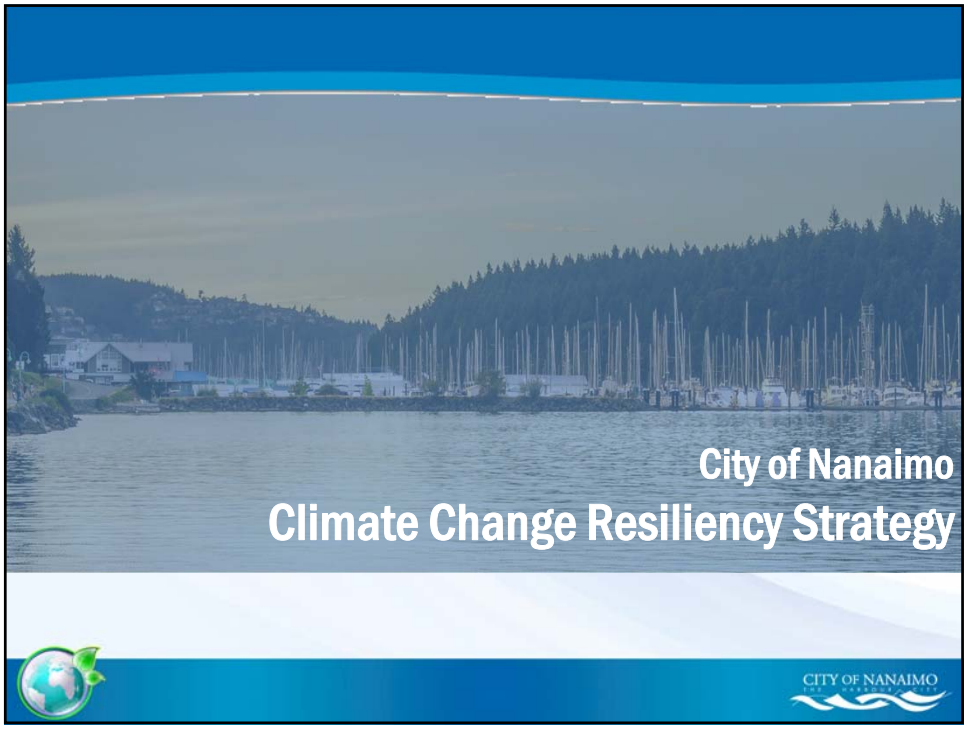
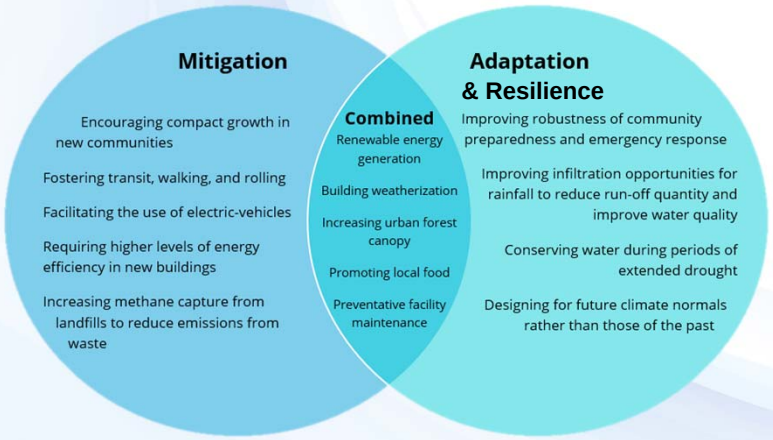


Responding to Climate Change



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Project Overview

Funding:

- Federation of Canadian Municipalities – Climate Innovation Program
- City of Nanaimo - staff time

Timeline:

- 2018: Sea Level Rise Study
- 2019/20: Resiliency Strategy

Associated Engineering · INTEGRAL GROUP · DIAMOND HEAD · pacificablue

Objectives:

- Identify local climate change impacts and specify actions to protect residents and municipal assets.

