coastal flooding and coastal erosion, specifically at Pleasant Point where public roads have been impacted, as well as in East Green Harbour, again where both private property and public roads have been impacted. The number of residents impacted is small, and no community infrastructure is at significant risk, however historical impacts have caused significant damage. Also of concern is access and egress from the Town of Lockeport itself, where the Lockeport Causeway has been significantly impacted by coastal flooding and storm surge in the past. Although the Lockeport Causeway is the responsibility of the Town of Lockeport, any impediment to access to services in Lockeport may have significant impacts for Municipal residents. Specifically of concern is access to fire and first responder services. It is regular practice during severe storms for the Lockeport Fire Department to relocate at least one vehicle to the other side of the causeway as a risk reduction measure. No community or municipal infrastructure is specifically at risk in the Lockeport Area.

Potential future impacts in the Lockeport area are related to increased frequency and severity of coastal flooding and erosion, which may impact a larger number of residents as well as access to private residences due to impacts to public roads.

Jordan Bay Area

The Jordan Bay area has seen some historical impacts as a result of coastal flooding and coastal erosion, but most private residences in the area are located at a high enough elevation that historical damage has been minimal. Some coastal erosion and impacts on access to private residences on public roads have been observed in West Green Harbour, specifically at the end of West Green Harbour Road and at the end of Stevens Road. No community or municipal infrastructure is specifically at risk in the Jordan Bay area.

Potential future impacts in the Jordan Bay area will be related to increased frequency and severity of coastal flooding and erosion, which may continue to impact private property and access on public roads.

Sandy Point & Gunning Cove Area

Historical impacts in the Sandy Point and Gunning Cove area are related to coastal flooding and storm surge. Specifically, a historical incident of coastal flooding in Birchtown required evacuation of several private residences. Community infrastructure at risk includes the Black Loyalist Heritage Society Museum, Birchtown Community Hall, Sandy Point Lighthouse Community Centre and the Churchover-Gunning-Carleton Village Cove Fire Hall. This area represents the highest population density level in the Municipality, and is also where municipally-owned sanitary sewer and storm water infrastructure is located in the Shelburne Industrial Park.

Potential future impacts in this area are related to increased frequency and severity of coastal flooding and storm surge, which may cause damage to community infrastructure and private residences as well as damage public roads and impact access and egress. In many areas Highway 3 (the primary access road) is very close to the coast and may be at risk of flooding.

Sable River Area

Historical impacts in the Sable River area are related to coastal flooding and storm surge. Impacts have been seen from storm surge at Louishead beach, where several residences located on the beach have been damaged. Storm surge at Louishead beach also poses a safety risk to users of the campground in the area. Several public roads in the area have also been temporarily impacted by coastal flooding, and most recently damage was sustained at the Little Harbour wharf during a storm surge in 2012. Community infrastructure at risk in this area includes the Sable River Fire Hall and the Sable River Community Hall because of their elevation and proximity to the coast.

Potential future impacts in the area are related to increased frequency and severity of coastal flooding and storm surge, which may continue to impact private residences, public roads and community infrastructure.

Facilities and Infrastructure

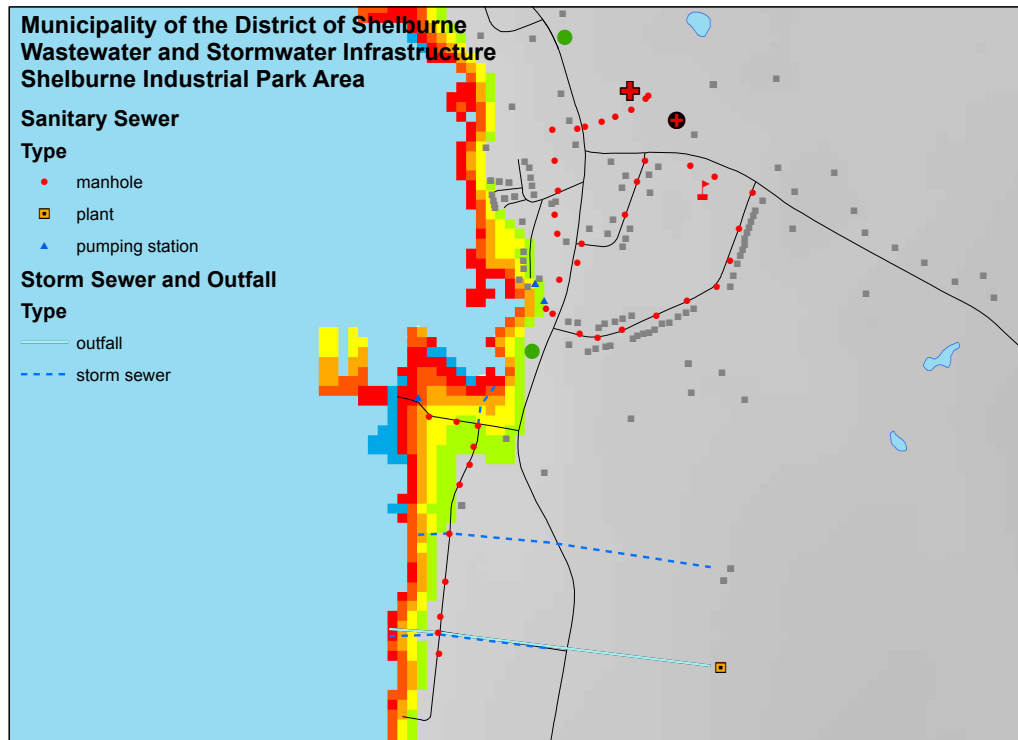
The Municipality of the District of Shelburne own and operate the following municipal infrastructure:

Category	Infrastructure	Description
Water System	None	N/A
Sanitary Sewer System	Sandy Point Sewage Treatment Plant	100,000 USGPD lagoon facility commissioned in 2011.
	Collection System	Gravity Sewer and Forecmain servicing Shelburne Industrial Park, Commission Street, School Street, NSCC-Shelburne Campus, Roseway Hospital
	Pumping Stations	Shelburne Industrial Park (Hero Road) 354 Sandy Point Road
Storm Sewer	Shelburne Industrial Park	Manholes, piping and 3 outfalls to Shelburne Harbour located within the Industrial Park
Municipal Buildings	Municipal Administration Building	136 Hammond Street Approximately 16,000 sq. feet Municipal offices, rented office space & Lock Up. Original building 1902. Addition 1969.
	Public Works Garage	243 Sandy Point Road Garage approximately 3000 sq. feet Built approximately 1940.
	Construction & Demolition Site Office Scale House	Approximately 120 sq. feet Approximately 140 sq. feet
Parks & Trails	Welkum Park	Lakeside park with beach, playground, changing rooms and portable toilets
	Trails	Roseway River, Tom Tigney, Foot Bridge, Jordan River, Seven municipal interpretive sites
Wind Turbine	50 kW COMFIT Wind Turbine	2447 Sandy Point Road

The MCCAP preliminary risk assessment spreadsheet provided by the Canada-Nova Scotia Infrastructure Secretariat was completed and is included on the following page. Based on this assessment, none of the municipally owned infrastructure is at high risk due to climate change. Some portions of the Sanitary Sewer system is at moderate risk due to its proximity to the coast, and a map of this infrastructure is included following the risk assessment spreadsheet. At greatest risk is the pumping station on Hero Road in the Shelburne Industrial Park. This infrastructure was assessed in detail using the PIEVC Protocol as described below.

PIEVC Protocol Analysis of Sandy Point Sewage Treatment Plant

The Protocol developed by the Public Infrastructure Engineering Vulnerability Committee (PIEVC), established by Engineers Canada, was used to assess the vulnerability of the Sandy Point Sewage Treatment Plant Upgrade to the effects of climate change during the design process in 2011 (the new facility was commissioned early in 2012). The



Climate Change Adaptation Plan

Municipal Asset	Sea Level Rise		Precipitation (extreme event)		Extreme Wind	Flooding	Temperature		Erosion	Earthquake	Total	Risk
			Snow	Rain			High	Low				
Water System												
Water Source (Wells, Surface Water, Other)	N	0	N	0	N	0	N	0	N	0	0	L
Water Treatment Plant	N	0	N	0	N	0	N	0	N	0	0	L
Water Storage Facilities	N	0	N	0	N	0	N	0	N	0	0	L
Water Pumping Facilities	N	0	N	0	N	0	N	0	N	0	0	L
Water Distribution System	N	0	N	0	N	0	N	0	N	0	0	L
Individual Water Service Lines	N	0	N	0	N	0	N	0	N	0	0	L
Total	0	0	0	0	0	0	0	0	0	0	0	
Sanitary Sewer System												
Wastewater Treatment Plant	L	1	L	1	L	1	L	1	L	1	9	L
Buildings	L	1	L	1	L	1	L	1	L	1	9	L
Wastewater Gravity Sewer	M	2	N	0	M	2	N	0	L	1	10	M
Wastewater Pressure Sewer (Forcemain)	L	1	N	0	L	1	N	0	L	1	7	L
Pumping Stations	M	2	N	0	M	2	N	0	L	1	10	M
Total	7	2	7	3	8	2	5	6	5	45		
Storm Sewer System												
Catchbasins	L	1	N	0	L	1	N	0	N	0	5	L
Manholes	N	0	N	0	N	0	N	0	N	0	0	L
Pipes	L	1	N	0	L	1	N	0	N	0	5	L
Total	2	0	2	0	2	0	0	2	2	10		
Municipal Buildings												
Buildings	L	1	L	1	L	1	L	1	L	1	9	L
Total	1	1	1	1	1	1	1	1	1	9		
Landfills/Solid Waste Facilities												
Flooding	N	0	N	0	N	0	N	0	N	0	0	L
Access Road	N	0	N	0	N	0	N	0	N	0	0	L
Leachate Collection	N	0	N	0	N	0	N	0	N	0	0	L
Leachate Treatment	N	0	N	0	N	0	N	0	N	0	0	L
Buildings	N	0	N	0	N	0	N	0	N	0	0	L
Total	0	0	0	0	0	0	0	0	0	0		
Dams												
Flooding	N	0	N	0	N	0	N	0	N	0	0	L
Control Gates	N	0	N	0	N	0	N	0	N	0	0	L
Access Road	N	0	N	0	N	0	N	0	N	0	0	L
Fish Passage	N	0	N	0	N	0	N	0	N	0	0	L
Total	0	0	0	0	0	0	0	0	0	0		
Roads												
Bridges	N	0	N	0	N	0	N	0	N	0	0	L
Traffic Signals	N	0	N	0	N	0	N	0	N	0	0	L
Street Lighting	N	0	N	0	N	0	N	0	N	0	0	L
Signs	N	0	N	0	N	0	N	0	N	0	0	L
Culverts	N	0	N	0	N	0	N	0	N	0	0	L
Sidewalks	N	0	N	0	N	0	N	0	N	0	0	L
Local Roads	N	0	N	0	N	0	N	0	N	0	0	L
Collectors	N	0	N	0	N	0	N	0	N	0	0	L
Total	0	0	0	0	0	0	0	0	0	0		

*Please note all of the drop boxes must be filled in for each of the asset classes

assessment was conducted in response to growing concerns about the vulnerability of public infrastructure located in coastal areas of Atlantic Canada to the expected local impacts of climate change including increasing storm frequency and intensity, rising sea levels, storm surge, and coastal erosion and flooding. This project was one of a series of case studies being conducted with the support of Engineers Canada to enhance the PIEVC Protocol and is the first assessment to be conducted in Nova Scotia.

The PIEVC Protocol combines basic risk assessment procedures into a process that first identifies vulnerabilities in public infrastructure systems and then applies an engineering analysis methodology in order to recommend mitigation measures to address the identified vulnerabilities. The vulnerabilities are defined as a combination of a climate event and its potential impact on a system component. The likelihood and consequence of the climate event and the system impact are considered, in order to determine the risk and whether mitigating action is required.

In this case, the PIEVC Protocol was applied at the pre-design stage of the project, rather than conducting the assessment after the infrastructure has been constructed. The Sandy Point Sewage Treatment Plant was originally constructed in 1969 to provide primary wastewater treatment to a small development area that includes residential, industrial and institutional development. The existing facility had a capacity of 30,000 USGPD and has been extensively studied since 2001 when deficiencies in treatment effectiveness were first identified. In response to previous studies and the Canada-wide Strategy for the Management of Municipal Wastewater Effluent, endorsed by the Canadian Council of Ministers of the Environment (CCME) in 2009, the decision was taken to replace the existing plant with a new secondary treatment facility which would both expand the capacity of the existing plant, and incorporate a more suitable and sustainable treatment technology.

The pre-design process identified suitable sites for the new facility and recommended a combination of a lagoon system with ultraviolet treatment as the most suitable technology given operational, maintenance and social consideration as well as capital costs, particularly for a system like this which is prone to peak flows during rainfall events as a result of inflow and infiltration into the aging collection system. In parallel with the technology and site selection process, the PIEVC Protocol was used to define the categories and components of system for assessment, which includes the new treatment facility and the existing collection system. Historical climate data as well as climate change model predictions for 2020, 2050 and 2080 were also gathered with support from Environment Canada. Relevant climate parameters were identified for the region and included:

- Precipitation as rain
- Precipitation as snow
- Sea level elevation
- Wind speed
- Frost
- Fog
- Storm surge
- Ice
- Temperature

A vulnerability (risk) assessment was then conducted based to identify interactions between infrastructure components and climatic events which could lead to vulnerability. The risk assessment included screening of the interactions by the engineering team, as well as a workshop that included participation from the Municipality of Shelburne, Environment Canada, Nova Scotia Environment, Municipality of Yarmouth, Emergency Measures Organization (Eastern Shelburne County) and ABL Environmental Consultants Ltd. Workshop participants were first asked to identify relevant interactions and then to rank the interaction as low, medium or high risk. This represented a significant simplification of the process

suggested in the Protocol, but the team felt it was appropriate given time limitations and the scale of the infrastructure being assessed.

