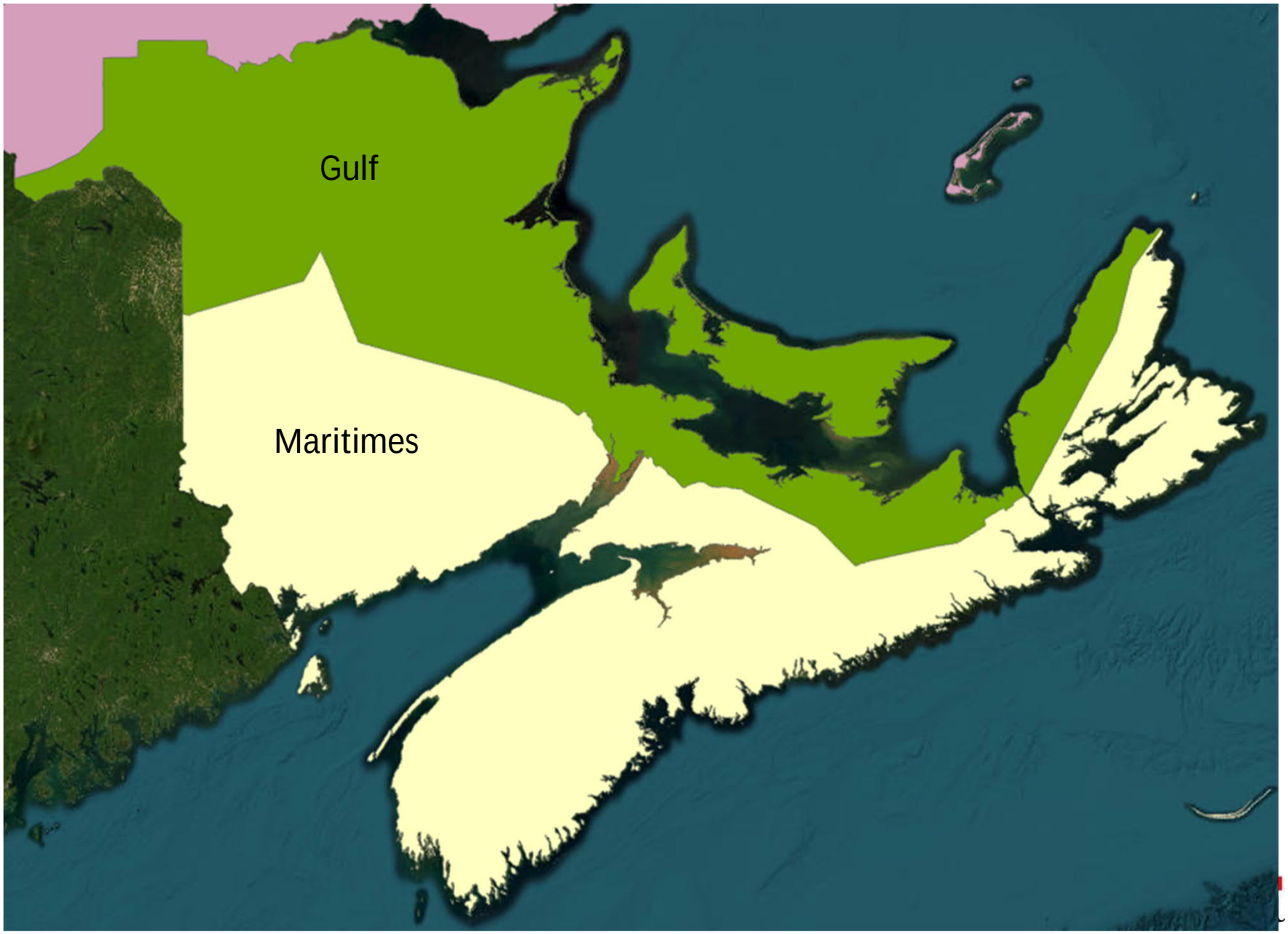
Office of Environmental Coordination

DFO's Approach to Climate Change Considerations
Maritimes and Gulf Regions

Roxanne MacLean


Gulf
Maritimes

Fisheries and Oceans Canada | Pêches et Océans Canada

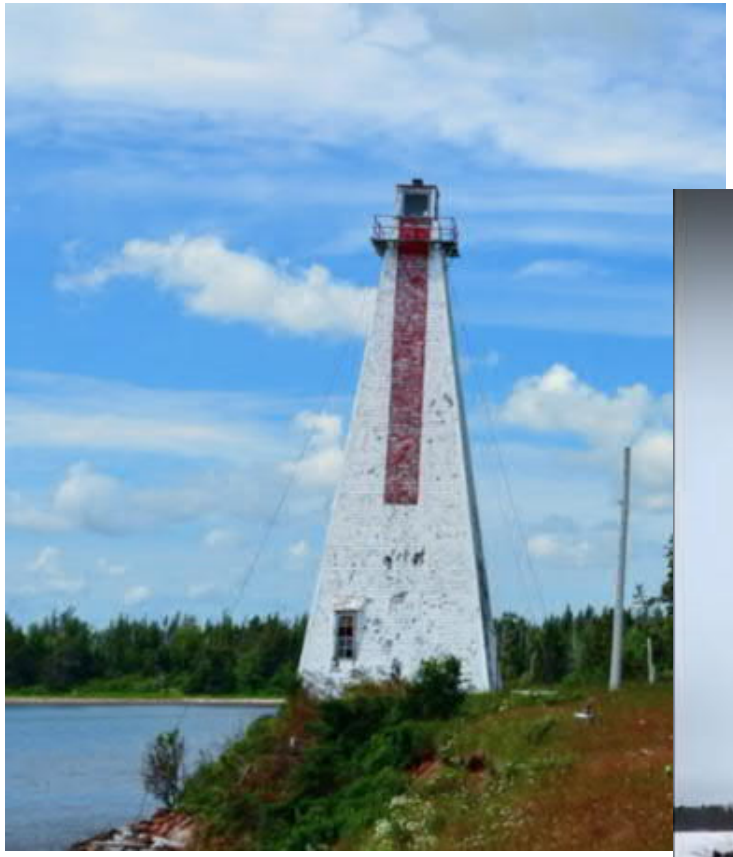
We are Coastal!

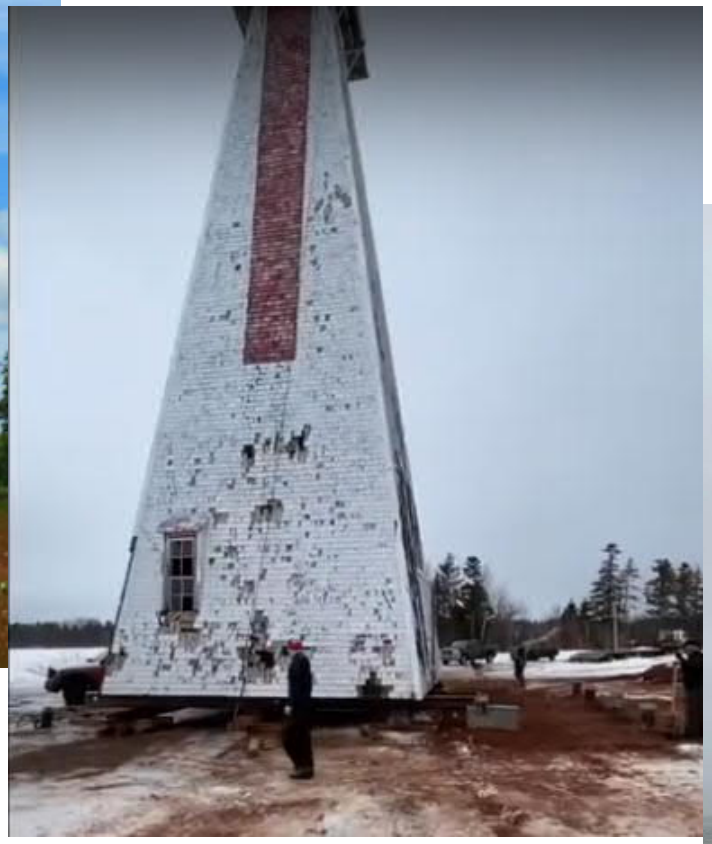
Fisheries and Oceans Canada | Pêches et Océans Canada

Soil Cap program

Fisheries and Oceans Canada | Pêches et Océans Canada

Coastal Erosion





Canada

Terrestrial

- Assessment
- Remediation/ Risk Management
  - High Risk
  - Low Risk

Aquatic

- Marine Waterlot Assessments

Fisheries and Oceans Canada | Pêches et Océans Canada

Federal Contaminated Sites Action Plan (FCSAP)

Integrating Climate Change Adaptation Considerations into Federal Contaminated Sites Management

Version 1.0

Environment and Climate Change Canada | Environnement et Changement climatique Canada

