





AGENDA INFORMATION	
<input checked="" type="checkbox"/> Council Workshop	Date: October 26, 2020
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The District of North Vancouver REPORT TO COMMITTEE

October 13, 2020
File: 11.5225.01/023.000

AUTHOR: Stephen Bridger, Section Manager Engineering Planning and Design
Nicole Foth, Community Planner

SUBJECT: Draft North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy

RECOMMENDATION:

THAT the report entitled "Draft North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy" dated October 13, 2020 is received for information;

AND THAT the Committee refers the North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy to a Regular Meeting of Council for consideration.

REASON FOR REPORT:

This report presents the draft North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy (SLR Strategy), and a summary of the focused, follow-up public engagement on the draft SLR Strategy that was held in September 2020.

SUMMARY:

Sea level rise is inevitable according to international scientists¹. It is expected to increase over time such that the consequences are significant without adaptation. The District of North Vancouver (DNV) has an opportunity to proactively address significant impacts as presented in the draft SLR Strategy. The draft SLR Strategy seeks to prepare the DNV for early action to plan and adapt. It will help increase our resiliency by reducing long-term costs through risk-based asset management, proactive environmental management, and enhanced public safety systems.

The draft SLR Strategy also enhances the DNV's understanding of vulnerabilities to coastal flooding due to sea level rise on the North Shore. Six priority next steps are highlighted for the DNV and the project partners. These priority steps focus on continued adaptation planning and managing potential risks.

¹ Intergovernmental Panel on Climate Change: Climate Change 2014: Synthesis Report.

SUBJECT: Draft North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy

October 13, 2020

Page 2

Sea level rise, and the DNV's response to it, has the potential to impact many residents and businesses, and infrastructure. A focused, follow-up engagement on the draft SLR Strategy was held from September 1-22, 2020. Overall, the majority of respondents agreed the draft SLR Strategy points the partners in the right direction for preparing for sea level rise. This engagement focused on re-connecting with participants from the initial consultation in early 2020, as well as with key community partners and infrastructure asset owners.

BACKGROUND:

The District of North Vancouver (DNV) practices a proactive approach to managing its natural hazards. Developing a SLR Strategy builds on this approach. The DNV partnered with the City of North Vancouver, District of West Vancouver, Port of Vancouver, Squamish Nation, and North Shore Emergency Management to undertake this work. Tsleil-Waututh Nation is currently preparing their own community climate change resiliency planning project and has been included in the public engagements. The project involved technical analysis to identify hazards, vulnerability, and risk, public engagement, development of adaptation approaches and concepts, and actions for next steps.

A summary of public engagement for this project is provided in **Attachment 1**.

EXISTING POLICY:

The Official Community Plan (2011) and the Climate Change Adaptation Strategy (2017) provide policy direction to integrate a climate change perspective into infrastructure and ecosystem management, and to plan for and adapt to sea level rise. The Community Energy and Emissions Plan (2019) complements climate adaptation work by also focusing on mitigating climate change.

ANALYSIS:

The draft SLR Strategy document is available online at www.DNV.org/SeaLevelRise.

Understanding sea level rise risk across the North Shore

The draft SLR Strategy follows the Province's guidelines that direct municipalities to plan for one metre of sea level rise by the year 2100, and two metres by the year 2200.²

Hazard analysis for sea level rise scenarios combined with a storm surge event show that coastal and low-lying areas of the DNV are at risk of flooding in the future if no adaptation measures are undertaken. These areas include residential, commercial, and industrial uses (primarily Port terminal industries), and park and natural spaces.

Norgate, Lynn Creek, and Maplewood are shown to be more extensively impacted (see section 5 "Hazard Analysis" and maps in Appendix B in the draft SLR Strategy). These areas were also previously identified as at risk of coastal flood hazards in the *Creek Hydrology, Floodplain Mapping and Bridge Hydraulic Assessment* (2014).

² Province of BC, Flood Hazard Area Land Use Management Guidelines, amended 2018.

If adaptation is not undertaken, consequences of sea level rise could include damage to buildings, and impacts to residents' homes, businesses, transportation and wastewater infrastructure, parks, and intertidal habitats. Some of the potential consequences are illustrated in Figure 1, below, and further described in section 6, "Consequences and Risk Assessment" in the draft SLR Strategy.

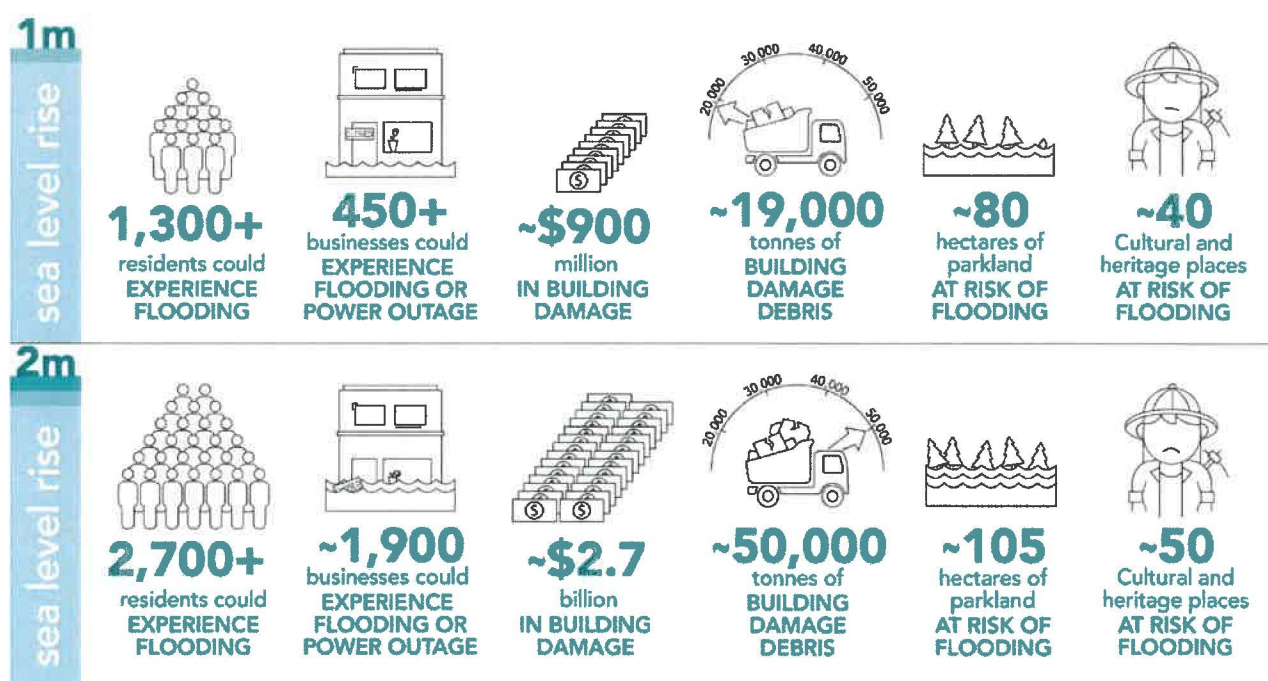


Figure 1: Potential consequences on the North Shore from one and two metre rises in sea levels combined with storm events.

By understanding potential consequences, the DNV and its project partners will be able to better assess how adaptation measures could reduce exposure to possible flooding.

High level adaptation approaches

To respond to coastal flooding and manage sea level rise risk on the North Shore, four different adaptation approaches illustrate what could be done to address sea level rise:

- **Resist:** Build structures to reduce the likelihood of flooding areas;
- **Accommodate:** Acknowledge flood risk, define how much risk can be tolerated, and raise livable spaces vulnerable to flooding;
- **Avoid:** Avoid building or adding more to areas vulnerable to flooding. Or, gradually relocate buildings and infrastructure away from areas at risk of flooding (also known as "managed retreat"); and
- **Advance:** Reclaim land to make space for structures to reduce the likelihood of areas flooding.

Illustrations of these approaches are available at [DNV.org/SeaLevelRise](https://www.dnv.org/SeaLevelRise) and described in section 7, "Adaptation Approaches and Concepts" in the draft SLR Strategy. These concepts were introduced and discussed at the DNV's community workshops held in February 2020. The approaches could be used in combination, and different combinations could be used in different areas across the North Shore.

Action areas to manage the risk

The draft SLR Strategy recommends six priority next steps to initiate over the next 10 years. These were developed based on the technical analysis by the consultant and shaped by input from the initial public engagement. These next steps apply across the North Shore and may be either completed by partners individually or in collaboration where appropriate (i.e. areas that span jurisdictional boundaries).

The six priority next steps are fully described in section 8, "Implementation Plan" of the draft SLR Strategy, and summarized as follows:

1. Formalize a North Shore sea level rise adaptation working group

Continue the collaborative staff working group that guided the development of the draft SLR Strategy. This group would coordinate shared opportunities for external funding, partner on implementation planning, and share adaptation progress. Invite Tsleil-Waututh Nation, who has been developing their own community climate change resiliency planning project, to join the working group.

2. Continue to build knowledge about the impacts of sea level rise

Continue investigating potential impacts of sea level rise both across the North Shore and within local community areas. Continue building and sharing knowledge on a range of topics as adaptation planning continues (i.e. impacts on groundwater quality, shoreline erosion, and impacts on the storm water system).

3. Establish Comprehensive Adaptation Plans in collaboration with partners

The draft SLR Strategy identifies nine comprehensive adaptation planning zones for low-lying areas across the North Shore. Three of the zones are partially or fully within the District of North Vancouver:

- Norgate-Mosquito (with City of North Vancouver, Squamish Nation, and Port of Vancouver);
- Lynn-Seymour (with City of North Vancouver, Squamish Nation, and Port of Vancouver); and
- Maplewood (with Port of Vancouver).