The risk assessment identified a total of eleven (11) interactions which were deemed to be high risk:

- Personnel / Hurricane Event
- Sanitary Manholes / Heavy (Intense) Rain
- Sanitary Gravity Mains / Heavy (Intense) Rain
- Pipe Connections and Fittings / Heavy (Intense) Rain
- Existing Pumping Station Power Supply / Hurricane Event
- Existing Pumping Station Power Supply / Ice Storm Event
- New Pumping Station Power Supply / Hurricane Event
- New Pumping Station Power Supply / Ice Storm Event
- Ocean Outfall / Sea Level Elevation
- Process Building Structure / Hurricane Event
- UV Disinfection / Sea Level Elevation
- Process Building Power Supply / Hurricane Event
- Process Building Power Supply / Ice Storm Event
- End Users / Hurricane Event

There were also one hundred eleven (111) interactions deemed to be medium risk. These interactions were all then subjected to engineering analysis to determine whether mitigation is necessary and possible, and then to recommend appropriate mitigation steps.

Much of the data required for the Engineering Analysis did not exist or was difficult to obtain, but professional judgment and experience was employed where data were not available. For the thirty-five (35) components for which potential vulnerabilities were identified, the analysis resulted in twenty-one (21) remedial engineering actions and four (4) management actions being recommended. Many of the recommendations could be combined and are summarized as follows:

- Reduce inflow and infiltration (I&I) into the collection system (IN PROGRESS)
- Install backup power supplies at the pumping stations (COMPLETE)
- Ensure the process building meets code for hurricane resistance (COMPLETE)
- Install a radio communications system at the pumping stations and process building (COMPLETE)
- Install high level pump shutoffs at the existing pumping station (COMPLETE)
- Install a bypass on the grit removal system (COMPLETE)
- Implement a policy to protect staff from hurricanes, storm surges and ice storms (IN PROGRESS)
- Discuss safe conditions for deliveries with septage haulage companies (IN PROGRESS)
- Adjust scheduling to accommodate required maintenance (COMPLETE)

Conducting the vulnerability assessment in parallel with the pre-design process also implicitly impacted design decisions about technology and site selection and ensured that data on the potential local effects of climate change was available and considered. It was also identified that climate monitoring equipment could easily be designed into new infrastructure to ensure that data are collected during the life of the system for future assessments as the effects of climate change become more apparent.

Facilities important during an emergency

The Shelburne County East Emergency Measures Organization (SCEEMO) Plan identifies the following facilities which will be important in an emergency. The Emergency Operating Centre is located within the Town of Shelburne and the Lockeport Emergency Management Site is located within the Town of Lockeport. Comfort Centres located at the Sable River Community Centre, Middle and Upper Ohio Fire Hall, the Churchover/Gunning Cove/Carleton Village Fire Hall and the Northeast Harbour Fire Hall are all located within the Municipality of the District of Shelburne. The Sable River Community Centre, Churchover/Gunning Cove Fire Hall and the Northeast Harbour Fire Hall have all been identified as potentially at risk of coastal flooding in the event of a severe storm surge due to their location.

- **Shelburne County East – Emergency Operating Centre (SCEEOC)** is located at the Shelburne Civic Centre, 63 King Street, Shelburne (Fire Hall) on the 2nd Floor.
- **Alternate EOC** is located at the Shelburne Lion's Hall, 188 Elliott Street, Shelburne.
- **Lockeport Emergency Management Site (LEMS)** at the Lockeport Fire Hall, 67 Hall Street, Lockeport, next to the Chief's office
- **Alternate Lockeport EMS** will be the Lockeport Fire department mobile command post, which will be driven to a safe location
- **Shelburne Evacuation Centre** in the auditorium of the Shelburne Civic Centre, 63 King Street, Shelburne (Fire Hall)
- **Lockeport Evacuation Centre** at the rear of the Lockeport Fire Hall, 67 Hall Street, Lockeport
- **SCEEMO Comfort Centres**
 - Sable River Community Centre (SRCC)
 - Middle and Upper Ohio Fire Hall
 - Churchover/Gunning Cove/Charlton Village Fire Hall
 - Northeast Harbour Fire Hall

Socioeconomic Impacts of Climate Change

Social Vulnerability

Vulnerability of communities, individuals and groups to climate change may be considered as a combination of their exposure to hazards (due to location or other factors), their sensitivity to the hazards, and their capacity to adapt. Usually emergency management professionals focus primarily on exposure by assessing the physical areas most likely to be impacted and identifying spatially where populations may be impacted (for example, in the case of flooding, by identifying populations that may be isolated if roads became impassable. This type of spatial analysis has been completed and is incorporated into the SCEEMO Plan and further work on exposure due to location was incorporated into the MCCAP process through the development of the information included in the section in this document on Affected Locations.

Evaluating sensitivity of populations can prove more complex. Census data from 2011 for the Municipality data do indicate some patterns of note:

- More than 56% of the population of the Municipality of the District of Shelburne are over the age of 44, and 20.8% are 65 years or older. The population is continuing to age, and older people may be more sensitive to event based climate hazards, and are more likely to be isolated.
- 20.4% of individuals have low-income status (based on after-tax low-income measure), compared to the provincial average of 17.4%
- Only 70% of dwellings are occupied year-round, indicating a large seasonal population and increasing the potential for residents to be isolated without help from neighbours
- 92% of dwellings are single, detached homes

Of primary concern in the event of a climate hazard with the potential to affect the health and safety of residents would be ensuring those in need of assistance are able to access the assistance required. This is most likely an issue when there is an event-based impact such as a severe storm, flooding, drought or heat wave. The primary response from emergency management will be based on spatial location, as well as local knowledge of those who may be more sensitive to impacts, such as the socially isolated, or elderly.

Connecting vulnerable residents to the appropriate support network can also reduce their risk. The following organizations and agencies would provide support in the event of a weather-related emergency and the Municipality should continue to ensure that all residents are informed of how to access assistance should they need it.

- Shelburne County East Emergency Measures Organization (SCEEMO)
- Red Cross
- RCMP
- Department of Community Services
- Emergency Health Services
- Roseway Hospital
- Tri-County Regional School Board
- Department of Environment
- Department of Transportation and Infrastructure Renewal
- Department of Natural Resources
- Fire Departments: Little Harbour, Sable River, Lockeport, Jordan, Lower Ohio, Middle and Upper Ohio, Churchover/ Gunning Cove, Northeast Harbour, Ingomar, Port Clyde

Evaluation of Adaptive Capacity

The final piece in helping to evaluate community resilience with respect to climate change is to try to understand the adaptive capacity of the community as a whole. This has been extensively studied by the Nova Scotia Climate Change Directorate (Stantec, 2012) and a scenario planning process suggested as a means to help communities evaluate their vulnerability. In June 2013, the MCCAP Working Group along with other invited stakeholders undertook a scenario planning workshop in an attempt to better understand the adaptive capacity of the Municipality of the District of Shelburne with respect to Climate Change.

The workshop included the following steps:

- Characterization of the community as thriving, stable, decline or crisis in the following ten themes:
 1. Health
 2. Education
 3. Demographics
 4. Sense of Community
 5. Governance
 6. Safety & Preparedness
 7. Infrastructure
 8. Local Economy
 9. Macro Economy
 10. Technology
- Consideration of the community's ability to respond to an event-based scenario with four different sets of external circumstances discussing in each case:
 - What could be our community's strengths in this scenario? What could be our vulnerabilities?
 - What could happen to our community in this scenario if nothing changes?
 - What would you do now to impact how the community may respond in this scenario?
 - Are there obvious 'leverage points' for lessening social and economic vulnerability?
- Harvesting common themes and strategies or adaptations that are robust under all scenarios

Characterization of the community gave the following results, showing the community as a combination of stable and decline, depending on the theme.

Theme	Thriving	Stable	Decline	Crisis
Health				
Education				
Demographics				
Sense of Community				
Governance				
Safety & Preparedness				
Infrastructure				
Local Economy				
Macro Economy				
Technology				

Further discussion of the characterization is recorded in the table below:

Thriving	Stable
• Our community is very different from thriving • Some things are the same - people are proud to live here, have a strong sense of community • Huge potential • Quality of life • Communities rally to help those in need • People don't always see the big picture - our standards may be too low	• Our community is a lot like this • Investing in the future and trying new things • Safety, EMO, high standards • Long established patterns • Not enough "selling" to create growth • Young professionals • Increased engagement with local government
Decline	Crisis
• Some similar, some different than this characterization • Economic definitely in decline or crisis • Housing, impact of high proportion of seasonal residents on property value, price • Population declining • Not able to support infrastructure (water, power, transportation) • Not able to support volunteer organizations/safety	• Outmigration • Aging population • Volunteer burnout (fire, emergency response) • At risk populations increasing • Some families in quiet despair

The Harvest from the workshop identified the following points, which have been incorporated into the Priorities for Adaptation Section of this document:

- Building strong enduring partnerships between municipal units and with other levels of government and with non-traditional partners (businesses, community groups) is important to increase resilience
- Proactive planning for responsibilities and improved communications
- Advocate for more supportive Provincial policies and structure for rural vs. urban
- Continue to provide services but ensure that residents are comfortable with accessing them and aware of how to engage with and use them
- Continue to encourage communities to become more self sufficient and sustainable (particularly with respect to food and energy)
- Develop strategies for supply and sharing of potable water sources in the event of an interruption in supply
- Develop policy and support for innovative and sustainable solutions to our own problems from within the community
- Collaborate on advocacy with other communities in the Province facing similar challenges
- Encourage citizen science projects
- Share knowledge of the current reality and future possibilities with the community
- Sustain sense of community through longer term thinking and better coordination and connection of people, skills and situations
- Support small, renewable energy projects
- Compile a list of vulnerable infrastructure and prioritize adaptation
- Develop and work with tools for community level infrastructure and coastline assessment

Economic Implications

As noted in the Municipality of the District of Shelburne's ICSP (2010), the primary economic activities in the District are fishing, fish processing and related marine industries. There is also a significant tourism industry. More than 23% of people in Shelburne County are employed in the natural resources, agriculture and related production occupations (Census, 2011). The Fishery, Tourism and Agriculture are the economic sectors most likely to be impacted by climate change.

The Municipality of the District of Shelburne is part of a study being conducted by the Partnership for Canada-Caribbean Community Climate Change Adaptation (ParCA) about the vulnerability of the Fishing and Tourism industries to climate change. A preliminary summary of key findings from this study is included as Appendix C to this document.

Climate Change Implications for the Fishing Industry

The Ecology Action Centre (2012) identify the following six expected stressors on the Fishing Industry in Atlantic Canada as a result of Climate Change:

- **Increasing Temperatures:** Global increases in air temperature will result in increased sea surface temperature. This may result in bottom dwelling species migrating northwards and to deeper waters as well as an increase in algal blooms and has the potential to impact cod, mackerel and lobster stocks
- **Reduced Salinity:** Coastal waters are becoming less saline due to melting sea ice and more rainfall which may increase water stratification resulting in a warmer, fresher upper surface and saltier, colder deep layer, and less mixing. This may reduce spring phytoplankton growth which relies on mixing to bring oxygen to deep water and nutrients to the surface.
- **Decrease in Oxygen:** Warmer water holds less oxygen, which may negatively impact crustaceans and fish, but may not impact more tolerant species such as mollusks, worms, sea stars, sea urchins and jellyfish
- **Increased Acidity:** Increases in atmospheric CO₂ resulting in ocean acidification may reduce the growth and productivity of crustaceans and mollusks
- **Less Sea Ice and Snow Cover:** This may increase coastal erosion as well as expanding distribution of grey seals which may impact fish stocks
- **Rising Sea Level and Storm Surges:** This may result in increased vulnerability of fishing industry infrastructure.

Preliminary findings from the ParCA study indicate that fishers in the area are already finding it increasingly difficult to predict natural cycles such as weather patterns, storms, fish spawning, species migration, which is impacting their ability to fish effectively and increasing their vulnerability. As the climate continues to change vulnerabilities in the fishing industry also include damage to physical infrastructure (wharves, vessels), increased maintenance costs, and increased risk to health and safety due to increasing intensity and severity of weather.

Opportunities for fishers include the possibility of increased lobster catches, as are already being observed, but this introduces an economic vulnerability in the form of low wharf pricing for lobster. As the climate continues to change it will be important to engage the fishing industry in monitoring changes and working to develop innovative adaptive solutions.

