



**AGENDA**  
**GOVERNANCE AND PRIORITIES COMMITTEE MEETING**

Monday, May 13, 2024, 1:00 P.M.  
SHAW AUDITORIUM, VANCOUVER ISLAND CONFERENCE CENTRE  
80 COMMERCIAL STREET, NANAIMO, BC

SCHEDULED RECESS AT 3:00 P.M.

---

**Pages**

**1. CALL THE MEETING TO ORDER:**

[Note: This meeting will be live streamed and video recorded for the public.]

**2. INTRODUCTION OF LATE ITEMS:**

**3. APPROVAL OF THE AGENDA:**

**4. ADOPTION OF THE MINUTES:**

a. Minutes

3 - 11

Minutes of the Governance and Priorities Committee Meeting held in the Shaw Auditorium, Vancouver Island Conference Centre, 80 Commercial Street, Nanaimo, BC, on Monday, 2024-APR-29 at 1:00 p.m.

**5. AGENDA PLANNING:**

a. Upcoming Topics and Initiatives

12

To be introduced by Sheila Gurrie, Director, Legislative Services.

**6. REPORTS:**

a. Green Nanaimo:

1. Geotechnical Guidelines Review

13 - 62

To be introduced by Jeremy Holm, Director, Planning and Development.

*Purpose: To present to the Governance and Priorities Committee for endorsement, guidelines associated with the preparation of*

*geotechnical reports and the assessment of mine-related geotechnical hazards in support of development applications within the City of Nanaimo.*

Presentation:

1. Carl Miller, Senior Principal Geotechnical Engineer, WSP

Recommendation: That the Governance and Priorities Committee recommend that Council endorse the following guidelines, as attached to the Staff Report dated 2024-MAY-13, associated with the preparation of geotechnical reports and the assessment of mine-related geotechnical hazards in support of development applications within the City of Nanaimo:

1. Guidelines for the Preparation of Geotechnical Reports; and,
2. Guidelines for Geotechnical Assessments Above Abandoned Mine Workings.

b. Healthy Nanaimo:

1. Allocation of Unallocated Pedestrian Funds

63 - 86

To be introduced by Bill Sims, General Manager, Engineering and Public Works.

*Purpose: To provide the Governance and Priorities Committee with options for the Financial Year 2024 Pedestrian Unallocated Funds of \$300,000, and reallocation of 2023 funds in the amount of \$182,500, and to provide a discussion about active school travel planning.*

Presentation:

1. Jamie Rose, Manager, Transportation.

Recommendation: That the Governance and Priorities Committee recommend that Council allocate \$300,000 of the 2024 Pedestrian Unallocated Funds and reallocate \$182,500 of the 2023 Pedestrian Unallocated Funds for a combined total of \$482,500 toward Albert Street Crossing Improvements from Milton Street to Dunsmuir Street.

7. QUESTION PERIOD:

8. ADJOURNMENT:



## MINUTES

### GOVERNANCE AND PRIORITIES COMMITTEE MEETING

Monday, April 29, 2024, 1:00 P.M.  
SHAW AUDITORIUM, VANCOUVER ISLAND CONFERENCE CENTRE  
80 COMMERCIAL STREET, NANAIMO, BC

- Members:
- Councillor I. Thorpe, Chair
  - Mayor L. Krog
  - Councillor S. Armstrong\* (joined 1:28 p.m.)
  - Councillor H. Eastmure
  - Councillor B. Geselbracht
  - Councillor E. Hemmens
  - Councillor P. Manly
  - Councillor J. Perrino
- Absent:
- Councillor T. Brown
- Staff:
- D. Lindsay, Chief Administrative Officer
  - R. Harding, General Manager, Community Services/Deputy CAO
  - L. Mercer, General Manager, Corporate Services
  - B. Sims, General Manager, Engineering and Public Works
  - S. Gurrie, Director, Legislative Services
  - J. Holm, Director, Planning and Development
  - D. LaBerge, Director, Public Safety
  - T. Pan, Manager, Sustainability
  - L. Rowett, Manager, Current Planning
  - C. Wood, Manager, Social Planning
  - B. Hornby, Senior Community Safety Officer
  - N. Sponaule, Communications Advisor
  - J. Vanderhoef, Recording Secretary

1. CALL THE MEETING TO ORDER:

\* Denotes electronic meeting participation as authorized by "Council Procedure Bylaw 2018 No. 7272"

The Governance and Priorities Committee Meeting was called to order at 1:00 p.m.

2. APPROVAL OF THE AGENDA:

It was moved and seconded that the Agenda be adopted. The motion carried unanimously.

3. ADOPTION OF THE MINUTES:

It was moved and seconded that the following Minutes be adopted as circulated:

- Minutes of the Governance and Priorities Committee Meeting held in the Shaw Auditorium, Vancouver Island Conference Centre, 80 Commercial Street, Nanaimo, BC on Monday, 2024-MAR-11 at 1:00 p.m.
- Minutes of the Governance and Priorities Committee Meeting held in the Shaw Auditorium, Vancouver Island Conference Centre, 80 Commercial Street, Nanaimo, BC on Monday, 2024-MAR-25 at 12:59 p.m.

The motion carried unanimously.

4. AGENDA PLANNING:

a. Upcoming Topics and Initiatives

Sheila Gurrie, Director, Legislative Services, spoke regarding topics and initiatives scheduled for upcoming Governance and Priorities Committee (GPC) meetings. Discussion took place. Highlights included:

- Unallocated pedestrian funds and if there is enough time to communicate with School District 68 before the GPC meeting
- School District 68 being aware that Council will be considering allocating funds to areas of concern around schools

5. REPORTS:

a. Prosperous Nanaimo:

1. Draft Monitoring Strategy

Introduced by Jeremy Holm, Director, Planning and Development.

Presentation:

1. Ting Pan, Manager, Sustainability, provided a PowerPoint presentation. Highlights included:

- The monitoring strategy tracks progress towards City Goals as defined within the City Plan
- Staff have identified 21 areas of impact (19 of which are active) that relate to different goal areas in the City Plan
- Staff are proposing a four-year indicator report to support and track how things are progressing
- Reviewed the current status of the areas of impact and whether they are meeting, or not meeting, goals
- Advancements in GIS technology is helping to create additional data
- Staff plan to update data and release the monitoring data during the fourth quarter of each year and provide a more fulsome report every four years

Councillor Armstrong joined the meeting electronically at 1:28 p.m.

Committee and Staff discussion took place. Highlights included:

- Collecting data from the Provincial and Federal Governments regarding air and water quality. Staff are not recommending monitoring these areas at this point as it is difficult to establish measures to determine if/how we are impacting those areas
- Absence of data and measureable indicators within the Empowered Nanaimo areas
- Suggestion that the Advisory Committee on Accessibility and Inclusiveness consider the topic of accessibility and inclusivity to suggest measurable indicators
- Staff have taken a two-step approach to the process of bringing the monitoring strategy before Council. The next step will be the communication/engagement process
- Staff are seeking more discussion regarding what monitoring committees would do
- Other municipalities are pursuing similar strategies; however, each municipality has different goals and is collecting different data

- Using the data collected through the Rick Hansen Foundation Audit reviews of Parks and Recreation facilities to monitor Connected Nanaimo goals
- The monitoring committee's purpose would be to communicate to the public about what the City is doing, what has been done, and what to focus on going forward. The committee would need to meet at least twice a year

It was moved and seconded that the Governance and Priorities Committee recommend that Council endorse in principle the draft Monitoring Strategy and engagement framework and direct Staff to proceed with next steps as outlined in the 2024-APR-29 Staff Report by the Manager, Sustainability. The motion carried unanimously.

b. Healthy Nanaimo:

1. Downtown Nanaimo Community Safety Action Plan Evaluation and Strategy Alignment

Introduced by Dave LaBerge, Director, Public Safety.

Presentation:

1. Alana Best, Director, Public Sector Transportation, Deloitte Inc., provided a PowerPoint presentation. Highlights included:
  - Deloitte Inc. was tasked with evaluating the Downtown Nanaimo Community Safety Action Plan (DNCSAP) to determine if the plan is meeting goals, is sufficiently resourced to achieve its goals, and ensuring it is aligned with other City initiatives
  - Reviewed feasibility of expanding the action plan beyond the downtown core
  - Met with Staff, community associations, and held interviews with individuals with lived experience
  - Reviewed measures that have been implemented, are partially implemented, in progress, and noted one that is incomplete
  - Received unanimous positive feedback regarding the success of the Community Safety Officers (CSO) and Clean Team

- Their first recommendation is to expand the number of resources, and the geographical location, surveyed by the CSO's and provided three potential scenarios to implement this expansion

Committee and Staff discussion took place regarding a report from Staff outlining potential costs for the three scenarios and including information regarding additional costs for increased RCMP staffing.

Alana Best, Director, Public Sector Transportation, Deloitte Inc., continued the presentation. Highlights included:

- The second recommendation is to increase and enhance the Clean Team services to mirror the expanded capacity of the CSOs
- Reviewed recommendations related to governance such as hiring a Downtown Safety Coordinator, implementing an interdepartmental working group and developing a stakeholder committee
- Outlined overall findings and recommendations such as: identifying a vision or "North Star", bridging gaps and coordinating with other partners, building a baseline of data to measure against, and creating a communication strategy
- Next Steps recommended are to coordinate with public safety partners, create a governance framework and hire resources, develop key performance indicators and implement recommendations (particularly the CSO expansion)

Committee and Staff discussion took place. Highlights included:

- The Downtown Nanaimo Business Association being involved in this review. Staff have been engaging with them regularly
- Praised the ongoing work of the CSO's and Clean Team
- Discussion regarding the engagement process and how interviews were conducted
- The need for increased resources and housing supports for the CSO's to send people to. Staff confirmed there are significant challenges due to the limited resources available

to the CSO's and they see more compliance when resources like warming centres and shelters are available

- CSO's are seeing improvements through collaboration with Island Health to address mental health and substance use issues and taking more of a compassion based approach
- Clarification regarding funding previously allocated towards the RCMP Downtown Engagement Team. The four RCMP positions have been filled and will be assigned to the downtown area in the summer
- Clarification that the intention behind the recommendation to promote the Vandalism Relief Grant Program is to continue to provide the grant program and expand it beyond the downtown core
- The need for a daytime warming centre and building out resources from there
- Implications related to changes around open drug use
- Engagement with neighbourhood associations saw strong support for increasing the CSO's and the Clean Team
- Concern regarding the potential tax increase next year related to the additional CSO and Clean Team staffing positions and the City taking on Provincial responsibilities

It was moved and seconded that the Governance and Priorities Committee recommend that Council direct Staff to proceed with a cost analysis of the preferred scenarios found in the Downtown Nanaimo Community Safety Action Plan Evaluation and Strategy Alignment Report, dated 2024-APR-29, for the expansion of the Community Safety Officer and Clean Team programs and to prepare a business case for 2025 budget deliberations. The motion carried.

Opposed: *Councillor Perrino*

Councillor Armstrong disconnected from the meeting at 2:59 p.m.

The Governance and Priorities Committee Meeting recessed at 2:59 p.m.

The Governance and Priorities Committee Meeting reconvened at 3:10 p.m.

2. Keeping of Poultry in Residential Areas

Introduced by Jeremy Holm, Director, Planning and Development.

Presentation:

1. Lainya Rowett, Manager, Current Planning, provided a PowerPoint presentation. Highlights included:
  - On 2023-SEP-25, Council directed Staff to review provisions of the Animal Control Bylaw and Zoning Bylaw in response to several calls and inquiries for services related to the keeping of poultry on residential lots
  - Provided an overview of the history of regulations related to keeping poultry on residential lots
  - Staff compared Nanaimo regulations to other municipalities and found that Nanaimo regulations were similar and sometimes less restrictive
  - Staff reviewed opportunities for ways to increase food security and poultry keeping:
    - Increasing allowable poultry (>12 poultry on a lot)
    - Reducing allowable poultry (<12 poultry on a lot)
    - Maintain existing regulations with revisions for clarity

Councillor Armstrong joined the meeting electronically at 3:25 p.m.

- Should the GPC wish to increase poultry provisions the following issues should be considered:
  - Increased land use conflicts
  - Manageable flock sizes
  - Waste disposal
  - Increased odor and noise
  - Pests and predators
  - Spread of diseases
  - Lack of inspections
- Should the GPC wish to maintain the current regulations Staff recommend amending the existing definition of agriculture to provide more clarity

Committee and Staff discussion took place. Highlights included:

- Clarification that food inspections are not required for small flocks; however, disease can spread to commercial flocks if they are within proximity

- The prohibition of roosters
- Clarification that the intention of the regulations are related to personal consumption and do not relate to commercial poultry farming

Delegation:

1. Collin MacQuarrie spoke providing an overview of the negative impacts resulting from the Animal Control Bylaw not being enforced in his neighbourhood. There is currently a residential lot in this neighbourhood that is housing a large number of chickens for sales purposes. He noted concerns regarding noise and smell that are negatively impacting the neighbourhood.

Committee and Staff discussion took place. Highlights included:

- Clarification that the number of chickens on the subject property is estimated to be 150 and would be considered a commercial operation on a residential property
- Neighbours are not able to enjoy their backyards due to smells
- The intention of the regulations are to limit the number of poultry on residential properties within reasonable bounds in order to reduce impacts on neighbours
- Clarification that prior to the current Animal Control Bylaw there was not a limit to the number of chickens allowed on properties over one acre in size; however, there was still a requirement under the Zoning Bylaw to align with the property designation as residential which would not allow for commercial production
- Staff noted that bylaw enforcement is complaint driven
- Potentially increasing the number of poultry allowed on smaller lots to increase food security
- Potentially providing allowance for legacy farms

It was moved and seconded that the Governance and Priorities Committee recommend that Council direct Staff to prepare amendments to the City of Nanaimo “Zoning Bylaw 2011 No. 4500”, as outlined in the Staff Report titled “Keeping of Poultry in Residential Areas” dated 2024-APR-29. The motion carried.

Opposed: *Councillor Geselbracht*

6. QUESTION PERIOD:

The Committee received no questions from the public regarding agenda items.

7. ADJOURNMENT:

It was moved and seconded at 4:01 p.m. that the meeting adjourn. The motion carried unanimously.

---

CHAIR

CERTIFIED CORRECT:

---

CORPORATE OFFICER

Meeting Time	Upcoming Topics and Initiatives	
<b>Wednesday, June 12, 2024 – GPC Meeting</b>		
9am	<b>Alternative Approval Process</b> (2023-DEC-18 Council motion)	<ul style="list-style-type: none"> <li>Review and discussion of policy options</li> </ul>
<b>June 24, 2024 – GPC Meeting</b>		
1pm	<b>Public Works Yard</b> (Nanaimo Operations Centre Project)	<ul style="list-style-type: none"> <li>Discussion re: options for funding (2024-FEB-12 Council motion)</li> </ul>

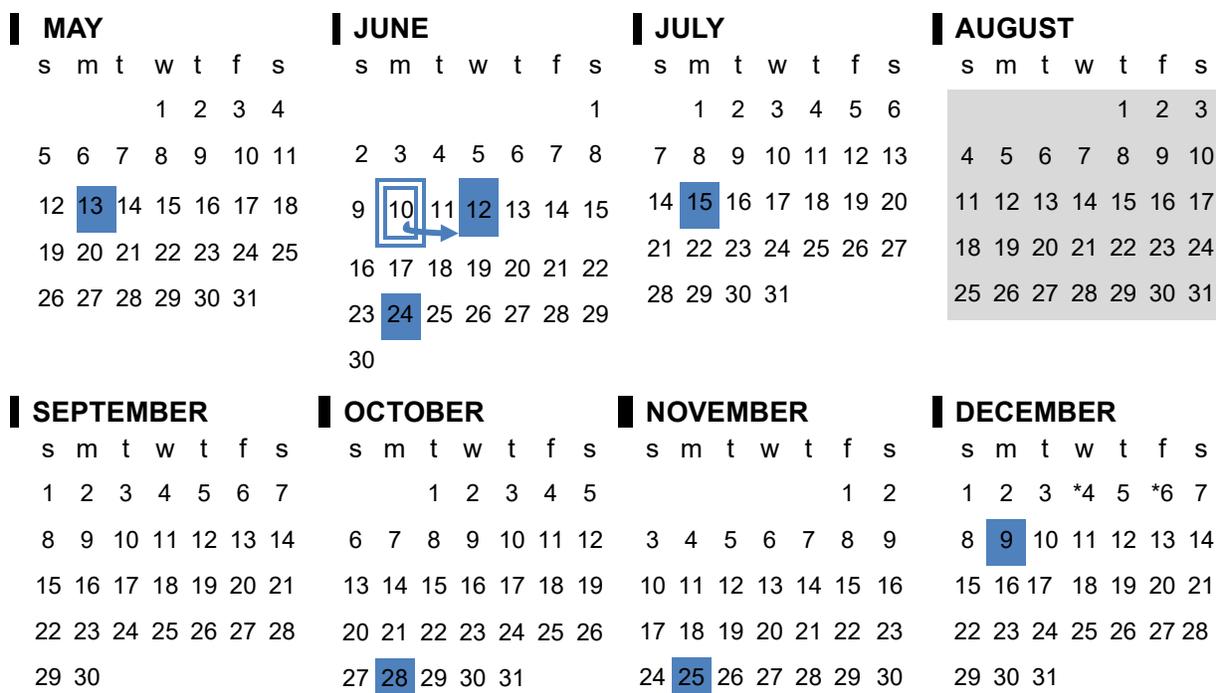
### Future GPC topics – dates TBD

<ul style="list-style-type: none"> <li>City Plan Monitoring Committee(s) (2023-MAY-1 Council motion)</li> </ul>
<ul style="list-style-type: none"> <li>School Zone Policy Update (2024-FEB-26 Council motion)</li> </ul>
<ul style="list-style-type: none"> <li>Incentives that support City Plan (2023-DEC-04 Council motion) – Tentative date 2024-OCT-28 GPC</li> </ul>

### Tentative GPC topics

<ul style="list-style-type: none"> <li><b>E-Mobility Strategy Phase 1</b> (IAP Action C1.1.37) Tentative date 2024-JUL-15 GPC</li> </ul>	Presentation & report for decision
<ul style="list-style-type: none"> <li><b>DPA8 Form and Character Design Guidelines</b> Tentative date 2024-OCT-28 GPC</li> </ul>	Presentation of new development permit (DP) guidelines for endorsement

Legend	
	Council requested topics
	Staff initiatives
	Integrated Action Plan (IAP) program



DATE OF MEETING MAY 13, 2024  
AUTHORED BY CLAIRE NEGRIN, MANAGER, SUBDIVISION  
SUBJECT **GEOTECHNICAL GUIDELINES REVIEW**

## **OVERVIEW**

### **Purpose of Report**

To present to the Governance and Priorities Committee for endorsement, guidelines associated with the preparation of geotechnical reports and the assessment of mine-related geotechnical hazards in support of development applications within the City of Nanaimo.

### **Recommendation**

That the Governance and Priorities Committee recommend that Council endorse the following guidelines associated with the preparation of geotechnical reports and the assessment of mine-related geotechnical hazards in support of development applications within the City of Nanaimo:

1. Guidelines for the Preparation of Geotechnical Reports; and,
  2. Guidelines for Geotechnical Assessments Above Abandoned Mine Workings;
- as attached to the Staff Report dated 2024-MAY-13.

## **BACKGROUND**

The geography of Nanaimo includes several geological conditions such as past glaciation; historic sub-surface coal mining; seismic shaking; steep lands prone to landslide, rockfall, and erosion; and, coastal erosion resulting from tidal effects and long-term sea level change. This varied and complex landscape means that much of the development in Nanaimo relies on geotechnical reviews of the land and proposed development at multiple stages of the development process to attempt to mitigate negative impacts to health and safety, damage to land, buildings and infrastructure, and harm to the environment.

Presently, there are two sets of guidelines available to geotechnical engineering professionals to outline the City of Nanaimo's expectations for geotechnical reporting documents: '*Guidelines for the Preparation of Geotechnical Reports: Subdivision*' and '*Guidelines for the Preparation of Geotechnical Reports: Building Inspections*'. These guidelines were last updated in 2013.

Since that time, there have been changes in processes at the City, growth in the understanding of geotechnical conditions and their interactions with development, as well as updated professional guidance for Engineers and Geoscientists, that have necessitated an update to the existing guidelines and the development of new guidelines related to abandoned mine workings. The adoption of *City Plan: Nanaimo Reimagined* created a new development permit area: DPA4 – Abandoned Mine Workings Hazards. The development of an associated set of guidelines has been in process since that time to provide applicable guidance to geotechnical professionals.

## **DISCUSSION**

### **Guidelines for the Preparation of Geotechnical Reports**

The Guidelines for the Preparation of Geotechnical Reports is a consolidation and update of two existing sets of guidelines currently available for reports associated with subdivision and building permit applications. The new Guidelines provide a single source for this information and also include guidance for geotechnical reporting documents (i.e. reports, memos, etc.) prepared for other development applications, including rezonings, development permits, and development variance permits.

The use of a single set of guidelines related to the preparation of reports will help Staff, applicants, and geotechnical professionals by ensuring that parties are aware of the expectations for reporting for all types of applications. The Guidelines also include process flowcharts for each application type, which identify the typical point during an application where relevant geotechnical reporting is required, as well as the typical level of assessment required at a given point in development review.

### **Guidelines for Geotechnical Assessments Above Abandoned Mine Workings**

The Guidelines for Geotechnical Assessments Above Abandoned Mine Workings provide a consolidation of information, including historical mining background information, legislative context, and mining-induced geological hazards. The Guidelines then provide an overview of the preliminary desktop risk assessment completed by the City's geotechnical consultant based on the consolidated information, which classifies areas as high, medium, or low risk based on risk screening criteria applied to different types of hazards. Finally, the Guidelines provide an overview of what information the City would expect to see in any report related to assessments above abandoned mine workings.