Canada

Canada

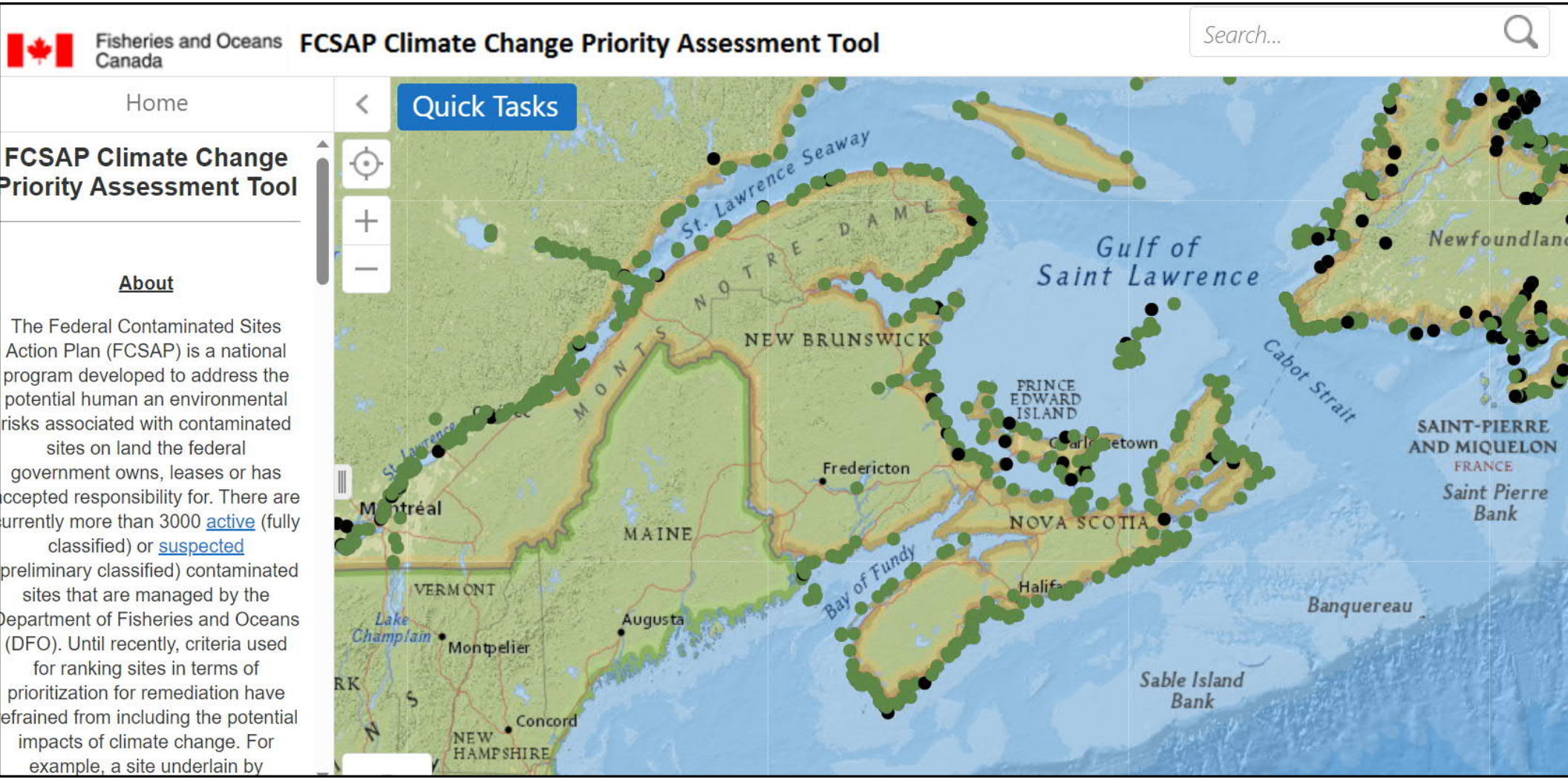
Terrestrial Assessments

1. What climate change hazards are relevant for the site?

2. What are the projections regarding those hazards under future climate scenarios?

3. How might those hazards influence contaminant distribution, exposure pathways, and receptors at the site? CSM

DFO Climate Change Tool



Canada

Description

Federal Site ID:
Property Number:
Site Status:
Current Priority:

Climate Prioritization

2016 - 2035: (/ 5)
2046 - 2065: (/ 5)
2081 - 2100: (/ 5)