Climate Change Implications for the Tourism Industry

Vulnerabilities created by climate change for the tourism industry include poor weather and property damage both of which contribute to low tourist rates and increased costs. Interviews conducted by the ParCA project also indicated that tourism operators are concerned about coastal erosion making it difficult to sell property and the risk of evacuation of campsites and beaches due to safety concerns as a result of storms reducing the attractiveness of the destination to

tourists. Some concern was also raised about water resource vulnerability as much of the Municipality is dependent on wells, particularly dug wells, which can be vulnerable to poor quality and supply in the summer months, an effect that will worsen with the predicted increased water deficit.

Opportunities created by climate change in the tourism industry include agricultural tourism, culinary tourism, wine tourism, surfing, clam digging, fishing expeditions, shipbuilding workshops, sailing related opportunities. The summer tourism and golf season could certainly be extended in future and there is an opportunity for tourism operators to reframe weather experiences for visitors so “bad” weather doesn’t equate to a bad vacation.

Climate Change Implications for Agriculture

Although agriculture is not currently a significant economic sector in the District of Shelburne, the current and future climatic attributes of the area may make alternative agricultural models feasible such as the production of high value fruit crops such as peaches, highbush blueberries and wine grapes. These are relative new crops to Nova Scotia that have very specific climatic requirements. An attempt to better understand the climatic conditions in Southwest Nova Scotia is current underway through the deployment of 42 temperature and solar radiation stations by the Applied Geomatics Research Centre in the spring of 2011. Based on initial data from this study, the area does offer significant potential for high value agricultural crops. Shelburne has heat accumulations comparable to the Annapolis Valley and suitable and in some cases superior climatic suitability for high value crops such as peaches, highbush blueberries and grapes than the agricultural standard represented by the Annapolis Valley (Lewis, 2011). Combined with anticipated climate change trends that will further increase frost free days and increase temperatures and heat accumulation, high value agricultural crops represent a significant opportunity for the area.

Environmental Issues

Environmental issues experienced in the past due to weather and anticipated as a result of climate change are almost exclusively related to coastal ecosystems and habitats. The health and productivity of natural systems, landscapes and features along the coast including salt marshes, wetlands, beaches, dunes and islands is essential for the social and economic health of our communities. Environmental issues in coastal areas are addressed in detail in Municipality's Coastal Management Strategy, as described below. Also of concern are the potential impacts of climate change on species at risk in the area, particularly Piping Plovers, whose habitat and breeding areas may be impacted by climate change. Procedures and facilities for the temporary storage of Household Hazardous Waste at the Municipal Public Works Garage are also reference below, as are Environmental Hazards addressed by the Shelburne County East Emergency Management Organization Plan.

Coastal Management Strategy

The Municipality of the District of Shelburne is a coastal community with over 350 km of coastline. More than 80% of homes and infrastructure in the Municipality are located within 5 km of the coast. In an asset mapping workshop held in 2008 as part of the public consultation process for developing the Integrated Community Sustainability Plan for the Municipality of the District of Shelburne, residents and stakeholders identified the coast as our community's most important natural asset. On October 15, 2012, the Municipality of the District of Shelburne adopted a Coastal Management Strategy. The purpose of the Coastal Management Strategy was to lay out short, medium and long term actions within the jurisdiction of the Municipality of the District of Shelburne which would balance environmental protection with public access and sustainable economic development to ensure coastal areas maintain their social, economic and environmental value for future generations. It was designed to provide a structure to help better manage our community's interactions with the coast to ensure its long term sustainability.

The development of the Coastal Management Strategy included public engagement through outreach programs, interviews with residents and stakeholder consultation and was guided by the Coastal Management Strategy Planning Advisory Committee. Included in the Coastal Management Strategy are three focus areas: Coastal Development, Sea Level Rise & Storm Events and Coastal Ecosystems & Habitats. Goals and objectives are stated for each focus area and a five-year action plan focused first on Education, Research and Outreach and progressing to Planning, Policy and Regulation is outlined. Committing to this strategy and taking this work forward will require continued coordination by the Sustainable Development Coordinator as well as engagement with a Planning Advisory Committee and other staff and stakeholders as described in the Implementation section of the Strategy.

The Coastal Management Strategy is included as Appendix D to this document, and the goals and action plan from the Coastal Management Strategy have been incorporated into the Priorities for Adaptation in this document.

Piping Plovers

In a study completed in 2010, it was found that if plover habitat cannot migrate, SLR [sea-level rise] is likely to reduce breeding areas. However, if habitat is able to migrate upslope and inland, breeding areas could actually increase with SLR. Unfortunately, this potential habitat gain is stymied by human development, which was found to reduce migrating habitat by 5–12%, depending on SLR estimates. It was also found that the spatial configuration of developed areas mattered more than intensity of development in blocking the migration of potential habitat area" (Seavey et al. 2010).

Though this study was based on the New York coast, the findings are likely quite applicable to beaches in Shelburne County. With rising sea levels and post-glacial subsiding coastline in Southwest Nova Scotia, beaches in Shelburne County will need the space and ability (e.g., free of hard structures such as armouring) to move landward to maintain

enough suitable nesting habitat for nesting Piping Plover. Some of the most productive beaches in NS are barrier beaches – beaches that can move and change in response to storms.

Hazardous Materials

The Municipality of the District of Shelburne operate a Household Hazardous Waste Depot at the Public Works Garage located at 243 Sandy Point Road to collect and temporarily store hazardous materials from households within the service area of the Municipality of the District of Shelburne. No collection services for the industrial sector are provided at this facility. The depot is owned and operated by the Municipality of the District of Shelburne and will accept household hazardous waste from resident taxpayers in the Municipality of the District of Shelburne (with no fee) and also provides a fee-based collection service for residents of the Town of Lockeport and the Town of Shelburne.

No hazardous waste is kept at the depot for more than 90 calendar days. The purpose of the facility is to prevent landfilling of residual hazardous materials and process hazardous waste in a safe and cost effective manner while providing maximum protection to the environment. Operation of the facility is guided by the document “Operation Procedures for the Temporary Storage of Hazardous Materials at the Public Works Facility for the Municipality of Shelburne” (December, 2002).

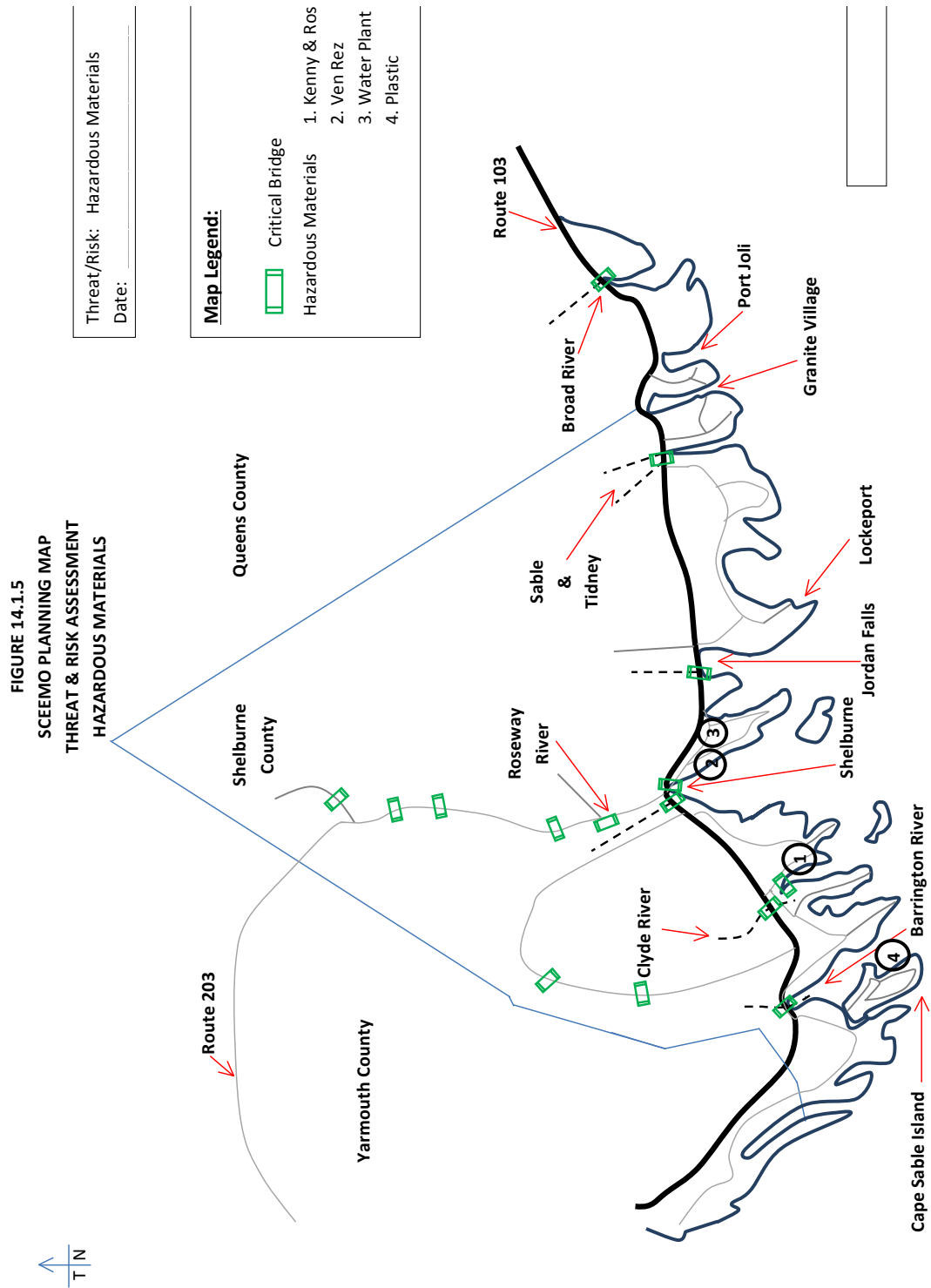
The Household Hazardous Waste Depot is not at significant risk of climate impacts due to its location. However, in the event of a spill or loss of containment, the largest weather-related risk would be high intensity rainfall which would cause dispersion of the spilled material. In 2013, the Municipality of the District of Shelburne installed secondary containment at the site in the form of a curb to provide 110% containment for waste volumes stored at the site, as well as a roof shelter and controlled drainage system to prevent rainwater from accumulating in the storage area.

Other locations for the storage of Hazardous Materials are identified in the SCEEMO Plan as part of the Threat and Risk Assessment. These include the Town of Shelburne's Water Plant, Ven Rez (Shelburne Industrial Park) and Kenney and Ross (Clyde River). These locations are shown in the map excerpted from the SCEEMO Plan on the following page.

Emergency Preparedness

The Shelburne County East Emergency Management Organization Plan is an “All Hazards” Emergency Response Plan which covers weather-related as well as environmental emergencies and disasters. In the SCEEMO Plan a chemical spill as a result of a motor vehicle accident or industrial accident is rated as the second most probable hazard, primarily due to the non-availability of hazardous response suits or equipment in all of Shelburne County. The response would be dependent on assistance from Liverpool or Yarmouth. Also identified as a significant risk is an offshore oil spill, which could have a devastating impact on the fishing industry with long term economic consequences. There is very little oil spill emergency response capability in the county. Neither of these environmental hazards are significantly impacted by weather or climate change. Vulnerability to the impacts of a hurricane is also identified in the SCEEMO plan, the impacts of which may worsen with the impacts of climate change.

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Priorities for Adaptation

The three priority climate hazards identified in this analysis are **Coastal Flooding and Erosion, Drought and Wildfires** and **Increased Precipitation and Inland Flooding**. The following table summarizes the impact associated with each of these hazards.

Hazard	Impact	Risk
Coastal Flooding and Erosion	Risk to Public Safety	High
	Property damage	Medium
	Economic Infrastructure - Damage and Disruption of Service (Power Outages, Fishing Wharf Damage)	Medium
	Damage to Roads and Bridges, Transportation and communication disruption and isolation of residents	Medium
Drought and Wildfires	Reduced quality and quantity of well water	High
	Crop damage	Medium
	Risk to Public Safety from Wildfires	Medium
	Property damage	Low
	Power utility disruption	Low
Increased Precipitation and Inland Flooding	Risk to Public Safety	High
	Property damage	Medium
	Damage to Roads and Bridges, Transportation and communication disruption and isolation of residents	Medium

The table below identifies priority adaptation actions for each hazard. Some of these actions are taken from existing related plans and documents (SCEEMO Plan, Coastal Management Strategy, PIEVC Assessment of Sandy Point Sewage Treatment Plant) and others are new as a result of this analysis.