From the Guidelines:

*'Abandoned mine workings underlie approximately 13 of the 93 square kilometres of land within the City limits. A further 7 square kilometres of abandoned workings are located below adjacent coastal waters. The presence of abandoned mine workings introduces geological hazards that have the potential to negatively impact development in the form of health and safety, the stability of structures or lands, and/or the natural environment. These hazards must be assessed and, if determined to constitute unacceptable risk, mitigated through the development process to provide the City with assurance that the land can be used safely for the use intended.'*

Mining was first established in Nanaimo in 1852. Mines were continuously opened and closed between then and 1964, when the last mine closed. As such, much of the development in Nanaimo has occurred during and after mining operations occurred. Information on mines has been available mostly through provincial databases, archived data, or other published works. The adoption of *City Plan: Nanaimo Reimagined* in 2022, included the creation of the Abandoned Mine Workings Hazards Development Permit Area (DPA4) prompted the need for information related to abandoned mine workings to be more readily available to the public, landowners, and developers in the city.

Development above abandoned coal mines is a unique circumstance. As such, the designation of the Development Permit Area within *City Plan: Nanaimo ReImagined* ensures that impacted landowners are aware of the presence of abandoned mine workings, and the availability of the Guidelines will ensure that all geotechnical professionals working in the area are aware of the relevant information and recommended approaches associated with assessing risks above abandoned mine workings. The City has historically required geotechnical assessments of mining hazards to be completed for development, and although information related to abandoned mine workings has previously been available through multiple data sources, the consolidation of that information should prove useful and convenient for geotechnical engineers completing the assessments.

## Process

Both the Guidelines for the Preparation of Geotechnical Reports and the Guidelines for Geotechnical Assessments Above Abandoned Mine Workings were prepared by Carl Miller, P.Eng, Senior Principal Geotechnical Engineer for WSP. The Guidelines were presented in a webinar format by Mr. Miller to Geotechnical Engineers working in the region. The session was recorded and available for watching for a month afterwards and comments and questions related to the draft Guidelines were welcomed, however, none were received. Pending Council endorsement, the Guidelines will be made available on the City's website. |

## OPTIONS

1. That the Governance and Priorities Committee recommend that Council endorse the following guidelines associated with the preparation of geotechnical reports and the assessment of mine-related geotechnical hazards in support of development applications within the City of Nanaimo:
  1. Guidelines for the Preparation of Geotechnical Reports; and,
  2. Guidelines for Geotechnical Assessments Above Abandoned Mine Workings; as attached to the Staff Report dated 2024-MAY-13.
  - The advantages of this option: The Guidelines will ensure that applicants and their Geotechnical Engineers are aware of the City's expectations for reports and ensure that all geotechnical professionals working in the area are aware of the relevant information and recommended approaches associated with assessing risks above abandoned mine workings landowners. The guidelines support implementation of *City Plan: Nanaimo ReImagined* policy objectives through protection of development from hazardous conditions.
  - The disadvantages of this option: None identified.
  - Financial Implications: None.
2. That Council withhold endorsement of the geotechnical guidelines and provide further direction to Staff.
  - The advantages of this option: None identified.
  - The disadvantages of this option: by withholding endorsement, the Guidelines will not be made public, meaning Geotechnical Reports may not meet Staff expectations for content or layout, which may unnecessarily delay development applications.
  - Financial Implications: Unknown.

**SUMMARY POINTS**

- The City of Nanaimo has prepared an updated and consolidated set of Guidelines for the Preparation of Geotechnical Reports, for geotechnical reports prepared in support of development applications within the City of Nanaimo.
- The City of Nanaimo has prepared Guidelines for Geotechnical Assessments Above Abandoned Mine Workings, for geotechnical assessments of development proposals located within the area covered by Development Permit Area 4: Abandoned Mine Workings Hazards as designated in *City Plan: Nanaimo ReImagined*.
- The Guidelines will ensure that applicants and their Geotechnical Engineers are aware of the City's expectations for reports and ensure that all geotechnical professionals working in the area are aware of the relevant information and recommended approaches associated with assessing risks above abandoned mine workings landowners.

**ATTACHMENTS:**

- ATTACHMENT A: Draft Guidelines for the Preparation of Geotechnical Reports  
ATTACHMENT B: Draft Guidelines for Geotechnical Assessments Above Abandoned Mine Workings  
ATTACHMENT C: Guidelines for the Preparation of Geotechnical Reports: Subdivision  
ATTACHMENT D: Guidelines for the Preparation of Geotechnical Reports: Building Inspections |

**Submitted by:**

Claire Negrin  
Manager, Subdivision |

**Concurrence by:**

Dean Mousseau  
Manager, Development Engineering &  
Environmental Protection

Jeremy Holm  
Director, Planning & Development |

# ATTACHMENT A



## GUIDELINES FOR THE COMPLETION OF GEOTECHNICAL REPORTS

***DRAFT***

May 2024

## TABLE OF CONTENTS

1	Introduction .....	3
2	Scope of Guidelines.....	3
3	Definitions and Responsibilities.....	4
4	Geotechnical Design Criteria.....	5
	<i>Natural and Mining-Induced Geological Hazard Risk</i> .....	5
	<i>Seismic Design</i> .....	6
	<i>Level of Landslide Safety</i> .....	7
	<i>Considerations of Changed Conditions, Maintenance, and Surveillance</i> .....	7
5	Geotechnical Setting.....	8
6	Geotechnical Reporting within the Approval Process .....	8
6.1	General.....	8
6.2	Geotechnical Report Requirements .....	9
	<i>Property Identification</i> .....	9
	<i>Reason for Report</i> .....	9
	<i>Reliance of Approving Officer and/or Building Official on the Report</i> .....	9
	<i>Safe Use of the Land</i> .....	10
	<i>Format for Submission</i> .....	10
7	References .....	10
	Appendix 1: City of Nanaimo Geotechnical Setting.....	13

### Figures

Figure 1: Development Approval Process

## GUIDELINES FOR THE COMPLETION OF GEOTECHNICAL REPORTS

### **1 Introduction**

These Guidelines present the City of Nanaimo's (City) expectations for legislated geotechnical assessments and reports related to the development of private lands within the City. The Guidelines identify the City's standard geotechnical design criteria in relation to natural hazards, seismic design, slope stability, and timeframe considerations. Background information is provided to outline the local geotechnical setting. Geotechnical reporting expectations and requirements are provided for Geotechnical Reporting Documents (GRD) that are submitted in support of planning and development applications.

The City, in discharging its duties as the Approving Officer and/or Building Official, must be authorized by the Qualified Professional or Engineer of Record to rely on the particular GRD when making a decision on a planning or development application. It is acknowledged that ground and groundwater conditions can vary from those expected and that changes may be required to the design and construction recommendations given in the GRD. Provision is made in the Guidelines for the City to require a Completion Report at the end of construction to document significant changes and/or geotechnical improvements that may have been undertaken to mitigate potential hazards.

These Guidelines are not intended to be prescriptive nor are they intended to serve as a substitute for engineering judgement and experience. It is anticipated that variations in the application of the Guidelines may be required for certain specific projects.

### **2 Scope of Guidelines**

These Guidelines apply to the practice of geotechnical engineering in relation to the legislated Geotechnical Reporting Documents (GRD) that the City may require in support of planning and development applications for private land within the City of Nanaimo, including:

- Zoning Amendment Applications;
- Development Permits;
- Development Variance Permits;
- Subdivision Applications; and,
- Building Permits.

The authority for the City to require GRDs may be found in a variety of statutes, bylaws, and regulations. In addition to these Guidelines, the reader should be aware of the following documents:

- Guidelines for Geotechnical Assessments Above Abandoned Mine Workings, 2024. These relatively specific guidelines relate to the City's expectations for assessment and reporting for lands that lie within the City's Development Permit Area 4: Abandoned Mine Workings Hazards;
- Manual of Engineering Standards & Specifications (MOESS): Section 3.7. Geotechnical Assessment and Reporting. This document describes requirements for geotechnical assessment and reporting in relation to the design process for new roads and underground utilities; and,
- Seismic Design Guidelines for Water, Sewer Utilities and Road 2022. These guidelines are referenced in the Manual of Engineering Standards & Specifications: Section 3.7. and outline the City's expectations for seismic design for components of City-owned infrastructure that are not covered under the BC Building Code.

### **3 Definitions and Responsibilities**

**Qualified Professional:** means a professional engineer or geoscientist who is registered or licenced in good standing with Engineers and Geoscientists BC. The Qualified Professional will have the appropriate level of education, training, and experience to complete the assessment required in support of the particular application.

**Geotechnical Engineer of Record (GER):** means the Professional Geotechnical Engineer responsible for a specific portion of the project design. The GER, who will be a Qualified Professional, is responsible to ascertain that the GER's final design (including any changes made during construction) meets applicable design standards, criteria and guidelines. The GER's responsibilities during construction include conducting Field Reviews for the geotechnical aspects of construction being installed by the contractor. The GER is primarily responsible for evaluating whether the geotechnical aspects of construction are performed in general accordance with the geotechnical aspects of project plans and specifications, and the geotechnical design recommendations prepared by the GER.

**Geotechnical Reporting Document (GRD):** Reports and other documents that communicate geotechnical data, analysis and recommendations. GRD's can be of many types and formats including Geotechnical Design Reports; Geotechnical Baseline Reports; Geotechnical Design Memo's; Geotechnical Field Memos; and Geotechnical Completion Reports. Multiple GRD's may be required by the City as a project moves through the development process from Re-zoning

and/or Development Permit; to Subdivision and Building Permit; and from preliminary design to detailed design to construction and operation.

**Approving Officer (AO):** means the City of Nanaimo’s municipal Approving Officer as defined in the *Land Title Act*. The Approving Officer is the statutory official responsible for ensuring that subdivisions applications comply with provincial statutes, regulations, and local government bylaws regulated to subdivision.

**Building Official:** means a qualified City of Nanaimo employee who is responsible for the administration and enforcement of Building Regulations.

**The Client:** means an individual or company who engages a Qualified Professional or Engineer of Record to provide geotechnical services in support of the land development or building permit application. The client is typically the land owner or a third party who has been contracted to oversee the process on behalf of the owner.

**Letters of Assurance:** means standard forms of the *British Columbia Building Code* informing authorities having jurisdiction which aspects of a project design and Field Reviews are the responsibility of the Engineer of Record.

#### **4 Geotechnical Design Criteria**

##### **Natural and Mining Induced Geological Hazard Risk:**

It is most important that natural and mining induced geological hazards (Hazards) be identified on land that is about to be subdivided or, in the case of a Building Permit application, developed. These hazards may include but are not limited to, flooding, debris torrent, landslide, rockfall, erosion, subsidence, and mining induced geological hazard. Pursuant to Section 86 of the *Land Title Act*, the Approving Officer may refuse to approve the subdivision application if the officer considers that the land in question may be subject to a hazard. Similar provisions apply under Section 56 of the *Community Charter*, the *Strata Property Act* and the *Bare Land Strata Regulations BC Reg. 75/78*.

For assessing landslide hazards, the most recent version of the EGBC Guidelines for Legislated Landslide Assessment for Residential Developments in BC must be followed. The City may require the Qualified Professional to fully execute the Landslide Assessment Assurance Statement in Appendix D.

The most recent version of the City’s Guidelines for Geotechnical Assessments above Abandoned Mine Workings is to be used in the geotechnical assessment or development of lands within the City’s DPA 4: Mine Working Hazards.

For assessing flood hazards, the most recent version of the EGBC Professional Practice Guidelines - Legislated Flood Assessments in a Changing Climate in BC shall be followed.

**Seismic Design:**

Seismic design objectives and expected performance of buildings are described in Commentary J of the Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B or latest version thereof). These relate to the protection of life and safety of building occupants and the general public as the building responds to strong ground shaking, as well as requirements to limit building damage during low to moderate levels of ground shaking.

For subdivisions, seismic design is required on all structures and slopes that form the lot grading plan. This includes retaining walls greater than 1.2 m in height that support a roadway or walls that support a cut above the roadway where failure of the wall or cut will enter the City's right-of-way. The most recent version of the EGBC Professional Practice Guidelines for Retaining Wall Design shall be used in wall design and in defining minimum performance requirements. The City may require the GER to complete the Appendix A: Engineer of Record Retaining Wall Assurance Statement. The City requires the Owner to obtain a Building Permit for all walls greater than 1.2 m in height and for the GER to provide Letters of Assurance for the wall design and subsequent completion of Field Reviews.

Methods of seismic analysis of soil slopes are described in the EGBC Guidelines for Landslide Assessments in BC. Liquefaction potential of the subsoil shall be evaluated for structures, walls and embankments and the design will incorporate ground improvements and other methods of addressing potential liquefaction to meet the performance expectations described herein.

Seismic considerations and performance for new roads and underground utilities are presented in the Manual of Engineering Standards and Specifications Section 3.7 with further guidance presented in the latest version of the City's Seismic Design Guidelines for Water, Sewer Utilities and Roads.

**Level of Landslide Safety:**

The City will assess the suitability of land for new development with respect to rotational and translational landslides on the basis of the following minimum Factors of Safety (FOS):

Table 1 – Minimum Factor for Safety for Slope Stability Hazard from Rotational and Translational Landslides

Type of Application	FOS > 1.3 (static) FOS > 1.0 (non-static, with D < 0.15 m with 1:475)	FOS > 1.5 (static) FOS > 1.0 (non-static, with D < 0.15 m with 1:2475)
Building Permit (<25% increase to gross floor area)	X	
Building Permit (≥25% increase to gross floor area and/or retaining walls >1.2m)		X
Rezoning		X
Subdivision		X
New Development (Development Permit)		X

Where: 1:475 and 1:2,475 are annual probabilities of seismic hazard based on the latest version of the building code.

D is ground displacement calculated in accordance with the procedures of the most recent version of the EGBC Guidelines for Legislated Landslide Assessment for Residential Developments in BC.

Where the potential for high velocity flow type landslides or rockfall hazard is identified, the assessment shall identify the mitigation measures necessary to verify that the land may be used safely for the use intended in accordance with the reporting requirements given below. The mitigation measures, maintenance, and surveillance requirements shall comply with the requirements below.

**Considerations of Changed Conditions, Maintenance and Surveillance:**

In completing their geotechnical assessment, the Qualified Professional and GER should consider the potential for changes to existing conditions resulting from natural processes such as sea level rise, erosion, wildfire, repeated freeze thaw, and from human activities and urban development. In the absence of a project specific agreement with the City, the assessment and geotechnical reporting for building and subdivision projects should consider the influence of potential changes over a period of 100 years. The GRD should include discussion and recommendations for geotechnically related maintenance and surveillance requirements to satisfy project performance expectations over this time period, including where the responsibility lies for such

actions. The professional's report together with a Section 219 covenant may be required to be registered on the title of the property pursuant to the *Land Title Act*.

Specific guidance related to civil and transportation infrastructure retaining walls is provided in the EGBC Professional Practice Guidelines for Retaining Wall Design, Version 1.1 25 February 2020.

## **5 Geotechnical Setting**

Nanaimo has a complex geological history that includes several regimes of glaciation along with deposition and erosion during the wasting of the last ice sheet. The area was home to commercial coal mining and large areas of the City are underlain by abandoned underground mine workings. The area is also prone to hazards from strong seismic shaking, and steeper areas to landslide, rockfall, and erosion. The eastern boundary of the City is formed by the Strait of Georgia and is subject to changing conditions and active erosion as a result of tidal effects and long-term sea level change. A general description of the local geotechnical setting is provided in Appendix 1.

## **6 Geotechnical Reporting within the Approval Process**

### **6.1 General**

GRD's take many forms, have many titles and can be prepared at various levels of detail commensurate to the various stage of a project; from feasibility to detailed design to construction. GRD's can vary from comprehensive design reports to focussed interpretive reports dealing with one phase of a design or one design element. GRD's also include baseline geotechnical reports that are limited to the presentation of factual data, as well as forensic reports addressing some form of failure. At the construction stage of a project, GRD's include field memos and site instructions that can contain recommendations or instructions that may substantially alter the recommendations given in the original geotechnical design report that formed the basis of approval.

The City operates within a development approval process with a legislative framework that, dependent on the project, may include requirements from bylaws covering rezoning applications, the *Local Government Act* (Development Permits), the *Land Title Act* (subdivisions), *Community Charter* (Building Permits), *Local Government Act* (Flood Plain Bylaw) and *BC Building Code*. The reporting requirements in this Guideline relate to the GRD's submitted in support of those applications. The City's AO and/or Building Official in discharging their responsibilities must have reliance on the GRD submitted for the particular development application.

The attached Figure 1 is a flowchart that summarizes the legislated development approval process followed by the City and identifies the City’s general expectations in terms of supporting GRD’s. Specific wording requirements for GRD’s are presented below.

## 6.2 Geotechnical Report Requirements

Geotechnical Reports provided in support of a development application must address the following requirements:

### Property Identification:

The report must identify the subject property by providing the legal description and civic address of the subject property as well as a plan showing the location of the property. Any existing covenants relative to land use or natural hazards shall be identified and attached to the report, with relevant zoning or geotechnical setbacks or easements marked on the plan, where applicable.

### Reason for Report:

Description of the intended use of the subject property that corresponds to the development application(s) being considered by the City.

### Reliance of Approving Officer and/or Building Official on the Report:

The applicable example statement shall be used in the case of:

- Rezoning:  
“Notwithstanding any other statement in this report, this report may be relied upon by the City of Nanaimo in considering a zoning amendment application to rezone the subject property from (*insert existing zoning*) to (*insert proposed zoning*) as regulated by City of Nanaimo Zoning Bylaw No. 4500.”
- Development Variance:  
“Notwithstanding any other statement in this report, this report may be relied upon by the City of Nanaimo in considering an application to vary the City of Nanaimo Bylaw No. 4500 "section to vary (*insert section of the bylaw being varied*).”
- Development Permit:  
“Notwithstanding any other statement in this report, this report may be relied upon by the City of Nanaimo in considering a development permit application under section (*insert section*) of the *Local Government Act* for lands within DPA (name DPA).”

- Subdivision:  
“Notwithstanding any other statement in this report, this report may be relied upon by the City of Nanaimo in considering a subdivision application under Section 86(1)(d) of the *Land Title Act*.”
- Building Permit:  
“Notwithstanding any other statement in this report, this report may be relied upon by the City of Nanaimo in considering a building permit application under section 56 of the *Community Charter*.”

### **Safe Use of the Land:**

The following statement on safety and suitability shall be included:

- “The land identified as *(insert property legal address)* may be used safely for the use intended.” or;
- “The land identified as *(insert property legal address)* may be used safely for the use intended, provided that the recommendations presented herein are followed.” or;
- “The land identified as *(insert property legal address)* is not safe nor suitable for the use intended.”

### **Format for Submission:**

An original, signed, and stamped copy of the report to be completed by the GER is required to be submitted to the City.

## **7 References**

Associated Engineering. City of Nanaimo Sea Level Rise Study, December 2018.

Canadian Foundation Engineering Manual 4<sup>th</sup> Edition, 2006.

CIRIA Abandoned Mine Workings Manual C758D 2019.

City of Nanaimo: Guidelines for Geotechnical Assessments above Abandoned Mine Workings, 2022.

City of Nanaimo: Manual of Engineering Standards & Specifications, 2022.

City of Nanaimo: Seismic Design Guidelines for Water, Sewer Utilities, and Roads, 2022.

Commentary J of the Structural Commentaries (User’s Guide – NBC 2015: Part 4 of Division B).

Engineers and Geoscientists BC Guidelines for Geotechnical Engineering Services for Building Projects.

Engineers and Geoscientists BC Professional Practice Guidelines, Retaining Wall Design, November 2019.

Engineers and Geoscientists BC Professional Practice Guidelines, Legislated Flood Assessments in a Changing Climate in BC, August 2018.

Engineers and Geoscientists BC Professional Practice Guidelines, Landslide Assessments in British Columbia, March 2023.

Geological Survey of Canada Surficial Geology Nanaimo Map 27-1963.

HBT Agra Ltd. North Slope Stability Study, Report prepared for the City of Nanaimo, 1993.

Ministry of Energy and Mines, Geological Survey Branch, Geology of the Wellington Area Nanaimo Coalfield, Open File 1998-07.

DRAFT

The City's Guidelines for the Completion of Geotechnical Reports will be updated from time to time and the latest version on the City's website should always be consulted. If you have any questions on these Guidelines, please contact the City of Nanaimo Planning & Development Department.

DRAFT

## APPENDIX 1

### CITY OF NANAIMO GEOTECHNICAL SETTING

The City is located within the Nanaimo Lowlands on the east side of Vancouver Island. The topography is characterized by gently rolling hills with an elevation of no more than about 250m that give way to flatter plains bordering the Strait of Georgia. West of the Nanaimo Lowlands, and beyond the limits of the City, are the more mountainous Southern Vancouver Island Ranges.

The nature and distribution of soils across the City is related to the several regimes of glaciation that overrode the area and the subsequent wasting of the last major ice sheet (the Wisconsin Glaciation) which ended about 10,000 years ago. Heavily over-consolidated pre-Wisconsin glacial and inter-glacial soils are exposed in the sea cliffs (the North Slope) along the northern coastline of the City. A blanket of glacial till deposited after the retreat of the last major ice sheet is found across much of the City. During the retreat and melting of this ice, the sea level was considerably higher than present. Heavily loaded streams issuing from the valley glaciers in the Nanaimo River and Haslam Creek valleys deposited sand and gravel as deltas into a sea that was approximately 150 m higher than the present sea level. Marine and glacio-marine soils were deposited in the seas that overlapped the lowlands. During the period of lowering of sea level to the present, streams deposited gravel and sand and cut terraces in older deposits while clays and silts continued to be deposited in the deeper waters. During the last century several low lying coastal areas within and adjacent to Nanaimo's downtown were infilled and reclaimed. The surficial geology of Nanaimo is shown on the Geological Survey of Canada Map 27-1963.

Aside from the volcanic rocks (Karmutsen Formation of Upper Triassic Period) that are exposed in the upland areas between Long Lake, Cottle Hill and Sugar Loaf Mountain, the bedrock that underlies the Nanaimo Lowland in the City is predominantly sedimentary in origin; belonging to the Nanaimo Group of the Upper Cretaceous Period. Principal rock types include sandstone, conglomerate, shale and coal. Coal was commercially extracted from the Nanaimo Coalfield from the mid-nineteenth century to the early 1960's. Coal was taken primarily from three major seams; the Douglas, Newcastle and Wellington Seams using a variety of methods including room and pillar, retreat and longwall mining. Approximately 15 percent of the land area of the City is underlain by abandoned coal mine workings. The local structural geology is dominated by strong faults that cross the area from southeast to northwest. In many cases these strong faults define the lateral extent of mining. The bedrock geology of Nanaimo is shown on the Ministry of Energy and Mines, Geological Survey Branch, Open File 1998-07.