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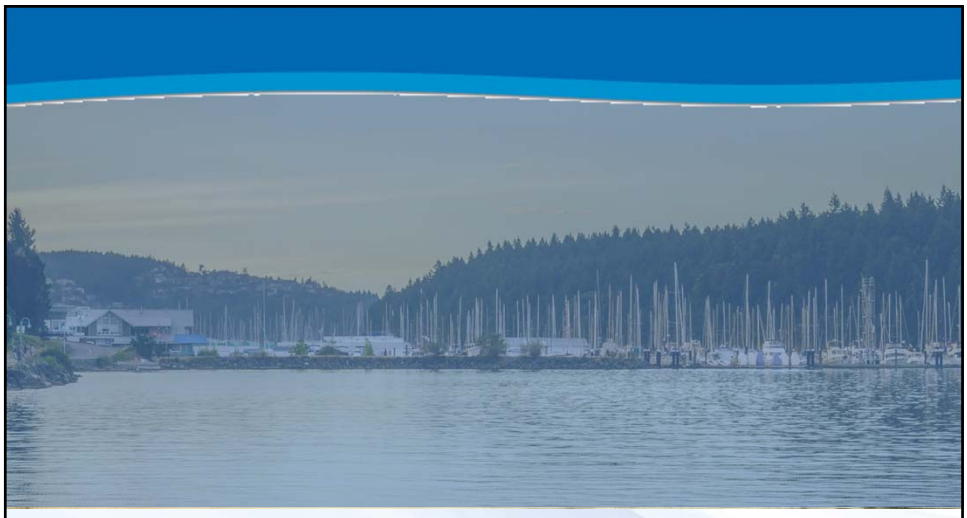

Sea Level Rise Study

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Project Overview

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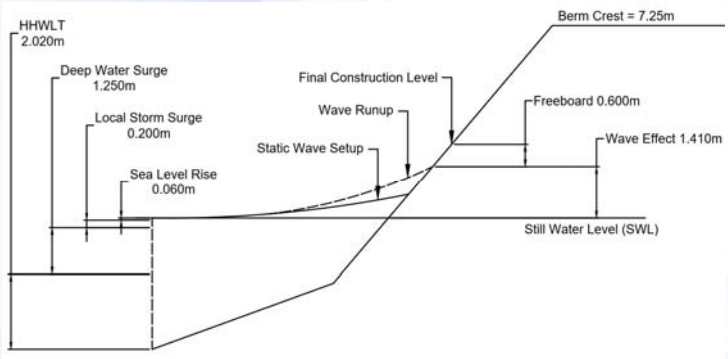
Determining Flood Construction Level



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Conclusions and Recommendations

The City is not as vulnerable to SLR as other areas of Vancouver Island and the Lower Mainland

Follow-up with 2-D inundation modeling and refine FCL mapping for:

- Departure Bay,
- Downtown,
- Protection Island,

Coastal Hazard Development Permit Area with guidelines for new construction and major renovations.

Review Zoning and Building bylaws to update flood hazard requirements.

Review and formalize a **coastal erosion monitoring program**

Green Shores Strategy to identify locations and techniques to install features to respond to coastal flooding and erosion

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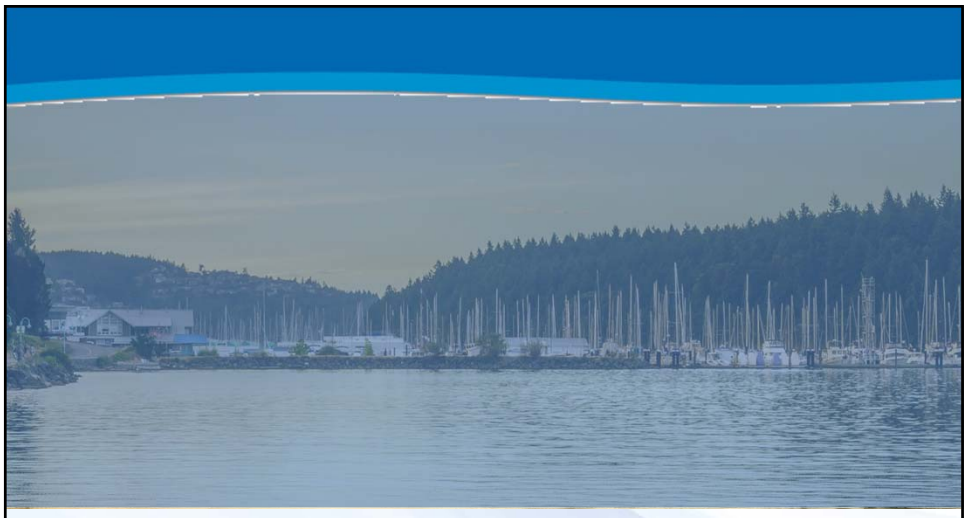

