City of Vancouver *Land Use and Development Policies and Guidelines*

Planning, Urban Design and Sustainability Department

453 West 12th Avenue, Vancouver, BC V5Y 1V4 | tel: 3-1-1, outside Vancouver 604.873.7000 | fax: 604.873.7100
website: vancouver.ca | email: planning@vancouver.ca | app: VanConnect

FLOOD PLAIN STANDARDS AND REQUIREMENTS

Adopted by City Council on September 16, 2014
Effective January 1, 2015
Amended March 7, 2023

Contents

1.0 Application and Intent

The purpose of this document is to provide guidance on meeting the City's designated flood plain standards as described in the Vancouver Building By-law and applied to building permits and subdivisions**.** The flood plain standards apply to all lands designated as flood plains and subject to flood construction level (FCL) requirements. Further review and revision of the designated flood plain areas and associated regulations is anticipated as global sea level rise and storm surge projections are refined over time and local impacts are better understood.

Note: Appendices A and B of this document contain the relevant sections of the Vancouver Building By-law related to construction on flood plains, flood construction levels, regulations related to designated flood plains and designated flood plain maps. For more information, visit the City of Vancouver website at **www.vancouver.ca**.

The City's flood construction levels (FCLs) and regulations seek to:

- reduce or prevent injury, human trauma and loss of life in the case of a flood,
- to minimize property damage during flooding events, and
- to reduce the amount of time it takes to return to operational functionality when flood waters recede.

2.0 Provincial Standards

The Province of BC publishes guidelines to support local governments in drafting flood management related policies and bylaws. The most recent official guidelines are the 2004 "Flood Hazard Area Land Use Management Guidelines." The Province is in the process of updating these guidelines to include considerations for sea level rise, based on a previously release technical document, "Climate Change Adaptation Guidelines for Sea Dikes and Coastal Flood Hazard Land Use" (Ausenco Sandwell, 2011), and consultation with location governments.

In general, flood construction levels[1] (FCLs) are determined by site specific modelling as outlined in the Provincial Guidelines. The setback requirements are from the Provincial Guidelines and vary depending on the flood hazard type. The City of Vancouver FCL's are based on a coastal flood risk assessment that considered sea level rise of 1m. The approach used by the City in establishing its FCL's is consistent with provincial guidelines and technical documents.

3.0 Flood Resilience

Enhancing flood resilience is achieved by:

- Meeting FCLs through the placement of fill and/or structural means;
- Restricting development near the water and requiring buildings to be setback;
- Providing adequate drainage systems; and
- Implementing flood resilient construction and/or protective measures to reduce the damage caused from flooding and reduce the recovery time from flood events.

For buildings located on a designated flood plain, the Chief Building Official may require that a restrictive covenant be registered against the title of the property under section 219 of the Land Title Act. The property owner should expect to enter into a covenant early in the building permit application process with finalization required prior to occupancy. For subdivision requirements, please see the section below.

Application – Land Use Specific

The following minimum requirements should be considered to guide development away from high hazard areas and to allow development to proceed in a safe manner. These minimum requirements should be place in the form of a covenant against land title as the time of subdivision and/or building permit issuance.

[1] A flood construction level is the minimum elevation of the underside of a floor system or the top of a concrete slab of a building used for habitation, business or the storage of goods damageable by flood water.

3.1 Agriculture

3.1.1 Livestock Housing

FCL -
Open-sided livestock structures do not require flood proofing by elevation.

Closed-sided livestock housing not behind Standard Dikes shall be located with the underside of a floor system or the top of a concrete slab no lower than the FCL minus freeboard. Main electrical switchgear shall be no lower than the FCL.

3.1.2 Other Farm Buildings

FCL –
Flood proofing by elevation may not be required where it does not create an unsafe or hazardous condition.

3.2 Public Recreation, Institutional Buildings, Parks and Open Space

FCL –
Institutional and closed-sided recreational buildings and/or equipment damageable by floodwaters require full flood proofing.

Recreation shelters, stands and other outdoor facilities susceptible to only marginal damage by floodwaters do not require flood proofing by elevation.

3.3 Industrial Areas

Industrial buildings may be granted special relief from this requirement. Setback requirements for certain industrial activities, such as on-loading and off-loading facilities, where the use of the waterfront is a necessary subsidiary part of the operation and would not adversely affect a floodway or significantly increase flood elevations, may be reduced.

FCL –
Industrial uses, other than main electrical switchgear, shall be located with the underside of a floor system or the top of the concrete slab no lower than the FCL minus freeboard. Main electrical switchgear shall be no lower than the FCL.