Details

Federal Site Identifier
16673

Property Number
1967

Name
Annandale Range Front

Population Within 25km
47877

Population Within 50km
101473

Province
Nova Scotia

Census Subdivision
Lunenburg

Federal Electoral District
South Shore--St. Margarets

Country
Canada

Latitude
44.291

Longitude
-64.336

Coastal Sensitivity
Lowest Priority

Permafrost Vulnerability
No Priority

Precipitation Change (%) 2016-2035 RCP 2.6
1.9561

Precipitation Change (%) 2016-2035 RCP 4.5
2.5072

Precipitation Change (%) 2016-2035 RCP 8.5
2.4082

Precipitation Change (%) 2046-2065 RCP 2.6
2.6581

Precipitation Change (%) 2046-2065 RCP 4.5
6.3784

Precipitation Change (%) 2046-2065 RCP 8.5
5.8443

Temperature Change (°C) 2081-2100 RCP 2.6
1.311

Temperature Change (°C) 2081-2100 RCP 4.5
2.4623

Temperature Change (°C) 2081-2100 RCP 8.5
4.7247

Coastal Sensitivity Index
5.2372

Permafrost Vulnerability Index (0-1)
0

PERMA_DIST
726783.5851

Precipitation Concern 2016-2035
Moderate Priority

Precipitation Concern 2046-2065
Low Priority

Precipitation Concern 2081-2100
Low Priority

Coastal Sensitivity Rank (0-5)
1

Permafrost Vulnerability Rank (0-5)
0

Climate Change Index 2016-2035 (0-5)
1.32

Climate Change Index 2046-2065 (0-5)
0.99

Climate Change Index 2081-2100 (0-5)
0.99

Climate Change Priority 2016-2035
Moderate Priority

Climate Change Priority 2046-2065
Lowest Priority

Terrestrial Remediation/Risk Management

- Appendix E internal (DFO/PSPC)
- Appendix E Climatologist
- Climate Change Resiliency Study

APPENDIX E: WORKSHEETS FOR INTEGRATING CLIMATE CHANGE ADAPTATION CONSIDERATIONS INTO FEDERAL CONTAMINATED SITES MANAGEMENT

Section 1: Project Definition

Section 2: Understanding Climate Change Hazards at the Contaminated Site – Compilation of Data from Climate Change Projections

Section 3: Understanding How Climate Change Hazards May Affect the Conceptual Site Model

Section 4: Remediation/Risk Management Options Comparison Table

Section 5: Demonstrating Resilience to Failure of R/RM Infrastructure

Appendix E Internal (DFO/PSPC)

Appendix E +

FCSAP document "Integrating Climate Change Adaptation Considerations into Federal Contaminated Sites Management – Version 1.0" for Step 7

Climate hazards

- Oceanic Changes
  - Sea level rise
  - Ocean Acidification
- Temperature
  - Mean Annual
  - Extreme
- Precipitation
  - Mean Annual
  - Extreme

Table 5.4 Climate Risk Evaluation Summary

Sea Level Rise	Mean Temperature	Extreme Temperature	Mean Precipitation	Extreme Precipitation
High Risk	Moderate Risk	Moderate Risk	Low Risk	Moderate Risk

Table 5.7 Climate Hazard and Impact of Remedial Options

Climate Parameter	FCSAP Listed Potential Climate Impact	Impact Expected
Option A - in-Situ Remediation (chemical oxidation)		
Increase to Air and Water Temperature	Increases in mean annual air temperature may increase the degradation rate, as warmer conditions increase rates of chemical reactions.	**Yes**
Sea-Level Changes	Climate change induced increases in storm surges (including wave action and erosion could damage or destroy R/RM projects.	**Yes**
Option B - ex-Situ remediation (soil excavation and off-Site disposal)		
No potential climate impact identified as impacts to Site are assumed to be removed within this option.	N/A	N/A

Fisheries and Oceans Canada | Pêches et Océans Canada

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CLIMATE CHANGE RESILIENCY ASSESSMENT TEMPLATE FOR FISHERIES AND OCEANS CANADA CONTAMINATED SITES

May 31, 2022

Prepared for:
Public Services and Procurement Canada

Prepared by:
Stantec Consulting Ltd.

