

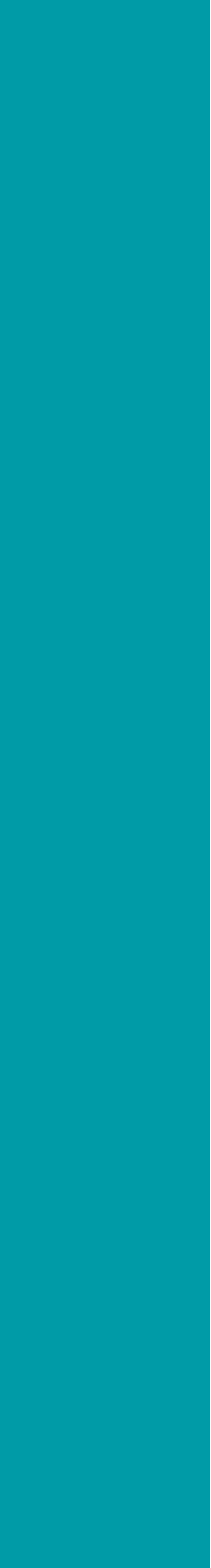


City of Vancouver

# COASTAL ADAPTATION

## False Creek

Final Report  
February 2021



In 30 years  
this will be the  
normal high tide.  
Twice a day.

Learn how sea level rise will impact  
False Creek and what we can do about it.

Visit [shapeyourcity.ca/sea2city](https://shapeyourcity.ca/sea2city)





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# Executive Summary

This report summarizes the outcomes of the City of Vancouver's Coastal Adaptation Plan for False Creek. The Coastal Adaptation Plan is a long-term planning effort to address sea level rise and coastal adaptation needs for the City of Vancouver.

The map shows Vancouver's coastal floodplain today and in 2100. Without flood management measures in place, areas in dark blue are vulnerable to flooding due to a major storm (1:500; 0.2 % AEP event) today, and areas in light blue are vulnerable to flooding due to a major storm and 1 metre of sea level rise by 2100.

The first phase of Coastal Adaptation Plan was completed in 2018 along Vancouver's Fraser River foreshore. The Fraser River Foreshore is the most at risk area of the city to coastal flooding today. The 2018 project engaged almost 1,400 residents, business owners, and other stakeholders to identify community values to be addressed when developing flood management approaches for the area; sought input on high-level adaptation approaches; and developed design and planning principles to use when developing future flood management options for the Fraser River. The project included a separate collaboration and engagement component with Musqueam Indian Band.

The False Creek Coastal Adaptation Plan was carried out between January and December 2020. It was informed by the Fraser River project and incorporated lessons learned from that phase of work. The objectives of the False Creek project were to:

- Build awareness of sea level rise and coastal flooding risks for False Creek.

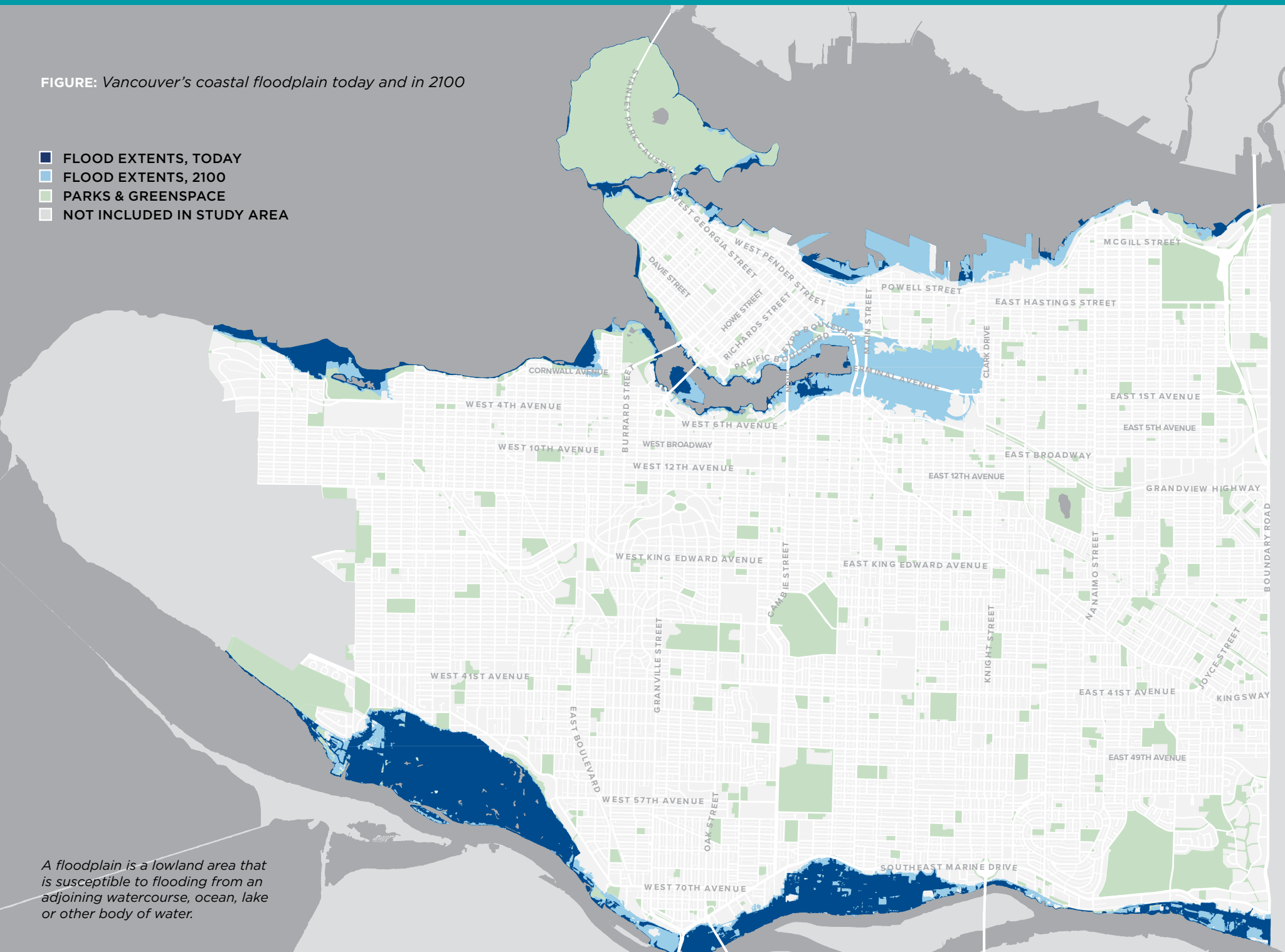
- Identify and confirm community values to help guide future work.
- Explore potential adaptation approaches to look at in more detail during the next phase of work.
- Introduce the next phase of the Coastal Adaptation Plan, the Sea2City Design Challenge.

The project involved over 2,000 residents, youth, business owners, and other stakeholders in a two-round engagement program.

In the spring of 2020, a False Creek asset owners' workshop was hosted online bringing together asset owners and utility operators with infrastructure or other interests in the False Creek floodplain. In the first round of public engagement in summer 2020, participants reviewed and refined the set of community values that were first identified during the Fraser River Coastal Adaptation Plan in 2018. Seven high-level values were presented to community members through a series of online engagement sessions and a citywide survey. Due to the COVID-19 global pandemic, all engagement was shifted online and supported by a creative communications program that included signage in and around False Creek, a social media program, a False Creek activity book about sea level rise, and an educational video series called Conversations in Canoes.

FIGURE: Vancouver's coastal floodplain today and in 2100

- FLOOD EXTENTS, TODAY
- FLOOD EXTENTS, 2100
- PARKS & GREENSPACE
- NOT INCLUDED IN STUDY AREA



A floodplain is a lowland area that is susceptible to flooding from an adjoining watercourse, ocean, lake or other body of water.



In late fall 2020, a second round of public engagement and activities focused on continuing to build awareness about sea level rise and coastal flooding risks for False Creek. The community values that were identified in the first round of engagement were reviewed and confirmed by members of the public. The general coastal flooding adaptation approaches that will be the focus of future phases of the Coastal Adaptation Plan were introduced and their relevance and fit for the False Creek context were discussed.

Both rounds of engagement introduced participants to the next phase of the Coastal Adaptation Plan to be undertaken by the City, the Sea2City Design Challenge. Starting in late 2021, the Sea2City Design Challenge will be a collaborative and participatory planning and design challenge engaging multidisciplinary teams to work co-operatively with the City of Vancouver and project partners to further expand the City's toolbox of coastal flood management approaches. Incorporating the community values, planning and design principles identified in the Coastal Adaptation Plan, the Sea2City Design Challenge will create a vision to guide urban development and ecological revitalization in False Creek.

False Creek is a bustling, urban, mixed-use waterfront area that is one of Vancouver's major destinations for residents and visitors alike. Historically one of Vancouver's major industrial centres, the last few decades have seen the area transition into the social and recreational heart of Vancouver, featuring a variety of higher density housing, commercial areas, and parks that are used by many for living, working, recreation, and marine activities.

The False Creek floodplain area encompasses numerous, diverse neighbourhoods. False Creek North includes portions of Northeast False Creek, Yaletown, and Chinatown. False Creek South passes through Fairview, South East False Creek, Olympic Village, and False Creek Flats along the south shore. False Creek North and South both include sizeable parcels of yet-to-be developed land. Managed by the Canada Mortgage and Housing Corporation, Granville Island is one of the most flood-vulnerable areas in False Creek. In addition, False Creek is also home to critical infrastructure that many Vancouverites rely on, including water, wastewater, electrical, and communications and transportation systems.

**FIGURE:** False Creek Flood Plain



## Engagement Summary

*The City of Vancouver launched the False Creek Coastal Adaptation Plan in the spring of 2020. Using a participatory, values-based approach, the project involved over 2,000 residents, business owners, and other stakeholders in a two-round engagement program over a six-month period. Due to the COVID-19 global pandemic, all engagement was shifted online. The first round of community and partner engagement events took place in the summer and early fall. The second round of community and partner engagement events took place in November. Engagement and communications included the following activities.*

- **Asset Owners Workshop:** A workshop was held with asset owners and utility operators on coastal flooding, sea level rise, and asset vulnerability in the False Creek floodplain. Due to the COVID-19 pandemic, the three-hour workshop was held virtually using the Zoom videoconference platform. Approximately 42 asset owners, operators, and City of Vancouver staff participated. Asset owners and operators included Fortis, BC Hydro, Telus, TransLink, the Department of Fisheries and Oceans (DFO), the Ministry of Forests Lands Natural Resource Operations and Rural Development (FLNROD), Port of Vancouver, False Creek Harbour Authority, CMHC-Granville Island, Metro Vancouver, and the City of Vancouver (Engineering, Park Board, Planning, Real Estate and Facility Management, and Sustainability). The workshop identified a number of important assets in the study area, including potential lifeline infrastructure whose damage or failure would likely pose a direct threat to public safety and wellbeing along with potential for injuries and death. These critical assets included the South East False Creek Neighbourhood Energy Utility (NEU) and associated service building infrastructure, sewer and stormwater infrastructure, and major City of Vancouver facilities (Engineering Emergency Operations Centre, Vancouver Fire and Rescue Services Training Centre, National Works Yard, and Evans Yard).
- **Community Conversations – Round 1:** The first round of False Creek Community Conversations was hosted online during September and October. A total of 11 webinar-style Community Conversations were held with 145 participants. Session objectives included:
  - *Building awareness of sea level rise and coastal flooding risks for False Creek.*
  - *Exploring and discussing community values for False Creek - what matters?*
  - *Learning about future project phases and engagement opportunities.*Using the Zoom video conferencing platform and the online polling platform Mentimeter, the sessions included facilitated group discussions and instant polling questions (multiple choice, short answer, ranking, and points assignment). Engagement took place with a range of stakeholders from around False Creek and Vancouver. Invitations for Community Conversations were sent out to various community and stakeholder groups including residents' associations, strata councils, recreation groups, community centres, youth-focused organizations, and arts and culture organizations. For background and context, staff also interviewed staff leads from major City projects (e.g., North East False Creek Plan, On Water, Broadway Plan, Vancouver Plan, East Park Plan, False Creek South Plan) to ensure that the community group list was complete. Participants could also register online through an EventBrite page which was widely advertised through City social media, on the City's Shape Your City project web page, and through a creative temporary signage program that was installed around False Creek.





- **Community Survey:** A citywide online survey was conducted during the first round of community engagement. The survey was administered through the City of Vancouver’s Talk Vancouver survey platform. It was launched at the beginning of August and closed on October 6th, 2020. The survey was taken by 1,618 respondents. Open-ended questions were analyzed using NVivo, a qualitative data analysis (QDA) software tool designed to help qualitative researchers organize, analyze, and find insights in unstructured or qualitative data like open-ended survey responses.
- **Youth Engagement:** With the recognition that youth will be some of the most impacted by sea level rise and coastal flooding in Vancouver, a concerted effort was made to engage younger people in the False Creek Coastal Adaptation Plan. As part of this commitment, the City partnered and collaborated with CityHive, a youth-led organization whose mission is to transform the way young people shape their cities and the civic processes that engage them. The CityHive team reviewed the False Creek Coastal Adaptation Plan Engagement Framework with a youth and young adult engagement lens and identified four engagement activities for their organization to lead. This included hosting three youth and young adult focused Community Conversation digital workshops (attended by 70 youth and young adults) that centred Indigenous and youth voices. In collaboration with the City and EcoPlan, CityHive created an activity guide for younger teens and children that was distributed online and in the community via parent volunteers. CityHive also supported project communications through their social media channels. The City also hosted three workshops with the University of British Columbia (Ocean Leaders Program, Forestry, Hydrotechnical Engineering and Environmental Fluid Mechanics), one with Arts Umbrella and one with Langara College. Approximately 175 students and professors total attended the four sessions.

- Indigenous Engagement and Communication:** Thousands of years before European settlement, x<sup>w</sup>məθk<sup>w</sup>əyəm (Musqueam), Skw<sup>x</sup>wú7mesh (Squamish), and səilwətaɫ (Tsleil-Waututh) villages and settlements dotted the shorelines, with trade and travelers using the waterways as highways to travel great distances. Each Nation had, and continues to have, its own relationship to the area, including place names and uses for the lands and resources. False Creek, in particular, was of significant importance to the Nations, as a hunting, fishing, and gathering area. Squamish has reserve lands and the planned Señákw development site in False Creek around the west end of Burrard Bridge. City staff-initiated engagement with the three Nations through existing City channels and protocols in September 2019. A Memorandum of Understanding was signed with Musqueam (who also participated in the 2018 Coastal Adaptation Plan – Fraser River Foreshore project) in 2020 to support communications and ongoing awareness building with their members on coastal flooding and sea level rise risks.
- Granville Island Consultation:** Within False Creek, Granville Island is one of the most flood-vulnerable areas. Managed by the Canada Mortgage and Housing Corporation, Granville Island features a mix of uses. Its 300 plus businesses, including a Public Market, and lively arts, culture, and culinary scene make it one of Vancouver’s most popular tourist destinations. It is also the site of a community centre, commercial, industrial, and office spaces, float homes, and a marina. As a federally managed site, Granville Island is a unique, but critically important site in False Creek. Outreach with Granville Island included staff participation in the Asset Owners Workshop, a special Community Conversation for their larger staff team, and a presentation to the Granville Island Council, the Island’s administrative board.
- Real Estate and Facilities Management Workshop:** A one-and-a-half-hour workshop was held with senior City staff from Real Estate and Facilities Management. The workshop focused on reviewing the results of the Asset

Owners Workshop, in particular City asset vulnerabilities and adaptation approaches. The workshop included reviewing a large undeveloped property between Olympic Village and the Cambie Bridge. The workshop presented the final outcomes of project public engagement and provided staff the opportunity to work through project materials themselves as part of a high-level gap analysis.

Efforts were also made to build relationships with Black residents, people of colour, and community groups to support their work and the project. With guidance from others, the project team reached out to the Hua Foundation, Hogan’s Alley Society, and the Chinatown Legacy Stewardship Group to enquire about opportunities for collaboration. Due to the COVID-19 global pandemic, these organizations were unable to participate in the project but communicated interest in future phases sea level rise and adaptation work.





## Other Outreach and Communications

The City of Vancouver supported community outreach and engagement with the following communications pieces:

- **Shape Your City False Creek:** A project page was established on the City's Shape Your City engagement portal. The page included a project overview, links to presentations and project materials, and opportunities to provide direct feedback, including place-based feedback via a map tool and idea brainstorm tool.
- **Conversations in Canoes:** Four short, entertaining, and educational videos were created to support communications and digital outreach. One "sea level rise 101" introductory video was produced along with three videos that featured interviews about sea level rise and coastal flooding with people who live, work, and play in False Creek, including a commercial diver working out of Granville Island, a marine biologist, and a high school student who is a member of the Vancouver-based Sustainabiliteens organization. Together the four videos have attracted over 1,400 views.
- **False Creek Activity Book:** An activity book for younger youth and children was created for distribution to parents and through schools. A collaboration with CityHive, the activity book helped to provide important information on what younger people and children like about False Creek to the project team. Approximately, 200 workbooks were downloaded from the Shape Your City project website and 70 paper copies were distributed directly.



## ENGAGEMENT IN THE TIME OF COVID-19

The original Engagement Plan for False Creek Coastal Adaptation included two rounds of in-person, high-touch workshops, staffed pop-events around False Creek timed to coincide with major events (e.g., Dragon Boat Festival, Canada Day, Bike to Work Week), and in-person focus groups.

With the declaration of the global pandemic on March 11, 2020 and the Province and Vancouver's health orders starting the following week, the original Engagement Plan was suspended, and a reworked approach developed.

The reworked approach shifted all engagement online with in-person workshop reimagined as digital Community Conversations. Recognizing the increased use of False Creek's parks and Seawall, the project team developed two rounds of temporary signs designed to take advantage of the increased numbers of people visiting and recreating along False Creek.

The shift to online engagement also allowed the project team to incorporate a range of interactive elements and software platforms. This included the use of Zoom video conferencing and webinar tools which allowed for participants to also use facilitated break-out rooms for larger events. The team also used Google Maps for group mapping activities, Mentimeter for instant smart phone polling questions (multiple choice, short answer, ranking, points assignment), and Mural, a digital workspace for visual collaboration, for participants to provide feedback on general coastal flooding adaptation options (i.e., resist, accommodate, move/avoid).

Feedback from Community Conversation participants on the content and tools used was consistently positive through both rounds of engagement. It also clearly highlighted both strong community interest in the critical issue and an appetite to dig deeper into the topic in future phases of work.

- **Coastal Adaptation Plan Signage Program:** Two rounds of unique, eye-catching lawn signs were developed and installed around False Creek in two separate rounds. The signs were placed at approximate future (2050) high tide water lines around False Creek. The first round of signs featured a simple rubber boot with the message, "In 30 years you might be standing in False Creek." The signs invited people to learn more about the project and included a QR code and web link. The second round of signs went out during the November king tide season and included one of two pictures of False Creek king tide events from 2019. The message on this round of signs was, "In 30 years this will be the normal high tide. Twice a day." As with the first round, the signs invited people to learn more about the project and included a QR code and web link.
- **Social Media Program:** The City of Vancouver's social media team supported a broad-based social media program that included project posts, promotions, and communications through the Greenest City Twitter and Instagram channels.

Several earned media events also took place, including CBC radio morning and afternoon shows. Vancouver is Awesome had a short article on the Activity Guides and the project's social media. The City of Vancouver's Greenest City social media channels were also used to promote project events.



## Community Values

*Community values represent the concerns and issues that residents and other stakeholders care about most. As a values-based planning program, the Coastal Adaptation Plan will develop clear measures for identified values and use them along with more technical engineering criteria in future project phases to evaluate coastal adaptation management options. These will be used to answer how options respond to community values and how options could be improved to better incorporate these values.*

The evaluation will be used by the landscape architects, engineers, city planners, and others who design the specific place-based coastal adaptation options, but also used in future project engagement and communications to help illustrate how well options meet (or do not meet) community values. This use of community values in the evaluation of adaptation options will help ensure that the potential flood options incorporate community concerns. They will also help ensure program transparency which will support future conversations around potential trade-offs within and between community values.