Action Item	Supporting Document	Responsibility
Hazard: Coastal Flooding and Erosion		
Integrate Climate Risks into SCEEMO Plan: Continue to work with EMO Planning Committee and the SCEEMO Plan to integrate climate change considerations into emergency response planning. Integrate coastal flooding risk maps into SCEEMO Plan.	SCEEMO Plan	EMO Coordinator Sustainable Development Coordinator
Storm Surge Monitoring: Initiate a program with fire departments and other emergency response organizations to record high water levels during storm surge events so they can be surveyed and integrated into coastal flood risk mapping.	MCCAP	EMO Coordinator Sustainable Development Coordinator

Action Item	Supporting Document	Responsibility
Increase Public Awareness of Emergency Preparedness: Continue to take an active role in communicating to residents best practices for being prepared for an emergency.	MCCAP	EMO Coordinator
Coastal Flood Risk Mapping: Work with the Nova Scotia Climate Change Directorate and the Applied Geomatics Research Centre to use newly acquired LiDAR data to complete coastal water level flood risk mapping to identify long term risk as well as to complete evacuation planning exercises for storm surge events in Eastern Shelburne County	MCCAP	Sustainable Development Coordinator EMO Coordinator
Coastal Impact Area: Define and communicate the definition of a coastal impact area within the Municipality using distance and elevation from the ordinary high water mark for the purposes of education and information gathering.	Coastal Management Strategy	Sustainable Development Coordinator
Education and Outreach Program: Develop and implement an education and outreach program for coastal landowners about stewardship and development best practices, including recommendations for distance and elevation for development from the high water mark, erosion control and vegetative buffers. Include a checklist or point system to help landowners assess development plans for flood risk. Make information packages available through the building inspection department.	Coastal Management Strategy	Sustainable Development Coordinator
Beach Planning: Work with stakeholders and other partners to examine the suite of beaches in the municipality and prioritize for conservation or development of recreation/tourism infrastructure. Advocate for the development of beach management plans and work with other levels of government to help manage our impacts on these valuable coastal resources.	Coastal Management Strategy	Sustainable Development Coordinator
Community Consultation: Consider creating a requirement for community consultation in coastal areas to ensure community members are consulted about significant non-residential developments (commercial, industrial).	Coastal Management Strategy	Sustainable Development Coordinator Municipal Council
Consider Zoning Sensitive Areas: Investigate and consider mechanisms, such as zoning or protection by definition, for the protection of sensitive areas within the coastal impact area.	Coastal Management Strategy	Sustainable Development Coordinator Municipal Council
Integrate Climate Change into Sustainability Outreach Programs: Ensure that climate change is included in public outreach related to Sustainability and continue to communicate the results of the MCCAP process to residents and in schools.	MCCAP	Sustainable Development Coordinator

Action Item	Supporting Document	Responsibility
Consider Land Use Planning in Coastal Areas: Based on the results of the education and planning activities, consider the implementation of land use planning including setbacks (horizontal and vertical) from the ordinary high water mark. Include flexibility in the policy where reasonable for variances if property owners can prove the suitability of the development based on soil type, shoreline type and other site specific data.	Coastal Management Strategy	Sustainable Development Coordinator Municipal Council
Communicate and Support Citizen Science: Communicate opportunities and encourage participation in citizen science projects designed to monitor and improve understanding of the impacts of climate change, particularly in the fishing industry.	MCCAP	Sustainable Development Coordinator Municipal Council
Support the development of Tools and Criteria for Coastal Adaptation: Support Saint Mary's University in as a pilot site for a project focused on the development of tools and criteria for selecting appropriate coastal adaptation strategies for infrastructure and private property.	MCCAP	Sustainable Development Coordinator
Weather Safety Policy: Implement a policy to protect staff and users at the Sandy Point Sewage Treatment Plant and Septage Receiving Facility from hurricanes, storm surges and ice storms.	PIEVC Assessment	Public
Hazard: Drought and Wildfires		
Private Water Supply Management Awareness: Work with Nova Scotia Environment and explore other partnerships to communicate and promote strategies for private water supply management for residents and businesses. Work with the Province to develop a tool to help residents assess their risk and plan for managing their private water supply long term.	MCCAP	Sustainable Development Coordinator
Support DNR Wildfire Prevention Programs: Explore ways to ensure residents are aware of wildfire prevention strategies.	MCCAP	Sustainable Development Coordinator
Hazard: Increased Precipitation and Inland Flooding		
Minimize inflow and infiltration in the wastewater system: Reduce inflow and infiltration into the wastewater collection system through the implementation of a long term cleaning, inspection and repair program (IN PROGRESS)	PIEVC Assessment	Public Works Municipal Engineer
Inland Flood Risk Mapping: Work with the Nova Scotia Climate Change Directorate and the Applied Geomatics Research Centre to use newly acquired LiDAR data to complete inland water level flood risk mapping to identify long term risk as well as to complete evacuation planning exercises for storm surge events in Eastern Shelburne County	MCCAP	Sustainable Development Coordinator EMO Coordinator

Action Item	Supporting Document	Responsibility
Watershed Mapping: Incorporate surface water systems into flood risk mapping and ensure that any watershed features and drainage are considered in any land use or development planning processes.	MCCAP	Sustainable Development Coordinator

Climate Change Mitigation

Energy and energy efficiency were identified as significant considerations in the Municipality of the District of Shelburne's Integrated Community Sustainability Plan (ICSP). The ICSP identifies the following goals for 2030:

Goal 12-1: Our community uses energy efficiently and is dependent on secure, renewable sources.

Goal 12-2: A renewable energy industry has developed in Shelburne County which includes both power generation and manufacturing.

Since 2009, the Municipality has been actively working to both better understand corporate and community energy use and to improve efficiency and promote renewable energy wherever possible. In June 2009, the Municipality of the District of Shelburne joined the Federation of Canadian Municipalities Partners for Climate Protection Program (PCP). The Municipality has now completed Milestones 1, 2 and 3 of this program, including adopting the following greenhouse gas reduction targets in December 2010:

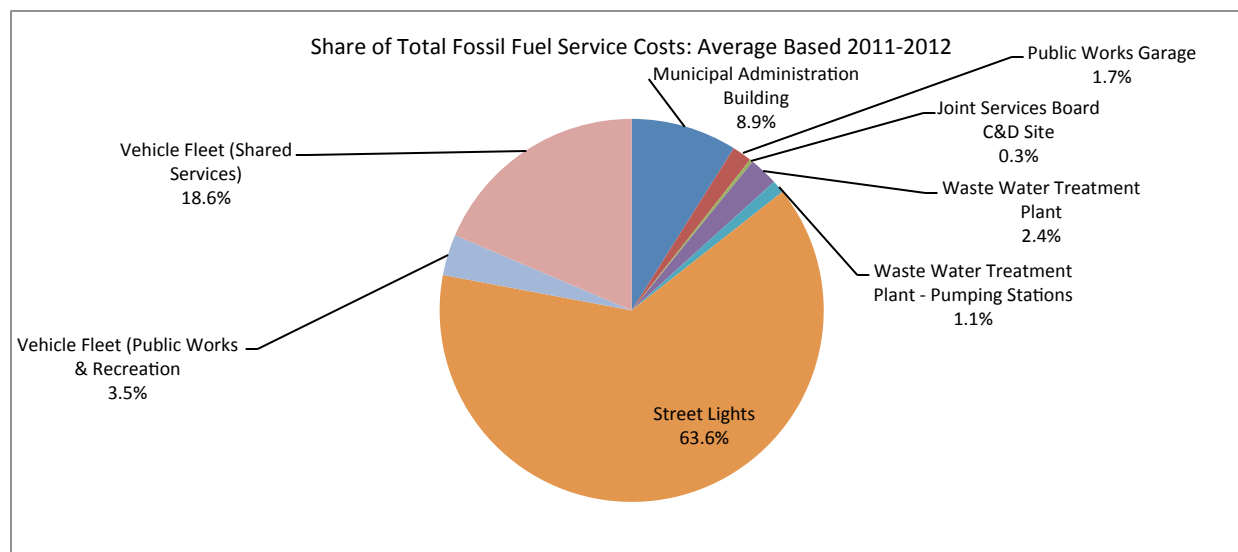
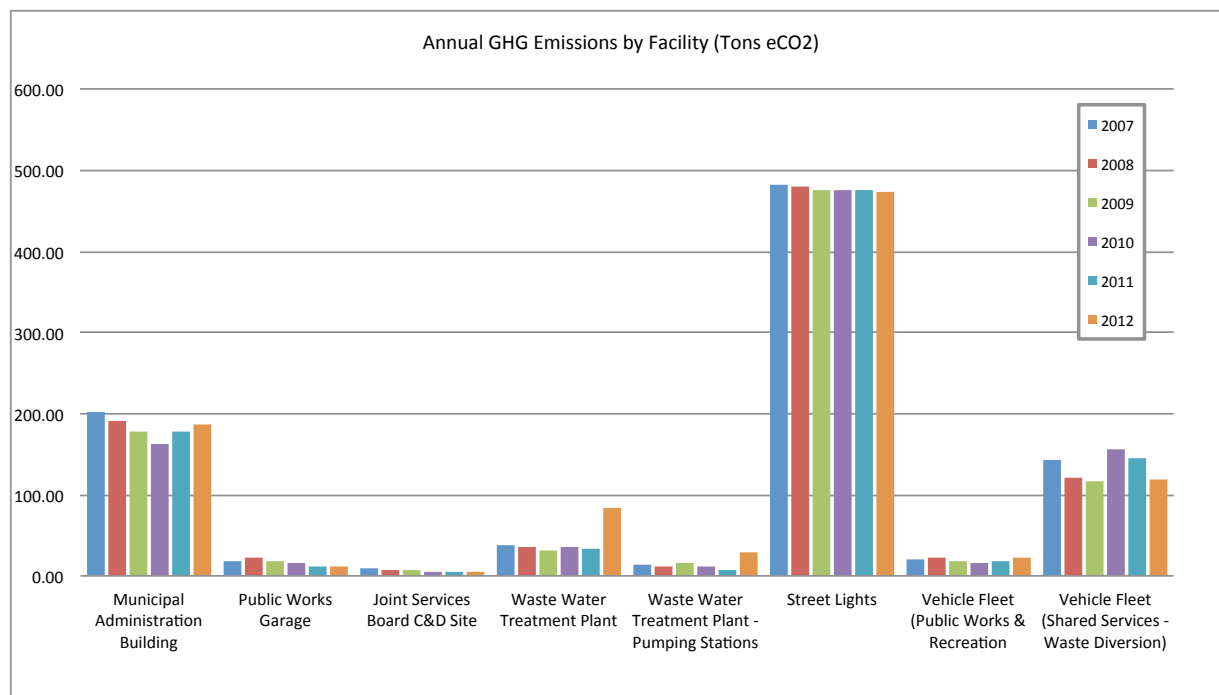
- A 20% reduction in corporate emissions from 2007 levels by 2020; and
- A 8.2% per capita reduction in community emissions from 2007 levels by 2020.

These targets were developed as part of Milestone 3 of the PCP program and as a result of the completion of the Eastern Shelburne County Energy Strategy (ESCES), developed in 2010 and adopted by Council in December 2010. The ESCES was developed in collaboration with the Towns of Shelburne and Lockport and identifies renewable and alternative energy opportunities for Eastern Shelburne County as well as measures to reduce greenhouse gas emissions, an approach to outreach and education about energy for residents and businesses, and an action plan to pursue opportunities. The ESCES is included as Appendix E of this document.

Energy and Emissions Inventory

The Municipality of the District of Shelburne completes a greenhouse gas inventory every two years and has done since 2007. Results of the 2011-2012 inventory are summarized below and the full inventory results are included as Appendix F.

- Municipal operations result in approximately **903 tons of eCO₂** to be emitted annually. This is a 1.5% decrease from 2007-2008 data, but a 2.7% increase from 2009-10 data.
- The increase from 2009-10 data can be primarily attributed to the commissioning of the new wastewater treatment plant and pumping station, which has three times the capacity of the infrastructure it replaced.
- These emissions also result in approximately **11,141 kg of air pollutants** to be emitted annually.
- By far, the greatest source of emissions is **electrical consumption (82%)**, accounting for **77% of costs**
- By far, the greatest functional source of emissions is **streetlights**, accounting for **64% of fossil fuel costs**
- The District of Shelburne spends **\$342,467 annually** on the direct purchase of fossil fuel services.
- GHG emissions and energy use the C&D Site, Municipal Administration Building, and Public Works Garage decreased 59%, 12% and 40%, respectively, since 2007.



Action Plan and Implementation

The ESCES identifies short and long term actions for the municipalities in Eastern Shelburne County, the first of which was to establish an Energy Strategy Coordinator for the three municipal units to focus on implementation. This dedicated resource was not established, however, implementation of several of the identified actions has proceeded and others are in progress or being considered. An updated action plan (including projects that have already been completed) is presented in the table below.