Areas of Nanaimo are susceptible to natural hazards and mining induced geological hazards (hazards). A critical part of the land development process is the identification of such hazards and the determination as to whether they can be avoided or suitably mitigated to the satisfaction of the City to enable development approvals to be provided. An important component of the hazard assessment is the determination of ground response to strong seismic shaking. The City of Nanaimo's Official Community Plan (OCP) provides discussion on known hazards and designates Development Permit Area 3 (DPA3) as Natural Hazard Lands. The City's published mapping of DPA3 areas includes areas of steep slopes prone to landslide and/or erosion adjacent to coastal waters and inland watercourses. It is noted that the City will consider the recommendations contained in the AGRA (1993) North Slope Study and subsequent follow-up studies when reviewing proposed development within DPA3 along the North Slope (coastal slopes from Departure Bay to Lantzville). The City's published mapping of DPA 4 includes known lands that are underlain by abandoned underground mine workings. The OCP and DPA 4 includes discussion on the legacy risks associated with abandoned underground mine workings and the need for site specific geotechnical assessment in accordance with the City's guidelines for geotechnical assessments above abandoned mine workings.

The eastern boundary of the City is formed by the Strait of Georgia and is subject to changing conditions and active erosion as a result of tidal effects and long-term sea level change. The City's study on sea level change provides guidance to the qualified professional on future anticipated changes in sea level.

## Zoning Amendment

### Application

Submission of Geotechnical Reporting Documents (GRD) to identify and quantify hazards and to provide recommendations to address the hazards identified, and to certify that the land may be used safely for the use intended.

The scope of work and extent of reporting to satisfy approval may be significant if a hazard is present that precludes the qualified professional from forming an opinion based on a preliminary scope of work. Along with a review of hazards, the report is expected to contain general guidance on geotechnical design and construction considerations, such as appropriate foundation systems and anticipated site preparation activities.

The City may require the Owner to fund a third-party geotechnical peer review for sites or projects of complexity.

### Comprehensive Review

City staff will complete a review of the GRD and provide comment or accept.

### Legal Documentation

If the project advances, prior to fourth reading by Council a Geotechnical Covenant that has the GRD as an appendix may be required to be prepared, reviewed by City staff and registered against the title of the property.

## Development Permit / Development Variance Permit

### Application

Submission of Geotechnical Reporting Documents (GRD) to identify and quantify hazards and to provide recommendations to address the hazards identified, and to certify that the land may be used safely for the use intended.

The focus of the geotechnical assessment will be to identify potential hazards; determine the risks posed to the proposed development; and develop recommendations to avoid or otherwise mitigate the risk. In the case of landslide and flooding hazards, the City will expect the pertinent EGBC professional practice guidelines to be followed. In the case of legacy mining issues, the City will expect the Guidelines for Geotechnical Assessments Above Abandoned Mine Workings to be followed. Sufficient assessment is required to support the statement that the land may be used safely for the use intended.

Recommendations may be provided for further detailed geotechnical assessment required in support of a subsequent stage of the development process.

A separate GRD Geotechnical Completion Report may be required by the City at the end of construction in the event that it was necessary to implement geotechnical works to mitigate a hazard or improve ground conditions, as a condition of approval. Examples may include the implementation of long term slope stabilisation measures, ground densification to mitigate liquefaction, and grouting/improvement of lands underlain by abandoned mine workings. The GRD Geotechnical Completion Report will serve as a record of “as-constructed” conditions and will include a statement that provides reliance to City that the land may be used safely for the use intended.

The City may require the Owner to fund a third-party geotechnical peer review for sites or projects of complexity.



### Comprehensive Review

City staff will complete a review of the GRD and provide comment or accept.



### Legal Documentation

Prior to approval of the DP by Council or Delegate, a Geotechnical Covenant that has the GRD as an appendix may be required to be prepared, reviewed by City staff, and registered against the title of the property.

## Subdivision

### Application

Submission of Geotechnical Reporting Documents (GRD) to certify that the land may be used safely for the use intended.

The scope and detail included in a GRD submitted in support of an application to subdivide can vary widely dependant on the nature of the development and complexity of ground conditions. At a minimum, the GRD geotechnical assessment will identify potential hazards and, if present, provide recommendations to address the site conditions with a view to certifying that the land may be used safely for the intended usage.

The scope of work and extent of reporting to satisfy approval will depend on the complexity and scale of the development and the nature of the ground conditions. In addition to an assessment of hazards, the City expect that the report will contain geotechnical discussion and recommendations for design and construction considerations related to foundation systems, and anticipated site preparation activities. The GRD geotechnical report should be prepared in conjunction with the civil lot grading plan and should contain recommendations in support of civil infrastructure including buried utilities and retaining walls. Recommendations may be provided for further detailed geotechnical assessment required in support of Building Permit requirements for structures and retaining walls. Discussion and recommendations should be provided for geotechnically required aspects of maintenance or surveillance required to meet the City's performance requirements over the lifetime of the project.

Supplemental GRDs may be required by the City to document the design and construction of ground improvement activities or special measures. Examples where further documentation should be expected include projects involving the implementation of long term slope stabilisation measures, deep ground densification and grouting/improvement of lands underlain by abandoned mine workings. If requested by the City, the Geotechnical Completion Report will serve as a record of "as-constructed" conditions and will identify any maintenance of works and measures that will be required in the future. The report will include a statement that provides reliance to City that the land may be used safely for the use intended.

The City may require the Owner to fund a third-party geotechnical peer review for sites or projects of complexity.

### Comprehensive Review

City staff will complete a review of the GRD and provide comment or accept.

### Legal Documentation

If the original GRD concluded that "the land may be used safely for the use intended" without any mitigative works or measures, prior to approval Final Approval of the subdivision by the Approving Officer or issuance of Substantial Completion by the City Engineer, a Geotechnical Covenant that has the GRD as an appendix is to be prepared, reviewed by City staff and registered against the title of the property.

If supplemental GRDs such a Geotechnical Completion Report were required, a Geotechnical Covenant that appends both the original, any supplemental design reports and the Geotechnical Completion Report, is to be prepared, reviewed by City staff and registered against the title of the property. The Geotechnical Covenant will be registered prior to approval Final Approval of the subdivision by the Approving Officer or issuance of Substantial Completion by the City Engineer.

## Building Permit

### Application

Submission of Geotechnical Reporting Documents (GRD) to certify that the land may be used safely for the use intended.

A GRD geotechnical assessment and report prepared in support of a Building Permit application will address in detail the specific needs of the project. In developing those details, the GER Geotechnical Engineer of Record is expected to interact with the Structural and/or Civil Engineer of Record, other design team members or contractors with a scope of work and process, as outlined in the EGBC Professional Practice Guidelines for Geotechnical Engineering Services for Building Projects. Dependent on the project, recommendations may be required for matters such as stability of slopes, utility support, storm water facilities, temporary support and construction and long term dewatering among other subsurface related matters such as ground improvement.

During construction, the GER will complete the necessary field reviews required to satisfy their obligations under the BCBC Letters of Assurance. Dependent on the nature of the work required, the City may require a Geotechnical Completion Report at the end of construction to serve as a record of “as-constructed” conditions and to identify any maintenance of works, and measures, that will be required in the future. The report will include a statement that provides reliance to City that the land may be used safely for the use intended.

The City may require the Owner to fund a third party geotechnical peer review for sites or projects of complexity.



### Issuance of Certificate of Occupancy

If the original GRD concluded that the property was “safe & suitable” without any mitigative works or measures, prior to issuance of a Certificate of Occupancy by the Building Official, a Geotechnical Covenant that has the GRD as an appendix is to be prepared, reviewed by City staff and registered against the title of the property.

If supplemental GRDs such as a Geotechnical Completion Report were required, a Geotechnical Covenant that appends both the original, any supplemental design reports, and the Geotechnical Completion Report, is to be prepared, reviewed by City staff, and registered against the title of the property. The Geotechnical Covenant will be registered prior to issuance of Substantial Completion by the City Engineer or issuance of Certificate of Occupancy.

## ATTACHMENT B



# GUIDELINES FOR GEOTECHNICAL ASSESSMENTS ABOVE ABANDONED MINE WORKINGS

***DRAFT***

May 2024

## TABLE OF CONTENTS

1	Introduction .....	3
2	Historical Mining Background Information.....	3
3	Legislative Context .....	6
4	Mining-Induced Geological Hazards .....	6
5	Abandoned Mine Workings Risk Assessment.....	7
5.1	High Risk.....	8
5.2	Moderate Risk .....	8
5.3	Low Risk .....	10
6	Site Investigation And Geotechnical Reporting .....	10
6.1	General.....	10
6.2	Content of An Abandoned Underground Mining Risk Assessment.....	11
6.3	Detailed Geotechnical Reporting .....	14
6.4	Geotechnical Completion or Validation Reporting.....	14
6.5	Third-Party Geotechnical Peer Review .....	15
7	Use of Guidelines and Limitations .....	15

### Figures

- Figure 1: Plan of Recorded Undermined Areas  
 Figure 2: Preliminary Risk Assessment of Mining-Induced Geological Hazard Areas

### Tables

- Table 1: Inventory of Abandoned Underground Mine Workings, City of Nanaimo  
 Table 2: Summary of Mining-Induced Geological Hazards, City of Nanaimo  
 Table 3: Preliminary Risk Assessment Screening Criteria, City of Nanaimo

### Photographs

- Photo 1: Partially Open Mine Shaft on Newcastle Island  
 Photo 2: Partially Collapsed Slope Entrance to Fitzwilliam Mine  
 Photo 3: Partially Collapsed Room and Pillar Workings of Abandoned Douglas Mine  
 Photo 4: Mine Roof Collapse and Migration of Soils Above the Douglas Mine  
 Photo 5: Open Fractures Above Shallow Workings of Wellington Mine  
 Photo 6: Sinkhole in the Horth Road Area Near Divers Lake

# GUIDELINES FOR GEOTECHNICAL ASSESSMENTS ABOVE ABANDONED MINE WORKINGS

## **1 Introduction**

This guideline outlines good practices for the geotechnical assessment of land intended for development that is underlain or influenced by abandoned underground mine workings in the City of Nanaimo (City). The guideline pertains to the geotechnical aspects of land development in the context of the City's land development and building approval process. The guideline falls under the broader umbrella of the City's *Guidelines for the Completion of Geotechnical Reports*<sup>1</sup>. The known extent of lands underlain by abandoned underground mine workings is described in the *City Plan Bylaw 2022 No. 6600* (City Plan) Development Permit Area 4: Abandoned Mine Workings Hazards (DPA 4) and shown on Schedule 9 to that bylaw, *DPA 4: Abandoned Mine Workings Hazards*.

Abandoned mine workings underlie approximately 13 of the 93 square kilometres of land within the City limits. A further 7 square kilometres of abandoned workings are located below adjacent coastal waters. The presence of abandoned mine workings introduces geological hazards that have the potential to negatively impact development in the form of health and safety, the stability of structures or lands, and/or the natural environment. These hazards must be assessed and, if determined to constitute unacceptable risk, mitigated through the development process to provide the City with assurance that the land can be used safely for the use intended.

In its role as the Approving Authority for land development and building permit applications, the City has developed these guidelines to provide proponents with background information and context on historical mining activities within the City, as well as good practices in the evaluation and mitigation of mining-induced geological hazards.

This Guideline is not intended to be prescriptive nor is it intended to serve as a substitute for engineering judgement and experience. This Guideline is a working document and will periodically be updated as historical information comes to light.

## **2 Historical Mining Background Information**

The Nanaimo Coalfield in the period 1850 to 1950 produced almost half of the coal mined in British Columbia<sup>2</sup>. Over ninety per cent of the coal was commercially mined from three seams;

---

<sup>1</sup> City of Nanaimo Guidelines for the Completion of Geotechnical Reports, 2023.

<sup>2</sup> Canada Department of Mines and Resources Mines and Energy Branch, Geological Survey Paper 47-22. Prepared by A.F. Buckham.

the Wellington, Newcastle, and Douglas seams. The distribution of historical mining across the City, based on available historical records, is shown in Figure 1.

Stratigraphically, the lowest of the three main coal seams was the Wellington Seam. As indicated in Figure 1, this seam was worked in North Nanaimo in the vicinity of Wellington, Jingle Pot and Wakesiah. Beyond the City limits, it was also worked in the Extension area. The productive area of this seam was bound by its outcrop and by extensive faulting along the southwest and to the north. Although collectively described as the Wellington seam, there were up to four separate seams referred to as the No. 1 or Main Wellington; above which were the Little Wellington (No. 2) seam and the Wellington No. 3 and No. 4 seams, respectively. The upper two seams rarely exceeded 0.6m in thickness. The lower seams were commercially mined as upper and lower workings in several areas of Nanaimo, as indicated through hatching on Figure 1. The Main Wellington seam is described in the Annual Reports produced by the BC Minister of Mines<sup>3</sup> and generally ranged in thickness from 1.2 to 2.1m. The floor of the mine was typically sandstone with roof rock that included weaker shales as well as areas of sandstone and conglomerate.

Present some 300 m stratigraphically above the Wellington Seam was the Newcastle Seam<sup>1</sup>. Workings in the nominally 1 m thick coal seam were predominantly limited to the Central Nanaimo areas of Newcastle and Protection Islands and adjacent offshore areas.

The Douglas seam lies approximately 20m stratigraphically above the Newcastle seam and generally averages 1.5m in thickness. However, the seam thickness can vary widely and there are Annual Reports produced by the BC Minister of Mines<sup>2</sup> indicating seam thicknesses that exceed 5m. The seam was extensively worked in the Central and South Nanaimo areas, as shown in Figure 1.

The structural geology of Nanaimo is complex and the coalfield itself has been truncated, thrust and downthrown by a number of geological faults. Figure 1 indicates the inferred trace line of the main faults (projected surface expression) shown on the published bedrock geology mapping<sup>4</sup>. Further discussion related to the potential impacts of faulting on land development is provided later in the guideline.

Approximately fifty recorded mining operations have been identified within the City limits. Some, such as the No.1 Mine in Central Nanaimo, operated for over fifty years and withdrew millions of tons of coal. Others operated for less than a year and focussed on the removal of pillars of coal left for roof support from earlier mining operations, such as those in the Wellington area of North Nanaimo.

---

<sup>3</sup> British Columbia Annual Report of Minister of Mines (1874 to 1965)

<sup>4</sup> Ministry of Energy and Mines Open File 1998-07. Geology of the Westward Lake Area, Nanaimo Coalfield, BC

A database of historical mining information is provided in Table 1. This information was assembled from a number of sources that included the Annual Reports of the BC Minister of Mines between 1874 and 1964<sup>2</sup>, records and mine plans held in the Nanaimo Community Archives and online information from the BC Ministry of Energy Mines and Petroleum Resources web site. Table 1 indicates the name of the mine and provides a location referenced in Figure 1. The age of the workings, mining method and physical attributes of the seam are included in the table along with a mine plan reference for the Nanaimo Community Archives, where available.

The two methods of mining used historically in Nanaimo were the room and pillar method and the longwall method. The room and pillar method, also known as “pillar and stall”, “bord and pillar”, post and stall”, “post and bank” and “stoop and room”, resulted in a rectilinear network of interconnecting roadways with un-mined “pillars” of coal left between them to support the roof. A review of historic working mine plans in the Nanaimo coalfield indicates that working areas were typically between 6 to 9 m wide with pillar widths of 10 to 20 m and an extraction ratio in the range of 50 to 60 per cent. However, pillars were often removed, or “robbed”, to various extents during the retreat process prior to the closure and final abandonment of the mine. This naturally reduces the ability of the remaining pillars to support the roof of the mine, thereby resulting in the potential for future collapse and possible void migration to the ground surface. As indicated in Table 1, a number of the more modest mining operations were developed specifically to remove pillars of coal left behind from larger commercial workings that had previously been abandoned. The method of roof support used during those activities along with the current stability of the roof, is uncertain, as is the extent of pillar removal. Longwall mining in the Nanaimo coalfield in and around the turn of the century and extending into the mid-19th century was largely non-mechanised. This methodology involved the development of a face of coal that was typically in the order of several tens of metres long. The face was worked in a series of shifts to undermine, cut, and drop the coal into manageable-sized pieces for removal. The mine roof area exposed by the extracted coal was temporarily supported with timber props and the process was repeated to further advance the coal face. As the working face advanced, the props and temporarily supported ground collapsed to form an area of waste rock or “goal”. The subsidence of the ground surface above and, to a limited extent in front, of the working face was a function of depth, seam thickness and the ratio of cut face length to overburden depth; along with local geological factors such as geology, the dip of the seam and the presence of faulting<sup>5</sup>. In contrast to the time-dependent process of room and pillar subsidence, the majority of ground subsidence associated with the longwall methodology of extraction occurred during and shortly after extraction.

---

<sup>5</sup> National Coal Mining Department 1975. Subsidence Engineers’ Handbook.

The reader is referred to CIRIA C758<sup>6</sup> (C758D for digital version) and Bell (1988)<sup>7</sup> for further discussion related to mining methodology and associated legacy issues.

### **3 Legislative Context**

Proposed residential development in British Columbia is governed by several provincial statutes. The statutes that require assessments by Qualified Professionals in relation to hazardous conditions include the *Land Title Act* (typically in support of subdivision approvals); the *Local Government Act* (typically in support of Development Permits); and the *Community Charter* (Typically related to Building Permits).

The City has recognized the potential for hazardous conditions caused by historical undermining or mining-related activities within portions of the City's boundaries and has established Development Permit Area 4 in *City Plan*, along with these guidelines, to set out the framework for geotechnical assessments for approvals for new development.

### **4 Mining-Induced Geological Hazards**

There is a broad range of mining-induced geological hazards associated with the historical mining in Nanaimo that have the potential to affect land development. There are various triggering mechanisms related to these hazards that include time-dependent natural geological processes of weathering erosion and stress relief, and more rapid changes induced by seismicity or land development activities such as earthworks, blast vibrations, changes in the water table, or additional loading. Table 2 identifies seven broad categories of abandoned mining elements, within which there are further sub-categories. For example, the category of abandoned entries to underground workings includes sub-categories for shafts, slopes and adits, and bell pits. The main categories shown in Table 2 are:

- Abandoned entries to underground workings;
- Room and pillar workings;
- Longwall coal mining;
- Fault reactivation and fissures;
- Mine gas;
- Mine Water; and
- Mine waste.

---

<sup>6</sup> Construction Industry Research and Information Association (CIRIA) C758 Abandoned Mine Workings Manual, 2019.

<sup>7</sup> Bell, F.G. 1988. The history and techniques of coal mining and the associated effects and influence on construction. *Bulletin Association Engineering Geologists*, 24, 471-504.

Table 2 provides a synopsis of the principle mining-induced geological hazards that are related to each category. Along with the discussion on hazards, Table 2 summarizes the potential triggering issues related to the hazard and the potential primary consequences as they pertain to land development activities. Consequences fall broadly into considerations of health and safety, damage to land, buildings and infrastructure, and harm to the environment. In some cases, there may be consequences associated with a hazard that triggers the need for an environmental assessment under provincial law that is not considered in this geotechnically focussed guideline.

The hazards that are summarized in Table 2 will not be present at all sites that are underlain by abandoned underground mine workings. It is necessary to complete an engineering and/or environmental assessment to determine the presence of the hazard, possible triggers related to the proposed development activity and the associated potential consequences. In some cases, there may be compound or secondary issues that are not covered in Table 2 that require the judgement of an appropriately qualified and experienced professional.

Certain elements of historical mining such as abandoned entries, mine gas, mine water and mine waste may trigger requirements for an environmental assessment under the BC Environmental Management Act, Contaminated Sites Regulation. Where considered most likely, this potential consequence has been included in Table 2. Notwithstanding the legislated requirements for assessment for activities specifically identified in Schedule 2 Industrial and Commercial Purposes and Activities of the Regulation, there may be instances where mining-induced settlement has created fractures and openings in the rock mass that introduce secondary hazards such as potential migration pathways for mine gas or water that may fall outside of a Schedule 2 activity but may need to be considered in the City's approval process.

## **5 Abandoned Mine Workings Risk Assessment**

Assessing potential risks related to mining-induced geological hazards is a critical part of the land development approval process. Where the assessed risk to health and safety, damage to land, buildings and infrastructure, or harm to the environment is judged to be unacceptable, some form of mitigation is required by the proponent to demonstrate that the land can be used safely for the use intended.

An abandoned mine working risk assessment must be completed by a professional engineer or geoscientist in good standing with Engineers & Geoscientists British Columbia experienced in geotechnical engineering ("Qualified Professional").

The City has completed a preliminary risk assessment of geotechnical issues of ground stability and mining legacy, which is included in Figure 2. The preliminary risk assessment was undertaken to assist the City at a planning level. The assessment is not to be used on a site-specific basis due to the coarseness of the information coupled with an inability to capture development-specific

risk components. It is a requirement of Section 18.4.3 of the City of Nanaimo Zoning Bylaw that a geotechnical assessment specific to the site and nature of the project be submitted to support the Development Permit Area 4 development permit application.

For the purpose of the City's planning, Figure 2 separates the results of the preliminary assessment into areas of High (red), Moderate (yellow) and Low (green) risk. The risk screening criteria that were applied to each potential type of hazard are summarized in Table 3. The preliminary assessment was restricted to potential risks from ground stability-related hazards and did not consider potential risks associated with environmental hazards related to mine water, mine gas, or mine waste. Risks associated with all forms of potential hazard will need to be evaluated by the proponent on a specific application basis.