Elevations noted should be used for the installation of fixed equipment susceptible to damage by floodwaters. An exception may be approved, by the Subdivision Approving Officer reviewing a proposed subdivision plan or the Chief Building Official reviewing a building permit application, if a suitably qualified professional determines that appropriate measures can be and are taken to provide protection against damage by flooding and erosion.

On-loading and off-loading facilities associated with water-oriented industry do not require flood-proofing. Heavy industrial development located behind a standard dike does not require flood-proofing.

3.4 Ancillary Buildings, Carports, Garages, Entryways and Renovations to Existing Buildings

FCL –
Requirements for flood-proofing through the use of elevation may be waived, at the discretion of the Chief Building Official, for:

- A renovation of an existing building or structure that does not involve an addition, nor increasing the number of dwelling units,
- That portion of a building or structure that is to be used as a carport, garage or entryway,
- Other minor buildings such as storage buildings, porches and domestic greenhouses.

3.5 Additions to Existing Buildings

Where a building or structure is legally non-conforming with the floodproofing requirements set out in this policy and/or established in a covenant applicable to the property, the Chief Building Official may allow an addition, at the original non-conforming floor elevation, that would increase the size of the building or structure by less than 25 percent of the floor area existing at the time of enactment of such flood-proofing requirements, provided that the degree of non-conformity regarding setback is not increased. Refer to Division C, Article 2.2.9.1 of the Building By-law.

4.0 Flood Construction Levels (FCLs)

The underside of a floor system (wood or steel) or the top of a concrete slab of any building used for habitation, business or storage of goods shall not be lower than 4.6 m from GVRD datum[2] in designated flood plains as outlined on Diagrams A1and B, in Appendix B of this document.

In certain areas of the City, shown on Diagram A2, in Appendix B of this document, an elevation in addition to the FCL for wave run-up may be required as determined by a suitably qualified Professional Engineer.

In some cases it may be impossible or impractical to implement the FCL due to existing City infrastructure and other constraints (e.g., a significantly lower street). Contingent on a report by a suitably qualified Professional Engineer, the Chief Building Official may provide conditional approval on a site by site basis of a reduction in elevation for such site specific issues. It may also be impossible or impractical to meet the FCLs solely by landfill due to smaller lot size, topography, site grade changes and impacts to adjacent streetscapes. In these situations, a combination of flood-resilient construction measures and elevation by structural means will be required. For large assemblies, a higher elevation may be possible through raising the entire site, including roads, thereby providing longer term resilience. In all these instances, it is important to have the City development, planning and building staff brought into the discussion early in the design process. Please seek preliminary guidance at the City Enquiry Centre.

The Director of Planning may exclude floors located at or below finished grade with a ceiling height of less than 1.5 m. from the computation of the floor area, in order to achieve flood construction levels on sites located in a designated flood plain in an R district.

Flood proofing standards and requirements may be extended to non-habitable buildings that are used for storage of goods damageable by flood-waters. The Chief Building Official may require flood construction level standards for *any* building in a designated flood plain. The City may make the determination during the initial enquiry or scoping sessions what, if any, special requirements are applicable and which approving authorities need to be brought in early into the Development Permit process.

5.0 Subdivision Requirements

When approving a subdivision on lands within a designated flood plain, the Subdivision Approving Officer requires:

(a) A suitably qualified Professional Engineer's report certifying that the land may be used safely for the intended purpose.

(b) A section 219 covenant (of the Land Title Act) to ensure the application of flood plain standards and requirements and a waiver of liability in favour of the City in the event of any damage caused by flooding or erosion.

[2] The City of Vancouver uses the GVRD datum. It is the datum used in the Vancouver integrated survey area listings published by the Province for the City of Vancouver. The vertical datum is based on mean sea level.

(c) The covenant will be registered at time of subdivision and may be modified later.
(d) Covenant conditions are to be registered with priority over all other charges requested against the property, save for those in favour of the City.

Where the land proposed to be subdivided may not be used safely, the subdivision may be refused. However, in situations in which consent to subdivision (or a building permit) would normally be refused due to a high flooding hazard, but is deemed appropriate to allow the subdivision and/or building permit due to extenuating circumstances, the owner may also be required to include in the "waiver" clause a provision to cover existing buildings that are to be retained on the property.

The above provisions also apply under the Strata Property Act and the Bare Land Strata Regulations.

6.0 RA-1 District

The documents listed below provide additional information regarding filling and drainage for lands within the RA-1 district (Southlands).