Action	Responsibility	Estimated Cost	Status
Wind Turbine Development Plan and Land Use Bylaw: Develop policy and implement a Wind Energy Development Plan and Wind Turbine By-Law for the District of Shelburne which balances the benefits of development with	Sustainable Development Coordinator	Project funded by Department of Energy	COMPLETE
Energy Efficiency Improvements - Public Works Garage: Complete lighting retrofit, insulation and programmable thermostats as recommended in Energy Audit in 2009.	Public Works	\$3000	COMPLETE
Municipality of the District of Shelburne 50 kW COMFIT: In the summer of 2013 the Municipality of the District of Shelburne installed a 50 kW wind turbine under the COMFIT program in Sandy Point. It is anticipated that this turbine will generate over 100,000 kWh per year in electricity, which will be sold to Nova Scotia Power.	Sustainable Development Coordinator	\$450,000	COMPLETE
Energy Efficiency Improvements - Shelburne County Arena: Complete lighting retrofit, new roof membrane, furnace and condenser, including heat recovery for domestic hot water.	Director of Recreation and Parks	\$350,000	COMPLETE
Activating the Energy Transition in Eastern Shelburne County: Implement recommended awareness and engagement programs to inform businesses, institutions and residents about the Energy Strategy and ways to access funding and programs including information sessions and targeted workshops. This project has been underway since October 2012 and is funded by Environment Canada (EcoAction) and led by the Shelburne County Women's Fishnet, a local non-profit.	Shelburne County Women's Fishnet, Municipality of the District of Shelburne.	The project budget over 18 months including in-kind contributions is approximately \$200,000.	In progress until March 31, 2014
Solar Thermal Project - Lockeport High School: As part of the Activating the Energy Transition Project, a workshop was held in March 2013 at the NSCC - Shelburne Campus where 17 local residents and tradespeople learned how to build and install solar hot water and solar air systems. Part of the project was refurbishing a solar thermal system and gathering donated parts in order to install it at the Lockeport High School. Final installation is expected by April 2014.	Shelburne County Women's Fishnet, Municipality of the District of Shelburne.	The materials and labour for this project were donated, but valued at \$20,000.	Fall 2013

Action	Responsibility	Estimated Cost	Status
Facilities Renewal: Improve energy efficiency of municipal administration building through the construction of a new, shared Government Services facility for the region including energy efficient and renewable energy technologies. Study completed in 2011 identified opportunities to incorporate a 40% reduction in energy use through the use of solar thermal for water and air space heating as well as heat pumps and improved lighting design	CAO	The total project costs are estimated at \$7,000,000	Planning
Large Wind (800 kW) COMFIT Project: Continue to assess the feasibility of proceeding with a large wind COMFIT project in the Sandy Point area based on wind energy data collected since 2011.	Sustainable Development Coordinator	\$3,000,000	Feasibility Analysis
Streetlight Policy and LED Transition: Continue to work with Nova Scotia Power to ensure an efficient transition to LED streetlights and reduce or remove streetlights where they are not needed.	Public Works	To be determined	Planning

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Adapting Atlantic Canadian Fisheries to Climate Change. Ecology Action Centre, 2012.

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Richards, William and Réal Daigle. Scenarios and Guidance for Adaptation to Climate Change and Sea Level Rise - NS and PIE Municipalities. August 2011.

Seavey, J. R., et. al. Effect of sea-level rise on piping plover (*Charadrius melodus*) breeding habitat. *Biol. Conserv.* (2010), doi:10.1016/j.biocon.2010.09.017

The Municipal Climate Change Action Plan Assistant: Learning From Others. Elemental Sustainability Consulting Ltd., 2011.

Tools for Community Climate Change Adaptation in Nova Scotia: Socio-Economic Indicators & Scenario Planning, Stantec, 2012.

Appendix A: Stakeholder Consultation Results

Stakeholder Interviews

Early in the MCCAP development process, a series of stakeholder interviews were conducted in order to understand work being undertaken by other government departments and external organizations, which was synergistic with the Municipality's work on the MCCAP. The following notes from the stakeholder interviews informed how the Municipality approached the MCCAP development process.

July 23, 2012	Department of Fisheries & Oceans	Paul MacDonald MacDonaldPG@dfo-mpo.gc.ca 902.863.5670
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- DFO is completed in a multi-year federal program looking at the impacts of climate change, from a science point of view, for both fish management and infrastructure (Aquatic Climate Change Adaptation Services Program)
 - 5-year funding started in Spring 2012 and involves a number of other departments, it is a fairly high profile program focused on what science is needed to evaluate strategies for adaptation
- Small craft harbours is focused on properties and infrastructure and what is the best process to identify vulnerability
- Should also talk to the Coast Guard about their infrastructure (to send contact) e.g. lighthouses
- DFO is looking harbour by harbour at the synergistic effects of climate change and the socio economic factors (e.g. value of boats, fish landings, social value of harbour as a gathering location)
- Are at the early stages of developing a national matrix for evaluating (Paul will send information) but methodology is not yet finalized and has not been rolled out to the Harbour Authorities
- No timeline to do this, they are right now focusing on the sustainability of programs
- Vulnerability of harbours will inform policy decisions for the long term including protection, relocation, etc.
- Should talk to Justin Houston at Fisheries and Aquaculture (have emailed)
- Could also talk to policy people in Halifax re expected long term impacts of climate change on fish stocks
- Jennifer Mullane indicated that there would be a workshop in October regarding the development of a tool for risk assessment along the coast and that we may be permitted to participate as observers
- [Generic info about the program \(click here\)](#).
- *This project will carry out a pilot implementation of methodologies for estimating extreme high sea levels associated with multiple climate change influences, with consideration of their uncertainties. These methodologies will primarily focus on the lower-frequency ocean variables, such as changes in mean sea level. This project will also provide pilot tools for ocean waves generated by storms and expected changes related to the future climate scenarios. The exact form of the tools will be determined through consultation and will partly depend on the methodology or methodologies chosen in and the external sea level projection experts.*

July 25, 2012	Nova Scotia Transportation and Infrastructure Renewal	Dr. Bob Pett (902) 424-4082 pettrj@gov.ns.ca
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- So far, our department's climate change activities have focused on the Chignecto Isthmus.
- Hoping to have the final report out very soon and available on the ACAS website.
- NSTIR also created an overview report of its ACAS activities (pdf copy provided).
- The report shows our intentions in the near term - something that I've been trying to get going this summer (not too much so far).
- We are looking to start an inventory of coastal problem areas that either have had frequent stormtide damage or are likely to in the near future. This year I intend to start the inventory along three coasts/Counties (Northumberland Strait/Cumberland, Atlantic/Lunenburg and Gulf/Inverness) and then do considerably more next summer, hopefully with the aid of a student.

August 2, 2012 Insurance Bureau of Canada

Amanda Dean
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adean@ibc.ca

- IBC is increasingly interested in climate change because their members are seeing an increase in water-related claims
- “Water is the new fire” – they are most concerned with rainfall, sea level rise, storm surge, also hurricanes and wind storms which are happening with greater frequency and intensity
- Overland flooding and coastal erosion is NOT covered by home insurance but water coming in through drains and sewers is insured, hence their interest in municipal infrastructure
- Will release research report about the “cost of doing nothing” in late summer or early fall
- Working with Natural Resources Canada and the regional adaptation collaboratives to develop a tool to identify the weakest points in infrastructure and help municipalities decide how to allocate limited resources (in its second year of testing but may not be available for 1-2 years)
- Can provide some claims evidence at a provincial level
- IBC does some consumer outreach and has done research in how to develop consumer friendly materials about how to talk about these issues with consumers which they can share
- Have 1-800 consumer information number which we can publish on our materials
- Can help develop consumer information pieces, clarify insurance coverage (e.g. sometimes poor maintenance can cause a claim to be denied)

August 21, 2012 Bell Aliant

Marcus Goodick
Marcus.goodick@aliant.ca
902.487.3329

- General emergency planning – EMO type operations, groups are monitoring when there are storms etc. There is a lot of resiliency in the network (e.g. cable cuts can be looped back)
- Based on Hurricane Juan and White Juan there have been improvements
- Bell Aliant has their own power systems plus a fleet of portable generators so that smaller facilities can carry on – usually 8 – 18 hours without electricity and then portable generators are looped around to recharge batteries. After white Juan the battery life was increased for some sites because roads were not cleared in time.
- Benefits in operating across the province/region, a lot of reserve to draw on from other locations – inter-communication and cooperation between regions
- Some communication with NS Power, but fully independent so they can supply their own power in the event of an outage
- Jeff Moore (Atlantic Network Operations Centre – within Bell Aliant) – tied into provincial and municipal EMO offices, always tightly tied to EMO if there is an outage.
- Just starting to work on other climate change impacts – for example in the Moncton area certain equipment and battery backup was moved from basement to 2nd floor because it was below 100 year flood line.
- Have contracts with pumping companies – high on priority list in the event of a flood – some work looking at that...looking to have more conversations internally.
- Fibreop – aerial cable – if we are expecting more extreme weather, higher winds, need to understand network infrastructure vulnerabilities
- Evaluating key network infrastructure and doing a risk assessment – more risk management overall across the company
- Have done a cursory analysis of where the sites are, for the most part they are well out of reach, mainly Moncton and Fredericton have some risk with respect to battery supply.
- Also looking at recent incidents that have caused concern.
- Identified in risk management to do some mapping of all facilities and plant – have it all in GIS now, LiDAR being considered, would be interested in partnering on LiDAR if it covered the area where Bell Aliant infrastructure is located.
- Can send info on where infrastructure is located
- Really extreme rainfalls called washouts in a number of areas last year more severe weather than ever before – underground infrastructure and vehicles can be at risk – cable washouts.

August 21, 2012	West Green Harbour Harbour Authority	Thomas MacKay 656-2018
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- Tried garbage boxes, but were filled with household garbage
- Had 3 barrels on top of oil tank for filters and oil jugs, they were also filled with garbage, had to take barrels
- No storm damage
- Just had cement wharf done, new concrete piles and cross piles put in two years ago, wharf should be pretty stable
- 20 boats at the wharf
- Lots of erosion on blue island off the point, seems to be eroding faster
- Beaches on East Green harbor side, one beach completely washed out, used to be a high beach
- Beaches around the point have rocks driven away into the woods.
- Temperatures are changing – things seem to be about a month behind time, usually get lobsters coming on in April, now not until the end of May (water is warm enough)
- Started out in 1958
- Milder winters, not as much snow
- Open winter, more out winds, harder for fishing – can't get out every day (lobster fishing)
- No one from WGH wharf goes long lining any more – no quota, to buy quota defeats the purpose, it was too expensive
- Interested in being contacted with more information about the workshop for stakeholders

August 30, 2012	Little Harbour Harbour Authority	Borden Williams 875-1526
• Have had frequent storm damage in recent years, and infrastructure has not been recently upgraded, is degrading and not always properly repaired • 10 boats at the wharf • Have noticed significant changes in water temperature, lobsters molting early and in some cases twice in one year, resulting in poor quality catch • Would be willing to participate in stakeholder meetings.		

September 6, 2012	Geological Services Division Nova Scotia Department of Natural Resources	Rob Naylor 902-424-8119
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- Biggest thing being done is the coastal work
 - Will support the Province's Coastal Strategy (PON) – but that was Fisheries based, now DFA needs rebuilding
 - Within DNR 3-4 years ago, looked at how to better make available expertise
 - Traditional expertise on mineral industry, mining, exploration
 - Broadened to include groundwater, geohazards and started a program to look at coastal erosion and flooding
 - Also had someone working on best practices for protection of coastal infrastructure
 - Very under-resourced
- Building climate change planning into overall strategic approach (e.g. siting of parks)
- Ultimately looking to be able to provide support to Municipalities (3-5 years)
- Could provide some models etc. (e.g. hurricane)
- Also want to tie into EMO to make sure they know where the risk is in case of emergency.
- Work in Lunenburg, Pugwash
- Bunch of work going on at Dalhousie, some funding to apply their modeling to communities – sea level rise, storm surge, wave run-up
- Areas of higher density and lower elevation
- Open ocean rather than bays
- These are what we recognize as being the risks – some information on the geology of the coastline
- People talk about sea level rise as being the big risk, but in fact the biggest risk is planning for major coastal storms
- Although there is a large camp of people that climate change will pose a large risk, however TODAY our communities are vulnerable to major coastal storms. The risk may change as climate changes,
- DNR could help us identify those areas
- Could look at provincial DEM, (2-3m), look at everything below 8-10 m is at risk
- Could certainly provide some support, good databases
- Also have a student coming on in the fall and she is looking at how to translate information that DNR has into a format that can be used by planners
- Could give some background on how geology may affect coastal processes
- Site assessments for Coastal Impact Area rather than setbacks

EMO Planning Committee Workshop

In March 2013, a workshop was held for the EMO Planning Committee where the potential impacts of climate change in the Municipality of the District of Shelburne were discussed and members were given the opportunity to provide feedback into the process. This Committee covers all of Eastern Shelburne County so the feedback gathered also covers the Towns of Shelburne and Lockport. The input gathered also included a review of the Affected Locations maps, where additional information was collected. The input is summarized below.

CLIMATE CHANGE ADAPTATION PLANNING EMO PLANNING MEETING MARCH 2013

What impacts have we seen from weather and changing climate in our communities already?

- Storm surge, high tidal water levels
- High winds for prolonged periods
- Soil erosion from torrential rain
- Flooding
- Coastal Erosion
- Higher Tides
- The flooding of Clyde River
- Beach eroding
- Extension of floating dock
- More trees have blown down
- Less ice in the winter
- More pest & Insects (ticks & Mosquitos)
- Water over the roads
- Milder winters
- Wetter Springs – Dryer warmer summers
- Wildfires
- Higher wind velocity for longer periods of time (more intense)
- Increase of wind and sustainability
- Seasons weather starting later every year

How well are we prepared - what if these events occurred more frequently?

- Not very well at present
- I don't think the average person is very prepared
- As Municipal Officials we need to complete some preventative measures and educate the public on how we can be more prepared

- More erosion
- Seems to have lots of notice through local media. Not sure if we or even the Province could handle a long duration event
- Red Cross group founded
- Comfort Stations set up
- I personally feel attempts are being made but community/residents definitely need to be more aware and take this seriously
- Our Fire Departments has been made into a comfort centre. We have also established a Red Cross group here to assist
- Continue Planning
- Develop Zoning & Information
- More events would make our community to work harder at getting prepared
- Although not at the top of the spectrum, feel we could “hold our own” in an emergency that last up to 3 days; unsure if emergency were to be longer
- To have lots of local notice through local media. Not sure if we or even the Province could handle a long duration event

What climate change hazards will have the largest impact in our communities?

