



**Ministry of Forests, Lands, Natural Resource Operations
and Rural Development**

Flood Hazard Area Land Use Management Guidelines Sea Level Rise Amendment

Effective January 1, 2018

What are the Flood Hazard Area Land Use Guidelines used for again?



Flood Hazard Area Land Use Management Guidelines

- Provincial guidelines intended to minimize injury and property damage resulting from floods
- Intended to support land use and development decisions broadly
- Recommend setbacks and flood construction level (FCL) for various hazard types
- *Local Government Act* – Local governments “must consider” guidelines when making bylaws for designated sea level rise (SLR) planning areas
- Linked to Compensation and Disaster Financial Assistance Regulation for determining “properly flood protected” properties in designated SLR areas

FLOOD HAZARD AREA LAND USE MANAGEMENT GUIDELINES



Updated by the Ministry of Forests,
Lands, Natural Resource Operations
and Rural Development – January 2018

Amendment to Sections 3.5 and 3.6

- The provincial guidelines have been amended to define SLR planning areas and to incorporate sea level rise into the determination of building setbacks and flood construction
- The amendment affects communities where potential flood levels will be increased by sea level rise
- The amendment comes into effect on **January 1, 2018**
- *In the absence of more site-specific studies of information by a qualified Professional Engineer, the Flood Hazard Area Land Use Management Guidelines are the recommended provincial minimum requirements for land use management in flood hazard areas*

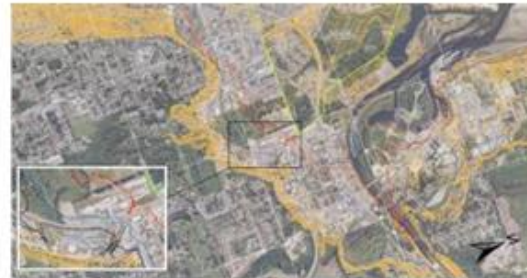
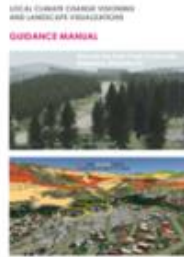
Flood Hazard Assessments

- The management of land use in coastal flood hazards may require flood hazard assessments to be completed by a suitably qualified Professional Engineer, experienced in coastal engineering. The standards of practice that these Professionals should follow include those outlined in the most recent revision of the “Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC”, published by Engineers and Geoscientists of BC.
- The Professional Practice Guidelines provide for use of risk based assessment methodologies not considered by this Amendment. Those choosing to base approval decisions on risk assessments prepared by Professional Engineers, must ensure the changes in risk over time due to sea level rise are fully taken into account.

How did this amendment come about?



Timeline of Milestones



Fraser River Hydraulic Model Update

BC's Adaptation Strategy

CALP's Local Climate Change Visioning "Guidance Manual"

Coastal Floodplain Mapping Guidelines and Coast Flood Hazard Areas

APEG Professional Practice Guidelines

Technical Working Group formed for FHALUM Guidelines Amendment



Examination of Factors Affecting Relative and Absolute Sea Level in BC

IPCC Temperature & Sea Level Rise in various scenarios

Projected Sea Level Changes for BC in the 21st Century

BC's Adaptation Strategy

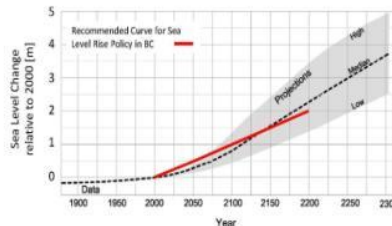
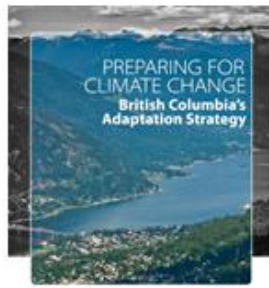
Seismic Design Guidelines for Dikes

Guidelines for Sea Dikes and Coastal Flood Hazard Land Use

Cost of Adaptation Report

Sea Level Rise Adaptation Primer

Amendment to Flood Hazard Area Land Use Management Guidelines



What type of engagement and consultation took place?