### 5.1 High Risk

The City's preliminary assignment of risk was based on the nature of the hazard and its potential consequences for land development. The High Risk designation was assigned to consequences that involve the potential for direct safety issues or sudden and severe distress to property. Areas of High Risk identified from the preliminary assessment are shown in red in Figure 2 and include:

- The potential for sudden ground collapse associated with all openings to mine workings and prospecting works including shafts, slopes, and adits. The preliminary assessment identified some 55 vertical shafts and some 35 inclined or level slopes and adits within the City limits. There may be significantly more unrecorded openings that were created for ventilation in shallow mines and related to the poorly recorded secondary mining extraction activities that followed the abandonment of the main workings. The attached Photo 1 shows an example of an open shaft on Protection Island while Photo 2 shows a partially collapsed unsupported slope leading to the shallow abandoned workings of the Fitzwilliam Mine; and
- The potential for roof rock failure leading to a crown or sink hole at the ground surface in areas above abandoned room and pillar mine workings with an inferred roof cover of rock of less than 10 times the seam thickness. Specific areas of high risk related to this hazard include portions of the west side of the Douglas Mine; the shallow workings of the Fitzwilliam Mine at the north end of Newcastle Island; and the north-westerly portion of the Wellington Mines, where there is a complex history of extraction from two shallow coal seams along with a poorly documented record of secondary pillar robbing that extended into the 1960's. Photo 3 shows shallow partially collapsed open workings under Victoria Road while Photo 4 shows a portion of crown hole that was encountered at the western edge of the Douglas Mine during a shallow utility replacement program. Photo 5 indicates the nature of open fracturing above the shallow abandoned Wellington Mines in the Gilfillan Road area.

## 5.2 Moderate Risk

Areas of Moderate Risk were defined through the City’s preliminary assessment and are indicated as yellow in Figure 2. The Moderate Risk designation was assigned to the following circumstances:

- Areas of abandoned room and pillar mine workings where there is an elevated potential for future surface subsidence as a result of pillar crushing or collapse of temporary supports within the workings. This includes the western side of the South Wellington mine, the central zone of the Douglas Mine, and the northern area of the East Wellington (Jingle Pot) mine. The inferred primary consequences from the hazard of a deeper collapse are related to serviceability-type settlement distress in structures and/or infrastructure as opposed to a direct impact on health and safety;
- Areas where geological conditions are complicated by the presence of main faults. Such complications may impact the stability of sloped sites; influence possible pathways for the movement of water or gas; or create zones of inherent weakness in the rock mass. These potentially more complex ground conditions warrant the need for a specific assessment relative to the proposed land development (Hellewell 1988) 8 (Donnelly 2000) 9;
- An area in the Wellington Coalfield south of Divers Lake where faulting has impacted and upthrown the room and pillar worked Wellington Seam and where there are historical records of sinkhole features that have developed in thick soil deposits above the bedrock surface. A portion of this designated area also contains a localized area of upper workings as well as a prospect shaft that was abandoned due to “running sands”. The historical records include notes on abandonment plans related to “lost houses” in this area as well as the documented case of sinkholes that were encountered during development in the Horth Road/Sloan Road area<sup>10</sup> and at a private residential property on Goldfinch Crescent. Photo 6 indicates the extent of “lost” soil associated with migration into historical mining operations in the Horth Road area of Nanaimo.

The inferred consequences from the hazard of a secondary mechanism involving the migration of soil into open void space are difficult, if not impossible, to quantify and can be affected by the

---

<sup>8</sup> Hellewell, F.G. 1988. The influence of faulting on ground movement due to coal mining. The UK and European experience. *Mining Engineer*, 147, 334-337.

<sup>9</sup> Donnelly, L.J. 2000. The reactivation of geological faults during mining subsidence from 1859 to 2000 and beyond. *Transactions Institution Mining and Metallurgy*, Section A, Mining Technology, 109, A179-A190.

<sup>10</sup> Geotechnical Investigation Subsidence in North Nanaimo, BC. Prepared by EBA Engineering Consultants Ltd for the City of Nanaimo May 1994.

soil type, groundwater conditions and the depth to bedrock. These unusual ground conditions warrant the need for a specific assessment relative to the proposed land development.

The (surface) trace lines of the main faults that are shown in Figure 2 were transposed from published mapping produced by the BC Ministry of Energy and Mines<sup>11</sup>. The lateral extents of several of the abandoned mines within the City are defined by faults, such as the eastern side of the Douglas Mine and the west side of the Jingle Pot and Wakesiah Mines. The Wellington Mines are truncated by a number of main faults that have resulted in elongated shadow zones with no undermining. These zones are the result of either a physical displacement of the coal seam caused by vertical movement on an inclined fault plane or by structural disturbance of the seam including pinching or heavy shearing. Due to the inclination of geological faults, the surface trace lines may be offset from the location of the fault at the depth of mining shown on the mine plan.

### 5.3 Low Risk

The preliminary screening assigned a Low Risk of appreciable future subsidence impacting the ground surface to much of the lands underlain by abandoned workings within the City limits. This designation was applied to deeper (greater than 60 m) mines that utilized longwall mining methodology or deeper (greater than 60 m) room and pillar workings that were documented to have a very high percentage of extraction/pillar robbing.

Notwithstanding the City's Low Risk preliminary assessment designation, all undermined lands are potentially hazardous due to unrecorded workings; unrecorded openings; the impacts on the rock mass and drainage characteristics that historical subsidence and fractures may have caused; the potential for remnant movements (Ferrari 1997)<sup>12</sup> (Karfakis 1993)<sup>13</sup> as well as the environmental considerations of gas and water that were not considered in the preliminary risk assessment.

## 6 Site Investigation and Geotechnical Reporting

### 6.1 General

As part of the land development and building permit approval process, the City will require a geotechnical report that extends professional reliance to the City for any property that is directly underlain by abandoned mine workings or located sufficiently close that, in the opinion of the City, might be impacted. The Qualified Professional preparing the report must consider the latest

---

<sup>11</sup> BC Ministry of Energy and Mines. Open File 1998-07. Geology of the Westwood Lake Area, Nanaimo Coalfield, BC

<sup>12</sup> Ferrari, C.R. 1997. Residual coal mining subsidence - some facts. *Mining Technology*, 79, 177-183.

<sup>13</sup> Karfakis, M.G. 1993. Residual subsidence over abandoned coal mines. In: *Comprehensive Rock Engineering, Volume 5, Surface and Underground Case Histories*, Hoek, E. (Ed.), Pergamon Press, Oxford, 451-476.

version of the City's Guidelines for the Completion of Geotechnical Reports. The geotechnical report should conclude with a summary of the abandoned mining legacy risks, any further investigations, remedial works and/or mitigation measures required to ensure the safety and stability of the proposed development. In the case of a building permit application, there may be requirements for the Geotechnical Engineer of Record to sign a BC Building Code Schedule B for the geotechnical aspects of the project and, upon successful completion of the project, a Schedule C-B along with a geotechnical validation or completion report.

Geotechnical reporting in relation to mining risk assessments typically proceeds in a phased manner commencing with preliminary investigations that involve desktop studies and site reconnaissance and progressing to ground investigations of varying intensity. The feasibility and requirements for development are weighed during this process. In some cases, the process may require the implementation of ground treatment and the remediation of workings and/or the use of specialized foundations. The geotechnical reporting documents that may need to be submitted in the overall development process include:

- Geotechnical Report that includes the findings of an abandoned underground mining risk assessment (which may be part of a broader scope of geotechnical reporting for the development);
- Detailed Geotechnical Report in which the measures required to mitigate or remediate unacceptable mining legacy risks are discussed and recommendations presented; and
- Geotechnical completion or validation report that documents the mitigation or remediation measures that were implemented, such as grouting up of the mine workings. In the case of a building project, the geotechnical completion report may accompany the Engineer of Record's Schedule C-B.

## 6.2 Content of an Abandoned Underground Mining Risk Assessment

The geotechnical report must include a mining risk assessment of sufficient detail to satisfy the land development and building permit approval process. The initial stage of the assessment will be a desktop-based mining risk assessment. Based on the review of the relevant information, the report may potentially discount the risks posed to the site or development by past mining activity. Where the associated risks cannot be discounted, the report should include details of the further investigations and/or land management strategies that are required.

The City's recommendations for the scope of the mining risk assessment portion of the geotechnical report are outlined below. These recommendations conform in general to the guidelines presented in CIRIA C758 Abandoned Mine Workings Manual (2019). Recommended content for the assessment includes:

## INTRODUCTION

The introduction should include the site location and a description, including a site location plan. It should also include a description and layout of the proposed development, including the planning application description and the inclusion of layout plans where possible.

## SOURCES OF INFORMATION USED TO PREPARE THE REPORT

This could include, but is not limited to:

- Mine abandonment and other historical plans
- Historical annual reports of the BC Minister of Mines
- Surficial and bedrock geological information
- A site history based on documentation of the area
- Past desk-based assessments of ground conditions for the application site or adjacent/nearby sites
- Results of past intrusive site investigation works undertaken to assess ground conditions for the application site or adjacent/nearby sites

## IDENTIFICATION AND ASSESSMENT OF SITE-SPECIFIC COAL MINING RISKS

This part of the report should identify the potential risks associated with mine working legacy for the proposed development site, as identified from sources of information. This should include consideration of such specific risks as:

- Mine entries;
- Shallow coal workings, recorded and probable;
- Workable coal seam outcrops;
- Mine gas;
- Recorded mine working-related hazards;
- Geological features, including fissures, faults, and topographic features; and
- Former surface mining sites or waste materials.

The potential for interaction between different factors which may have a bearing on relative ground stability should also be appropriately considered, such as the depth of competent rock cover above shallow coal workings, type and thickness of soil cover, specific geological characteristics, seismicity, and hydrological factors.

While the initial stage of a mining risk assessment is primarily desk-based with site reconnaissance, the exact location of such features as mine entries should be established, if present. This is particularly important when the feasibility and layout of a given development is being considered. It should be demonstrated that the layout of the development has duly

considered the location of mine entries, their potential zones of influence and associated ‘no-build’ zones.

For mining features identified as being present or potentially present, a more detailed discussion and assessment should be made of the risks to the application site and the proposed development. Consideration should be given to both individual risks and also their possible cumulative effects.

### **MITIGATION STRATEGY PROPOSED**

This section is a key part of the report. It should explain how the mine working issues have influenced the proposed layout and design of the development, where necessary.

The mitigation strategy should set out and illustrate with plans in the case of mine entries, how any on-site issues identified in the assessment will be dealt with to ensure the safety and stability of the development. This should include the assessment of mine gas and the mitigation measures required, as necessary. Consideration should also be given to the possible influence of other land development activities or elements on the safety and stability of the land such as blasting, grading, in-ground stormwater disposal or geothermal installations.

The reader is referred to the Construction Industry Research and Information Association (CIRIA) C758 Abandoned Mine Workings for further technical reference.

In circumstances where the preliminary risk assessment cannot provide adequate evidence to discount the risks posed to the development by past mining activity, details of the proposed intrusive site investigation work necessary to establish the legacy present should be set out within the report.

### **CONCLUSION**

The geotechnical report should conclude with a summary of the mining legacy risks, any further investigations, remedial works and/or mitigation measures required to ensure the safety and stability of the proposed development. If no further investigations, remedial works, or mitigation measures are required, the report should include an opinion by the Qualified Professional on whether the land may be used safely for the use intended and within the BC Building Code performance objectives for structural safety and sufficiency, and health.

The report should demonstrate a clear strategy for addressing the mining legacy.

### **RELEVANT APPENDICES**

The City will expect copies of the relevant information to be referenced or included within the appendices of the mining risk assessment; this is particularly important when information has been used to discount any risks posed by past mining activity such as borehole data.

### 6.3 Detailed Geotechnical Reporting

A detailed geotechnical report may be required in the event the preliminary desktop study concludes the mining legacy risks to be unacceptable to the development or the uncertainty in information too great. The nature of the geotechnical works for the detailed report should be governed by the complexity of the development and the nature of the ground conditions with the intent of refining the risk assessment and, if necessary, establishing and maintaining ground stability. The Canadian Foundation Engineering Manual 4th Ed<sup>14</sup> states that “investigations must be extremely thorough wherever such differential settlement conditions are suspected”. The reader is referred to CIRIA C758 as a technical resource for the planning and execution of a site investigation over abandoned mine workings.

As noted previously, a separate environmental assessment may be required.

The geotechnical report should provide a clear strategy for addressing the mining legacy issues in the context of the BC Building Code performance requirements for structural safety and sufficiency, and health. Depending on the findings of the further investigations, possible outcomes that might be discussed in the geotechnical report include:

- Optimization of building footprint locations or the alignment of linear or development features;
- Geotechnical design aspects of foundations and civil works;
- Design of remedial ground treatment; and
- Identification of the need for performance monitoring of treated and untreated areas for residual risk purposes.

If no further investigations, remedial works, or mitigation measures are determined from the detailed work to be necessary, the report should include a statement that the land may be used safely for the use intended.

### 6.4 Geotechnical Completion Or Validation Reporting

It is important that the City be provided with good quality construction records, as-built drawings, and completion reports for ground improvement works. These are essential for the immediate project as well as future project planning, maintenance, and repair. The geotechnical completion or validation report will provide the City with a statement from the design engineer that the works have met the intent of the design in a manner akin to that of the BC Building Code Schedule C. Information provided in the completion report will:

- Identify the extent of ground treatment;

---

<sup>14</sup> Canadian Foundation Engineering Manual 4<sup>th</sup> Edition, 2006

- Identify the nature of ground conditions encountered during the works;
- Describe the methodology and nature of the improvement works;
- Present the results of interpretations/testing that establish the status of the site on completion of the works. This should include clear detailed record drawings and progress photographs;
- Confirm that the work has been completed to the standard required for the particular development and that the site may be used safely for the use intended; and
- Clearly define any residual risks present and future requirements for their mitigation. This will include any monitoring and surveillance requirements as well as pre-approved agreements to manage future settlements within the context the BC Building Code structural design requirements for sufficiency and any City infrastructure.

The completion report will be filed on the land title.

### **6.5 Third-Party Geotechnical Peer Review**

In its role as the Approving Officer, the City has the right to request a third-party peer review to assess the adequacy of any geotechnical report submitted as part of the land development or building permit application process.

In the case of an application for land development in an area identified as High Risk of future subsidence from the preliminary risk assessment described in Section 5, the proponent should expect that the City will conduct a third-party peer review of the geotechnical report; this review will be at the cost of the proponent.

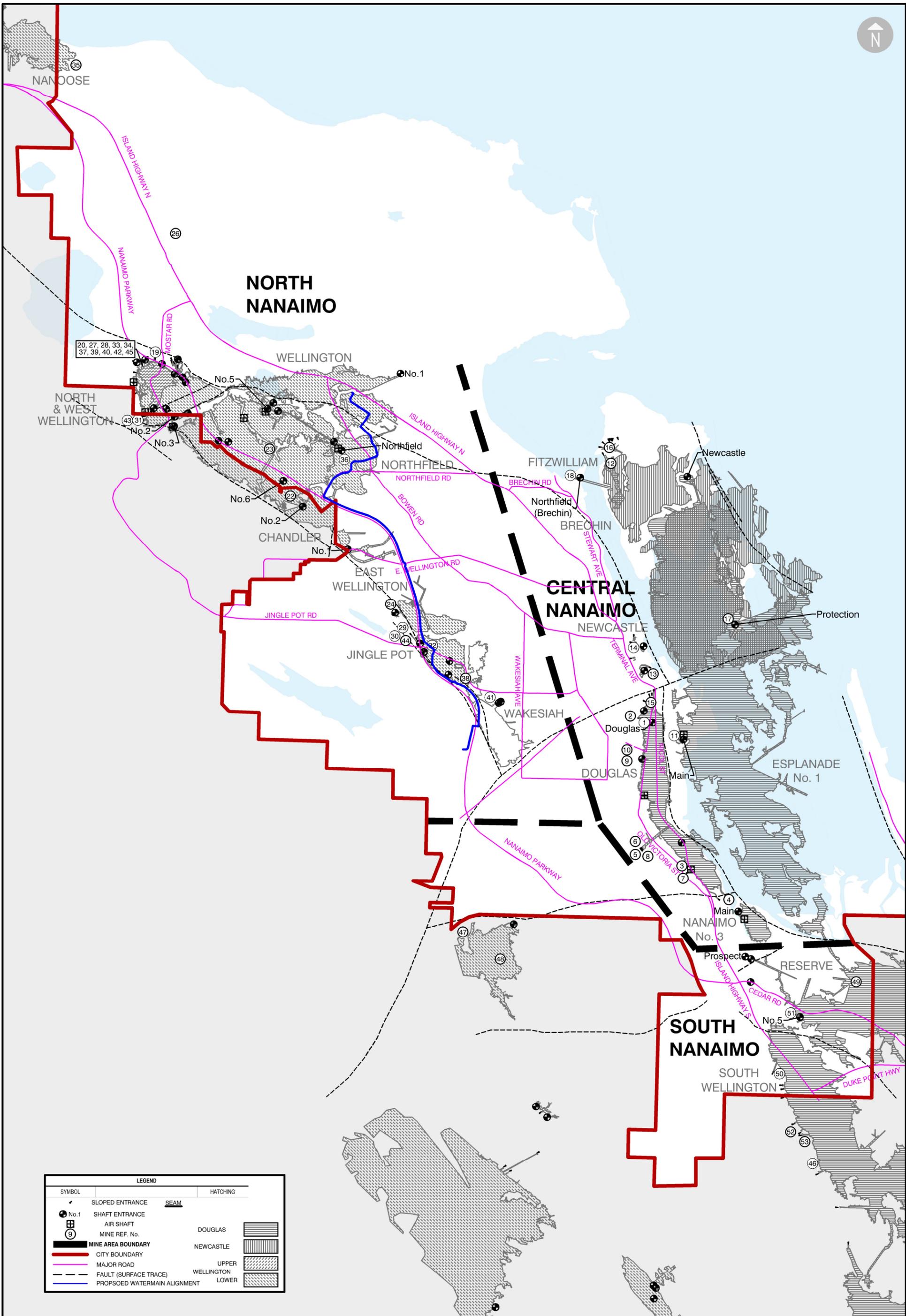
## **7 Use of Guidelines and Limitations**

These Guidelines are not intended to be prescriptive nor are they intended to serve as a substitute for engineering judgement and experience. It is anticipated that variations in the application of the Guidelines may be required for certain specific projects.

The information contained in these guidelines has been prepared for use by applicants, consultants, and staff in preparing, submitting, and reviewing applications for development within the City that may be impacted by abandoned mine workings.

The content of these guidelines is based on a compilation of historical information available at the time of preparation. The accuracy and completeness of the historical information has not been independently verified. Additional information may become available over time that will result in periodic updates to the guidelines.

Changes to these guidelines may occur periodically as new information becomes available and/or conditions are verified.



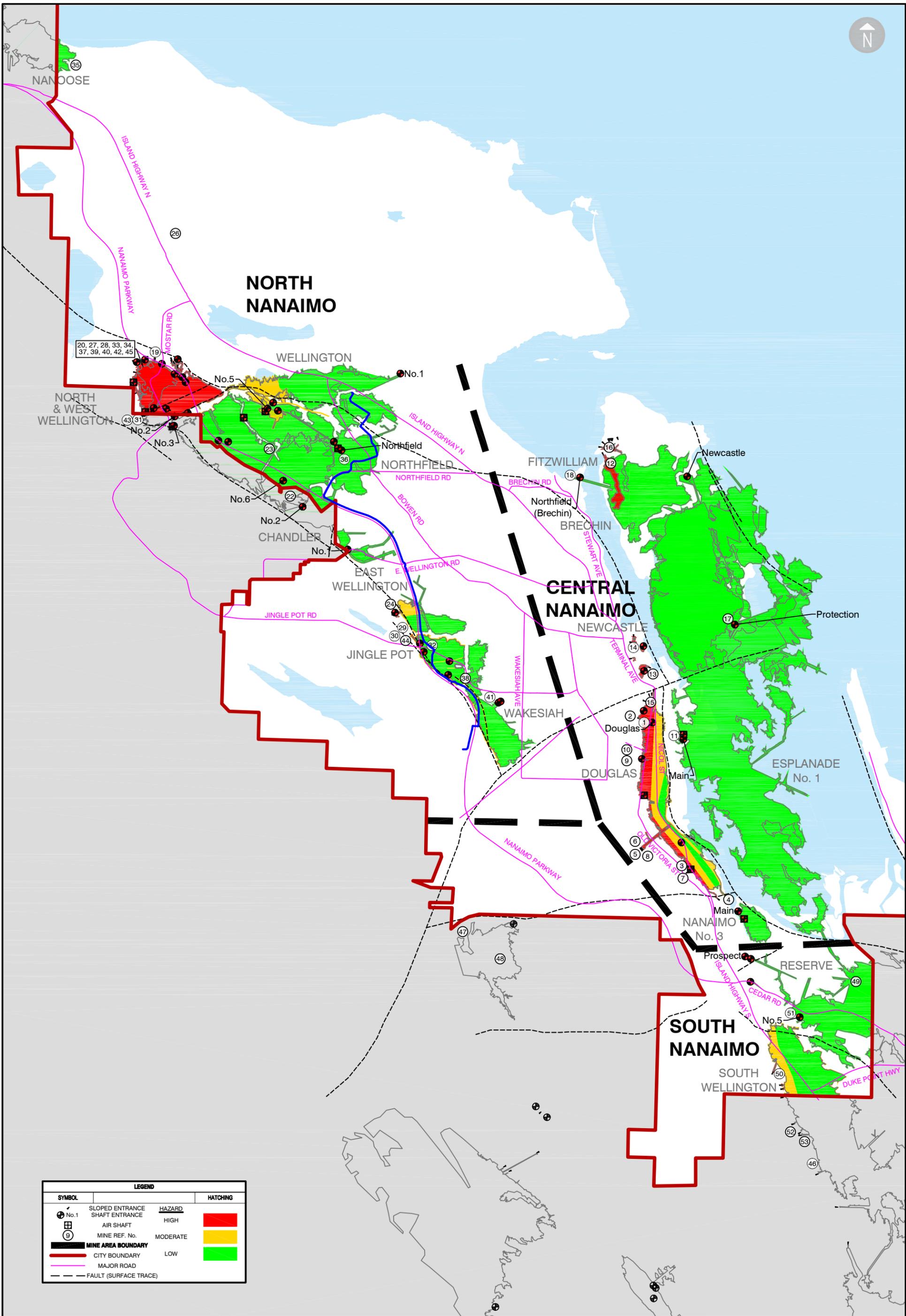
SYMBOL		LEGEND		HATCHING	
	SLOPED ENTRANCE		SEAM		DOUGLAS
	SHAFT ENTRANCE		NEWCASTLE		WELLINGTON
	AIR SHAFT		UPPER		LOWER
	MINE REF. No.				
	MINE AREA BOUNDARY				
	CITY BOUNDARY				
	MAJOR ROAD				
	FAULT (SURFACE TRACE)				
	PROPOSED WATERMAIN ALIGNMENT				

