

PLANNING FOR FLOODING IN THE CITY OF NORTH VANCOUVER AND DISTRICT OF NORTH VANCOUVER, BRITISH COLUMBIA



Restoration efforts along MacKay Creek aim to mitigate flooding and enhance habitat quality across both the City and the District of North Vancouver. Photo by Merlin/PNG.

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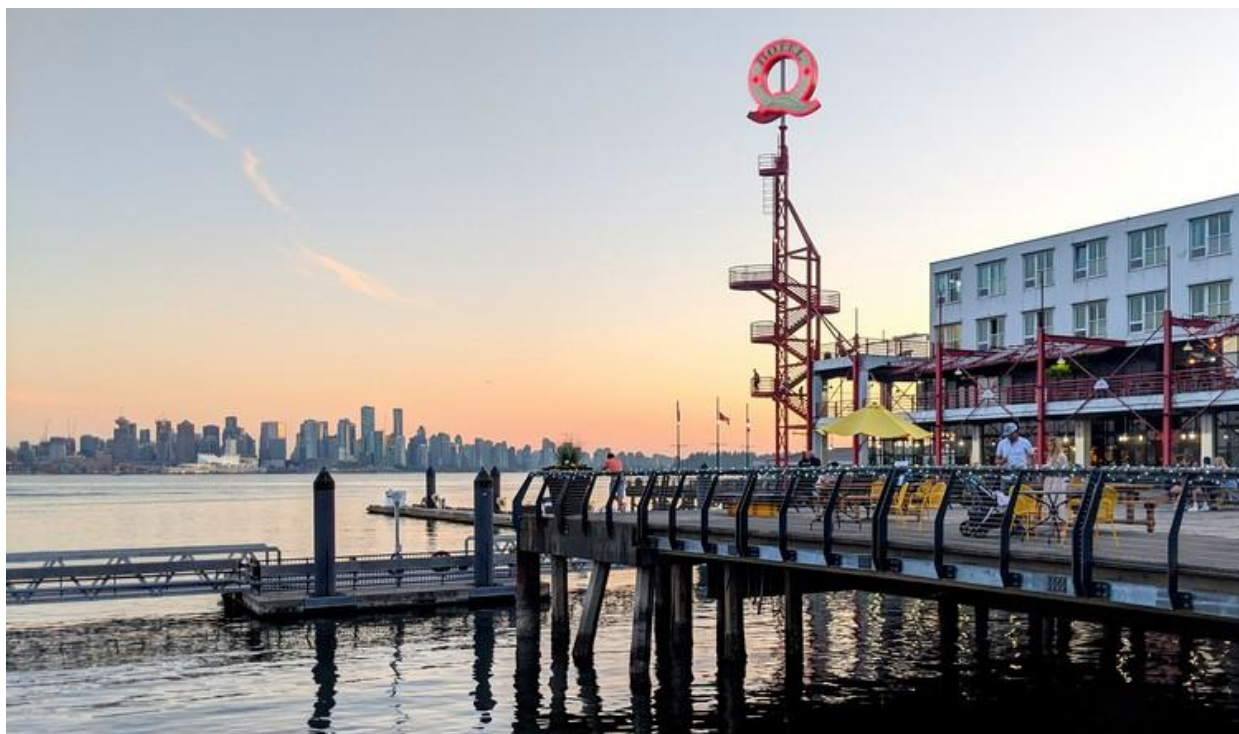
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Lonsdale Quay in the City of North Vancouver. Photo by Persaudtravel.com



Mackay Creek trail in the District of North Vancouver. Photo by Alltrails.com

INTRODUCTION

Released in 2024, the provincial [BC Flood Strategy](#) highlighted the urgent need to address flooding concerns across British Columbia (BC) by understanding risk areas, strengthening governance, enhancing preparedness and response, and investing in long-term flood resilience. Just the following year, in 2025, the [province announced](#) that they did not have the funds required to implement the initiatives outlined in this comprehensive plan, leaving municipalities to essentially fend for themselves against ever-increasing flood concerns due to rising sea levels, increases in extreme weather events, and expanding coastal and riverine populations. Additionally the [BC Flood Area Land Use Management Guidelines](#), a previous provincial publication, was amended in 2018 to substantially update municipal requirements for managing land use in flood hazard areas by addressing future sea level rise and mandating that Flood Construction Levels for buildings be designed to the Year 2100 flood level. The provincial sea level rise planning scenario assumes 0.5 m by 2050, 1.0 m by 2100, and 2.0 m by the year 2200. It is clear that the provincial government is well-aware of the pressing issue of flooding in municipalities such as the City of North Vancouver (CNV) and the District of North Vancouver (DNV), yet for the moment it appears that real top-down support is not forthcoming.

CNV and DNV are both coastal municipalities on the North Shore of Metro Vancouver and must therefore contend with increasing fluvial floods from creeks and watercourses running downstream from the Coast Mountains, pluvial floods from significant rainfall events, and coastal floods from potential acute events as well as gradual sea level rise. Fraser Basin Council published the [Lower Mainland Flood Strategy Synthesis of Technical Analysis](#) in 2023. The analysis focuses on flooding of the Lower Mainland, mainly covering a 500-year Fraser River flood or 500-year coastal flood event, the latter of which is particularly pertinent for both CNV and DNV. Both municipalities are exposed to the 0.2% Annual Exceedance Probability (AEP) coastal flood event (meaning a flood with a 1-in-500-year probability in any given year) and the same scenario combined with 1 m of sea level rise. Water and wastewater infrastructure system deficits are a major contributor to vulnerability throughout the region.

Given this greater context of flood risk, CNV and DNV must therefore respond and develop strategies to decrease exposure in their communities and build resilience via their policy, strategy, regulations, and inter-jurisdictional collaboration. This report analyzes the specific mechanisms within these four main areas that both CNV and DNV are enacting and enforcing to address flood hazards and assesses their general effectiveness, along with the strengths and deficiencies of the approaches of each municipality. [A recent atmospheric river event](#) in October of 2024 caused significant damages to many properties on the North Shore and spurred the development of novel strategic response plans in CNV and DNV; the policy and regulatory responses, both current and in-progress, will be crucial to protecting North Shore communities and fostering awareness, preparedness, adaptability, and resilience in these two at-risk coastal communities.

METHODOLOGY

Data Collection

This study uses qualitative document analysis of publicly available planning and regulatory materials from the District of North Vancouver and the City of North Vancouver. Documents were selected for their relevance to flood mitigation, land-use regulation, and climate adaptation. Sources include Official Community Plans (OCPs), zoning bylaws, Development Permit Area (DPA) guidelines, floodplain and stormwater management policies, emergency response planning, climate adaptation strategies, infrastructure plans, and supporting technical or consulting reports. Only current or most recent versions of documents were included to reflect contemporary policy frameworks. Documents were retrieved from municipal websites and public document repositories.

Analytical Approach

A directed qualitative content analysis was conducted, informed by climate adaptation and planning implementation literature. To systematically identify flood mitigation content, a structured keyword search strategy was used during document review. Initial searches focused on direct flood-related terms such as “flood,” “floodplain,” “sea level rise,” “coastal,” “riverine,” and “water”, to locate explicit hazard policies and regulatory provisions. Subsequent searches expanded to broader climate adaptation and risk terminology, including “climate adaptation,” “resilience,” “hazard,” and “vulnerability,” to capture strategic framing and longer-term adaptation objectives.

Keyword emphasis was also adjusted by document type. In statutory and regulatory documents, searches also focused on terms that signal enforceable requirements, such as “elevation,” “setback,” and “flood construction level.” In policy and strategy documents, broader language related to resilience, environmental protection, and risk reduction was also prioritized. Technical and infrastructure reports were reviewed using general drainage and stormwater terminology to identify structural and systems-based mitigation approaches. This tiered approach ensured that both explicit flood regulations and more embedded mitigation measures were consistently identified across planning instruments.

Table 1. Keywords Utilized in document scans.

Armouring	Dike / Dyke	Hazard	River	Stream
Aquifer	Drainage	Infrastructure	Riverine	Vulnerable
Climate	Elevation	Infiltration	Runoff	Water
Coastal	Flood	Mitigate	Sea level rise	
Creek	Flow	Permeable	Seepage	
Debris	Fluvial	Resilience	Storm	

SPATIAL ANALYSIS

Overview

Understanding the spatial distribution of hazards is fundamental to assessing risk. This section examines the distribution of fluvial, coastal, pluvial, and landslide hazards within both jurisdictions. It addresses the exposure of both the natural and built environment, outlines relevant past events and current mitigation measures.