- Southlands RA-1 Guidelines
- Height Relaxation - RA-1 District

7.0 Fill, Drainage and Grades

7.1 Filling and Drainage

In all ~~e~~ zones in the designated flood plain, other than the RA-1 district, increasing site grade by using fill as outlined in this document will be considered on a site by site basis. Please seek pre-application guidance beginning with the City's Enquiry Centre.

Where landfill is used to raise the natural ground elevation, the following are required as part of a Development Permit Application:

(a) A Filing and Drainage Plan prepared by a Professional Engineer, to the satisfaction of the Chief Engineer. The Plan will show that run-off from the site, including from impervious and filled areas, will not be directed to adjacent properties. Where necessary, permeable materials and/or detention systems should be used to limit and control excess runoff. The Plan will include:
   (i) existing and proposed grades of the subject site;
   (ii) existing grades of the adjoining site measured 3.1m from the common property line; and
   (iii) proposed drainage treatments.

(b) Fill placement shall be supervised by a geotechnical engineer in such a manner as to have no net effect on adjacent properties and the overall hydraulic conditions of the flood-prone area.

(c) The toe of the landfill slope should be no closer to the natural boundary than the prescribed setback and the face of the landfill slope should be adequately protected against erosion from flood flows, wave action, ice or other debris.

(d) All flood-proofing fill and impervious surfaces should be inconspicuously integrated into the prevailing topography and landscaping to avoid any detrimental impacts on adjacent properties. This can be achieved by ensuring that:
   (i) the 4.5 m fill apron follows the outline of the building footprint;
   (ii) no abrupt changes in grade occur at property lines; and
   (iii) a 20% transition to base grade is provided.

(e) In narrow side yard conditions, the apron size may be reduced or flood proofing should be provided by structural means.

(f) The use of retaining walls, terracing and rockeries will be considered only when an apron of constant slope cannot be provided due to site constraints.

(g) Building height is measured from the existing grade prior to development and fill placement.

(h) Trees to be retained should be identified in the Filling and Drainage Plan.

7.2 Limits on Fill Elevations

To protect the amenity of low lying areas where FCLs apply, the following height limits to fill elevations exist apply:

(a) In all cases, where a flood construction level exists, fill is required to a minimum of 0.9 m (3 ft) above the elevation of the street fronting the site.
(b) If the elevation of the adjacent street is greater than 2.5 m GVRD datum, the FCL can be achieved by fill alone.
(c) If the elevation of the adjacent street is less than 2.5 m GVRD datum, fill is limited to 2.6 m GVRD datum.
(d) Non-flood proofing fill is permitted, but is limited to a maximum .6 m (2 ft.) above base surface[3] of the existing grades, determined by an interpolative average of the four corners of the site.

7.3 Pre-Loading

Pre-loading requires a Development Permit (DE) to allow for an evaluation of the site and neighbouring properties. An application for a DE can be made either separately or as part of a comprehensive site and building DE. Applicants are advised to have their comprehensive site and building DE approved before proceeding with pre-loading. Applicants who begin pre-loading before the location, shape and size of the development is approved *do so at their own risk*. Although staff may give preliminary advice on the general direction of the development, a final evaluation cannot be completed until after a formal DE application is made.

Required documentation for a pre-loading DE application includes the following:

(a) Geotechnical analysis of the soil conditions and general specification for the pre-load.
(b) Site plan showing property boundaries, existing buildings, landscaping, proposed building(s) and an outline of the pre-load area, indicating how long the pre-load is required.
(c) Drainage plan for the entire property during the pre-loading.
(d) Survey of existing and proposed grades.
(e) Sectional profile of the pre-load.
(f) Details of any protective barriers required for existing trees.
(g) Arborist report for any trees requiring a protective barrier.

As a condition of approval, all DE's related to pre-loading will have a time limit for the pre-load material to be permitted on site. If the DE does not proceed and becomes void after one year, any pre-loading material on site should be removed.

7.4 Final Grades

Supervision during site re-grading is to be monitored by a Professional Engineer with a signed Letter of Assurance submitted at completion of grading. Additionally, a re-survey of completed

[3] Base Surface means that hypothetical surface determined by joining the official established building grades at all corners of the site, provided however that where official established building grades cannot be obtained through application to the City Engineer, existing grades shall be used. For the purpose of measuring the height of a building at any point, the elevation at that point on the base surface shall be determined by interpolating from the official established building grades or, where official established building grades cannot be obtained, from existing grades;

grades will be required to ascertain that the final grades are in conformance with the approved construction documents and a Survey Certificate prepared by a B.C. Land Surveyor verifying flood plain standards.