The draft SLR Strategy includes preliminary adaptation concepts for the zones. These concepts are illustrative only and intended to provide a starting place for future adaptation planning efforts that would assess these concepts in more detail and compare them with alternative concepts. They do not represent preferred or the final selection of measures by the North Shore partners.

The preliminary concepts for the DNV's zones are described in section 7.4 of the draft SLR Strategy. In brief, the concepts include:

- Land raising generally in port/industrial/commercial areas;
- Setback dikes (dikes that are built inland and set back further than a traditional shoreline dikes) generally to protect residential/commercial areas;
- Flood-proofing measures for buildings north of setback dikes;
- Opportunities to provide space for habitat areas and natural shorelines; and
- Potential opportunities to reduce risk through land use planning (e.g. density restrictions, avoid/managed retreat adaptation approaches described above.)

Should the SLR Strategy be approved by Council, these preliminary adaptation concepts would be used to launch more detailed planning. This work would be needed before selecting preferred concepts and implementing them in each of the zones. Future work anticipated would include evaluation of concepts (i.e. considering costs, level of risk reduction, feasibility, and environmental and social impacts and benefits), cost estimates, and public engagement.

4. Integrate findings from this strategy into community-wide flood management initiatives

Update or develop bylaws, regulations, and development permit areas to proactively respond to the potential impacts of sea level rise.

For the DNV, staff anticipate drafting a coastal Development Permit Area to sensitively guide development in the areas potentially at risk from sea level rise. This step would also support implementation of the following OCP policies:

- Establish a new Marine Foreshore Development Permit Area to protect and improve the health of the marine foreshore (OCP policy 9.3.9); and
- Encourage the management of shoreline areas to adapt to potential climate change impacts as well as to protect ecologically sensitive areas (OCP policy 10.4.3).

5. Continue to build public awareness about coastal flooding and sea level rise

Ongoing engagement would build community awareness of sea level rise impacts and understanding of potential adaptation approaches in each community. Actions could include sharing strategy outcomes on the project webpage, publicly communicating ongoing progress towards implementing the strategy, and continuing to engage the public and community groups as each Comprehensive Adaptation Plan is developed.

6. Coordinate with other levels of government

Continue to engage with relevant senior levels of government and agencies during implementation of the SLR Strategy, including the development of Comprehensive Adaptation Plans and regulatory approaches. The DNV is well positioned for this action as it already collaborates with key agencies on this topic and is a partner on the Fraser Basin Council, which is developing the Lower Mainland Flood Management Strategy.

SUBJECT: Draft North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy

October 13, 2020

Page 6

To support continued sea level rise adaptation planning and implementation of the previously described six priority next steps, the draft SLR Strategy includes a number of useful resources, such as a sea level rise adaptation toolkit tailored to the North Shore (section 7.2 in the draft SLR Strategy), policy and regulatory guidance on managing development in the coastal floodplain (section 7.3 of the draft SLR Strategy), and suggested evaluation criteria (section 7.5 of the draft SLR Strategy).

PUBLIC ENGAGEMENT

Initial public engagement (January-March 2020)

Initial public engagement for this project was held in January-March 2020. It included community workshops in the DNV, and an online survey held jointly with the project partners. The DNV promoted the engagement opportunities in the following ways:

- Promoted on the DNV webpage;
- Posted on DNV social media;
- Mailed letters to property owners within the sea level rise planning area in the DNV; and
- Emailed notifications to local community organizations, government organizations, agencies and infrastructure asset owners, Tsleil-Waututh Nation, relevant DNV committees, and long-term leaseholders on DNV property in the planning area.

The mailed letters and email notifications encouraged those interested in the development of the SLR Strategy to sign-up on an email list for notifications.

A brief summary of the key themes from the initial public engagement is below. Full summaries are available in **Attachment 1** and section 3 “Community Engagement” of the draft SLR Strategy.

Community Workshops

The DNV hosted three community workshops to provide in-person opportunities for participants to learn about sea level rise and share their views about adapting to sea level rise through facilitated, interactive activities. Workshops were held in Norgate, Maplewood, and Deep Cove with a total of 48 participants in February 2020. Some highlights include:

- Participants had a general understanding of the challenges at hand, and the need for on-going, long-term planning for sea level rise; and
- Participants discussed the benefits and disadvantages of the high-level adaptation approaches (i.e. resist, accommodate, avoid, and advance). As there is no “silver bullet” solution, participants expressed concerns about each approach, as well as made suggestions for how these approaches could work.

Online Survey Results

The online survey was available on the webpage, [DNV.org/SeaLevelRise](https://dnv.org/SeaLevelRise), from January 21, 2020 to March 9, 2020. In total, there were 77 respondents. The majority of respondents identified as residents in the DNV (63 of 74, 85%). The following list highlights several key findings:

SUBJECT: Draft North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy

October 13, 2020

Page 7

- Criteria that should be considered when selecting sea level rise adaptation measures: low environmental impact, effectively reduce risk, and can be adjusted over time (top three); and
- Comments on the potential consequences of sea level rise and the adaptation approaches indicated a desire to prepare now for sea level rise and avoid building in areas vulnerable to flooding.

Public input received during the initial engagement has been considered alongside technical analysis to develop the draft SLR Strategy. Section 3.3 of the draft SLR Strategy describes how the input has been reflected in the draft SLR Strategy.

Follow-up targeted engagement (September 2020)

From September 1-22, 2020, the DNV hosted an online survey at [DNV.org/SeaLevelRise](https://www.dnv.org/SeaLevelRise) on the draft SLR Strategy. The online engagement was accompanied by a summary of the key aspects of the draft SLR Strategy and draft SLR Strategy documents.

This follow-up engagement aimed to re-connect with those who previously expressed interest in following the draft SLR strategy process. Specifically, the DNV sent email notifications to participants who expressed interest during the initial engagement (workshops attendees, email list), and key community partners and stakeholders (e.g. Metro Vancouver, infrastructure asset owners, Tsleil-Waututh Nation). The survey was also available online for any interested members of the public.

As the follow-up engagement focused on a more targeted audience of participants who expressed interest in the project, the result was a smaller number of survey respondents (19), all of whom identified as residents in the DNV. The following list highlights key themes identified in comments that received more than one response:

- Support for sea level rise regulations for new and existing development (3);
- Support for more education and awareness about sea level rise (2);
- Comments on specific measures or actions (e.g. support for avoid approach, do not support building close to waterways) (3); and
- Do not think much sea level rise will happen, so do not think a strategy is needed (2).

Timing/Approval Process:

The SLR Strategy will be ready for consideration by Council at a Regular Meeting of Council after any additional refinements are made as a result of the workshop discussion.

Completion of this project is required before February 28, 2021 in order to meet the grant requirements from the Federation of Canadian Municipalities.

Should Council approve the SLR Strategy, staff will implement the actions by preparing a new coastal Development Permit Area for the DNV, and Comprehensive Adaptation Plans for the comprehensive adaptation planning zones identified in the DNV.

Concurrence:

The project is being co-led by DNV Engineering and Community Planning staff with support from Communications. In addition, staff from Transportation, Public Works, Utilities, Parks,

Properties, Development Planning, and Finance have been involved in reviewing the draft SLR Strategy.

Financial Impacts:

The draft SLR Strategy is a high-level document and outlines action areas where further, detailed evaluation, costing, and planning for sea level rise adaptation measures are needed. Should Council approve the SLR Strategy, the DNV's long-range financial plan would be updated in future years as required.

Liability/Risk:

Coastal flooding and sea level rise are natural hazards that impact the DNV, and it is in the public interest to reduce and mitigate the risks associated with these natural hazards over time.

Social Policy Implications:

Areas at risk of sea level rise include places where people in the DNV live, work, and recreate. The draft SLR Strategy considers how sea level rise could impact people in the DNV, and the spaces, places, and infrastructure that they use.

Environmental Impact:

The draft SLR Strategy outlines potential impacts to the natural environment from sea level rise if no adaptation measures are taken. Minimizing or avoiding these impacts is a critical factor to be considered when exploring adaptation approaches and options.

Conclusion:

Developing a North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy (SLR Strategy) is an important step towards building adaptive capacity and resiliency to rising sea levels. Working with the District of North Vancouver's neighbouring jurisdictions, the draft SLR Strategy seeks to proactively respond to the potential natural hazard, and facilitates opportunities for joint partnership on implementation and integration of actions into asset management, operations, and maintenance programs, community planning policies, long-term funding plans, and emergency management strategies.

Options:

1. THAT the report entitled "Draft North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy" dated October 13, 2020 is received for information;

AND THAT the Committee refers the North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy to a Regular Meeting of Council for consideration.
(Staff recommendation)

OR

2. Take no further action.

SUBJECT: Draft North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy

October 13, 2020

Page 9

Respectfully submitted,

A blue ink signature of Stephen Bridger, written in a cursive style.

Stephen Bridger,
Section Manager Engineering Planning and Design

A black ink signature of Nicole Foth, written in a cursive style.