In general, the coastline of the City and District of North Vancouver runs along the north shore of Burrard Inlet and continues up Indian Arm, backed by the steep Coast Mountains. The City of North Vancouver (CNV) has a comparatively short, urbanised waterfront concentrated along Burrard Inlet and is surrounded by the District of North Vancouver (DNV). Eastwards of the DNV the shoreline transitions toward more natural terrain towards Deep Cove and Indian Arm. Within both jurisdictions six rivers and several creeks flow through. Along Burrard Inlet, the Capilano River marks the western boundary, while the Seymour River, Lynn Creek, Mosquito Creek, and MacKay Creek drain from the Coast Mountains. Indian Arm receives the Indian River at its head. Within the CNV there are four watersheds (Mackay Creek, Mosquito Creek, Wagg Creek, Lynn Creek) and one catchment (Lower Lonsdale Creek catchment). The creeks and the catchment can be seen in a [Hydrology Map](#) by the DNV, as well as in Figure 1. The CNV further has individual [watershed maps](#) for each creek or catchment. All watercourses flow directly into Burrard Inlet.

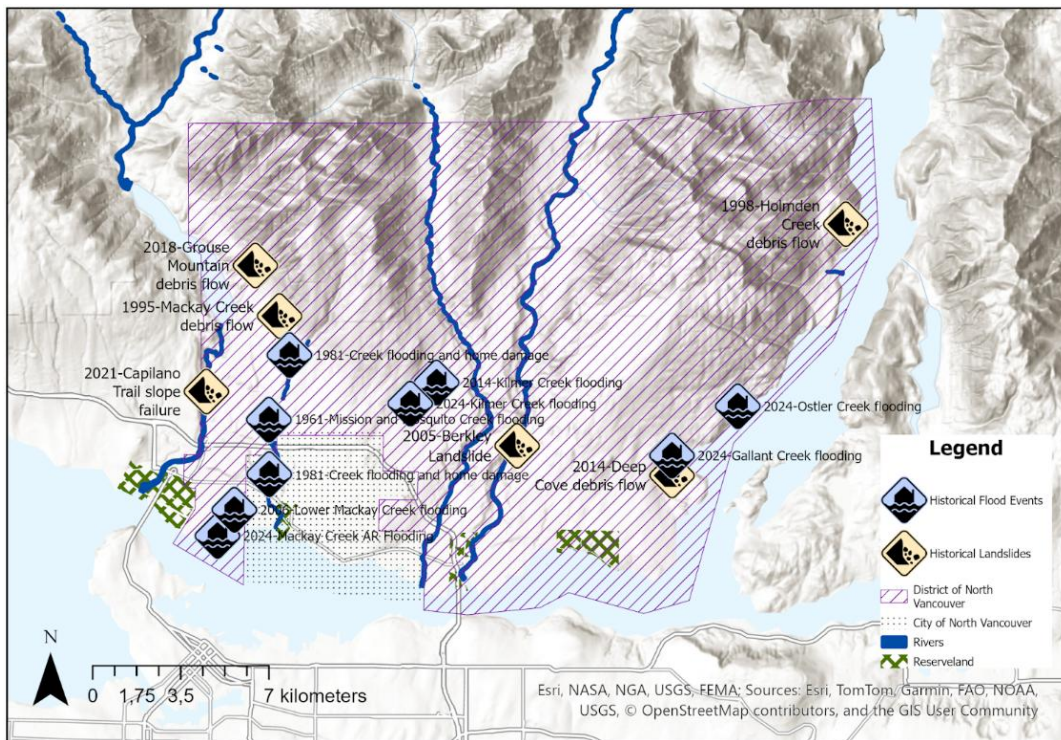


Figure 1. The boundaries of the City and District of North Vancouver, Skwxwú7mesh Úxwumixw reserve lands, rivers and watercourses, and major historical hazards. Data derived from [DNV GeoWeb Open Data Portal](#) and [North Shore Disaster and Climate Risk Profile](#).

Population and Land Use

Population

The City and District of North Vancouver are densely populated along their lower slopes and valley floors. The CNV is predominantly urban, while the DNV extends from dense southern neighbourhoods into more dispersed residential development toward the mountains. Population density can be seen in Figure 2 (CNV) and Figure 3 (DNV).

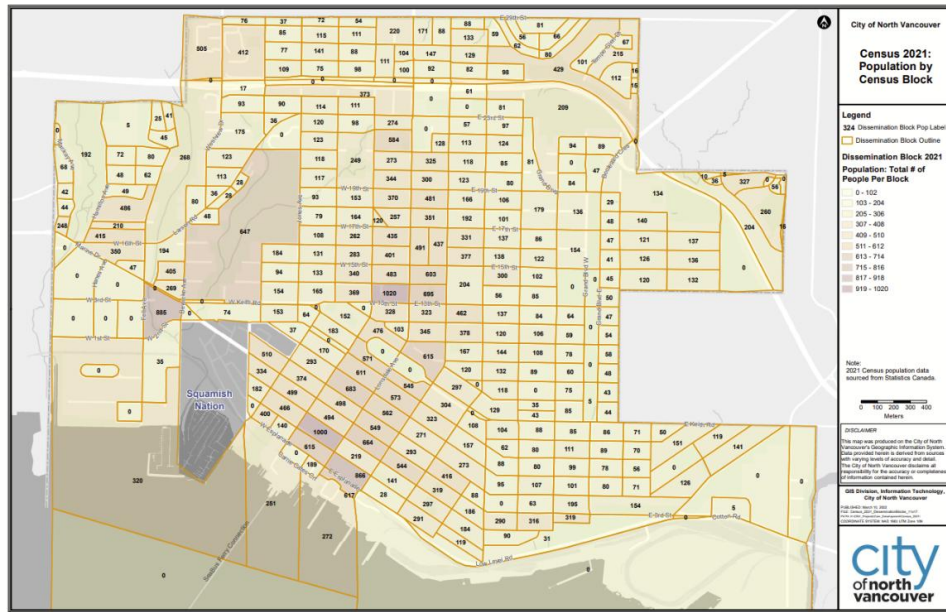


Figure 2. Population by Census Block in the CNV From: [CNV Map of Population by Census Block \(2021\)](#).

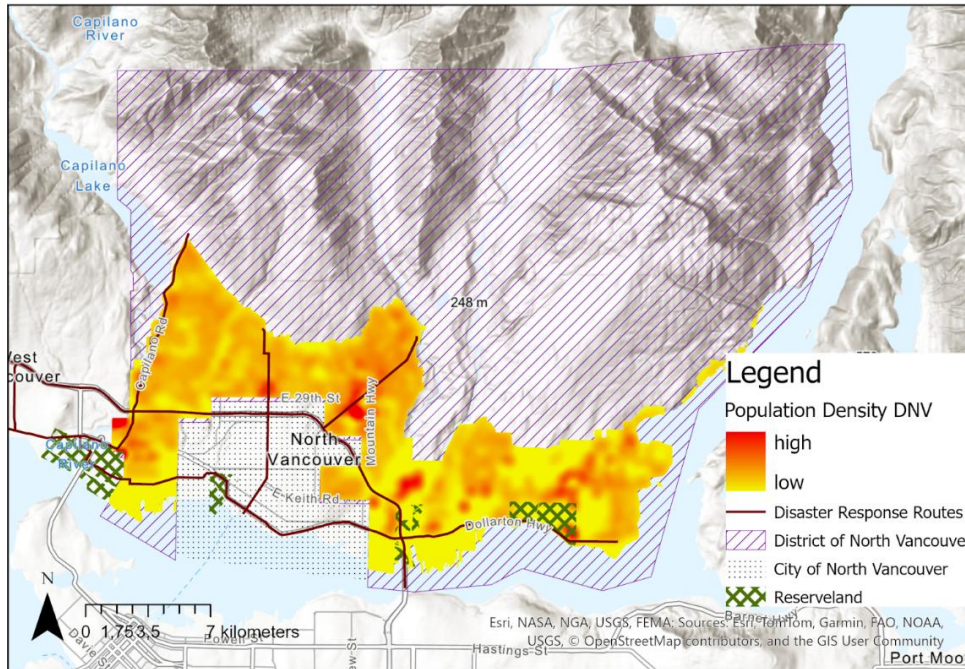


Figure 3. Population Density of DNV and Disaster Response Routes in both DNV and CNV. Data derived from the [DNV GEOWeb Open Data Portal](#).