Resilience Strategy

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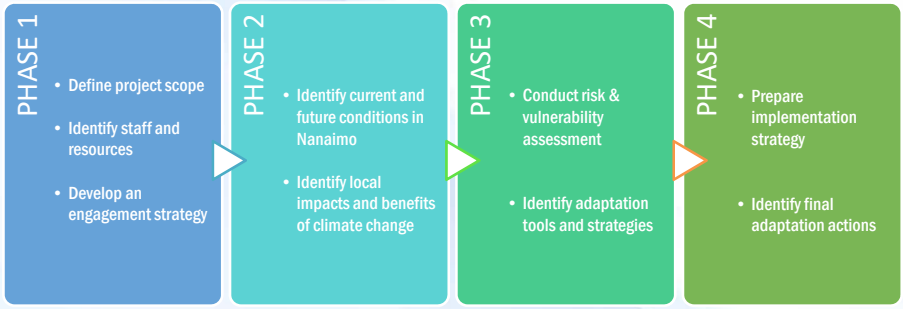
Project Phases



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Engagement

Internal Stakeholders

- **The Core Project Team:** Core members of City staff from Planning, Engineering, and Emergency Management coordinated the project.
- **Resilience Strategy Working Group:** City staff representing an array of departments and areas of expertise (Development Services, Engineering and Public Works, Parks, Recreation and Culture).
- **Staff subject matter experts across the organization.**

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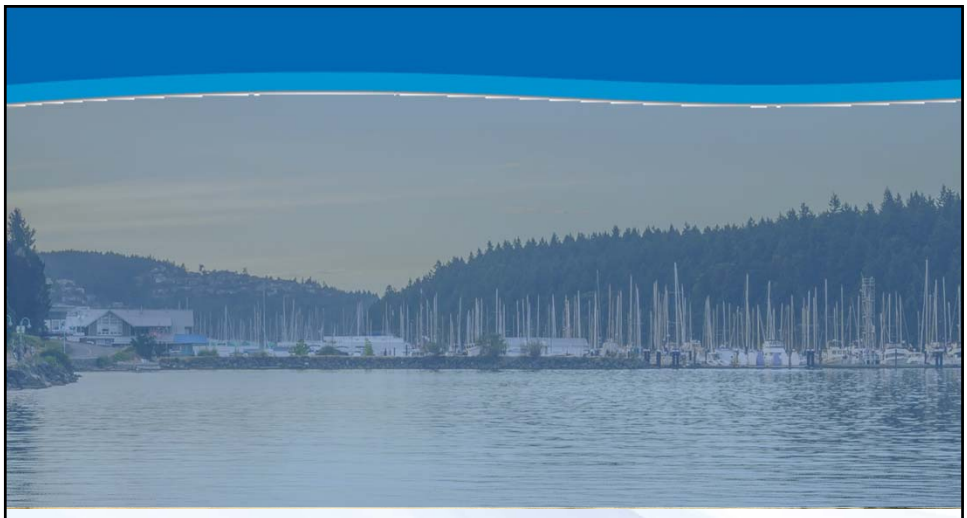
Engagement

External Stakeholders

Engagement with external stakeholders took place on a *consultative* level of engagement with a focus on receiving feedback throughout the phases of the process.

Stakeholders who participated and who were contacted were:

- *Island Health*
- *Nanaimo Port Authority*
- *Snuneymuxw First Nation*
- *RDN- Planning, Environment and Emergency Planning staff*
- *Ministry of Transportation and Infrastructure*
- *BC Ferries – Brian Green,*
- *BC Hydro - Ted Olynyk*
- *Harmac Paper Products – David Bramley (Environmental Officer)*
- *School District #68*
- *Nature Trust of British Columbia*
- *BC Housing*
- *Vancouver Island University*



Review: High Risk Impacts

Expected Climate Impacts:

- Reduced water availability and strain on water supply from hotter, drier summers
- Impact of short duration/high-intensity rain on storm drains leading to flooding and potential property damage
- Potential changes to tree species' range and increased incidences of mortality, affecting urban forests and vegetation (e.g., cedar, salal)
- Incidences of heat-related illnesses exacerbated by aging demographics and rising homelessness
- Landslides may be triggered by saturated soils, leading to loss of homes and damage to infrastructure (e.g., storm and sanitary sewers)
- Increased stress and anxiety from those impacted, first responders, and supporting community members
- Long-term economic and social impacts, including challenges for the tax base, given expense of continued response and recovery

