District of Hope Community Wildfire Resiliency Plan

FRONTERA FOREST SOLUTIONS INC.

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Professional Signature and Seal

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Date Signed	

I certify that the work described herein fulfils the standards expected of a registrant of Forest Professionals British Columbia and that I did personally supervise the work.

Frequently Used Acronyms

AOI	Area of Interest
BC	British Columbia
BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
BP	Burn Potential
CFFDRS	Canadian Forest Fire Danger Rating System
CFRC	Community FireSmart and Resiliency Committee
CFS	Community Funding and Support
CI	Critical infrastructure
CIFFC	Canadian Interagency Forest Fire Centre
CRI	Community Resiliency Investment
CWH	Coastal Western Hemlock (BEZ Zone)
CWPP	Community Wildfire Protection Plan
CWRP	Community Wildfire Resiliency Plan
CWSSP	Community Wildfire Structure Protection Plan
DP	Development Permit
DPA	Development Permit Area
EMBC	Emergency Management British Columbia
EOC	Emergency Operations Centre
EPA	Emergency Program Act
ERRP	Emergency Response and Recovery Plan
FCFS	FireSmart Community Funding and Support
FBP	Fire Behaviour Prediction System
FESBC	Forest Enhancement Society of British Columbia
FESIMS	Forest Enhancement Society Information Management System
FMP	Fuel Management Prescription
FSCCRP	FireSmart Canada Community Recognition Program
FLNRO	Forests, Lands, Natural Resource Operation
FNESS	First Nations Emergency Services Society
FVRD	Fraser Valley Regional District
HFI	Head Fire Intensity
HIZ	Home Ignition Zone
HRVA	Hazard Risk and Vulnerability Analysis
HVRA	High Value Resources and Assets
IR	Indian Reserve
LRMP	Land and Resource Management Plan
MOF	Ministry of Forests
MH	Mountain Hemlock (BEC Zone)
MOTI	Ministry of Transportation and Infrastructure
NDT	Natural Disturbance Type
OBSCR	Open Burning and Smoke Control Regulation
OGMA	Old Growth Management Area
PSOE	Provincial State of Emergency
PSTA	Provincial Strategic Threat Assessment
OCP	Official Community Plan

OFC	Office of the Fire Commissioner
ROS	Rate of Spread
SARA	Species at Risk Act
SOLE	State of Local Emergency
SWPI	Strategic Wildfire Prevention Initiative
UBCM	Union of British Columbia Municipalities
VAR	Values at Risk
WHA	Wildlife Habitat Area
WRR	Wildfire Risk Reduction
WUI	Wildland Urban Interface
WUIWRR	Wildland Urban Interface Wildfire Risk Reduction Plan

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Executive Summary

Wildfire is becoming increasingly prevalent across the BC landscape, with climate change impacting moisture regimes, temperatures, and weather patterns. Wildfire threat and the associated risk to communities within the Wildland Urban Interface (WUI) is therefore likely to increase due to climatic changes, making it more critical than ever to understand wildfire risk and identify the most effective strategies for its mitigation.

The purpose of this Community Wildfire Resiliency Plan (CWRP) is to identify wildfire risk within and surrounding the District of Hope and to quantify the risks and potential impacts to the community from wildfire. The CWRP outlines strategies to reduce wildfire threat and risk by providing recommendations to decrease the likelihood of wildfires entering the community, to increase the preparedness of the community to respond to wildfires, and reduce the potential loss of homes, businesses, culturally significant sites and critical infrastructure from wildfire.

The CWRP focuses on wildfire risk assessment and the seven FireSmart disciplines including:

1. Education
2. Legislation and Planning
3. Development Considerations
4. Interagency Cooperation
5. Cross-training
6. Emergency Planning
7. Vegetation Management

Several factors are considered when determining the community's wildfire risk, including the landscape surrounding the community, fuel types, fire history, and weather data. This CWRP outlines the methodology used to determine wildfire risk, the key driving key factors (summarized below in Table 1), and explores feasible mitigation options for wildfire risk reduction (summarized in Table 2).

Action Plan

Table 1. Risk Assessment for the District of Hope.

Risk Assessment
The purpose of a risk assessment is to identify the specific risks to a community and its assets. An ongoing review of the risk assessment should occur and an update to this CWRP should occur in 5 years.
The major identified risks for the District of Hope are: 1. Wildfire threat assessments and risk modelling show the following main wildfire risks: a. Although wildfire threat within the District is generally moderate, area of steep slopes have high to extreme wildfire behaviour potential. b. Winds are highly erratic in Hope due to the surrounding topography. This may lead to unexpectedly high wildfire behaviour and spread shifts during peak wildfire conditions. c. The primary risk is large, upslope wildfire outside Hope spreading embers into the community. 2. Many homes across the District are not FireSmart compliant and are vulnerable to ember ignition. 3. The District lacks a complete Structure Protection Unit to defend structures from wildfire. 4. Many areas of the District lack adequate water supply for supporting wildfire suppression. 5. Much of the District's critical infrastructure, particularly water supply infrastructure, is vulnerable to wildfire.

Table 2. Summary of Actions recommended in this CWRP.

Action	Lead(s)	Priority	Resources Required	Metric for Success	Notes
Foundations of FireSmart					
The foundations of FireSmart are the key components of wildfire resilience that underpin the seven disciplines of FireSmart. These factors are crucial components for long-term wildfire resiliency planning and aid in transitioning from the CWRP planning process into implementing the actions recommended in this CWRP.					
1. Read and understand this CWRP's identified risks and recommended actions.	District Staff	Very High	• Completed CWRP • Staff time	District staff meet to review the CWRP's risks and action items.	N/A
2. Review CWRP annually.	District Staff	High	• Staff time	District staff to meet annually to review implementation status	Assess implementation status of the included recommended actions, and note any significant community or wildfire environment changes that may impact wildfire risk and risk mitigation activities.
3. Formally update CWRP five years from publication.	District Staff	High	• Staff time • External consultant • CRI funding	Completion of updated CWRP	N/A
4. Maintain the FireSmart Coordinator role.	District staff	Very High	• Staff time • CRI funding	Maintain this position	Funding is available through UBCM's CRI FCFS program.
5. Establish a regional CFRC.	District staff	Very High	• Staff time • CRI funding	Active participation in a CFRC committee.	Funding is available through UBCM's CRI FCFS program. **Note: additional Hope specific recommendations under the Interagency Cooperation section.**

Action	Lead(s)	Priority	Resources Required	Metric for Success	Notes
Education					
Education is a critical piece of resiliency planning as it relates directly to the recruitment and retention of community members in the FireSmart program as well as reduces the probability of wildfire ignitions within the WUI.					
6. Provide summary of CWRP to community members.	District Staff	High	• Staff time	Information made available	Provide this summary at key community locations and information sources
7. Continue to join community events with FireSmart booths and resources	DHVFD	High	• Staff time	FireSmart booth present at major community events	Funding is available through UBCM's CRI FCFS program.
8. Include FireSmart education events when planning large wildfire resiliency projects.	DHVFD	High	• Staff time	FireSmart events held in conjunction with projects.	Funding is available through UBCM's CRI FCFS program.
9. Plan community clean-up days to assist in landscaping and FireSmart maintenance for homes in the community.	DHVFD	High	• Staff time	Completing one community clean up day annually.	Funding is available through UBCM's CRI FCFS program.
10. Maintain FireSmart website on the District of Hope website. Regularly update this webpage.	District Staff	High	• Staff time	FireSmart webpage is kept up to date to reflect ongoing initiatives in community.	
11. Provide FireSmart resources at key community information points.	District Staff	High	• Staff time • Communication resources (fliers, brochures, posters, etc)	Information is provided at library, District Hall, recreation centre.	Funding is available through UBCM's CRI FCFS program.
12. Install and maintain wildfire hazard sign at a highly visible community location.	District Staff	High	• Signage	Signs successfully installed and maintained in prominent locations	

Action	Lead(s)	Priority	Resources Required	Metric for Success	Notes
13. Include educational signage with FireSmart or wildfire resiliency activities, such as fuel management areas or critical infrastructure that has been mitigated.	District Staff	High	• Staff time • Sign design, creation, and installation.	Signs installed when projects are ongoing/completed.	Funding is available through UBCM's CRI FCFS program.
Legislation and Planning					
Legal or regulatory changes and community planning will improve community resiliency by encouraging and supporting decisions to build a more resilient community.					
14. Inform developers of potential fire hazards and requirements of the Fire Bylaw when land clearing is required for development.	District Staff	High	• Staff time	A process established for informing developers of Fire Bylaw. This may involve a simple brochure or handout.	
15. Update tree management bylaw with guidelines for removing vegetation to reduce wildfire risk.	District Staff	High	• Staff time	Establishment of clear guidelines within and updated tree management bylaw to reflect FireSmart principles.	Funding is available through UBCM's CRI FCFS program.
Development Considerations					
Development considerations deal with how planned development (home, business and critical infrastructure) should be designed to optimize the community's resiliency to wildfire.					
16. Complete FireSmart Assessments are completed for all Critical Infrastructure.	District Staff	Very High	• Staff time	All Critical Infrastructure identified in this plan receives assessment.	Funding is available through UBCM's CRI FCFS program.
17. Complete mitigation actions identified in the FireSmart Assessments for all Critical Infrastructure.	District Staff	Very High	• Staff time • Contractor for retrofits and vegetation management	Vulnerabilities for all Critical Infrastructure identified in this plan are mitigated.	Funding is available through UBCM's CRI FCFS program.
18. Develop policy for including FireSmart building materials and landscaping for construction or renovation of District owned facilities.	District Staff	High	• Staff time	Creation of policy	

Action	Lead(s)	Priority	Resources Required	Metric for Success	Notes
19. Investigate developing a wildfire development permit area to address wildfire risk on private land.	District Staff	High	• Staff time	Determine the feasibility of a wildfire DPA, create provisions for establishing Wildfire DPA in next OCP.	Funding is available through UBCM's CRI FCFS program.
20. Develop guidelines for new construction to ensure compliance with FireSmart principles.	District Staff	High	• Staff time	A set of guidelines is created to guide all future District construction.	Funding is available through UBCM's CRI FCFS program to assist with development planning.
Interagency Cooperation					
To increase and share local knowledge, develop relationships and to collaborate on future projects.					
21. Maintain Mutual Aid Agreements with Yale and Popkum Fire Departments.	DHVFD	High	• Staff time	Ongoing existence and maintenance of these agreements.	
22. Maintain relationships with key regional wildfire resiliency actors, including the FVRD, local First Nations, and the BCWS.	District Staff	Very High	• Staff time	Regular informal and formal communications continue between these partners.	These partnerships are in place, but should be maintained.
23. Establish a District of Hope CFRC.	District Staff	Very High	• Staff time • CRI funding Stakeholder participation	Establishment of a Hope CFRC.	Funding is available through UBCM's CRI FCFS program.
24. Send key District FireSmart staff to the annual BC Wildfire Resiliency and Training Summit.	District Staff	High	• Staff time	Send two staff members to the annual conference.	Funding is available through UBCM's CRI FCFS program.
Cross-Training					
Cross-training increases the community's wildland firefighting capacity while simultaneously supporting the structural volunteer fire department.					
25. Maintain current wildfire training standard for DHVFD members.	DHVFD	Very High	• Staff time	Maintain existing training standards (S-100, ICS-100, and S-185).	Funding is available through the UBCM's CRI program to support cross-training.
26. Continue to deploy DHVFD members to provincial wildfire incidents.	DHVFD	High	• Staff time	Aim to have three certified engine bosses in DHVFD.	
27. Host annual table-top wildfire exercise and wildfire readiness	DHVFD	Very High	• Staff time • Participation from regional partners	Annual exercise held in spring in advance of fire season.	Funding is available through the UBCM's CRI program to support cross-training.