Nicole Foth,
Community Planner

Attachment 1: Public Engagement Summaries

Attachment 2: Presentation

SUBJECT: Draft North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy

October 13, 2020

Page 10

REVIEWED WITH:		
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<input type="checkbox"/> Development Planning	_____	<input checked="" type="checkbox"/> Communications <i>Q.</i>
<input type="checkbox"/> Development Engineering	_____	<input type="checkbox"/> Finance
<input type="checkbox"/> Utilities	_____	<input type="checkbox"/> Fire Services
<input checked="" type="checkbox"/> Engineering Operations <i>SL</i>	_____	<input type="checkbox"/> ITS
<input type="checkbox"/> Parks	_____	<input type="checkbox"/> Solicitor
<input type="checkbox"/> Environment	_____	<input type="checkbox"/> GIS
<input type="checkbox"/> Facilities	_____	<input type="checkbox"/> Real Estate
<input type="checkbox"/> Human Resources	_____	<input type="checkbox"/> Bylaw Services
<input type="checkbox"/> Review and Compliance	_____	<input checked="" type="checkbox"/> Planning <i>JP</i>

External Agencies:	
<input type="checkbox"/> Library Board	_____
<input type="checkbox"/> NS Health	_____
<input type="checkbox"/> RCMP	_____
<input type="checkbox"/> NVRC	_____
<input type="checkbox"/> Museum & Arch.	_____
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Public Engagement Summaries

The following public engagement summaries are included in this attachment:

- North Shore Sea Level Rise Strategy: District of North Vancouver Community Workshops – February 2020 – Summary
- North Shore Sea Level Rise Adaptation Strategy Initial Public Engagement Survey Summary (Winter 2020)
- North Shore Sea Level Rise Strategy: Summary of Public Engagement on Draft Strategy (September 2020)

North Shore Sea Level Rise Strategy District of North Vancouver Community Workshops – February 2020 Summary

Three community workshops were held by the District of North Vancouver as part of the initial public engagement for the North Shore Sea Level Rise Strategy. The North Shore Sea Level Rise Strategy is a proactive, multi-partner project aimed at understanding vulnerabilities to coastal flooding due to sea level rise on the North Shore and developing options, with public input, to manage the potential risks. The project partners are the District of North Vancouver, City of North Vancouver, District of West Vancouver, Squamish Nation, Port of Vancouver, and North Shore Emergency Management.

The District of North Vancouver community workshops provided face-to-face engagement opportunities for those who could be potentially impacted by sea level rise if no adaptation is undertaken. The objectives of the workshops were to:

- Build awareness and understanding of sea level rise, and the potential risks of coastal flooding on the North Shore if no adaptation is undertaken;
- Educate about possible adaptation approaches;
- Start a community conversation about the potential trade-offs and co-benefits of managing coastal flood risk; and
- Listen to participants' views and issues about adapting to sea level rise.

Through structured group activities and a presentation, participants were able to learn more about sea level rise, ask questions, identify what matters to them, and share thoughts on a range of adaptation approach concepts. The workshops were held in Norgate, Maplewood, and Deep Cove with a total of 48 participants.

- February 11, 6:00 – 8:00 pm, Norgate Elementary School (20 participants)
- February 12, 9:00 – 11:00 am, Wild Bird Trust Corrigan Nature House (14 participants)
- February 13, 6:00 – 8:00 pm, Cove Cliff Elementary School (14 participants)



Communication

To invite participants to the workshops, letters were mailed to property owners within the sea level rise planning area in the District, and email notifications were sent to local community organizations; other government organizations, agencies and infrastructure asset owners; Tsleil-Waututh Nation¹; District committees; and long-term leaseholders on District property in the planning area. Interested participants were invited to register in advance on the project webpage.



What we heard

As participants learned more over the course of the workshop, there was a general understanding of the challenges at hand, and the need for on-going, long-term planning.

During the presentation, participants shared comments and asked questions; in general these included: asking about the cost of adaptation, asking clarifying questions about sea level rise, recognition that we need to plan for adaptation, and identifying the need to update bylaws to allow buildings to adapt.

Key themes heard during the workshop activities are summarized below.

Activity 1: What matters most?

Participants were asked to share what matters most to them when thinking about sea level rise and coastal flooding. After discussion in table groups, each group was asked to note their top three themes discussed at their table, then verbally report out to the whole group.

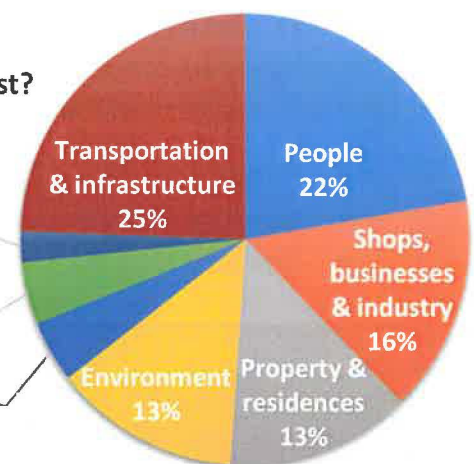
Overall, the top three themes reported by the most groups were transportation and infrastructure; people; and shops, businesses and industry. Close behind were properties and residences, and environment.

Activity 1: What matters most?

Culture & heritage
2%

Parks & recreation
4%

Emergency planning
& safety
5%



¹ Squamish Nation, the other First Nation with reserves on the North Shore, is a partner on the North Shore Sea Level Rise Strategy.

During the whole group discussion, key comments included:

- Update bylaws to allow buildings to adapt (height, siting);
- Environmental concerns (erosion, impact on animals and people, potential contamination);
- Importance of maintaining transportation routes and infrastructure;
- Concern about businesses (access, jobs, long-term impacts);
- Recognition that all themes matter;
- At the Norgate workshop, suggestion to focus adaptation in the industrial area between Norgate residential and the ocean to protect the residential area;
- Continue to engage with potentially impacted communities; and
- Concern about potential impact to homes.

Activity 2: Explore adaptation approaches

Participants learned about the adaptation approaches (resist, accommodate, avoid, and advance) and the benefits and disadvantages of each approach. They were asked to share their thoughts on the approaches and their benefits and disadvantages. Participants were encouraged to discuss these high-level concepts, and reminded that the group was not deciding or designing adaptation measures in these workshops. After discussion in table groups, each group was asked to verbally report out a summary of their discussion to the whole group. Key themes from the whole group discussion were as follows.

Resist – *Focus on structural measures such as building dikes to reduce the likelihood of flooding.*

- Support for the resist approach, particularly for waterfront industrial areas.
- Concern about impacts of the resist approach (land required, false sense of security in event of structural failure, questions of cost and implementation, bylaw changes needed).
- Co-benefits such as recreation trails with dikes or noise buffering with walls.
- A few suggested specific measures such as a sea dam or flood gates for creeks.

Accommodate – *Focus on non-structural adaptation measures, including consciously acknowledging flood risk, defining how much risk we are willing to tolerate, and raising livable spaces in areas vulnerable to flooding.*

- Interest in wet flood-proofing (floodable basements), and living with water.
- Concern about how to adapt existing structures.
- Leverage new development to implement the accommodate approach.
- Need to continue working with land owners and regulatory agencies (e.g. Port, Province).
- Concerns with this approach include: bylaw changes needed to facilitate the accommodate approach, how this approach addresses areas outside of buildings (e.g. roads), how to use accommodate with limited property space, and how it works with other natural hazards.

Avoid – *Focus on land use planning to avoid building or adding more uses in areas that are vulnerable to flooding, or gradually relocating buildings and infrastructure away from areas at risk of flooding.*

- Avoid adding more development in flood hazard areas.
- Question of costs to implement the avoid approach.
- General support for the avoid approach.
- Concerns with this approach included: equity issues of who should move or where could move to, loss of property value, need to update bylaws to allow for flexibility, and privacy on property if surrounding uses change.

Advance – *Reclaim land to make space for structures such as dikes, which can reduce the likelihood of flooding in coastal areas.*

- Concern about the environmental impacts from the advance approach (e.g. Maplewood mudflats).
- Some expressed support for the advance approach in waterfront industrial areas or where filling has already occurred, noting the advance approach has historically been used in some places on the North Shore.
- Questions about implementing the advance approach: cost, limiting regulation, how to implement it.

During Activity 2, there were comments during the large group discussion about adaptation in general. Key themes included:

- Concern about the environmental impacts from sea level rise and adaptation approaches;
- Concern about being able to achieve political consensus for action, recognizing that sea level rise is a difficult topic, and concern about failure of measures;
- Appreciate sea level rise planning is happening on the North Shore to build resiliency;
- Question of how much adaptation measures will cost versus taking no action;
- Update bylaws to be flexible and responsive to different areas; and
- Some voiced support for different combinations of adaptation approaches or all four approaches, and the need to tailor adaptation by area.

Activity 3: Reflection on workshop

To conclude the workshop, participants shared their final thoughts. Key themes during the group discussion included:

- Appreciate planning for sea level rise and opportunity for engagement;
- Recognize that climate mitigation (i.e. decreasing greenhouse gases) is important, too;

- Identify the need for coordination across many different groups to address the challenges presented by sea level rise;
- Concerns about impacts to human health, transportation routes, other natural hazards; and
- Recognize that the present state today is inherited from past decisions.

Next steps

Input received from the initial engagement will be considered alongside technical analysis as the draft Sea Level Rise Strategy is developed. Initial engagement for the Sea Level Rise Strategy included the District's community workshops, and an online survey jointly hosted by the project partners (input received via the online survey is summarized separately). Input from initial engagement will help inform the Strategy for Council's consideration.

North Shore Sea Level Rise Adaptation Strategy

Initial Public Engagement Survey Summary (Winter 2020)

As part of the development of the North Shore Sea Level Rise Adaptation Strategy, the project partners (District of North Vancouver, City of North Vancouver, District of West Vancouver, Squamish Nation, Port of Vancouver, and North Shore Emergency Management) conducted a public survey, part of the initial public engagement.

The survey was open from January 21, 2020 to March 9, 2020 on the District of North Vancouver's website at DNV.org/SeaLevelRise. Each partner determined how to communicate the survey to their respective communities.

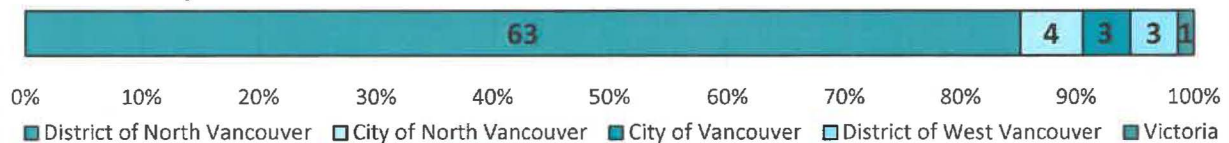
Total number of respondents: 77

The number of responses for each question may vary, as not all respondents answered every question.