Land Use

In the DNV, the waterfront along Burrard Inlet is dominated by industrial land use. Towards more mountainous area land use transitions mostly to residential neighbourhoods. Detailed land use is illustrated in the [District of North Vancouver Official Community Plan Land Use Map](#).

Within the CNV, land use has a more mixed-use character. The waterfront and Lonsdale corridor include a blend of commercial, residential, and harbour-related uses. Most residential neighbourhoods, parks, schools, and institutions are located away from the waterfront. Land use distribution across the CNV is shown in [CityMAP](#), the CNV's interactive mapping tool.

In summary, the areas most exposed to flood and landslide hazards are precisely those where population and development are most concentrated. Low-lying residential, commercial, and industrial properties close to Burrard Inlet and along creek corridors face the greatest fluvial and coastal flood risk, as well as by sea level rise. In the CNV, dense urban cover amplifies pluvial flood risk. Further north, residential development in the DNV extends into areas of elevated slope hazard and flood risk along creek corridors.

Hazard Distribution

Fluvial and Pluvial Flooding

Fluvial flood hazards are associated with the six major rivers and several creeks draining from the Mountains through both jurisdictions into Burrard Inlet. Pluvial flooding events happen due to intense rainfall (stormwater) and generate surface water flooding across low-lying and urbanized areas where drainage capacity is exceeded. The CNV is particularly vulnerable given its density of built infrastructure. Figure 4 shows the risk of fluvial and pluvial flooding, the NSEM classifies those two flooding categories as “Clearwater Flood Risk”.

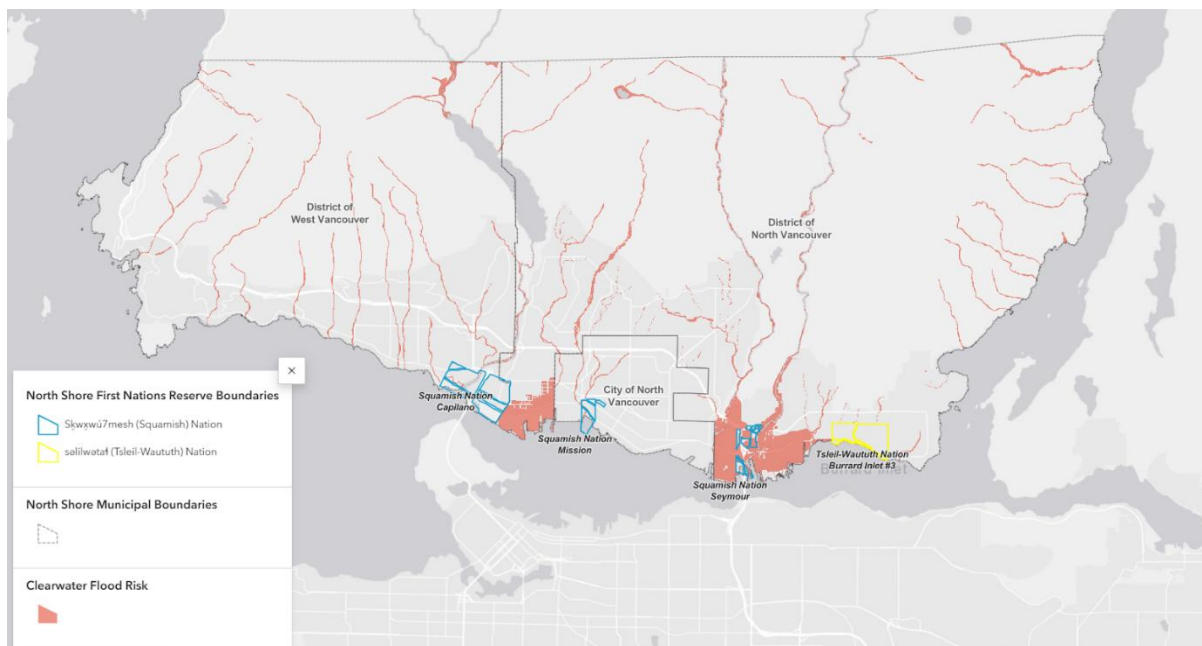


Figure 4. Clearwater flood risk in DNV and CNV. From: [North Shore Disaster and Climate Risk Profile](#).

Climate change projections indicate the North Shore will experience more frequent and intense storms in the coming decades. Flood risk on the North Shore ranges from rare to likely, with warning times of hours to days, events lasting days to weeks, and peak occurrence from fall through spring ([North Shore Disaster and Climate Risk Profile](#)).

Coastal Flooding and Sea Level Rise

The North Shore has an extensive waterfront along Burrard Inlet and Vancouver Harbour, much of it exposed to coastal flooding. Industrial and residential waterfront properties in both jurisdictions face the greatest exposure. The main exposed areas run from Ambleside Park to Lonsdale Quay and from Queensbury Avenue to Maplewood Flats, including port terminals, transportation corridors, parks, and residential, commercial, and industrial properties that may contain hazardous materials. Coastal flood extents are shown in Figure 5.

Projected sea level rise will progressively increase the frequency and extent of coastal flooding across the North Shore. The [North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy](#) provides future inundation scenarios.

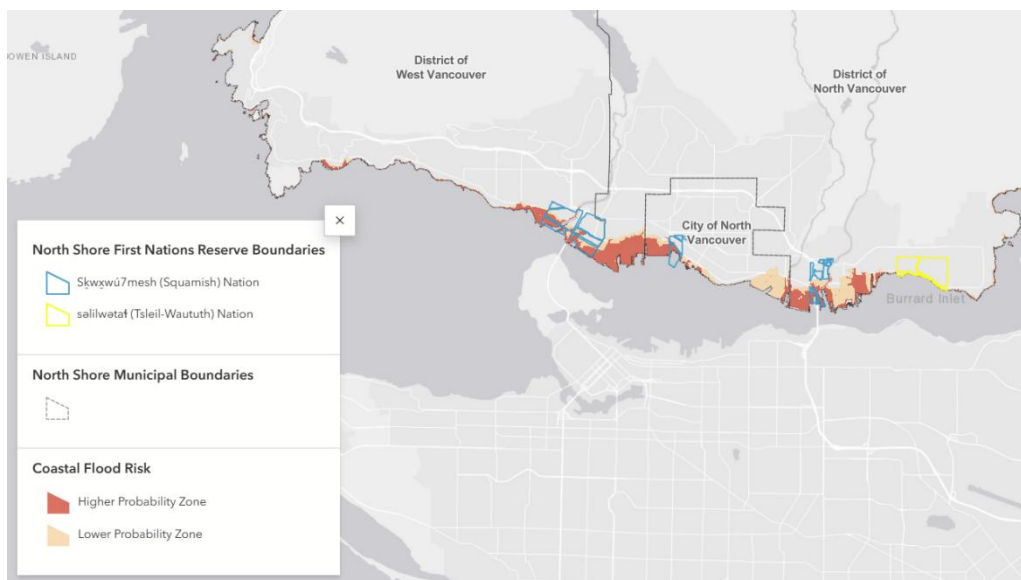


Figure 5. Coastal flood risk in CNV and DNV. From: [North Shore Disaster and Climate Risk Profile](#).

Landslides and Slope Hazards

Steep terrain throughout the DNV and upper CNV creates significant exposure to debris flows and slope instability. Climate change projections indicate increasing precipitation intensities, which will also increase the risk of landslides ([North Shore Disaster and Climate Risk Profile](#)). The [Slope Hazard Development Permit Area Map 2.3](#) shows where slopes exceed 20 degrees with a vertical rise of at least 10 metres. The hazardous areas reach into the built footprint, particularly in the northern parts of both jurisdictions.