Action	Lead(s)	Priority	Resources Required	Metric for Success	Notes
exercise with regional wildfire response partners.					
Emergency Planning					
Emergency Planning informs community leaders and members on how to respond to different types of emergencies.					
28. Integrate findings from this CWRP into updated Emergency Response and Recovery Plan.	District Staff	High	• Staff time	Ensure wildfire risk, as described in this CWRP, is integrated into new ERRP.	
29. Assess backup power supply for critical infrastructure that is necessary for supporting wildfire response.	District Staff	High	• Staff time	Identify and rectify power deficiencies in critical infrastructure necessary for wildfire response.	
30. Acquire a complete structure protection unit for the District of Hope Fire Department.	DHVFD	High	• Staff time	Complete acquisition of SPU in a phased approach.	Funding is available through UBCM's CRI FCFS program.
31. Conduct a community water delivery analysis for wildfire suppression for the District's water supply network.	District Staff	Very High	• Staff time • Consultant support	Creation of a comprehensive water supply analysis document.	Funding is available through UBCM's CRI FCFS program.
32. Continue to promote and support resident participation in the Alertable emergency alert system.	District Staff	Very High	• Staff time	Increase participation by public residents in this program.	
33. Develop a Community Wildfire Structure Protection Plan for the District of Hope	DHVFD	High	• Staff time • Consultant support	Creation of a Community Wildfire Structure Protection Plan.	
Vegetation Management					
The purpose of vegetation management is to reduce wildfire risk through the reduction of vegetative fuels available for consumption, while supporting forest values and healthy ecosystems.					
34. Continue to provide FireSmart home assessment services to residents of Hope.	District Staff	Very High	• Staff time	Increased uptake in assessments annually	Funding is available through UBCM's CRI FCFS program.
35. Support neighbourhoods in pursing FireSmart Canada Neighbourhood Recognition.	District Staff	High	• Staff time	Successful recognition of one neighbourhood within the District.	Funding is available through UBCM's CRI FCFS program.
36. Continue rebate program for residents within Hope to support FireSmart mitigation activities on private land.	District Staff	Very High	• Staff time	Maintain rebate program.	Funding is available through UBCM's CRI FCFS program.

Action	Lead(s)	Priority	Resources Required	Metric for Success	Notes
37. Develop program for providing labour to residents that are unable to perform FireSmart activities.	District Staff	High	• Staff time	Development of a program for supplying labour.	Funding (for costs of labour) is available through UBCM's CRI FCFS program.
38. Develop program for facilitating green waste disposal for debris produced through FireSmart activities on private land.	District Staff	High	• Staff time	Successful program developed for reducing or waiving FireSmart green waste disposal costs.	Funding is available through UBCM's CRI FCFS program.
39. Host annual chipping days to facilitate disposal of waste from FireSmart activities on private land.	District Staff	High	• Staff time • Contractor	Host one chipping day every year in the spring.	Funding is available through UBCM's CRI FCFS program.
40. Develop fuel management prescriptions for areas identified in this CWRP.	District Staff	High	• Staff time • Consultant Support	Create fuel management prescription for two treatment area within two years.	Funding is available through UBCM's CRI FCFS program.
41. Implement fuel management prescription for areas identified in this CWRP	District Staff	High	• Staff time • Contractor	Implement one fuel management prescription in this timeframe.	Funding is available through UBCM's CRI FCFS program.

1 Introduction

Wildfire is a natural disturbance agent on the landscapes of BC. With warming temperatures and changing precipitation regimes due to climate change, the frequency, severity, and size of wildfires in British Columbia has been increasing in the last decade. This can be seen in 2017 and 2018, which were two of the worst wildfire seasons in BC history, with 1.2 and 1.3 million hectares burned.[1] The 2021 wildfire season was notable as well, with approximately 868,000 hectares burned, 181 community evacuation orders, and 304 community evacuation alerts. The 2023 wildfire season in British Columbia continued this distressing trend, with a record setting 3 million hectares burned across the province. Specific incidents, such as The West Kelowna Fire, Shuswap Fire and Donnie Creek Fire, drew national attention and highlighted the escalating challenge of managing wildfires amid changing climatic conditions. The increased presence of fire across BC, along with lessons learned, advances in knowledge, and loss prevention programs have encouraged the need for deliberate and effective wildfire risk prevention measures to occur within the wildland-urban interface (WUI), the area where structures and other human development meet or intermingle with surrounding wildland/vegetative fuels.

The District of Hope has directly been impacted by wildfires in recent years. In 2022, the Flood Falls Trail wildfire occurred within the boundaries of the District of Hope, on the steep slopes south of Highway 1. This fire was large, at approximately 750 hectares, and led to evacuation alerts within the community and the temporary closure of Highway 1, Canada's most important transportation corridor. This wildfire demonstrates that severe wildfire is possible and can have potentially severe impacts to the District of Hope, and the need for proactive actions to increase community resilience to the risk of wildfire.

[1] British Columbia Wildfire Service. 2023. *Wildfire Season Summary.* Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary

1.1 Overview

Community Wildfire Resiliency Plans (CWRPs) are the next generation of Community Wildfire Protection Plans (CWPPs) in British Columbia. CWPPs were introduced in 2004 as a comprehensive and science-based approach toward wildfire risk reduction planning that reflects local priorities and provincial goals for wildfire mitigation.[2] These have since evolved into the CWRP framework, a new iteration that focuses on a broader approach to overall community resilience to wildfire. Key provincial goals of the newly revised Community Wildfire Resiliency Planning (CWRP) process are to:

- Increase communities' capacity and understanding of wildfire threat and risk
- Foster greater interagency collaboration across administrative boundaries
- Be more responsive to the needs of different types of communities throughout British Columbia
- Develop achievable and accountable action items for reducing wildfire threat and risk.

Specifically, the new CWRP process addresses the seven principles/disciplines of FireSmart Canada:[3]

1. Education
2. Vegetation Management
3. Legislation and Planning
4. Development Considerations
5. Interagency Cooperation
6. Cross-training
7. Emergency Planning

In 2024, Frontera Forest Solutions Inc. was retained by the District of Hope to develop a CWRP. This represents an opportunity to lay a new foundation for the community in wildfire resiliency planning within the community, building off the various existing wildfire resiliency initiatives in place.

[2] See: https://www.ubcm.ca/cri/firesmart-community-funding-supports
[3] See: https://www.firesmartcanada.ca/what-is-firesmart/understanding-firesmart/seven-firesmart-disciplines/

1.2 Plan Goals

The purpose of this CWRP is to identify wildfire threat within and surrounding the District of Hope, to quantify the potential risks and impacts to the community from wildfire, and to provide strategies for reducing identified threats and risks. Specifically, the landscape-level wildfire risk assessment of this CWRP will inform strategies that will aim to:

1. Reduce the likelihood of wildfire entering the community.
2. Increase the safety of community members in the event of a wildfire, including egress safety.
3. Reduce the impacts/losses to property and critical infrastructure by employing FireSmart principles.
4. Provide recommendations to reduce the negative economic and social impacts of wildfire to the District of Hope.

1.3 Plan Development Summary

The study area for this CWRP consists of the District of Hope (defined as the Area of Interest or "AOI") and the surrounding Wildland-Urban Interface (WUI). The WUI is the zone where structures and other human development meet or intermingle with undeveloped vegetated, or wildland, areas (See 3.2 Wildland-Urban Interface). For the purposes of this CWRP, the WUI is defined as a one-kilometer buffer around structures and development within the study area. This is aligned with the provincial guidance for CWRP planning.

In developing this CWRP, the consultants worked through three key phases:

1. **Consultation with local government representatives and wildfire specialist.** Information sharing occurred with Hope representatives throughout plan development and to ensure the CWRP was linked with existing plans (See Relationships to Other Plans). Additional consultation and information sharing was conducted with regional stakeholders and local First Nations.
2. **Identification of the values at risk (See Community Description) and assessment of local wildfire threat and risk.** Wildfire threat assessments were conducted, incorporated the natural fire regime and ecology, Provincial Strategic Threat Analysis, field assessments and forest fuel type verification, and GIS wildfire threat analyses (see Wildfire Risk Assessment). These assessments were then combined to create a wildfire risk assessment.
3. **Developing a risk mitigation strategy.** This strategy was developed as a guide for the District of Hope to implement wildfire mitigation and risk reduction activities. The risk mitigation strategy focuses on FireSmart activities around homes and structures, legislation and planning around emergency management, prioritization of fuel treatments, and wildfire response recommendations to reduce overall wildfire risk within the community (See Disciplines of FireSmart).

2 Relationships to Other Plans

The Community Wildfire Resiliency Plan (CWRP), as well as any wildfire risk mitigation plan or activity, relates to many plans that inform, or may be informed by the CWRP. Community Wildfire Protection Plans (CWPP) or CWRPs may exist for the community or neighbouring communities. For communities that are surrounded by crown land, Wildfire Risk Reduction Tactical Plans[4] may have been developed by the provincial government. These landscape level plans identify the wildfire risk for a region, and identify areas for vegetation management to reduce wildfire risk. No Wildfire Risk Reduction Tactical Plan has been developed for the study area for this CWRP, however the Natural Resource District of Chilliwack plans to develop a tactical plan for the area surrounding Hope within the next 2-3 years.

There is no existing CWPP or CWRP for the District of Hope. The CWRP study area is surrounded by Electoral Area B of the Fraser Valley Regional District (FVRD). The FVRD has a 2019 Community Wildfire Protection Plan for this electoral area. This CWPP assessed portions of the District of Hope's WUI as having a mosaic of wildfire risk from very low to extreme, largely driven by the forest composition in the wake of disturbance such as forest harvesting. Several recommendations were developed relevant to the District of Hope CWRP, and are discussed in the specific FireSmart discipline section of this CWRP.

Table 3 summarizes the plans that were consulted for the development of this CWRP. This includes District of Hope plans and policy documents, neighbouring government plans and documents, and provincial agency plans and policies. Where possible recommendations in this CWRP are aligned with objectives of these plans. Objectives or policies within these plans that conflict with CWRP objectives have also been identified where applicable, and are discussed fully in the relevant action recommendation within the FireSmart discipline section of this CWRP.

Table 3. Key plans and their relationship to this CWRP.

Plan Type	Description	Relationship to CWRP	Important Findings or Notes
Official Community Plan	District of Hope Integrated Official Community Plan (Consolidated to Bylaw 1434, 2018 - November 2018)	This OCP provides a long-term vision for the District of Hope. All bylaws enacted within Hope must comply with this plan. Any bylaw recommendations included in this CWRP must comply with this plan.	Goal 6 is to "protect people and property from natural hazards". Objective 6.5 is to "regulate development in areas with natural hazards in order to mitigate risk" which may be used to apply to wildfire in a potential wildfire development permit area.