The first round of False Creek community engagement (Community Conversations, Talk Vancouver community survey) presented the seven community values that were identified as part of the 2018 Fraser River Coastal Adaptation Plan. These values were identified during community workshops and then organized into seven thematic categories with related sub-concerns that were confirmed, validated, and prioritized through community open houses and a citywide Talk Vancouver survey.

False Creek Coastal Adaptation participants confirmed the applicability of the community values for False Creek and identified specific gaps, themes, and priorities for the False Creek floodplain area. While the community values are presented as separate categories for discussion and evaluation purposes, it is acknowledged that there is considerable connection and reinforcement between them. The refined False Creek community values are presented below in general order of priority and importance based on community feedback.





## **Communities, People, and Homes**

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Communities, People, and Homes was ranked as the highest priority value in Community Conversations and the Talk Vancouver survey.

Over 38,000 people live in the area around False Creek in a variety of housing types. There are tight knit and unique residential communities living on and around False Creek, including long-running housing co-ops in South False Creek, live-aboard boats, and unique houseboat communities. Based on feedback and participant discussions, the value was changed from “Communities and People” to “Communities, People, and Homes” to reflect the importance, quantity, and diversity of housing in the False Creek area. Common discussion points around this value included:

- Worries over maintaining the existing stock of affordable housing in the area, often highlighted in tandem with Vancouver’s ongoing housing and affordability issues.
- Concerns over the impact of sea level rise on existing housing, and on the ability to create new housing options within the floodplain.
- Damage to existing housing and property, negative impacts to property values, impacts to insurance rates, the costs of preparation and repair on housing owners, and costs to strata corporations.
- Apprehension over the displacement of people and potential relocation, both from the impacts of coastal flooding and potential future adaptation actions.
- Equity concerns over how adaptation efforts might be steered by powerful interest groups, and how they might impact marginalized or equity seeking groups.



## **Health and Safety**

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Health and safety includes the possible direct impacts of a flood event on the health, safety, and wellbeing of people in the area, and the impact of sea level rise on lifeline infrastructure such health facilities, police and fire services, and water, sewer, and power services and infrastructure. These impacts range from the immediate physical safety of people during a flood event, to the longer-term mental health and wellbeing impacts of recurring flooding or the implementation of flood adaptation options. Common discussion points around health and safety values included:

- Concerns over the possibility of injury or death during a flooding event.
- Questions about the potential loss of access for emergency services during a flood event.
- Concerns around the wisdom of locating people, homes and services in a floodplain.
- Concerns about the impact of coastal flood-related water pollution and contamination on health and safety.
- Concerns over disruptions to lifeline infrastructure and services (power, water, roads, and communications).
- Concerns over the location of St. Paul’s Hospital within the floodplain, and questions as to how it is being designed to handle sea level rise.
- Expression of the need for seismically resilient adaptation options.
- Concerns over the impact of flood adaption options on mental wellbeing (potential loss of views, access, and connection to nature).



## Infrastructure and Transportation

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Significant infrastructure and transportation facilities and networks are spread throughout the False Creek floodplain area. These include major energy facilities such as the False Creek Energy Centre which provides heat to the Olympic Village area and a growing number of buildings in the False Creek Flats area. It also includes telecommunications infrastructure, Metro Vancouver and City of Vancouver water, wastewater and green infrastructure assets, major SkyTrain stations and sections of both the Canada Line and Expo Line, and transportation arteries, including roads, bridges, bike paths, and the False Creek Seawall. Common discussion points around infrastructure and transportation values included:

- Concerns around damage to infrastructure, including possible impacts to local schools and childcare facilities such as False Creek Elementary School, disruption to municipal service delivery, and damage to valuable and important City infrastructure.
- Potential for damage to the Seawall and the loss of access to the walking and biking routes.
- Concerns over the loss of services during and after a flood event (power, heat, gas, communications).
- Worry over the loss of bike routes, sky train flooding, loss of transportation options, and concern that car infrastructure would be prioritized over other forms of transport in adaptation options.
- Concerns around the siting of the St. Paul's Hospital, including long-term potential for damage from flooding and loss of access during a flood event.



## Environment

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The marine and terrestrial environment in and around False Creek has undergone profound change over the past 150 years. The area transformed from a productive intertidal area surrounded by old-growth forests and fed by salmon bearing streams to a heavily polluted industrial waterbody with no remaining areas of natural shoreline. The area has undergone further transformation from its heyday as an industrial area less than 60 years ago. Water quality is slowly improving, areas of the shoreline are being restored, and life is returning to the water and intertidal areas. While it remains a predominantly urban waterway, False Creek is widely seen and appreciated as an urban refuge and its environmental features are highly valued by residents and stakeholders. Common discussion points around environmental values included:

- Concerns over the loss of biodiversity, loss of habitat, water pollution and the spread of toxins, damage to ocean ecosystems, impacts to marine life, impacts to birds, and potential changes to False Creek because of flood mitigation measures.
- Preservation of existing shoreline ecosystems and habitat.
- Opportunities to expand and enhance the ecological value of the shoreline through shoreline “softening” and green shores approaches.
- Apprehension around the presence of contaminated soils and the effects that flooding would have on water quality and ecosystems within False Creek and the Salish Sea.
- Desire to protect and enhance highly valuable seabird habitat and marine life.



## Local and Regional Economy

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The False Creek floodplain is a significant component of Vancouver's local economy. Many small and medium sized enterprises are located within the area, alongside hundreds of industrial properties, including a growing number of high tech and knowledge-based companies. The current valuation of the property within the area is \$19 billion (2019 BC Assessment). Property tax revenue from the False Creek area is important to the City budget, and there are significant sites within the area that have yet to be developed. False Creek, including Granville Island, Science World, BC Place, Rogers Arena and Chinatown, is a major tourism destination. False Creek also sits directly between the two largest employment centers in the province (Downtown Vancouver and the Broadway Corridor) and provides the backdrop for a significant amount of economic activity. Common discussion points around local and regional economy values included:

- Concerns over the overall cost of adaption, effects of businesses, damages to businesses, impact on the City's finances, and the economic consequences of serious flooding.
- Concerns for a number of unique small businesses around False Creek that are exposed to current flood risks, including on Granville Island and in Leg and Boot Square.
- Appreciation for the many community serving functions of Granville Island and its critical role in maintaining food availability throughout the pandemic.
- Concerns about the total economic impact of flooding in False Creek including the impact to the City's budget.
- Concerns around flooding in False Creek Flats and the potential impacts to industrial lands.



## Arts, Culture, and Heritage

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False Creek is an area with significant cultural and heritage value. Before the area became known as False Creek, it was called Seńákw and was used by the Musqueam, Squamish, and Tsleil-Waututh people since time out of mind. Their presence on the land continues today. False Creek is also home to a range of arts venues and theatres, public art, art education and production venues, community cultural spaces, and historically meaningful sites. Many of these venues are clustered on Granville Island, which is both one of the most at-risk areas from a major flood event today and outside of the City's management authority as a federally managed area. Portions of Chinatown and the Hogan's Alley communities are within the False Creek area and are neighborhoods of significant cultural value. Common discussion points around arts, culture, and heritage included the following:

- The history and presence of Musqueam, Squamish, and Tsleil-Waututh in and around False Creek is highly valued but could be better shared and celebrated.
- False Creek, and Granville Island in particular, are important sites for Vancouver's arts and culture community.
- Desire to see design elements from the local Indigenous peoples incorporated into any future coastal flood adaptation works.
- Desire to see public art incorporated into any future coastal flood adaptation works.



## Recreation

False Creek functions as major recreational centre for many Vancouver residents and visitors alike with its network of parks and public spaces along the Seawall. Playing fields, tennis and basketball courts, dog parks, playgrounds, plazas, and natural areas provide areas for sport, recreation, play, and relaxation. The Seawall is used by many for walking, running, rolling, and cycling. Rowing and paddling occur on the still waters of False Creek itself, and False Creek provides a gateway for boaters to access the Salish Sea. Common discussion points around recreation included the following:

- Concerns around potential flood damage to recreation facilities, parks, and the False Creek Seawall.
- Concerns around access to the Seawall during flood events and from flood-related repairs.
- Worries over the long-term viability of the Seawall, particularly if dikes are built around False Creek that do not incorporate walking and rolling paths.
- Future potential loss of outdoor space from possible adaption options that could limit or reduce the size of dog parks and other recreation facilities.
- Concerns around the loss of green space as a place for residents to relax, reflect, and feel part of nature.



## Coastal Adaptation in Context

The two rounds of Community Conversations and the Talk Vancouver survey also asked participants two important questions about coastal flooding and sea level rise to help frame the community values conversation. First, participants were asked about the relative importance of preparing for coastal flooding in Vancouver compared to other issues that the City is facing. Participants were then asked if they believed that the risk of flooding in Vancouver will change over the next 30 years. The results and discussion from these questions and the approximately 2,000 people who answered them provide compelling context for future coastal adaptation planning in the City.

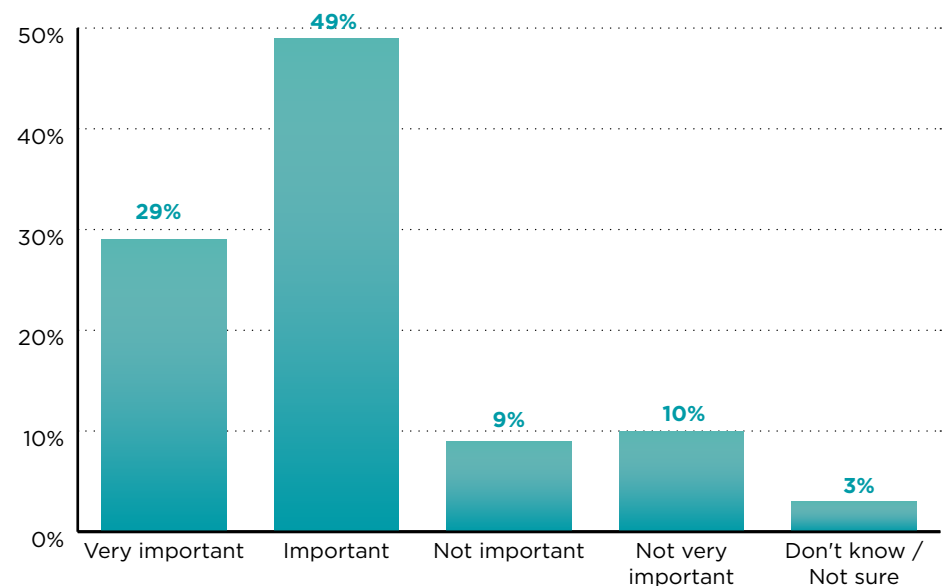
While acknowledging the importance of other major issues the City is facing, including housing affordability, the ongoing fentanyl crisis, and COVID-19 recovery, the majority of participants (>78% of Talk Vancouver respondents and 90% of Community Conversation participants) felt that preparing for coastal flooding over the next five years is important or very important as compared to other issues the City of Vancouver is facing. In both the Community Conversations and Talk Vancouver survey, participants emphasized the importance of starting to plan and take early actions in the near-term to begin a phased and ongoing mitigation and adaptation program.

Respondents also acknowledged that there will be both anticipated and unpredictable or unanticipated consequences for all residents and that it is better to be proactive than reactive to these challenges.

***“Climate change is a real thing, and it’s clear that our environment is shifting. We need to be making preparations for rising sea levels and erratic weather.”***

Talk Vancouver survey respondent

**FIGURE:** Compared to other issues the City of Vancouver is facing, how important do you think it is for us to be preparing for coastal flooding in the next five years? (Talk Vancouver)



***“We are a city on the coast. It is inevitable that water levels are rising, and we need to be prepared.”***

Talk Vancouver survey respondent

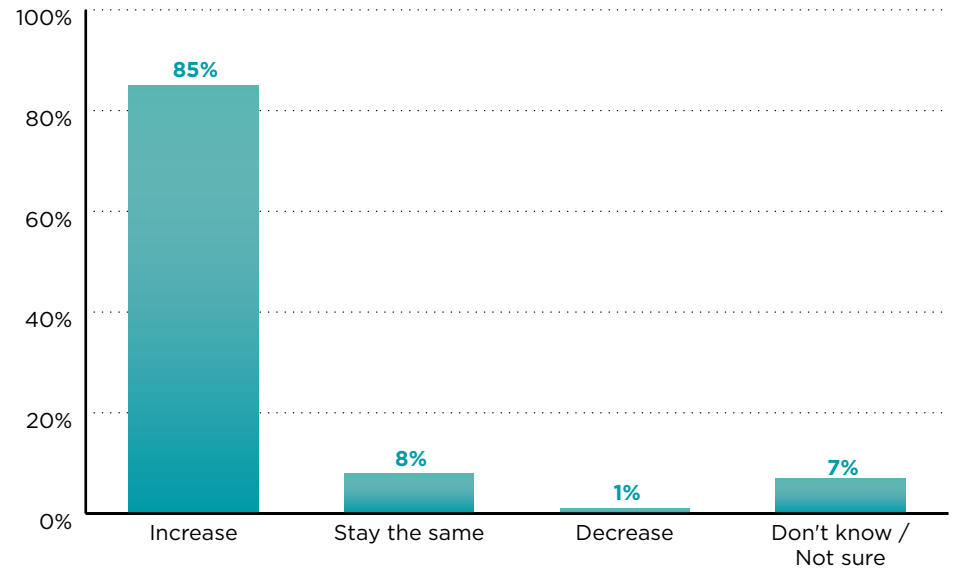
When asked about how the risk of flooding in Vancouver will change over the next 30 years, over 85% of the 1,600+ Talk Vancouver survey respondents and Community Conversation participants thought it would increase. Most indicated that they understand that climate change is worsening and will bring many changes to Vancouver including sea level rise. Overall, respondents thought coastal flooding from sea level rise will increase over the next 30 years because climate change is accelerating global heating and melting ice, which increases the risk of flooding.

For the Talk Vancouver survey, respondents relied on science for this information (e.g., research and projections about climate change), personal observations (sea level rise, higher king tides, and increased storms), and public awareness campaigns (including the sea level rise public art project under the Cambie Street bridge). Many respondents did not think that substantial actions were being taken to address climate change (e.g., mitigate carbon emissions internationally) and did not anticipate conditions would improve. Community Conversation participants and Talk Vancouver survey respondents noted that as sea levels rise and storms increase over time, the possibility of flooding would also likely increase.

***“Climate Change - sea levels are rising, and storms are becoming more frequent and more severe. Thus, the odds of having a bad flooding event increase every year.”***

- Talk Vancouver survey respondent

**FIGURE:** How do you believe that the risk of flooding in Vancouver will change over the next 30 years? (Talk Vancouver)



***“We’ve already seen flooding from “king tides” along the sea wall at our current levels, this will only get worse seasonally and annually as sea level rise occurs worldwide.”***

- Talk Vancouver survey respondent

## Planning Principles

*The following planning principles were developed to support internal City planning and future project work, including the Sea2City Design Challenge. They were reviewed by City project staff, but not presented to the public. They are not presented in any hierarchy.*

- **Plan for integration:** Integrate the flood management strategy with relevant and concurrent citywide plans (e.g., Vancouver Plan, Climate Emergency Action Plan, RainCity Strategy).
  - Coordinate and collaborate with Vancouver Plan engagement and leverage potential opportunities for broader community engagement to inform people about the sea level rise and coastal flooding in False Creek.
  - Integrate and coordinate with the Northeast False Creek Local Area Plan, and the Northeast False Creek park and East Park design processes.
  - Integrate and coordinate with On Water - Vancouver's Non-motorized Watercraft Strategy and Van Play - Vancouver's Parks and Recreation Services Master Plan.
  - Integrate Engineering Design Reference for Shoreline Flood Protection and NEFC Shoreline Flood Protection Performance Criteria.
  - Coordinate with Charleson Park Water and Stormwater Upgrades (2021 to 2023).
  - Coordinate work with upcoming Sewer and Rainwater Master Plan initiative, particularly work involving the False Creek receiving waters.
  - Coordinate Coastal Adaption Plan work with City development planning processes occurring through Real Estate and Facilities Management and the Property Endowment Fund.

- **Plan for coordination:** Coordinate planning with other organizations, agencies, and asset owners manage lands, water, and assets in False Creek. Where required, provide direction and input on necessary policy amendments (e.g., zoning changes, development review).
  - Coordinate with provincial and federal regulators and asset owners including Ministry of Environment; Ministry of Forests, Lands, Natural Resource Operations, and Rural Development; Fisheries and Oceans Canada; Environment and Climate Change Canada.
  - Coordinate planning with Granville Island
  - Share information and maintain coordination with asset owners on vulnerability assessments and adaptation actions
  - Incorporate Fraser Basin Council's Seismic Guidelines for Dikes (professional practice guidelines to improve the seismic resilience of Lower Mainland dikes) when completed.
  - Coordinate with major developers, including Plaza, NEFC, Seḥákw and MST Development Corporation.

● **Plan for reconciliation:** Ongoing coordination, collaboration, and engagement with Musqueam, Squamish, and Tsleil-Waututh Nations is critical given their interests and rights in False Creek, and, for Squamish, the emerging Seṇákw development. Incorporate City of Reconciliation policy, protocols, and procedures to engage Indigenous partners and collaborators.

- Specifically address Squamish, Musqueam, and Tsleil-Waututh values, and any cultural/archeological sites in False Creek.
- Support cultural programming and interpretative signage along False Creek.
- Integrate and coordinate flood management approaches in Seṇákw with broader False Creek adaptation approaches.
- Coordinate and support flood resiliency measures for Seṇákw.

● **Plan for transparency (education):** Flood management approaches should include educational and awareness building components that openly communicate flood risks facing the area, as well as the City's decision-making and management processes.

- Engage residents, businesses, stakeholders, and collaborators throughout the design and decision-making process of developing flood management strategies.
- Communicate that absolute protection is not feasible and that we should plan for safe-to-fail flood management approaches.
- Improve awareness of flood risk, sea level rise, and climate change through educational signage and interpretive features.
- Openly communicate flood risk to decision makers, asset owners, and the public.

● **Plan for Equity:** Ensure that future sea level rise planning and implementation integrates equity into project processes (how we engage, and with whom) and outcomes (what is prioritized). Equity should be supported towards the promotion of justice and fairness and the removal of systemic barriers that may cause or aggravate disparities experienced by equity-seeking groups.

- Apply an equity lens to future project communications (digital equity, translation of materials, accessibility) and engagement (honorariums to support participation, targeted outreach, youth-specific methods, etc.).
- Engage equity focused City Advisory Groups including the Urban Indigenous Peoples Advisory Group; Racial and Ethno-Cultural Equity Advisory Committee; Persons with Disabilities Advisory Committee; 2SLGBTQ+ Advisory Committee; Children, Youth and Families Advisory Committee; Seniors' Advisory Committee; and Trans, Gender Diverse and Two-Spirit Inclusion Advisory Committee; Hogan's Alley Society; Chinatown Stewardship Legacy Group; Urban Design Panel.

● **Plan for cost-sharing:** Work with all levels of government, asset holders, and other stakeholders to implement short-, medium-, and long-term flood control infrastructure measures and maintenance efforts.

- Pursue funding strategies based on value and equity.
- Take advantage of opportunities that arise through infrastructure lifecycles and land redevelopment.
- Demonstrate public benefits beyond the protection of private land for publicly funded flood management projects.
- Prioritize and phase solutions to obtain the best value for money.