1. Where do you live?

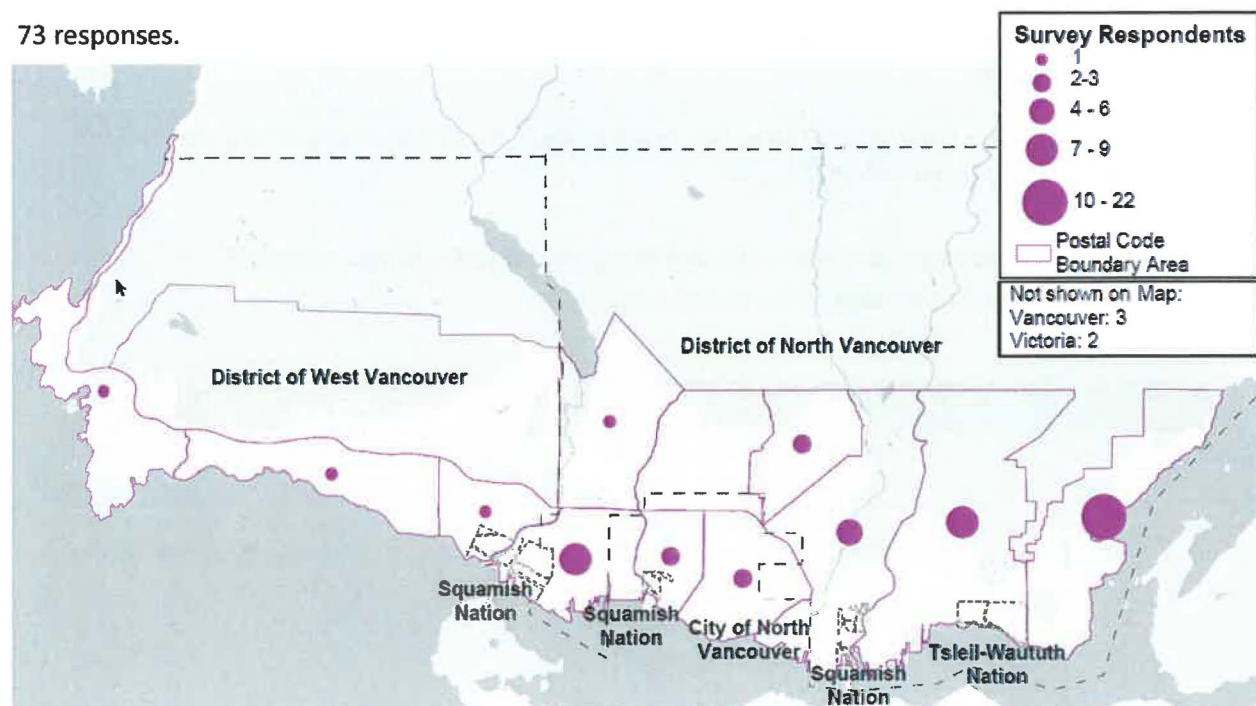
The majority of respondents said they live in the District of North Vancouver (63 of 74, 85%).

Where do you live?



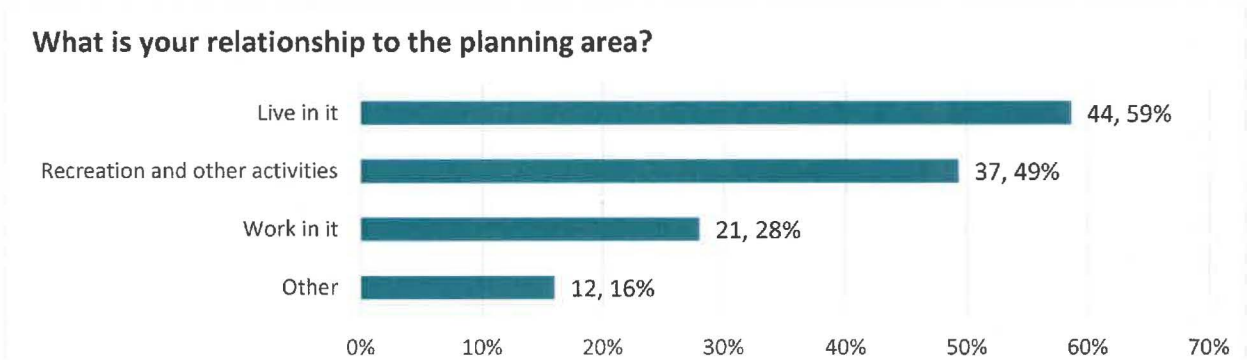
2. What are the first three letters of your postal code?

73 responses.



3. What is your relationship to the planning area? Choose all that apply.

Over half of the respondents live in the planning area (44 of 75, 59%), and almost half of the respondents recreate or participate in similar activities in the planning area (37 of 75, 49%).



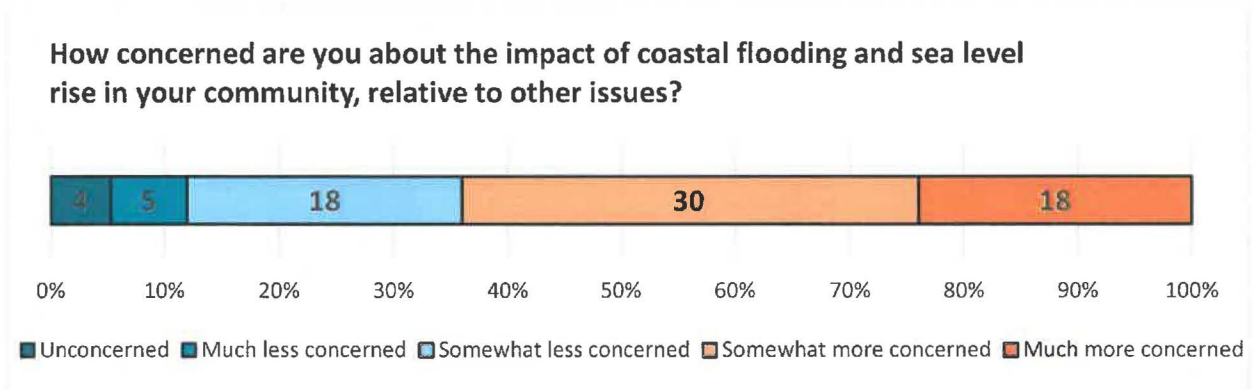
(Since respondents could choose more than one option, the percentage represents the portion of respondents who selected an option of the total respondents.)

Of the 12 respondents who selected “Other”, the responses had the following themes:

- Live near or want to live in the planning area (3 responses)
- Own property in the planning area (3 responses)
- Use transportation routes through the planning area (3 responses)
- Use businesses in the planning area (1 response)
- Concerned about environmental impact (1 response)
- Interested in topic (1 response)

4. How concerned are you about the impact of coastal flooding and sea level rise in your community, relative to other issues?

Most respondents indicated they are somewhat more or much more concerned about sea level rise than other community issues (48 of 75, 64%).



5. Do you have comments about these guiding principles?

The guiding principles presented were:

- 1. Sea level is rising and we have to be willing to accept change**
Areas at risk of flooding due to sea level rise will be affected unless we take proactive steps to minimize the impact.
- 2. Adaptation is flexible in the face of uncertainty**
New scientific and technical information informs our decisions. Adaptation should prepare us for a range of scenarios in the future, including changes in the pace and height of sea level rise over time.
- 3. Decisions are risk-based and consider impacts to different sectors**
Hazard and risk information drives our discussions, and impacts to environment, economic, and social sectors are considered.
- 4. Everyone has a role in adaptation**
We need to work together to create more resilient communities by working collaboratively across levels of government and with our communities on our actions.
- 5. Planning includes education and awareness opportunities**
Openly communicating flood risks facing different areas on the North Shore, and being transparent about adaptation planning as it evolves, helps ensure our communities have a shared awareness.

Of the 30 respondents who provided comments, most agreed with the guiding principles as presented (15 of 30, 50%). The responses had the following themes (some comments had more than one theme):

- Agree with the principles (15 responses)
- Climate change mitigation is important, too (5 responses)
- Importance of protecting habitats and the environment (3 responses)
- Concern about funds spent on sea level rise planning (2 responses)
- Concern about new development in sea level rise planning area (1 response)
- Impact on local First Nations (1 response)
- Importance of human safety and transportation (1 response)
- Sea level rise is less important than other issues (1 response)
- Need to be able to respond to changing scenarios (1 response)
- Support for adaptation planning (1 response)
- Suggestion to partner with communities outside the region (1 response)