[4] https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/prevention/fire-fuel-management/fuels-management/crown_land_wildfire_risk_reduction_planning_guide_2023_2024_final.pdf

Plan Type	Description	Relationship to CWRP	Important Findings or Notes
Zoning Bylaw	District of Hope Zoning Bylaw No. 1324, 2012	This bylaw outlines how land, buildings, and other structures may be used within the District of Hope.	This bylaw contains no specific regulations regarding wildfire.
Emergency Plans	District of Hope Fire Department Evacuation Map (2017)	This map outlines four key zones for coordinating evacuation of District of Hope if necessary.	Wildfires have previously required evacuations in the District of Hope.
Strategic Plan	District of Hope 2022-2026 Strategic Plan (April 2023)	This plan outlines the objectives for the District of Hope for 2022-2026, which includes a focus on emergency management.	This plan notes wildfire as a hazard that must be planned for. Proposes: an updated Hazard, Risk, and Vulnerability Analysis for the District of Hope in 2025, review current emergency plan in 2025, coordinate with neighbouring First Nations, and pursue funding programs for emergency planning.
Fire Bylaw	District of Hope Fire Bylaw (Bylaw No. 1006, 1998)	This bylaw outlines the role and responsibility for the District of Hope Volunteer Fire Department, including the fire protection area.	The District of Hope Volunteer Fire Department has an established fire protection area that corresponds with the District's municipal boundary
Fire Service Policy	District of Hope Fire Department Service Level Policy (2016)	This policy document outlines the level of service for the District of Hope Volunteer Fire Department.	The District of Hope Volunteer Fire Department service level policy is in accordance with the Interior Operations Service Level as per the Fire Services Act and Office of the Fire Commissioner.
Housing Reports/Plans	District of Hope Housing Needs Assessment	This assessment provides insight onto housing needs in Hope, which in turn impacts future development patterns	This plan notes growing development pressure within Hope. Future development may present opportunities to reduce wildfire risk, discussed further in the Development Considerations section of this CWRP.
Urban Forest Plans or Strategies	District of Hope Tree Protection Bylaw (Bylaw No. 20/95)	This bylaw outlines regulations for tree removal. Tree removal for wildfire risk reduction	Removal of trees to reduce wildfire risk must be conducted in accordance with this bylaw.

Plan Type	Description	Relationship to CWRP	Important Findings or Notes
		purposes must coordinate with this bylaw.	
Related CWPP or CWRPs	Fraser Valley Regional District Electoral Areas A and B Community Wildfire Protection Plan (2019)	This CWPP identifies wildfire risk and mitigation options for the FVRD, the local government for all areas surrounding the District of Hope. CWPPs were the precursor to CWRPs, and follow a different wildfire risk methodology and planning process.	Hope is surrounded by EAB. Identified risk around Hope as mosaic from very low to extreme, largely driven by the forest composition resulting form land disturbance (harvesting). CWPP recommends: review of stocking standards, develop collaborative committee, various training and collaboration that includes DHVFD; no fuel management treat areas recommended in Hope CWRP WUI.
FLNRO Landscape Unit Plan Background Reports	Four landscape units overlap with the WUI for this CWRP, including the Coquihalla, Silverhope, Yale and East Harrison Landscape Units: Coquihalla Landscape Unit Plan Background Report (2004) Cascades Landscape Units Plan Background Report for: Silverhope, Manning and Yale Landscape Units (2004) Biodiversity Chapter for East Harrison Landscape Unit (2005)	These plans set out objectives for sustaining biodiversity within the landscape unit. Some areas within these landscape units, particularly Old Growth Management Area, are legally protected (see legal orders below).	Fuel management or any modification of vegetation within the areas these plans apply to must comply with the guidelines provided. Specifically maintaining biodiversity in the form of Old Growth Management Areas and Wildlife Habitat Areas, which are protected. The Coquihalla Landscape Unit includes legally protected wildlife habitat areas for Spotted Owl (See Order below for details).
FLNRO Orders for Landscape Units and Objectives	There are four Orders for Landscape Units and Objectives for Landscape Units that overlap with the WUI for this CWRP, with two additional amendments: Order to Establish a Landscape Unit and Objectives: East	These orders delineate Old Growth Management Areas within the landscape unit. These areas legally protected from most forest harvesting activities.	Activities, including fuel management, are limited within Old Growth Management Areas. Small incursions may be permitted, and boundaries may be amended.

Plan Type	Description	Relationship to CWRP	Important Findings or Notes
	Harrison Landscape Unit (2005, amended 2010) Order to Establish a Landscape Unit and Objectives: Silverhope Landscape Unit (2004) Order to Establish a Landscape Unit and Objectives: Coquihalla Landscape Unit (2004) Order to Establish a Landscape Unit and Objectives: East Harrison Landscape Unit (2004, amended 2010)		
FLNRO Orders for Landscape Units and Objectives	Order – Wildlife Habitat Areas S-494 to 2-510 (2011)	This order delineates wildlife habitat areas for Spotted Owl and outlines requirements to preserve habitat. Wildlife Habitat Area 2-498 overlaps with the WUI and AOI for this CWRP.	Certain forestry activities are limited within wildlife habitat areas. Fuel management within these areas must comply with the requirements in this Order.

3 Community Description

3.1 Area of Interest

The Area of Interest (AOI) for a Community Wildfire Resiliency Plan (CWRP) is defined as the municipal boundaries of the local government. The AOI for this CWRP is the municipal boundary of the District of Hope. The District of Hope is a district municipality at the head of the Fraser Valley in the lower mainland of BC, with a total area of approximately 4,600 hectares. Most of the development within the AOI surrounds the Fraser River, on mostly flat to slightly rolling terrain, however the slopes of the Fraser River Valley rise very steeply on all sides, climbing over 1500m. The AOI neighbours one other municipality, Electoral Area B of the Fraser Valley Regional District, which surrounds the District of Hope.

The District of Hope is comprised of an urbanized core downtown area, with minimal forested vegetation. This transitions to more forested suburban and acreage style development, with forested patches interspersed with structures. Towards the perimeters of the District boundary, this transitions to native conifer forests, comprised of Douglas-fir (*pseudotsuga menziesii*), western redcedar (*thuja plicata*), and western hemlock (*tsuga heterophylla*). These forests extend in all directions and are continuous with the broader landscape forests of the region.

Photo 1. Downtown Hope

3.2 Wildland-Urban Interface

The Wildland-Urban Interface (WUI) occurs where homes, structures, and critical infrastructure are found adjacent to or intermixed with combustible vegetated lands. For the purpose of the provincial FireSmart Community Funding and Support (FCFS) program[5], the eligible WUI is defined as a one-kilometer buffer from areas where structure density is greater than 6 structures/km². A structure is defined as a residence, business, or critical infrastructure. This one-kilometer buffer represents a reasonable distance that embers from a wildfire can travel and ignite a structure. The WUI for the District of Hope CWRP has been updated using the community structure locations.

For most communities, the WUI differs from the AOI, which refers to the jurisdictional boundaries of the community. Many communities have WUI's that expand beyond their jurisdictional boundaries that comprise the AOI, while many large rural communities have WUI's considerably smaller than their jurisdictional boundaries that comprise the AOI. Within this CWRP, the WUI expands beyond the District of Hope's administrative boundaries, with a total area of 9961 ha. This area is heavily forested with minimal development.

Photo 2. Homes within the WUI

[5] https://www.ubcm.ca/cri/firesmart-community-funding-supports

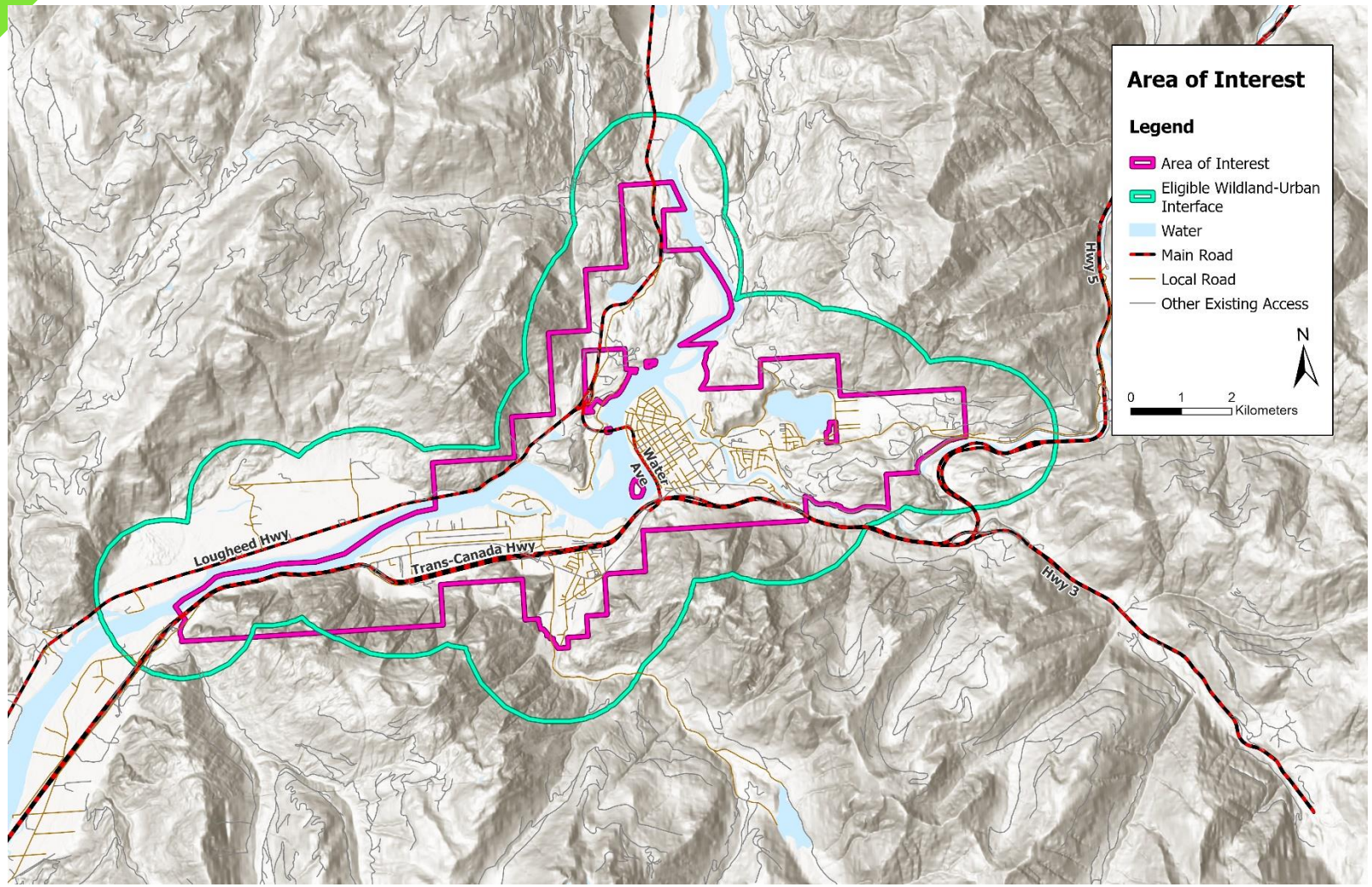

Figure 1. AOI and WUI for this CWRP.

3.3 Community Information

The District of Hope has a population of 6,686 as of the 2021 census. The population growth was 8% since 2016, fairly close to the BC population growth of 7.6% in that period. However, this growth should be noted in sharp contrast with a long period of stable population and periods of negative population growth that preceded the 2016 census. Thus, growth at this rate in Hope is a major departure from relatively stable population historically.[6]

The median income is 20% below the provincial average, coupled with an unemployment rate at 11.6%, well above the provincial average of 8.4%. Household income is also below the provincial average of $85,000, at $64,000. The median age in District of Hope is 54.8, well above the provincial average of 42.8. Overall, the District of Hope skews to an older, lower income population in comparison with the rest of BC.