Combined Risk

Coastal flooding may coincide with fluvial flooding leading to regional impacts. MacKay Creek has been identified as the area most vulnerable to such a combined event at current sea levels. An extreme combined coastal flood and sea level rise scenario estimated damage to nearly 600 buildings, displacement of over 2,700 residents, and power outages affecting 12,000 people. With sea level rise, the frequency and extent of coastal flooding is expected to increase, affecting areas not currently at risk ([North Shore Disaster and Climate Risk Profile](#)). Figure 6 illustrates the spatial extent of creek hazard and slope hazard Development Permit Areas (DPAs) across the DNV, as well as existing flood mitigation measures across both jurisdictions.

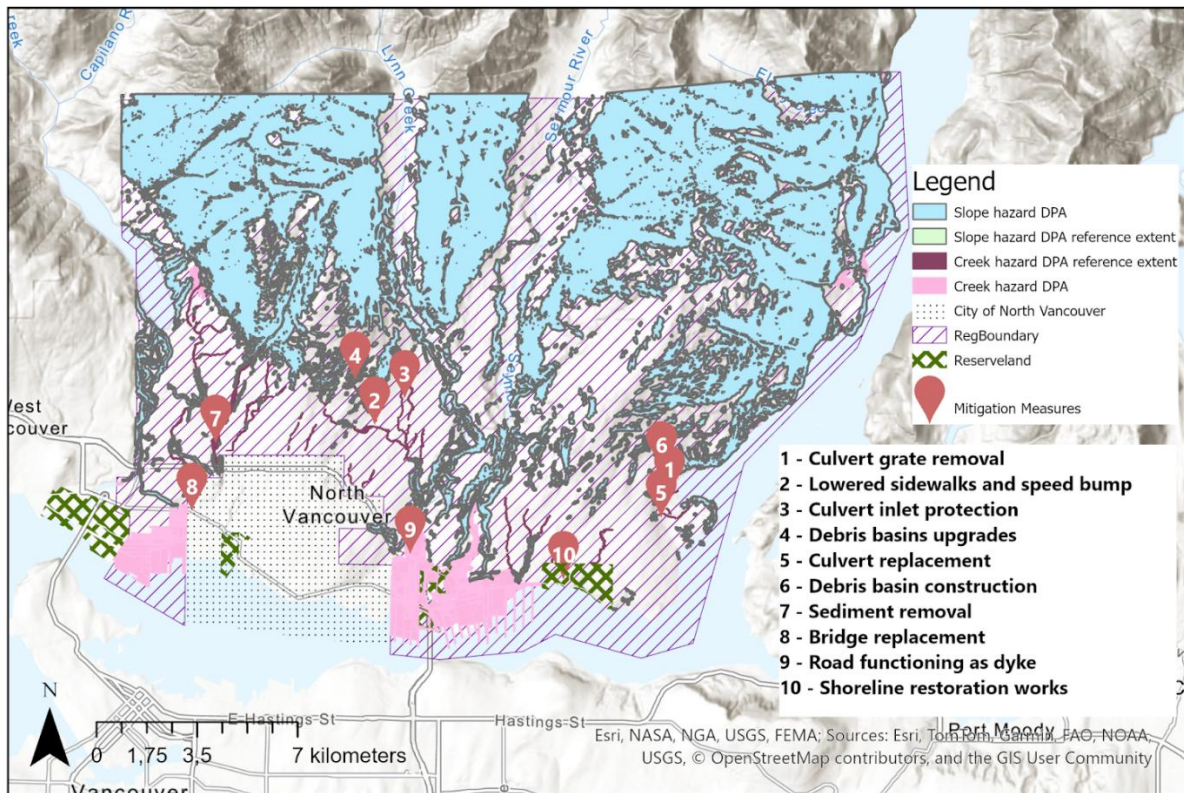


Figure 6. Development Permit Areas in the DNV. Data derived from [DNV GeoWeb Open Data Portal](#).

CITY OF NORTH VANCOUVER

Overview

The CNV is a small, primarily urban municipality in British Columbia’s (BC) Metro Vancouver Region. It is situated between Burrard Inlet and the North Shore Mountains with a land area of ~ 11.8 km². In 2021, the [census](#) reported a population of 58,120 with a population density of ~ 4,900 people per km². The city is characterized by a mix of residential, commercial, and waterfront industrial land with transportation corridors and critical infrastructure. Its proximity to the inlet and multiple creeks, combined with projected sea level rise and intense rainfall events, makes flood management an important planning consideration for long term resilience.

Policy

[Official Community Plan \(2014, updated 2025\)](#)

The City of North Vancouver Official Community Plan (OCP) identifies resiliency and adaptability as one of their guiding principles for city development to adapt to future climate change and frames its OCP through a Sustainable City Framework lens (Figure 7). The OCP also identifies flooding as a

primary risk to community wellbeing along with fire, extreme weather, and landslides. Policies are constructed primarily through a lens of proactive adaptation to withstand and recover from flooding events as they occur. Key mechanisms and policies through which the OCP promotes climate adaptation measures for flood resilience include:



Figure 3 The Sustainable City Framework

Figure 7. The City of North Vancouver Sustainable City Framework. From: [Official Community Plan](#).

- **Development Control:** Managing development in flood-prone areas through both outright avoidance and regularly updated minimum development heights
- **Community Resiliency:** Collaborating with community partners, educating public on emergency preparedness, ensuring access to emergency response materials
- **Green Infrastructure:** Proactively retrofitting existing drainage infrastructure, utilizing green or natural strategies to adapt to future anticipated flooding
- **Stormwater Management:** Reducing hard surface areas, improving on-site stormwater retention to reduce peak runoff volumes

The primary mechanism through which the OCP addresses flooding is the delineation of [Development Permit Areas](#) that include area-specific stormwater management and development requirements, such as the ‘Hazard Lands’ that refer specifically to flood plain areas designated in the [Sewerage and Drainage Utility Bylaw](#). The OCP also calls for the creation of an updated [Integrated Stormwater Management Plan](#) in collaboration with adjacent jurisdictions.

Strategic Plans

Climate and Environment Strategy (2024)

The CNV acknowledges the rising flood risk driven by more frequent extreme precipitation, storm surges, and up to 1 m of sea-level rise by 2100 due to climate change. Furthermore, the strategy emphasises that these impacts fall disproportionately on vulnerable and marginalised residents.

Integrated Stormwater Management Plan (2016)

The Integrated Stormwater Management Plan (ISMP) establishes a watershed-based framework for managing stormwater across the City of North Vancouver, with the goal of improved watershed health in support of the regional [Integrated Liquid Water and Resource Management Plan](#). It addresses the cumulative impacts of urbanization and climate change on drainage infrastructure, stream health, flood risk, and public safety.

The plan identifies flood risk as a significant and growing concern. Approximately 55% of the City's land area is impervious surface, and 21% of the storm sewer network is already undersized. Without intervention, the proportion of undersized pipes is projected to grow from 21% today to 70% by the end of the century under climate change. The City and the District of North Vancouver collaborated on a joint ISMP for the shared Mosquito Creek and Mackay Creek watersheds in 2020, with a District wide ISMP currently in progress and expected in 2026.

Flooding on Mackay Creek is specifically flagged as a recurring hazard, occurring on average every 10 years, driven by an undersized channel, and inadequate bridge crossings. The City identified a joint flood protection dike project in this corridor as a priority, with federal and provincial cost sharing. To manage flood risk, the plan proposes the following actions:

- Requiring source controls (rain gardens, infiltration chambers, soil cells) on all new development to reduce runoff volume and relieve pressure on the storm sewer system
- Retrofitting 30% of road storm drains and 50% of pipe outlets with green infrastructure features to reduce and treat stormwater runoff
- Ongoing sediment management in Mosquito Creek at Marine Drive
- Construction of a flood protection dike on Mackay Creek (planned for 2017)
- Long-term monitoring of streamflow and water quality across major watersheds

Emergency Response Plans

Find shared emergency response plans for both the City and District of North Vancouver under the [North Shore Emergency Management](#) section of this report.

Climate Change Adaptation Plan (2013)

This plan establishes a framework for adapting City operations and infrastructure to the projected impacts of climate change, with the goal of increasing community resilience across all municipal service areas.

Flooding is identified as the single highest priority climate risk for the City, driven by projected increases in intense precipitation and sea level rise. Extreme precipitation events that once occurred every 25 years are projected to occur every 10 years by the 2050's, and BC provincial guidelines call for planning around 0.5 m of sea level rise by 2050 and 1 m by 2100. Several commercial and low-lying areas, including the Harbourside business park, are flagged as vulnerable to coastal flooding.