Engagement and Consultation

Review, discussion, and input was sought and incorporated into the amendment, including from the following agencies:

- Fisheries & Oceans Canada
- Natural Resources Canada
- Multiple Provincial Ministries
- Experts from the University of BC and University of Victoria and Simon Fraser University
- Numerous private sector professionals
- Engineers and Geoscientists BC
- 113 coastal First Nations



Engagement and Consultation

A technical working group (TWG) was formed in 2014 consisting of 20 local governments and representation from the Union of BC Municipalities.

Advice and recommendations from the TWG and from written submissions were invaluable in drafting the final amendment for approval by the Province's Water Policy and Legislation Committee.

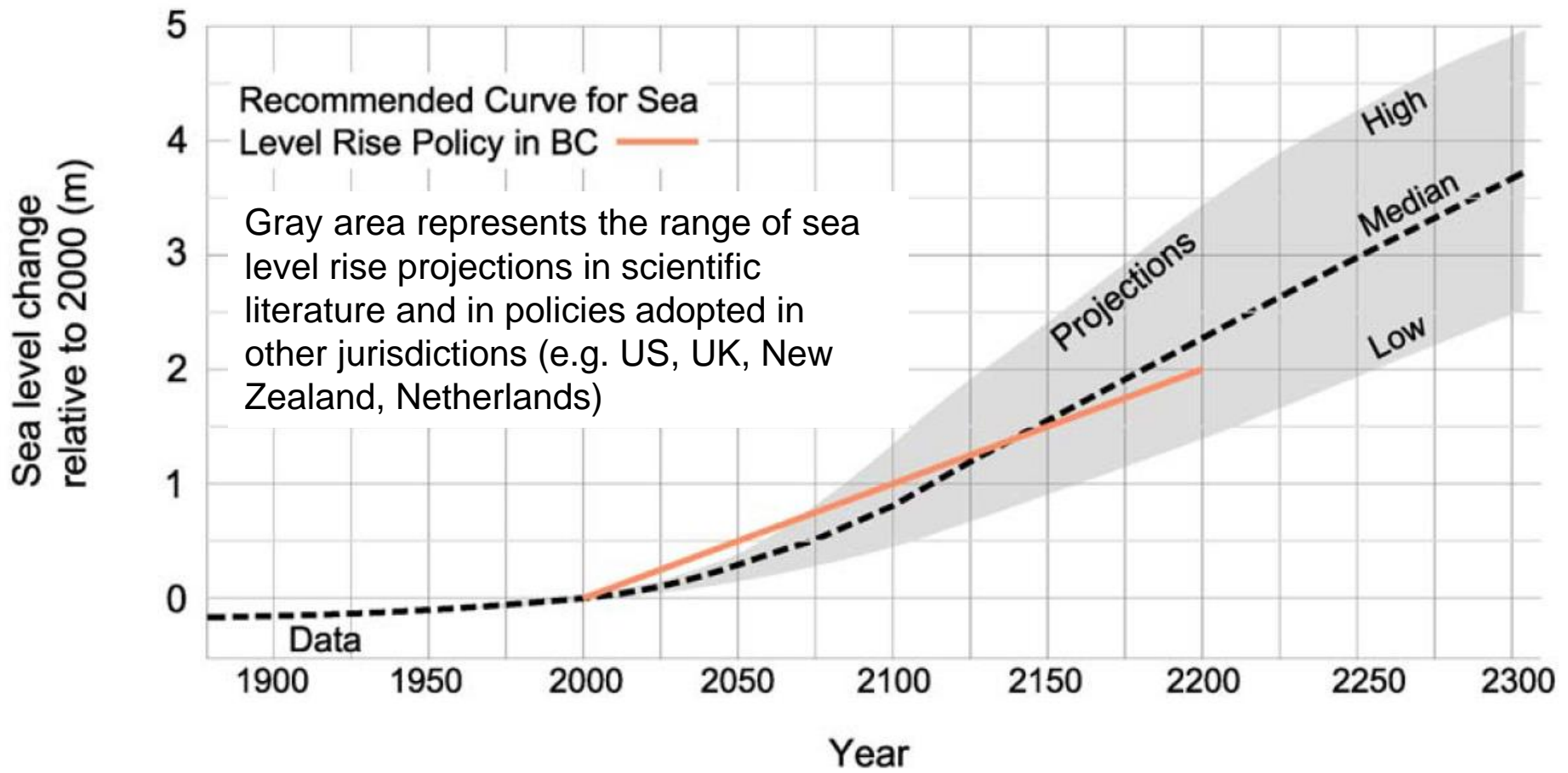
The local government representation on the TWG consisted of staff from:

District of West Vancouver	Town of View Royal	Corporation of Delta
Juan de Fuca EA (CRD)	District of Squamish	District of Tofino
City of Vancouver	City of Nanaimo	District of Sooke
City of Surrey	Strathcona Regional District	Islands Trust
City of Richmond	City of Campbell River	Town of Qualicum Beach
District of North Saanich	Town of Sidney	City of Victoria
Capital Regional District	Cowichan Valley Regional District	

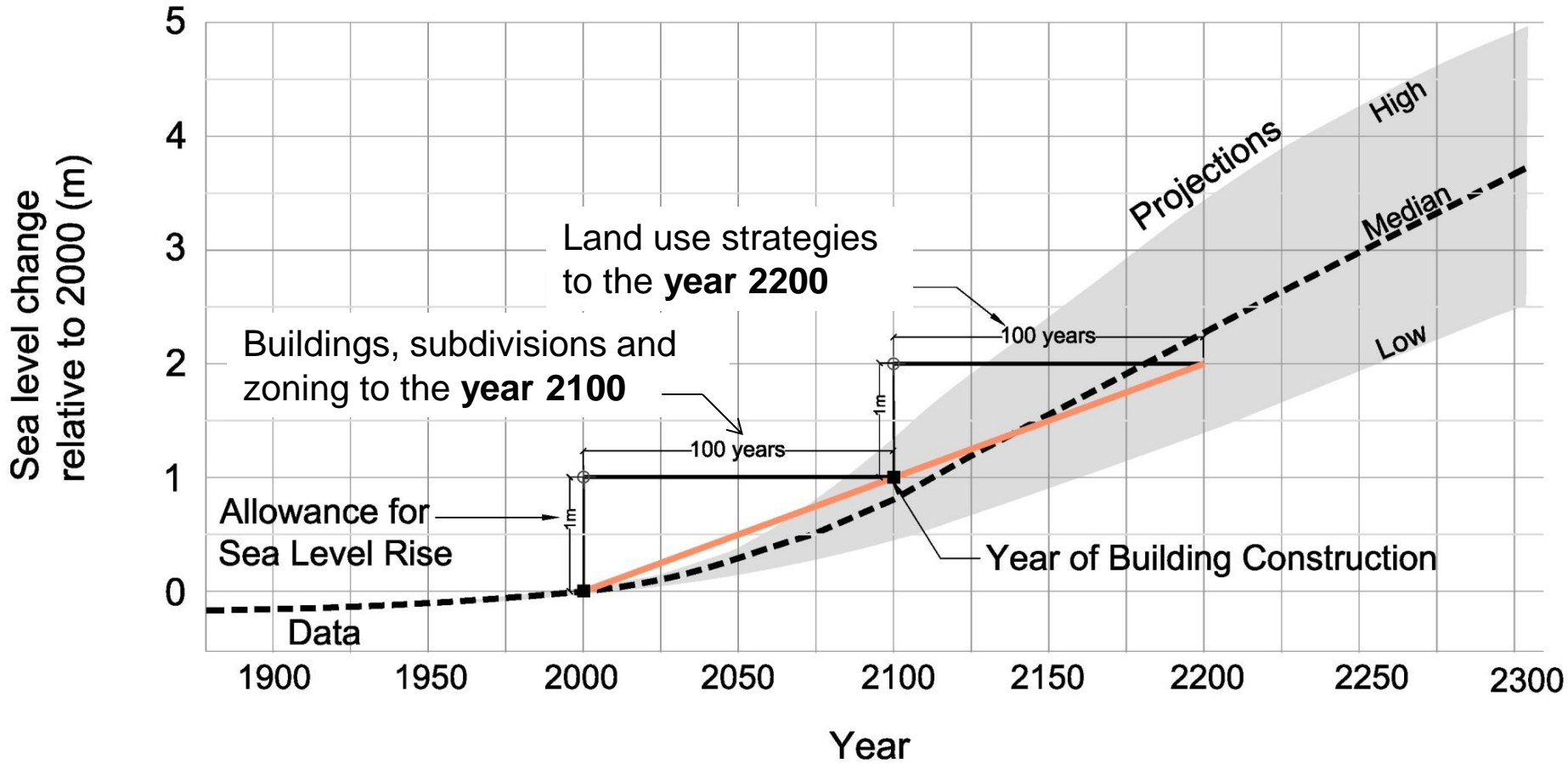
What did the science say about expected sea level rise and how far out should we be looking?