Project Number:
121417411

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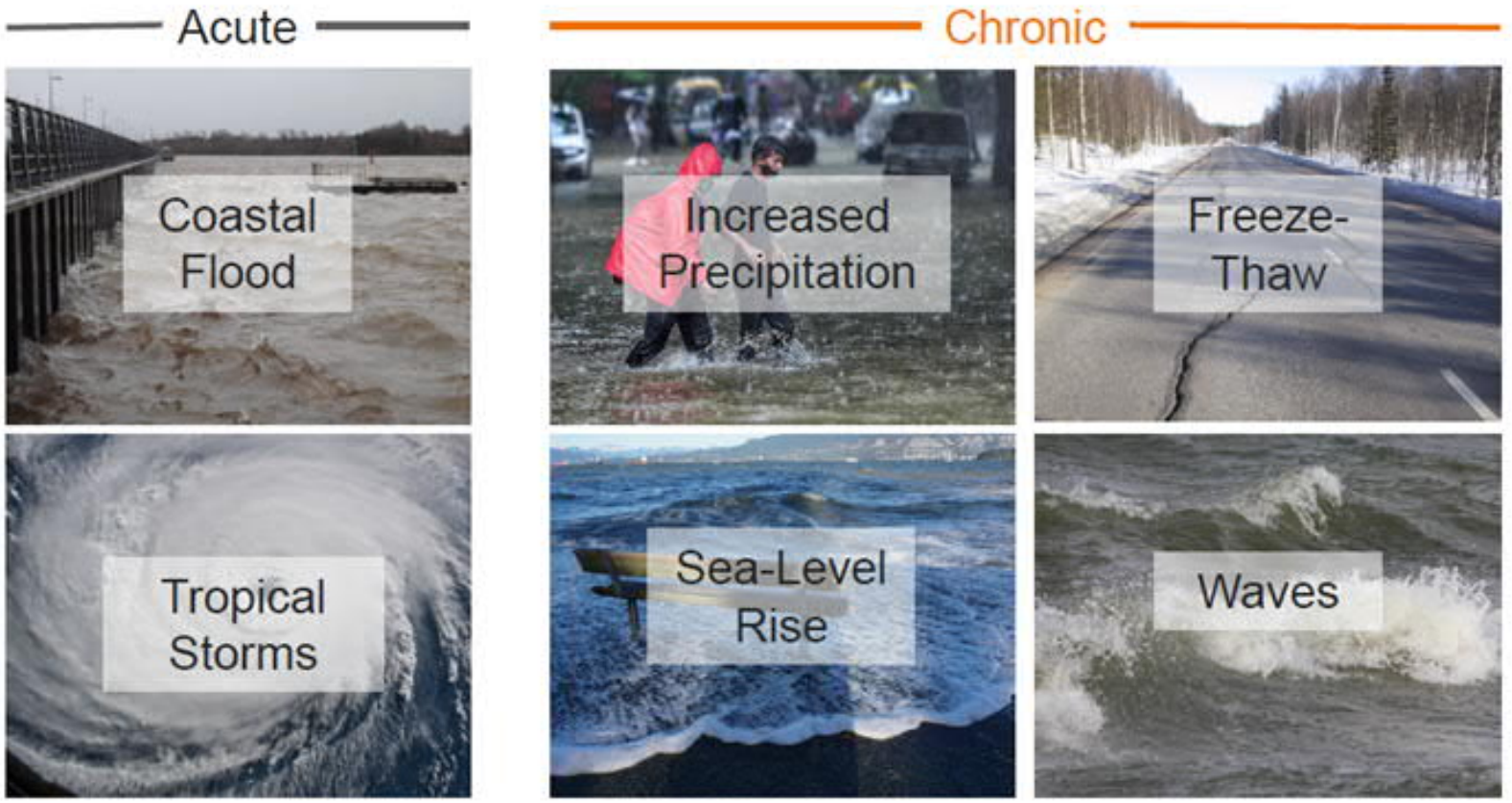
Canada