8.0 Training and Erosion Protection Works[4]

Works include any structures used to prevent a stream from leaving its channel or used to minimize erosion (dikes, sea walls, revetments etc.). Where works are required, the approving officer should require details of the design, construction, operation and maintenance of works prior to final approval of a subdivision or a relaxation of the requirements in a covenant. Works are to be designed and certified by a suitably qualified Professional Engineer.

(a) If the erosion protection works or training works are built on private property and intended to protect only the property of the person owning the training works and property on which they are located (including a strata corporation), an ongoing maintenance program may be assured through the addition of relevant requirements to the covenant registered under section 219 of the Land Title Act.

(b) If the erosion protection or training works, when constructed, will protect multiple properties of more than one person, then an ongoing operation and maintenance program and registered easements, rights of way, land dedications or combinations thereof, and access to structures must be assured. In addition,
   (i) The training works require the approval of the Inspector of Dikes. An approved operation and maintenance manual for the training works is to be prepared as a condition of subdivision approval and a copy is to be sent to the Inspector of Dikes.
   (ii) Approvals under the provincial Water Act and federal Fisheries Act are also normally required for both training and erosion protection works.
   (iii) For erosion protection works, an approved operation and maintenance manual for the local government is to be prepared as a condition of approval.

[4] Training works are any wall, dike or protective structure used to prevent a stream from leaving its channel at a given location. This includes any debris flow training structures including basins, trash racks or other works. Erosion protection works include any structures such as sea walls, revetments, etc. used to minimize erosion of a property.

Appendix A - Building By-law Excerpts

Flood Construction Levels and Regulations related to Designated Flood Plains Vancouver Building By-law

The following sections of the Vancouver Building By-law related to flood construction levels and regulations for buildings on designated floodplains are provided for your convenience. Please refer to the Vancouver Building By-law for complete information.

Definitions (Books 1 and II, Division A, Part 1, Vancouver Building By-law)

1. **Designated floodplain:** means those lands in the City which are hereby designated**,** for the purposes of section 306(1)(cc) of the Vancouver Charter, as flood plains susceptible to flooding and subject to *flood construction level requirements*, and those lands so designated include:

    (a) lands located in proximity to the natural boundary of Burrard Inlet, English Bay, False Creek and the Fraser River, which are located within the areas shown shaded on the maps attached to this By-law as Diagrams A1 and A2. (See Appendix A for Diagram A1- Burrard Inlet, English Bay, False Creek and Fraser River flood plains and for Diagram A2 - Burrard Inlet, English Bay, False Creek and Fraser River flood plain wave effect zone.); and

    (b) lands located in the areas shown crosshatched on the map attached to this By-law as Diagram B. (See Appendix A for Diagram B – Still Creek flood plain and *flood construction levels*.)"

2. **Flood construction level requirements means:**

    (a) on the Burrard Inlet, English Bay, False Creek and Fraser River flood plains:
        (i) for *building*s located within the areas shown shaded on the map attached to this By-law, the underside of a floor system or the top of a concrete slab of a *building* used for habitation, business or storage of goods, shall not be lower than 4.6 m Greater Vancouver Regional District datum. (See Appendix A for Diagram A1- Burrard Inlet, English Bay, False Creek and Fraser River flood plains); and
        (ii) for *building*s located in the areas shown shaded on the map attached to this By-law, an additional elevation allowance above 4.6 m may be required for wave run-up, at a level as determined by a Professional Engineer and to the satisfaction of the Chief *Building* Official. (See Appendix A for Diagram A2 - Burrard Inlet, English Bay, False Creek and Fraser River flood plain wave effect zone)

    (b) on the Still Creek flood plain:
        (i) the underside of a floor system or the top of a concrete slab of any *building* used for habitation, business or storage of goods shall not be lower than the applicable elevation shown on the map attached to this by-law. (See Appendix A for Diagram B – Still Creek floodplain and flood construction level.)

Permits in Designated Flood Plain (Books I and II, Division C, Part 1 – Article 1.5.2.11)

1. If a building is located on a designated flood plain the Chief Building Official may:

    (a) require plans and supporting documents to demonstrate that the elevation or design of the *building* incorporates *flood construction level requirements* intended to reduce the risk of flood damage,

    (b) require that a covenant acknowledging the risk of flood damage be registered against the land, and
    (c) withhold issuance of a *permit* until the requirements of the *Chief Building Official* have been satisfied.