- Tidal – Storm Surges
- Coastal Erosion
- Access from road washouts
- Trees are falling
- Increase in disease
- Ticks & Mosquitos
- Increase Agricultural & Farming
- Water temperature - affecting lobster & fishing industry

What opportunities may arise for our community as a result of climate change?

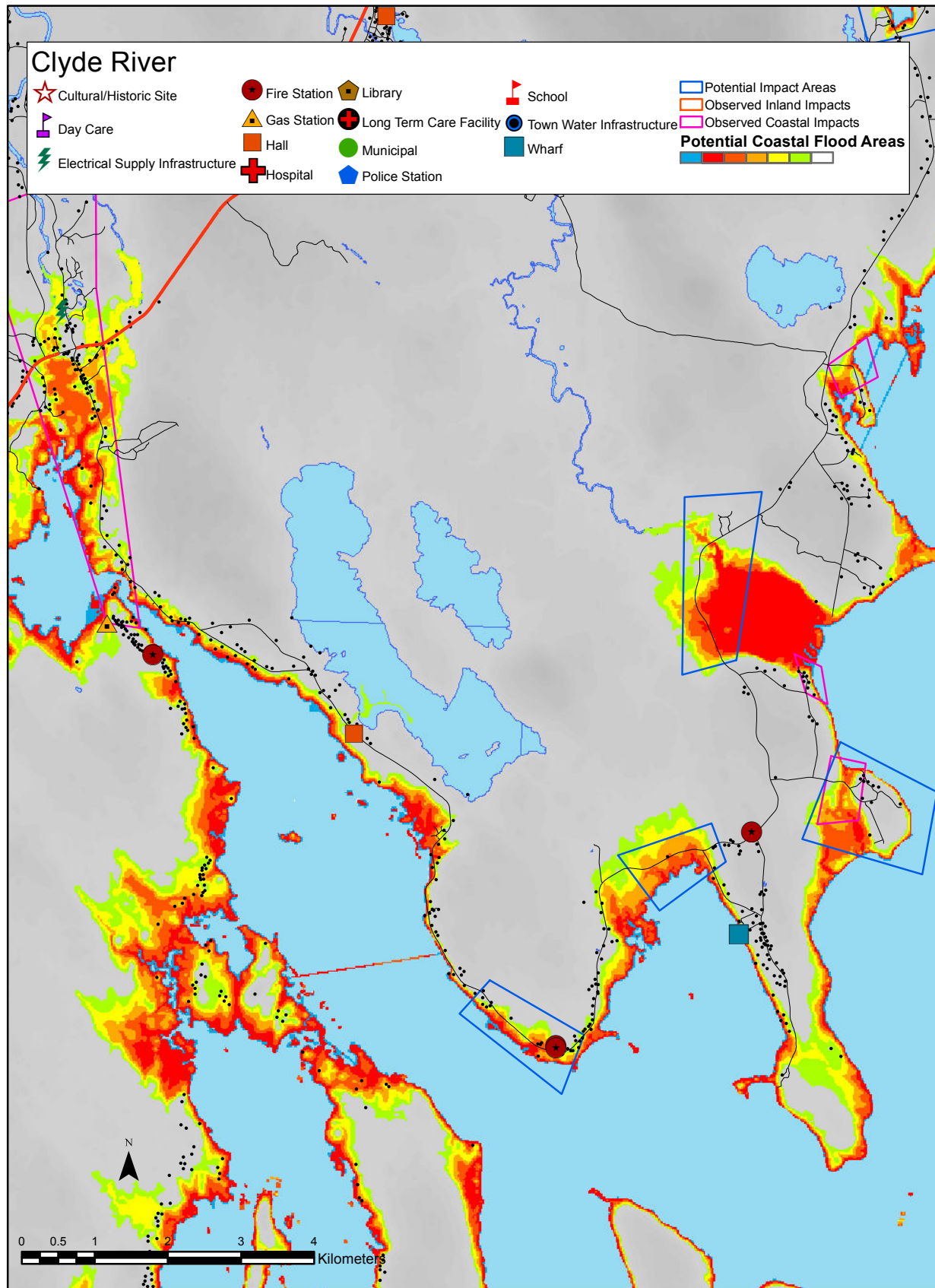
- Longer warmer summers – Tourism
- Warmer weather – longer seasons could create economic spin offs
- More land flooding – Becoming an Island
- No Road Access
- Potential for extending growing seasons - maybe a variety of crops (ie. Watermelons)
- Different fish species
- Attract more tourists with warmer summers and milder winters. People are coming to local cottages in the wintertime now as appose to when the winters were colder and snowier

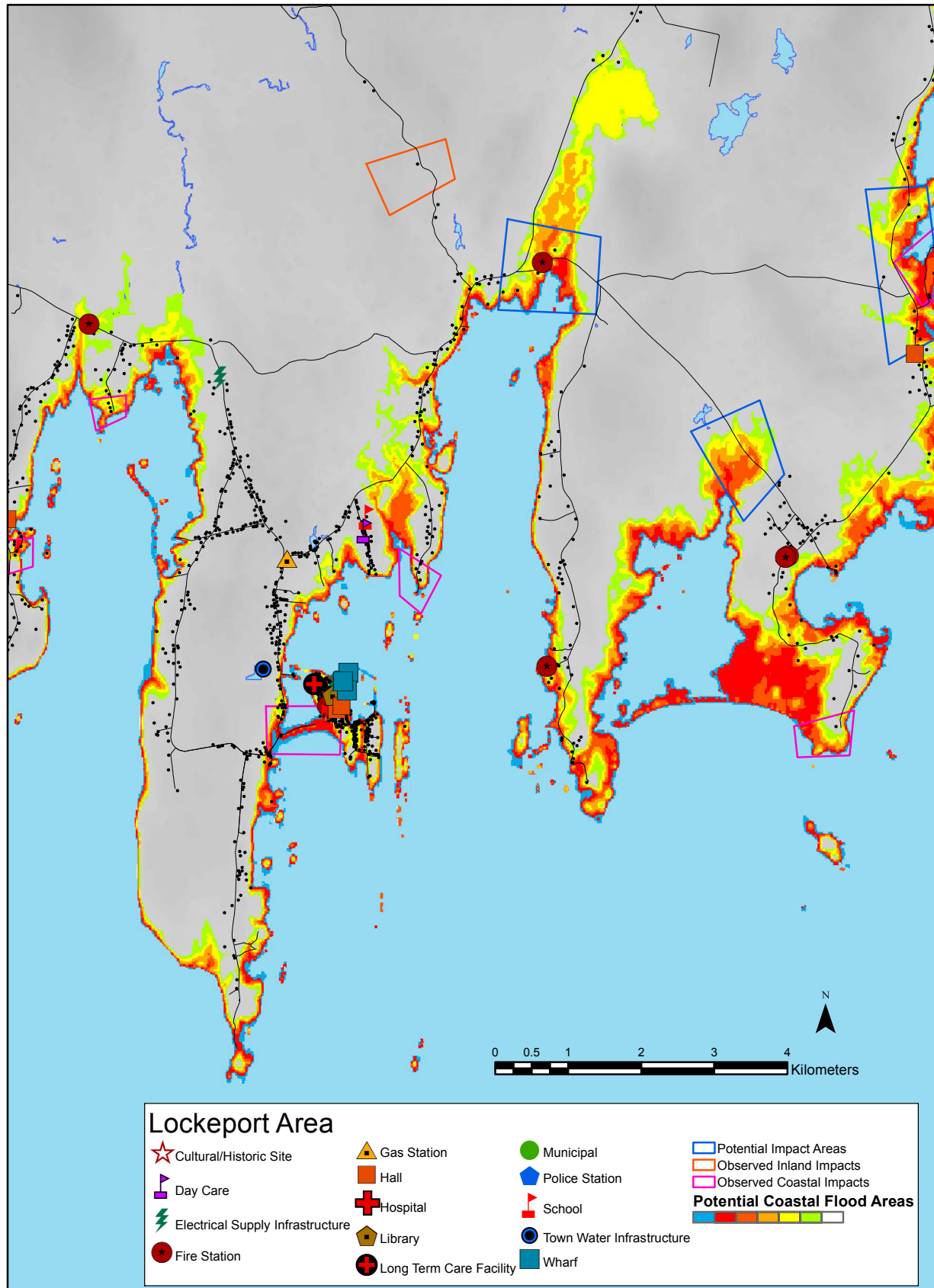
- Construction (i.e. moving, rebuilding houses)

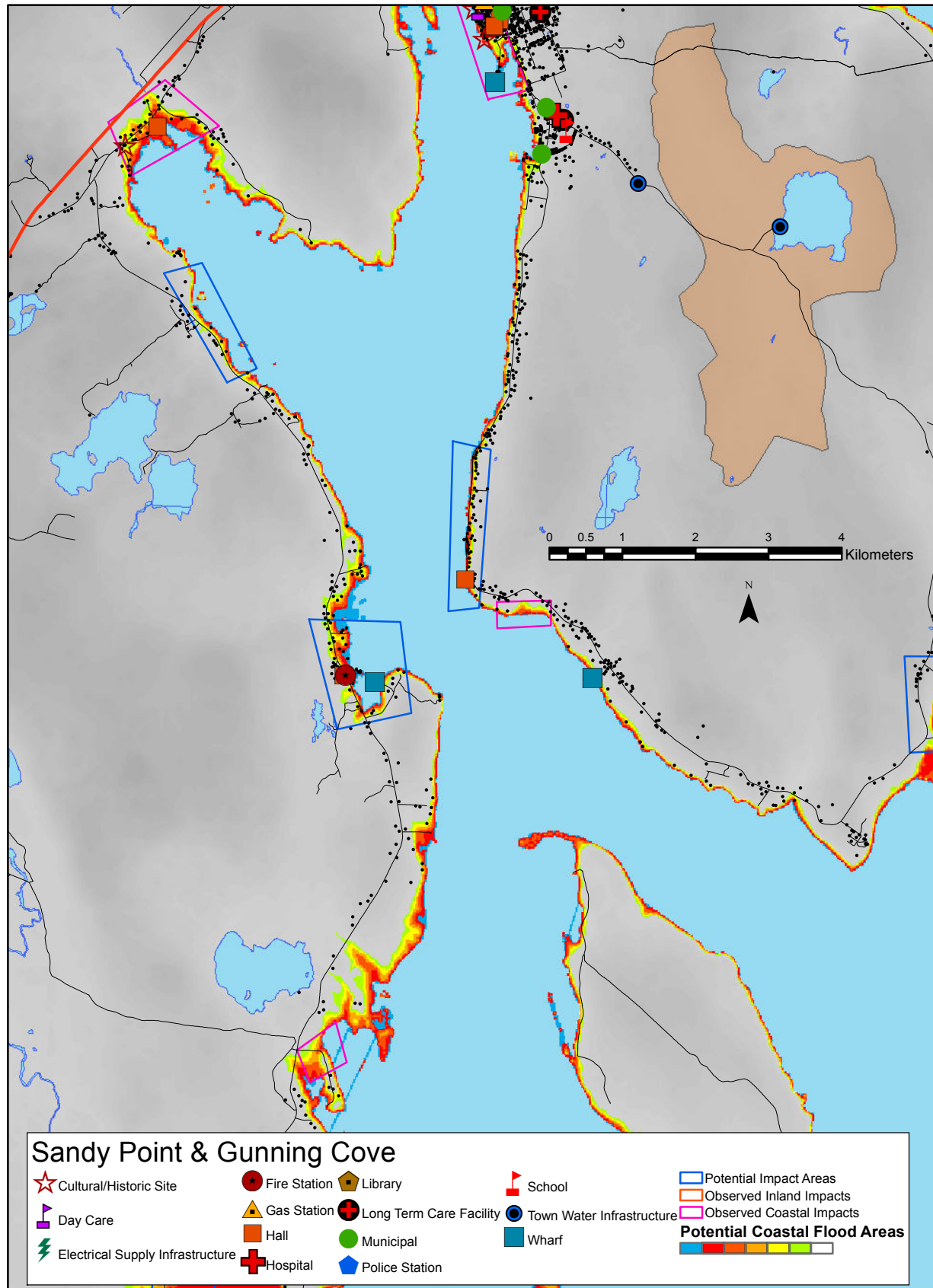
Where in our communities might climate hazards have the greatest impact? (indicate on maps)