Climate Hazards



Stantec, 2022

Example CSM

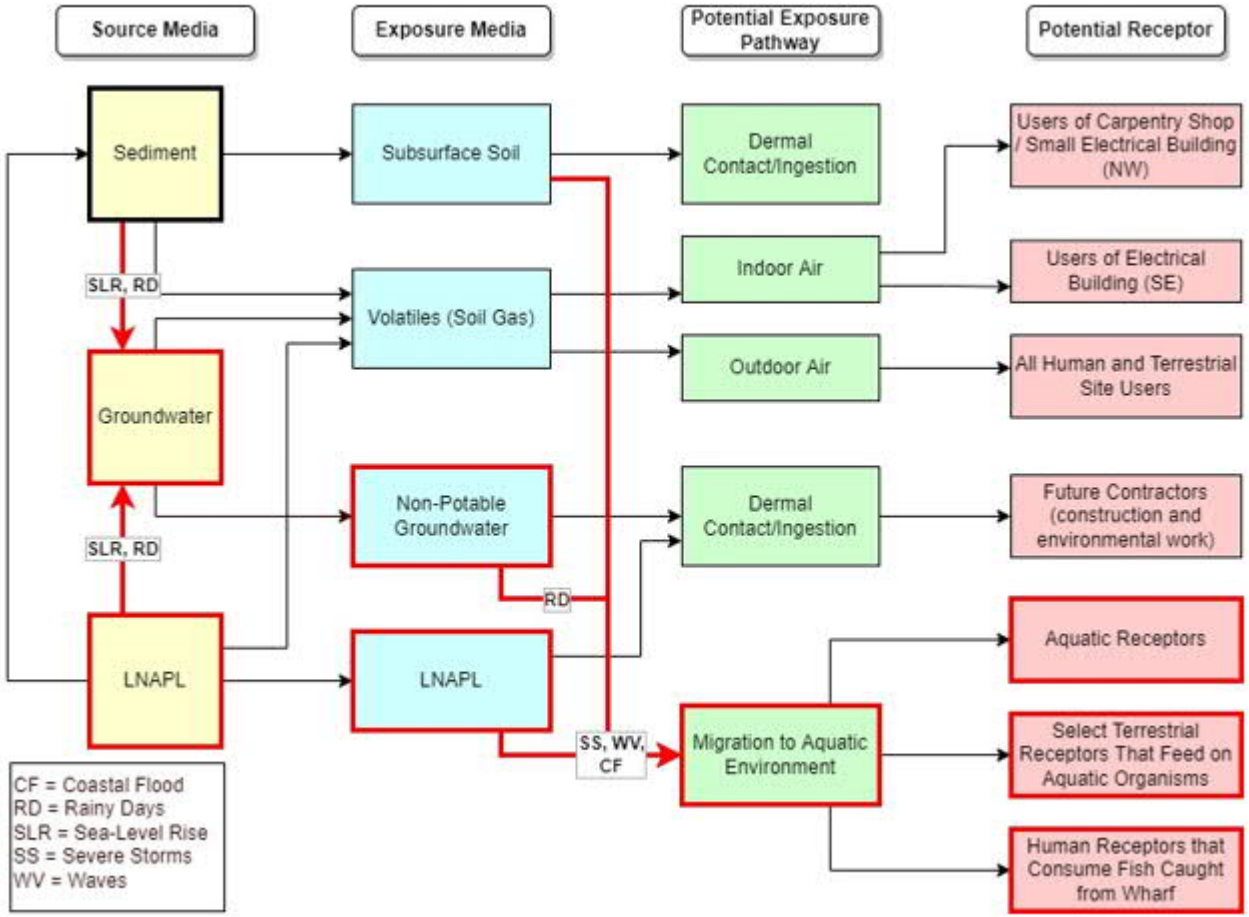


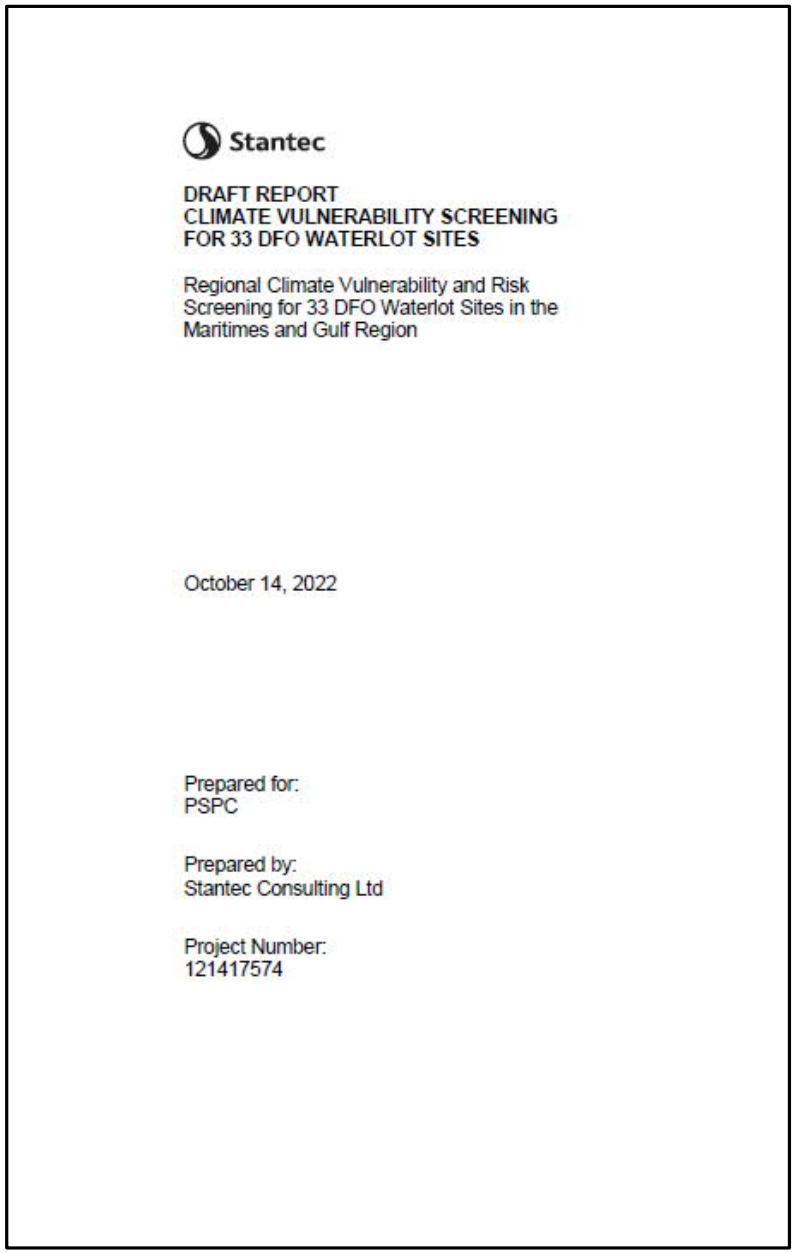
Figure 3: Example of Climate Change Impacts on CSM