To reduce flood risk, the plan identifies the following actions:

- Complete and implement the Integrated Stormwater Management Plan (ISMP) accounting for future hydrologic and sea level changes (completed in 2016)
- Establish priorities and timelines for structural flood protection measures (e.g. dikes)
- Prepare Development Permit Area guidelines for flood plains and steep slopes
- Maintain a regular schedule for updating flood maps and risk assessments
- Ensure storm sewer systems are adequately sized for future climate conditions

Land Use Regulations

Zoning Bylaw (1995, Updated 2025)

Flood risk is addressed in the Zoning Bylaw via the Flood Construction Level (FCL) as defined in the [Sewerage and Drainage Bylaw](#), as well as via property-level stormwater management requirements which together regulate land use primarily by:

- Mandating a minimum elevation for floors, including basements, in any development used for dwelling, business, or storage of electrical equipment
- Setting a maximum building height as defined as the top of the building to the FCL in comprehensive development zones located in areas designated as flood plains
- Designating minimum permeable area percentages for stormwater retention on residential lots according to per-unit dwelling density

Stream and Drainage System Protection Bylaw (2003, Updated 2020)

This bylaw regulates development on land parcels adjacent to slopes, watercourses, lands with a history of erosion events, or lands with a likelihood of future floods or landslides. Although its primary stated purpose is environmental stewardship and stream protection, the bylaw also accounts for flood risk by:

- Prohibiting the obstruction or impeding of existing natural watercourses
- Requiring an Erosion and Sediment Control Plan prior to and during construction to limit erosion, delineate drainage flows and catch basins, and outline any changes to constructed watercourses

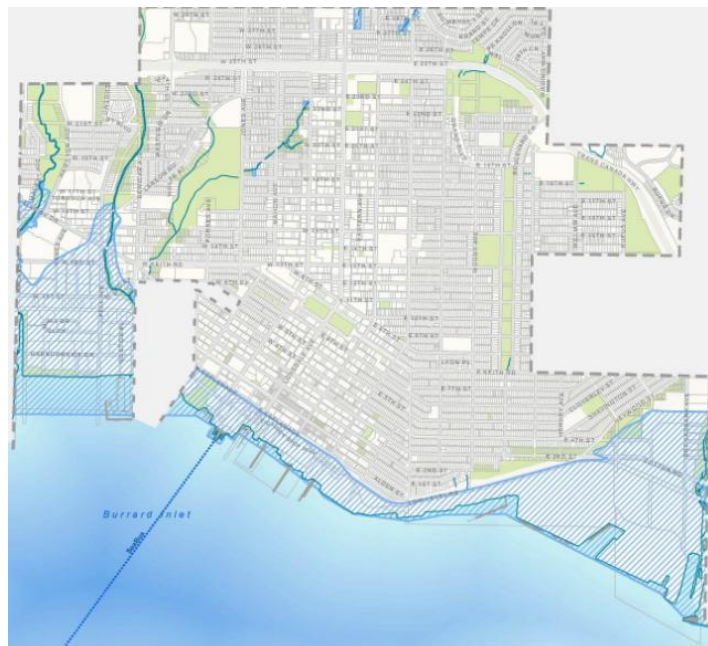
Sewerage and Drainage Utility Bylaw (1995, Updated 2024)

The Sewerage and Drainage Utility Bylaw functions as the primary regulatory and enforcement tool for sewage management, stormwater infrastructure maintenance and installation, and remediation of potential surface water issues. The bylaw officially designates:

- **Flood Plains:** Areas of the city officially designated as coastal and river flood plains (Figure 8)
- **Flood Construction Level (FCL):** The minimum floor elevation utilized in the [Zoning Bylaw](#) for regulating structures, last updated at 4.5 meters above sea level in 2013

Development in areas designated as flood plain are subject to comply with the FCL in terms of minimum floor elevations and maximum building heights. The City Engineer has authority to raise or lower the FCL for a given parcel to account for site-specific variations in flood risk, predicted sea level rise, or unique hydrological features.

Figure 8. Designated flood plains of CNV shown in striped blue.
From: [Sewerage and Drainage Utility Bylaw](#).



Development Permit Areas (1995-2014, Updated 2025)

The City of North Vancouver utilizes development permit areas (DPAs), which they often title as ‘guidelines,’ to regulate design, form, and character of specific areas defined in the [OCP](#) as shown in Figure 9. Those with requirements to address flood concerns are described below.

Streamside Protection and Enhancement (p. 17): for any development proposal that includes work within 15 meters of a watercourse bank or 10 meters of a ravine bank, visualized in Figure 10. Requires detailed analyses of sensitive areas; developments are assessed on a basis of limiting encroachment and mitigating net loss of riparian habitat wherever possible.

Harbourside Waterfront (p. 29): Requires detailed methods to manage floods and sea level rise via the limitation of impermeable areas, directing flows to permeable areas, installing visible rainwater controls with educational signage, and using green roofs to reduce stormwater runoff.

Moodyville (p. 67) and Harry Jerome Neighbourhood Lands (p. 129): Both set requirements to provide permeable surfaces to manage peak stormwater runoff through on-site topsoil infiltration, green roofs, bioswales, and ponds. The Moodyville DPA requires parcels to retain and store 500 liters of rainwater for every 350 square meters of roof in barrels or cisterns.

Low Rise Neighbourhoods (p. 154), Mid-Rise Neighbourhoods (p. 174), and Accessory Coach Houses (p. 23): DPAs applying to low rise, mid-rise, and laneway residential developments, respectively. Regulate stormwater by minimizing impermeable paved areas, provisioning space for deep soil infiltration (accepting green roof integration in lieu), and requiring uncovered parking to be paved with permeable materials for laneways.



Figure 9. Development Permit Areas in the City of North Vancouver. From: [Official Community Plan](#).

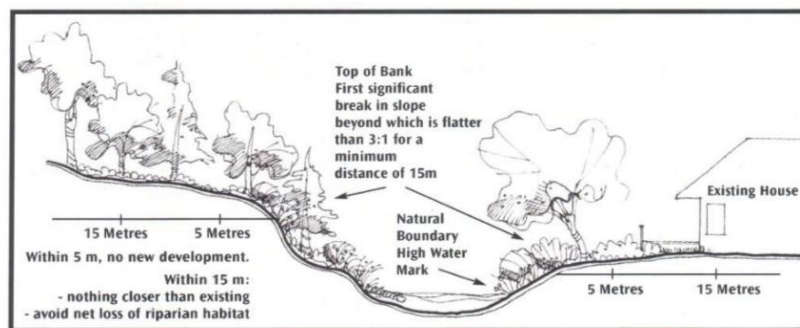


Figure 10. Diagram summarizing the Streamside Protection DPA. From: [Development Permit Areas](#).

Related Hazards and Consulting Reports

[Geotechnical Stability Study Preliminary Partial Risk Analysis – Phase I \(2009\)](#)

The purpose of this study was to assess the geotechnical stability of creek ravine slopes and determine the preliminary landslide risk for areas near buildings and infrastructure. Its objective was to identify and characterize landslide hazards to help the CNV prioritise locations for further investigation, monitoring and mitigation.

[Geotechnical Stability Study Detailed Risk Analysis – Phase II \(2010\)](#)

This study expands on the phase I assessment by conducting geotechnical evaluations of specific steep slope properties previously identified as potentially at risk for landslides.

Phase I and Phase II studies identified steep terrain, groundwater seepage, stream erosion and excessive water infiltration as key contributors to landslide risk. Surface runoff, poor drainage, uncontrolled stormwater discharge, creek bank erosion and properties built on loose fill were all found to reduce soil strength and heighten slope failure potential, increasing the risk of sediment and debris entering the creeks. Both studies emphasized improving stormwater management by ensuring that all homes are connected to the CNV's storm sewer system.

[Mosquito Creek Ravine East Bank Assessment – Phase I \(2006\)](#)

This study conducted a preliminary landslide risk assessment of Mosquito Creek ravine, with a focus on how slope instability may impact nearby infrastructure, water quality, and fish habitat.

[Mosquito Creek Ravine East Landslide Risk Analysis – Phase II \(2007\)](#)

This builds on the 2006 phase I study by conducting detailed geotechnical assessments of 27 properties along the east bank of Mosquito Creek.