Recommended Curve for Sea Level Rise



Plan for 0.5m sea level rise by 2050, **1.0m by 2100**, and 2.0m by 2200 (based on year 2000 and adjusted for regional uplift or subsidence)



What are the highlights of this amendment?



Amendment Highlights

General

In the absence of more site-specific studies or information by a qualified Professional Engineer, these guidelines are the recommended provincial minimum requirements for land use management in flood hazard areas.

Current Guideline	Amendment
No sea level rise	Sea level rise (SLR) planning encouraged
Flood hazard based on designated flood with a 1:200 annual exceedance probability (AEP)	SLR to 2100 for buildings, zoning, subdivisions
	SLR to 2200 for land use adaptation
	1:200 (minimum) return period water level for combined high tide and storm surge

1:200 AEP event has a 22% probability of occurring once in a 50 year period and 39% probability of occurring once in a 100 year period.

Amendment Highlights

Flood Construction Level

Current Guideline	Amendment
<p>Strait of Georgia:</p> <p>1.5m above elevation of natural boundary</p>	<p>Greater of FCLs calculated based on tsunami hazard (if present) or:</p> <ul style="list-style-type: none">• Sea level rise to year 2100• Land uplift/subsidence to 2100
<p>Outside Strait of Georgia:</p> <p>Determined by site-specific analysis of tsunami hazard (professional report)</p>	<ul style="list-style-type: none">• 1:200 Annual Exceedance Probability as determined by probabilistic analyse of tides and storm surge*• Wave effects for design storm• Freeboard