Table 4. Census data for residents of District of Hope.[7]

Category	Hope
Total Membership Population (2021)	6,686
Population Density	163.6 people/km^2
Median Age (2021)	54.8
Housing Units	3,243
Median Household Income	$64,000
Unemployment Rate	11.6%

Hope's population data is skewed by residents that may not have been captured in the latest Census data. The 2021 Housing Needs Assessment estimates that around 100 individuals have precarious housing situations. Field assessments identified several encampments in forested areas. Cooking and warming fires at these encampments present a possible ignition source, however the Hope Fire Department is leading a multi-agency task force to investigate options to mitigate this issue.

Additionally, the construction of the Trans Mountain Pipeline Expansion Project has created a "shadow population." This consists of workers who have moved to Hope for the duration of the construction, or for long periods, while maintaining permanent residents in other communities. Many of these workers are living in campgrounds or in trailers on private property, increasing the population, and this increase is not captured in the latest Census. Although this project was drawing to a close at the time of writing this CWRP, further large infrastructure projects are in development, and will create a similar shadow population issue.

[6] District of Hope. *District of Hope Housing Needs Assessment.* Prepared by Urbanics Consultants Ltd. October, 2021.
[7] Statistics Canada. *2021 Census of Canada: Profile Data for Hope, BC[Census Subdivision], British Columbia.* 2021 Census of Population. Statistics Canada Catalogue no. 98-316-X2021001. Ottawa. Released November 15, 2023. https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E (accessed July 24, 2024).

3.4 Values at Risk

The following section is a description of the extent to which wildfire has the potential to impact the values at risk (VAR) identified within the AOI. VAR are the human or natural values that may be impacted by wildfire; this includes human life, property, critical infrastructure, high environmental and cultural values, and resource values. High VAR are often found within the WUI, but can also be geographically isolated, such as communication towers.

3.4.1 Human Life and Safety

Human life and safety are the highest priority in the event of a wildfire. A key consideration during interface wildfire is the evacuation of at-risk areas and safe egress. Evacuation can be complicated by the unpredictable and dynamic nature of wildfire. Orderly evacuation takes time and safe egress routes can be compromised by quickly moving/changing wildfire, or by traffic congestion and accidents. The population distribution (both people and structures) within the AOI is important in determining the wildfire risk and identifying mitigation activities as well as evacuation efforts.

The District of Hope is well connected regionally, with major highways extending north, east, and west, providing connectivity and evacuation routes. Although highways have been shutdown in the past for wildfires, such as during the Flood Falls Trail wildfire in 2022. Highway 1, providing a northern evacuation route, is subject to frequent wildfire closures outside the WUI during wildfire season, limiting its effectiveness for egress. However, overall, it is highly unlikely that the District of Hope will have all main egress routes compromised by a wildfire.

Several interface neighbourhoods have limited access, including East Kawkawa Lake and homes along the Silver Skagit road. These neighbourhoods are accessed by narrow single roads with dense forest surrounding, limiting their access to regional evacuation routes. This single route access and egress increases the vulnerability of these neighbourhoods to wildfire, which is not reflected in the quantitative wildfire risk analysis.

Despite the overall good regional connectivity for the District, there are community level barriers to egress. Within the study area, the main constraints for local evacuation are the Fraser and Coquihalla Rivers. Each of these rivers only have single bridge crossings, which may limit egress in the event of a smaller evacuation due to wildfire. However, each area does have backup egress routes outside the WUI, which although more time consuming, provide suitable alternative routes for evacuation.

Photo 3. The Fraser River.

3.4.2 Critical Infrastructure

Critical infrastructure (CI) are structures or facilities that are essential to the health, safety, security, economic well-being, and/or effective functioning of a community or government. Protection of critical infrastructure during a wildfire event is an important consideration for emergency response preparedness and effectiveness, ensuring that coordinated evacuation can occur if necessary, and that essential services can be maintained and/or restored quickly after an emergency event. Critical infrastructure includes emergency and medical services, electrical and natural gas services, transportation and primary road networks, drinking and wastewater systems, social/support services, and communications infrastructure. Ensuring critical infrastructure is resilient to wildfire by incorporating FireSmart principles is crucial to mitigating wildfire impacts to a community. Table 5 summarizes the critical infrastructure identified in this CWRP, and Figure 2 shows the location of critical infrastructure in the WUI.

Photo 4. Critical Infrastructure: water reservoir in the wildland-urban interface.

Table 5. Identified critical infrastructure.

Critical Infrastructure	Location	Latitude	Longitude
Hope Public Works	1225 Nelson Ave	49.3712	-121.4366
Fraser Canyon Hospital	63200 Starret Road	49.3672	-121.4803
FVRD Regional Airpark	62720 Airport Road	49.3690	-121.4931
BCAS Station 214	999 Water Ave	49.3759	-121.4410
Coquihalla Elementary School	455 6th Ave	49.3868	-121.4378
Silver Creek Elementary School	63831 School Rd	49.3613	-121.4636
Hope Secondary	444 Stuart St	49.3864	-121.4439
Emergency Reception Centre (Hope Secondary)	444 Stuart St	49.3864	-121.4439
Hope Recreation Centre	1005 6 Ave	49.3790	-121.4325
Riverside Manor	765 Old Hope Princeton Way	49.3760	-121.4235
Canyon Golden Age Club	560 Douglas St	49.3838	-121.4383
DHVFD - Hope Fire Hall #1	865 3 Ave	49.3786	-121.4407
DHVFD - Hope Fire Hall #2	63610 Old Yale Road	49.3558	-121.4696
EOC - District Hall	325 Wallace St	49.3800	-121.4415
BCWS - Haig Fire Base	63900 Lougheed Highway	49.3883	-121.4675
Hope Wastewater Treatment Plant	63701 Tom Berry Rd	49.3696	-121.4661
Hope Reservoir 87	64600 Trans-Canada Highway	49.3720	-121.4411
Hope Reservoir 138	1200 Coquihalla Highway		
Thacker Mountain Reservoir	21388 Thacker Mountain Road	49.3850	-121.4253
East Kawkawa Lake Reservoir	66700 Othello Road	49.3852	-121.3822
Downtown Pump Station Network	508 Water Ave	49.3826	-121.4477
Downtown Pump Station Network	695 Kawkawa Lake Rd	49.3786	-121.4289
Downtown Lift Station Network	525 Water Ave	49.3826	-121.4476
Downtown Lift Station Network	325 Rupert Street	49.3895	-121.4483
Silver Creek Pump Station Network	20004 Silverview Rd	49.3620	-121.4650
Silver Creek Pump Station Network	19590 Silverhope Rd	49.3526	-121.4694
Silver Creek Pump Station Network	20118 Beacon Rd	49.3642	-121.4613
Silver Creek Lift Station Network	63897 Tom Berry Road	49.3675	-121.4614
West Bank Pump Station Network	22533 Ross Road	49.4059	-121.4517
East Hope Lift Station Network	21395 Kettle Valley	49.3842	-121.4119
North Silver Creek Reservoir	19480 Silverhope Road	49.3530	-121.4665
BC Hydro Substation	7th and Kawkawa Lake Road	49.3790	-121.4288

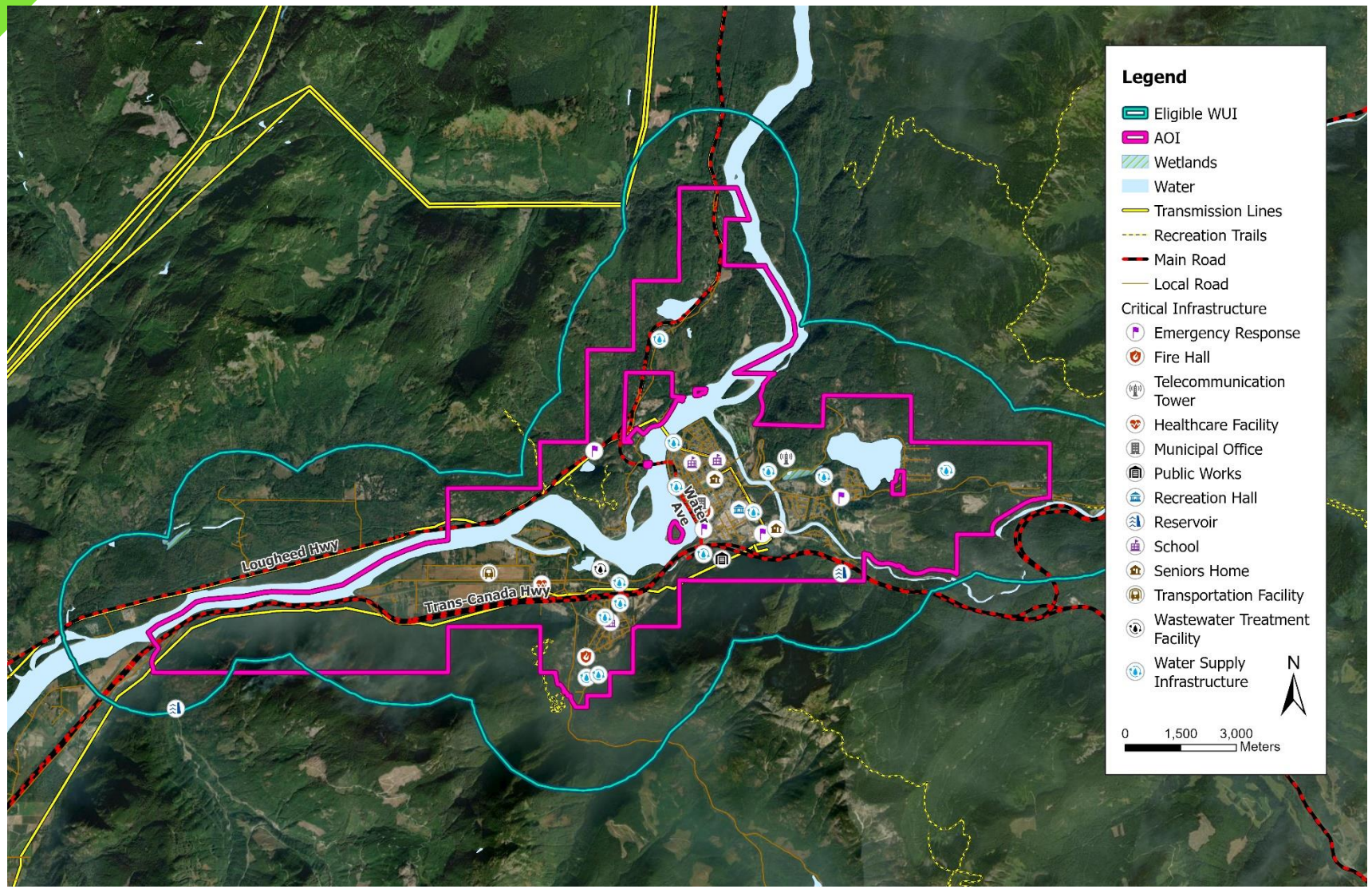

Figure 2. Critical Infrastructure locations within the AOI and WUI.

3.4.3 Fire Suppression Capabilities

The District of Hope Volunteer Fire Department (DHVFD) provide fire suppression services throughout the District of Hope. The Fire Protection Area for the DHVFD includes the Hope municipal boundary, as well as the nearby Chawathil First Nation Reserve lands. DHVFD provides fire protection within these areas through a services agreement with the Chawathil First Nation. Mutual aid agreements are in place with the nearby Yale and Popkum Fire Departments, ensuring resource support in the event of a significant even in any community.

DHVFD consists of three fire halls, staffed by a five full-time and fourteen volunteer/paid on call firefighters. Members are trained to the BC Structure Firefighter Minimum Training Standard, as per the BC Office of the Fire Commissioner. DHVFD members have a high level of wildfire specific training, with all members receiving Wildfire Structure Protection Program training, which includes wildfire specific courses S-100, ICS-100, and S-185. In addition, ten members are trained as engine bosses, one officer qualified as a structure defence task force leader, and three members with wildfire structure protection 115 certificates. This training is supplemented by hands on wildfire experience, as many members have been deployed to large wildfire incidents through the provincial interagency agreement.