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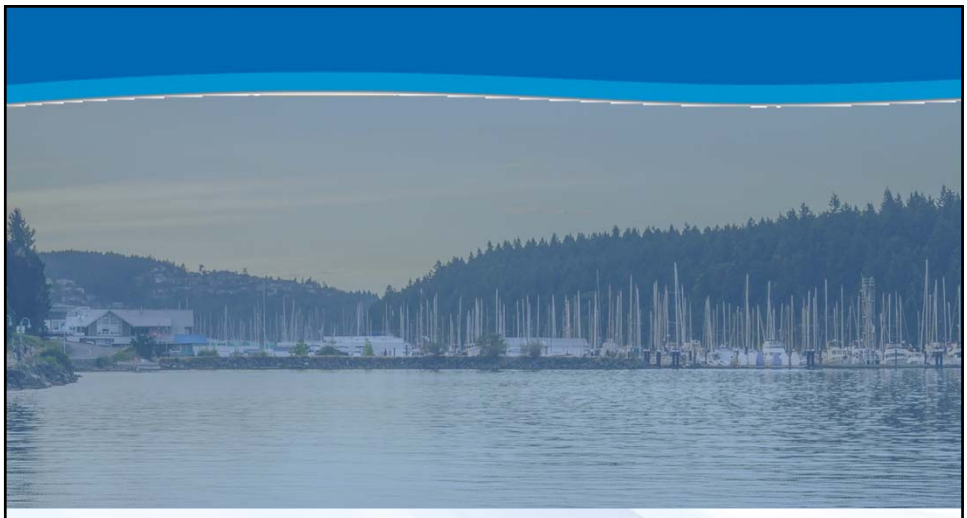

Strategy Development Process

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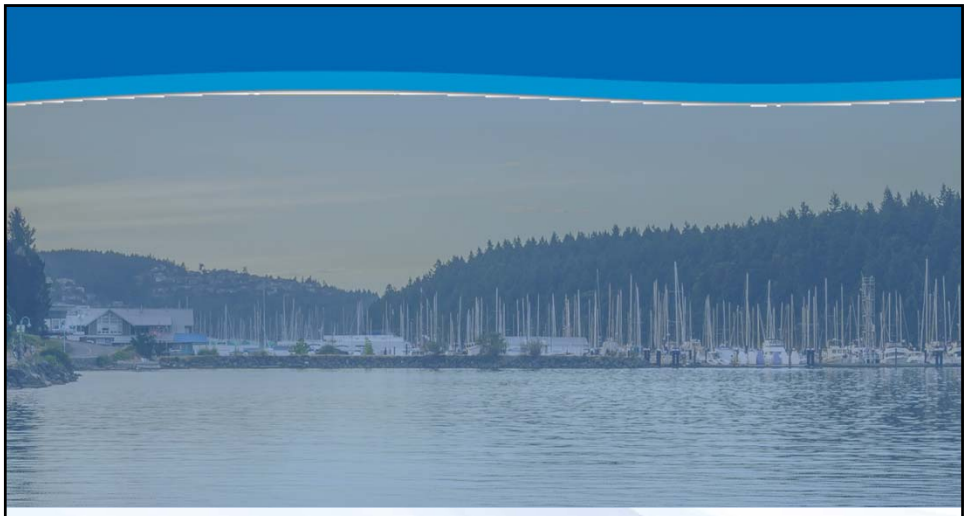
Strategy Development Process

Impacts	• Impact Statements
Prioritize	• Vulnerability and Risk Assessment
Actions	• Quick Wins • Brainstorm, Evaluate and Refine Actions
Plan	• Vision and Guiding Principles • Goals and/or Objectives
Implement	• Implementation Plan (responsibility, timeline, funding) • Monitoring and Review Framework

Evaluation & Implementation

Evaluation Criteria					Implementation Planning			
GHG	Resilience	Cost	Effort	Co-benefits	Start Date	Lead Dept.	Resources	Partners
1 – increases GHGs 2 – no impact/no reductions 3 – reduces GHGs	Increases resilience: 1 – slightly 2 – somewhat 3 – significantly	$ - under $50k $$ - $50-$100k $$$ - $100k - $500k $$$$ - over $500k	1 – significant effort 2 – moderate effort 3 – low effort	1 – slightly 2 – somewhat 3 - significantly	YEAR, or Immediate Ongoing ST (1-2 years) MT (3-7 years) LT (10+ years)	Indicate relevant City of Nanaimo dept	Can be accomplished with existing staff vs. new FTE required	List potential stakeholder partners E.g. District of Nanaimo, Island Health



Recommended Actions

Water Supply

Objective 1: Prepare for a more limited water supply and improve resiliency of water infrastructure