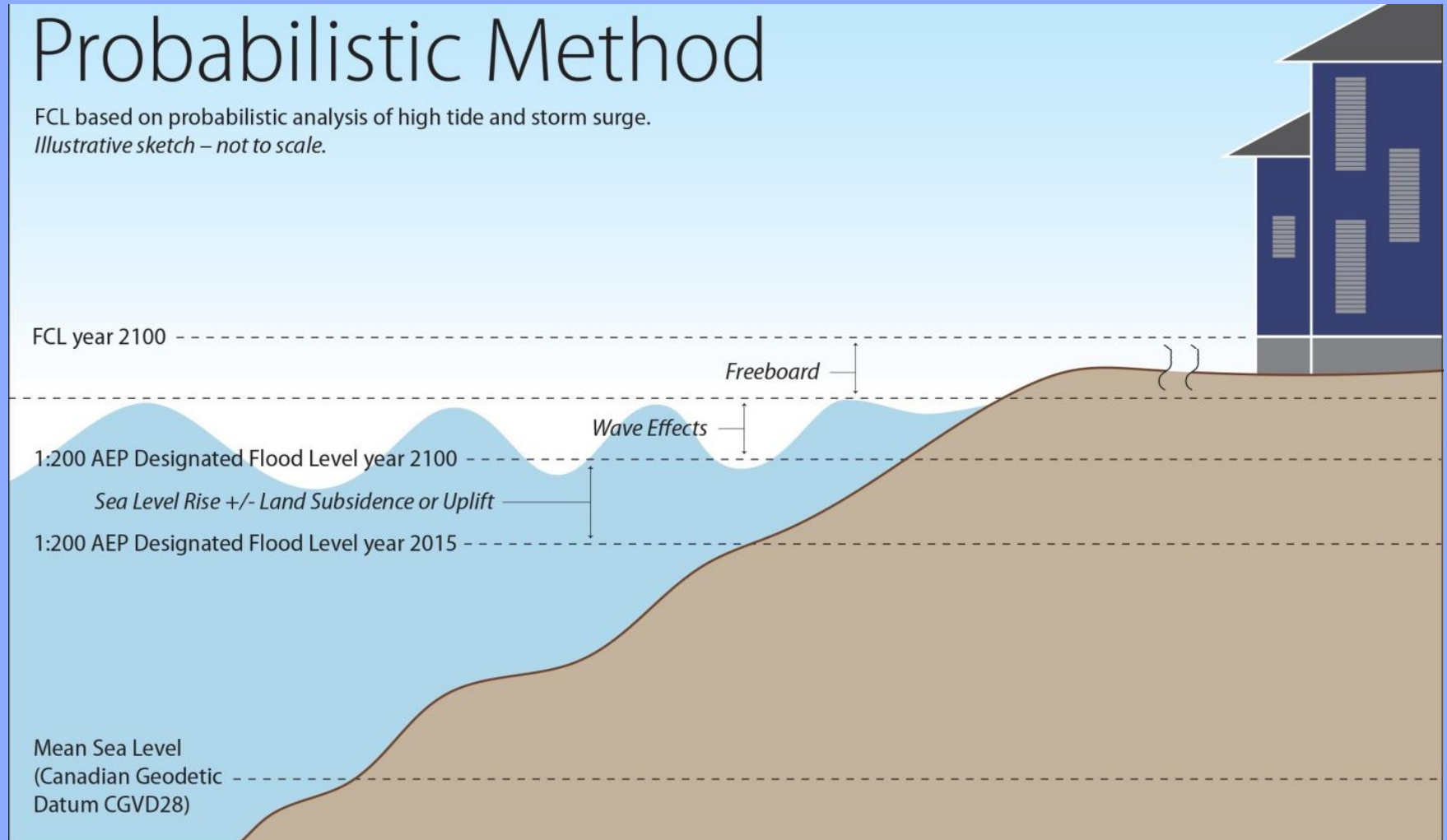
* A more conservative “combined method” is available as an alternate method to determine FCLs.

Two Methods for Determining the Flood Construction Level in **Non-Tsunami** Areas

Probabilistic Method

FCL based on probabilistic analysis of high tide and storm surge.

Illustrative sketch – not to scale.