Remediation/ Risk Management Plan

Based on the results of the climate change risk assessment and discussions with the project team, the following adaptation strategies could be considered:

- **Maintenance and Inspection of infrastructure**
- **Maintenance of Asphalt Cap**
- **Natural Attenuation**
- **Hydrogeological Studies**

Marine Waterlot Assessment Program



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DRAFT REPORT
CLIMATE VULNERABILITY SCREENING
FOR 33 DFO WATERLOT SITES

Regional Climate Vulnerability and Risk Screening for 33 DFO Waterlot Sites in the Maritimes and Gulf Region

October 14, 2022

Prepared for:
PSPC

Prepared by:
Stantec Consulting Ltd

Project Number:
121417574

Climate Hazard	CSM Exposure Pathway(s) Potentially Exposed to Climate Hazard?	Carried Forward for Consideration?	Potential Interactions
Precipitation Change	Yes	Yes	Precipitation changes can bring changes in waterbody flows, surface runoff, infiltration, erosion as well as changes in flooding and fire events. It can also bring forth changes in dilution and degradation. Overall, can impact exposure assessment (both increases and decreases).
Air Temperature Change	Yes	Yes	Air temperature changes can bring changes in both air and water temperatures which can bring forth changes in volatilization and degradation. It can also change snow cover (which when present can limit exposures). Overall, can impact exposure assessment (both increases and decreases).
Permafrost Change	No	No	Not Applicable to Atlantic Canada.
Snow Cover Change	Yes	Yes	Changes in snow cover can impact exposure assessment. Presence of snow cover can limit exposures by creating a seasonal barrier to contaminants. Presence of snow cover can also limit potential volatilization and degradation.
Sea-level Change	Yes	Yes	Changes in sea-level can bring changes in storm surge magnitude. An increase in sea-level can also submerse low shorelines and increase erosion. Overall can impact exposure assessment (both increases and decreases).
Sea-Ice Change	Yes	Yes	Changes in sea ice can impact exposure assessment. Presence of sea ice can limit exposures by creating a seasonal barrier to contaminants. Presence of sea ice can also limit potential volatilization and degradation and change fate and transport behaviours of contaminants.
Ocean Acidification	Yes	No	Changes in ocean acidification is expected to have neutral impact on exposure assessment. Although it is recognized that ocean acidification would impact fate and behaviour of contaminants, overall this would be expected to increase for some, and decrease for other contaminants.
Storm Events	Yes	Yes	Changes in storm events can bring changes in storm surges magnitude. An increase in storm events can also increase erosion and disperse particulates and sediment. Overall can impact exposure assessment (both increases and decreases).
Flora Shifts	Yes	No	Although changes in flora may impact the types of receptors found at a given site, it is expected to have neutral (both positive and negative) impact on exposure assessment
Fauna Shifts	Yes	No	Although changes in fauna may impact the types of receptors found at a given site, it is expected to have neutral (both positive and negative) impact on exposure assessment
Forest Fires	Yes	No	Although it is recognized that forest fires may impact the overall flora and fauna, as well as potential contaminant concentrations, forest fires are expected to have limited occurrence on a waterlot property. If a forest fire was to occur nearby or on the site, most severe impacts would be associated with destruction and beyond that captured by an HHERA.