- **Update Water Supply Strategy Plan** to include climate change impacts and implement additional watershed storage projects ($$$$/S-LT)
- Work with Province and conservation partners to identify locations where **water can be seasonally held and released during summer low flow** to improve resiliency of urban streams ($$$/ST)
- **Update Emergency Response Plan** for water treatment plant / water infrastructure ($$/ST)
- **Establish a water governance committee** to addressing increasing demand from neighbouring communities and First Nations for water ($/LT)

Flooding and Drainage

Objective 1: Minimize Urban Overland flooding resulting from heavy rainfall

- Identify, enhance and establish new **overland flow paths, drainage basins and protected right-of-ways** on private property ($$$$/S-LT)
- Prioritize and accelerate **storm water catchment master planning** and implement infrastructure upgrades ($$$$/ST)
- Explore **developing a storm utility rate** to generate revenue as a sustainable funding source to mitigate impacts from climate change ($/S-MT)

Flooding and Drainage

Objective 2: Prepare for the impacts of sea level rise, including associated erosion and coastal flood risk

- Review the minimum flood construction levels (FCLs) and **incorporate the results of Nanaimo's sea level rise FCL Study into the Building and Zoning Bylaws** ($$/S-MT)
- **Complete inundation modeling** and mapping for areas identified as vulnerable in the SLR Study (**Departure Bay, Downtown, Protection Island**) ($$/S-MT)
- Review and formalize a **coastal erosion monitoring program** ($/S-MT)

Environment, Parks and Recreation

Objective 1: Quantify and Manage Nanaimo Urban Forests

- Improve **tree resilience** to storm and wind events **along main transportation routes** ($$/MT)
- Develop appropriate **tree planting targets** and schedules to replace trees lost during storm events ($$/MT)
- Develop guidelines for **fuel management zones within high use parks** ($$/MT)
- **Conduct Park condition assessments in all City Parks** and develop adaptation measures to address climate impact risks ($/S-MT)
- Review and update **City Tree Planting Standards** (for City and private developments) to include climate resilient tree species ($/ST)
- Develop a **community education program** on park use fire safety and awareness ($/MT)

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Environment, Parks and Recreation

Objective 2: Assess and restore Nanaimo's ecological diversity, focusing on the City's urban watercourse and marine foreshore

- Assess, identify and implement **additional water storage and impoundment** opportunities as a way to build resistance for urban streams within the Millstone River catchment area for fish habitat use during low summer flows ($$$/ST)
- Coordinate with the RDN to **complete a detailed watercourse habitat assessment** for urban watercourses within the City ($$/MT)
- **Identify and inventory key City natural assets** and incorporate into City's asset management program in order to protect and maintain their function ($$/ST)
- **Prioritize ecological restoration along riparian areas within the City,** as a way to build resilience and enhance habitat corridors ($$/MT)

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Well Being and Preparedness

Objective 1: Work with Community Partners to minimize health impacts of extreme weather (higher heat days and poor air quality from wildfires) on residents

- Develop an **Extreme Heat Response Strategy** ($$/M-LT)
- **Apply a resiliency lens when planning and designing public facilities.** Consider whether the facility can act as a cooling centre or providing a space with clean air during periods of low air quality from forest fires ($$/MT)
- **Expand Blue Community Program** to increase public water fountain and water bottle filling stations ($$/ST)
- Work with Island Health and other community stakeholders to put forward **coordinated and consistent messaging on limiting exposure to high heat and poor air quality events** ($/ST)

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Well Being and Preparedness

Objective 2: Improve knowledge, capacity and response plans to deal with increasing risk of landslides and wildfires

- Review existing practice around servicing **public infrastructure located on private property** ($$$/M-LT)
- Review and **update the North Slope Geo-tech Study** to incorporate known climate projections ($$/MT)

Objective 3: Improve community capacity and resilience to extreme events by increasing public awareness of climate change, expected impacts and how to prepare for them

- Work with community stakeholders to support neighbourhood-level organizations in **building resident awareness around climate emergency preparedness** ($$/ST)
- Establish an outreach program for property owners of overland flow paths and provide awareness training to maintain these structures ($/MT)

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Land Use and Buildings

Objective 1: Improve resilience planning for new and existing City facilities and residential development

- Provide information to homeowners on the **benefits of heat pumps** for improved energy efficiency and home comfort. **Review and revise any regulatory restrictions** ($/MT)
- Include assessments for climate change impacts (e.g. wildfires, flooding, land-slip) into City-owned **building facility asset assessments** as well as mitigation action ($/MT)
- **Require future climate considerations** into new construction projects / rezoning applications (e.g. passive design, future climate modeling, appropriate shading, etc.) ($/MT)