GUIDELINES FOR GEOTECHNICAL ASSESSMENTS ABOVE ABANDONED COAL MINE WORKINGS

**FIGURE 1:**  
**PLAN OF RECORDED UNDERMINED AREAS**

- NOTES:
1. THIS FIGURE IS FOR ILLUSTRATIVE PURPOSES AND MAY ONLY BE USED IN CONJUNCTION WITH THE FULL REPORT.
  2. THIS DRAWING SHOULD BE PLOTTED TO TABLOID SIZE (11x17 in.).
  3. SCALE: 1:50,000





GUIDELINES FOR GEOTECHNICAL ASSESSMENTS ABOVE ABANDONED COAL MINE WORKINGS

**FIGURE 2:  
PRELIMINARY RISK ASSESSMENT OF MINING-INDUCED  
GEOLOGICAL HAZARD AREAS**

**NOTES:**

1. THIS FIGURE IS FOR ILLUSTRATIVE PURPOSES AND MAY ONLY BE USED IN CONJUNCTION WITH THE FULL REPORT. THE FIGURE IS INTENDED FOR THE EXCLUSIVE USE OF THE CITY OF NANAIMO.
2. THIS DRAWING SHOULD BE PLOTTED TO TABLOID SIZE (11x17 in.).
3. FAULT LINES ADAPTED FROM BCGS OF 1998-07.
4. SCALE: 1:50,000

**Table 1. Inventory of Recorded Mine Workings  
Abandoned Underground Mine Workings, City of Nanaimo**

Name	Ref #	Mining Company	Seam	Started	Completed	Years since abandonment	Method of Mining	Nominal Depth of workings (m)	Seam thickness (m)	Percentage extraction	Mine Access Type	Archive Map Ref	Comments
<b>CENTRAL NANAIMO</b>													
Douglas Mine												OS22/Map	
Douglas shaft	1	Vancouver Coal Mining & Land	Douglas	1862	1886	132	Room and pillar (drawn pillars)	shallow to +100 m	1.5 to 1.8	High	Shaft		
Douglas slope	2												
New Douglas Slope	3	Vancouver Coal Mining & Land	Douglas	1874	1886	132	Room and pillar (drawn pillars)		2.1	High	Slope	Map 6	Near Island Hwy between McKenzie/Melideo Road
New Douglas Mine (adit level)	4												
Also see Level Free Workings/Parkhead Level													
New Douglas Slope	5	Western Fuel Company	Newcastle	1911	1914	104	limited workings	shallow		Low	Two slopes approx 500 m long		workings consist of two slopes 11 by 6 feet about 1700 ft long well timbered, limited workings
Chase River prospect	6		Newcastle				Prospect	shallow outcrop		Limited workings	Adit	Map 6	900 Douglas Ave approx
McKenzie Prospect	7		Newcastle				Prospect	shallow outcrop		Limited workings	Adit	Map 6	1019 Old Victoria Road
River Prospect	8		Newcastle				Prospect	shallow outcrop		Limited workings	Adit	Map 6	End of Ryan Road/Pine Street
Connaught Prospect	9		Newcastle				Prospect	shallow outcrop		Limited workings	Adit	Map 6	717 Connaught Ave approx
Duke Prospect	10		Newcastle				Prospect	shallow outcrop		Limited workings	Adit	Map 6	58 Duke Street approx
No. 1 Mine (Esplanade No 1 and 2)	11	Western Fuel/Vancouver Coal Mining & Land	Douglas	1881	1938	80	room and pillar - drawn pillars	200 to 300	0.9 to 2.1	High	Shaft 200 m deep		Extensive submarine workings including Protection Island
No. 1 Mine (Esplanade No 1 and 2)	11	Western Fuel/Vancouver Coal Mining & Land	Newcastle	1887	1938	80	longwall and room and pillar	200 - 300 m	0.9	High			
Fitzwilliam (Newcastle Island)	12	HBC/Vancouver Coal Mining & Land	Douglas	1872	1882	136	room and pillar (drawn)	shallow to 75 m	0.8 to 1.5	High	Slope 730 m long		
Hudson Bay Co. No.1 Pit	13	Hudson Bay Company	Douglas	1852	1856	162	Limited room and pillar	shallow	1.1	Uncertain	Shaft approx 10 m deep	M1 38/A	
Hudson Bay Co. No.2 Pit		Hudson Bay Company	Douglas		1860	158	Dead workings	Unknown	N/A	Uncertain		M1 38/A	
Hudson Bay Co. No.3 Pit	14	Hudson Bay Company	Newcastle	1857	1861	157	Limited room and pillar	25 m	1.8	Uncertain	Shaft and adit	M1 38/A	Shaft located under former Malaspina Hotel minor workings accessed by adit off of Front Street
Level Free Workings / Park Head Level	15	Hudson Bay Company	Douglas		1860	158	Limited room and pillar	shallow	1.2	Uncertain	Slope	M1 38/A	Beginning of the Douglas Mine at the south end of Victoria Road
Newcastle (Sage) - on Newcastle Island	16	HBC/Nanaimo Coal Company	Newcastle	1853	1876	142	Limited room and pillar	shallow outcrop	0.9 to 1.8	Uncertain	slope 220 m long	M1 38/A	
Protection Island Shaft	17	New Vancouver Coal Mining & Land Co	Douglas	1890	1938	80	Room and pillar (pillars drawn)	Deep 200 to 400 m	1.2 to 2.1	High			Became a part of No.1 mine. Significant faulting reported. Shaft is 3.6 m by 5.5 m
Protection Island	17	Western Fuel/New Vancouver Coal Mining & Land Co	Newcastle	1890	1938	80	Longwall	Deep 200 to 400 m	0.9	high	shaft approx 250 m deep		Protection Island
Brechin Mine (Brechin Connection) also referred to in 1911 as Northfield Mine	18	Western Fuel Company	Douglas	1903	1914	104	longwall	70 -150	0.8 to 1.5	High	shaft 18 m deep leading to slope to workings. Served as ventilation shaft	OS 21/OS22	Connection to No 1 mine workings under Newcastle Island
		Western Fuel Company	Newcastle	1903	1914	104	Longwall	70 -150	0.9	High	As above		Connections to Fitzwilliam Mine on Newcastle Island
<b>NORTH NANAIMO</b>													
Biggs Mine near Well. No 9	19	J.Biggs	Wellington	1937	1939	79	Robbing pillars from retreat operations	Shallow	0.9 typ	High	slope 35 m long	M1/20	on the site of the old original Wellington Colliery (Dunsmuir). Some opencast mining
Carruthers Mine No. 3 (& Wakeham)	20	R. Carruthers	Upper Wellington	1944	1961	57	Room and pillar - uncertain details	Shallow	0.9 m typ	Uncertain	Slope ?	E-06-02 Box 10	Near to abandoned Wellington No 9 workings and separated from Loudon Mine by 35 feet wide barrier pillar in the upper wellington seam
<b>Wellington Collieries (East)</b>													
Wellington Extension No 9 (formerly Island Collieries Ltd)	19	Robert Dunsmuir & Sons Ltd.	Upper Wellington	1895	1931	87	Longwall	10 m	0.4	High		OS 14	Seam badly fissured from earlier operations in deeper workings
Slope 2	21	Dunsmuir, Diggle and Company	Wellington	1882	1896	122	Longwall		0.9	High	Slope		Location not shown on Figures
East Wellington Colliery	22	East Wellington Coal Company (W.S.Chandler)	Wellington	1882	1893	125	Longwall		0.9	High	Shaft		Highly faulted, coal locally to 1.8 m
Wellington Colliery: No. 1, 2, 3, 4, 5 and 6 shaft	23	Robert Dunsmuir & Sons Ltd.	Wellington	1895	1899	119	Longwall and room and pillar (drawn)		0.9 typ	High	Shafts		Dunsmuir purchased and pumped out the failed mine.
East Wellington Mine	24	Sabiston, Horne, Dick and Blessing	Wellington	1879	1881	137	Room and pillar (pillars drawn)	150 m	0.9	Slope			
		Heisterman & Fagan E.W.C. Co.	Wellington	1924	1928	90	Longwall	150 m	0.9	High	Slope		Faulting on west and north side of mine
South Wellington Colliery	25	Francis and Nicholas (Cornish Shaft)	Wellington	1876	1878	140	Room and pillar	45 to 50 m	2.4	uncertain	Shaft 45 m deep		Location not shown on Figures
		R.D. Chandler	Wellington	1878	1879	139	Room and pillar	45 to 50 m	2.4	uncertain			
		Dunsmuir, Diggle and Company	Wellington	1879	1900	118	Room and pillar	45 to 50 m	2.4	uncertain			
Hydesville Mine	26	D.Caldwell	Wellington ?		1939	79	Prospect	35 m	Uncertain		Slope 50 m long		Lot 14 Wellington District on Uplands Road
<b>Island Collieries (Wellington No 9)</b>													
No 2 Mine	27	Island Collieries Ltd	Upper Wellington	1920	1929	89	Longwall	Shallow	0.9 typ	High	Two slopes		Seam disturbed by mining in lower seam
No 5 Mine	28	Island Collieries Ltd	Lower Wellington	1920	1929	89	Room and pillar (drawn pillars)		0.9 typ	High			Faulted ground. Weak roof rock
Jingle Pot (New East Wellington)	29	Vancouver-Nanaimo Coal Mining Co	Wellington	1907	1917	101	Room and pillar and longwall		0.6 to 2.4	High	Two slopes 430 m long and shafts		
		British Columbia Coal Mining Co	Wellington	1917	1918	100	Room and pillar - all pulled		1.5 (locally greater)	High			Barrier pillars on east and north side 15 m wide. Faulted. Shale roof, sandstone floor.
		E. Wellington Coal Co. (Maynard & Grant)	Wellington	1920	1923	95				High			
		Sinclair	Wellington	1930	1934	84	Retreat drawing pillars			High			
Lewis Mine	30	T & G Lewis	Wellington	1937	1940	78	Removal of remnant pillars	shallow	0.9 typ	Uncertain	Using old Jingle Pot Slope		
Little Ash Mine (West Wellington/Jordan Mine)	31	R. Cambers & Co.	Wellington	1928	1931	87	Uncertain	Shallow	1.8	Uncertain	Slope west side of workings		Half a mile from old No 9
Little Jingle Pot Mine	32	J.Stewart	Wellington		1930	88	Retreat drawing pillars from jingle Pot mine	Shallow	0.6 to 2.4	High	Old slope		situated on the site of the Jingle Pot Mine
Loudon Mine No 3 Well.	33	W. Loudon	Wellington	1936	1939	79	Outcrop coal	Shallow	1.2	High			
Loudon Mine No 5 and 6 Well.	34	W. Loudon & Associates	Upper Wellington	1944	1964	54	Outcrop coal	Shallow	1.2	High	Slope 60 m long		Looking to intercept the No 9 workings to rob pillars
Nanose Collieries	35	Nanose Wellington Collieries Ltd	Wellington	1920	1926	92	Room and pillar	120 m	1 to 2.7	Moderate	Shaft		Only a small portion of the colliery is in the City of Nanaimo
	35	Canadalan Collieries (Dunsmuir) Ltd	Wellington	1926	1926	92	Room and pillar	120 m	1 to 2.7	Moderate	Shaft		Only a small portion of the colliery is in the City of Nanaimo
Northfield (North Field)	36	New Vancouver Coal Mining & Land Co	Wellington	1889	1895	123	Longwall	Deep	0.6 to 1.2	High	Shaft	OS 18, OS 34	Adjacent to Wellington Mines - 1911 MR indicates that coal was working under Newcastle Island
	36	Canadian Collieries (Dunsmuir) Ltd	Wellington	1936	1941	77	Longwall		0.6 several seams	High	Shaft		Reopened after 42 year shut down

**Table 1. Inventory of Recorded Mine Workings  
Abandoned Underground Mine Workings, City of Nanaimo**

Name	Ref #	Mining Company	Seam	Started	Completed	Years since abandonment	Method of Mining	Nominal Depth of workings (m)	Seam thickness (m)	Percentage extraction	Mine Access Type	Archive Map Ref	Comments
Pacific Mines No 1 and 2	37	F. John & G. Gerlock	Wellington	1942	1945	73	Removal of remnant pillars	shallow	0.9 typ	High	short slope		
Renney Prospect	38	Renney & Assoc.	Uncertain		1935	83	Prospect	Shallow	Uncertain	Limited	Short slope		Midway Jingle Pot and Wakesiah
Stronach Mine (Old Adit Colliery)	39	C. Stronach	Upper Wellington	1933	1963	55	Removal of remnant pillars	Shallow	0.9 typ	High	Adit mine		Biggs area - closed in 1934 and reopened
Victory Mine	40	S. Dines & J. Colby	Wellington		1942	76	Outcrop coal	shallow	0.9 typ	Limited	Drifts		Biggs area - worked for 2 months
Wakesiah (New Wakesiah Mine)	41	Canadian Western Fuel Company	Wellington	1918	1930	88	Room and pillar and long wall	80 to 200 m	0.9 to 4.3	High	Shaft 1 and 2 approx 100m		Mine produced 770,000 tonnes
Wende Mine Well	42	J. McArthur	Upper Wellington	1952	1954	64	Outcrop coal	Shallow	0.5	Limited	Drifts		
West Wellington	43	Brannan Claim	Wellington	1882	1895	123	Limited working		1.2 to 1.8				
		West Wellington Coal Co. Ltd (D. Jordan)	Wellington	1896	1897	121	Limited working		1.2 to 1.8				Near Jingle Pot
Westwood Prospect	44	Ira Westwood	Uncertain		1935	83	Limited workings	Shallow	Uncertain		Short slope with shaft for ventilation		Near Jingle Pot Mine
White Mine	45	J. White	Lower Wellington	1957	1959	59	Removal of pillars (from old Wellington slope and Pacific No 2 mine)	Shallow	1.8 to 2.4	limited workings			60 m south of stronach
<b>SOUTH NANAIMO</b>													
Alexandria (south wellington)	46	James Beck	Douglas	1879	1882	136	Room and pillar		0.9 - 5.4		Slope at the south end 200 m long	M1/5	Chase river area - mine was started then stopped for 18 years
		Dunsmuir, Diggle and Company	Douglas	1882	1902	116	Room and pillar		0.9 to 5.4		Slope at the south end 200 m long	M1/1 Also OS 2, OS24	Wellington Colliery refused to publig returns
Furnace Portal Mine (Harwood Ridge)	47	J. Biggs	Douglas ?	1945	1951	67	Removal of pillars and outcrop coal	Shallow		High	slope	M1-20	Located on Harewood Ridge
Harewood	48	Harewood Coal Company	Wellington (Harewood)	1864	1865	153	Room and pillar	120 to 150	0.9 to 2.7		slope and shafts	M1-20	Poor roof conditions
		Thomas Bulley (lease)	Wellington	1874	1878	140	Room and pillar		2.1 to 2.4				Mine closed from 1902 to 1917
		Vancouver Coal Mining & Land	Wellington	1878	1923	95	Removal of pillars			High			
Reserve	49	Western Fuel Company	Douglas	1910	1939	79	Room and pillar (drawn)	Deep 300 m	up to 6	High	two shafts 290 m deep		Roof conditions poor
Southfield No 1 and 2	50	Vancouver Coal Mining & Land	Douglas	1882	1894	124	Room and pillar (drawn)	40 to 70	0.9 to 1.2	High	Slope approx 240 m long	OS 18, OS 22	Conglomerate roof/faulted
Southfield No 4 and 5	51	Vancouver Coal Mining & Land	Douglas	1888	1901	117	Room and pillar (drawn)	150 m	1.8 to 9	High	Shaft to No 5 155 m deep	OS 2, OS 18, OS 21	Coal from No 5 was brought to surface using the No 4 mine slope
<b>South Wellington</b>													
Fiddick slope (Slope 1 to Fiddick Colliery)	52	Pacific Coast Coal Mines Ltd	Douglas	1907	1928	90	Room and pillar, some longwall	Shallow	1.8 to 6 (2.4 typ)	Uncertain	Slope 450 m long and shaft		Roof poor many cave ins to surface
		R. Fiddick	Douglas	1928	1936	82	Removal of pillars	Shallow		High			
		P. Phillips & Associates	Douglas		1938	80							
Richardson slope (Slope 2 to Fiddick Colliery)	53	Pacific Coast Collieries	Douglas	1913	1921	97	Room and pillar, some longwall	Shallow	1.5 to 4.3	Uncertain	Slope (near Fiddick)		
Richardson slope		Richardson Bros.	Douglas	1928	1931	87	Removal of pillars	Shallow		High			
Richardson slope (Ida Clara Mine)		Richardson	Douglas	1933	1937	81	Removal of pillars	Shallow		High			
South Wellington Mine (see Fiddick)		South Wellington Coal Mines Ltd	Douglas										
South Wellington No 5		Canadian Collieries (Dunsmuir) Ltd	Douglas	1918	1930	88	Room and pillar (drawn)		up to 6		Slopes		Ground faulted
END OF CITY OF NANAIMO TABLE													

**Table 2. Summary of Mining Induced Geological Hazards  
Abandoned Underground Mine Workings, City of Nanaimo**

Category	Sub-category	Hazard	Triggers	Potential Consequence
Abandoned Entries to Underground Workings	Shafts	Due to their age and method of construction, abandoned mine shafts that remain untreated are susceptible to sudden collapse and/or subsidence. The prediction of a collapse event is not possible although the risk of an old mine shaft failing in some manner is high. Within the mines of Nanaimo, shaft opening dimensions ranged from small area ventilation shafts to production shafts with an area in excess of 20 m <sup>2</sup> . Recorded shaft depths ranged from less than 10 m to in-excess of 250 m.	<ul style="list-style-type: none"> <li>Triggering issues include the nature of historic mining, ground related and environmental related factors.</li> <li>Critical degradation of an internal support or cap.</li> <li>Change in equilibrium related to groundwater level variation</li> <li>Disturbance from construction activity</li> <li>Disturbance related to mine subsidence</li> <li>Additional loading from construction/seismic/development</li> </ul>	Range from localized settlement of backfill within a shaft to catastrophic collapse. Sudden and unexpected collapse can result in consequences of safety and severe damage. See below for related issues of mine gas and mine water which may be trapped in the shaft or use the shaft as a preferred pathway. Elevated potential for environmental assessment under the Contaminated Sites Regulations.
	Slopes and Adits	Horizontal or inclined openings to access and remove coal and facilitate ventilation were widely used in the Nanaimo mines. Slopes were typically lined with dimensions of 10 to 20 m <sup>2</sup> and could be in-excess of 500m in length. Adits typically evolved as simple unsupported entries into a hillside, becoming lined or supported in the event of successful exploration or workings. There are a number of adit type prospects recorded at coal outcroppings in Nanaimo.	<ul style="list-style-type: none"> <li>Triggering issues include the nature of historic mining, ground related and environmental related factors.</li> <li>Critical degradation of an internal support.</li> <li>Change in equilibrium related to groundwater level variation</li> <li>Disturbance from construction activity</li> <li>Disturbance related to mine subsidence</li> <li>Additional loading from construction/seismic/development</li> </ul>	Subsidence tends to manifest as crown holes or a linear trough towards the opening in areas of lesser roof cover similar to that of roof collapse above room and pillar workings. Open slopes or adits provide ready egress to hostile/gassy mine environments with potential safety consequences. Elevated potential for environmental assessment under the Contaminated Sites Regulations.
	Bell Pits	The use of bell pit to extract coal from shallow depths is unproven in the Nanaimo area but considered quite plausible. The bell pit shaft section was typically unlined and should be considered unstable and prone to sudden collapse and/or subsidence. The dome section from which coal was mined presents unsupported ground prone to subsidence. Subsidence typically take the form of a circular crater wider than the shaft and less than the bell diameter. Bell pits typically limited to depths of 10 m or less.	<ul style="list-style-type: none"> <li>Triggering issues include the nature of historic mining, ground related and environmental related factors.</li> <li>Critical degradation of an internal support or cap.</li> <li>Change in equilibrium related to groundwater level variation</li> <li>Disturbance from construction/seismic activity</li> <li>Additional loading from construction/development</li> </ul>	Consequences range from localized settlement of backfill within the shaft to catastrophic collapse. Sudden and unexpected collapse can result in life safety consequences. Elevated potential for environmental assessment under the Contaminated Sites Regulations.
Room and Pillar Workings	Roof failure	Collapse of roof rock to the floor of the mine thereby propagating the void towards the ground surface. Void will either become choked off through bulking, arrested by competent strata or result in a crown hole at surface. The roof height in certain portions of the mine such as main headings may exceed the typical worked seam height. Temporary timbers/supports may be in place from pillar removal that deteriorate with time.	<ul style="list-style-type: none"> <li>Nature of roof rock, depth of workings, bulking factor influence critical migration height of void</li> <li>Triggering issues include the nature of historic mining, ground related and environmental related factors.</li> <li>Change in equilibrium related to groundwater level variation</li> <li>Disturbance from construction/seismic activity</li> <li>Additional loading from construction/development</li> </ul>	Crown hole at surface constitutes the greatest consequence to development and safety. Collapse can be sudden and potentially result in loss of support to foundation elements, roads or buried infrastructure.
	Floor heave	Floor heave is the result of a bearing failure of pillars into weak pavement deposits lying at the floor beneath the pillars.	<ul style="list-style-type: none"> <li>Nature of floor materials, most notably presence of seat earth beneath pillars</li> <li>Disturbance from construction/seismic activity</li> <li>Additional loading from construction/development.</li> </ul>	General lowering of the ground surface above the impacted pillars along with induced straining, differential settlement and tilt. Extensive pillar removal can lead to sag subsidence comparable with longwall but may occur over a longer time frame and with less predictability (see below)
	Pillar failure	Pillar failure occurs when they can no longer sustain the overburden pressures they were intended to support. Factors that influence the potential for pillar collapse include depth, pillar dimensions, coal strength along with time relate of weathering and erosion. Temporary timbers/supports may be in place from pillar removal that deteriorate with time.	<ul style="list-style-type: none"> <li>Collapse of remnant failures after cessation of workings is most prevalent in workings at depths between 30 and 60 m</li> <li>Nature of roof/floor rock, changes in imposed loading</li> <li>Triggering issues include deterioration of pillar through weathering and erosion and environmental related factors.</li> <li>Disturbance from construction/seismic activity</li> <li>Additional loading from construction/development</li> </ul>	Lowering of the ground surface above the impacted pillars along with induced straining, differential settlement and tilt. Potential for local pillar failures to lead to a "domino" effect and an increased impact at surface. Extensive pillar removal can lead to sag subsidence comparable with longwall but over a longer time frame and with less predictability.
Longwall Coal Mining	Longwall	Complete removal of coal seam results in trough shaped sag subsidence at surface. Amount of subsidence depends on dimensions of the worked area, its depth and extracted seam thickness.	<ul style="list-style-type: none"> <li>Appreciable subsidence reported finishes shortly after longwall mining</li> <li>Residual subsidence of 2.5 to 5 % can occur in the subsequent 2 to 4 years following mining</li> <li>Haulage roads and other protected openings within the collapsed longwall workings may experience collapse well after sag subsidence</li> </ul>	General lowering of the ground surface above and beyond the mined area along with induced straining, differential settlement and tilt. Impacts to buildings, roads and underground infrastructure. Can be a complicating factor in relation to mine gas and surface drainage well after subsidence is complete
Fault reactivation and Fissures	Mining activity	Pervasive discontinuities in the ground influence the deformational behaviour of the rock mass. There are multiple case records where underground mining activities have reactivated movements along fault zones. In the case records, the movement occurred at the time of mining subsidence.	<ul style="list-style-type: none"> <li>Structural geology and the presence and orientation of faults</li> <li>Removal of ground support (most typically associated with long wall workings)</li> </ul>	Ground displacements, ruptures constitute zones of weakness and potential differential movement and should be avoided when siting foundations, roadways and utilities unless mitigative measures are undertaken. Reactivated faults constitute preferential pathways or potential barriers to the movement of groundwater and gas.
Mine Gas	In mine workings or fractured rock near workings	Mine gas may accumulate in the unsaturated portions of mine openings and fractured rock. Mine gas contain oxygen, nitrogen, methane, carbon dioxide, carbon monoxide and hydrogen sulphide. For mine gas to reach the surface it must travel through a permeable pathway, either man-made or natural. An obvious man-made pathway is mine openings although activities such as trenching and excavation can remove low permeable soils that might normally provide a barrier to migration. Exploratory investigations should be planned with respect to mine gas hazards.	<ul style="list-style-type: none"> <li>A rapid fall in barometric pressure is the most important emission trigger. Flows in and out of abandoned workings are controlled by pressure differences between the interior of the mine and the surface</li> <li>Changes of pressure within the mine can be triggered by changes in the watertable, subsidence or development.</li> <li>Can be mobilized during drilling works through drilling "flush" activities. This should be reviewed as part of the exploratory works safety plan.</li> </ul>	Noxious, flammable and potentially explosive gas accumulations. Confined space entry leading to asphyxiation and death. Elevated potential for environmental assessment under the Contaminated Sites Regulations.
Mine Water	Discharge	Environmental risks associated with mine water discharge are long term and can result from discharge from underground workings or spoil heaps (mine waste).	<ul style="list-style-type: none"> <li>The presence of gravitational mine drainage increases the potential for partially saturated mine workings, the promotion of pyrite oxidation and the opportunity for direct discharge to the environment.</li> <li>The introduction of water into unsaturated workings may initiate pyrite oxidation and create acidic mine water</li> </ul>	Consequences are most notably associated with aquatic pollution related to low pH and elevated metals concentrations. Elevated potential for environmental assessment under the Contaminated Sites Regulations.
Mine Waste	Surface spoil piles or areas of made ground (fill).	Waste from coal extraction mainly comprises siltstones and mudstones with seat earth and other sedimentary rocks separated from the coal in its preparation process. Potential hazards are wide ranging and include geotechnical (settlement and stability), combustion and chemical properties of the spoil waste.	<ul style="list-style-type: none"> <li>Infiltration and movement of water through the waste material can result in geotechnical and environmental hazards.</li> <li>Disturbance of material allowing the introduction of oxygen can initiate combustion.</li> <li>Imposed loading and increase in effective stress through development or lowering of the watertable can initiate settlement.</li> </ul>	Spontaneous combustion can occur in well compacted waste materials during ground disturbance. Pollutants in the form of acidic and elevated metals discharge Settlement or stability issues related to loose waste subject to imposed loads or saturation. Elevated potential for environmental assessment under the Contaminated Sites Regulations.