DHVFD is well provisioned for a small municipal fire department, with three fire halls and eight fire suppression vehicles. This includes three type 1 engines, two type 1 tenders, one type 6 engine, as well as two support trucks. One tender have been frequently deployed to large wildfires in BC, and the type 6 engine has also been deployed, both through the provincial interagency agreement. However, DHVFD lacks comprehensive structure protection equipment.

The BCWS Haig Fire Base is located just outside the District of Hope and within the WUI for the District. This fire base is central to BCWS wildfire response in the Fraser Fire Zone within the Coastal Fire Centre, and as such is the central operating base for several BCWS resources. This includes five initial attack crews, one unit crew, several wildfire officers, and a small warehouse of suppression equipment. This is augmented by a main warehouse in Chilliwack when additional supplies are required. The District of Hope is fortunate to have ample BCWS resources located nearby, however it should be noted that during particularly busy periods throughout the province, many of these crews may be redeployed out of the area, and unavailable for local wildfire suppression.

3.4.4 Community Water Supply

Water supply is critical to the functioning of a community and also delivering water for suppression in the event of a wildfire. The District of Hope's public water network is a complex system, accessing drinking water through eleven wells, and stored in five reservoirs.[8] The drinking water supply area is divided into four zones, each with varying capacities and pressures. Drinking water quality is very high, and no water treatment plant is required.

Most of the District of Hope is well serviced by fire hydrants, however the water delivery capabilities of each zone vary. The 87 Zone has restricted fire flows throughout the system. The 138 Zone/753 System has restricted flows in high elevation zones on Thacker Mountain Road. The East Kawkawa Zone lacks hydrants sufficient for fire suppression. The Silver Creek zone has limited ability to supply water to hydrants throughout the zone. The more rural areas of the District lack connectivity with the Hope water supply network and hydrants, relying on private wells. Numerous areas require water shuttling by water tenders for fire suppression. Overall, water supply and pressure for fire suppression in the event of a wildfire is expected to be low and limited throughout the District.

Photo 5. Hydrants in the Kawkawa Zone may not provide sufficient water supply for fire suppression.

[8] District of Hope. *District of Hope Water Master Plan.* True Engineering and Land Surveying. District of Hope, 2019.

3.4.5 Electrical Infrastructure and Supply

Electricity is critical to the functioning of communities, particularly during an emergency response. Electricity is provided in Hope by BC Hydro by a network of a above ground transmission lines, and a primarily above ground distribution line. Most lines are supported by wooden power poles. The transmission lines follow Highway 1 and Highway 7A from west to east across the study area, with another line connecting them north to south through downtown Hope and across the Fraser River. Backup generators are in place at some critical infrastructure to ensure response is not impacted by these shutdowns, however some critical infrastructure does lack back up power.

Power lines pose both an ignition concern, through vegetation falling onto power lines and igniting wildfires, as well as a safety concern for first responders. Wildfires near electrical lines must be deenergized by BC Hydro prior to any wildfire response. No wildfire can be safely actioned near a powerline until the lines have been deenergized, and that has been confirmed by BC Hydro staff. Large wildfires often require shutdowns of entire networks, which can complicate emergency response when support facilities lack backup power.

BC Hydro has a comprehensive vegetation management program to reduce the likelihood of trees falling on powerlines. Crews regularly assess right of ways, identify trees that may require proactive removal, and coordinates removal of these trees. BC Hydro also dedicates staff in the event of a wildfire for strategically de-energizing lines to ensure first responder staff safety.

Photo 6. BC Hydro substation on 7th Ave.

3.4.6 Cultural Values

The nexus of the Coquihalla and Fraser Rivers has been an important First Nations site for thousands of years, with a long history of habitation and use. The Chawathil First Nation, the Union Bar First Nation, and the Yale First Nation, were consulted throughout the development of this CWRP, due to their historic use of this area. Cultural values, such as archaeological sites, can be impacted by wildfire risk mitigation activities, and further consultation is required prior to any active land management activities that have the potential to impact these sites.

The BC Archaeological Branch maintains a spatial database of archaeological and heritage sites that may be protected under BC's *Heritage Conservation Act*.[9] This database is intended to facilitate high level planning, and is not intended to replace local First Nations consultation regarding these sites, which may include internal archeological databases, or requirements for detailed site level archaeological assessments. This data was reviewed as part of the CWRP development process, and 151 protected sites were identified. This indicates that archaeological sites and artefacts are widespread, emphasizing the need for rigorous consultation prior to any site level land management.

3.4.7 Environmental Values

The AOI/WUI is home to unique ecosystems and valuable habitat for a multitude of fish and wildlife. Several species and ecosystems at risk exist within the area. Species and ecosystems at risk are legally protected under a multitude of federal and provincial acts including the federal *Species at Risk Act*[10], *Fisheries Act*[11] and *Migratory Birds Convention Act*[12] , as well as the provincial *Wildlife Act*[13] and *Forest and Range and Practices Act*[14] .

The AOI/WUI for this CWRP includes several Wildlife Habitat Areas (WHAs) and Old Growth Management Areas (OGMAs). These are areas with various protections and activity restrictions as per government legislation, which is supplemented through Orders (as detailed in Table 3 of section 2). The Two WHAs that overlap with the WUI are for Spotted Owl protection, and harvesting is not permitting within this area. There are 27 OGMAs that overlap with the WUI, where forest operations are limited. Forest operations to reduce wildfire risk are possible within OGMAs and WHAs, but must ensure they are compliant with the guidelines of the relevant Orders.

[9] *Heritage Conservation Act*, *Revised Statutes of BC* 1996, c 187. https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96187_01
[10] *Species at Risk Act, Statutes of Canada* 2002, c. 29. https://laws.justice.gc.ca/eng/acts/s-15.3/
[11] *Fisheries Act*, *Revised Statutes of Canada* 1985, c F-14. https://laws-lois.justice.gc.ca/eng/acts/f-14/
[12] *Migratory Birds Convention Act, Statutes of Canada* 1994 c.22. https://laws.justice.gc.ca/eng/acts/M-7.01/
[13] *Wildlife Act, Statutes of British Columbia* 1996 c. 488. https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96488_01
[14] *Forest and Range Practices Act, Statutes of British Columbia* 2002 c. 69. https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/00_02069_01

There are several regional and provincial parks within the AOI/WUI. This includes Thacker Regional Park and Coquihalla Canyon Provincial Park. Any wildfire risk management activities within these areas must be planned in close collaboration with their land managers, the FVRD and BC Parks respectively. Wildfire risk management activities must be consistent with the overall planning objectives for these parks.

The Conservation Data Centre (CDC) is a provincial dataset with information related to plants, animals, and ecosystems at risk. Species are rated as being Red, Blue or Yellow Listed based on their conservation status rank, to help set conservation priorities. Of highest conservation concern are the Red-Listed species which are species or ecosystem that are at risk of being lost (extirpated, endangered or threatened). Blue-Listed and Yellow-Listed are species or ecosystems of special concern. Within the AOI, there are several animals and one ecosystem at risk, detailed in Table 6.

When conducting future site-level vegetation management activities and operational treatment plans, it is vital to follow best management practices for these at-risk species and their habitats. Prior to implementing any wildfire risk reduction activities within these areas, consulting with a Registered Professional Biologist or other qualified professionals may be necessary to evaluate potential impacts and guide effective treatment strategies.

Table 6. Provincial publicly available occurrences of species and ecosystems at risk identified and recorded within the Hope wildland urban interface.

Common Name	Scientific Name	Category	BC List Rank
Euphyes vestris	Dun Skipper	Invertebrate Animal	Blue
Aplodontia rufa	Mountain Beaver	Vertebrate Animal	Yellow
Potamogeton strictifolius	Stiff-leaved Pondweed	Vascular Plant	Blue
Tsuga heterophylla - Pseudotsuga menziesii / Rhytidiadelphus triquetrus Dry Submaritime 1	Western Hemlock - Douglas-fir / Electrified Cat's-tail Moss Dry Submaritime 1	Ecological Community	Blue
Acipenser transmontanus pop. 4	White Sturgeon (Lower Fraser River Population)	Vertebrate Animal	Red
Allogona townsendiana	Oregon Forestsnail	Invertebrate Animal	Red
Callophrys johnsoni	Johnson's Hairstreak	Invertebrate Animal	Red
Sorex trowbridgii	Trowbridge's Shrew	Vertebrate Animal	Blue
Corynorhinus townsendii	Townsend's Big-eared Bat	Vertebrate Animal	Blue
Brotherella roellii	Roell's Brotherella	Nonvascular Plant	Red

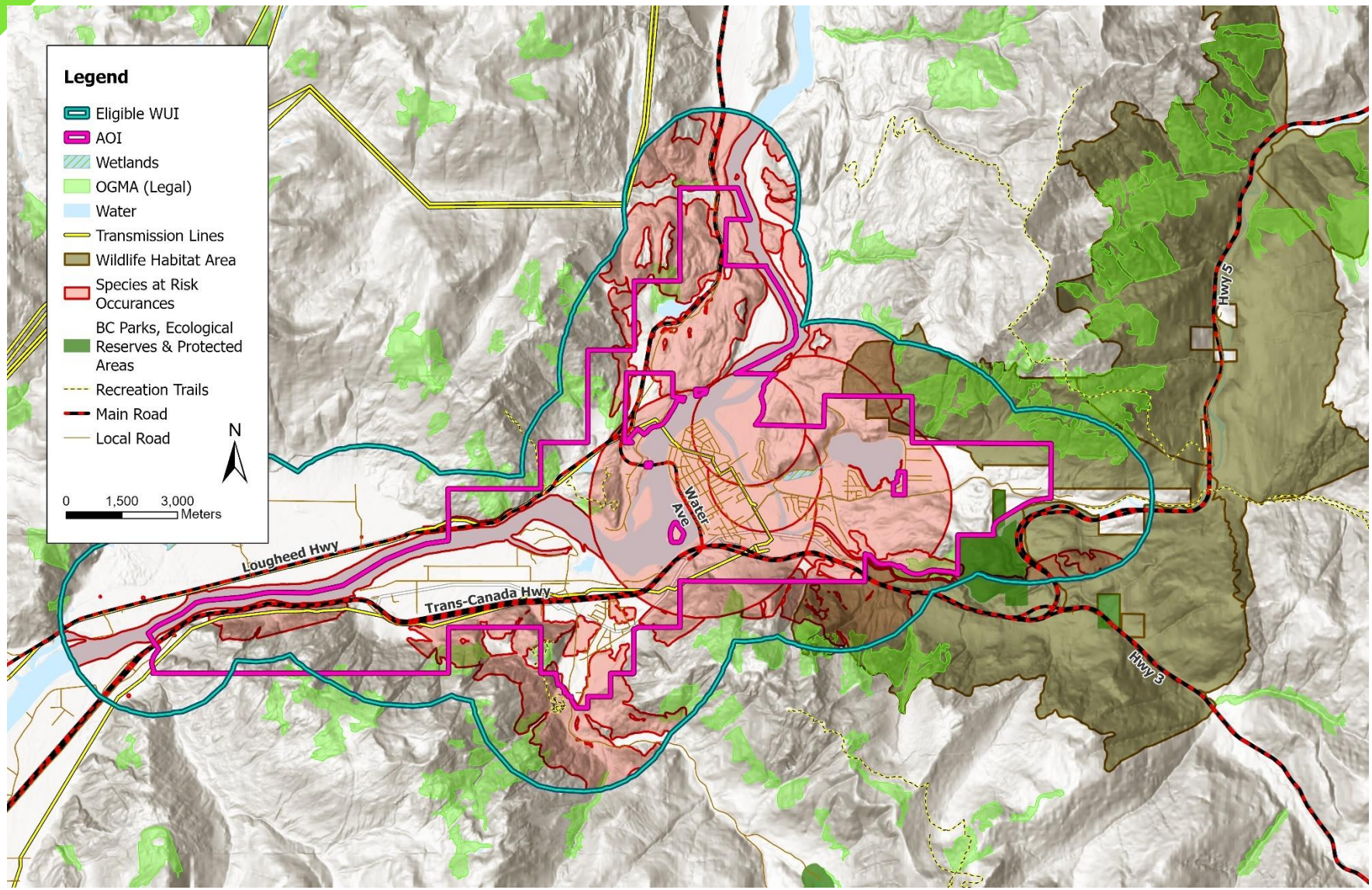

Figure 3. Environmental values within the AOI and WUI.