2. The *Chief Building Official* may increase the *flood construction level requirements* or the setback requirements as provided in Article 2.2.9.5.

3. The *Chief Building Official* may relax the *flood construction level requirements* or the setback requirements in this By-law as provided in Article 2.2.9.6."

Buildings on Designated Flood Plains (Book I and II, Division C, Part 2 - Subsection 2.2.9)

2.2.9.1. Exemptions from Flood Construction Level Requirements

1. *Flood* construction *level requirements* do not apply to:

   (a) *alteration* of an *existing building*, not including *reconstruction* as defined in this By-law. (See Appendix A),

   (b) *alteration* of an *existing building* to increase the *building area* by less than 25 per cent of the total *building area* existing as of July 29 1999, if
      i) the number of *dwelling units* is not increased,
      ii) there is no further encroachment into setbacks required by this By-law, and
      iii) there is no further reduction in the *flood construction level*,

   (c) enclosed parking areas, including bicycle and residential storage areas, in a *multiple dwelling*, if there is
      i) an unobstructed non-mechanized means of pedestrian ingress and egress to the areas, above the *flood construction level*, and
      ii) a sign posted at all entry points warning of the risk of flood damage,

   (d) *buildings* and portions of *buildings* used as a carport or garage,

   (e) non-residential accessory *building*s, and

   (f) loading facilities used for water oriented industry.

2.2.9.2. Design Considerations on Designated Flood Plains

1. For buildings constructed on *designated flood plains*, the *building* designer shall comply with by-law requirements regarding *construction* materials and service equipment installations below *flood construction level requirements,* to the satisfaction of the *Chief Building Official*. (See Article 1.5.2.11. of Division C.)

2.2.9.3. Construction Considerations on Designated Flood Plains

1. For buildings constructed on *designated flood plains, construction* of the *buildings* to *flood construction level requirements* shall be achieved, to the satisfaction of the *Chief Building Official,* by

   (a) the structural elevation of the floor system of the building
   (b) the use of adequately compacted fill, or
   (c) a combination of structural elevation and compacted fill.

2. No person shall install furnaces, electrical switchgear, electrical panels, fire protection systems or other fixed *building* services susceptible to flood damage, below the *flood construction level,* unless such services are protected from flood damage and accessible for servicing during a flood, to the satisfaction of the *Chief Building Official*.

3. No person shall store hazardous or toxic substances below the flood construction level.

4. All piping, wiring and conduit penetrations shall be water stopped and sealed to prevent water seepage into the building.

2.2.9.4. Setback Requirements on Designated Flood Plains

1. Subject to the provisions of this By-law, no *building,* structural support or fill shall be constructed or located within
   (a) 30 m of the *natural boundary* of the Fraser River,

   (b) 15 m of the *natural boundary* of Burrard Inlet, English Bay or False Creek,

   (c) 5 m of the *natural boundary* of Still Creek,

   (d) 7.5 m of any structure erected for flood protection or seepage control, or

   (e) in the case of a building, structural support, or fill located on a bluff in a designated flood plain, where the toe of the bluff is subject to erosion or is closer than 15 m from the natural boundary, a setback measuring 3.0 times the height of the bluff as measured from the toe to the crest of the bluff.

2.2.9.5. Increase of Flood Construction Level and Setback Requirements on Designated Flood Plains

1. The *Chief Building Official* may increase the *flood construction level requirements* or the setback requirements in this By-law if, in the opinion of the *Chief Building Official,* a higher *flood construction level* or a greater setback is necessary as the result of a site-specific geological or hydrological feature.

2.2.9.6. Relaxation of Flood Construction Level and Setback Requirements on Designated Flood Plains

1. The *Chief Building Official, in consultation with the City Engineer,* may relax the *flood construction level requirements* in this By-law in accordance with Article 1.5.2.11., if
   (a) the *owner* demonstrates to the satisfaction of the *Chief Building Official*, that, due to existing site characteristics and the location of existing infrastructure, it is impractical to meet the *flood construction level requirements*,

   (b) the *owner* demonstrates to the satisfaction of the *Chief Building Official,* the proposed construction methods are designed to mitigate flood damage, and

   (c) the *owner* provides a report, to the satisfaction of the *Chief Building Official*, stamped by a professional engineer, certifying that the habitable space in the *building* will be safe during a flood if a lower *flood construction level* is applied."