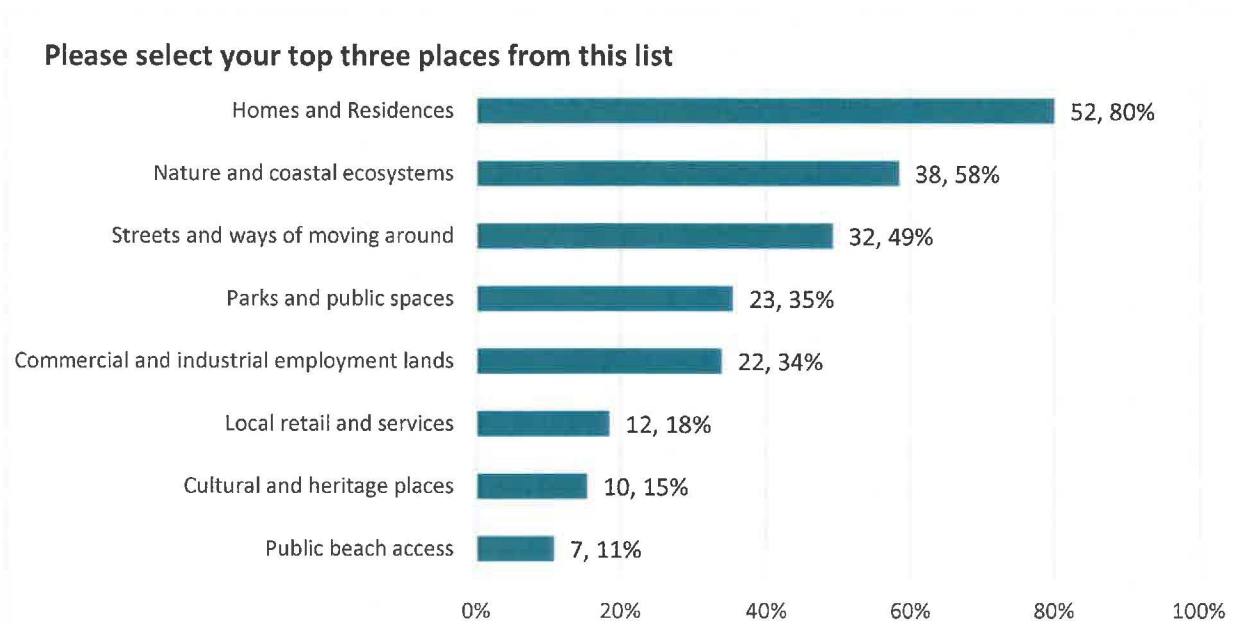
North Shore Sea Level Rise Adaptation Strategy

Initial Public Engagement Survey Summary (Winter 2020)

6. Please select your top three places from this list.

Respondents were asked to select their top three places that matter most to them from a list of options.

The top three places selected by respondents were: homes and residences (52 of 65, 80%), nature and coastal ecosystems (38 of 65, 58%), and streets and ways of moving around (32 of 65, 49%).



(Since respondents could choose more than one option, the percentage represents the portion of respondents who selected an option of the total respondents.)

7. Are there other kinds of places that matter to you?

Of the 18 respondents who provided comments, one third expressed that they felt they couldn't choose or rank them because all or most of these places are important (6 of 18, 33%). The responses had the following themes:

- All or nearly all of these places are important (6 responses)
- Concern about vulnerable populations living or accessing services in or near areas at risk of flooding (2 responses)
- Critical infrastructure (2 responses)
- Schools (2 responses)
- Concern about impacts to First Nations' land (1 response)
- Transportation hubs (1 response)
- Ecosystems (1 response)
- Watersheds (1 response)
- Parks and streets and ways of moving around (1 response)
- Commercial and industrial employment lands (1 response)

8. Do you have thoughts about the consequences of sea level rise?

Of the 37 respondents who provided comments, nearly a quarter expressed the need to prepare for sea level rise now to reduce the consequences (9 of 37, 24%). The responses had the following themes:

- We need to prepare for sea level rise now (9 responses)
- Prevent new development in high-risk areas (6 responses)
- Build new buildings with sea level rise in mind (4 responses)
- We have time to adapt (3 responses)
- To reduce consequences, we need to mitigate climate change as well as adapt (2 responses)
- Preserve and restore coastal ecosystems (2 responses)
- Concern about the consequences of sea level rise (2 responses)
- Continue to educate residents about sea level rise (2 responses)
- There are more pressing issues than sea level rise (2 responses)
- Work with other levels of government and with other North Shore municipalities (1 response)
- Balance risks and costs (1 response)
- Use parkland as a natural barrier to sea level rise (1 response)
- Concerned about the costs of adaptation (1 response)
- Concerned about displacement of residents and businesses (1 response)

9. Do you have comments, ideas, or concerns about these adaptation approaches?

The four approaches presented were:

- **Resist:** Build structures to reduce the likelihood of flooding
- **Accommodate:** Acknowledge flood risk, define how much we are willing to tolerate, and raise livable spaces vulnerable to flooding
- **Avoid:** Avoid building or adding more to areas vulnerable to flooding, or gradually relocate buildings and infrastructure away from areas at risk of flooding
- **Advance:** Could include reclaiming (filling in) land to create space for a dike, for example

There were 34 respondents who provided comments. Of the 30 respondents who commented on a specific adaptation approach, almost half supported the Avoid approach (14 of 30, 47%). The responses had the following themes (some respondents' comments had more than one theme):

Comments supporting individual adaptation approaches:

- Support for Avoid (14 responses)
- Support for Accommodate (7 responses)
- Support for Resist (7 responses)
- Support for Advance (2 responses)

Other comments:

- General support for adaptation approaches (5 responses)

North Shore Sea Level Rise Adaptation Strategy

Initial Public Engagement Survey Summary (Winter 2020)

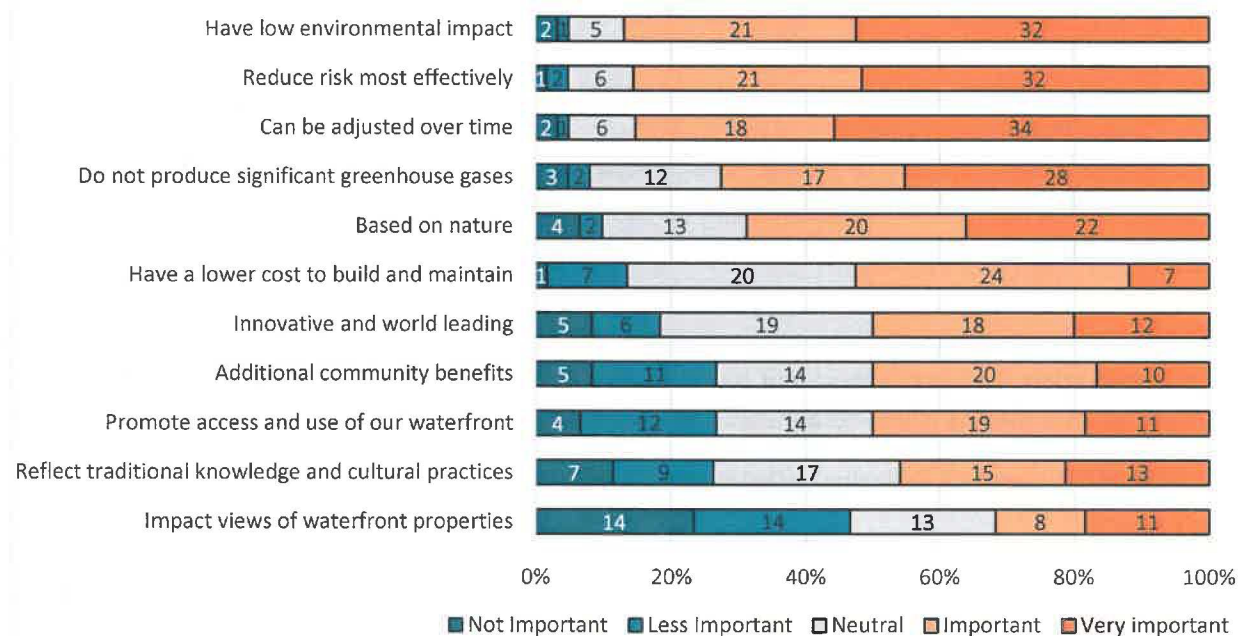
- Support nature-based solutions (3 responses)
- Do not shift impact onto another property (2 responses)
- Limit impact on environment (2 responses)
- Continue raising awareness about adaptation approaches and the risks of sea level rise (2 responses)
- Consider life cycle costs of these approaches, including future upgrades or maintenance (2 responses)
- Incentivize moving away from flood prone areas (1 response)
- Mitigation needed as well as adaptation (1 response)
- Support beach nourishment (1 response)
- Property owners should be compensated for loss of value (1 response)
- Incorporate sea level rise uncertainties (1 response)

10. How important are these criteria in establishing sea level rise adaptation measures?

Respondents were asked to rank the importance of criteria from a list of options.

The top ranking criteria that respondents indicated were important or very important to consider in establishing sea level rise adaptation measures were: have a low environmental impact (53 of 61, 87%), reduce risk most effectively (53 of 62, 85%), and be able to adjust over time (52 of 61, 85%).

How important are these criteria in establishing sea level rise adaptation measures?



(Total number of responses varies for each criterion.)

North Shore Sea Level Rise Adaptation Strategy
Initial Public Engagement Survey Summary (Winter 2020)

11. Please indicate the level of funding you think each group should provide.

Respondents were asked to rank the order of how much funding the following groups should provide for adaptation measures:

- Public and private owners of land that is on today's waterfront,
- Public and private owners of land that could be flooded from sea level rise if we do not adapt (on today's waterfront as well as inland),
- Taxpayers across the respondent's community, and
- Taxpayers outside of the respondent's community, including senior levels of government (Provincial, Federal).

There were 65 total responses. Responses were categorized by respondents who identified as living in the sea level rise planning area, and those who are not living in the planning area or did not specify (survey question 3).