**Table 3. Preliminary Geotechnical Risk Assessment Screening Criteria  
Abandoned Underground Mine Workings, City of Nanaimo**

Hazard Category	Sub-Category	Potential Consequence	Preliminary Risk Screening Criteria
Abandoned Entries to Underground Workings	Shafts	Range from localized settlement of backfill within a shaft to catastrophic collapse. Sudden and unexpected collapse can result in consequences of safety and severe damage. See below for related issues of mine gas and mine water which may be trapped in the shaft or use the shaft as a preferred pathway. Elevated potential for environmental assessment under the Contaminated Sites Regulations.	All shafts are considered <b>High Risk</b> features. It is important to assess the potential lateral extent of collapse beyond the actual shaft when considering the specifics of the land development project.
	Slopes and Adits	Subsidence tends to manifest as crown holes or a linear trough towards the opening in areas of lesser roof cover similar to that of roof collapse above room and pillar workings. Open slopes or adits provide ready egress to hostile/gassy mine environments with potential safety consequences. Elevated potential for environmental assessment under the Contaminated Sites Regulations.	All slopes and adit entrances are considered <b>High Risk</b> features. In assessing risks, it is important to consider the durability of any remaining opening supports, the reliability of the roof materials and the potential for shallow interconnectivity with other openings or abandoned workings.
	Bell Pits	Consequences range from localized settlement of backfill within the shaft to catastrophic collapse. Sudden and unexpected collapse can result in life safety consequences. Elevated potential for environmental assessment under the Contaminated Sites Regulations.	All bell pits are considered <b>High Risk</b> features. Although no documented cases were found in the inventory search, bell pits were an early form of mining that was likely not documented.
Room and Pillar Workings	Roof failure	Crown hole at surface constitutes the greatest consequence to development and safety. Collapse can be sudden and potentially result in loss of support to foundation elements, roads or buried infrastructure.	Room and pillar workings with a roof rock cover of less than 10 times the seam thickness are considered to carry a <b>High Risk</b> designation due to the consequences of roof failure impacting the surface. Workings with greater than a 10 times cover are considered to have a low risk of roof failure impacting the surface. The actual project assessment should consider the dip of the strata, bulking characteristics of the collapsed rock/soil, groundwater flow, pillar robbing and temporary support, strong rock layers which may attenuate upward migration and the influence of seismic loading.
	Floor heave	General lowering of the ground surface above the impacted pillars along with induced straining, differential settlement and tilt. Extensive pillar removal can lead to sag subsidence comparable with longwall but may occur over a longer time frame and with less predictability (see below)	Future surface subsidence associated with room pillar workings that is attributed to a mode of failure other than roof collapse, is considered of <b>Moderate Risk</b> to land development for workings that occur at depths of less than 60 m. At depths greater than 60 m, the substantial overburden pressures have likely led to the crushing of the small pillars used in early mining operations and reduced the risk of surface subsidence to that of remnant movements in the order of 2.5 to 5 % of the total subsidence.
	Pillar failure	Lowering of the ground surface above the impacted pillars along with induced straining, differential settlement and tilt. Potential for local pillar failures to lead to a "domino" effect and an increased impact at surface. Extensive pillar removal can lead to sag subsidence comparable with longwall but over a longer time frame and with less predictability. Potential for secondary migration of soils into open fractures in the rock mass.	The actual assessment should consider the impact of pillar failure, stress transfer to adjacent pillars and the potential for a "domino effect". In cases where original pillars have been robbed/removed, consideration must be given to the possible presence of temporary roof support and the potential risks from their collapse.
Longwall Coal Mining	Longwall	General lowering of the ground surface above and beyond the mined area along with induced straining, differential settlement and tilt. Potential for secondary migration of soils into open fractures in the rock mass. Impacts to buildings, roads and underground infrastructure. Can be a complicating factor in relation to mine gas and surface drainage well after subsidence is complete	Appreciable future surface subsidence associated with historical mines that were worked using the longwall technique is generally considered to be of <b>Low Risk</b> . The actual assessment should consider the potential for residual subsidence of 2.5 to 5 % of the total subsidence related to changes in effective stress or seismic shaking. Strategies should be developed for possible fractures in the rock mass related to foundation/infrastructure support and preferential pathways.
Fault reactivation and Fissures	Mining activity	Ground displacements, ruptures constitute zones of weakness and potential differential movement and should be avoided when siting foundations, roadways and utilities unless mitigative measures are undertaken. Reactivated faults constitute preferential pathways or potential barriers to the movement of groundwater and gas, along with the potential for secondary migration of soils into open fractures in the rock mass.	Mining induced fault reactivation takes place virtually contemporaneously with mining subsidence. The magnitude of any residual movement is relatively small. Notwithstanding that, because of the potential influence of main faults to gas and groundwater migration, as well as to larger scale slope/rock stability, the inferred trace of main fault lines has been assigned of <b>Moderate Risk</b> to land development, subject to specific project review.
Mine Gas	In mine workings or fractured rock near workings	Noxious, flammable and potentially explosive gas accumulations. Confined space entry leading to asphyxiation and death. Elevated potential for environmental assessment under the Contaminated Sites Regulations.	Not considered in this review
Mine Water	Discharge	Consequences are most notably associated with aquatic pollution related to low pH and elevated metals concentrations. Elevated potential for environmental assessment under the Contaminated Sites Regulations.	Not considered in this review
Mine Waste	Surface spoil piles or areas of made ground (fill).	Spontaneous combustion can occur in well compacted waste materials during ground disturbance. Pollutants in the form of acidic and elevated metals discharge Settlement or stability issues related to loose waste subject to imposed loads or saturation. Elevated potential for environmental assessment under the Contaminated Sites Regulations.	Not considered in this review

Photo	Description
	<p><b>Photo 1:</b></p> <p>Partially open mine shaft on Newcastle Island approximately 200 m deep</p>
	<p><b>Photo 2:</b></p> <p>Partially collapsed and backfilled slope entrance to the shallow abandoned workings of the Fitzwilliam Mine</p>

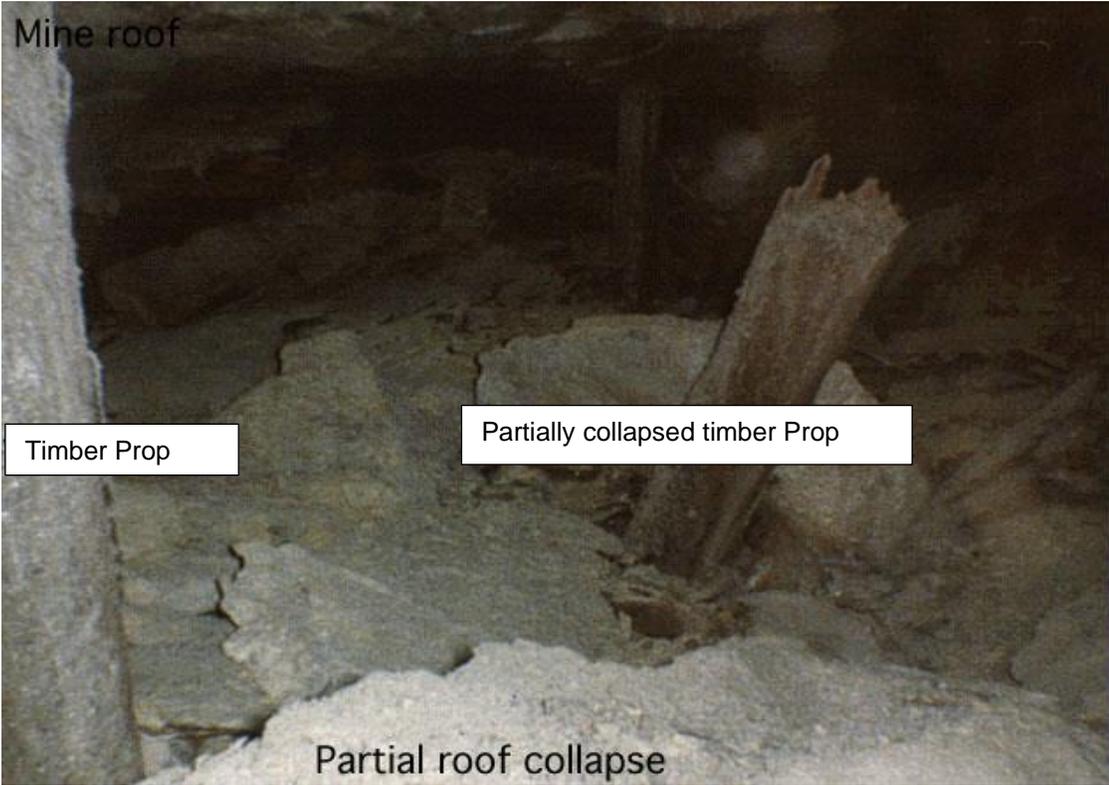
Photo	Description
 <p>Mine roof</p> <p>Timber Prop</p> <p>Partially collapsed timber Prop</p> <p>Partial roof collapse</p>	<p><b>Photo 3:</b></p> <p>Partially collapsed shallow room and pillar workings of the abandoned Douglas Mine at a depth of 15 m beneath Victoria Road</p>
	<p><b>Photo 4:</b></p> <p>Mine roof collapse and migration of soils above the Douglas Mine on Fifth Street, Nanaimo encountered during shallow utility replacement works.</p>

Photo	Description
	<p><b>Photo 5:</b></p> <p>Open fractures above shallow workings of the Wellington Mine in the Gilfillan Road area.</p>
	<p><b>Photo 6:</b></p> <p>Secondary migration of soil resulting in open void and sinkhole in the Horth Road area near Divers Lake.</p> <p>Note presence of watermain and gas in vicinity of sinkhole.</p>

## Subdivision

### **Guidelines for the Preparation of Geotechnical Reports**

---

A geotechnical report (the “Report”) is required to confirm that the land may be used safely for the intended use without undue risk of hazards. The Report shall be prepared at the cost of the applicant by a professional engineer registered in British Columbia with qualifications and experience in geotechnical engineering (the “Engineer”).

The Engineer shall inspect the property, supervise the geotechnical site investigations and the Report shall clearly state all relevant restrictions, conditions and/or limitations to the proposed development of the land. The geotechnical site investigations and the Report shall be completed in accordance with good engineering practice. The Report shall address the following minimum criteria:

1. Identify any hazards which may affect the safe development of the land including, but not limited to:
  - a) flooding
  - b) mud flows
  - c) debris flows
  - d) debris torrents
  - e) erosion
  - f) land slip
  - g) ground water flows
  - h) rock falls
  - i) subsidence
  - j) avalanche
  - k) earthquake
2. Provide recommendations to reduce the risk of damage to the land, buildings and the Works and Services in regards to:
  - a) identifying of any part of the Works and Services which require inspection by specialized personnel and outline a recommended inspection program during the development of the land;
  - b) further geotechnical investigations and reports;
  - c) restricting the use of the land, buildings or the Works and Services;
  - d) remediation of any unstable or potentially unsuitable soils; and
  - e) further reports during the maintenance period.
3. Evaluate the development plans for the property using the relevant City bylaws, Schedule “C” of the Zoning Bylaw, the Environmentally Sensitive Area (ESA) and Natural Hazard Area (NHA) designations and the Development Permit guidelines of the Official Community Plan to determine the suitability of the land to accommodate the use intended.

4. Establish a safe setback line from any watercourses, steep slopes or hazard areas to protect the land, buildings and inhabitants from the risk of injury or damage that may, in the opinion of the Engineer, be caused by the hazards of flooding, mud flows, debris flows, debris torrents, erosion, land slip, ground water flows, rock fall, subsidence, avalanche, earthquake, or any combination thereof. The recommended setback cannot diminish the minimum setback requirements established by the municipal bylaws.
5. Quantify the risks of a geotechnical failure or any substantial hazard.
6. Certify that “the land is safe for the use intended.”

**The Engineer’s recommendations and the conclusions of the Report must:**

1. acknowledge that the City, its Approving Officer and Building Inspectors may rely upon the Report when making a decision on applications for the subdivision or development of the land;
2. certify the land is safe for the use intended with the probability of a geotechnical failure resulting in property damage of less than:
  - a) 2% in 50 years for geotechnical hazards due to seismic events, including slope stability; and
  - b) 10% in 50 years for all other geotechnical hazards;
3. reference the Association of Professional Engineers and Geoscientists of British Columbia’s (APEGBC) “Guidelines for Legislated Landslide Assessments for Proposed Residential Development in British Columbia” where slope stability is identified as a hazard;
4. identify any deficiency in the design of the buildings, the proposed water, sewer, drainage, access and road works (the “Works and Services”) or the construction standards intended for the development; and
5. prescribe the geotechnical works and any changes in the standards of the design of the development which are required to:
  - a) ensure the land, buildings and the Works and Services are developed safely for the use intended; and
  - b) maintain the safety of the land, buildings and any Works and Services as a condition of the approval of the development.

The Report and two duplicate copies shall be provided to the City for consideration of the approval of the application. If the Report identifies any hazards or site conditions which, in the opinion of the Engineer or the City, may impact the safe development of the land or an adjacent property unless restrictions on development are established, the Report together with a Section 219 covenant may be required to be registered on the title of the property pursuant to the Land Title Act.

Registration of a covenant and/or the approval of an application does not warrant or represent that the land may be developed and used safely without risk of damage from hazardous conditions. Notwithstanding the registration of a covenant, a further Report could be required by the City if there is a change in the conditions or if some other circumstances arise which are substantially different than those anticipated by the Report.

## **Building Inspections**

### **Guidelines for the Preparation of Geotechnical Reports**

---

A geotechnical report (the “Report”) is required to confirm that the land may be used safely for the intended use without undue risk of hazards. The Report shall be prepared at the cost of the applicant by a professional engineer registered in British Columbia with qualifications and experience in geotechnical engineering (the “Engineer”).

The Engineer shall inspect the property, supervise the geotechnical site investigations and the Report shall clearly state all relevant restrictions, conditions and/or limitations to the proposed development of the land. The geotechnical site investigations and the Report shall be completed in accordance with good engineering practice. The Report shall address the following minimum criteria:

1. Identify any hazards which may affect the safe development of the land including, but not limited to:
  - a) flooding
  - b) mud flows
  - c) debris flows
  - d) debris torrents
  - e) erosion
  - f) land slip
  - g) ground water flows
  - h) rock falls
  - i) subsidence
  - j) avalanche
  - k) earthquake
2. Provide recommendations to reduce the risk of damage to the land, buildings and the Works and Services in regards to:
  - a) identifying of any part of the Works and Services which require inspection by specialized personnel and outline a recommended inspection program during the development of the land;
  - b) further geotechnical investigations and reports;
  - c) restricting the use of the land, buildings or the Works and Services;
  - d) remediation of any unstable or potentially unsuitable soils; and
  - e) further reports during the maintenance period.
3. Evaluate the development plans for the property using the relevant City bylaws, Schedule “C” of the Zoning Bylaw, the Environmentally Sensitive Area (ESA) and Natural Hazard Area (NHA) designations and the Development Permit guidelines of the Official Community Plan to determine the suitability of the land to accommodate the use intended.

4. Establish a safe setback line from any watercourses, steep slopes or hazard areas to protect the land, buildings and inhabitants from the risk of injury or damage that may, in the opinion of the Engineer, be caused by the hazards of flooding, mud flows, debris flows, debris torrents, erosion, land slip, ground water flows, rock fall, subsidence, avalanche, earthquake, or any combination thereof. The recommended setback cannot diminish the minimum setback requirements established by the municipal bylaws.
5. Quantify the risks of a geotechnical failure or any substantial hazard.
6. Certify that “the land is safe for the use intended.”

**The Engineer’s recommendations and the conclusions of the Report must:**

1. acknowledge that the City, its Approving Officer and Building Inspectors may rely upon the Report when making a decision on applications for the subdivision or development of the land;
2. certify the land is safe for the use intended with the probability of a geotechnical failure resulting in property damage of less than:
  - a) 2% in 50 years for geotechnical hazards due to seismic events, including slope stability; and
  - b) 10% in 50 years for all other geotechnical hazards;
3. reference the Association of Professional Engineers and Geoscientists of British Columbia’s (APEGBC) “Guidelines for Legislated Landslide Assessments for Proposed Residential Development in British Columbia” where slope stability is identified as a hazard;
4. identify any deficiency in the design of the buildings, the proposed water, sewer, drainage, access and road works (the “Works and Services”) or the construction standards intended for the development; and
5. prescribe the geotechnical works and any changes in the standards of the design of the development which are required to:
  - a) ensure the land, buildings and the Works and Services are developed safely for the use intended; and
  - b) maintain the safety of the land, buildings and any Works and Services as a condition of the approval of the development.

The Report and two duplicate copies shall be provided to the City for consideration of the approval of the application. If the Report identifies any hazards or site conditions which, in the opinion of the Engineer or the City, may impact the safe development of the land or an adjacent property unless restrictions on development are established, the Report together with a Section 219 covenant may be required to be registered on the title of the property pursuant to the Land Title Act.

Registration of a covenant and/or the approval of an application does not warrant or represent that the land may be developed and used safely without risk of damage from hazardous conditions. Notwithstanding the registration of a covenant, a further Report could be required by the City if there is a change in the conditions or if some other circumstances arise which are substantially different than those anticipated by the Report.

DATE OF MEETING MAY 13, 2024

AUTHORED BY SADIE ROBINSON, ACTIVE TRANSPORTATION PROJECT SPECIALIST, TRANSPORTATION

SUBJECT **ALLOCATION OF UNALLOCATED PEDESTRIAN FUNDS**

## **OVERVIEW**

### **Purpose of Report**

To provide the Governance and Priorities Committee with options for the Financial Year 2024 Pedestrian Unallocated Funds of \$300,000, and reallocation of 2023 funds in the amount of \$182,500, and to provide a discussion about active school travel planning.

### **Recommendation**

That the Governance and Priorities Committee recommend that Council allocate \$300,000 of the 2024 Pedestrian Unallocated Funds and reallocate \$182,500 of the 2023 Pedestrian Unallocated Funds for a combined total of \$482,500 toward Albert Street Crossing Improvements from Milton Street to Dunsmuir Street.