## Design Principles

*Design principles represent foundational guidelines for the design of coastal flood management approaches. The design principles were first developed during the 2018 Fraser River Coastal Adaptation Plan project. They were based on the accumulated knowledge and experience of the City and consultant team with coastal flood management.*

They were also informed by past project planning work including the sea level rise planning principles put forward in the third and final Coastal Flood Risk Assessment study that the City completed in 2018, which included:

- Use the best available science and practice adaptive management.
- Seek adaptable, green, and robust solutions that can be phased over time.
- Seek flexible “no regret” actions with co-benefits.
- Pursue funding strategies based on value and equity.
- Take advantage of opportunities that arise through infrastructure lifecycles and land redevelopment.
- Take a risk-based approach.
- Be resilient by providing redundancy.

The six Coastal Adaptation Plan design principles were presented to the community at the two Fraser River open house events and through a citywide Talk Vancouver survey for feedback and refinement. The design principles will be used by landscape architects, engineers, city planners, and others to inform the design of the specific place-based coastal adaptation options.

The first round of False Creek community engagement (Community Conversations and Talk Vancouver community survey) presented the six principles for review and feedback for their application in False Creek. Feedback from the first



round of Community Conversations and the Talk Vancouver survey clearly indicated that most participants and respondents felt the design principles were comprehensive and covered all their concerns.

The Talk Vancouver survey asked respondents to prioritize the design principles by importance to them. The principles are presented in the order they were ranked in the survey.

Moving forward, the design principles should also incorporate and bring forward the guiding Indigenous design principles from the Northeast False Creek Park Design process.



**Design for safe-to-fail infrastructure systems:** Ensure risks to lifeline<sup>1</sup> infrastructure and services are minimized, and that redundant systems are in place in case of failure.



**Design for safety and public health:** Ensure risks to lifeline infrastructure and services are minimized, and that public health and wellbeing are protected.



**Design for adaptability:** Develop flexible options that can adjust to a wide range of future conditions, including the pace of sea level rise, the height of sea level rise, and future land uses.



**Design with nature:** Ensure that approaches support ecological revitalization.



**Design for co-benefits:** Ensure that new approaches support multiple community values (e.g., recreation, health and wellbeing, communities and people).



**Design for access:** Improve access to False Creek and include recreational and interpretive opportunities where feasible.

<sup>1</sup> Lifeline infrastructure includes the systems and facilities that provide services vital to the function of communities and society and are critical to natural disaster emergency response and recovery.

## Sea2City Design Challenge

*Both rounds of False Creek Coastal Adaptation Plan engagement introduced participants to the next phase of the Coastal Adaptation Plan to be undertaken by the City, the Sea2City Design Challenge.*

To start in late 2021, the Sea2City Design Challenge will be a collaborative and participatory planning and design challenge engaging multidisciplinary teams to work co-operatively with the City of Vancouver, residents, and project partners to further expand City's toolbox of coastal flood management approaches. Incorporating the community values, planning principles and design principles identified in both the False Creek and Fraser River Coastal Adaptation Plan projects, the Sea2City Design Challenge will create a vision to guide urban development and ecological revitalization in False Creek. A separate and distinct process will be implemented for the Fraser River Foreshore.

The principal objectives of the Sea2City Design Challenge are to:

- Increase public awareness of climate change and sea level rise.
- Expand the City's toolbox of coastal flood management approaches.
- Explore coastal adaptation approaches that respond to the social equity, economic, and ecological challenges posed by sea level rise and coastal flooding.
- Investigate coastal adaptation approaches for sea level rise beyond 1 metre.

Sea2City will also engage with residents, business owners, community groups, and xʷməθkʷəy̓əm (Musqueam), Skwxwú7mesh (Squamish), and səliwətaɬ (Tsleil-Waututh) Nations.

The Sea2City Design Challenge will involve two teams selected through a two stage application and selection process. The two final teams will be asked to:

- Provide detailed, site-specific flood management designs for two sites in False Creek (the Challenge Sites).
- Provide a map illustrating a proposed alignment for the False Creek "Ribbon." The Ribbon demarcates a potential alignment from the East Basin along the north and south shores of False Creek where future flood protection structures could be developed.
- Engage with community groups, including a Community Advisory Group established for the Challenge during three rounds of engagement events.
- Take part in participatory and collaborative public learning and design events, including a joint design charrette for an additional site in False Creek at the end of the project.

The identified Challenge Sites were selected by the City to represent the varied land use typologies found in False Creek and also represent a range of coastal flood management constraints and opportunities. The sites include high density mixed-used neighbourhoods, lower density residential areas, mixed-use local commercial areas, and valued public spaces.

## Recommendations and Considerations

The following recommendations and considerations were developed by the project consultant team and City staff based on an analysis of project outputs and feedback from residents, business owners, asset owners and operators, and other project stakeholders and planning partners. They are intended to help ensure that valuable lessons learned from the False Creek Coastal Adaptation Plan are carried forward to help guide future project phases, including the Sea2City Design Challenge.

### **Continue public education around the existing coastal flood risk in False Creek.**

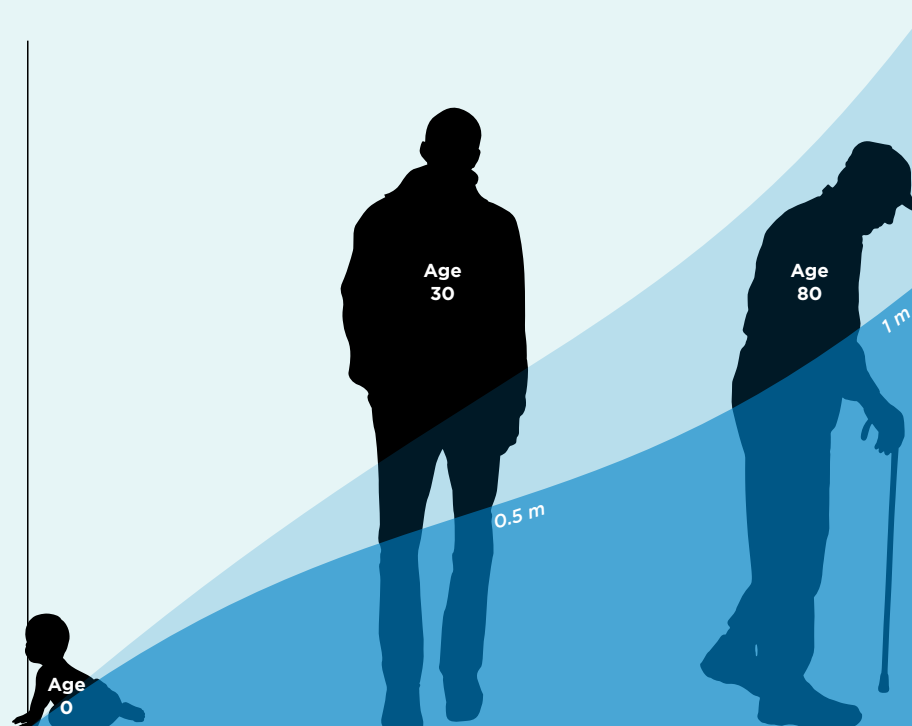
Even without climate change and sea level rise, large areas of False Creek are at risk from coastal flooding resulting from a major storm event. However, many residents, asset operators, and businesses who participated in the project were not aware of the extent and depths of potential flooding in the False Creek floodplain. Continued public education and awareness-building on the part of the City is required to address this issue and improve community resilience in the area.

Public education should also include frank and honest discussion around the accelerating pace of climate change and sea level rise, planning in a context of uncertainty, and the potential for Vancouver to expedite their planning program to better manage future risk.

Greater awareness and understanding of the challenges and opportunities embedded in coastal adaptation in a dense urban area like False Creek will also help build support for the eventual implementation of future flood management options.

Someone born today will experience at least 1 metre of sea level rise by the time they are 80 years old as shown by the darker blue line. The lighter blue line shows the potential sea level rise expected under a higher GHG emission scenario.

**FIGURE:** A Lifetime of Sea Level Rise



### **Continue to refine and validate community values in future project phases.**

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As a values-based, participatory planning process, the community values identified during the first two phases of the Coastal Adaptation Plan (Fraser River and False Creek) will be a critical component of future planning work. This future work includes the Sea2City Design Challenge, planning in other Vancouver coastal neighbourhoods (Downtown and Port Lands, Jericho-Kitsilano), and longer-term work in False Creek and along the Fraser River Foreshore. Residents, business owners, and other stakeholders who did not participate in the first phases of the project will be engaged in future phases, particularly as preliminary flood adaptation options are developed and evaluated beginning with the Sea2City Design Challenge. To ensure there are as few gaps as possible, and to fully engage new participants, it is important to continue eliciting, refining, and prioritizing community values in future project phases. Furthermore, over time, and with growing awareness of the challenges posed by climate change, sea level rise, and coastal flooding, community values and priorities may shift.

### **Maintain values-based, participatory process through future project phases.**

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Participant feedback collected during the two rounds of Community Conversation and other outreach indicates that the City's commitment to participatory, values-based planning was strongly supported. Given that trade-offs and difficult conversations will be inevitable as the project moves into future phases, maintaining this commitment going forward will be a critical component of ongoing relationship-building with residents and key project partners. A continued focus on a values-based, participatory process will help maintain a transparent and open approach to planning with the community and project partners.

### **Continue to work with and collaborate with xʷməθkʷəyəm (Musqueam), Skwxwú7mesh (Squamish), and səliłwətał (Tsleil-Waututh) Nations as key partners.**

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The City of Vancouver should continue building relationships and building awareness of coastal flood risks with Musqueam, Squamish, and Tsleil-Waututh through established channels and protocols. Working with them to help the broader community better understand False Creek from Indigenous perspectives is also critical, and an important part of ongoing reconciliation efforts at the City. Squamish Nation in particular has an important role in future phases of the False Creek Coastal Adaptation Plan project with reserve lands and the planned Seńákw development site in False Creek around the west end of Burrard Bridge.

### **Continue to collaborate with and engage youth and equity-seeking groups.**

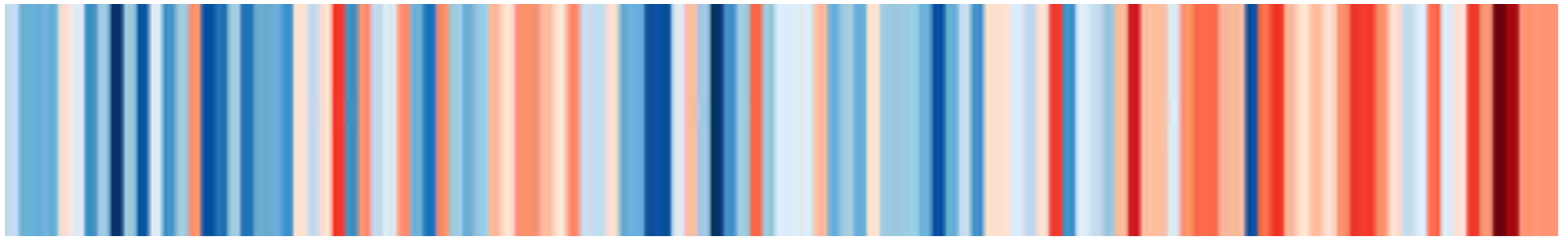
Climate change and sea level rise will continue to disproportionately impact equity-seeking groups and youth. Recognizing this, the City should continue to ensure that future planning and implementation integrates equity into project processes (how the City engages, and with whom) and outcomes (what is prioritized). Equity should be supported towards the promotion of justice and fairness and the removal of systemic barriers that may cause or aggravate disparities experienced by equity-seeking groups. Current and future coastal adaptation planning must also reflect youth perspectives and lived experience.

### **Continue to engage asset owners and operators.**

The False Creek floodplain is home to major infrastructure, including critical lifeline infrastructure. Feedback from a workshop for asset owners with facilities and linear utilities located within the study area confirmed a strong desire to stay engaged in the False Creek Coastal Adaptation Plan process and to build on the preliminary vulnerability assessment carried out in the workshop. The workshop also underscored the need for the City to continue building relationships with the asset owners going forward into future phases of the project, particularly for those areas where City facilities and critical lifeline infrastructure are clustered in the False Creek Flats area.

# Background

As our global climate continues to warm, sea levels around the world are rising from increasing volumes of polar and glacial meltwater and thermal expansion as ocean temperatures increase. The shorelines where Vancouverites work, live, and play are already experiencing modest sea level rise and episodes of coastal flooding.



**FIGURE:** *Climate Stripes - British Columbia (Average Temperatures: 1909 - 2019)*

The Climate Stripes figure illustrates the general upward trend of annual average temperatures from 1850 to 2018. Blue shows lower temperatures, and red shows higher. Globally, average temperatures have risen 0.9°C higher than they were at the start of the 20th Century. If emissions go unchecked, warming will reach 1.5°C above pre-industrial levels by 2050 or earlier.

Based on sea level rise observations and computer modelling, the Province advised municipalities in 2011 to plan for at least 1 metre (3 feet) of sea level rise by 2100, and 2 metres (6 feet) by 2200. The shorelines where Vancouverites work, live, and play are already experiencing sea level rise and increased episodes of coastal flooding. To date, observed sea level change in Vancouver over the past century (1910 - 2017) has been 3.7centimetres (Environmental Reporting BC).

Historic sea level rise cannot be used to predict future increases given the increasing pace of climate change. It is clear, however, that higher sea levels in the future will erode beaches, damage or destroy buildings and infrastructure in low-lying coastal areas, and permanently inundate some locations. Beaches and critical coastal ecosystems will be lost, and areas near the coast will experience soil salinization resulting from salty ocean water pushing up into the groundwater table. Currently, Vancouver's shoreline infrastructure is not designed to withstand rising sea levels and future storm events.



## A CLIMATE EMERGENCY

In January 2019, Vancouver City Council unanimously approved a motion recognizing the climate emergency that the planet faces and acknowledged that the City needs to do more in response to this emergency. As a coastal city, sea level rise and flooding pose one of the major climate adaptation challenges Vancouver is facing.

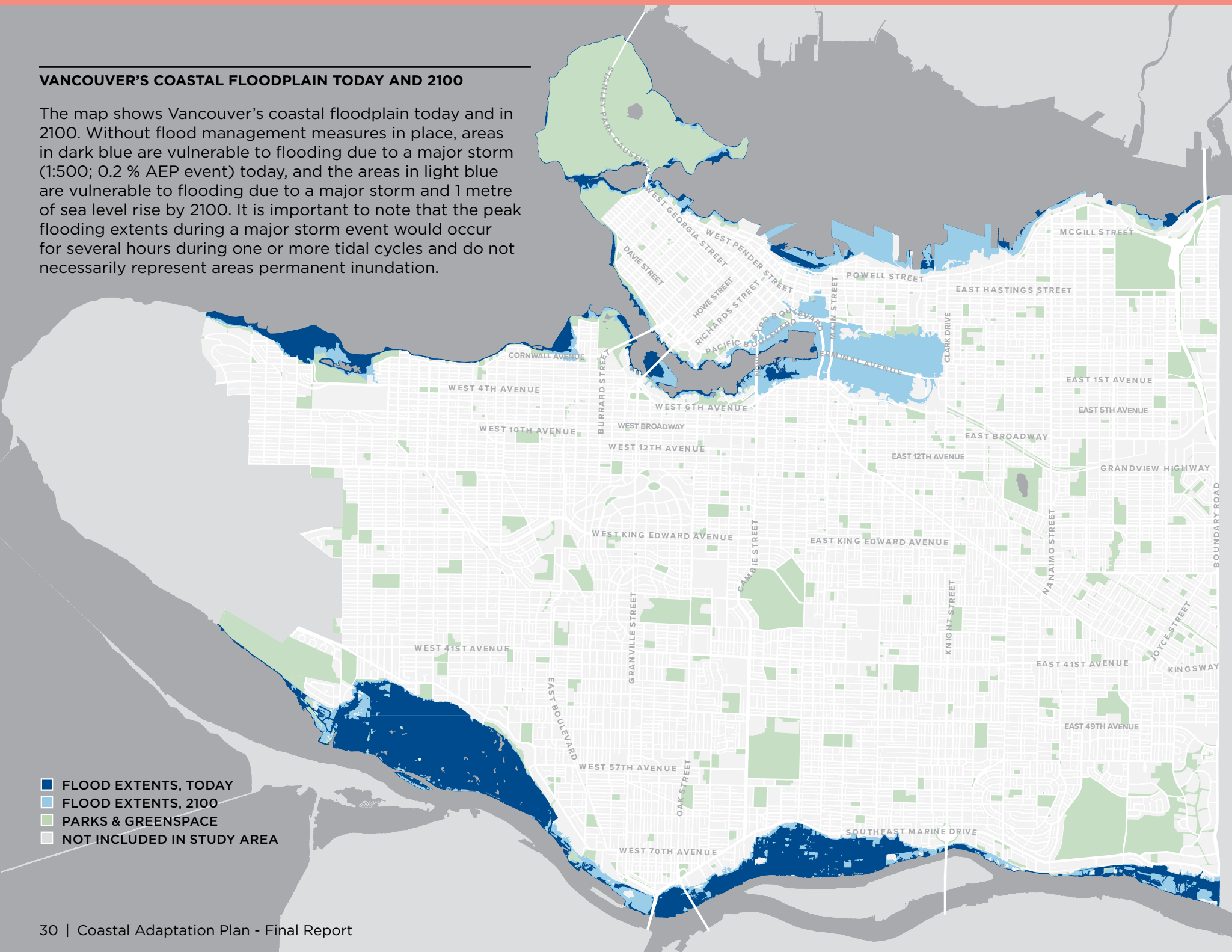
Following the declaration, City Council approved an ambitious Climate Emergency Action Plan in November 2020. The plan puts Vancouver on track to reduce carbon pollution by 50% by 2030, in alignment with the recommendations of the United Nations Intergovernmental Panel on Climate Change to limit global warming to 1.5°C.



## VANCOUVER'S COASTAL FLOODPLAIN TODAY AND 2100

The map shows Vancouver's coastal floodplain today and in 2100. Without flood management measures in place, areas in dark blue are vulnerable to flooding due to a major storm (1:500; 0.2 % AEP event) today, and the areas in light blue are vulnerable to flooding due to a major storm and 1 metre of sea level rise by 2100. It is important to note that the peak flooding extents during a major storm event would occur for several hours during one or more tidal cycles and do not necessarily represent areas permanent inundation.