The studies found that periods of high rainfall can exacerbate slope instability by increasing surface runoff, saturating soils and raising groundwater within the permeable Capilano Sediments. Toe erosion from creek flow further weakens slope stability. Additional triggers include past flood erosion (in 1955) and infrastructure failures such as the 2004 water main rupture. The primary recommendations are improving stormwater/surface drainage, maintaining water infrastructure, removing debris that impeded drainage and reviewing features that may promote infiltration (such as small ponds). Measures are tailored to new developments, existing developments and specific high-risk properties (Section 9, Phase I study 2006).

Summary

The City of North Vancouver (CNV) integrates flood control measures into multiple aspects of their policy, resulting in a multi-pronged approach that addresses flooding across multiple different policy contexts, such as community-wellbeing, sustainable greenhouse gas reductions, and green infrastructure. Stormwater management currently receives the most attention in policy, as their [dedicated management plan](#) delineates specific improvement and resilience projects regarding stormwater infrastructure in collaboration with multiple jurisdictions. The [Climate Change Adaptation Plan](#) from 2013 laid the foundation for much of the integration of flooding into those currently in place. Their primary regulatory mechanisms to address flooding involve implementing a minimum elevation for structure floors that can be updated as needed to respond to changes in sea level predictions, as well as through Development Permit Areas (DPAs) that require development applications to address the area-specific flood-prone conditions.

The North Shore Emergency Management (NSEM) initiative in collaboration with jurisdictions across the North Shore allows the City to respond to flood risks and flooding events in coordination across watershed levels. CNV appears to rely mostly on this joint initiative to respond to flood risk, as flood hazard is not centred in their own documents so much as integrated secondarily across policy and regulations. Additionally, while OCP policy does delineate avoidance regarding development in flood-prone areas, there appears to be a lack of regulation to specifically implement this goal. Overall, the City appears to manage flooding through integrative and holistic policy, multi-jurisdictional collaboration, and area-specific regulation but does not typically centre flooding as a hazard across its official documentation.

DISTRICT OF NORTH VANCOUVER

Overview

The DNV is a largely suburban and semi rural municipality that surrounds the CNV. It has a larger land area than the CNV (~160.7km²). The district has a population of ~88,168 according to the 2021 [census](#). A broad mix of land uses such as residential neighborhoods, parks and natural terrain makes up the areas. There is also varied topography in the district such as creeks, mountainous slopes and coastal areas along Burrard Inlet which contributes to flood and debris hazards. As a result, understanding watershed dynamics, slope stability and other hazards is critical when assessing flood risk.

Policy

[Official Community Plan \(2011, Updated 2025\)](#)

The Official Community Plan (OCP) addresses flooding and sea level rise through environmental management, climate adaptation, and development regulations. Flooding is treated as a primary natural hazard alongside landslides and wildfires (pg. 75), with coastal development policies acknowledging the increased risk from storms and sea-level rise (pg. 74). Climate adaptation is framed as a proactive necessity requiring a climate change perspective in infrastructure design and emergency preparedness.

To preserve the natural water balance, the OCP promotes green infrastructure and low-impact development through:

- **Infiltration:** Rain gardens, bioswales, bio-retention basins, and exfiltration trenches
- **Absorbent surfaces:** Pervious pavers, deep absorbent soils, and minimized impervious coverage
- **Vegetated features:** Green roofs, living walls, and native/drought-tolerant planting
- **On-site storage:** Cisterns and infiltration galleries for rainwater capture and reuse
- **Natural capital:** Preserving undisturbed areas and daylighting culverted creeks



Figure 11. Lynn Creek during a 100 year rain storm event. From: [Official Community Plan](#).

Key programs and actions include the Natural Hazard Management Program (pg. 75) for flood and debris-flow monitoring, integrated stormwater management plans for all urbanized watersheds (pg. 71), and collaboration with the North Shore Emergency Management Office on extreme weather response (pg. 80). The OCP also interacts with several Local Area Plans and Community Plans (described below) that promote low-impact development through permeable surfaces, rain gardens, absorbent soils, and tree preservation, encouraging rainwater diversion away from storm sewers to reduce downstream flood risk.

[Lynnmour / Inter-River Local Plan \(2004\) and Design Guidelines \(2006\)](#)

The plans address flooding within Lynn Creek's floodplain, with existing risk managed through bank riprap and gravel removal. Engineering measures include raising St. Denis Avenue and Keith Road as dykes, constructing deflection berms at the Fire Training Centre and Lynnmour School, and creating a floodway in Inter-River Park (2004, p. 30). All new development must meet FCLs (~2 feet above road level), with basements generally prohibited and lot consolidation encouraged in low-lying areas to improve drainage management (2006, p. 2).

[Seymour Local Plan \(2003\)](#)

This plan addresses debris flow and flood hazards from mountain creeks around Deep Cove and Indian Arm. DPA designations are expanded into debris flow and fan areas, watershed management plans are encouraged, and clear-span creek crossings are required to maximize flow capacity (p. 7).

Maplewood Local Plan (2002)

Low-lying lands near the Seymour River are under consideration for formal floodplain designation. Business Park site plans must assess hydrological impacts, and natural waterways must be protected from stormwater discharge (p. 5).

Lower Capilano Area Plan (1997) and Lower Lynn Area Plan (1993)

Development in the Capilano-Mosquito floodplain is subject to seismic and flood considerations (1997, p. 9). New developments, such as Seylynn Village, are required to incorporate on-site infiltration and design that respects natural hydrological functions (1993, p. 19).

Alpine Area Plan (1990) and North Lonsdale Community Plans (1995)

These community plans address flooding through environmental preservation and hazard management in a steep, high-precipitation landscape. Forest retention is the plan's primary flood mitigation strategy, with strict compliance required on steep slopes to maintain water absorption and prevent downstream flooding. The district may designate flood-prone areas as tree cutting permit areas to regulate or prohibit tree removal (1990, p. 11; 1995, p. 7).

Strategic Plans

Climate Adaptation Strategy (2017)

Purpose: This strategy outlines how DNV plans to prepare for and respond to the impacts of climate change. Its purpose is to reduce climate-related risks, protect infrastructure and ecosystems while strengthening long-term community resilience through coordinated planning and action.

The strategy identifies that climate change is increasing extreme weather events which is leading to debris flooding and damage to property. This risk is expected to increase with intense rainfall alongside other hazards such as wildfires, droughts and landslides. To reduce flood risk, the strategy states required actions which are ongoing and or were meant to be completed by 2018 (Chapter 4):

- Completing and implementing an Integrated Stormwater Management Plan to manage runoff
- Identifying eco-assets which may reduce the need for grey infrastructure such as sea walls
- Implementing recommendations from the Debris Geohazard Risk and Risk Control Assessment for debris flood/flow creeks, such as design for culverts and guidance for sediment management for creeks

Emergency Response Plans

Find shared emergency response plans for both the City and District of North Vancouver under the [North Shore Emergency Management section](#) of this report.

Land Use Regulations

Zoning Bylaw (1965, Updated 2025)

The current Zoning Bylaw 3210 governs land use and development standards, managing flood risk primarily through Flood Construction Level (FCL) enforcement:

- Habitable space and basements must be at or above FCLs; underground parking requires engineer-certified flood protection (p. 305)
- Mechanical and electrical rooms above the FCL are exempt from floor area calculations, incentivizing safer placement (p. 426)
- Building height in certain zones is measured from FCL rather than finished grade (p. 367)

High-risk sites require a flood hazard report from a registered professional engineer, with protection measures secured by a restrictive covenant (p. 305). Stormwater is further managed through landscaping requirements, porous parking surfaces, and setbacks from the ocean boundary and creek corridors. Density bonuses may also be granted in exchange for amenity contributions, including flood protection infrastructure funding (p. 544).

Development Servicing Bylaw (2017, Updated 2025)

The current Development Servicing Bylaw 8145 governs infrastructure requirements for subdivision and development, with all works completed at the developer's expense. The District targets flood risk through four key mechanisms:

- **Dual Drainage System:** Minor system (sewers, catch basins) for 10-year events; major system (overland paths, watercourses) for 100-year events; creek crossings sized for 200-year peak flows (p. 49)
- **Site-Level Standards:** Habitable floors must meet FCL (flood level plus 0.6m freeboard), lots graded 2% away from foundations (pg. 51), with engineer certification and restrictive covenants for flood-prone sites (p. 68)
- **Green infrastructure:** 90% of annual rainfall captured on-site via rain gardens, bioswales, porous pavers, and ground-discharged roof drainage (p. 48)
- **Debris & erosion control:** Trash racks upstream of culverts and riprap protection where drainage meets natural watercourses (p. 63)

All measures aim to preserve the natural water balance and maintain a setback from watercourses.