2. The Chief Building Official, *in consultation with the City Engineer*, may relax the setback requirements in this By-law in accordance with Article 1.5.2.11., if
   (a) the owner demonstrates to the satisfaction of the Chief Building Official, that, due to existing site characteristics and the location of existing infrastructure, it is impractical to meet the setback requirements,

   (b) if considered necessary by the Chief Building Official, the owner agrees to construct erosion protection works to mitigate flood damage and erosion, and

   (c) the owner provides a report, to the satisfaction of the Chief Building Official, stamped by a professional engineer, certifying that the habitable space in the building will be safe during a flood if a reduced setback requirement is applied."

Appendix B - Flood Plain Diagrams

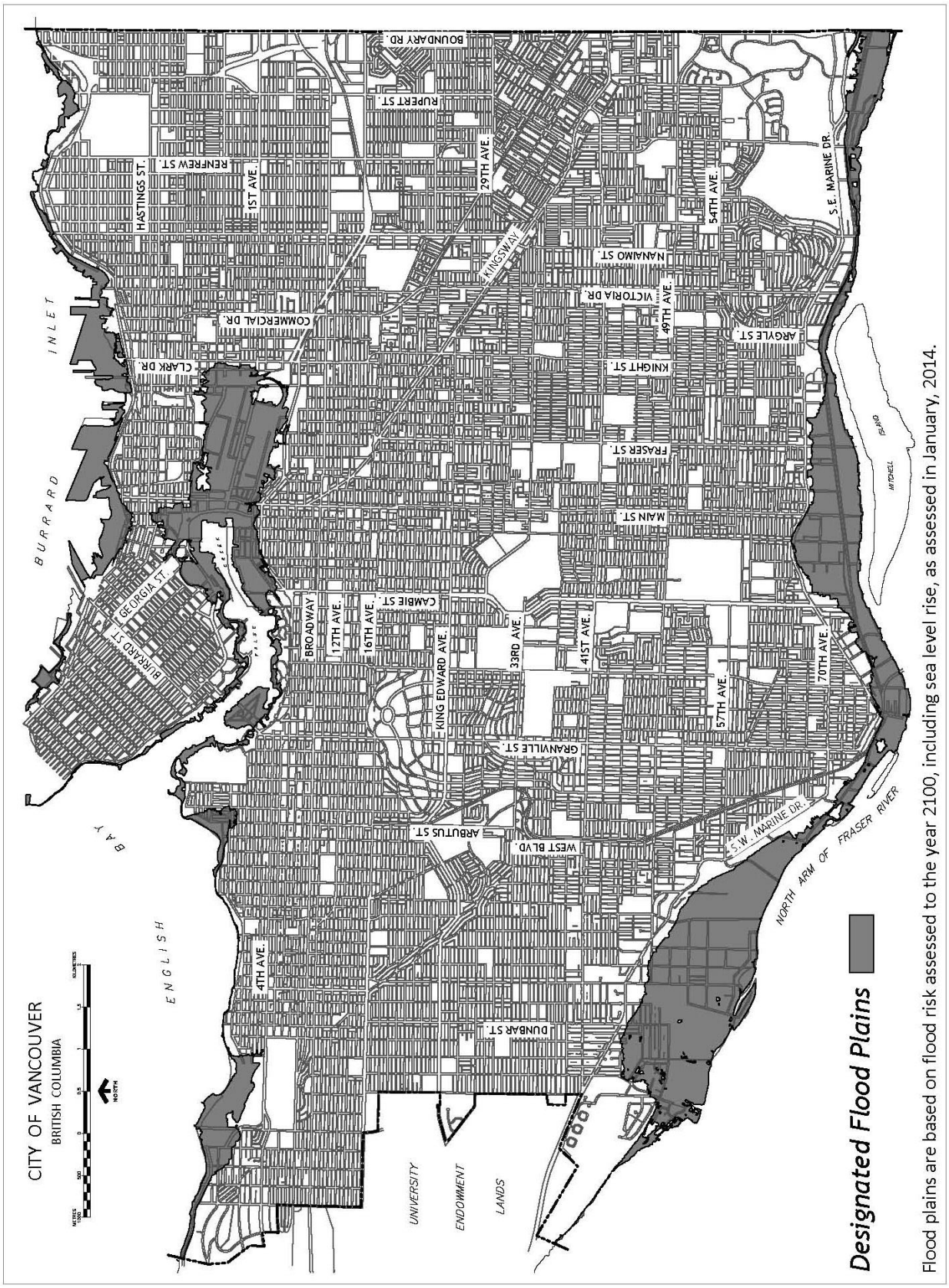


Diagram A1: Burrard Inlet, English Bay, False Creek and Fraser River Flood Plains

Flood plains are based on flood risk assessed to the year 2100, including sea level rise, as assessed in January, 2014.