- FLOOD EXTENTS, TODAY
- FLOOD EXTENTS, 2100
- PARKS & GREENSPACE
- NOT INCLUDED IN STUDY AREA



## Storm Surges and King Tides

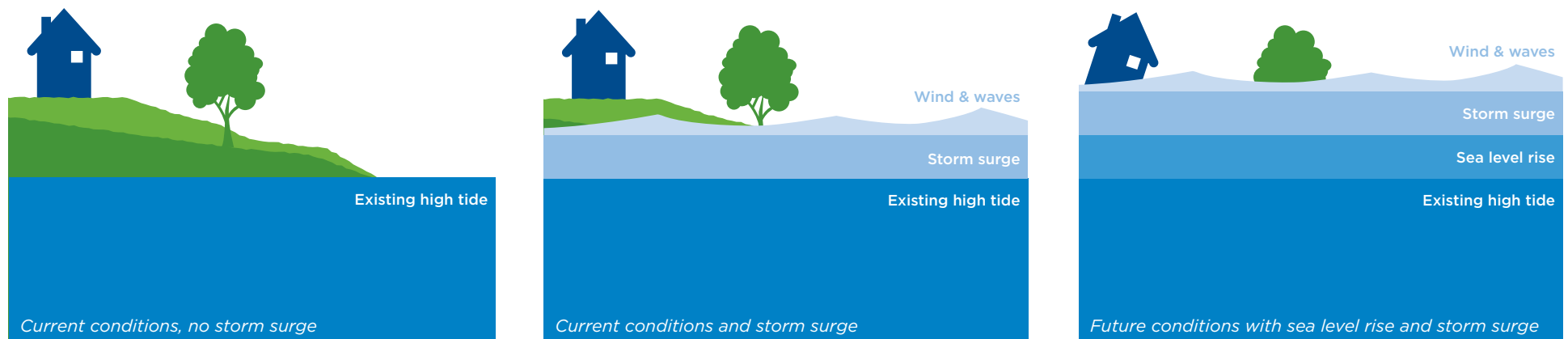
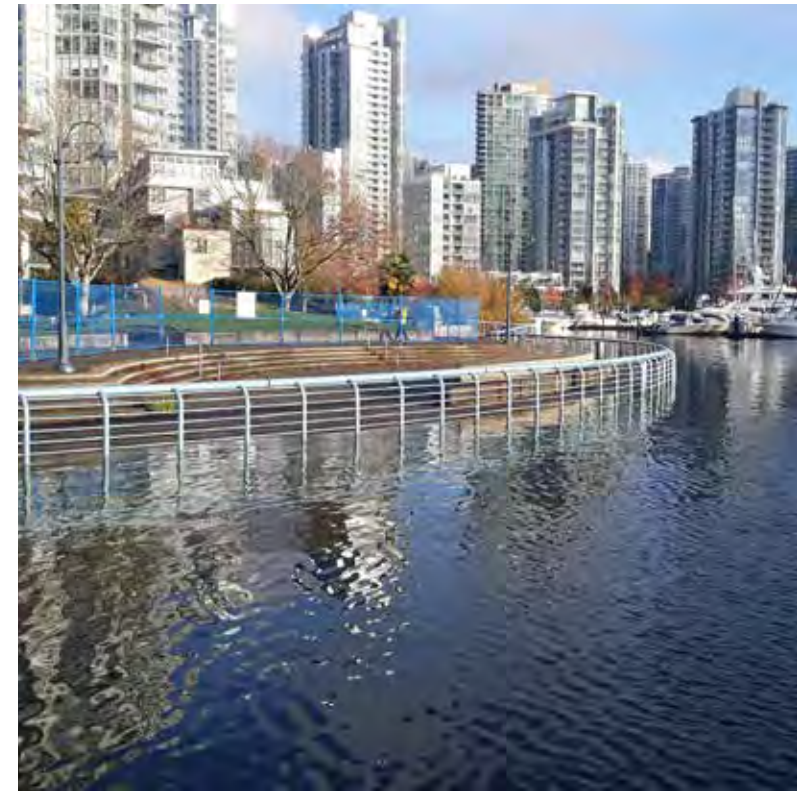
Scientists and climate experts expect that we will experience more extreme weather conditions due to climate change. Vancouver is expected to face more frequent and severe winter storms with heavy precipitation.

These winter storms will create powerful storm surges, driving more water up onto our shorelines and flooding low-lying areas. Unexpectedly large storm surges have already damaged some of Vancouver's most treasured places, including the Seawall in Stanley Park, which was closed for repairs after storm surges during the winters of 2012 and 2015, 2020, and the Kitsilano Pool, which was flooded in 2012.

From December to February, Vancouver regularly experiences winter storms whose winds can push water levels up anywhere from 50 cm to 100 cm above normal levels. These storm surges can generate problems when they coincide with high seasonal tides, called king tides. King tides occur in sets of four to six days, three or four times a year during the winter months of November, December, January, and sometimes February. King tides are 50 cm to 100 cm higher than regular high tides.

King tides offer us a chance to see what normal high tide sea levels may look like in the future as they rise due to climate change. By 2050, when sea levels are expected to be 50 cm higher than today, our regular high tide sea levels could look like some of today's king tides. The photo illustrates a king tide event in False Creek from November 2020.

PHOTO: King tide False Creek, November 2020



## Vancouver's Response

The City of Vancouver has long recognized the need to plan for future sea level rise and to help vulnerable neighbourhoods, communities, and businesses along the shoreline become more resilient to the coastal flooding challenges ahead. In 2012, City Council approved a Climate Change Adaptation Strategy, which recommended several priority actions for the City. As one of the priority actions, a program was launched shortly afterwards to address sea level rise and its impacts on the City of Vancouver.

Since the release of Vancouver's Climate Change Adaptation Strategy, the City has been working to understand and manage coastal flood risk. Starting in 2013, the City began a five-year, three-part coastal flood planning program called the Coastal Flood Risk Assessment (CFRA).

The first phase of the CFRA project modelled and mapped current (i.e., 2013) and future flood hazard (2100 and 2200) risk in Vancouver under different storm surge scenarios. A complex computer model, with detailed topographic data, was used to determine flood extent and depth under each of these scenarios, across the entire City. The modelling approach used has since been adopted by the Province and other organizations, including the Fraser Basin Council, to model regional flood hazards.

Following the completion of CFRA I, City Council approved raising the flood construction level from 3.5m to 4.6m within an expanded flood plain area to improve flood resilience of new buildings. The Vancouver Building By-law was amended to reflect these changes.

**FIGURE:** Sea Level Rise Planning in Vancouver

### TIMELINE

#### 2012 – 2016 Assessing our Vulnerabilities and Options

- Coastal Flood Risk Assessment I and II
- Flood hazard modelling and assessment
- Preliminary adaptation options
- New Flood Construction Level (FCL) adopted for Vancouver's floodplain

#### 2017 – 2020 Building Shared Understanding

- Coastal Flood Risk Assessment III
- Coastal Adaptation Plan – Fraser River
- Coastal Adaptation Plan – False Creek

#### 2021 – 2022 Rising to the Challenge

- Sea2City Design Challenge
- Creating a shared vision to guide urban development and ecological revitalization in False Creek and along the Fraser River Foreshore



#### 2023+ Making it Happen

- Implementation – moving from vision to development on priority actions
- Coastal Adaptation Plan – Jericho and Spanish Banks, Downtown, and Port Lands

Completed in October 2016, CFRA II provided a high-level assessment of flood management options, or adaptation approaches, for flood hazard areas within Vancouver. The assessment evaluated the pros and cons, estimated costs, and likely trade-offs for each option. Through the Phase II work, it became clear that much of Vancouver's coastline will likely require flood protection due to the high value of the park space and amenities, industrial land, critical infrastructure and, in some cases, the large number of residents in floodplain areas. Phase II also highlighted that future adaptation approaches will need to emphasize cost effectiveness, adaptability over time, and, wherever possible, should offer co-benefits such as habitat restoration and enhanced walking and cycling paths.

The third and final phase, CFRA III, was completed in 2018 and provided a risk-based methodology to prioritize flood management planning and implementation across the City. Taking a "pathways approach" to planning for sea level rise, the report acknowledged that while not all flood management decisions can be made now, they can be anticipated, prioritized, and prepared for while remaining responsive to changing circumstances such as re-development, future climate change uncertainties (including the rate of sea level rise), and stakeholder values.

All of this work has informed the Coastal Adaptation Plan, a long-term planning effort to further assess coastal adaptation needs for the City of Vancouver and elicit community and stakeholder values to help inform and guide future planning.





## SEA LEVEL RISE AND CLIMATE CHANGE - RISING UNCERTAINTY, RISKING RISKS?

The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body responsible for assessing science related to climate change. The group publishes comprehensive scientific Assessment Reports, every six to seven years. These reports cover the physical science of climate change, vulnerability to climate impacts and adaptation, and mitigation strategies to slow climate change. The Assessment Reports ultimately provide guidance for national and provincial climate policies, including sea level rise guidance here in BC.

The Fifth Assessment Report was completed in 2014 and provided the main scientific input to the Paris Agreement. The IPCC is currently in its Sixth Assessment cycle, during which the IPCC will produce and release its next Assessment Report in 2022.

The Special Report on the Ocean and Cryosphere\* in a Changing Climate was released in 2019 as part of the larger Assessment Report process. It reported that sea level rise has accelerated due to the combined increased ice loss from the Greenland and Antarctic ice sheets and that sea level continues to rise at an increasing rate. The report raised forecasted sea level rise to 1.1 metre by 2100 and recommended that stakeholders with a low risk tolerance like the City of Vancouver (e.g., those planning for coastal safety in cities and long-term investment in critical infrastructure) may also consider sea level rise above this range. Expert elicitation studies conducted as part of the report indicate that sea level rise of 2m in 2100 cannot be ruled out.

The City of Vancouver needs to be prepared to update coastal flood mapping should the next Assessment Report update guidance for sea level rise. This need for the periodic updating of flood risk assessments to reflect the latest science is reflected in the planning principles identified in the 2018 Coastal Flood Risk Assessment III report:

- Use the best available science and practice adaptive management.
- Seek adaptable, green, and robust solutions that can be phased over time.
- Seek flexible “no regret” actions with co-benefits.
- Pursue funding strategies based on value and equity.
- Take advantage of opportunities that arise through infrastructure lifecycles and land redevelopment.
- Take a risk-based approach.
- Be resilient by providing redundancy.

*\*Note: The cryosphere is defined as the components of the Earth System at and below the land and ocean surface that are frozen, including snow cover, glaciers, ice sheets, ice shelves, icebergs, sea ice, lake ice, river ice, permafrost, and seasonally frozen ground.*

## ADAPTATION APPROACHES: WHAT VANCOUVER CAN DO TO MANAGE COASTAL FLOODING

The coastal flood management options used in CFRA and explored through a community values-based methodology in the Coastal Adaptation Plan can be organized into three general adaptation approaches.

**1. Resist:** Build structures to keep floodwater out and protect areas and community assets. Common resist approaches include shoreline and inland dikes and walls or barriers. They can also include offshore features to help reduce wind and wave action.



**2. Accommodate:** Rather than keeping floodwater out, accommodate approaches aim to keep community assets safe when flooding occurs. Examples include raising buildings and infrastructure or designing them so that they can accommodate temporary flooding (which is known as “wet proofing”) or stay dry when flooding occurs (which is known as “dry proofing”).



**3. Move/Avoid:** This approach plans for the eventual relocation of people and/or facilities and buildings in high exposure, high risk areas of the city. This approach can include returning portions of land to pre-development conditions (i.e., “naturalizing”) or integrating land into green infrastructure systems.



These approaches are often used in combination with one another to achieve a wider range of community values, like health and safety, habitat conservation, recreation, and livability.

## COASTAL ADAPTATION PLAN

The Coastal Adaptation Plan is a long-term, participatory, and values-based planning program to assess coastal adaptation needs for the City of Vancouver and elicit community and stakeholder values to help inform and guide future phases.

### Coastal Adaptation Plan - Fraser River Foreshore

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As the area most vulnerable to coastal flooding today, the first phase of the Coastal Adaptation Plan was completed in 2018 along Vancouver's Fraser River foreshore. The project engaged almost 1,400 residents, business owners, and other stakeholders to identify community values to be addressed when developing flood management approaches for the area; sought input on high-level adaptation approaches; and developed design and planning principles to use when developing future flood management options for the Fraser River. The project included a separate engagement component with Musqueam Indian Band.

The objectives of the Fraser River Foreshore project were to:

- Increase awareness and educate stakeholders on climate change and the specific risks and vulnerabilities facing the Fraser River floodplain due to sea level rise and storm surge events.

- Engage stakeholders in a comprehensive, values-based discussion to ascertain what matters most to the people most affected.
- Develop and review a set of guiding design principles and supporting attributes to carry forward into future project phases, which may include the development of flood management options, infrastructure design and policy.

The project included three workshops, two open houses, an Asset Owners Workshop, two Talk Vancouver surveys, and production of an introductory sea level primer called *Vancouver's Changing Shoreline: Preparing for Sea Level Rise*. The project also included a separate engagement process with Musqueam Indian Band whose principal reserve and population centre is located adjacent to the Fraser River and Vancouver's Southlands neighbourhood.



The Fraser River project identified a series of seven community values to inform future planning work, including the False Creek Coastal Adaptation Plan project. Community values represent the concerns and issues that residents and other stakeholders care about most. As a values-based planning program, the Coastal Adaptation Plan will use community values in the evaluation of future coastal flood adaptation options to help ensure they incorporate and respond to community concerns. The use of values will also help ensure program transparency which will support future conversations around potential trade-offs within and between community values (e.g., How does the option respond to community values? How could the option be improved to better incorporate community values?).

In future project phases, measures will be developed for the identified values and will be used along with more technical engineering and risk criteria to help more fully evaluate coastal adaptation management options. Risk assessment criteria will include a summary of the likelihood and impact of a failure and will consider how well the option would perform during hazards such as an earthquake, or a large flood event (i.e., 1:500 storm). The technical assessment would consider things such

as capital cost, operations and maintenance cost, and future adaptation cost (i.e., the cost of adapting the option to higher sea levels). The values criteria would also be used in future project engagement and communications to support ongoing community conversations and to help illustrate how well options meet (or do not meet) community values.

Finally, the Fraser River project also identified a series of planning and design principles. The foundational guidelines were informed by past sea level rise planning work undertaken through the CFRA and based on accumulated knowledge and experience of the City and consultant team with coastal flood management. They were presented to the community at two open house events and through a citywide Talk Vancouver survey for feedback and refinement. The design principles will be used by the landscape architects, engineers, city planners, and others to inform the design of specific place-based coastal adaptation options.



An aerial photograph of a coastal area. A paved road curves through the scene. To the left of the road is a rocky shoreline with some sparse vegetation. To the right of the road is a well-maintained lawn and a house with a brick roof. The text 'Coastal Adaptation Plan — False Creek' is overlaid on the image in a blue font.

# Coastal Adaptation Plan — False Creek



*The False Creek Coastal Adaptation Plan was carried out between January and December 2020. It was informed by the Fraser River project and incorporated lessons learned from that phase of work. The objectives of the False Creek project were to:*

- Build awareness of sea level rise and coastal flooding risks for False Creek.*
- Identify and confirm community values to help guide future work.*
- Explore potential adaptation approaches to look at in more detail during the next phase of work.*
- Introduce the next phase of the Coastal Adaptation Plan, the Sea2City Design Challenge.*

The project involved over 2,000 residents, business owners, and other stakeholders in a two-round engagement program.

In the first round of engagement, participants reviewed and refined the set of community values that were first identified during the Fraser River Coastal Adaptation Plan in 2018. Seven high-level values were presented to community members through a series of online engagement sessions and a citywide survey. Due to the COVID-19 global pandemic, all engagement was shifted online and supported by a creative communications program that included signage in and around False Creek, a social media program, and an educational video series called Conversations in Canoes.

A second round of engagement activities focused on continuing to build awareness of sea level rise and coastal flooding risks for False Creek. The community values that were identified in the first round of engagement were reviewed and confirmed. The general coastal flooding adaptation approaches that will be the focus of future phases of the Coastal Adaptation Plan were introduced and their relevance and fit for the False Creek context were discussed.

Both rounds of engagement introduced participants to the next phase of the Coastal Adaptation Plan to be undertaken by the City, the Sea2City Design Challenge. Starting in 2021, the Sea2City Design Challenge will be a collaborative and participatory planning and design challenge engaging multidisciplinary teams to work co-operatively with the City of Vancouver and project partners to further expand the City's toolbox of coastal flood management approaches. Incorporating the community values and design principles identified in both the False Creek and Fraser River Coastal Adaptation Plan projects, the Sea2City Design Challenge will create a vision to guide urban development and ecological revitalization in False Creek and along the Fraser River Foreshore.

## False Creek

*Vancouver has always been a coastal community defined by its proximity to the ocean and the Fraser River. Thousands of years before European settlement, xʷməθkʷəy̓əm (Musqueam), Skwxwú7mesh (Squamish) and səliwətəʔ (Tseil-Waututh) villages and settlements dotted the shorelines, with trade and travelers using the waterways as highways to travel great distances. At that time, False Creek extended east to present-day Clark Drive, and existed as a tidal mud flat east of today's Main Street. Numerous streams provided a source of fresh water and nutrients to False Creek and the area provided abundant habitat for birds, fish, and mammals including elk, deer, and bear. Each Nation had, and continues to have, its own relationship to the area, including place names and uses for the lands and resources.*

Tseil-Waututh oral histories tell of elk hunting around False Creek and sturgeon fishing in what is now known as the False Creek Flats. Before the large tidal mud-flat was filled-in by the City of Vancouver to make way for rail yards, this area was known as Skwa-chice, which translates as “deep hole in water” or “water coming up from ground beneath”. This area was and continues to be a place of importance.

Squamish has reserve lands and the planned Seńákw development site in False Creek around the west end of Burrard Bridge. The lands around Seńákw are part of the unceded territory of the Squamish Nation, and were historically home to a seasonal fishing village which became a permanent village in the 19th century. The original 80-acre reserve included most of Kits Point, including modern-day Vanier Park, Molson Brewery, Seaforth Armory, and condominiums and offices of Creekside Drive. Beginning in the early 20th century, however, pressures from the City of Vancouver, senior levels of government, and various non-Indigenous public and private interests displaced Squamish residents and dismantled reserve land holdings. In the late 1970s, the Squamish Nation began a decades long court

action over rightful ownership of the Kitsilano Reserve lands. In 2001, they were awarded the return of a small, 10.5-acre parcel of land under and surrounding the Burrard Street bridge.

As colonialization took place and European settlement grew, industry increased its presence in False Creek with demand for waterfront land. Portions of the Creek were filled in by individual landowners, while the municipally led filling in of False Creek Flats to the east of Main Street began in 1915, the same year the first Georgia Viaduct was constructed.

As industry shifted, changed, and moved out of False Creek, the area became the centre of numerous urban revitalization efforts in the 1970s that continue through to this day. Today, False Creek is a busy, urban, mixed-use waterfront area that is one of Vancouver's major destinations for residents and visitors alike. The area has become a social and recreational heart, featuring a variety of higher density multi-family residences, commercial areas, and parks that are used by many for recreational and marine activities.



**FALSE CREEK TODAY**

**MAIN STREET**

## What's at Risk

*A diverse and dynamic area, the False Creek flood plain is home to several neighbourhoods, including portions of Yaletown, Chinatown, Strathcona on the north shore, and Fairview, South East False Creek, Olympic Village, and False Creek Flats along the south. False Creek North and South both include sizeable parcels of yet-to-be developed land. The False Creek floodplain area itself includes:*

- 38,000+ residents and a range of housing
- \$19 billion in assessed property value (2019 BC Assessment data)
- 200 industrial properties
- Emergency and medical facilities
- Schools and childcare facilities
- Granville Island
- Parks, recreation, and activity centres
- Major utilities and other assets

False Creek is also home to Granville Island, which is one of the areas most vulnerable to flooding. Managed by the Canada Mortgage and Housing Corporation, the island features a mix of uses. Its 300 plus businesses, including a Public Market, and lively arts, culture, and culinary scene make it one of Vancouver's most popular tourist destinations. It is also the site of a community centre, commercial and office spaces, float homes, and a marina.

The figures show a historic map of False Creek in 1893. The second figure overlays the historic boundaries of False Creek on top of a current aerial photo of Vancouver. The second image overlays the projected flood extent of what is at risk of flooding without flood management measures in place in False Creek with 1 metre of sea level rise and a major storm event (1:500; 0.2 % AEP event). The three figures also illustrate how closely the future extent aligns with False Creek's historic boundaries.



The next set of figures illustrates existing and current flood hazards in three different areas in False Creek using the flood extent and depth information presented in the False Creek floodplain map. The following images of specific neighbourhood areas represent a different development typology found in False Creek: developed, urban spaces; parks and open space; and undeveloped areas. The images were used during Community Conversations to illustrate where water may go in two scenarios: a flood event due to a winter storm surge; and, a winter storm surge with 1 m of sea level rise.