Environmental Protection and Preservation Bylaw (1993, Updated 2022)

The current Environmental Protection and Preservation Bylaw 6515 focuses on flood risk by safeguarding natural stream systems. It regulates structures in stream corridors to maintain channel capacity, enforces vegetated buffers to minimize erosion, and prohibits stream obstructions (pg. 4), requiring the removal of soil or other materials (p. 7).

Mandated bank stabilization involves native planting and engineering where riparian areas are disturbed. Any work near watercourses or steep slopes requires permits and assessments (p. 8). Notably, culverts, ditches, and storm sewers are treated as "streams," ensuring all drainage modifications meet the same protective standards as natural watercourses (p. 3).

Development Permit Areas (2011, Updated 2025)

The District of North Vancouver uses five Development Permit Areas (DPAs) and associated guidelines outlined in Schedule B of the Official Community Plan (2025) to manage flood and related hazards:

Creek Hazard DPA (p. 187): The primary flood mitigation tool, prohibiting habitable space and mechanical/electrical equipment below the FCL, minimizing development in floodplains and natural floodways, and requiring vegetation maintenance along creek banks to control erosion.

Streamside Protection DPA (p. 175): Protects streams and wetlands by establishing 15–30 m development setbacks from the top of bank, with any permitted development required to protect natural drainage patterns and remove impervious surfaces where possible.

Slope Hazard DPA (p. 193): Addresses debris flow and saturation risks on steep terrain by requiring controlled water diversion away from slopes, limiting impervious surfaces, and directing concentrated roof drainage to storm drains rather than over sloped land.

Energy, Water Conservation & GHG DPA (p. 269): Requires Low Impact Development techniques—bioswales, rain gardens, pervious surfaces, and deep topsoil—to manage stormwater at the source and enhance on-site infiltration.

Form and Character DPA (p. 205): Incorporates stormwater considerations into site planning by minimizing building coverage and preserving natural features to reduce runoff into creeks.

Related Hazards and Consulting Reports

10-Year Geohazard Risk Mitigation Program (2019)

This report aimed to update and evaluate debris flow and sediment mitigation measures, assessing their performance and identifying remaining risks. Its objective was to recommend improvements and actions to reduce flood and debris hazard to nearby infrastructures.

Significant flood hazards remain in relation to ongoing sediment transport, channel aggradation and potential blockage at culverts during intense rainfall events. Overbank flooding and damage to downstream infrastructure can occur when debris and sediment is mobilized during heavy rainfall. Climate change may increase peak flows and debris loading, further increasing flood risk if channels are not maintained.

Maplewood Village Flood Assessment Study (2016)

Maplewood Village is bordered by the coast of Burrard Inlet and the DNV engaged with consultants to assess flood hazards and vulnerabilities in this district. Their goal was to estimate economic losses in terms of building damages and propose flood risk mitigation strategies.

The main issues identified were riverine flooding from Seymour River and Coastal flooding from Burrard Inlet which are expected to worsen with climate change and sea level rise. Key vulnerabilities identified are older townhouses, single family houses, industrial buildings and major roads (Mount Seymour parkway and Dollarton highway). Shown in Figure 12, the study recommends short term, medium term and long-term actions with consultation from Squamish Nation, the Ministry of Transportation and Infrastructure and CN rail (Section 8). Updating the Maplewood Creek culvert, establishing a coastal hazard DPA and aligning with Fraser Basin Council’s Lower Mainland Regional Flood Management Strategy are all actions mentioned in these sections.

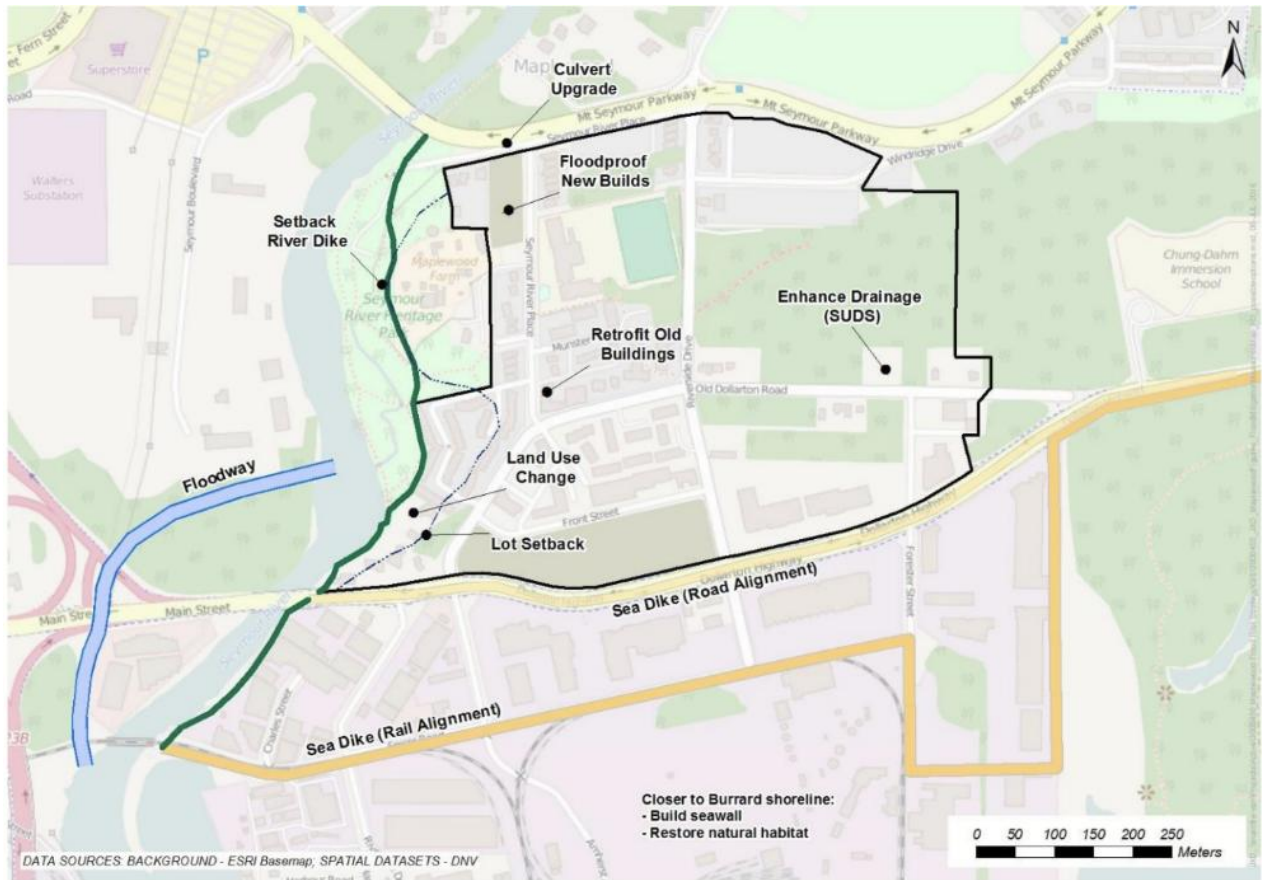


Figure 12. Potential flood management measures in Maplewood Village. From: [Maplewood Village Flood Assessment Study](#).

[Flood Assessment Study North Vancouver \(2010\)](#)

This assessment investigated flood hazards across five local watercourses (Capilano River, Mackay Creek, Mosquito Creek, Lynn Creek, Seymour River). It also aimed to identify gaps in existing flood data to help support flood risk mapping, emergency planning and future mitigation efforts through the development of a spatial flood hazard database.

The HAZUS-MH Flood Model was developed for riverine and coastal flooding. Using available hydraulic data, the researchers generated flood extents for 10-, 25-, 50-, 100-, and 200-year return period events. Results showed that flooding is generally confined to main channels during smaller events while larger return periods could produce more extensive flooding in the surrounding floodplain. Key recommendations include collecting missing survey data which limits the model's accuracy, updating flood hazard mapping and enhancing long term monitoring by expanding gauge networks.