Of the 38 respondents who live within the planning area, they generally ranked the order of who should pay the most (ranked 1st or 2nd) as follows:

Most	Senior levels of government/taxpayers outside community (24 of 38, 63%)
	Taxpayers across their community (22 of 38, 58%)
	(Tied) Public and private owners of land that is on today's waterfront (15 of 38, 39%)
	(Tied) Public and private owners of land that could be flooded from sea level rise if we do not adapt (15 of 38, 39%)
Least	

Of the 27 respondents who live outside the planning area or did not specify where they live, they generally ranked the order of who should pay the most (ranked 1st or 2nd) as follows:

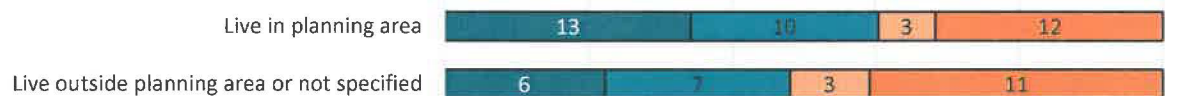
Most	Public and private owners of land that could be flooded from sea level rise if we do not adapt (17 of 27, 63%)
	Public and private owners of land that is on today's waterfront (14 of 27, 52%)
	Taxpayers across their community (12 of 27, 44%)
Least	Senior levels of government/taxpayers outside community (11 of 27, 41%)

North Shore Sea Level Rise Adaptation Strategy

Initial Public Engagement Survey Summary (Winter 2020)

Please indicate the level of funding you think each group should provide.

Public and private owners of land that is on today's waterfront



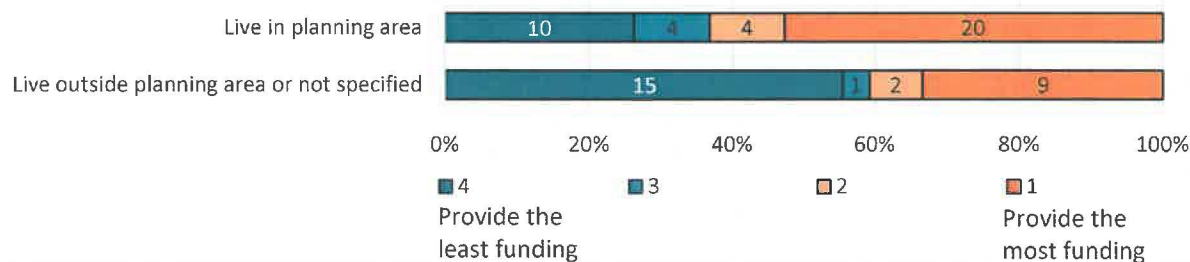
Public and private owners of land that could be flooded from sea level rise if we don't adapt



Taxpayers across your community



Senior levels of government/taxpayers outside your community



Other input received

One letter was received from the Medical Health Officer, Vancouver Coastal Health – North Shore was received in response to the initial public engagement (attached).

February 21, 2020

Stephen Bridger, PEng, MAsC
Section Manager - Engineering Planning & Design
District of North Vancouver
355 West Queens Road
North Vancouver, BC V7N 4N5

via email: bridgers@dnv.org

Dear Mr. Bridger,

RE: North Shore Sea Level Rise Strategy

Thank you for giving Vancouver Coastal Health (VCH) the opportunity to participate and comment on the early phase of the North Shore Sea Level Rise Strategy. VCH supports engagement with community members and overall strategic planning to mitigate impacts of sea level rise near the North Shore shorelines due to climate change.

Climate change will impact human health in BC through various pathways including air and water quality deterioration, wildfires, flooding, extreme heat, change in food sources, and range extension of pathogens and disease vectors. These impacts may exacerbate current health and social disparities. Health impacts will be dependent on a person's exposure to the risk (e.g. location and quality of housing, occupation), sensitivity to that exposure (e.g. age, health status or health care needs) and adaptive capacity (e.g. economic resources, social capital, access to technology and information and skills). These health impacts will likely place increased stress on the health care system. The 2018 Lancet Countdown on Health and Climate Change states that "climate change threatens to undermine the past 50 years of gains in public health, and conversely, that a comprehensive response to climate change could be "the greatest global health opportunity of the 21st century."¹

With this great opportunity, we offer the following recommendations for consideration:

1. Climate change and sea level rise will impact the physical, psychological, and social well-being of the population on the North Shore. We recommend reviewing information on the BC Centre for Disease Control (BCCDC) Community Health Profiles² about the demographics in each municipality, and various factors that could affect the health of the residents, especially the vulnerable populations. You may visit our VCH community care facilities website³ for information about the locations of childcare and residential care facilities where vulnerable populations are in care. Furthermore, we encourage the committee to understand the demographic forecasts for the North Shore by utilizing the functions on the My Health My Community Health Atlas⁴ when strategizing any adaptation approaches in specific areas.

¹ Watts N, Amann M, Ayeb-Karlsson S, Belesova K, Bouley T, Boykoff M, Byass P, Cai W, et al. (2018). The Lancet Countdown on health and climate change: from 25 years of inaction to a global transformation for public health. *The Lancet* 391: 581-630. doi:10.1016/S0140- 6736(17)32464-9.

² BCCDC Community Health Profiles - <http://communityhealth.phsa.ca/GetTheData>

³ VCH Childcare and Residential Care Facility - <https://inspections.vcha.ca/ChildCare/Table>

⁴ My Health My Community Health atlas - <https://myhealthmycommunity.org/explore-results/results-by-community/dashboard/>

2. Climate change is a health equity issue that has the potential to exacerbate existing social and health vulnerabilities. Those with the least resources will likely be impacted the most. For example, BCCDC states that "neighbourhood-level investments to mitigate climate change may instigate neighbourhood gentrification and lead to further marginalization of low-income residents who can no longer afford to live in the very neighbourhoods designed to support them."⁵ Communities can therefore be strengthened by articulating the potential health co-benefits and/or implications to vulnerable populations.
3. We encourage all participating municipalities to review and strengthen bylaws, policies, and strategies with standards that are equivalent to or higher than the Metro Vancouver Board's recently-approved Climate 2050 Strategic Framework⁶ for the purpose of building resilience in the communities.
4. We strongly recommend ongoing public education and engagement in communities throughout all phases of this project to raise their understanding of how their neighbourhood may be directly affected by the rising sea level now and in the future. The collaborative approach offers a great opportunity to generate support and to ensure transparency in an authentic, cross-cultural community engagement and the decision-making process.
5. Given the topography of the area, we recommend planners consider the population and infrastructure impacts associated with a trifecta of potentially simultaneously occurring issues, including: (1) sea level rise, (2) king tides and (3) run off from increased precipitation on the slopes and potential associated water quality contamination/turbidity and infrastructure damage/loss of power from flooding.

VCH looks forward to working with the strategic team throughout all phases in this project. If there are any further questions regarding the comments above, please contact me at mark.lysyshyn@vch.ca or 604-983-6701.

Sincerely,



Mark Lysyshyn, MD, MPH, FRCPC
Medical Health Officer
Vancouver Coastal Health, North Shore

⁵ BC Centre for Disease Control. (2017). Fact sheet: Supporting health equity through the built environment. Retrieved from http://www.bccdc.ca/resource-gallery/Documents/Educational%20Materials/EH/BCCDC_equity-fact-sheet_web.pdf

⁶ Climate 2050 Strategic Framework - http://www.metrovancouver.org/services/air-quality/AirQualityPublications/AQ_C2050-StrategicFramework.pdf

North Shore Sea Level Rise Strategy: Summary of Public Engagement on Draft Strategy

September 2020

Overview

An online survey was hosted on the District's webpage from September 1-22, 2020 (three weeks) to seek public input on the draft North Shore Sea Level Rise Strategy. The online survey was accompanied by summary information highlighting key aspects of the draft strategy, and a copy of the complete document. The initial public engagement on developing the Sea Level Rise Strategy was held in January-March 2020, and the September 2020 public engagement was a focused follow-up engagement.

Communication

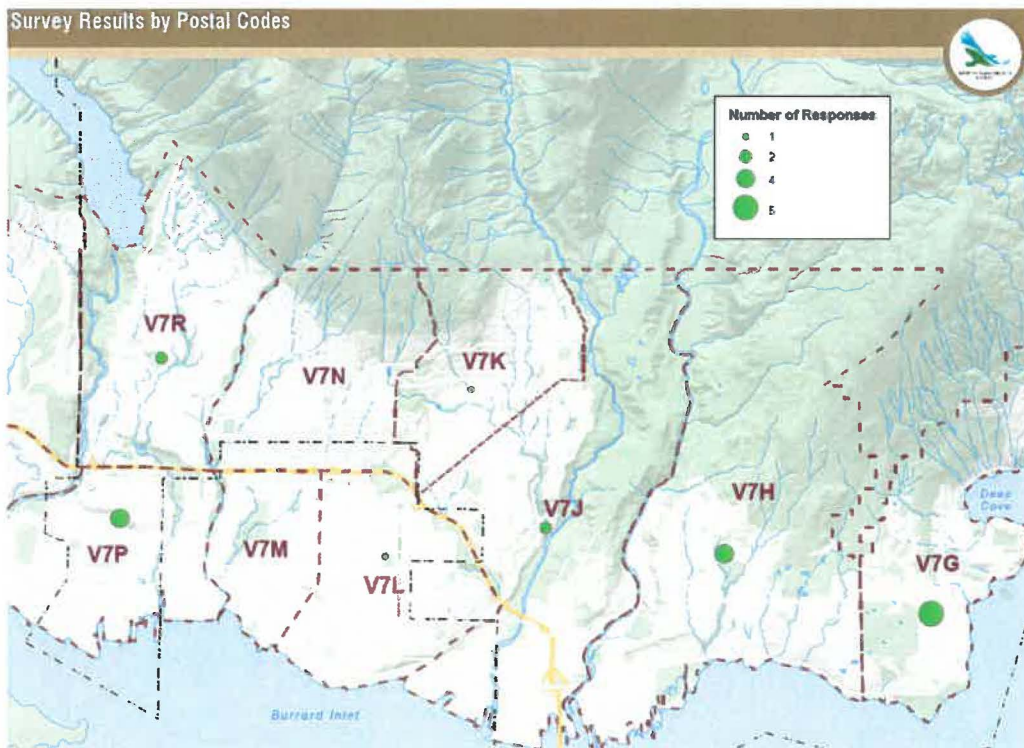
The District sent email notifications about the survey to participants from the community workshops held in February 2020, those who signed up for email notification and identified as District residents (each project partner is responsible for communicating with their respective communities), and key community partners and stakeholders (e.g. Metro Vancouver, infrastructure asset owners, Tsleil-Waututh Nation). The survey was also available online for any interested members of the public.