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Land Use and Buildings

Objective 2: Ensure development regulations and guidelines incorporate anticipated changes to climate-related natural hazards

- Develop **guidelines for new development / renovation and infrastructure placement** in areas at risk of coastal flood up to 2100 ($$/ST)
- **Update the *Hazard Land and Steep Slope Development Permit Area Guidelines*** and other pertinent bylaws to indicate need for preparation of geotechnical reports for new construction to ensure capturing current knowledge of future landslide / flood risk ($/ST)
- Develop a **climate adaptation assessment checklist for rezoning and development permits** and for a climate adaptation DPA. Provide incentives for development in higher risk areas to offset costs of response ($/ST)

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Corporate Governance

Objective 1: Improve the City's agility in respond and recover from climate related hazard events

- Ensure contingency **reserves contain an allowance for recovery** from climate related events ($$$/MT)
- Incorporate climate resiliency into the review and development of **asset management plans** ($/ST)
- Review **large capital infrastructure investments** using a Public Infrastructure Engineering Vulnerability Committee (PIEVC) assessment method ($$/ST)

Corporate Governance

Objective 2: Work with neighbouring jurisdictions to support climate resilience and limit transfer of risk across jurisdictional boundaries

- Continue to work with Snuneymuxw First nation and other regional partners on the Nanaimo Estuary Management Committee and the Nanaimo Watershed Roundtable to support climate adaptation initiatives that conserve and enhance habitat and protect property within the watershed ($/ST)
- **Share information and collaborate** with the Regional District of Nanaimo (RDN), neighbouring municipalities and Snuneymuxw First Nation (SFN) **on sea level rise planning and other resiliency strategies** ($/ongoing)
- **Review existing servicing agreements** between the City, SFN and Lantzville in light of climate projections and make appropriate adjustments to **ensure consistent service and limit the transfer of risk across jurisdictional boundaries** ($/ongoing)

Implementation and Monitoring

Action Area	Indicator
Water Supply	Growth in volume of water stored (% from baseline)
	Per capita water use
Flooding and Drainage	Number of complaints registered in Tempest CMMS
	Value of assets in unprotected future floodplain
Environment, Parks and Recreation	Urban trees captured in a tree inventory (%)
	Canopy cover
	Riparian restoration projects (#)
Well-being and Preparedness	*Heat Response Plan* complete and implemented
	Cooling centres available during extreme heat (#)
Land Use and Buildings	DPAs adopted and guidelines for areas at coastal risk completed (% or #)
	City owned facilities assessed for resilience (% or #)
Corporate Governance and Mainstreaming	Asset management planning includes a well integrated climate lens
	Capital infrastructure projects assessed for climate risk (% annually)

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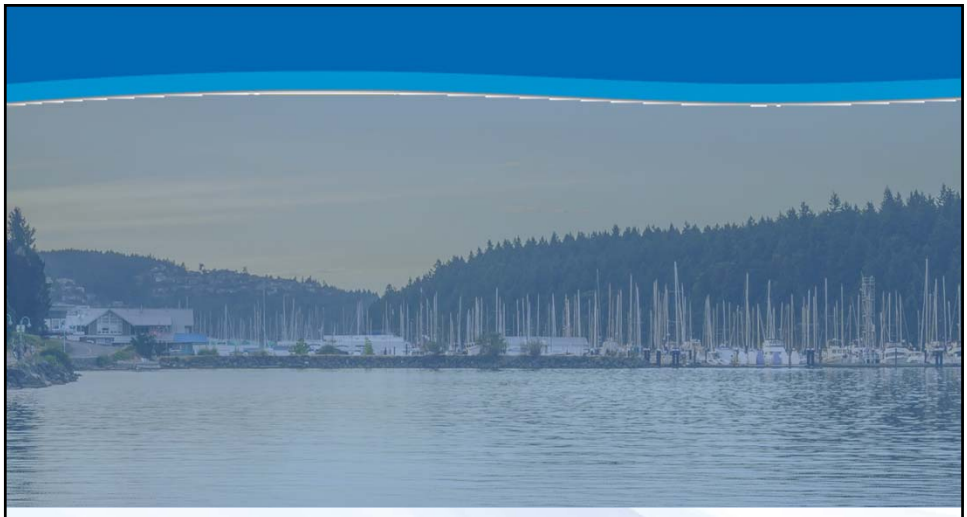

Questions / Discussion

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