Summary Report on Debris Flow Studies (2003)

This report aimed to evaluate debris flow and debris flood hazard in creeks identified within DNV. The report defines risk as the combination of consequence and hazard. Severe hazards in undeveloped areas can pose less risk than less severe hazards in developed areas. The purpose was to identify high risk creek systems and provide recommendations to guide planning.

Intense rainfall and watershed conditions (ie. steep slopes) can generate high water discharge which transports large volumes of sediments and debris which may threaten downstream communities. Creek fans are the most vulnerable areas because development can be located near creek channels and fans where debris flows deposit. The report outlines mitigation measures to reduce flood risk through five main measures (Section 3):

- Land use planning (ie. Hazard mapping)
- Warning Systems
- Watershed management (ie. Slope stabilization)
- Mitigation structures (ie. Debris basin/barrier)
- Creek management measures (i.e. upgrade/replace culverts)

Summary

The District of North Vancouver demonstrates a comprehensive approach to flood risk management, owing largely to its complex geography, mountainous terrain, numerous creek systems, and coastal exposure. The DNV has a broad collection of flood-specific regulatory tools. This includes a Creek Hazard DPA that directly prohibits occupancy below flood construction levels, a Streamside Protection DPA with 15–30m setbacks, and a Slope Hazard DPA targeting debris flow and saturation risk. The DNV also includes area-specific flood mitigations in its Local Area Plans for neighbourhoods to address local contexts and flood considerations. Its Development Servicing Bylaw mandates a drainage system sized for up to 200-year events and requires 90% on-site stormwater capture.

Both municipalities benefit equally from the shared North Shore Emergency Management (NSEM) framework, which covers planning, response, and recovery across all three North Shore jurisdictions. Overall, the DNV appears well positioned to handle current and future flood risk, with its regulatory framework. The DNV has proactively assessed sea level rise through the North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy (2021), and has identified the need for a dedicated coastal hazard DPA.

NORTH SHORE EMERGENCY MANAGEMENT COLLABORATION

Overview

[North Shore Emergency Management \(NSEM\)](#) is the shared emergency management department for the City of North Vancouver, District of North Vancouver, and District of West Vancouver. This agency was established to coordinate emergency planning and response across all three North Shore jurisdictions.

[North Shore Disaster and Climate Risk Profile](#)

This ArcGIS Story Map provides residents with an accessible overview of disaster and climate risks across the North Shore. It highlights when hazards are most likely to occur throughout the year and which neighbourhoods and infrastructure are most exposed.

Plans and Strategies

[City of North Vancouver and District of North Vancouver Emergency Plan \(2007\)](#)

This plan (with different documents for each municipality that each consist of the same plan) serves as the overarching framework for the City of North Vancouver and the District of North Vancouver to prepare for, respond to, and recover from major emergencies and disasters. It is a legislative requirement under BC's Provincial Emergency Program Act (RSBC 1996) and establishes the coordination structure, roles, and authorities needed to preserve life and protect property across all hazard types. The plan takes an "all hazards" approach, with flooding and creek flooding identified in the Hazard, Risk and Vulnerability Analysis (HRVA) as priority hazards for the North Shore.

Its scope is reactive mobilizing resources and coordinating response once a flood event occurs through the following measures:

- Flood operations response via sandbagging, emergency pumping, drainage, and reporting to the Emergency Operations Center, led by the Engineering, Parks & Environment Division (Section 3)
- Evacuation authority enforced flood evacuations may only be ordered following a formal Declaration of a State of Local Emergency (Section 5)
- Inter-jurisdictional coordination with the North Shore Emergency Management Office (NSEMO) coordinates response across DNV, City of North Vancouver, and District of West Vancouver (Section 3)

North Shore Emergency Management 2024 Annual Report (2025)

The NSEM Annual Report documents the emergency management activities, programs, and responses carried out across the District of North Vancouver, City of North Vancouver, and District of West Vancouver for 2024. As the tri-municipal emergency management body established in 1978, NSEM operates under the *Emergency and Disaster Management Act* and is responsible for emergency planning, preparedness, response, recovery, and volunteer coordination across the North Shore.

To strengthen preparedness for future flood and climate-related events, the report highlights several ongoing planning initiatives:

- NSEM, in partnership with the three North Shore municipalities and Squamish and Tsleil-Waututh Nations, is developing a North Shore Resilience Strategy (to be launched fall/winter 2025), which identifies climate resilient infrastructure, extreme temperatures, and multi hazard emergency management as key priorities.
- NSEM completed the North Shore Extreme Heat Resilience Project, signaling a broader mandate to assess and plan for intensifying climate hazards, including those that interact with flood risk such as atmospheric rivers and debris flows.
- EOC training was delivered to over 100 staff, volunteers, and partners across six courses, ensuring municipal capacity to coordinate flood and extreme weather responses.

The report underscores that recovery from flood related events extends well beyond immediate response, with NSEM continuing to advocate to the Ministry of Emergency Management and Climate Readiness for policy changes to better support long-term recovery efforts.

North Shore Evacuation Guide (2025)

This guide provides an overview of how evacuations on the North Shore are planned and carried out, explaining evacuation types and stages, communication methods, zones and routes, supports for residents, and what people should expect before, during, and after an evacuation.

The North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy is a collaborative regional effort involving the District of North Vancouver, City of North Vancouver, District of West Vancouver, Squamish Nation, Port of Vancouver, and North Shore Emergency Management. The strategy's primary focus is mapping the extent of coastal overland flooding using high-resolution LiDAR data to model still-water levels — the combined effect of high tides and storm surges — under two future scenarios: a 1-metre and 2-metre sea level rise during an extreme storm event (0.5% annual probability). A Sea Level Rise Flood Planning Area is established using the 2-metre scenario plus an additional 0.6 metres of freeboard as a safety buffer, providing a high-level planning tool for coastal floodplain assessment across the region. Importantly, the strategy acknowledges its own limitations — regional maps do not account for localized wave effects or concurrent river flooding, and site-specific assessments remain mandatory for individual shoreline properties. The strategy is intended as a technical foundation for long-term adaptive management, with a more detailed technical report in preparation to guide future phases of implementation.

North Shore Sea Level Assessment and Adaptive Management Strategy (2021)

This strategy is a collaborative regional effort involving the District of North Vancouver, City of North Vancouver, District of West Vancouver, Squamish Nation, Port of Vancouver, and North Shore Emergency Management. The strategy's primary focus is mapping the extent of coastal overland flooding using high-resolution LiDAR data to model still-water levels, to investigate the combined effect of high tides and storm surges under two future scenarios: a 1 metre and 2 metre sea level rise during an extreme storm event (0.5% probability) (Section 2). A Sea Level Rise Flood Planning Area is established using the 2-metre scenario plus an additional 0.6 metres of freeboard as a safety buffer, providing a high-level planning tool for coastal floodplain assessment across the region. Importantly, the strategy acknowledges a limitation as being that the regional maps do not account for localized wave effects or concurrent river flooding, and site-specific assessments remain mandatory for individual shoreline properties (Section 5). The strategy is intended as a technical foundation for long-term adaptive management, with a more detailed technical report in preparation to guide future phases of implementation.

CONCLUSION

The CNV and DNV both recognize flooding as an important climate-related hazard and incorporate mitigation strategies within their bylaws, OCPs, DPAs, strategies and response plans. These policies emphasize reducing exposure to flood hazards through flood construction levels, improved stormwater management, and infrastructure planning. Both municipalities also highlight the importance of climate change adaptation and resilience, recognizing that increasing rainfall intensity, sea-level rise, and watershed runoff will influence future flood risk.

However, differences in geography influences how each municipality approaches flood mitigation. The CNV, which is a more densely urbanized waterfront municipality, generally relies on the OCP with zoning bylaws. In contrast, due to its mountainous terrain and extensive stream networks the DNV addresses flood risk not only through the OCP but area specific plans and hazard specific DPAs related to creeks and slopes. Both municipalities still align with the broader regional coordination by NSEM which emphasizes integrated risk reduction, preparedness, response, and recovery. By combining land-use regulation, infrastructure planning, and inter-municipal coordination, both municipalities contribute to a comprehensive approach to flood risk mitigation and climate resilience on the North Shore.

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