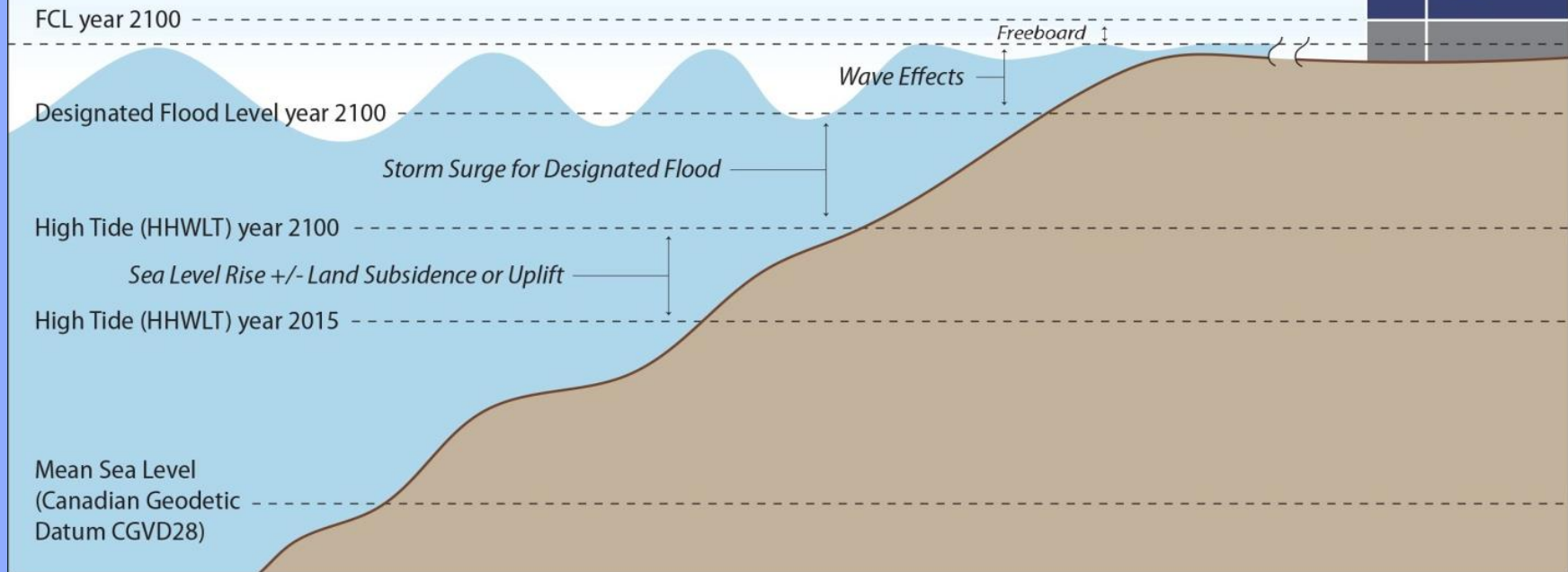


Two Methods for Determining the Flood Construction Level in **Non-Tsunami** Areas

Combined Method

FCL based on high tide (HHWL) plus storm surge.
Illustrative sketch – not to scale.

MORE CONSERVATIVE



Amendment Highlights

Setbacks

Current Guideline

Strait of Georgia:

- Buildings: 15m from natural boundary
- Fill/dikes: 7.5m from natural boundary (non-erodible)
- Erosion hazards may require increased setbacks
- Special conditions for coastal bluffs

Outside Strait of Georgia:

Determined by site-specific analysis of tsunami hazard (professional report); minimum 30m

Amendment

Strait of Georgia:

- 15 m from estimated location of future natural boundary based on:
- Sea level rise to year 2100
 - Land uplift/subsidence to 2100
 - 1:200 water level for high tide + storm surge for design storm
 - Wave effects for design storm
 - Freeboard

Outside Strait of Georgia:

Determined by site-specific analysis of tsunami hazard (professional report); minimum 30m from estimated location of future natural boundary

Areas Subject to Significant Tsunami Hazard

- Subdivision applications in tsunami prone areas (zones A,B,C and D as shown on the “Tsunami Notifications Zones for BC” map following slide)
- Setbacks and FCL for tsunami hazards must be determined for each proposed lot by a qualified Professional Engineer experienced in coastal engineering
- Setback must be sufficient to protect buildings and must be at least 30m from the 2100 estimated (future) natural boundary
- Reductions should only be considered where the building can be built to Tsunami FCL on bedrock