- TODAY - Shoreline Water Level Mean Estimate 1:500 yr
- 1m Sea Level Rise
- Example Flood Hazard Areas





## Between Bridges

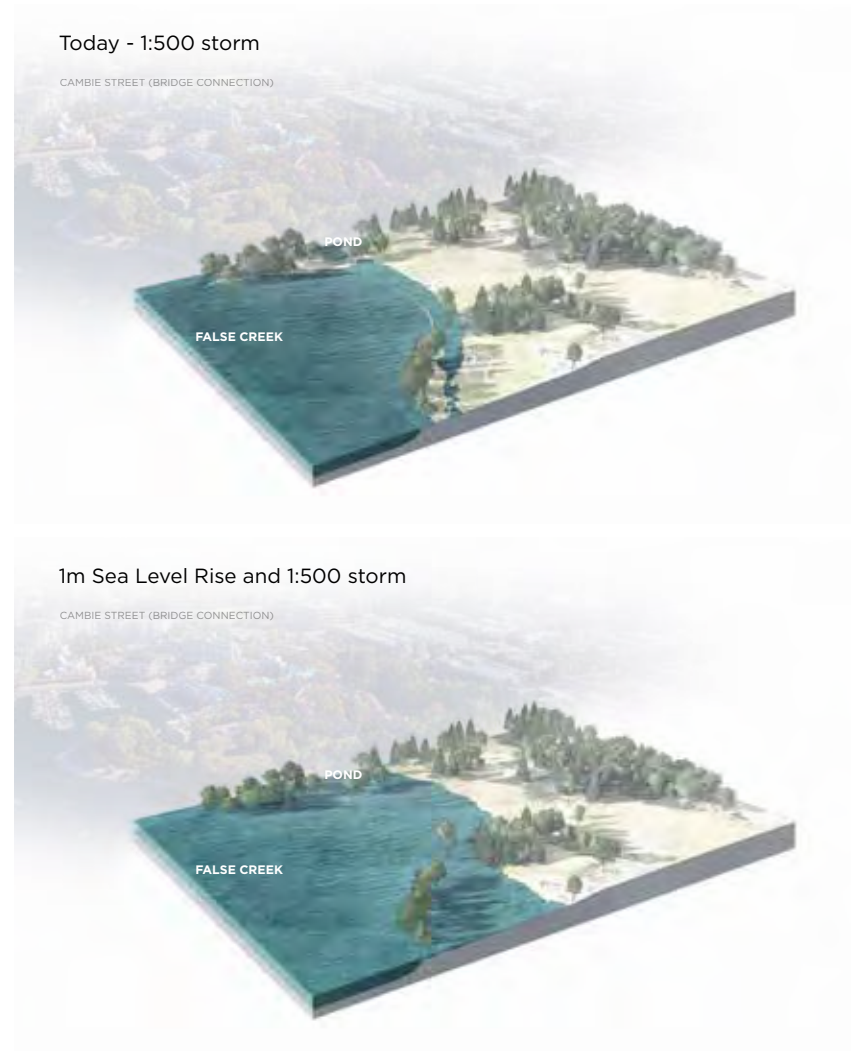
Between Bridges is a complex site located east of Burrard Bridge and west of Granville Bridge. The urban, developed site includes the Seawall, the Hornby False Creek Ferry dock for the Aqua Bus service, a private marina, high-density residential towers, and mixed-use ground floors that include commercial and office uses. The site was developed between the mid-1980s and the early 2000s. To the northwest is Sunset Beach and the Vancouver Aquatic Centre, to the northeast is Beach Avenue and recent developments including Vancouver House, and to the southeast is high-density residential development and George Wainborn Park.





## Charleson Park

Charleson Park is a large waterfront park on the southern shore of False Creek. The park features a mix of forested areas, a lagoon, off-leash dog areas, open fields, and a community garden. The shoreline is composed entirely of rip-rap revetments. The site is bordered by a mix of private and City-owned leasehold residential buildings that were first developed in the 1970s as part of the Granville Island/False Creek redevelopment that marked the beginning of the transition of the area from an industrial area. False Creek Elementary School is west of the site. The City is exploring options for new approaches for stormwater management, ecological restoration, and the functioning of the lagoon at the site.





## East of Cambie

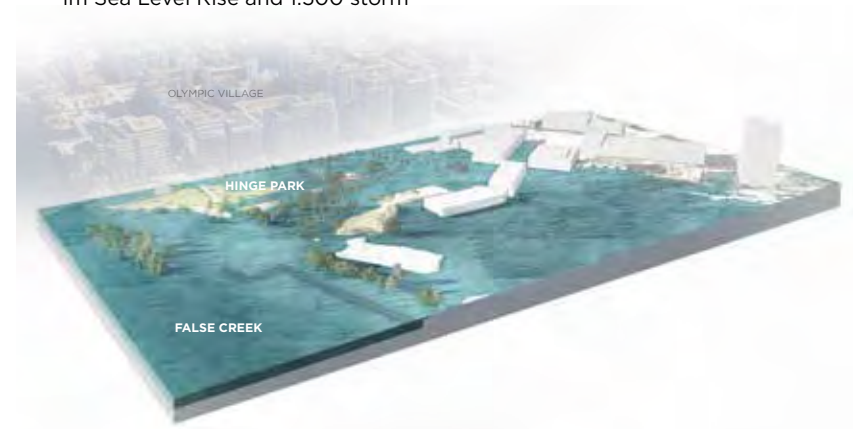
East of Cambie is a large City-owned site located between the Cambie Street Bridge and Hinge Park. As a low area, the site is exposed to the greatest potential coastal flooding depths in False Creek under current conditions. Current uses of the site include a large social enterprise urban farm operated by Sole Foods Street Farms, a City works yard and parking facility for the Vancouver Police, and City-operated affordable, temporary modular housing. Undeveloped portions of the site have been used to host community events, including food truck festivals and visiting Cirque de Soleil performances. The site neighbors Hinge Park, which is the only City recognized biodiversity hotspot in False Creek. The site also neighbours Olympic Village, which is a large mixed-use development built initially for the 2010 Winter Olympics.



Today - 1:500 storm



1m Sea Level Rise and 1:500 storm



## Community Engagement and Outreach

*The City of Vancouver launched the False Creek Coastal Adaptation Plan in the spring of 2020. Using a participatory, values-based approach, the project engaged residents, business owners, and other stakeholders over a six-month period. Due to the COVID-19 global pandemic, all engagement was shifted online. The first round of community and partner engagement events took place in during the summer and early fall. The second round of community and partner engagement events took place in November. Engagement and communications included the following activities.*

### Engagement and COVID-19

The original Engagement Plan for False Creek Coastal Adaptation included two rounds of in-person, high-touch workshops, staffed pop-events around False Creek timed to coincide with major events (e.g., Dragon Boat Festival, Canada Day, Bike to Work Week), and in-person focus groups.

With the declaration of the global pandemic on March 11, 2020 and the Province and Vancouver's health orders starting the following week, the original Engagement Plan was suspended, and a reworked approach developed.

The reworked approach shifted all engagement online with in-person workshop reimagined as digital Community Conversations. Recognizing the increased use of False Creek's parks and Seawall, the project team developed two rounds of temporary signs designed to take advantage of the increased numbers of people visiting and recreating along False Creek.

The shift to online engagement also allowed the project team to incorporate a range of interactive elements and software platforms. This included the use of Zoom videoconferencing and webinar tools which allowed for participants to also use facilitated break-out rooms for larger events. The team also used Google Maps for group mapping activities, Mentimeter for instant smart phone polling questions (multiple choice, short answer, ranking, points assignment), and Mural, a digital workspace for visual collaboration, for participants to provide feedback on general coastal flooding adaptation options (i.e., resist, accommodate, move/avoid).

Feedback from Community Conversation participants on the content and tools used was consistently positive through both rounds of engagement. It also clearly highlighted both strong community interest in the critical issue and an appetite to dig deeper into the topic in future phases of work.



Photo by Dan Toulgoet, Vancouver Courier

## ASSET OWNERS WORKSHOP

The City organized a workshop for asset owners of facilities and utilities located within the False Creek floodplain. Due to the COVID-19 pandemic, the workshop was held virtually using the Zoom videoconference platform. The half-day workshop was held on June 18th and engaged 42 asset owners, operators, and City of Vancouver staff. Asset owners and operators included Fortis, BC Hydro, Telus, TransLink, the Department of Fisheries and Oceans (DFO), the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD), Port of Vancouver, False Creek Harbour Authority, Canadian Mortgage and Housing Corporation-Granville Island, Metro Vancouver, and the City of Vancouver (Engineering, Park Board, Planning, Real Estate and Facility Management, and Sustainability).

The objectives of the workshop were to:

- Build awareness of sea level rise and coastal flooding risks for False Creek.
- Identify critical assets in the floodplain and their sensitivity to flooding.
- Explore the consequences of failed/damaged assets.
- Review adaptation approaches to reduce exposure, sensitivity, or consequences of flooding.

The workshop identified a number of important assets in the study area, including potential lifeline infrastructure<sup>2</sup> whose damage or failure would likely pose a direct threat to public safety and wellbeing along with potential for injuries and death. These critical assets included:

- South East False Creek Neighbourhood Energy Utility (NEU) and associated service building infrastructure
- BC Hydro Murrin substation and rectifier station<sup>3</sup>

- Sewer and stormwater infrastructure (Nelson Baker Pump Station, Thornton Pump Station, Charleson Pump Station, Jervis Pump Station, West End Interceptor, Cambie Street Combined Trunk Sewer, Columbia Forcemain, Jervis Forcemain, Vernon Forcemain, and Heather Street Combined Sewer Outfall)
- City facilities (City of Vancouver Engineering Emergency Operations Centre, Vancouver Fire and Rescue Services Training Centre, National Works Yard, and Evans Yard)
- Major Bridges (Burrard, Granville, and Cambie) and arterials (Quebec Street and Pacific Boulevard)
- Communications lines (Telus duct bank)
- Provincial groundwater treatment plant at Andy Livingston Park

In addition to assessing the vulnerability of single assets (facilities and linear assets), workshop participants explored the linkages to and from other impacted assets and subsequent cascading impacts that could be expected from the failure of one asset. Through this activity, participants narrowed their focus to a few priority assets considered to be of most consequence if they failed due to a flood event. The workshop did not identify all lifeline assets that could pose catastrophic cascading impacts in the event of a failure.

Other assets posing serious but not catastrophic cascading effects include the potential loss of heating to dozens of buildings in the event of a failure of the False Creek Energy Centre; potential health, economic, and environmental impacts from the failure of sewer and groundwater treatment infrastructure; and disruption to transportation networks and impacts on emergency response vehicles.

<sup>2</sup> Lifeline infrastructure are the systems and facilities that provide services vital to the function of communities and society and are critical to natural disaster emergency response and recovery.

<sup>3</sup> While BC Hydro was not represented at the Asset Owners workshop, the facility has been identified as a critical asset. Built in 1947, the substation is reaching end-of-life and needs to be replaced. BC Hydro has purchased property in East Vancouver for a future East Vancouver substation to replace the Murrin Substation which is expected to be decommissioned around 2030.

## COMMUNITY CONVERSATIONS - ROUND 1

A first round of False Creek Community Conversations was hosted online from August through October of 2020. A total of 11 webinar style Community Conversations were held with 145 participants attending the sessions. Session objectives included:

- Building awareness of sea level rise and coastal flooding risks for False Creek.
- Exploring and discussing community values for False Creek – what matters?
- Learning about future project phases and engagement opportunities.

Using the Zoom videoconferencing platform and the online polling platform Mentimeter, the sessions included facilitated group discussions and instant polling questions (multiple choice, short answer, ranking, and points assignment). Engagement took place with a range of stakeholders from around False Creek and Vancouver. Invitations for Community Conversations were sent out to various community and stakeholder groups including residents' associations, strata councils, recreation groups, community centres, youth-focused organizations, and arts and culture organizations. Participants could also register online through an EventBrite page which was widely advertised through City social media, on the City's Shape Your City project web page, and through a creative temporary signage program that was installed around False Creek.

Some consistent themes from the Community Conversations value discussions included the following.

- Many participants had limited awareness of the present-day risks associated with living in active and largely unprotected (i.e., non-diked) coastal floodplain.
- Participants generally thought that sea level rise is an important issue, and that the City should be planning for future impacts, even if they are decades away.

- Generally, the same broad values and concerns were heard at each session. The most widely stated concerns included future and potential impacts to homes and housing, potential impacts on (and loss of) property values, public health and safety concerns (injuries, contamination from flood events), impacts to infrastructure and transportation routes, loss of access to False Creek, impacts to parks and recreational facilities (marinas, Dragon Boat docks), and environmental impacts.
- Those that lived in False Creek south were concerned about how sea level rise and planning for flooding could affect discussions about land leases with the City.
- Many participants had questions about how undeveloped lands like North East False Creek would be developed to manage flood risk.
- Participants were generally not aware of seismic risks and their implications for flood management



## COMMUNITY CONVERSATIONS - ROUND 2

A second round of False Creek Community Conversations was hosted online during November 2020. Four webinar style Community Conversations were held with 114 participants attending the four events. Session objectives included:

- Continuing to build awareness of sea level rise and coastal flooding risks for False Creek.
- Reviewing False Creek community values identified during the first round of project engagement.
- Exploring potential adaptation approaches to look at in more detail during the next phase of work in 2021.

As with the first round of Community Conversations, the sessions included facilitated group discussions and instant polling questions (multiple choice, short answer, ranking, and points assignment). The sessions also included the use of Mural, a digital workspace for visual collaboration that enabled participants to provide feedback on general adaptation options (i.e., what they liked or did not like about each approach, how they would improve each approach). Engagement took place with a range of stakeholders from around False Creek and was widely advertised through City social media, on the City’s Shape Your City project web page, and a second round of creative, temporary signage installed around False Creek. Of note, over 70% of participants were new to the process and had not attended the first round of Community Conversations, indicating a growing local awareness of the project.

Some consistent themes from the Community Conversations around adaptation approaches included the following. The Adaptation Approaches section provides additional feedback.

| ADAPTATION APPROACH | COMMON FEEDBACK AND CONCERNS   |
|---------------------|--|
| <b>Resist</b>       | <ul style="list-style-type: none"> <li>• Would help protect property values and communities over the short-term</li> <li>• Appreciation that in some areas, where infrastructure or buildings cannot be moved or accommodated, this may be the most effective option</li> <li>• Questions around long-term efficacy of diking with ongoing sea level rise</li> <li>• Questions and concerns on ability of dikes to hold up during earthquakes and tsunamis</li> <li>• Concerns over impact on shoreline access and Seawall experience</li> <li>• Some interest in exploring potential sea dam or barrier under Burrard Bridge</li> </ul> |
| <b>Accommodate</b>  | <ul style="list-style-type: none"> <li>• Concerns over cost of retrofitting buildings to be dry/wet proofed</li> <li>• Concern over loss of homes that could be a part of any accommodate strategy</li> <li>• Support for habitat creation benefits of approach</li> <li>• Support for flexibility of approach and use as a measure to deal with flood risks in the medium-term</li> </ul>   |
| <b>Move/Avoid</b>   | <ul style="list-style-type: none"> <li>• Some participants see the approach as a “last resort”</li> <li>• Loss of property values a considerable concern with this approach</li> <li>• Concern over the loss of land for housing and impacts on affordability</li> <li>• Appreciation for the potential to create new shoreline habitat and parks</li> <li>• Support as a long-term (100+ year) strategy (i.e., “don’t build or re-build in the floodplain”)</li> </ul>  |

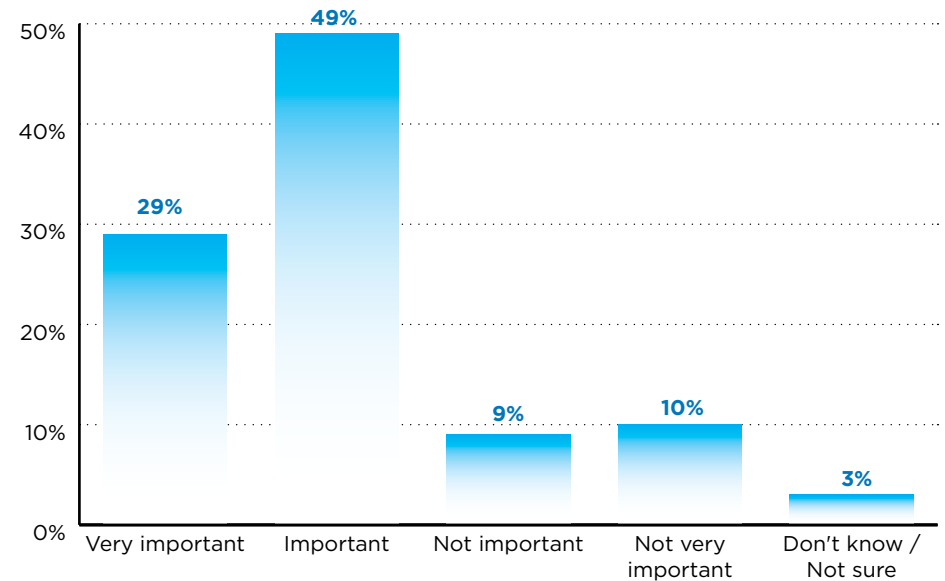
## COMMUNITY SURVEY

A citywide online survey was conducted as part of the first round of community engagement. The survey was administered through the City of Vancouver's Talk Vancouver survey platform. It was launched at the beginning of August and closed on October 6, 2020. Approximately 1,618 respondents completed the survey representing a mix of age groups, household incomes, ethnicities, and gender identities. Approximately 42% of respondents were aged 60+, with 23% of that number aged 70+.

The survey also asked participants two important questions about coastal flooding and sea level rise to help frame the values conversation. First, participants were asked about the relative importance of preparing for coastal flooding in Vancouver compared to other issues that the City is facing. Second, participants were asked if they believed that the risk of flooding in Vancouver will change over the next 30 years.

While acknowledging the importance of other major issues the City is facing, including housing affordability, the ongoing fentanyl crisis, and COVID-19 recovery, the majority of participants (78%) felt that preparing for coastal flooding over the next five years is important or very important as compared to other issues the City of Vancouver is facing. An analysis of open-ended questions found the many respondents emphasized the importance of starting to plan and take early actions in the near-term to begin a phased and ongoing mitigation and adaptation program.

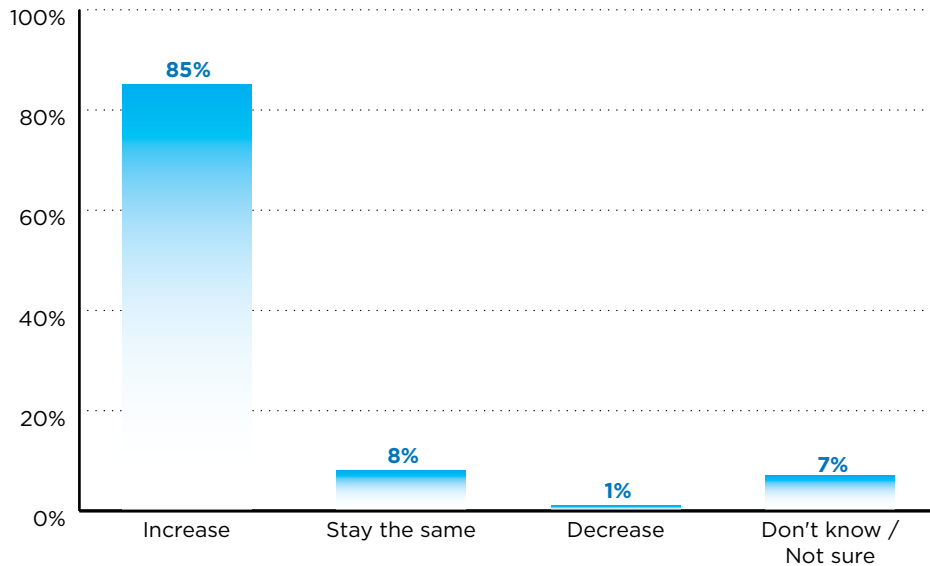
**FIGURE:** Compared to other issues the City of Vancouver is facing, how important do you think it is for us to be preparing for coastal flooding in the next five years?



Respondents also acknowledged that there will be both anticipated and unpredictable or unanticipated consequences for all residents and that it is better to be proactive than reactive to these challenges.