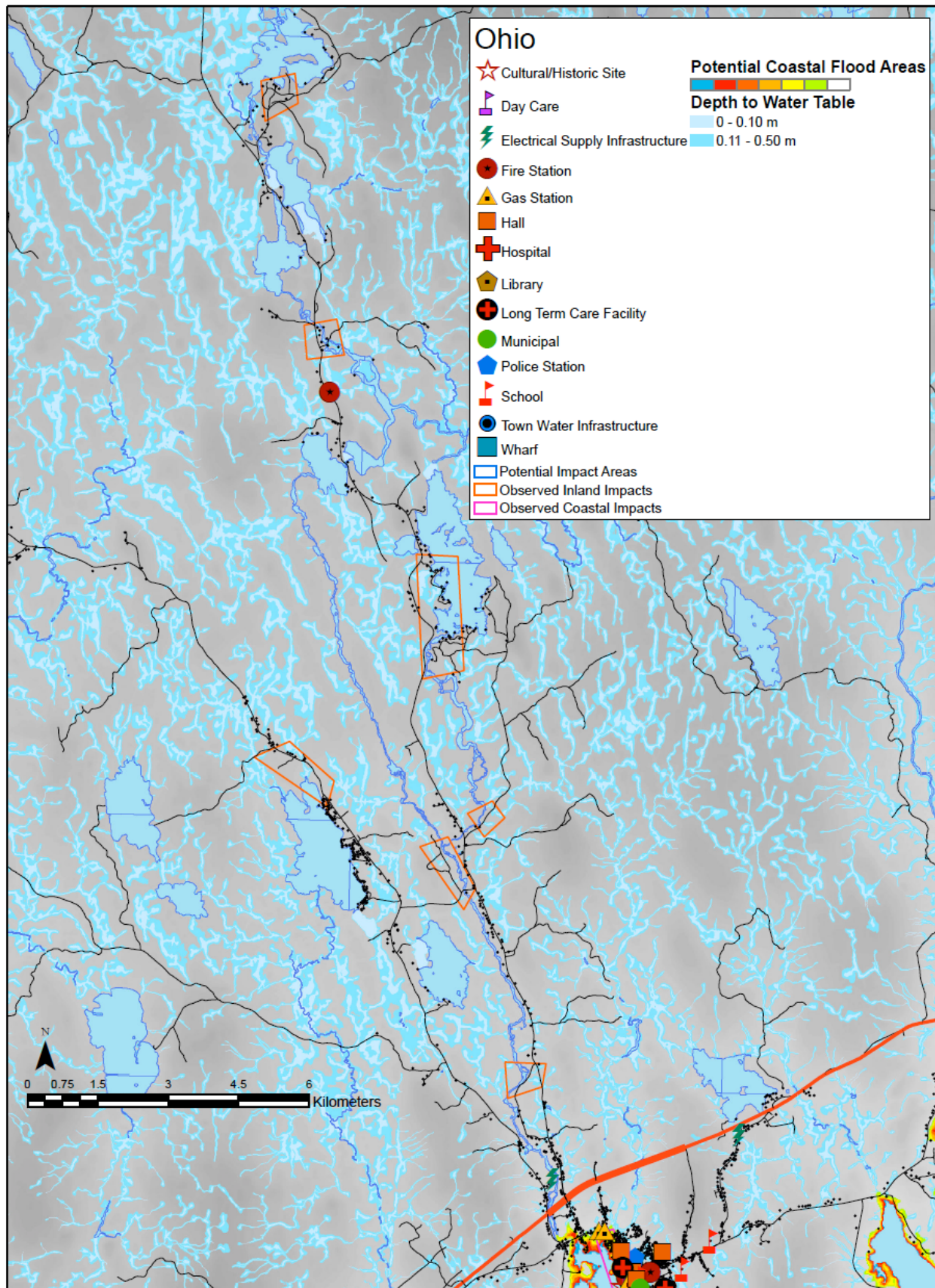
- Crescent Beach - Calf Island Road – Chetwynds Beach any; low lying coastal areas
- Concerns for Black Point/Ingomar
- Storm Surges * Residents close to the water
- Water comes up over the roads in Ingomar and Round Bay making roads in passable
- Dock Street
- Magill
- Coastal predominately
- All along our coast
- Wharves
- Dock Street
- Lockeport
- Causeways
- Cape Sable Island

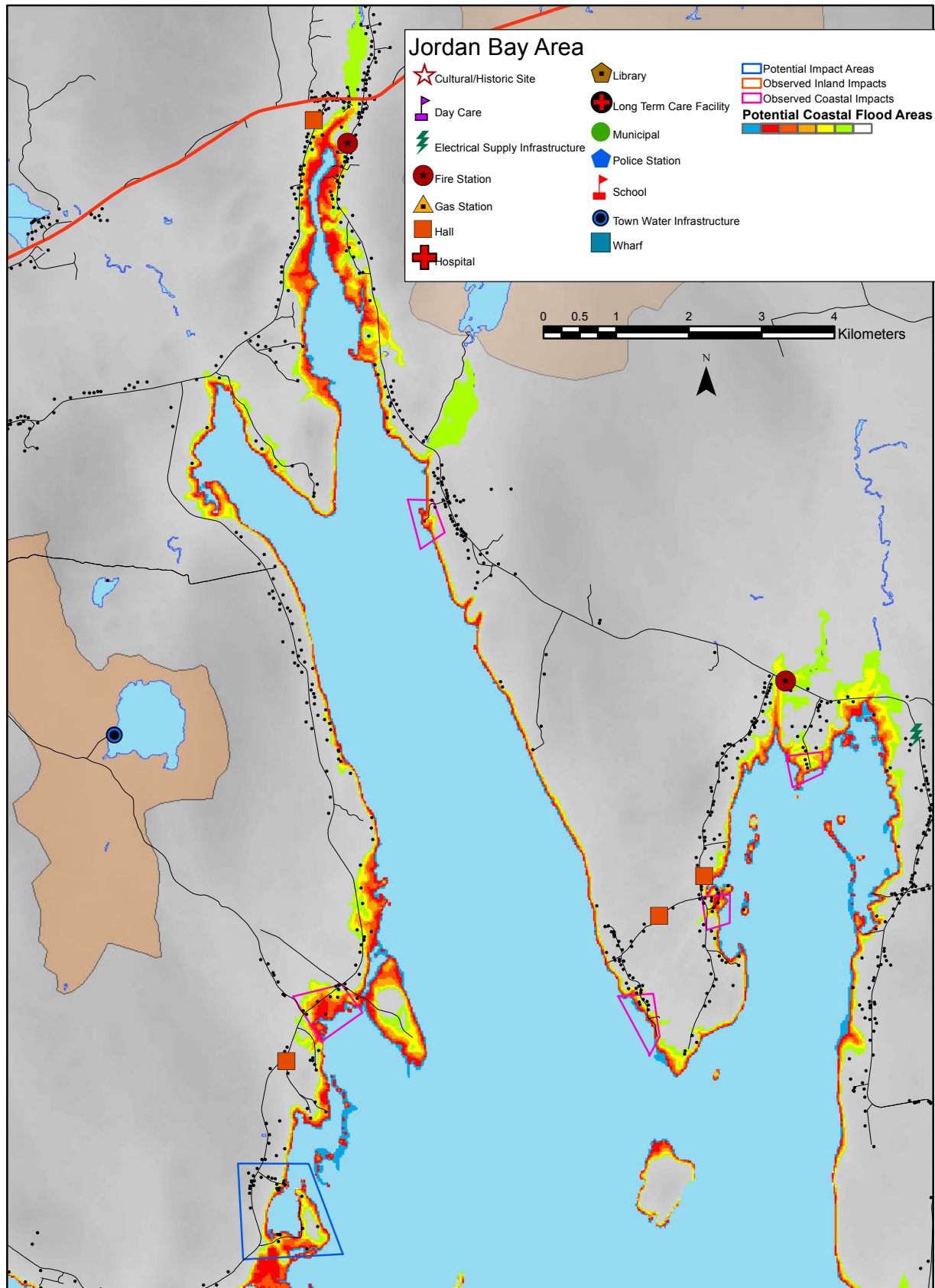
Appendix B: Affected Location Maps and SCEEMO Plan Maps