3.4.8 Hazardous Materials

The Trans Mountain pipeline runs from Calgary, Alberta, to Burnaby, BC, and bisects the WUI for the District of Hope. This pipeline was in the progress of being expanded during the writing of this CWRP, with heavy construction throughout the pipeline right of way in the WUI. While the pipeline itself is buried, there are several aboveground facilities found throughout, including one large facility within the District of Hope. This facility contains large quantities of highly flammable hydrocarbons and other potentially hazardous materials. Wildfire threatening this facility will have potentially severe consequences.

Photo 7. Oil and gas facility within the AOI.

The District of Hope operates a transfer station for disposing of waste. This facility stores abundant flammable materials and hazardous materials. Wildfire response at this facility will be complex and hazardous to first responders.

4 Wildfire Risk Assessment

A wildfire risk assessment provides a decision support tool for determining the most appropriate wildfire risk reduction activities and opportunities to increase community resiliency. The wildfire risk profile of each community is different, and capturing this wildfire risk accurately is critical to ensuring mitigation actions reflect that wildfire risk profile.

In the context of a Community Wildfire Resiliency Plan (CWRP), ***wildfire risk*** has a specific definition, and is different from the similar term ***wildfire threat***. Wildfire threat is ability of a wildfire to ignite, spread, and consume organic material (trees, shrubs, and other organic materials) in the forest. Wildfire threat describes the potential wildfire behaviour, or wildfire environment, in an area (see Figure 4). The major components used to define wildfire threat are fuel, weather, and topography, also known as the wildfire environment. Wildfire threat is simply put, the probability of a vegetated area to support severe wildfire.

Figure 4. The wildfire behaviour triangle.

Wildfire risk combines wildfire threat with the potential consequences it will have on human life and communities; wildfire risk is the likelihood of severe wildfire having impacts on values. Therefore, to understand wildfire risk, we must first understand wildfire threat, and the wildfire environment that drives it. Section 4.1 of this CWRP describes all the factors that drive wildfire threat, and Section 4.2 describes the overall wildfire threat assessment for the WUI.

Wildfire danger, or hazard, is an additional technical term which describes the potential for severe wildfire at a moment in time, usually summarized daily during wildfire season. Wildfire danger is useful for estimating the daily likelihood of wildfire ignition and spread, which can in turn be used to guide wildfire preparedness and operational planning. Wildfire danger is highly variable, and thus less useful for long term planning. For a complete discussion of wildfire danger, see 4.1.8.

4.1 Wildfire Environment

The three main components that drive wildfire threat are topography, vegetation (potential fuel for wildfire), and weather. Together these impacts interact to influence the potential wildfire behaviour (wildfire threat) in a vegetated area.

4.1.1 Topography

Topography is a landscape component that can influence fire behaviour, particularly slope, slope position, and aspect. Slope position and aspect can affect the temperature, solar intensity, fuel moisture, and relative humidity as a consequence of varying degrees of solar radiation. Slope affects local wind patterns, with steeper slopes facilitating greater up-slope wind speeds during the day, and fuels upslope being closer to flames during a fire. Warmer aspects ie. south facing in Canada, and steeper slopes increase the rate of spread of a fire. Fire that spreads faster is more difficult to control, making potential values situated on upper slopes more vulnerable. Topography also plays a large role in weather, particularly in the District of Hope AOI, where topographic features can increase wind speed or alter wind direction. This is particularly concerning during outflow conditions, where warm, dry air is funnelled from BC's interior through valleys to the coastal regions. These conditions are called "outflow", and are associated with the highest wildfire danger periods throughout the coast.

The District of Hope AOI is located at the head of the Fraser Valley, and has a highly varied terrain. Most of the community is located on the flat portions of the Valley surrounding the Coquihalla and Fraser Rivers. However, beyond these flat valley bottom areas, the slopes of the surrounding valley peaks rise very steeply up to heights of over 1500m. These slopes will significantly impact wildfire behaviour. This was demonstrated in the Flood Falls Trail wildfire of 2022, where wildfire spread rapidly up the steep slopes surrounding the Silver Creek area. However, since most values are located below these steep slopes, the slopes do not directly increase the risk of values within the study area. But rather, the slopes increase the probability of a valley bottom wildfire increasing in size and intensity very quickly, and subsequently spreading east or west into the community.

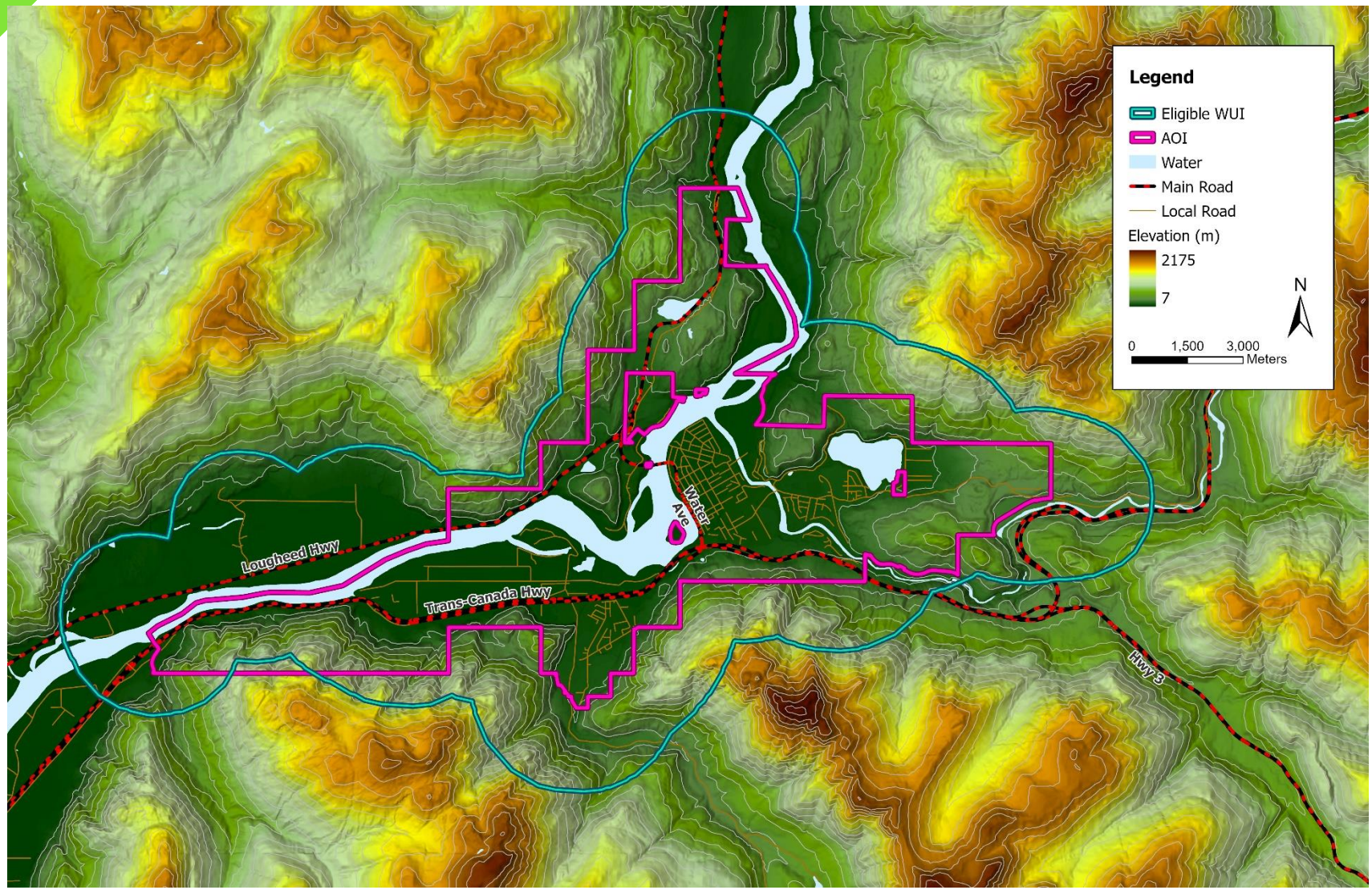

Figure 5. Map of topography in the AOI.

4.1.2 Vegetation (Fuels)

Vegetation is the fuel that sustains wildfire, and is therefore referred to as fuels. Fuels refers to the loading, size and shape, arrangement (horizontal and vertical), compactness, chemical properties, and moisture content within organic materials. In a forest environment, the focus is primarily on woody fuels.

4.1.3 Biogeoclimatic Ecosystem Classification (BEC) Zones

Understanding the ecosystems of an area provides insight on the fuel conditions in the area, as well as the historical wildfire regime. The vegetation (fuels) within any given area of British Columbia can be summarized using the provincial Biogeoclimatic Ecosystem Classification (BEC) system.[15] The BEC system in BC describes and categorizes ecological zones by vegetation, soils, and climate. Regional subzones are derived from relative precipitation and temperature. Subzones may be further divided into variants based upon climatic variation and the resulting changes in the vegetative communities. By understanding the vegetative communities of an area, we can better predict the natural disturbance regime of those ecosystems, including the historical wildfire intensity and severity. regime.

The District of Hope AOI and WUI are in the Coastal Western Hemlock (CWH) BEC zone. There are two subzones present: the CWH Southern Dry Sub Maritime (CWHds1) and the CWH Southern Moist Sub Maritime (CWHms1) subzones.[16] The CWHds1 is a transitional zone between interior and coastal climates. Summers are warm and dry, while winters are cool and moist with moderate snowfall. This subzone dominates the lower elevation portions of the study area up to around 600m. Above 600m, the CWHms1 is the dominant subzone. The overall climate is similar, however snowfall is much more common in this elevation. Summer moisture deficits are common in both BEC subzones, which have led to a history of infrequent stand replacing wildfires (see Wildfire History below).