When asked about how the risk of flooding in Vancouver will change over the next 30 years, over 85% of survey respondents thought it would increase. Most indicated that they understand that climate change is worsening and will bring many changes to Vancouver including sea level rise. Overall, respondents thought coastal flooding from sea level rise will increase over the next 30 years because climate change is accelerating global heating and melting ice, which increases the risk of flooding.

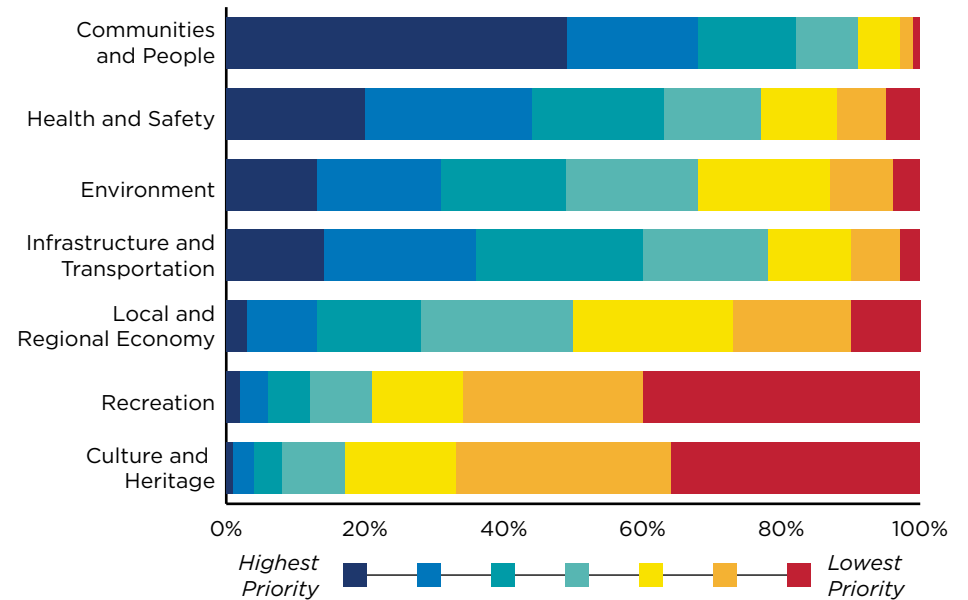
**FIGURE:** How do you believe that the risk of flooding in Vancouver will change over the next 30 years?



For the Talk Vancouver survey, respondents relied on science for this information (e.g., research and projections about climate change), personal observations (of sea level rise, higher king tides, and increased storms), and public awareness campaigns (including the sea level rise public art project under the Cambie Street bridge). Many respondents did not think that substantial actions were being taken to address climate change (e.g., mitigate carbon emissions internationally) and did not anticipate conditions would improve. Survey respondents noted that as sea levels rise and storms increase over time, the possibility of flooding would also likely increase.

The survey asked participants to prioritize the following topics of concern, which were first identified from community consultation for the Coastal Adaptation Plan - Fraser River Foreshore (2018). This survey presented the areas of concern for feedback and prioritizations in the context of False Creek.

**FIGURE:** What impact areas (community values) are you most concerned about?



The community value that was highest ranked in terms of worry around impacts related to coastal flooding was Communities and People. The next impact areas were, in descending order: Health and Safety; Environment; Infrastructure and Transportation; Local and Regional Economy; Recreation; and Culture and Heritage. The top four values remained the same as for the Fraser River with the only difference being that Environment and Infrastructure and Transportation flipped positions in False Creek.

Respondents were asked to rank seven general impact areas. Additional questions on each of the areas was provided for their top three selections. Some respondents chose to elaborate on other concerns not listed. Using manual coding, the following analysis highlights respondents' worries, and concerns related to coastal flooding that were not included in the list provided in the survey. Some concerns, such as the costs and hospital infrastructure, overlap multiple areas of impact.

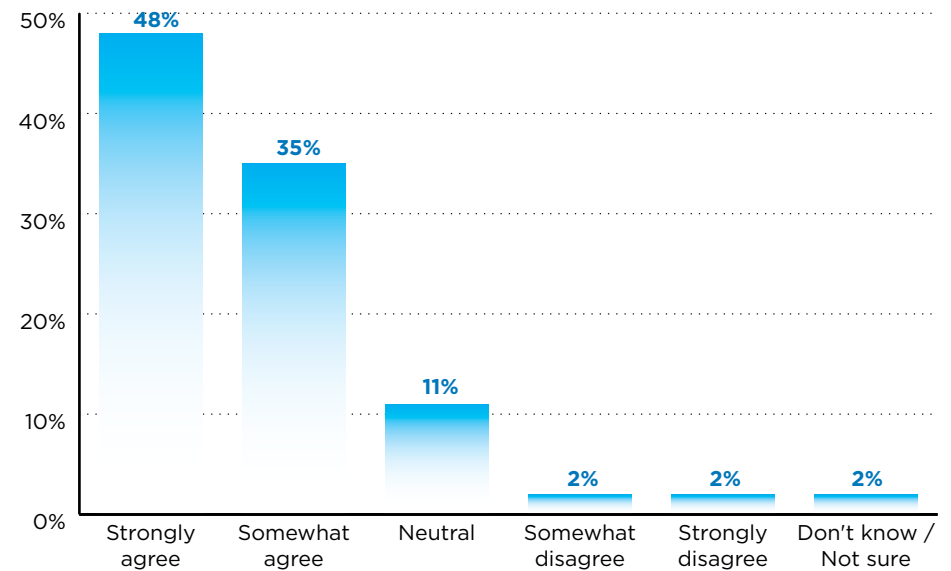
Approximately 10% of the 508 individuals who responded to the question about general impact areas emphasized that they have no concerns. The other 90% highlighted some key, broad concerns shared by multiple respondents:

**TABLE:** General Points of Concern/Interest

| BROAD IMPACTS AND CONCERN  | POINT OF CONCERN/INTEREST  |
|--|--|
| <ul style="list-style-type: none"> <li>· <i>“New St. Paul’s Hospital. Are they building with this in mind?”</i></li> </ul>   | <ul style="list-style-type: none"> <li>· <b>Hospital</b> - 10% emphasized concern regarding the location of the new St. Paul’s Hospital in a floodplain.</li> </ul>  |
| <ul style="list-style-type: none"> <li>· <i>“Disturbance of pollutants sequestered in sediment and other layers.”</i></li> </ul>   | <ul style="list-style-type: none"> <li>· <b>Contamination</b> - 13% worried about contaminants in the soil, and other sources of pollution including sewer systems and boats, that could be released into the environment in the event of flooding.</li> </ul>   |
| <ul style="list-style-type: none"> <li>· <i>“Costs of cleanup and remediation and disruption will far exceed the costs of prevention. Anyone who has had a ‘ordinary’ house flood could tell you that.”</i></li> </ul> | <ul style="list-style-type: none"> <li>· <b>Financial burden</b> - 8% voiced concern about the financial burden of adaptation and repair, and many respondents suggested that the Federal government and developers should be responsible.</li> </ul>  |
| <ul style="list-style-type: none"> <li>· <i>“Damage to significant numbers of homes and businesses.”</i></li> </ul>  | <ul style="list-style-type: none"> <li>· <b>Property value</b> - 7% were concerned that the risk of flooding could affect property values and increase insurance premiums.</li> </ul>  |
| <ul style="list-style-type: none"> <li>· <i>“It would make the housing crisis worse in Metro Vancouver”</i></li> </ul>   | <ul style="list-style-type: none"> <li>· <b>Housing</b> - 8% worried that flooding would damage their homes and further aggravate affordable housing challenges in Vancouver.</li> <li>· <b>Displacement</b> - 4% were anxious about displacement of people and the impacts relocation could have on other areas of the City.</li> <li>· <b>Equity-seeking</b> - 3% highlighted that equity-seeking groups (e.g., low income, under-housed) may be disproportionately affected by flooding.</li> </ul> |

Respondents were also asked if they agreed with the design principles which were first identified from community consultation for the Coastal Adaptation Plan – Fraser River Foreshore (2018). Approximately 83% of the 753 respondents who answered the question indicated that they either strongly agreed (48%) or somewhat agreed (35%) with the design principles.

**FIGURE:** In general – do you agree or disagree with the design principles?



## YOUTH

Youth will inherit the impacts of sea level rise and coastal flooding in Vancouver. Recognizing this, a concerted effort was made to engage young people in the False Creek Coastal Adaptation Plan. As part of this commitment, the City partnered and collaborated with CityHive, a youth-led organization whose mission is to transform the way young people shape their cities and the civic processes that engage them.

The CityHive team reviewed the False Creek Coastal Adaptation Plan Engagement Framework with a youth and young adult engagement lens and partnered to run a series of online workshops aimed at involving stakeholders under age 30. CityHive identified four engagement activities for their organization to lead. This included three youth and young adult focused Community Conversation workshops (attended by 70 youth and young adults) and an activity guide for younger teens and children. CityHive also supported project communications through their social media channels.

The CityHive workshops included presentations from Marissa Nahanee (designer and cultural coordinator with the Squamish Nation), Sierra Tasi Baker (lead cultural and Indigenous design consultant at Sky Spirit Consulting), and Jeff Cutler and Isabel Kunigk of space2place landscape architect (False Creek Coastal Adaptation Plan's landscape architecture consultant). The workshops introduced participants to the complex planning and design process involved with coastal flood management, and included examples from Vancouver's emerging River District neighbourhood adjacent to the Fraser River in southeast corner of the City as a case study.

In order to elevate the voices of youth on sea level rise in Vancouver, an episode of "Conversations in Canoes" was hosted with a 15-year old climate activist who is active in the Sustainabiliteens organization.

The City also hosted three workshops with UBC (Ocean Leaders Program, Forestry, Hydrotechnical Engineering, and Environmental Fluid Mechanics), one with Arts Umbrella, and one with Langara College. Approximately 175 students and professors attended the four sessions.

Several general themes emerged from engagement with youth, including:

- Concerns over the impact of coastal flooding and coastal flood management on housing and affordability in the City.
- A desire to integrate reconciliation into coastal adaptation work, including through indigenous design elements and shoreline restoration.
- An openness to long-term adaptation options that are focused on environmental values, including "move" or "avoid" options.



***"Wow! What a cool event,  
we can't wait to hear what  
the input is "***

*- Georgia Straight Alliance  
September 17, 2020*



**PHOTO:** Musqueam participation in the 2018 Coastal Adaptation Plan - Fraser River project



## INDIGENOUS ENGAGEMENT AND COMMUNICATIONS

Thousands of years before European settlement, x<sup>w</sup>məθk<sup>w</sup>əy<sup>əm</sup> (Musqueam), Skw<sup>x</sup>wú7mesh (Squamish), and səliwəta<sup>+</sup> (Tsleil-Waututh) villages and settlements dotted the shorelines, with trade and travelers using the waterways as highways to travel great distances. Each Nation had, and continues to have, its own relationship to the area, including place names and uses for the lands and resources. False Creek, in particular, was of significant importance to the Nations, as a hunting, fishing, and gathering area. Squamish has reserve lands and the planned Se<sup>n</sup>ákw development site in False Creek around the west end of Burrard Bridge. The three Nations were engaged in this project through existing City channels and protocols. At the direction of Musqueam, Squamish and Tsleil-Waututh Nations, the City of Vancouver moved forward with a Memorandum of Understanding with Musqueam. City staff continue to build relationships and are working to understand points of collaboration with Musqueam, Squamish and Tsleil-Waututh on the next phase of work, the Sea2City Design Challenge, as part of the Vancouver Plan.

A Memorandum of Understanding was signed with Musqueam (who also participated in the 2018 Coastal Adaptation Plan - Fraser River Foreshore project) to support communications and ongoing awareness building with their members on coastal flooding and sea level rise risks.

As part of the Memorandum of Agreement, additional educational and communication products on sea level rise and coastal flooding in Musqueam were produced. This included photo realistic flood visualizations for important community facilities, and production of a general information PowerPoint presentation for staff, Council, and members.

In addition, Northwest Hydraulic Consultants, Coastal Adaptation Plan False Creek's coastal engineering consultant, produced a report to support Musqueam preparedness and emergency response to coastal flood hazards from the north bank of the Fraser River. This project produced a map set that illustrates:

- Projected inundation for specific flood levels; and
- Specific actions to mitigate flood damages, along with when and where to deploy them.

An accompanying report presented data sources, methods, findings, limitations, and next steps for Musqueam to consider.

## GRANVILLE ISLAND CONSULTATION

Within False Creek, Granville Island is one of the most flood-vulnerable areas. Managed by the Canada Mortgage and Housing Corporation, Granville Island features a mix of uses. Its 300 plus businesses, including a Public Market, and lively arts, culture, and culinary scene make it one of Vancouver's most popular tourist destinations. It is also the site of a community centre, commercial, industrial, and office spaces, float homes, and a marina.

As a federally managed site, Granville Island is a unique, but critically important site in False Creek. Outreach with Granville Island included:

- Staff participation in the Asset Owners Workshop.
- A special Community Conversation for their larger staff team.
- A presentation to the Granville Island Council, the Island's administrative board, on flood risk in False Creek and the Sea2City project.

Granville Island Council received the information and indicated that they are concerned about Granville Island's vulnerability to flood hazard. They directed Granville Island staff to work with City staff to understand how the two organizations could collaborate on adaptation to sea level rise and coastal flooding as part of the Sea2City Design Challenge.



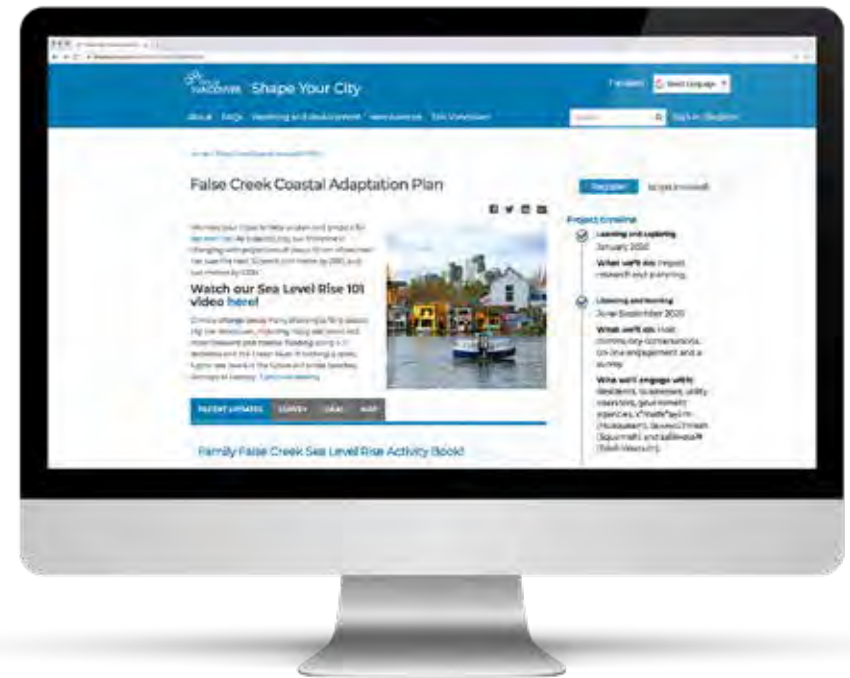


## OTHER OUTREACH AND COMMUNICATIONS

*The City of Vancouver supported community outreach and engagement with the following communications pieces.*

### Shape Your City - False Creek

A project page was established on the City's Shape Your City engagement portal. The page included a project overview, links to presentations and project materials, and opportunities to provide direct feedback, including place-based feedback via a map tool and idea brainstorm tool. Shape Your City saw 2,530 visitors who downloaded 340 documents.



## Conversations in Canoes

Four short, entertaining, and educational videos were created to support communications and digital outreach. With one “sea level rise 101” introductory video, the remaining three videos included interviews about sea level rise and coastal flooding with people who live, work, and play in False Creek, including a commercial diver working out of Granville Island, a marine biologist, and a high school student who is a member of the Vancouver-based Sustainabiliteens group. Together the four videos have attracted over 1,500 views.



***"This video series was my favourite climate engagement of the year! It was diverse, positive, and forward-looking."***

*December 11, 2020*



## Sea Level Rise Signage Program

Two rounds of unique, eye-catching lawn signs were developed and installed around False Creek in two separate rounds. The signs were placed at approximate future (2050) high tide water lines around False Creek. The first round of signs featured a simple rubber boot with the message, “In 30 years you might be standing in False Creek.” The signs invited people to learn more about the project and included a QR code and web link. The second round of signs went out during the fall king tide season and included one of two pictures of king tide events from 2019. The message on this round of signs was, “In 30 years this will be the normal high tide. Twice a day.” As with the first round, the signs invited people to learn more about the project and included a QR code and web link. Some members of the public took photos of the signs and posted them to social and others emailed the project leads to inquire further about the project. When the signage came up in Community Conversations, some participants indicated that that they had observed the signs

without prompting. In one discussion, a resident told a City project staff team member that the signs were “frank, bold and necessary public messaging.”

The signage program was highly successful in generating engagement with the False Creek Coastal Adaptation Plan. In the 14-days after the first round of signs went out on August 17th, direct and search engine traffic to the Shape Your City page increased by 308%, as compared to the previous 14-day period. In the 14-days after the second round of signs went out on November 13th, direct and search engine traffic to the Shape Your City page increased by 287%, as compared to the previous 14-day period. Some of this additional traffic may have been generated from the Community Conversations, which were held in the same weeks as the signage programs. The signs may have also driven additional people to participate in the Community Conversations.



## False Creek Activity Book

An activity book for younger youth (12-15 years old) and children (6 - 11 years) was created for distribution to parents and through schools. A collaboration with CityHive, the activity books helped provide important information on what younger people and children like about False Creek. Approximately 200 workbooks were downloaded from the Shape Your City project site and 70 paper copies were distributed directly. The average age of participants who returned their activity books was 10 to 12. The top three improvements to False Creek noted in the completed workbooks were to reduce pollution and improve cleanliness, plan “fun things” and green spaces, and improve community affordability. The top three favourite things about False Creek noted in the completed workbooks was being close to nature, enjoying the views, and the sense of community.

**SENSES WALK**

Today is a perfect day for a *Senses Walk!* Head to or imagine your favourite spot along False Creek. Get comfy and answer these questions.

What do you **SEE**?  
False Creek and Downtown Vancouver

What do you **HEAR**?  
Bikes, foot-steps, and the water.

What do you **SMELL**?  
Goose-poop, water and Wet dog.

What do you **FEEL**?  
cool breeze/wind and birds.

In the space below, draw what you see here!

What's your **favourite** thing about this place?  
The pretty view and sidewalks

**FALSE CREEK**  
Walk, Bike and Roll Tour

Visit one or two of the places on the map below, circle the places you want to and tell us about them by answering these questions. Feel free to visit a different place, just be sure to tell us what it is by circling it on the map.

What makes this a great place visit or live in?  
All of the nature and animals.

What would make this place even better?  
If there wasn't so much garbage, makes me very sad.

What would you miss if part of this place becomes flooded in the future?  
I miss everything, my house would be destroyed.

Fill in the blanks. It's 2020 and I am \_\_\_ years old. In 2050, I will be \_\_\_ years old. In the future, I'm hoping False Creek will be...  
I would like it to still be alive and stay more natural.

**Map Labels:**  
1. The Welcome Figure was erected by Squamish on land that was once the site of a traditional Squamish village called Senakw. False Creek was and continues to be an important place for Moqumam, Squamish and Tsil-Wautah.  
2. The False Creek Bridge connects the Olympic Village and False Creek Flats.  
3. The blue stripes under Centre Bridge show the future sea level rise we can expect.