## **BACKGROUND**

Beginning in 2018, Council used Strategic Infrastructure Reserve funds to create an annual unallocated budget of \$300,000 within the Financial Plan for pedestrian mobility and safety enhancements. These funds were to be used to address issues that arise during the year and are more urgent than could be dealt with through the financial planning process. Council increased this amount to \$1,000,000 in Financial years 2021, 2022, and 2023. Year 2024 of the 2024-2028 Financial Plan has \$300,000 identified for Unallocated Pedestrian Transportation Improvements.

The program focus is on enhancing pedestrian mobility. Staff aim to increase the comfort and safety of all road users with projects including small scale street improvements, pedestrian crossing enhancements, updating of safer school travel plans, and traffic calming.

At last years 2023-JUL-17 Governance and Priorities Committee meeting, where Council discussed potential 2023 Pedestrian Unallocated projects, Council advised that Departure Bay Sidewalk Improvements should be prioritized in 2023 over the Albert Street Crossing Improvements. Due to the successful grant application for the Departure Bay Sidewalk: Alan-A-Dale to Wardropper, it is anticipated that \$182,500 can be reallocated to a new project. Staff understood, based on discussions regarding the BC Active Transportation Infrastructure grant during the 2023-SEP-13 Council meeting, that if grant money was received to support the Departure Bay Sidewalk, the difference in funds from the 2023 Pedestrian Unallocated Funds could be used to support the Albert Street upgrades in 2024. Council direction is requested for reallocation of remaining 2023 funds.

This report presents options for allocating the 2024 funding, and reallocating 2023 remainder funds, for a combined total of \$482,500, and a discussion about active school travel planning. |

## **DISCUSSION**

Staff receive frequent requests for sidewalks and pedestrian crossing enhancements throughout Nanaimo. Locations are prioritized annually for improvements based on the Pedestrian Prioritization Tool developed and supported by Council at the 2021-NOV-08 Governance and Priorities Committee Meeting. The tool considers observed traffic and pedestrian volumes, adjacent land use, and other factors. City Plan reflects the community's needs and desires related to active transportation and led to the development of the pedestrian infrastructure prioritization tool. The tool provides a clearer and more transparent method for prioritizing active transportation projects by using data on several factors to assign a score to each crossing (e.g., speed, volume, safety, crossing distance, proximity to school, etc.).

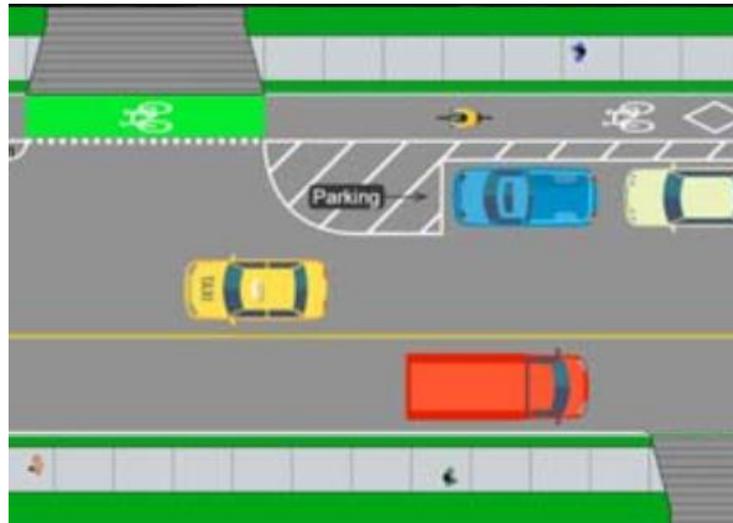
Higher scores represent higher priority, and lower scores represent lower priority; however, it is important to acknowledge that these numbers are attention-directing, not an explicit ranking. This assists when considering which locations represent the best investment in our community's needs to support walkability. At the same time, pedestrian collisions rarely occur along corridors; instead, they typically occur at crossings. That said, pedestrians spend most of their journeys on corridors, and if they are not comfortable, they are not likely to walk. Staff seek to balance these competing needs when developing the list of options in this annual report.

### **Recommended Project**

1. **Albert Street Crossing Improvements from Milton Street to Dunsmuir Street**  
Selby Street crossing **(49 points)**  
Dunsmuir Street crossing **(53 points)**  
Add raised crosswalks, or bump-out curb extensions, or RRFB's as appropriate.  
**Estimate: \$475,000**

The intersections of Albert Street with Dunsmuir Street and Albert Street with Selby Street are uncontrolled pedestrian crossings on a Mobility Collector within the Downtown Primary Urban Centre and along the City's Primary Active Mobility Route. There is no marked crossing at Prideaux Street; a new pedestrian crossing could be added here. Adding raised crosswalks and shortening the crossings with reconfigured bump-outs are expected to enhance pedestrian safety and comfort along the Albert Street section of the City's Primary Active Mobility Route, and at the gateway to the Downtown Primary Urban Centre. This area is also within the Pauline Haarer and Fairview Elementary School catchments. Design details have not been confirmed, however, with support from Council, provisions for an uphill bike lane could be considered with the elimination of some parking.

The following page is an example of the potential future cross section of Albert Street, showing a bike lane on the uphill side only, with some retention of parking:



### Future Considerations for Unallocated Pedestrian Funding

1. Funding for Accessibility Improvements at Existing Crossings & Sidewalks  
**Estimate: \$300,000+**

There are many historically built segments of the transportation network that remain inaccessible. Accessible design elements such as tactile walking surface indicators and directional indicators are incorporated into the design of new facilities, and where possible, into existing facilities during infrastructure improvements. However, existing facilities generally lack overall design (space allocation) and design elements to support accessibility. In 2022, Staff worked with the Transit Stop Accessibility Working Group of ACAI to understand challenges of accessing transit stops in Nanaimo. At the 2022-SEP-21 meeting, Council directed Staff to identify and establish transit accessibility improvements, and while many projects have been completed, retrofit opportunities continue to emerge beyond original funding. Money would allow for retrofit upgrades to improve accessibility at existing crossings, along pedestrian facilities in locations with known issues, and/or transit accessibility improvements.

2. Third Street East Sidewalk – Rotary Field House to Jingle Pot Road  
**Estimate: \$400,000**

The sidewalk on the east side of Third Street terminates approximately half-way between the Rotary Field House and the intersection of Jingle Pot Road near Buttertubs Marsh. The shoulder continues for more than 400m along Third Street to the intersection with Jingle Pot Road. In order to complete a separated walking facility between Wakesiah Avenue and the Jingle Pot Road Intersection there can be 150m of infill work between the existing connection at the parking lot to the intersection. This would increase the pedestrian connectivity between the Buttertubs trail network, the Rotary Field House, and transit stops, while increasing pedestrian comfort along Third Street. An easterly sidewalk would discourage pedestrians from jaywalking across Third Street to the nearest existing sidewalk. As well, it would improve the walkability of the stadium district which is becoming increasingly important as the district becomes busier on event days.

### High Priority Projects - Not Suited to Pedestrian Unallocated Funding

Staff have carefully chosen the above locations for improvements within this program based on a rigorous prioritization process. There are several high priority locations for intersection improvements or sidewalk enhancements that are not suited for the pedestrian unallocated funding program; some improvements are of a value beyond what this program can offer, and some locations have already been incorporated into larger projects and will be addressed within the current 5-year Financial Plan. A sampling of locations that were considered and excluded are:

<b>Crossing Location</b>	<b>Consideration</b>
Norwell Drive (Island Hwy to Barons Rd)	In approved capital plan
Third Street at Howard Avenue	Adjacent development
Wallace Corridor (Comox Rd to Franklyn St)	In approved capital plan
Fitzwilliam Corridor (Milton St to Bastion St)	In approved capital plan
Fifth St Corridor (Shephard Ave to Wakesiah Ave)	In approved capital plan
Wakesiah Avenue at Foster Street	In future capital plan
Crosswalk at 700 block of Third, just west of Nanaimo Ice Centre and at the Ice Centre/Aquatic Centre	Exceeds Pedestrian Unallocated budget
Stewart Avenue at Dawes Street	Requires consultation with Ministry of Transportation and Infrastructure (MOTI)
Stewart Avenue at Rosehill Street	Requires consultation with MOTI
Stewart Avenue at Townsite Avenue	Requires consultation with MOTI
Stewart Avenue at Larch Street	Requires consultation with MOTI
Needham Street at Nicol Street	Requires consultation with MOTI
Uplands Drive at Primrose Drive	Redevelopment may bring cost sharing opportunities
Fitzwilliam Street at Wesley Street	Primary emergency response route
Maki Road at Island Highway	Requires consultation with MOTI
Seventh Street (Railway Ave and Victoria Rd)	Requires consultation with SVI

### Projects of Community Interest

The following projects are not suited to the Pedestrian Unallocated funding program. They have been identified out of community interest, however, there are other processes suited to addressing these projects:

Hammond Bay Road:

- a. Request for enhanced pedestrian facility from 3190 Hammond Bay Road (the Biological Station) to Lagoon Road.

The Stephenson Point Neighbourhood Association has a long history of requesting a sidewalk along Hammond Bay Road between 3190 Hammond Bay Road (the Biological Station) and Lagoon Road, a distance of approximately 2 kilometres.

A sidewalk would be cost prohibitive, in the order of \$10,000 per metre. There is limited road right-of-way with narrow pinch points which could sterilize access to some properties. In the

near term, the road will be impacted as the Regional District of Nanaimo (RDN) completes major sewer upgrades in this location within the next three-five years. Through discussion at the Neighbourhood Association engagement event in April of 2023, Staff considered a painted 1.2m-1.5m wide paved shoulder with a painted fog line as an interim measure. However, with these limited improvements estimated at approximately \$100,000, and the short time frame before the road is impacted by the RDN Hammond Bay Road Sewer Project, it is not recommended for Pedestrian Unallocated funds to be used on this project, but improvements could be considered when restoring roads from RDN Hammond Bay Road Sewer Project.

b. Hammond Bay Road at Oakridge Drive – Add Rectangular Rapid Flashing Beacons (RRFB's)

Residents have shared concerns regarding the safety of the crosswalk on Hammond Bay Road at Oakridge Drive, citing low compliance of vehicles stopping, and that children use this crossing to access a nearby transit stop. The Pedestrian Prioritization Tool scores this crossing as a 24, well below the threshold of action currently. Staff are reviewing how to improve visibility of the existing crosswalk, such as by realigning existing signage.

Hammond Bay Road generally has a low walkability score and has known speeding issues. Another common inquiry is adding crossings along Hammond Bay Road. There is a perception that adding crossings increases safety for pedestrians. However, this is a misconception; as adding crossings alone without reducing vehicle speeds may increase risks. More needs to be done along Hammond Bay Road to reduce vehicle speeds before enhancing or adding new crossings.

### Active School Travel

a. Bayview Elementary School Pedestrian Facilities

The South End Community Association recently enquired about the potential for sidewalks within the vicinity of Bayview Elementary School. Specifically, the Needham Street (north side) and Princess Street (west side) frontages currently lack sidewalks. A sidewalk was installed along View Street during a previous Active School Travel program.

Typically, sidewalks are installed in association with a new development where they are required to provide frontage works. The cost for sidewalks is continually escalating, so where possible, Staff try to include sidewalks where there are other City infrastructure projects taking place in the same location and budget is available. In this case, the sewer is located on the opposite side of Princess Street from the school, and new sidewalks are well beyond the financial scope of the sanitary sewer project. It is estimated that adding sidewalks to the Needham and Princess Streets frontages would add \$600,000 to the project cost.

The request for sidewalk arose from neighbourhood concerns. The data does not reflect speed issues or high traffic volumes in this area. However, with the sewer project cost coming in under budget, a defined pedestrian shoulder could be provided on the Needham and Princess Streets frontages within the existing project budget. This improvement would include limited grading, gravel shoulder, bollards, and No Stopping at Any Time signage. Unless Council directs otherwise, Staff will proceed with this work.

Additionally, in the future, if the community association and school district are supportive, there may be an opportunity to close View Street between Old Victoria Road and Needham Street to implement a School Street in this location through a future Active School Travel (AST) process. A School Street is a road adjacent to a school that is closed to vehicles during school hours to prioritize walking, rolling, and cycling. School Streets are shown to improve safety, encourage active school travel, and ease vehicle congestion around schools. Anything beyond the delineated pedestrian facilities would need to be addressed through an Active School Travel planning process.

b. Park Avenue Elementary School – Sidewalk Infill

Residents of Park Avenue have inquired regarding potential for sidewalks within the vicinity of Park Avenue Elementary School. While some segments of sidewalk have been installed near the school due to surrounding development, many segments remain where children must either cross the street to use a sidewalk or walk along a gravel shoulder. There is an estimated 1,050m of sidewalk that could be infilled within an approximately 420m radius of the school, for an estimated cost of \$3,150,000.

Currently, there are no capital plans to install sidewalks in the vicinity of Park Avenue and sidewalks would only be provided if development nearby provides frontage works. The Transportation department has a prioritized and rigorous process for selecting sites for upgrades and tend to prioritize intersection improvements rather than sidewalks as intersections are much higher conflict points where collisions take place, rather than sidewalks which tend to increase comfort more than safety. Crosswalks in the Park Avenue neighbourhood all rank in either the good or medium category.

c. Ecole Quarterway Elementary – Add RRFB's to Existing Crossing & Add a New Crosswalk

Some parents of children who attend Ecole Quarterway have indicated the need for flashing lights at the existing crossing of East Wellington Road in front of the school. The existing crossing of East Wellington Road scores 41.5, in the medium category. Staff are working to collect data for future decision making but note that the score is below the threshold for action at this time.

Parents have also asked for a new crossing to be added mid-block on Townsite Road between Bowen Road and East Wellington Road. This segment of Townsite Road does not have any existing pedestrian crossing and while there is a desire line for pedestrian traffic connecting residential neighbourhoods from the north to commercial services and Ecole Quarterway to the south, the pedestrian facilities are very limited on the south side of Townsite Road. Adding a crosswalk on Townsite Road does not address that there are no pedestrian facilities to connect the requested crossing and Ecole Quarterway. This type of project could be identified as a priority through a future AST process. However, as Ecole Quarterway is a commuter school with no defined catchment, it is anticipated that the potential for active travel to school travel is much lower here than at other schools. Without going through the AST process, we do not know the share of students walking to school from this direction.

School selection for AST programs occurs in conjunction with the School District. Staff are currently working with the School District on completing AST Plans for Cinnabar, Chase River, and Rutherford Elementary Schools, which will take place over the next 2-3 years. Staff also work to implement AST action items to address priorities acknowledged by schools which have already

gone through the AST process. Through these processes, key active transportation improvements are identified by the school and justified based on data collection and school engagement. Once an action plan is established within the AST process, Staff monitor and work to implement priority improvements where possible in an ongoing manner. Improvements identified through the AST process can be incorporated into the five-year Financial Plan, either within existing programs or into project allocations. Staff take a measured approach, identifying priorities and developing reliable cost estimates which are then incorporated in the financial planning process, and delivered through the established construction program.

The intent of pedestrian unallocated funding is to allow for projects that would otherwise not be completed due to lack of funding. Since the AST program is ongoing, it can be rolled into existing City budget processes. To put in new crossings or sidewalks without data collection and school engagement, would undermine the AST process, minimize the priority action items identified by schools who have already completed the AST process, and impact the funding of pedestrian projects that would otherwise not get completed.

## **Closing**

Staff strive to strike a balance between strategic efforts to generate mode shift versus necessary investments to support pedestrian safety. With this in mind, Staff have considered several options for improvements, and recommend these funds be used to enhance pedestrian safety at intersections.

Staff recommend that the full \$300,000 of the 2024 Pedestrian Unallocated Funds and the remaining 2023 Pedestrian Unallocated Funds in the amount of \$182,500 be reallocated toward Option 1, as described below. The Albert Street upgrades are the highest priority as the project would facilitate a safer and more comfortable pedestrian network within the City's Primary Urban Centre and along its Primary Active Mobility Route. The improvements are targeted to improve safety at intersections.

## **OPTIONS**

Option 1 includes the Albert Street multiple crossing improvements, and Option 2 provides for Council to give alternate direction.

1. That the Governance and Priorities Committee recommend that Council allocate \$300,000 of the 2024 Pedestrian Unallocated Funds and reallocate \$182,500 of the 2023 Pedestrian Unallocated Funds for a combined total of \$482,500 toward Albert Street Crossing Improvements from Milton Street to Dunsmuir Street.
  - One advantage of this option is that it balances active transportation corridor improvements and safety enhancements for pedestrian mobility in identified high conflict intersections.
  - This option strategically supports walkability in the city's most pedestrian dominant areas.
  - Financial Implications - funding is included in the approved 2024 - 2028 Financial Plan.
  - Project Delivery Implications – construction industry growth; with a shortage of workers and materials, supply chain disruptions contribute to a level of uncertainty with respect to construction costs, timelines, and project delivery.

2. That the Governance and Priorities Committee provide alternate direction to Staff. |

**SUMMARY POINTS**

- Staff have used the Council endorsed process to evaluate priority locations for annual improvements based on safety, risk factors, geographical data, influence on mode shift, and public input.
- The recommendation has both safety and connectivity benefits which serve to balance strategic and operational needs.
- Staff recommend that the 2024 Pedestrian Unallocated Funds be allocated toward upgrades to Albert Street.

**ATTACHMENTS:**

ATTACHMENT A: Map and Images – Albert Street Crosswalks (Existing Conditions)

ATTACHMENT B: Images – Future Considerations

ATTACHMENT C: Map and Images – Projects of Community Interest (Existing Conditions)

ATTACHMENT D: PowerPoint Presentation |

**Submitted by:**

Sadie Robinson  
Active Transportation Project Specialist,  
Transportation

**Concurrence by:**

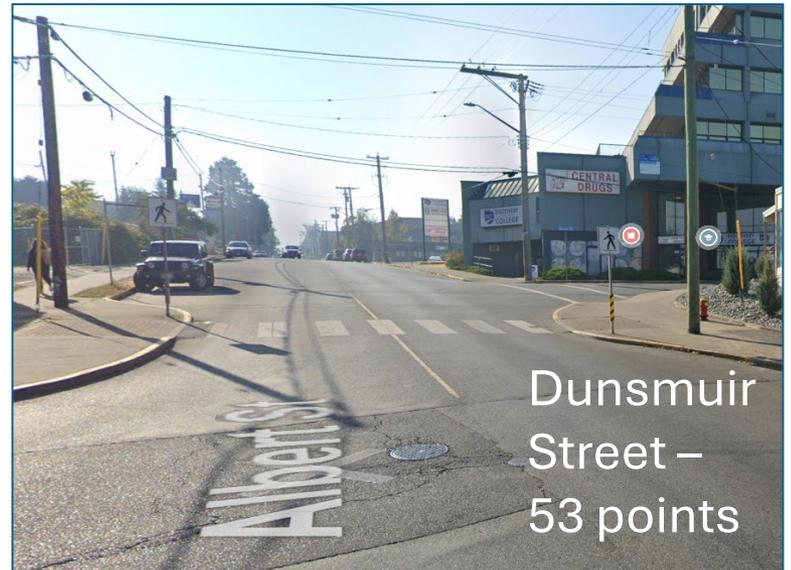
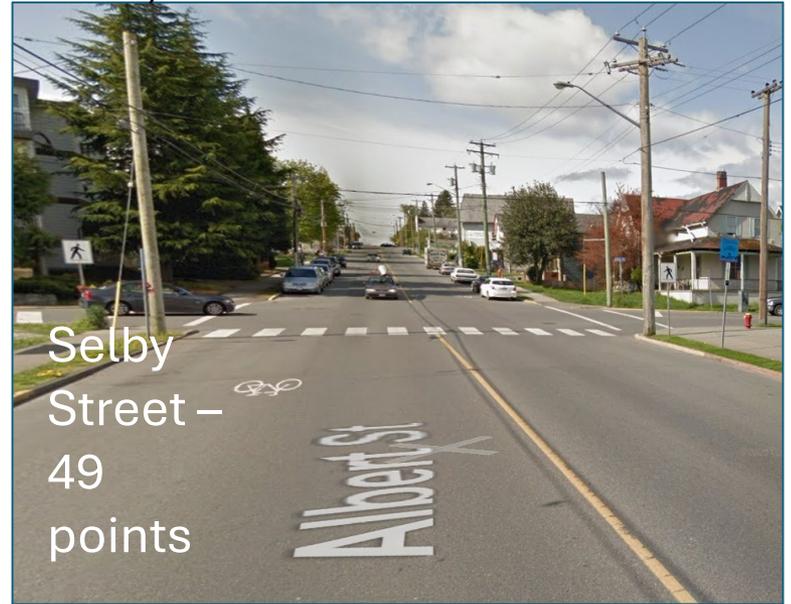
Poul Rosen  
Director, Engineering

Wendy Fulla  
Director, Finance

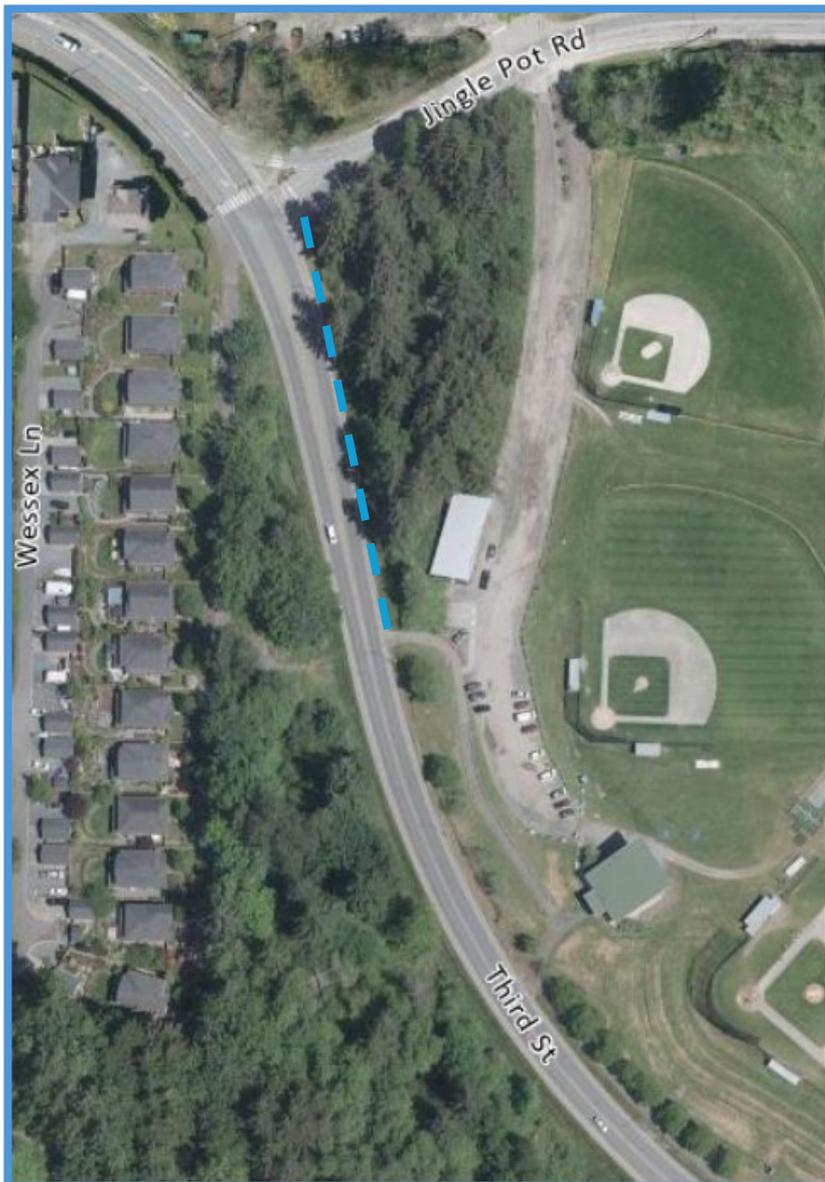
Bill Sims  
General Manager, Engineering and Public  
Works