[15] See: https://www.for.gov.bc.ca/hre/becweb/system/how/index.html#basic_concepts
[16] R.N. Green and K. Klinka. 1994. *A Field Guide to Forest Site Identification and Interpretation for the Vancouver Forest Region.* BC Ministry of Forests. https://www.for.gov.bc.ca/hfd/pubs/docs/Lmh/Lmh28.pdf

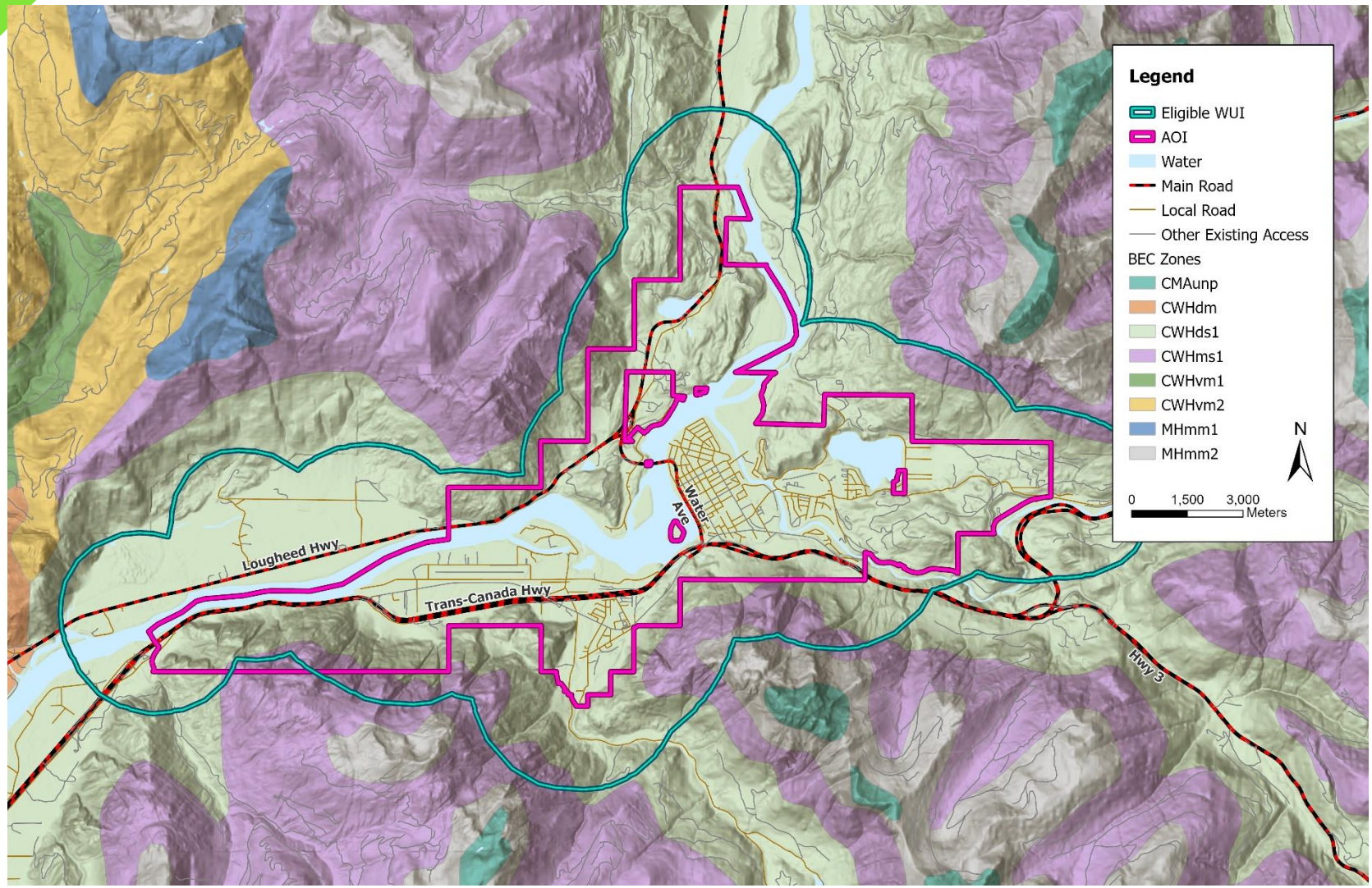

Figure 6. Map of BEC zones in and around the AOI.

4.1.4 Fuel Types

The Canadian Forest Fire Behaviour Prediction (FBP) System outlines five major fuel groups and sixteen fuel types modeled based on characteristic fire behaviour within common boreal vegetation under defined weather conditions[17]. In general, fuel types are defined in the FBP System by overall vegetation structure, dominant overstory species, and understory, ladder fuel, and forest floor characteristics. Fuel typing is used to aggregate forests into similar categories to estimate potential wildfire behaviour.

Fuel typing is a subjective process, as many of the vegetation communities of BC are not suitably represented by the boreal forest-based FBP fuel types. Therefore, the most appropriate fuel types were assigned based on best-available scientific research and information, professional experience, and practical knowledge. In BC, there are accepted fuel types used to align forests with the best representative FBP fuel type. [18]

Fuel types are a key driver of wildfire threat, and accurately capturing fuel type is crucial to ensuring the projected wildfire threat is accurate. Therefore, determining fuel types is a critical component of this CWRP. This process involves reviewing the latest BCWS fuel types map, a map driven by remote sensing with minimal ground truthing. Inaccuracies are very common. During the CWRP, these inaccuracies are identified by completing site visits throughout the community, corrected as necessary using study plots, and a new and accurate fuel type map is created for use in identifying local wildfire threat (see 4.2 Wildfire Threat).

C-5 is the most common fuel type within the WUI for the District of Hope. This is a typical coniferous coastal fuel, comprised of Douglas-fir, western Hemlock, and western redcedar. These forests have high crown fuel continuity, but are characterized by large gaps between the surface fuels and the aerial crowns. This means that extreme wildfire behaviour in the form of crown fire is unlikely under most conditions, including high wildfire danger days. However, when winds are elevated, or steep slopes are present, and during elevated wildfire danger, extreme wildfire behaviour is possible. Given the large accumulations of crown fuel, crown fires in this fuel type are extremely vigorous with rapid spread rates, and are very challenging to manage. This is concerning in the area surrounding Hope, where C-5 fuel types are present on extremely steep slopes. Table 7 provides a summary of fuel types within the AOI and their characteristics, and Figure 7Figure 7 provides a map of fuel types.

[17] Natural Resources Canada. Canadian Wildland Fire Information System: Canadian Forest Fire Danger Rating System (CFFDRS). https://cwfis.cfs.nrcan.gc.ca/background/summary/fdr
[18] Perrakis, D. and G. Eade. 2015. *British Columbia Wildfire Fuel Typing and Fuel Type Layer Description 2018 Version.* BC Wildfire Service, Ministry of Forests, Lands, and Natural Resource Operations. *https://cfs.nrcan.gc.ca/publications?id=39432*

Table 7. Fuel types within the WUI of the District of Hope AOI.

Fuel Type	Area (ha and % of total	FBP/ CFDDRS Description	AOI Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type- Crown Fire/ Spotting Potential
C-3	33 (0%)	Mature jack or lodgepole pine	Young, denser coastal conifers with elevated vertical and horizontal continuity	Surface and crown fire, high fire intensity and rate of spread	High
C-5	3379 (34%)	Red and white pine	Lower density conifers with large gap between crowns and surface fuels	Surface fire with intermittent crowning, moderate fire intensity and rate of spread	Moderate
D-1/2	3158 (32%)	Aspen (leafless and green)	Deciduous stand, primarily alder, cottonwood, and maple	Surface fire, low to moderate rate of spread and fire intensity	Low
M-1/2 (11%)	1847 (19%)	Boreal mixedwood (leafless and green)	Mixed stand of conifers and deciduous species, often patchy	Surface fire spread, torching of individual trees and intermittent crowning	Moderate
S-3	24 (0%)	Coastal Slash	Cedar-Hemlock-Douglas-Fir Slash	Surface fire with high intensity	High
Non-fuel	572 (6%)	-	Little to no flammable vegetation, paved surfaces, recent burns, gravel pits	Minimal potential for fire.	None
Water	938 (9%)	-	Water	None	None

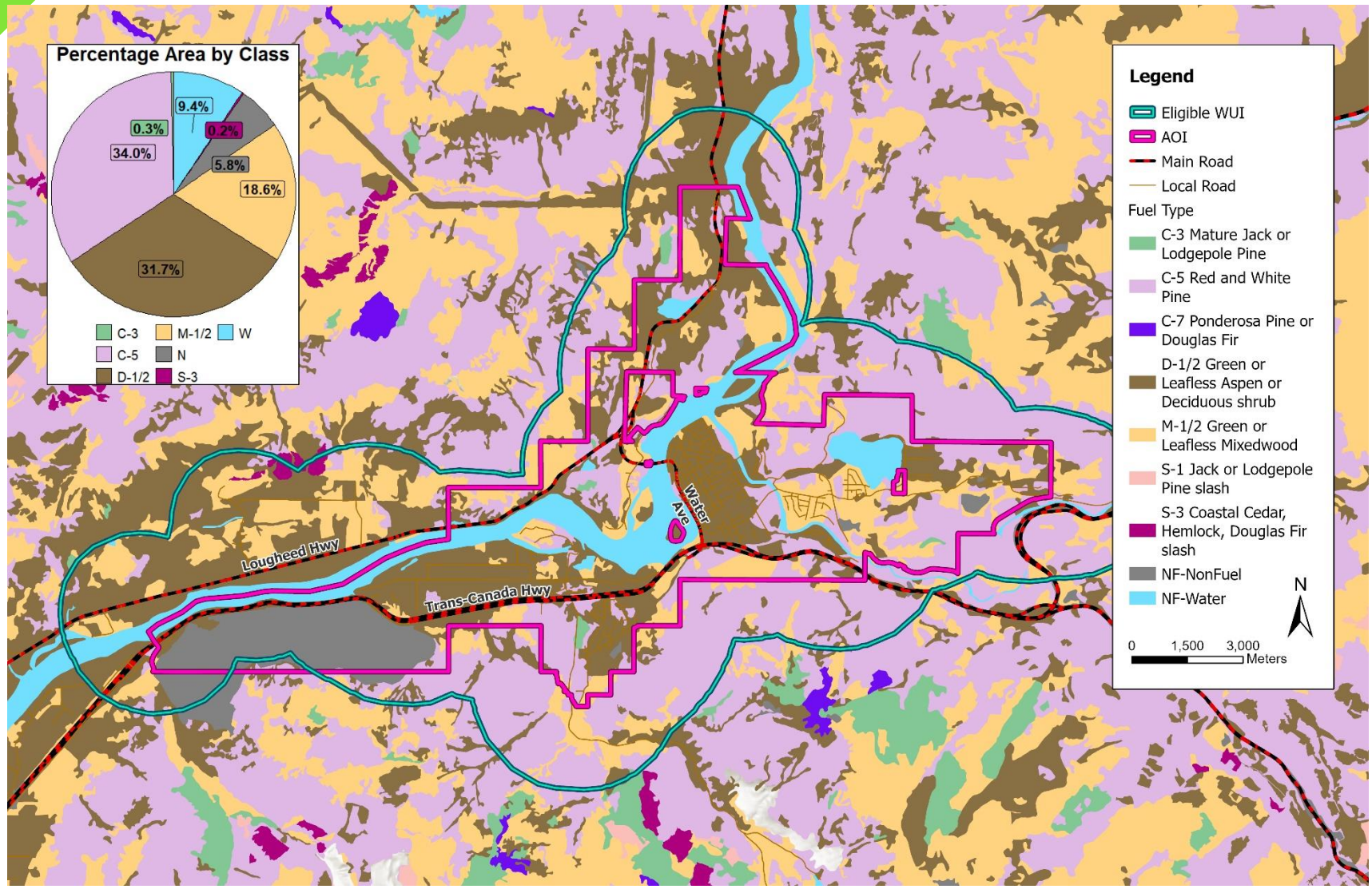

Figure 7. Fuel type map of the AOI, WUI, and surrounding area.

4.1.5 Forest Health Issues

Forest health issues can contribute to fuel loading by causing or increasing tree mortality, which in turn leads to dead fuel throughout the forest. Dead fuels, particularly when elevated, are drier than live fuels and burn more readily. Stressed vegetation is more susceptible to pest impacts, further increasing mortality and fuel loading.