Tsunami Notification Zones for BC



Tsunami Notification Zones

- A** ZONE A - THE NORTH COAST AND HAIDA GwaiI
- B** ZONE B - THE CENTRAL COAST AND NORTHEAST VANCOUVER ISLAND COAST INCLUDING KITIMAT, BELLA COOLA, AND PORT HARDY
- C** ZONE C - THE OUTER WEST COAST OF VANCOUVER ISLAND FROM CAPE SCOTT TO PORT RENFREW
- D** ZONE D - THE JUAN DE FUCA STRAIT FROM JORDAN RIVER TO GREATER VICTORIA INCLUDING THE SAANICH PENINSULA
- E** ZONE E - THE STRAIT OF GEORGIA INCLUDING THE GULF ISLANDS, GREATER VANCOUVER AND JOHNSTONE STRAIT

What is an estimated (future)
natural boundary?



Boundaries Now and Then

Natural boundary is defined in the *Land Act*:

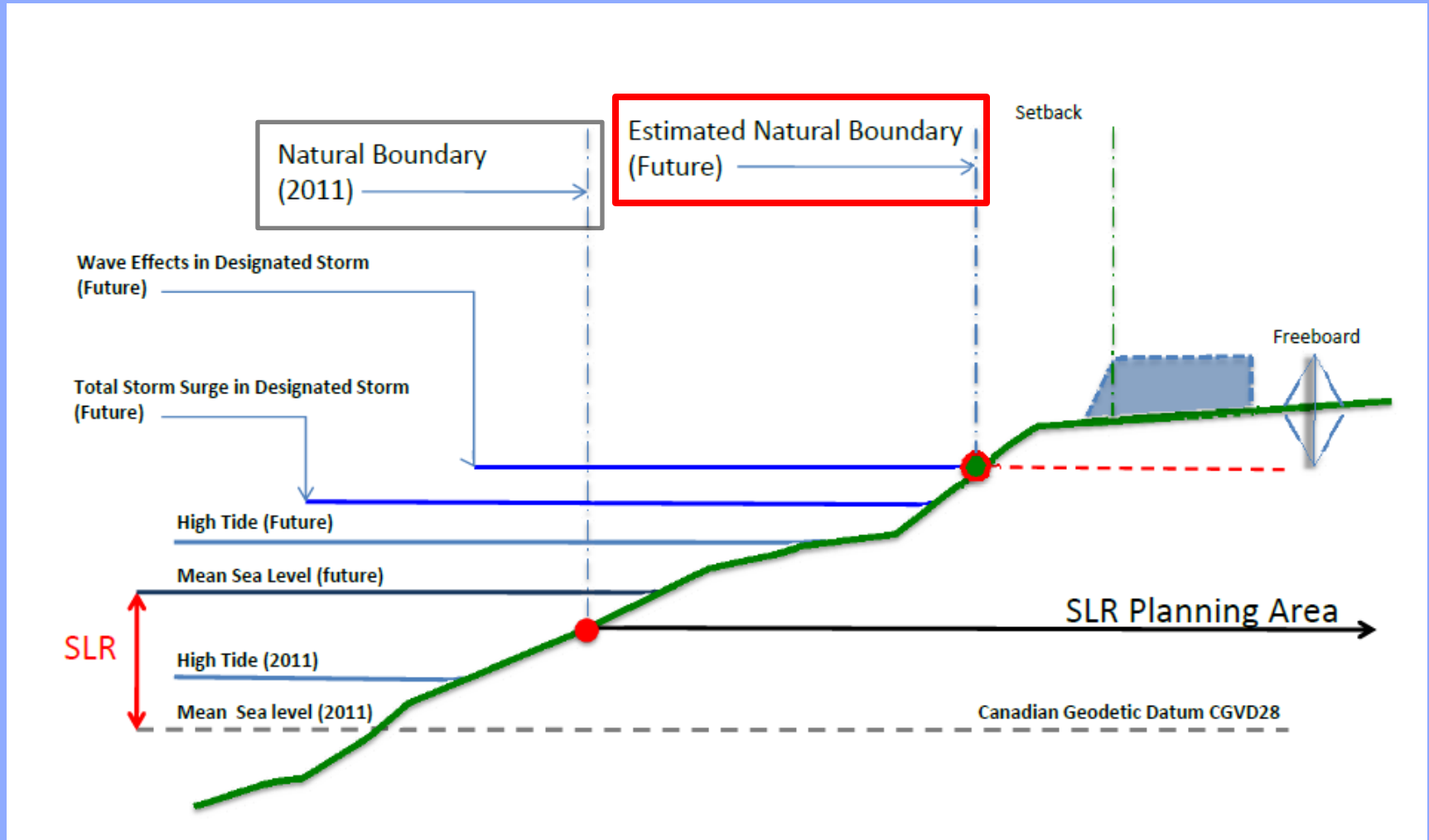
"natural boundary" means the visible high water mark of any lake, river, stream or other body of water where the presence and action of the water are so common and usual, and so long continued in all ordinary years, as to mark on the soil of the bed of the body of water a character distinct from that of its banks, in vegetation, as well as in the nature of the soil itself;