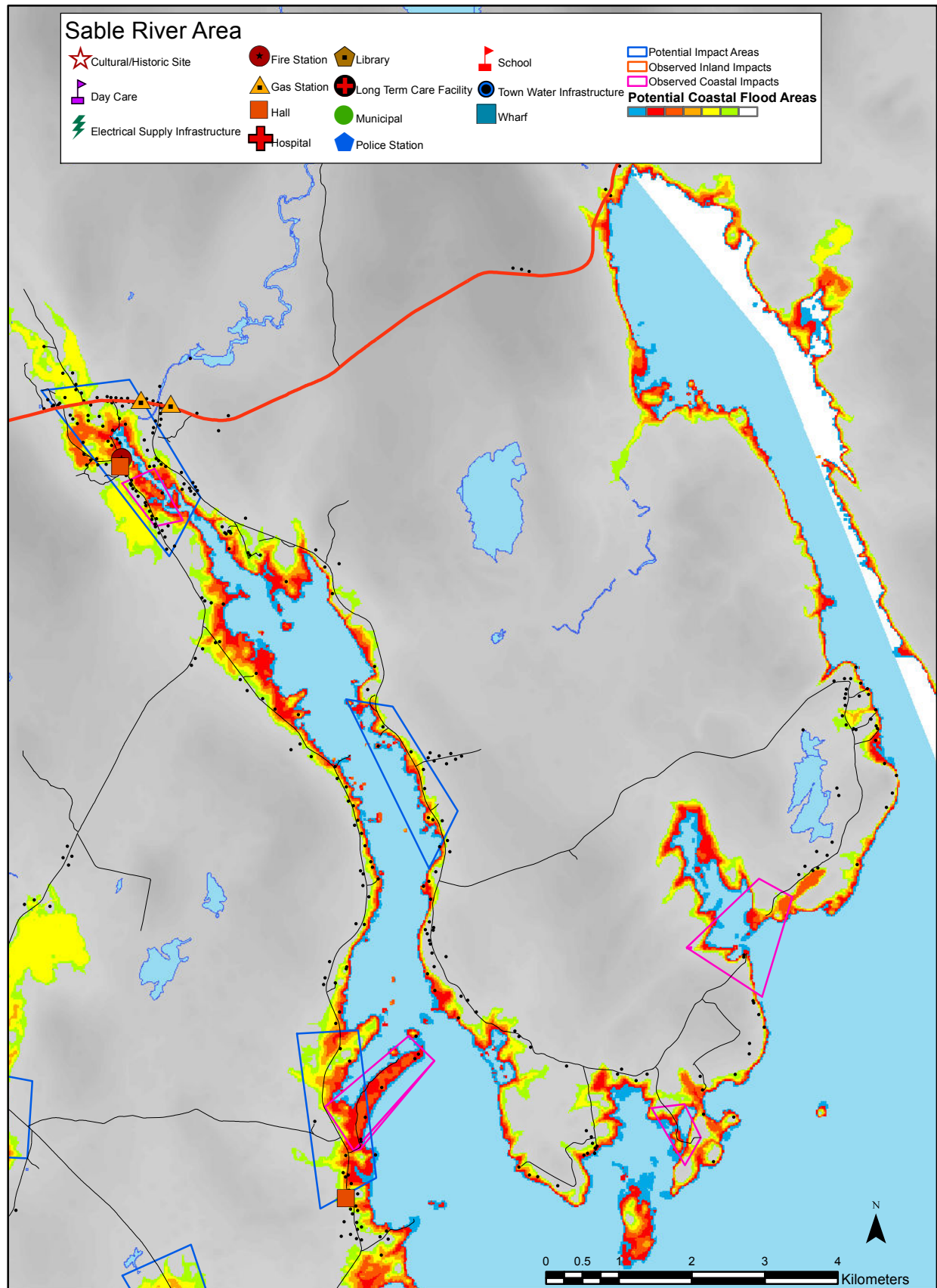




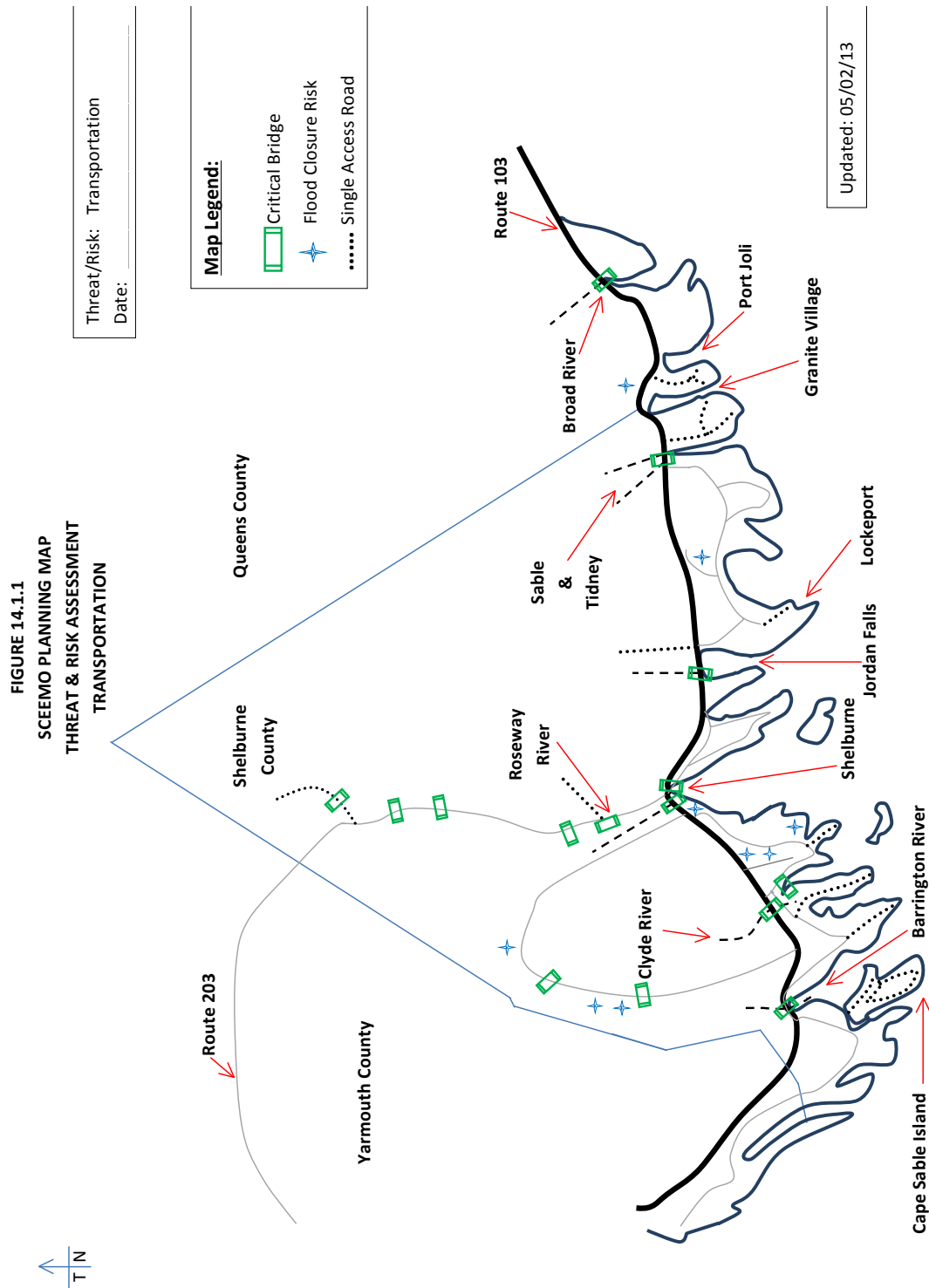




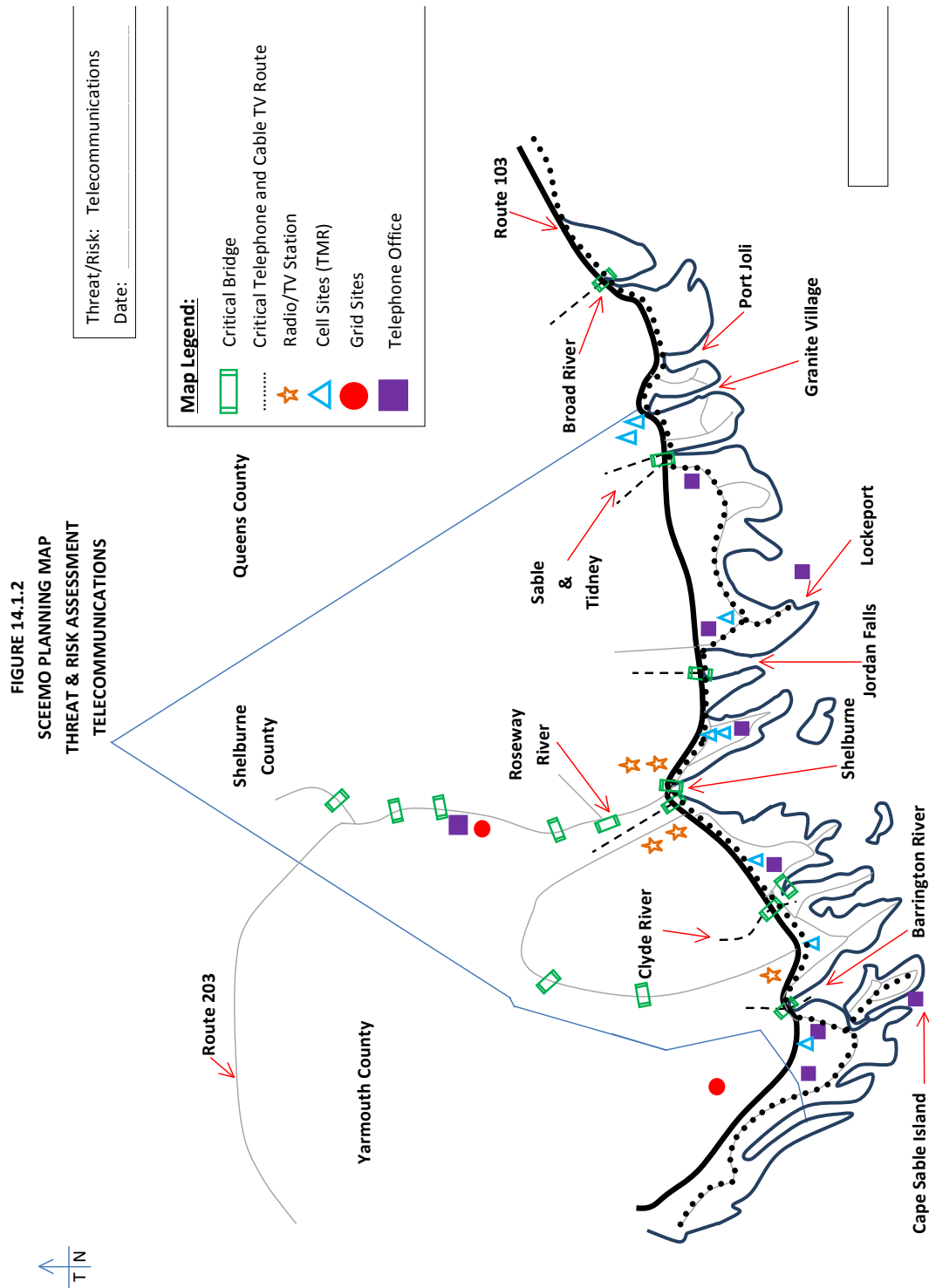




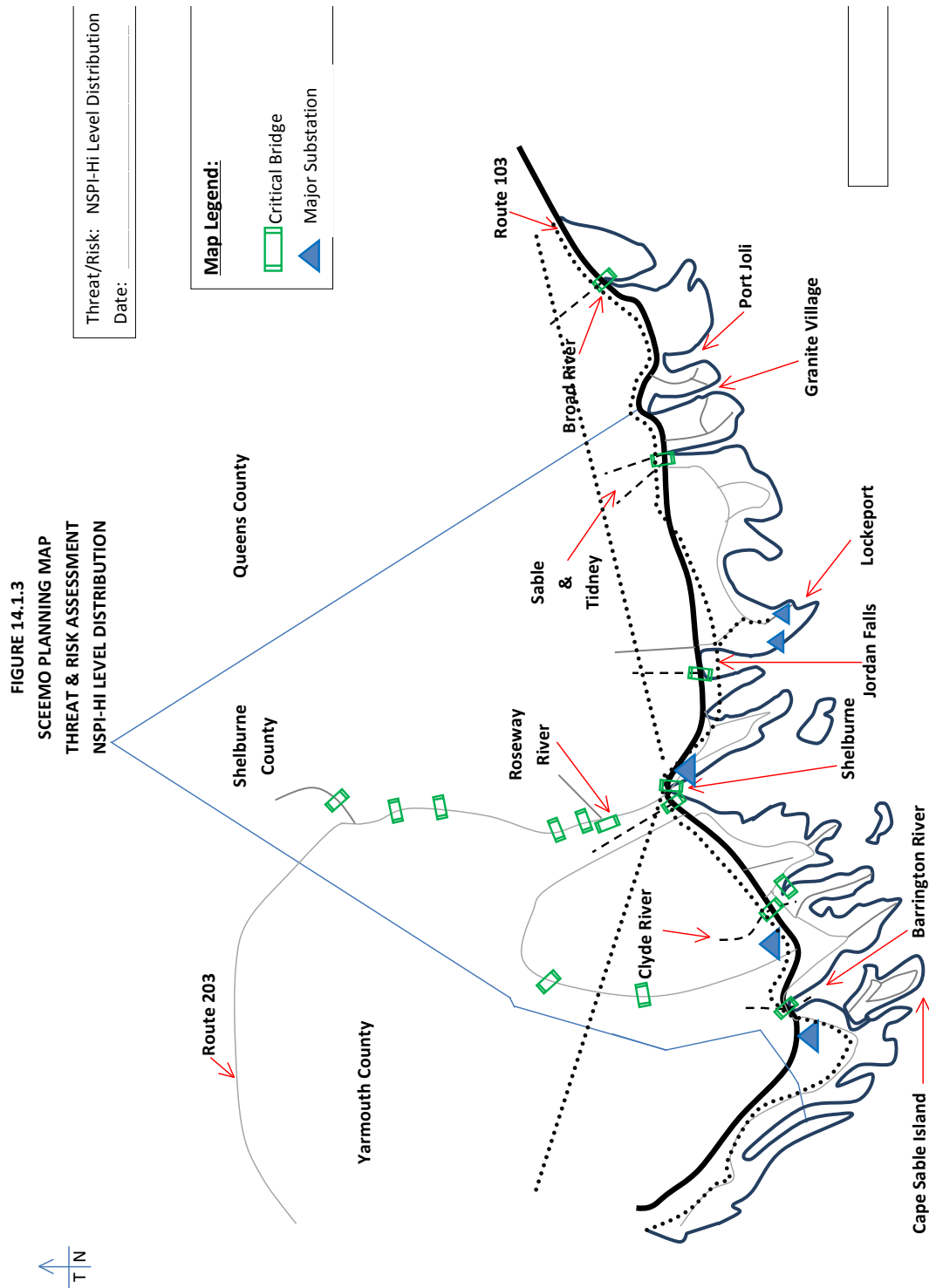
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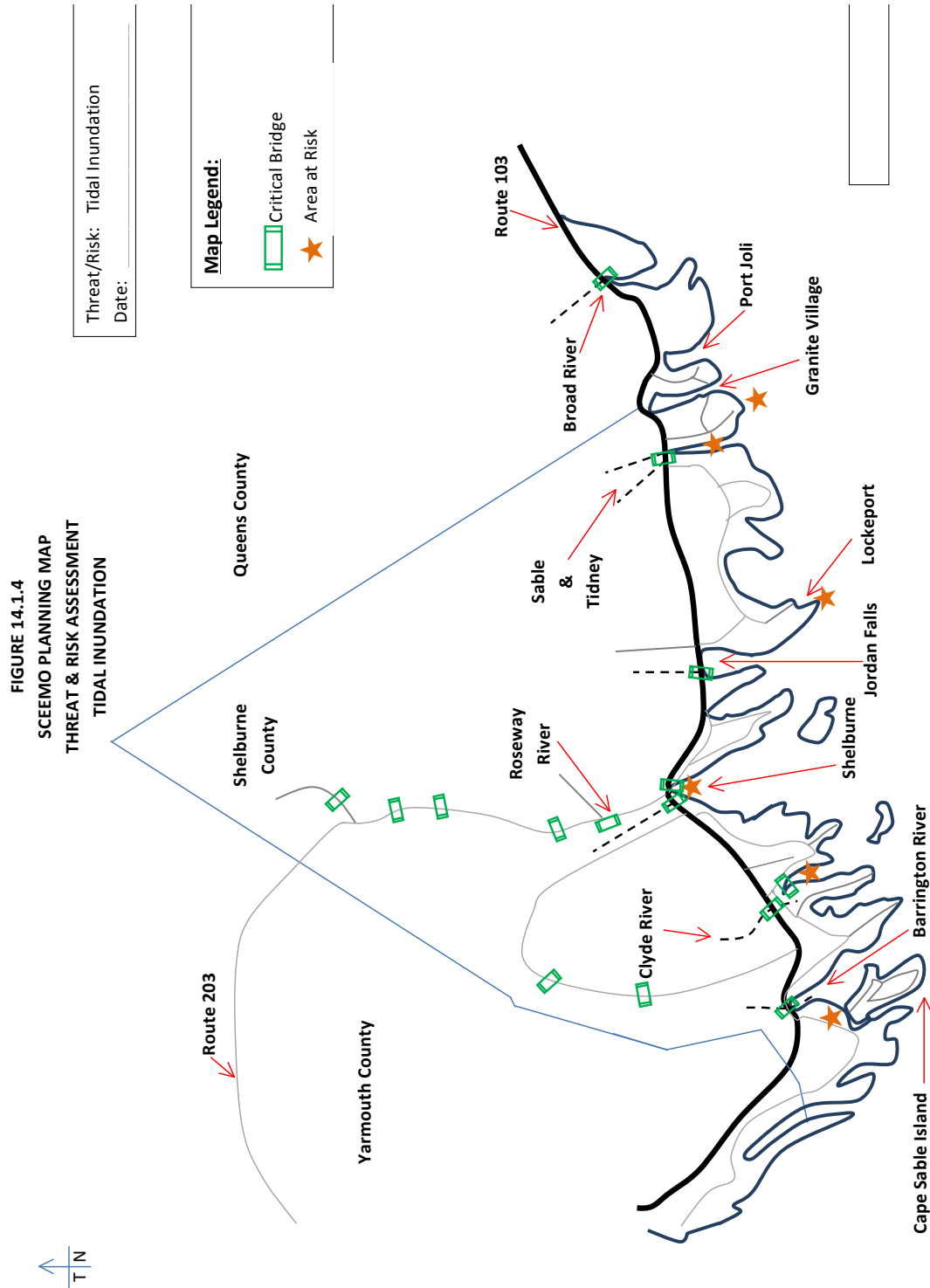
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Appendix C: Preliminary Results from ParCA Study

Appendix D: Coastal Management Strategy

Appendix E: Eastern Shelburne County Energy Strategy

Appendix F: Greenhouse Gas Inventory Results 2011 - 2012