## Social Media Program

The City of Vancouver's social media team supported a broad-based social media program that included project posts, promotions, and communications about the previous four communication pieces. The social media program was conducted through the City's Twitter (@CityofVancouver), Greenest City Twitter (@greenestcity), Facebook, and Instagram channels.

Between August 21 and December 5, 2020, there were a total of 70 social media posts about the False Creek Coastal Adaptation Plan. Most of the social media posts (32) were shared on Twitter. In terms of generating engagement and driving users to interact with further materials, Twitter was the most successful social media platform for this project. One tweet about the False Creek activity book went viral, generating 58,794 views and 10,702 interactions. After the mid-November viral post, there was a significant bump in traffic to the Shape Your City webpage. The Conversations in Canoes videos were successful on all platforms, and generated the greatest average engagement (likes, shares, comments) of all the communication pieces on Facebook and Instagram.



## Earned Media

Several earned media events also took place, including CBC radio morning and afternoon shows. Vancouver is Awesome had a short article on the Activity Guides and the project's social media. The City of Vancouver's Greenest City social media channels were also used to promote project events.

## Community Values

*Community values represent the concerns and issues that residents and other stakeholders care about most. As a values-based planning program, the Coastal Adaptation Plan will develop clear measures for identified values and use them along with more technical engineering criteria in future project phases to evaluate coastal adaptation management options. These will be used to answer how options respond to community values and how options could be improved to better incorporate these values.*

The evaluation will be used by the landscape architects, engineers, city planners, and others who design the specific place-based coastal adaptation options, but also used in future project engagement and communications to help illustrate how well options meet (or do not meet) community values. This use of community values in the evaluation of adaptation options will help ensure that the potential flood options incorporate community concerns. They will also help ensure program transparency which will support future conversations around potential trade-offs within and between community values.

The first round of False Creek community engagement (Community Conversations, Talk Vancouver community survey) presented the seven community values that were identified as part of the 2018 Fraser River Coastal Adaptation project.

False Creek Coastal Adaptation participants confirmed the applicability of the community values for False Creek and identified specific gaps, themes, and priorities for the False Creek floodplain area. While the community values are presented as separate categories for discussion and evaluation purposes, it is acknowledged that there is considerable connection and reinforcement between them. The refined False Creek community values are presented in general order of priority and importance based on community feedback.





## COMMUNITIES, PEOPLE, AND HOMES

Communities, People, and Homes was ranked as the highest priority value in Community Conversations and the Talk Vancouver survey. Over 38,000 people live in the area around False Creek in a variety of housing types. There are tight knit and unique residential communities living on and around False Creek, including long-running housing co-ops in South False Creek, live-aboard boats, and unique houseboat communities. Based on feedback and participant discussions, the value was changed from “Communities and People” to “Communities, People, and Homes” to reflect the importance, quantity, and diversity of housing in the False Creek area. Common discussion points around this value included:

- Worries over maintaining the existing stock of affordable housing in the area, often highlighted in tandem with Vancouver’s ongoing housing and affordability issues.
- Concerns over the impact of sea level rise on existing housing, and on the ability to create new housing options within the floodplain.
- Concerns over damage to existing housing and property, negative impacts to property values, impacts to insurance rates, the costs of preparation and repair on housing owners, and costs to strata corporations.
- Apprehension over the displacement of people and potential relocation, both from the impacts of coastal flooding and potential future adaptation actions.
- Equity concerns over how adaptation efforts might be steered by powerful interest groups, and how they might impact marginalized or equity seeking groups.
- Insistence that future flood management approaches must consider impacts on communities and people, and, where practical and feasible (technically, in terms of risk tolerance, etc.), minimize permanent displacement of residents.

***“I’m worried about the extreme negative psychological and economic impact this will cause families and individuals.”***

Talk Vancouver survey respondent





## HEALTH AND SAFETY

Health and safety includes the possible direct impacts of a flood event on the health, wellbeing, and safety of people in the area, and the impact of sea level rise on lifeline infrastructure such as health facilities, police and fire services, and water, sewer, and power services and infrastructure. These impacts range from the immediate physical safety of people during a flood event, to the longer-term mental health and wellbeing impacts of recurring flooding or the implementation of flood adaptation options. Common discussion points around health and safety values included:

- Concerns over the possibility of injury or death during a flooding event.
- Questions about the potential loss of access for emergency services during a flood event.
- Concerns around the wisdom of locating people, homes and services in a floodplain.
- Concerns about the impact of coastal flood-related water pollution and contamination on health and safety.
- Concerns over disruptions to lifeline infrastructure and services (power, water, roads, and communications).
- Concerns over the location of St. Paul's Hospital within the floodplain, and questions as to how it is being designed to handle sea level rise.
- Expression of the need for seismically resilient adaptation options.
- Concerns over the impact of flood adaption options on mental wellbeing (potential loss of views, access, and connection to nature).

***“Mental health impacts of flooding on people who are displaced. Literature is mounting on this topic suggesting that the impacts of floods/fires have significant mental health impacts.”***

Talk Vancouver survey respondent





## INFRASTRUCTURE AND TRANSPORTATION

Significant infrastructure and transportation facilities and networks are spread throughout the False Creek floodplain area. These include major energy facilities such as the False Creek Energy Centre which provides heat to the Olympic Village area and a growing number of buildings in the False Creek Flats area. It also includes telecommunications infrastructure, Metro Vancouver and City of Vancouver water, wastewater, and green infrastructure assets, major SkyTrain stations and sections of both the Canada Line and Expo Line, and transportation arteries, including roads, bridges, bike paths, and the False Creek Seawall. Common discussion points around infrastructure and transportation values included:

- Concerns around damage to infrastructure, including possible impacts to local schools and childcare facilities such as False Creek Elementary, disruption to municipal service delivery, and damage to valuable and important City infrastructure.
- The potential for damage to the Seawall and the loss of access to the walking and biking routes.
- Concerns over the loss of services during and after a flood event (power, heat, gas, communications).
- Worry over the loss of bike routes, sky train flooding, loss of transportation options, and concern that car infrastructure would be prioritized over other forms of transport in adaptation options.
- Concerns around the siting of the St. Paul's Hospital, including long-term potential for damage from flooding and loss of access during a flood event.

***“It could take a very long time, plus some innovative new technology, and a lot of money to maintain the functioning of the city.”***

Talk Vancouver survey respondent





## ENVIRONMENT

The marine and terrestrial environment in and around False Creek has undergone profound change over the past 150 years. The area transformed from a productive intertidal area surrounded by old-growth forests and fed by salmon bearing streams to a heavily polluted industrial waterbody with no remaining areas of natural shoreline. The area has undergone further transformation from its heyday as an industrial area less than 60 years ago. Water quality is improving, areas of the shoreline are being restored, and life is slowly returning to the water and intertidal areas. While it remains a predominantly urban waterway, False Creek is widely seen and appreciated as an urban refuge and its environmental features are highly valued by residents and stakeholders. Common discussion points around environmental values included:

- Concerns over the loss of biodiversity, loss of habitat, water pollution and the spread of toxins, damage to ocean ecosystems, impacts to marine life, impacts to birds, and potential changes to False Creek because of flood mitigation measures.
- Preference for the preservation of existing shoreline ecosystems and habitat.
- Opportunities to expand and enhance the ecological value of the shoreline through shoreline “softening” and green shores approaches.
- Apprehension around the presence of contaminated soils and the effects that flooding would have on water quality and ecosystems within False Creek and the Salish Sea.
- Desire to protect and enhance highly valuable seabird habitat and marine life.

***“I’m concerned about the larger impacts about how increased flooding will impact migration patterns, microclimates, etc.”***

Talk Vancouver survey respondent





## LOCAL AND REGIONAL ECONOMY

The False Creek floodplain is a significant component of Vancouver's local economy. Many small and medium sized enterprises are located within the area, alongside hundreds of industrial properties, including a growing number of high tech and knowledge-based companies. The current valuation of the property within the area is \$19 billion (2019 BC Assessment). Property tax revenue from the False Creek area is important to the City budget, and there are significant sites within the area that have yet to be developed. False Creek, including Granville Island, Science World, BC Place, Rogers Arena and Chinatown is a major tourism destination. False Creek also sits directly between the two largest employment centers in the province (Downtown Vancouver and the Broadway Corridor) and provides the backdrop for a significant amount of economic activity. Common discussion points around local and regional economy values included:

- Concerns over the overall cost of adaption, effects of businesses, damages to businesses, impact on the City's finances, and the economic consequences of serious flooding.
- Concerns for a number of unique, small businesses around False Creek that are exposed to current flood risks, including on Granville Island and in Leg and Boot Square.
- Appreciation for the many community serving functions of Granville Island and its critical role in maintaining food availability throughout the pandemic.
- Concerns around flooding in False Creek Flats and the potential impacts to industrial lands.
- Concerns about the total economic impact of flooding in False Creek including the impact to the City's budget.

***“Granville Island is one of the main tourist items in Vancouver, generating jobs and wealth.”***

Talk Vancouver survey respondent

Photo by Joe Mabel, CC-by-sa





## ARTS, CULTURE, AND HERITAGE

False Creek is an area with significant cultural and heritage value. Before the area became known as False Creek, it was called Seṇákw and was used by the Musqueam, Squamish, and Tseil-Waututh people since time out of mind.

Today, False Creek is home to a range of arts venues and theatres, public art, art education and production venues, community cultural spaces, and historically meaningful sites. Many of these venues are clustered on Granville Island, which is both one of the most at-risk areas from a major flood event today and outside of the City's management authority as a federally managed area. Portions of Chinatown and the Hogan's Alley communities are within the False Creek area and are neighborhoods of significant cultural value. Common discussion points around arts, culture, and heritage included the following:

- The history and presence of Musqueam, Squamish, and Tseil-Waututh in and around False Creek is highly valued but could be better shared and celebrated.
- False Creek, and Granville Island in particular, are important sites for Vancouver's arts and culture community.
- Desire to see design elements from the local Indigenous peoples incorporated into any future coastal flood adaptation works.
- Desire to see public art incorporated into any future coastal flood adaptation works.

***“Highest density of artist studio spaces -- in effect they will lose their workspaces which is happening already”***

Talk Vancouver survey respondent





## RECREATION

False Creek functions as major recreational centre for many Vancouver residents and visitors alike with its network of parks and public spaces along the Seawall. Playing fields, tennis and basketball courts, dog parks, playgrounds, plazas, and natural areas provide areas for sport, recreation, play, and relaxation. The Seawall is used by many for walking, running, rolling, and cycling. Rowing and paddling occur on the still waters of False Creek itself, and False Creek provides a gateway for boaters to access the Salish Sea. Common discussion points around recreation included the following:

- Concerns around potential flood damage to recreation facilities, parks, and the False Creek Seawall.
- Concerns around access to the Seawall during flood events and from flood-related repairs.
- Worries over the long-term viability of the Seawall, particularly if dikes are built around False Creek that do not incorporate walking and rolling paths.
- Future potential loss of outdoor space from possible adaption options that could limit or reduce the size of dog parks and other recreation facilities.
- Concerns around the loss of green space that provide a place for residents to relax, reflect, and feel part of nature.

***“I paddle dragon boat and outrigger canoe in False Creek on a regular basis. I am concerned about the impact on my access to False Creek for paddling.”***

Talk Vancouver survey respondent



## Planning Principles

*In addition to the design principles, the following planning principles were developed to support internal City planning and future project work. They were reviewed by City project staff, but not presented to the public. They are not presented in any hierarchy.*

- **Plan for integration:** Integrate the flood management strategy with relevant and concurrent City-wide plans (e.g., Vancouver Plan, Climate Emergency Action Plan, RainCity Strategy).
  - Integrate Engineering Design Reference for Shoreline Flood Protection and NEFC Shoreline Flood Protection Performance Criteria.
  - Coordinate with Charleson Park Water and Stormwater Upgrades (2021 to 2023).
  - Coordinate work with upcoming Sewer and Rainwater Master Plan initiative, particularly work involving the False Creek receiving waters.
  - Coordinate Coastal Adaption Plan work with City development planning processes occurring through Real Estate and Facilities Management and the Property Endowment Fund.
  - Coordinate and collaborate with Vancouver Plan engagement and leverage potential opportunities for broader community engagement to inform people about the sea level rise and coastal flooding in False Creek.

- **Plan for coordination:** Coordinate planning with other organizations, agencies, and asset owners manage lands, water, and assets in False Creek. Where required, provide direction and input on necessary policy amendments (e.g., zoning changes, development review).
  - Coordinate with provincial and federal regulators and asset owners including Ministry of Environment; Ministry of Forests, Lands, Natural Resource Operations, and Rural Development; Fisheries and Oceans Canada; Environment and Climate Change Canada.
  - Coordinate planning with Granville Island
  - Share information and maintain coordination with asset owners on vulnerability assessments and adaptation actions
  - Incorporate Fraser Basin Council's *Seismic Guidelines for Dikes* (professional practice guidelines to improve the seismic resilience of Lower Mainland dikes) when completed.
  - Coordinate with major developers, including Plaza, NEFC, Señákw and MST (I know this is in reconciliation, but it's also important just from their perspective as a major developer.)

● **Plan for reconciliation:** Ongoing coordination, collaboration, and engagement with Musqueam, Squamish, and Tsleil-Waututh Nations is critical given their interests and rights in False Creek, and, for Squamish, the emerging Seḥákw development. Incorporate City of Reconciliation policy, protocols, and procedures to engage Indigenous partners and collaborators.

- Specifically address Squamish, Musqueam, and Tsleil-Waututh values, and any cultural/archeological sites in False Creek.
- Support cultural programming and interpretative signage along False Creek.
- Integrate and coordinate flood management approaches in Seḥákw with broader False Creek adaptation approaches.
- Coordinate and support flood resiliency measures for Seḥákw.

● **Plan for transparency (education):** Flood management approaches should include educational and awareness building components that openly communicate flood risks facing the area, as well as the City's decision-making and management processes.

- Engage residents, businesses, stakeholders, and collaborators throughout the design and decision-making process of developing flood management strategies.
- Communicate that absolute protection is not feasible and that we should plan for safe-to-fail flood management approaches.
- Improve awareness of flood risk, sea level rise, and climate change through educational signage and interpretive features.
- Openly communicate flood risk to decision makers, asset owners, and the public.

● **Plan for Equity:** Ensure that future sea level rise planning and implementation integrates equity considerations into project processes (how we engage, and with whom) and outcomes (what is prioritized). Equity should be supported towards the promotion of justice and fairness and the removal of systemic barriers that may cause or aggravate disparities experienced by equity-seeking group.

- Apply an equity lens to future project communications (digital equity, translation of materials, accessibility) and engagement (honorariums to support participation, targeted outreach, youth-specific methods, etc.).
- Engage equity focused City Advisory Groups including the Urban Indigenous Peoples Advisory Group; Racial and Ethno-Cultural Equity Advisory Committee; Persons with Disabilities Advisory Committee; 2SLGBTQ+ Advisory Committee; Children, Youth and Families Advisory Committee; Seniors' Advisory Committee; and Trans, Gender Diverse and Two-Spirit Inclusion Advisory Committee.

● **Plan for cost-sharing:** Work with all levels of government, asset holders, and other stakeholders to implement short-, medium-, and long-term flood control infrastructure measures and maintenance efforts.

- Pursue funding strategies based on value and equity.
- Take advantage of opportunities that arise through infrastructure lifecycles and land redevelopment.
- Demonstrate public benefits beyond the protection of private land for publicly funded flood management projects.
- Prioritize and phase solutions to obtain the best value for money.

## Design Principles

*Design principles represent foundational guidelines for the design of coastal flood management approaches. The design principles were first developed during the 2018 Fraser River Coastal Adaptation Plan project. They were based on the accumulated knowledge and experience of the City and consultant team with coastal flood management. They were also informed by past project planning work including the sea level rise planning principles put forward in the third and final Coastal Flood Risk Assessment study that the City completed in 2018, which included:*

- Use the best available science and practice adaptive management.
- Seek adaptable, green, and robust solutions that can be phased over time.
- Seek flexible “no regret” actions with co-benefits.
- Pursue funding strategies based on value and equity.
- Take advantage of opportunities that arise through infrastructure lifecycles and land redevelopment.
- Take a risk-based approach.
- Be resilient by providing redundancy.

The six Coastal Adaptation Plan design principles were presented to the community at the two Fraser River open house events and through a citywide Talk Vancouver survey for feedback and refinement. The design principles will be used by landscape architects, engineers, city planners, and others to inform the design of the specific place-based coastal adaptation options.

The first round of False Creek community engagement (Community Conversations and Talk Vancouver community survey) presented the six principles for review and feedback for their application in False Creek. Feedback from the first round of Community Conversations and the Talk Vancouver survey clearly indicated that most participants and respondents felt the design principles were comprehensive and covered all their concerns.



The Talk Vancouver survey asked respondents to prioritize the design principles by importance to them. The principles are presented in the order they were ranked in the survey.

Supporting the design principles, design attributes were developed during the Fraser River Foreshore component of the Coastal Adaptation Plan in 2018. Design attributes are a subset of design principles that are intended to provide more detail about design considerations and elements under which they are organized. Multiple attributes can be employed across adaptation approaches to help ensure that co-benefits across both principles and community values area achieved. They are provided in Appendix C.



**Design for safe-to-fail infrastructure systems:** Ensure risks to lifeline<sup>4</sup> infrastructure and services are minimized, and that redundant systems are in place in case of failure.



**Design for safety and public health:** Ensure risks to lifeline infrastructure and services are minimized, and that public health and wellbeing are protected.



**Design for adaptability:** Develop flexible options that can adjust to a wide range of future conditions, including the pace of sea level rise, the height of sea level rise, and future land uses.



**Design with nature:** Ensure that approaches support ecological revitalization.



**Design for co-benefits:** Ensure that new approaches support multiple community values (e.g., recreation, health and wellbeing, communities and people).



**Design for access:** Improve access to False Creek and include recreational and interpretive opportunities where feasible.

4 Lifeline infrastructure includes the systems and facilities that provide services vital to the function of communities and society and are critical to natural disaster emergency response and recovery.



## Adaptation Approaches

*Coastal flood adaptation options can be organized into three general approaches – resist, accommodate, and move/avoid. During the second round of Community Conversations, participants were asked to review the general options and to provide feedback on them, including what they liked about them, what they did not like about them, and how they could improve the different options.*

Various concerns and comments were provided. One of the most prominent concerns was over the potential loss of homes and where people would relocate to. These concerns were stated particularly in the discussions about move and accommodate approaches. At the same time, people questioned the long-term efficacy of diking as part of the resist approach and raised concerns over how diking would hold up over the long-term or during events like earthquakes or tsunamis.

Some participants had questions about the logistics of raising roads and homes and buildings up to new Flood Construction Levels (FCLs) in the accommodate approach. Some participants also had questions around the City continuing to allow new development in the floodplain (e.g., St. Paul’s Hospital) given the long-term challenges.

The cost of each approach was also brought up, in terms of what the costs would be and who would cover them. While it is too early to discuss potential costs, the costs of implementing various approaches will likely be an ongoing concern and interest.

As expected at this early stage of conversation, there was a strong protection bias, with participants showing an interest in the resist approach, including looking at the possibility of a sea dam under the Burrard Street Bridge. There was also wide understanding that the path forward will likely involve a combination of approaches. The table summarizes consistent and common feedback on the three adaptation approaches.