Laura Mercer  
General Manager, Corporate Services |

# ATTACHMENT A: ALBERT STREET CROSSWALKS (EXISTING CONDITIONS)



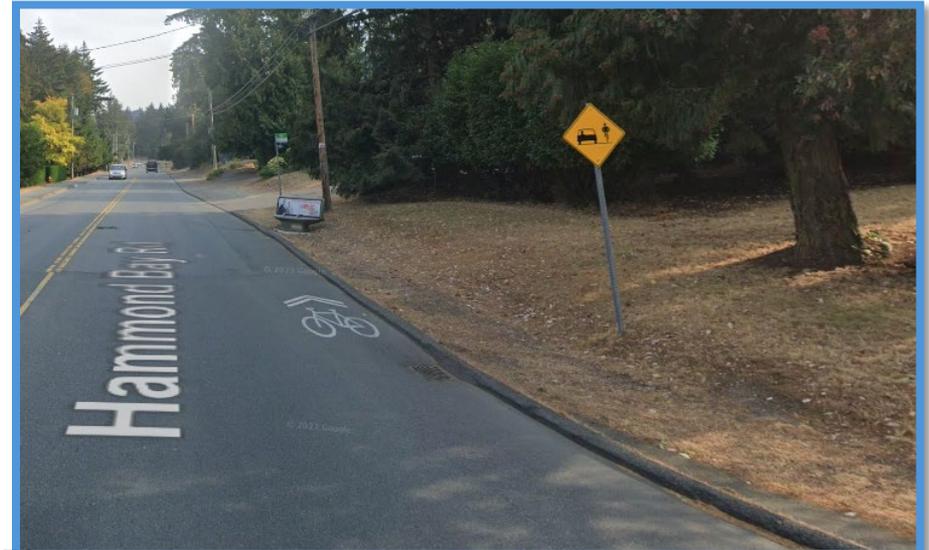
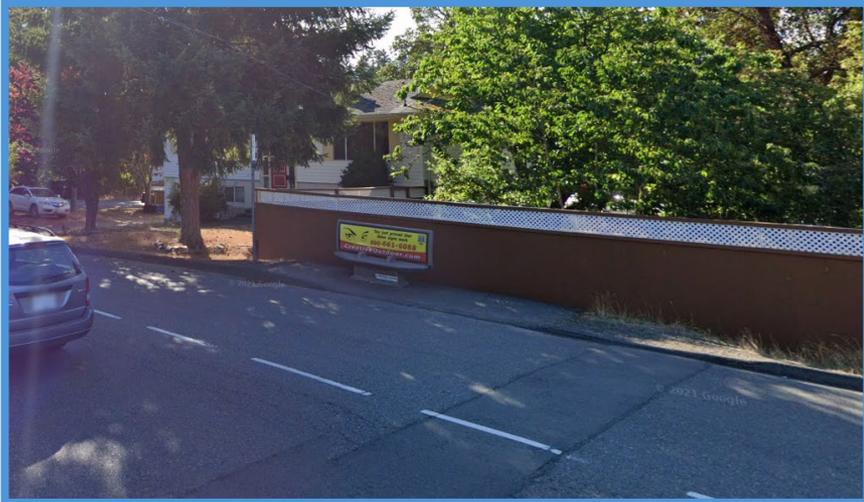
# ATTACHMENT B: FUTURE CONSIDERATIONS



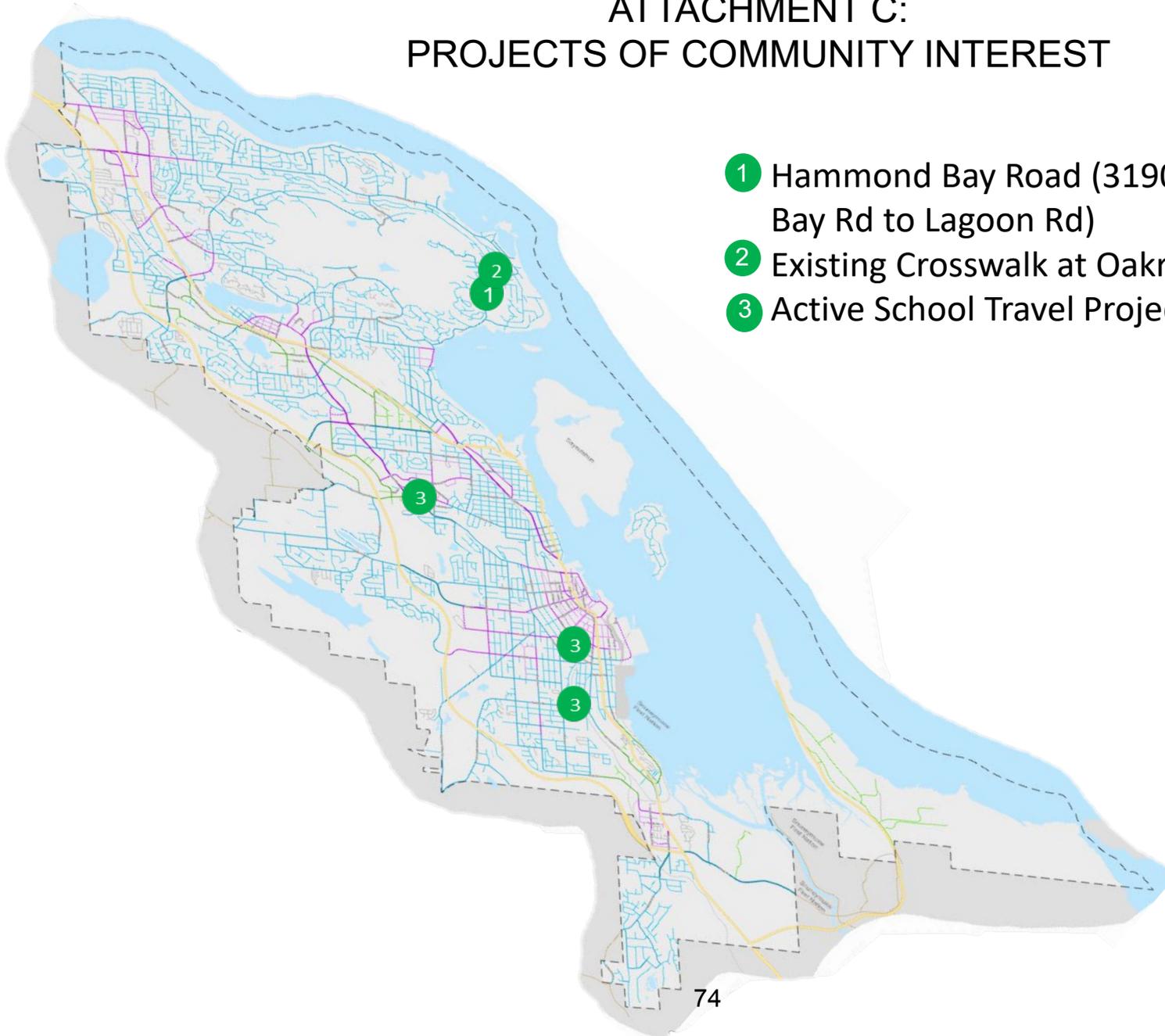
Third Street Existing Conditions



# Accessibility Improvements for Existing Transit Stops

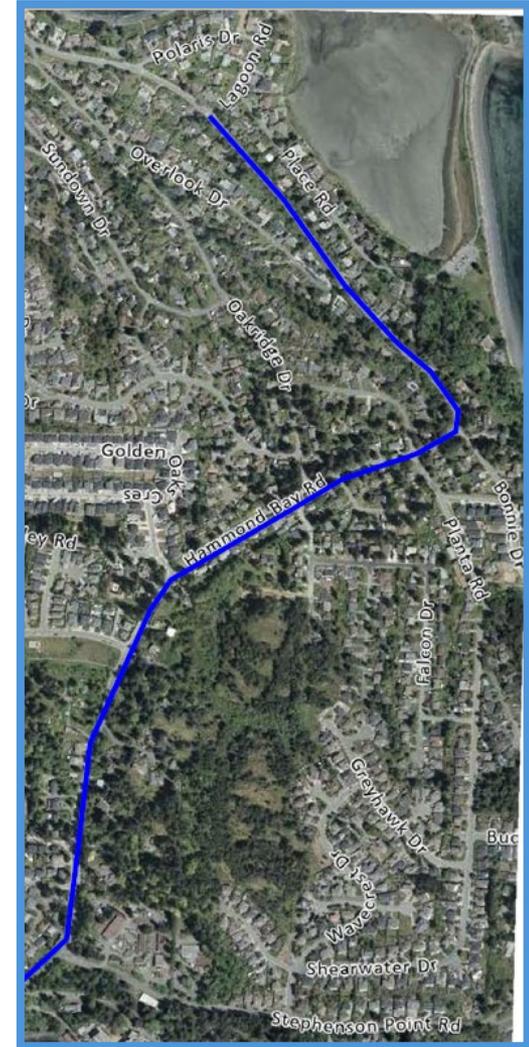


# ATTACHMENT C: PROJECTS OF COMMUNITY INTEREST



- ① Hammond Bay Road (3190 Hammond Bay Rd to Lagoon Rd)
- ② Existing Crosswalk at Oakridge Drive
- ③ Active School Travel Projects

1 Hammond Bay Road (3190 Hammond Bay Rd to Lagoon Rd)



2 Existing Crossing at Oakridge Drive on Hammond Bay Road



### 3 Active School Travel



École Quaterway Elementary School



Park Avenue Elementary School



77 Bayview Elementary School

CITY OF NANAIMO  
THE HARBOUR CITY

May 13, 2024

# Allocation of Pedestrian Unallocated Funding

## Governance and Priorities Committee Meeting

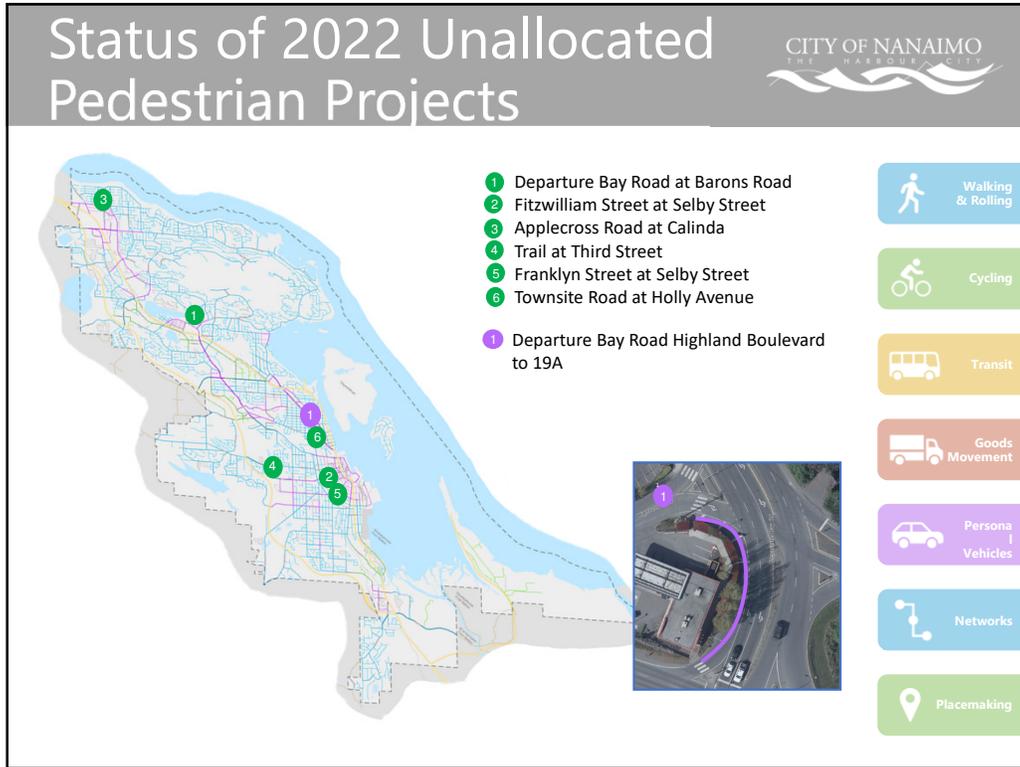
1

## Overview

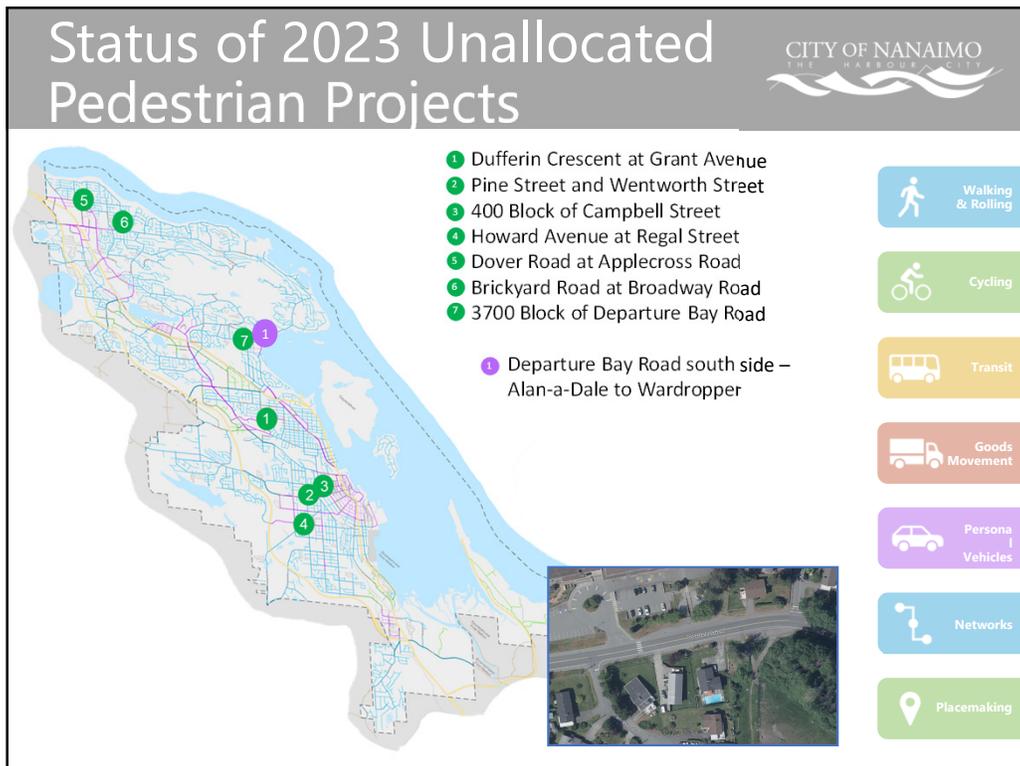
CITY OF NANAIMO  
THE HARBOUR CITY

- Status of 2022 Projects
- Status of 2023 Projects
- 2024 Allocation of Pedestrian Unallocated Funding
  - Albert Street Crossing Improvements
  - Future Considerations for Unallocated Pedestrian Funding
  - High Priority Projects
  - Projects of Community Interest

2



3



4

# Recommended Project

CITY OF NANAIMO  
THE HARBOUR CITY

## Albert Street Crossings

At Selby Street – 49 points

At Dunsmuir Street – 53 points

Walking & Rolling

5

# Recommended Project - Continued

CITY OF NANAIMO  
THE HARBOUR CITY

Existing Crosswalks

- 1 Add raised crosswalks and reconfigure bump-outs at Dunsmuir Street
- 2 Add raised crosswalk and bump-outs at Selby Street
- 3 Explore adding a pedestrian crossing at Prideaux Street

Walking & Rolling

6

# Projects for Future Consideration

CITY OF NANAIMO  
THE HARBOUR CITY

Accessibility Improvements at Transit Stops

- Tactile walking surface indicators
- Directional indicators






7

# Projects for Future Consideration - Continued

CITY OF NANAIMO  
THE HARBOUR CITY

Third Street Sidewalk Expansion






8

## Priority Capital Projects

Crossing Location	Consideration
Norwell Drive (Island Hwy to Barons Rd)	In approved capital plan
Third Street at Howard Avenue	Adjacent development
Wallace Corridor (Comox Rd to Franklyn St)	In approved capital plan
Fitzwilliam Corridor (Milton St to Bastion St)	In approved capital plan
Fifth St Corridor (Shephard Ave to Wakesiah Ave)	In approved capital plan
Wakesiah Avenue at Foster Street	In future capital plan
Crosswalk at 700 block of Third, just west of Nanaimo Ice Centre and at the Ice Centre/Aquatic Centre	Exceeds Pedestrian Unallocated budget
Stewart Avenue at Dawes Street	Requires consultation with Ministry of Transportation and Infrastructure (MOTI)
Stewart Avenue at Rosehill Street	Requires consultation with MOTI
Stewart Avenue at Townsite Avenue	Requires consultation with MOTI
Stewart Avenue at Larch Street	Requires consultation with MOTI
Needham Street at Nicol Street	Requires consultation with MOTI
Uplands Drive at Primrose Drive	Redevelopment may bring cost sharing opportunities
Fitzwilliam Street at Wesley Street	Primary emergency response route
Maki Road at Island Highway	Requires consultation with MOTI
Seventh Street (Railway Ave and Victoria Rd)	Requires consultation with SVI

WALKING & ROLLING

CYCLING

TRANSIT

GOODS MOVEMENT

PERSONAL VEHICLES

NETWORKS

PLACEMAKING

9

## Projects of Community Interest

- 1 Hammond Bay Road (3190 Hammond Bay Rd to Lagoon Rd)
- 2 Existing Crosswalk at Oakridge Drive
- 3 Active School Travel Projects

Walking & Rolling

10

# Hammond Bay Road

CITY OF NANAIMO  
THE HARBOUR CITY

- Projected \$100,000 to restripe
- RDN Sewer Project 2027 – 2029
- Future Opportunity



Walking & Rolling

11

# Bayview Elementary School Existing Conditions

CITY OF NANAIMO  
THE HARBOUR CITY



Walking & Rolling

12

### Park Avenue Elementary School Existing Conditions

CITY OF NANAIMO  
THE HARBOUR CITY



Walking & Rolling

13

### École Quaterway Elementary School Existing Conditions

CITY OF NANAIMO  
THE HARBOUR CITY

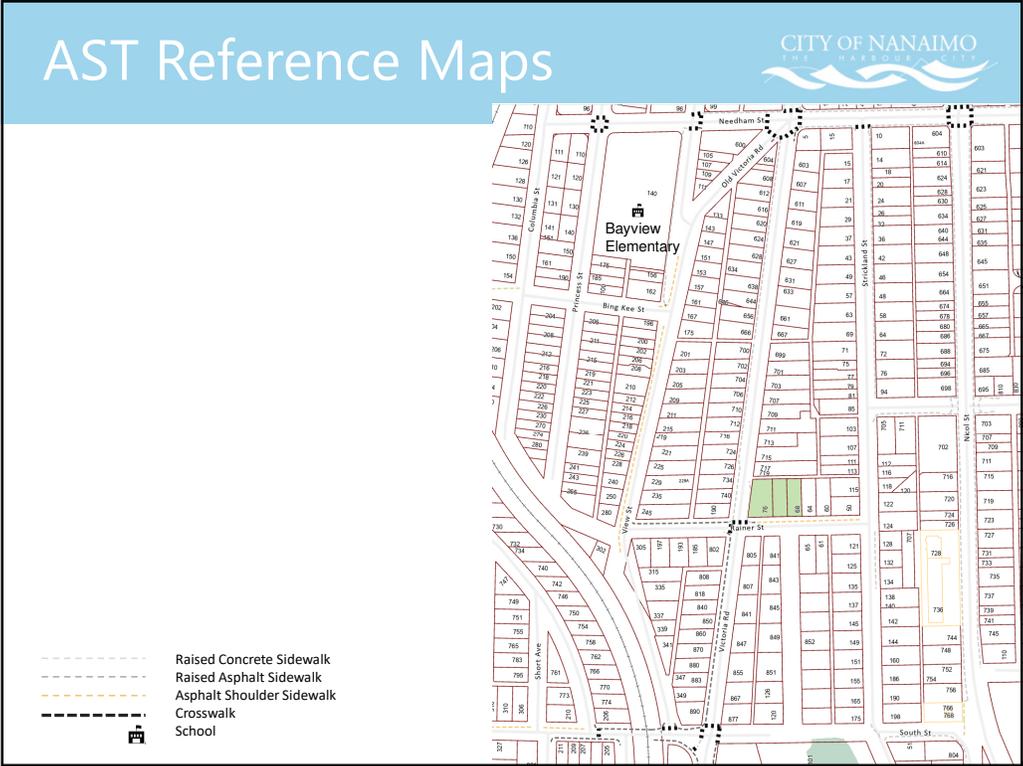


Walking & Rolling

14



# AST Reference Maps



17