Survey questions and responses

1. Where do you live?

District of North Vancouver (19 of 19 respondents, 100%)

2. What are the first three letters of your postal code? Total respondents: 19.



3. Do you have comments about the key actions outlined in the draft strategy?

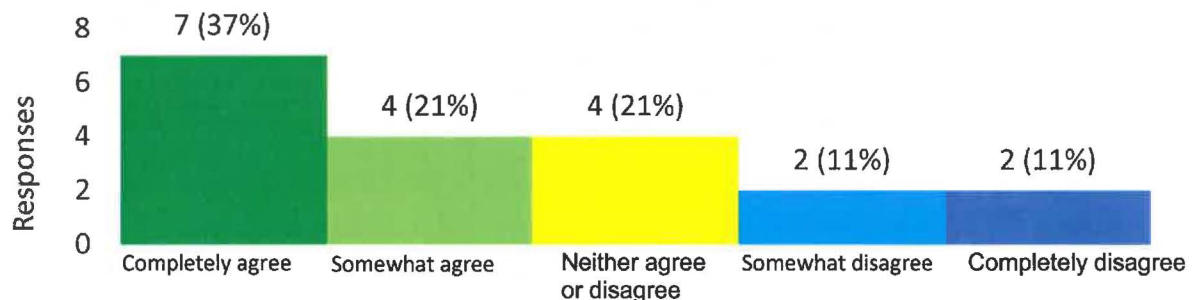
Total respondents: 14.

Response themes (open-ended question format; note that some respondents mentioned more than one theme):

- Support for the actions and continuing sea level rise adaption planning (3)
- Support for specific measures or actions:
 - nature-based adaptation measures (1)
 - avoid or accommodate approaches (1)
 - assess the feasibility of adaptation measures (1)
 - dikes in Maplewood (1)
 - tax large vehicle owners (1)
 - consider impacts of a large earthquake that will have larger consequences than sea level rise (1)
- Do not think much sea level rise will happen (2)
- Concern that lack of political will impede implementation (1)
- Concern about climate change and human impacts on the environment (1)
- Concern that long-term sea level rise projections are too far into future for planning today (1)
- Desire to be involved in future sea level rise planning (1)
- Concern some properties on Indian Arm currently experience flooding during storms (1)

4. Please respond to this statement: The draft strategy points us in the right direction to continue our work towards preparing our communities for sea level rise.

Total respondents: 19.



5. Do you have other comments about sea level rise adaptation or the draft strategy?

Total respondents: 13.

Response themes (open-ended question format; note that some respondents mentioned more than one theme):

- Support for sea level rise regulations for new and existing development (3)
- Support for more education and awareness about sea level rise (2)
- Comments on specific measures or actions:
 - Support for avoid or accommodate approaches (1)
 - Support for dikes in Maplewood (1)
 - Do not support dikes or building close to waterways (1)
- Do not think much sea level rise will happen, so do not think a strategy is needed (2)
- Suggestion to prioritize protection of natural environment as the most cost-effective long-term solution (1)
- Suggestion that impacts of a large earthquake that will have larger consequences than sea level rise (1)
- Suggestion to add a carbon cost on all projects (1)
- Ensure flexibility in adaptation measures (1)
- Concern about the long-term horizon of the sea level rise projections (1)
- Concern that larger changes are needed to prevent sea level rise from happening (1)
- Desire to be involved in future sea level rise planning (1)

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North Shore Sea Level Rise Risk Assessment & Adaptive Management Strategy

Draft Strategy Presentation

October 26, 2020
Council Workshop

North Shore Sea Level Rise Strategy

DISTRICT OF
NORTH
VANCOUVER

west vancouver

city
of north
vancouver



PORT of
vancouver



Skwxwú7mesh
Úxwumíxw
Squamish Nation

NS^{EM}

Grant Funding:



FEDERATION
OF CANADIAN
MUNICIPALITIES

Consultant:



KERR WOOD LEIDAL
consulting engineers



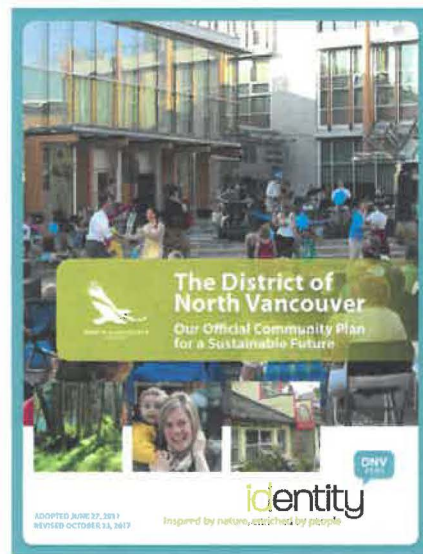
DISTRICT OF
NORTH
VANCOUVER

North Shore Sea Level Rise Strategy

Slide 2 of 12
DM 4537211

THE INFORMATION CONTAINED HEREIN IS UNCLASSIFIED

Policy Context

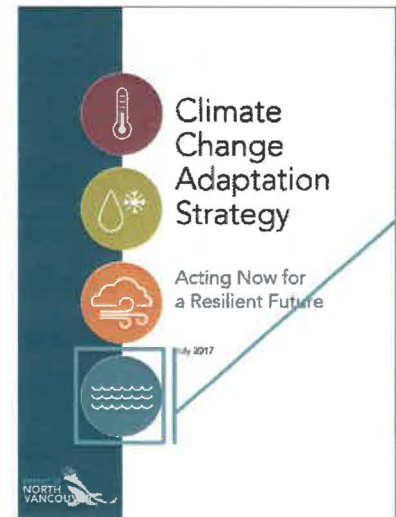


Official Community Plan

- Climate change objectives & policies

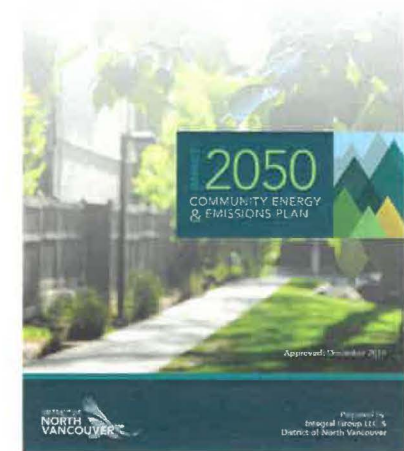
Adaptation

Mitigation



Climate Change Adaptation Strategy

Sea Level Rise



Community Energy and Emissions Plan



Sea Level Rise

Process

PHASE 1-3

Technical Analysis

SUMMER 2018 - SPRING 2019

- Review context
- Identify coastal flood hazards
- Assess vulnerability and risk



Norgate



Maplewood



Deep Cove

PHASE 4

Adaptation Actions Development

SUMMER 2019 - WINTER 2020

- Explore adaptation approaches
- Develop adaptation concepts and action areas

Public engagement:
exploring adaptation

PHASE 5

Final Strategy

2020

- Refine adaptation concepts and action areas
- Finalize strategy

Public engagement:
draft strategy

We are here



North Shore Sea Level Rise Strategy

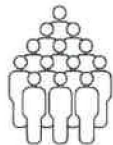
Slide 4 of 12
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North Shore Consequences

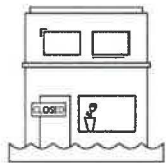
Without adaptation measures

1m

sea level rise



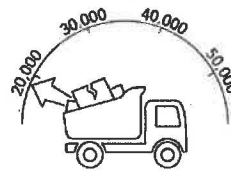
1,300+
residents could
EXPERIENCE
FLOODING



450+
businesses could
EXPERIENCE
FLOODING OR
POWER OUTAGE



~\$900
million
IN BUILDING
DAMAGE



~19,000
tonnes of
BUILDING
DAMAGE
DEBRIS



~80
hectares of
parkland
AT RISK OF
FLOODING

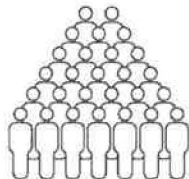


~40
Cultural and
heritage places
AT RISK OF
FLOODING

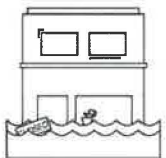
During major storm (10% annual probability), whole study area

2m

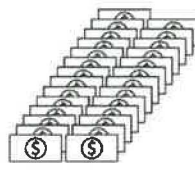
sea level rise



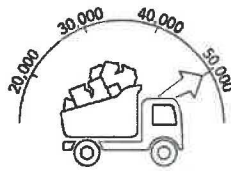
2,700+
residents could
EXPERIENCE
FLOODING