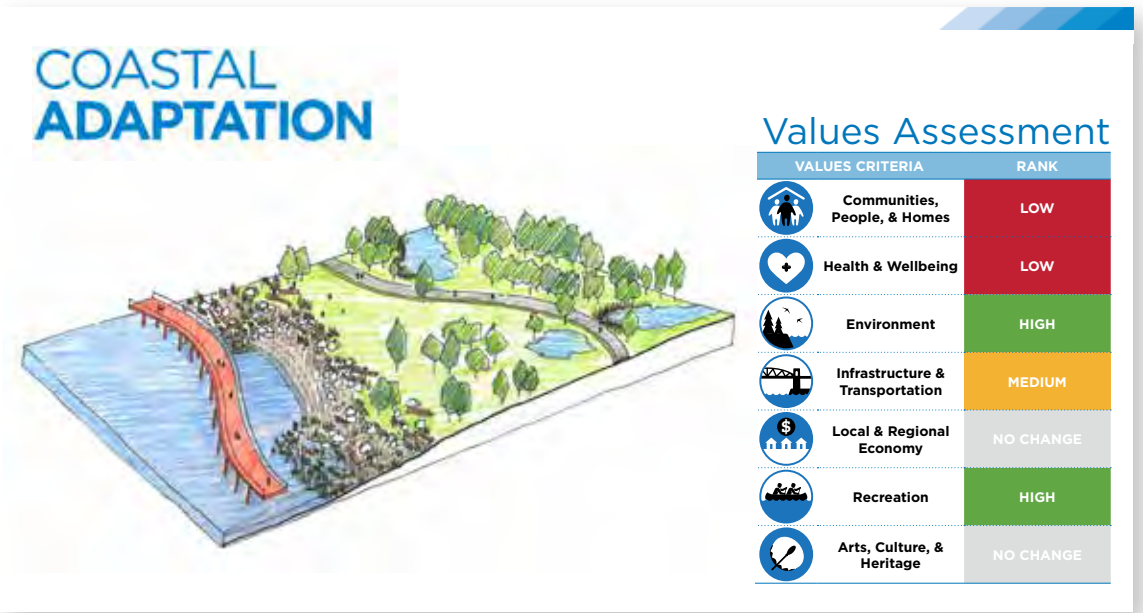
| ADAPTATION APPROACH | COMMON FEEDBACK AND CONCERNS   |
|---------------------|--|
| <b>Resist</b>       | <ul style="list-style-type: none"> <li>· Would help protect property values and communities over the short-term</li> <li>· Appreciation that in areas where infrastructure or buildings cannot be moved or accommodated, this may be the most effective option</li> <li>· Questions around long-term efficacy of diking with ongoing sea level rise</li> <li>· Questions and concerns on ability of dikes to hold up during earthquakes and tsunamis</li> <li>· Concerns over impact on shoreline access and Seawall experience</li> </ul>   |
| <b>Accommodate</b>  | <ul style="list-style-type: none"> <li>· Concerns over cost of retrofitting buildings to be dry/wet proofed</li> <li>· Concern over loss of homes that could be a part of any accommodate strategy</li> <li>· Concern about the burden of building stratas having to plan, implement, and monitor building scale adaptation approaches rather than investing in government managed adaptation approaches</li> <li>· Support for habitat creation benefits of approach</li> <li>· Support for flexibility of approach and use as a measure to deal with flood risks in the medium-term</li> </ul> |
| <b>Move/Avoid</b>   | <ul style="list-style-type: none"> <li>· Some participants see the approach as a “last resort”</li> <li>· Loss of property values a considerable concern with this approach</li> <li>· Concern over the loss of land for housing and impacts on affordability</li> <li>· Appreciation for the potential to create new shoreline habitat and parks</li> <li>· Support as a long-term (100+ year) strategy (i.e., “don’t build or re-build in the floodplain”)</li> </ul>  |

## Principles, Values, and Future Option Evaluation

Design principles represent foundational guidelines that were first developed during the 2018 Fraser River Coastal Adaptation Plan project. They will be used by landscape architects, engineers, city planners, and others to inform the design of specific place-based coastal adaptation options to be explored in later stages of sea level rise planning work, including the Sea2City Design Challenge. The design of adaptation options will also be informed by community values elicited through the Coastal Adaptation Plan.

As a values-based planning program, the Coastal Adaptation Plan will use community values in the evaluation of future adaptation options to help ensure that the potential flood options incorporate community concerns. They will also help ensure program transparency which will support future conversations around potential trade-offs within and between community values (e.g., How does the option respond to community values? How could the option be improved to better incorporate community values?).

In future project phases, measures will be developed for the identified values and will be used along with more technical engineering and risk criteria to help more fully evaluate coastal adaptation management options. Risk assessment criteria will include a summary of the likelihood and impact of a failure and will consider how well the option would perform during hazards such as an earthquake, or a large flood event (i.e., 1:500 storm). The technical assessment would consider things such as capital cost, operations and maintenance cost, and future adaptation cost (i.e., the cost of adapting the option to higher sea levels). The values criteria would also be used in future project engagement and communications to support ongoing community conversations and to help illustrate how well options meet (or do not meet) community values.



The figure above shows how an illustrative adaptation option could be evaluated against community values, with the High, Medium, Low scores indicating how well the option incorporates each value using current conditions as a baseline against which it is measured. Those values with no score indicate no change from the baseline. In future evaluations, detailed descriptions of the anticipated impacts to community value would be provided. A supporting Coastal Adaptation Plan Values Primer (City of Vancouver, February 2021) has been produced which provides more information on how the Coastal Adaptation Plan will use values-based criteria identified in early public engagement and outreach in False Creek alongside technical criteria in a framework to assess future coastal adaptation options over the medium- and long-terms.

# Sea2City Design Challenge

*Both rounds of False Creek Coastal Adaptation Plan engagement introduced participants to the next phase of the Coastal Adaptation Plan to be undertaken by the City, the Sea2City Design Challenge.*

To start in later 2021, the Sea2City Design Challenge will create a vision to guide urban development and ecological revitalization in False Creek and along the Fraser River Foreshore. The project will engage multidisciplinary teams to work co-operatively with the City of Vancouver and project partners to:

- Increase public awareness of climate change and sea level rise.
- Expand the City's toolbox of coastal flood management approaches.
- Explore coastal adaptation approaches that respond to the social equity, economic, and ecological challenges posed by sea level rise and coastal flooding.
- Investigate coastal adaptation approaches for sea level rise beyond 1 metre.

Participating teams will be guided by the community values, planning principles, and design principles developed through the Coastal Adaptation Plan project for the Fraser River Foreshore and False Creek. Sea2City will also include additional engagement with residents, business owners, community groups, and xʷməθkʷəy̓əm (Musqueam), Skwxwú7mesh (Squamish), and səliwətaɬ (Tsleil-Waututh) Nations.

The Sea2City Design Challenge will engage two multidisciplinary teams selected through a competitive application process to:

- Provide detailed, site-specific flood management designs for four sites (two per team) in False Creek (the Challenge Sites).
- Provide a map illustrating a proposed alignment for the False Creek "Ribbon." The Ribbon demarcates a potential alignment from the East Basin along the north and south shores of False Creek where future flood protection structures could be developed.
- Engage with community groups, including a Community Advisory Group established for the Challenge during three rounds of engagement events and activities.
- Take part in participatory and collaborative public learning and design events, including a joint design charrette for an additional site in False Creek at the end of the project.

The identified Challenge Sites were selected by the City to represent the varied land use typologies found in False Creek and also represent a range of coastal flood management constraints and opportunities. The sites include high density mixed-used neighbourhoods, lower density residential areas, mixed-use local commercial areas, and valued public spaces.



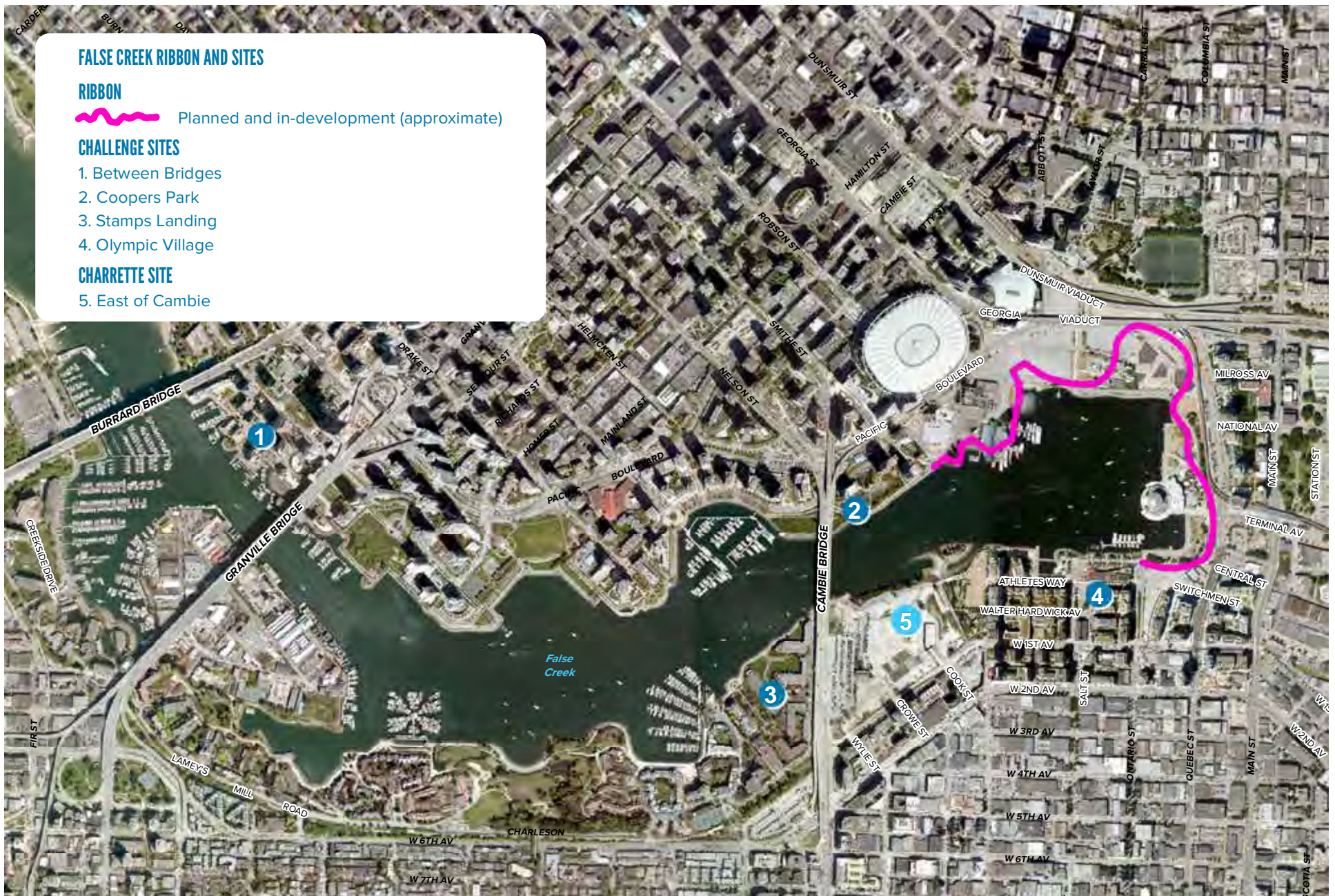
The City of Vancouver has begun to plan and implement flood protection structures (berms, dikes, and seawalls) in the False Creek Basin (the eastern portion of False Creek). The Sea2City Coastal Design Challenge refers to these structures and their general alignment as the “Ribbon”. The two selected design teams will be asked to illustrate a proposed alignment for the remainder of the False Creek “Ribbon,” showing where future flood protection structures could be developed, highlighting future connection considerations between False Creek west of Burrard Bridge (i.e., Kitsilano and Sunset Beach/English Bay).

During the final round of public events, the two teams will be asked to work together on a collaborative, public design charette for a City-owned area between Olympic Village and the Cambie Bridge. The charette will provide an opportunity for the teams to work together with the City to apply learning from the Sea2City Design Challenge to the undeveloped site as part of wrap-up celebrations for the initiative.

Outputs from the Sea2City Design Challenge will be used to inform and develop the City’s Coastal Adaptation Plan. The Coastal Adaptation Plan will provide a framework and vision to guide urban development and ecological revitalization in False Creek. The Sea2City Design Challenge is planned to launch in late 2021 and be complete within 18-months of the official launch date.

Project outcomes will also be used to inform the City’s work on the Vancouver Plan, and any updates to Vancouver’s next iteration of the Greenest City Action Plan, the Resilient Vancouver strategy, and other emerging and ongoing City planning initiatives and programs (e.g., Sewage and Rainwater Management Plan).

MAP: False Creek Challenge Sites



# Recommendations and Considerations

*The following recommendations were developed by the project consultant team and City staff based on an analysis of project outputs and feedback from residents, business owners, asset owners and operators, and other project stakeholders. They are intended to help ensure that valuable lessons learned from first phase of the False Creek Coastal Adaptation Plan are carried forward to help guide future project phases, including the Sea2City Design Challenge.*

## **Continue public education around the existing coastal flood risk in False Creek.**

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Even without climate change and sea level rise, large areas of False Creek are at risk from coastal flooding resulting from a major storm event. However, many residents, asset operators, and businesses who participated in the project were not aware of the extent and depths of potential flooding in the False Creek floodplain. Continued public education and awareness-building on the part of the City is required to address this issue and improve community resilience in the area.

Public education should also include frank and honest discussion around the accelerating pace of climate change and sea level rise, planning in a context of uncertainty, and the potential for Vancouver to expedite their planning program to better manage future risk.

Greater awareness and understanding of the challenges and opportunities embedded in coastal adaptation in a dense urban area like False Creek will also help build support for the eventual implementation of future flood management options.

## **Continue to refine and validate community values in future project phases.**

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As a values-based, participatory planning process, the community values identified during the first two phases of the Coastal Adaptation Plan (Fraser River and False Creek) will be a critical component of future planning work. This future work includes the Sea2City Design Challenge, planning in other Vancouver coastal neighbourhoods (Downtown and Port Lands, Jericho-Kitsilano), and longer-term work in False Creek and along the Fraser River Foreshore. Residents, business owners, and other stakeholders who did not participate in the first phases of the project will be engaged in future phases, particularly as preliminary flood adaption options are developed and evaluated beginning with the Sea2City Design Challenge. To ensure there are as few gaps as possible, and to fully engage new participants, it is important to continue eliciting, refining, and prioritizing community values in future project phases. Furthermore, over time and with growing awareness of the challenges posed by climate change, sea level rise, and coastal flooding, community values and priorities may shift.

### **Maintain values-based, participatory process through future project phases.**

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Participant feedback collected during the two rounds of Community Conversation and other outreach indicates that the City's commitment to participatory, values-based planning was strongly supported. Given that trade-offs and difficult conversations will be inevitable as the project moves into future phases, maintaining this commitment going forward will be a critical component of ongoing relationship-building with residents and key project partners. A continued focus on a values-based, participatory process will help maintain a transparent and open approach to planning with the community and project partners.

### **Continue to work with and collaborate with xʷməθkʷəy̓əm (Musqueam), Skwxwú7mesh (Squamish), and səliwətaʔ (Tseil-Waututh) Nations as key partners.**

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The City of Vancouver should continue building relationships and building awareness of coastal flood risks with Musqueam, Squamish, and Tseil-Waututh through established channels and protocols. Working with them to help the broader community better understand False Creek from Indigenous perspectives is also critical, and an important part of ongoing reconciliation efforts at the City. Squamish Nation in particular has an important role in future phases of the False Creek Coastal Adaptation Plan project with reserve lands and the planned Seńákw development site in False Creek around the west end of Burrard Bridge.

### **Continue to collaborate with and engage youth and equity-seeking groups.**

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Climate change and sea level rise will continue to disproportionately impact equity-seeking groups and youth. Recognizing this, the City should continue to ensure that future planning and implementation integrates equity into project processes (how the City engages, and with whom) and outcomes (what is prioritized). Equity should be supported towards the promotion of justice and fairness and the removal of systemic barriers that may cause or aggravate disparities experienced by equity-seeking groups. Current and future coastal adaptation planning must also reflect youth perspectives and lived experience.

### **Continue to engage asset owners and operators.**

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The False Creek floodplain is home to major infrastructure, including critical lifeline infrastructure. Feedback from a workshop for asset owners with facilities and linear utilities located within the study area confirmed a strong desire to stay engaged in the False Creek Coastal Adaptation Plan process and to build on the preliminary vulnerability assessment carried out in the workshop. The workshop also underscored the need for the City to continue building relationships with the asset owners going forward into future phases of the project, particularly for those areas where City facilities and critical lifeline infrastructure are clustered in the False Creek Flats area.

# Appendices

Appendix A: Asset Owners Workshop – Summary Report

Appendix B: Community Survey Summary Report

Appendix C: Design Attributes

## Appendix C: Design Attributes

*Attributes are a subset of design principles that provide more detail about design considerations and elements intended to operationalize and support the principle(s) under which they are organized. The attributes were developed during the Fraser River Foreshore component of the Coastal Adaptation Plan in 2018. They were developed by project consultants and presented to community members, stakeholders and City staff for feedback and refinement. Multiple attributes can be employed across adaption approaches to help ensure that co-benefits across both principles and community values area achieved.*



### **Design for safe-to-fail infrastructure systems**

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- Relocation of lifeline infrastructure and services out of the floodplain should be the first consideration
- Where relocation is not possible, lifeline infrastructure should be protected to higher standards (e.g., 1:10,000) than non-lifeline infrastructure
- Where relocation is not possible, robust strategies to reduce the consequence of failed lifeline infrastructure should be developed and implemented to ensure continuity of critical services
- Wet proof/ dry proof strategies



### **Design for safety and public health**

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- Adaptation strategies should first focus on seeking opportunities for relocation
- Where risk to public health and safety is high (e.g., higher density, community amenities, brownfield sites) and relocation is not feasible, build in redundancy through the incorporation of multiple structural and non-structural flood management approaches (e.g., protective dike, building wetproofing, emergency warning system, public education and communications), as well as build to higher flood protection standards
- Ensure floodplain can be preventively evacuated within 24-hours. If this is not feasible, ensure safe havens (areas inside the threatened zone that will not be affected) are built to high safety standards
- Flood management approaches developed on brownfields should minimize risk of water contamination during construction and flood inundation
- Seek strategies that lower the vulnerability of at-risk and vulnerable populations and coordinate with emergency response planning
- Built in redundancy, such as wet proof buildings
- Flood tolerant land uses, such as parking located below FCL
- Elevate or raise critical access roads
- Remove contaminants from flood zones
- Relocate homes from flood zone where possible



## Design for adaptability

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- Prioritize options that can be phased with increasing levels of sea level rise
- Prioritize options that continue to be feasible with more than 2 meters of sea level rise
- Areas where flooding would have higher consequences should be protected to higher standards than areas with lower consequences (e.g., parks and community amenities should not be protected to the same standards)
- Resist features (e.g., dikes, sea walls) phased over time with increasing sea level rise
- Tiered development with flood tolerant uses, such as pathways, at lower elevations
- Flood Construction Levels (FCLs) raised over time
- Sponge parks or flood parks
- Raise roads
- Relocate over time
- Flood tolerant building techniques (e.g., stilts, floats, wet-proof, dry-proof)



## Design with nature

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- Restore, rehabilitate or create new foreshore habitat areas where practical
- Address overland flooding hazards by prioritizing 'at source' solutions (e.g., green infrastructure)
- Where feasible allow for river channel migration or expansion to accommodate additional flows (riverine, freshet flooding hazard)
- Work with the natural water dynamics
- Utilize Green Shores\* techniques for resist approaches
- Sea wall with habitat features
- Green infrastructure (overland flooding)
- River channel migration
- Expanded riparian areas
- Remove sea walls and barriers and restore foreshore habitat

\* Green Shores is a program of the Stewardship Centre for BC. It provides science-based tools and best practices to help communities and people minimize the impacts of new developments, and to restore shoreline ecosystem function of previously developed sites. Projects can also receive certification through our credits and rating system.



## **Design for access**

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- Integrate shoreline access and trails into flood management approach
- Ensure access to docks, piers and marinas
- Ensure access to shoreline access and trails where practical
- Seek opportunities to improve trail connections and shoreline access
- Trails on flood management features (e.g., trails on dikes)
- Improve shoreline access
- Improved access to recreation (e.g., nature watching, fishing, paddling)



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WORKSHOP