Diagram A2: Burrard Inlet, English Bay, False Creek and Fraser River Flood Plain Wave Effect Zone

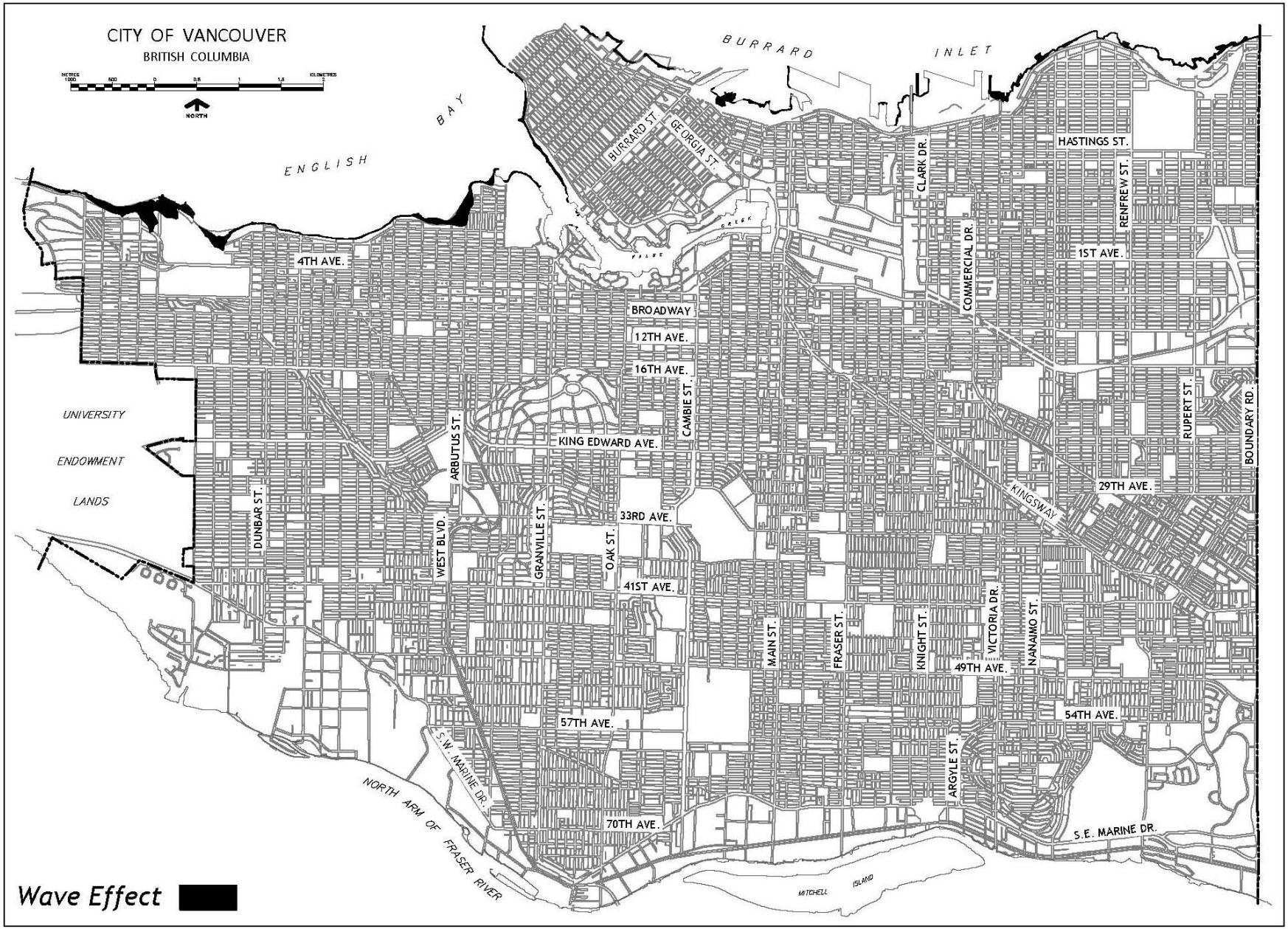
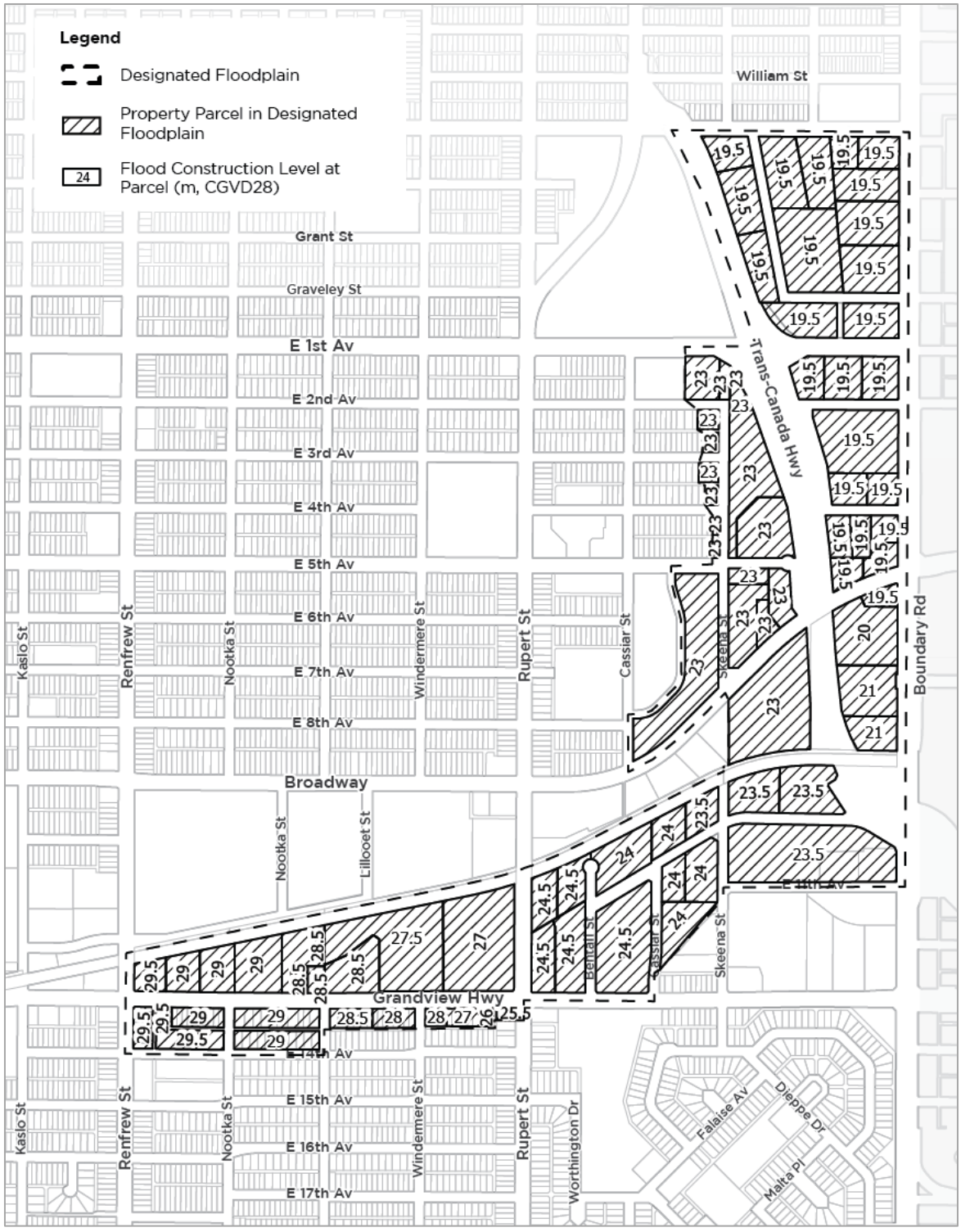


Diagram B: Still Creek Flood Plain and Flood Construction Levels



Appendix C - Reference Documents

City of Vancouver

- **Building By-law**
  Books I and II, Division A, Part 1, Article 1.4.1.2.
  Books I and II, Division A, Note A-1.4.1.2.(1) diagrams A1, A2, and B
  Books I and II, Division C, Part 1, Article 1.5.2.11.
  Books I and II, Division C, Part 2, Subsection 2.2.9.

- **Southlands RA-1 Guidelines**

- **Height Relaxation – RA-1 District (By-law Administration Bulletins)**

Engineers and Geoscientists British Columbia (EGBC)

- **Practice Advisory – Electrical Engineering Considerations in Flood-Resilient Design of Buildings (December 18, 2020)**

Government of British Columbia

- **Climate Change Adaptation Guidelines for Sea Dikes and Coastal Flood Hazard Land Use (2011)**

- **Flood Hazard Area Land Use Management Guidelines (2004)**

- **Land Title Act**
  Section 86 “Subdivided Land Subject to Flooding”
  Section 219