~1,900
businesses could
EXPERIENCE
FLOODING OR
POWER OUTAGE



~\$2.7
billion
IN BUILDING
DAMAGE



~50,000
tonnes of
BUILDING
DAMAGE
DEBRIS



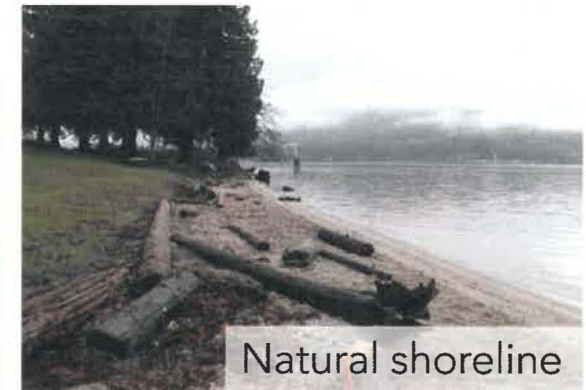
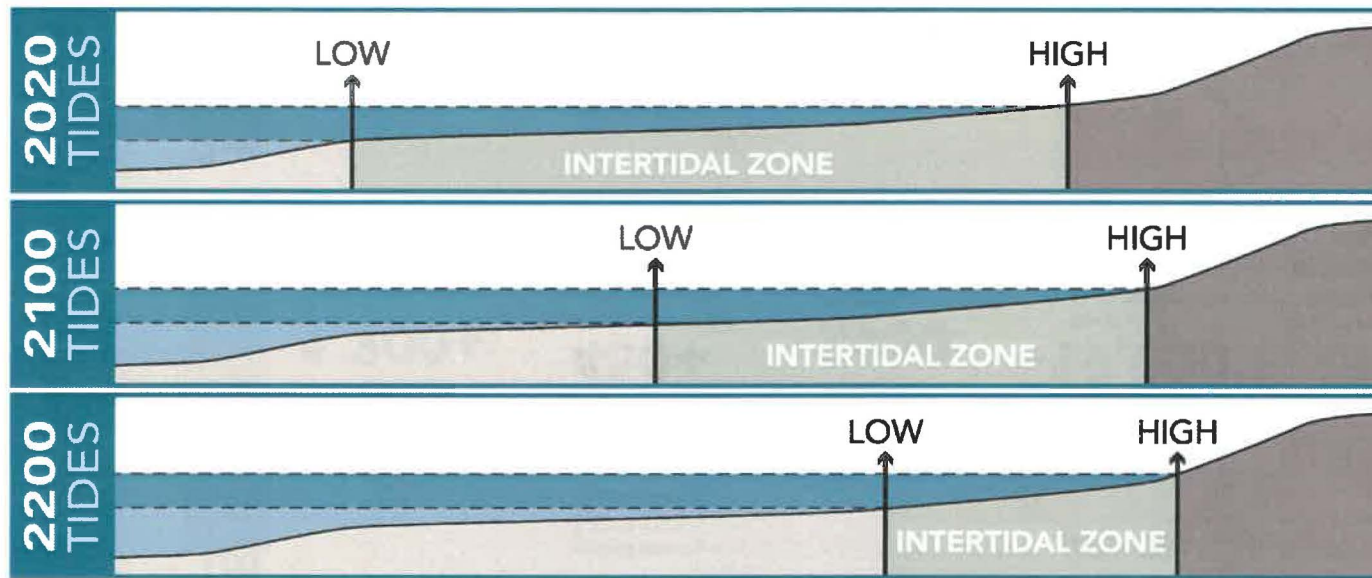
~105
hectares of
parkland
AT RISK OF
FLOODING



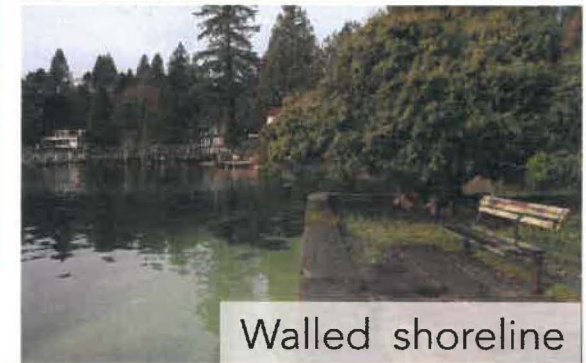
~50
Cultural and
heritage places
AT RISK OF
FLOODING

During extreme storm (0.5% annual probability), whole study area

Consequences: Intertidal Habitat



Natural shoreline



Walled shoreline

Adaptation Approaches

Likely a combination of approaches



North Shore Adaptation Measures Toolkit

- Toolkit tailored to North Shore context
- 26 adaptation measures



Adaptation Measures Toolkit Examples



Nature-based measures for waves & erosion



Storm water management



Land raising



Land reshaping



Building flood-proofing

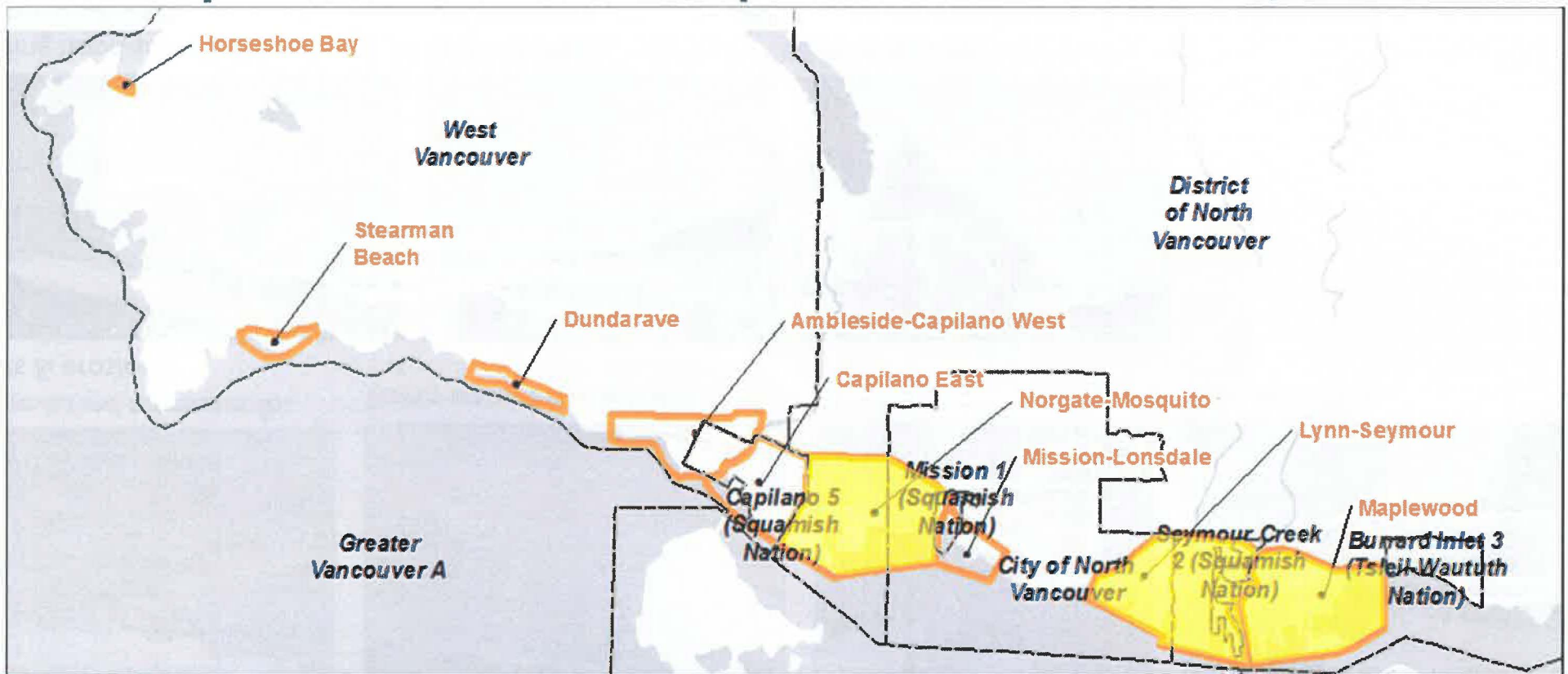


Setback dike



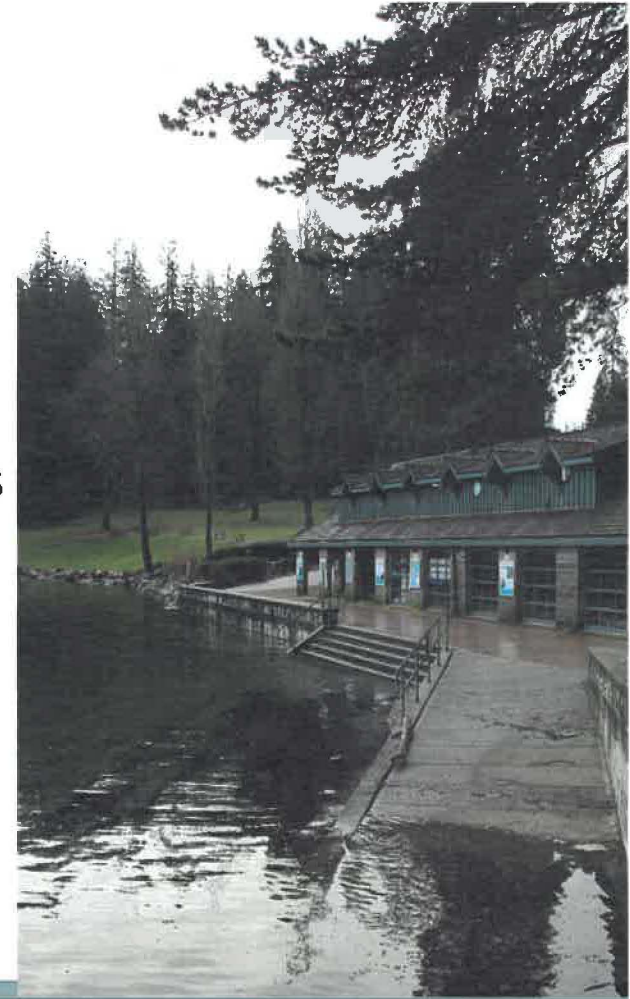
Pump stations

Comprehensive Adaptation Planning Zones



Implementation Actions

1. Continue North Shore sea level rise working group
2. Build knowledge and fill gaps
3. Create Comprehensive Adaptation Plans for 3 zones
Norgate, Lynn-Seymour, Maplewood
4. Update regulations & policies (e.g. coastal DPA)
5. Continue building public awareness
6. Coordinate with other governments



Next step

- Bring final strategy to Regular Meeting for Council consideration