For defining sea level rise planning areas a new approach involving estimating the **future location of the natural boundary** is required.

The **future natural boundary** now includes for sea level rise (with regional uplift or subsidence), high tide, storm surge, wave effects, and minimum freeboard.

Defining the Sea Level Rise Planning Area

Natural versus Estimated (Future) Natural Boundary

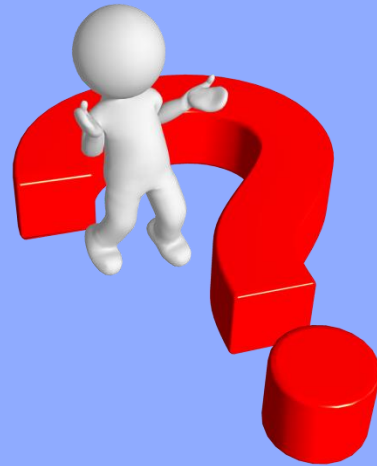


SLR Planning Areas

Sea level rise planning areas should include areas exposed to coastal flood hazards, diked areas and inland floodplains adjacent to tidally influenced rivers.

Lands within a designating SLR planning areas may be designated as flood plains under Section 524 of the *Local Government Act* to allow the specification of flood levels and setbacks, by bylaw, to address sea level rise.

Where can I find more
information?



Resources

Amendment to Sections 3.5 and 3.6 of the FHALUMG:

<https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/flood-hazard-land-use-management>

Technical reports referenced in the amendment:

Draft Policy Discussion Paper (Ausenco Sandwell)

http://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/integrated-flood-hazard-mgmt/draft_policy_rev.pdf

Sea Dike guidelines (Ausenco Sandwell)

http://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/integrated-flood-hazard-mgmt/sea_dike_guidelines.pdf

Coastal Flood Hazard Land Use (Ausenco Sandwell)

http://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/integrated-flood-hazard-mgmt/guidelines_for_mgr_coastal_flood_land_use-2012.pdf

Other sea level rise documents:

Sea Level Rise Adaptation Primer

<http://www2.gov.bc.ca/assets/gov/environment/climate-change/adaptation/resources/slr-primer.pdf>

An Examination of the Factors Affecting Relative and Absolute Sea Level in Coastal British Columbia

http://publications.gc.ca/collections/collection_2015/mpo-dfo/Fs97-18-260-eng.pdf

All links were tested at the time of posting this presentation, but this document will not be updated to reflect any changes to addresses.



Ministry of **F**orests, **L**ands, **N**atural Resource **O**perations and **R**ural **D**evelopment

Visit the Integrated Flood Hazard Management website at:

<https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management>