Climate Vulnerability Screening for 33 Waterlot Sites:

Vulnerability (V) = Exposure (E) X Sensitivity (S) X Adaptive Capacity (AC)

V = the degree to which a site is susceptible to harm arising from climate change impacts
E = physical interaction between a climate hazard and exposure pathway
S = the degree to which a site is expected to be affected when exposed to a climate impact
AC = ability of a site to adjust to climate change impacts

	Precipitation Changes			Air Temp. Change			Snow Cover Change			Sea-level Change			Sea-Ice Change			Storm Events			Pathway Vulnerability
Pathway	S	AC	V	S	AC	V	S	AC	V	S	AC	V	S	AC	V	S	AC	V	
Human Incidental Dermal Contact and Ingestion of Surface Water	1	3	3	1	3	3	1	3	3	1	3	3	3	3	9	1	1	1	22
Human Incidental Dermal Contact and Ingestion of Suspended Se	1	3	3	1	3	3	1	3	3	1	3	3	3	3	9	1	1	1	22
Human Vapour Inhalation (Surface Water)	1	3	3	3	3	9	1	3	3	1	3	3	3	3	9	1	1	1	28
Human Ingestion of Fish (Surface Water)	1	3	3	1	3	3	1	3	3	1	3	3	3	3	9	1	1	1	22
Human Ingestion of Vegetation (Surface Water)	1	3	3	1	3	3	1	3	3	1	3	3	3	3	9	1	1	1	22
Human Dermal Contact and Ingestion of Sediment (Shoreline)	1	3	3	1	3	3	3	3	9	3	3	9	2	3	6	3	1	3	33
Human Airborne Particles Inhalation of Sediment (Shoreline)	1	3	3	1	3	3	3	3	9	3	3	9	2	3	6	3	1	3	33
Human Vapour Inhalation (Shoreline)	1	3	3	3	3	9	3	3	9	3	3	9	2	3	6	3	1	3	39
Human Ingestion of Fish (Shoreline)	1	3	3	1	3	3	3	3	9	3	3	9	2	3	6	3	1	3	33
Human Ingestion of Shellfish (Shoreline)	1	3	3	1	3	3	3	3	9	3	3	9	2	3	6	3	1	3	33
Human Ingestion of Vegetation (Shoreline)	1	3	3	1	3	3	3	3	9	3	3	9	2	3	6	3	1	3	33
Human Airborne Particles Inhalation of Sediment (Sub-tidal)	1	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1	1	1	16
Human Dermal Contact and Ingestion of Sediment (Sub-tidal)	1	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1	1	1	16
Human Ingestion of Fish (Sub-tidal)	1	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1	1	1	16
Human Ingestion of Shellfish (Sub-tidal)	1	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1	1	1	16
Human Ingestion of Vegetation (Sub-tidal)	1	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1	1	1	16
Ecological Direct Exposure and Ingestion to Surface Water	1	3	3	1	3	3	1	3	3	1	3	3	3	3	9	1	1	1	22
Ecological Ingestion of Fish (Surface Water)	1	3	3	1	3	3	1	3	3	1	3	3	3	3	9	1	1	1	22
Ecological Ingestion of Vegetation (Surface Water)	1	3	3	1	3	3	1	3	3	1	3	3	3	3	9	1	1	1	22
Ecological Direct Exposure and Ingestion to Sediment (Shoreline)	1	3	3	1	3	3	3	3	9	3	3	9	2	3	6	3	1	3	33
Ecological Ingestion of Fish (Shoreline)	1	3	3	1	3	3	3	3	9	3	3	9	2	3	6	3	1	3	33
Ecological Ingestion of Shellfish (Shoreline)	1	3	3	1	3	3	3	3	9	3	3	9	2	3	6	3	1	3	33
Ecological Ingestion of Vegetation (Shoreline)	1	3	3	1	3	3	3	3	9	3	3	9	2	3	6	3	1	3	33
Ecological Direct Exposure and Ingestion to Sediment (Sub-tidal)	1	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1	1	1	16
Ecological Ingestion of Fish (Sub-tidal)	1	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1	1	1	16
Ecological Ingestion of Shellfish (Sub-tidal)	1	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1	1	1	16
Ecological Ingestion of Vegetation (Sub-tidal)	1	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1	1	1	16

Climate Change Workshop

Stantec

DFO SMALL CRAFT HARBOUR WATERLOT CLIMATE VULNERABILITY SCREENING

GUIDANCE DOCUMENT

February 3, 2023

Prepared for:
PSPC

Prepared by:
Stantec Consulting Ltd

File: 121417574

We Are Still Learning

- Our review of the 22/23 approach prompted change, and we will look back at 23/24 to keep improvement
- Do other regions, departments and consultants have a different approach to discuss?