There are a number of forest pests and diseases present in the forest that are found in the study area for this CWRP.[19] Primary concerns are forests pests that affect Douglas-fir, western hemlock, and western redcedar, the most common tree species found in the study area. However, there have been few notable outbreaks within the study area in the past decade.

Drought is the primary forest health issue in the forests in and around the District of Hope. Since 2001, there have been frequent summers with prolonged periods of minimal to no precipitation. Drought stress can result in tree decline or death, leading to an accumulation of dead material elevating wildfire threat. Trees, particularly those on steeper slopes or in coarse textured soils, are more susceptible to drought stress due to the lower moisture retention associated with these growing sites. Western redcedar is the species in the study are most susceptible to drought stress, and declining cedars were noted during field assessments for this CWRP.

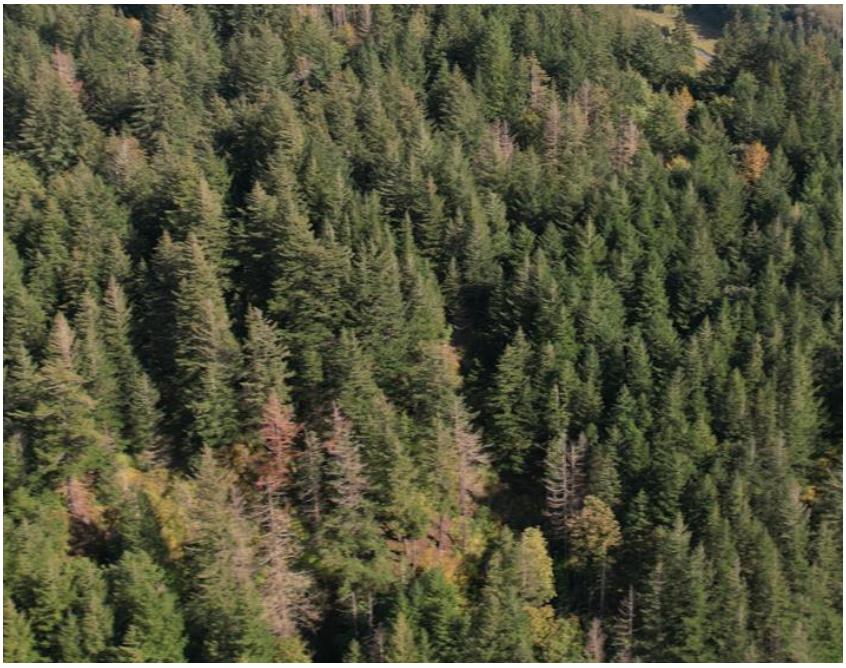

Photo 8, Stressed trees and mortality were common throughout the WUI.

[19] David Rusch. *Forest Health Strategy 2024-27 Coast Area.* 2024. BC Ministry of Forests. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/forest-health/fh-strategies/ca_fhoverview_2024-27.pdf

Windthrow is also a health issue in the forests in and around the District of Hope. Severe winter storms can produce very strong westerly coastal wind. These winds can funnel through the Fraser Valley and increase their speed when they reach Hope. This can lead to widespread windthrow, where trees are uprooted or broken and fail. These dead trees can contribute fuel loading and increase wildfire threat.

4.1.6 Wildfire History

Natural Disturbance Type

Ecosystems in BC are classified into five natural disturbance types based on the frequency and severity of disturbances, such as wildfires, windstorms, landscapes, and insects.[20] Wildfires are a primary agent of disturbance in most ecosystems in BC. Both the CWDds1 and CWHms1 are classified as *Natural Disturbance Type 2 – Ecosystems with infrequent stand-initiating events*. Historically, wildfires occurred with relatively low frequency, occurring an average of once every two hundred years. These fires were moderate sized, between 20 to 1,000 hectares, and often patchy with large unburnt areas found throughout. As a result, post-wildfire forests were of a patchy composition, with a wide variety of ages, sizes, densities, and species.

The current forest composition throughout the Fraser Valley has been impacted by human activity, including tree harvesting, fire suppression, and silviculture. Wildfire was largely eliminated from these forests, both through a prohibition on the Indigenous use of wildfire as a tool, and through aggressive wildfire suppression strategies. This, combined with forest resource extraction, has led to a forested landscape dominated by 2nd growth forests. These forests are much more homogenous than the natural forests that preceded them, leading to much more continuous forests throughout the landscape. As such, the Natural Disturbance Regime has likely also been altered, and wildfires that we can expect may behave much differently than historic wildfires. Future wildfires may spread much more quickly and display higher wildfire behaviour due to the increased fuel continuity and density on the landscape.

[20] BC Ministry of Forests. *Forest Practices Code Biodiversity Handbook.* 1995. King's Printer for British Columbia. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/frep/frep-docs/biodiversityguidebook.pdf

Observed Wildfire History

The BCWS maintains a database of all wildfires that have occurred and required a BCWS response in the province since 1920. This includes point data for where a wildfire ignited and its ignition cause, as well as polygon data for fires that exceed 2 hectares.

The recorded wildfire history in and around the AOI reflects the Natural Disturbance Type of the ecosystems present. Wildfires greater than 2 hectares are infrequent, but can occur, most notably the Flood Falls Trail wildfire in 2022. However, despite numerous wildfire point ignitions, a majority of these ignitions have been quickly suppressed and managed by fire suppression agencies.

Photo 9. The aftermath of the Flood Falls Trail Fire.

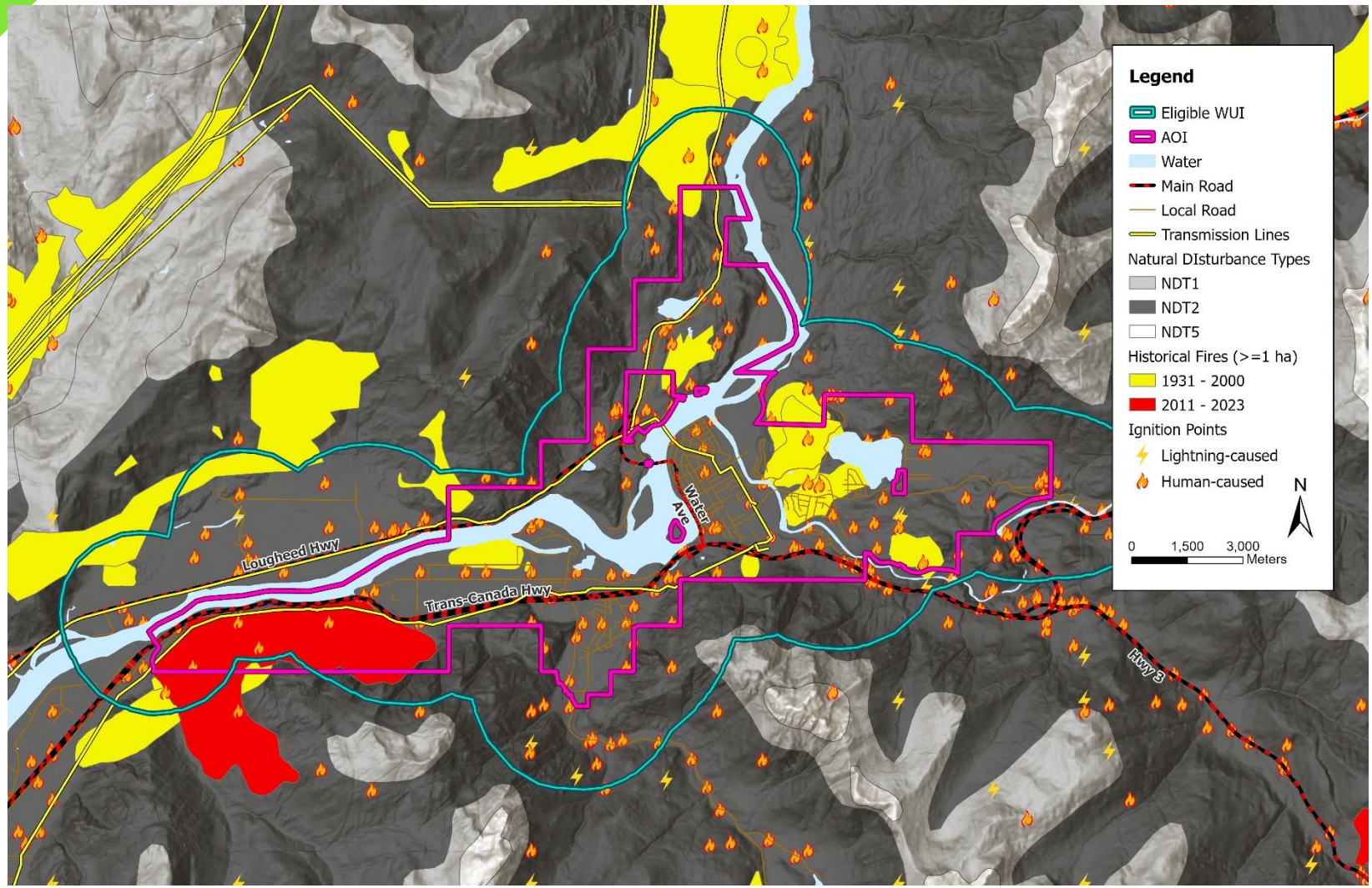

Figure 8. Wildfire history within the AOI.

4.1.7 Weather

Weather refers to changes in our atmosphere that take place over short periods of time, such as days, weeks, or months. Attributes including temperature, relative humidity, precipitation, wind speed, and wind direction play a critical role in the ignition, spread, and duration of wildfires. These factors, combined with the broader climate conditions, also shape the development of forest ecosystems and the accumulation of vegetative fuel, creating conditions conducive to potential wildfire behavior.

In contrast, climate describes the typical prevailing weather of an area over an extended period of time, typically decades to centuries. Climate is important for predicting typical weather patterns during fire season months.

The District of Hope is in a region characterized by an oceanic climate, but is located right on the transition zone from oceanic climate to the continental climate of the interior. Winters are moderately cold and moist, with snowfalls frequent. Winter temperatures are usually at or slightly above 0°C, with the occasional colder snap bringing temperatures down to -10 °C. Most of the precipitation occurs between October and February, mostly as rain, but snow is common. In contrast, summers are exceptionally dry, with an average precipitation less than half of the other months average precipitation. Since 2000, summer droughts have been frequent, with prolonged periods of minimal to no precipitation in July and August.

Westerly winds are by far the most common wind direction during fire season in the study area for this CWRP. This is largely due to coastal winds, predominantly westerlies, funneling through the Fraser Valley west of the District of Hope. However, this Valley makes sharp curve north of Hope, and a similar wind funneling affect can bring winds from the interior south to the AOI. This occurs during “outflow” conditions, where warm air masses in the central interior force warm, dry air out to the coast. This phenomenon, though infrequent, can dramatically increase the wildfire danger by producing atypically warm, dry, and windy conditions. Outflow conditions are one of the few weather patterns that produces “cross-over”, where the relative humidity as a percent is less than the temperature in Celsius. Cross-over is associated with increased wildfire behaviour and intensity. Topography plays a major role in wind direction and speeds at a local scale, causing funneling and swirling winds that may be stronger, or vary in direction, from the macro scale wind patterns.

The climate in the District of Hope AOI is conducive to severe wildfire conditions during the driest and warmest periods of the fire season in July and August. These conditions generally peak in late July and early August, the driest period of the year. While these conditions typically do not persist for long, during the most dangerous days of outflow winds, the wildfire behaviour potential can be extreme.

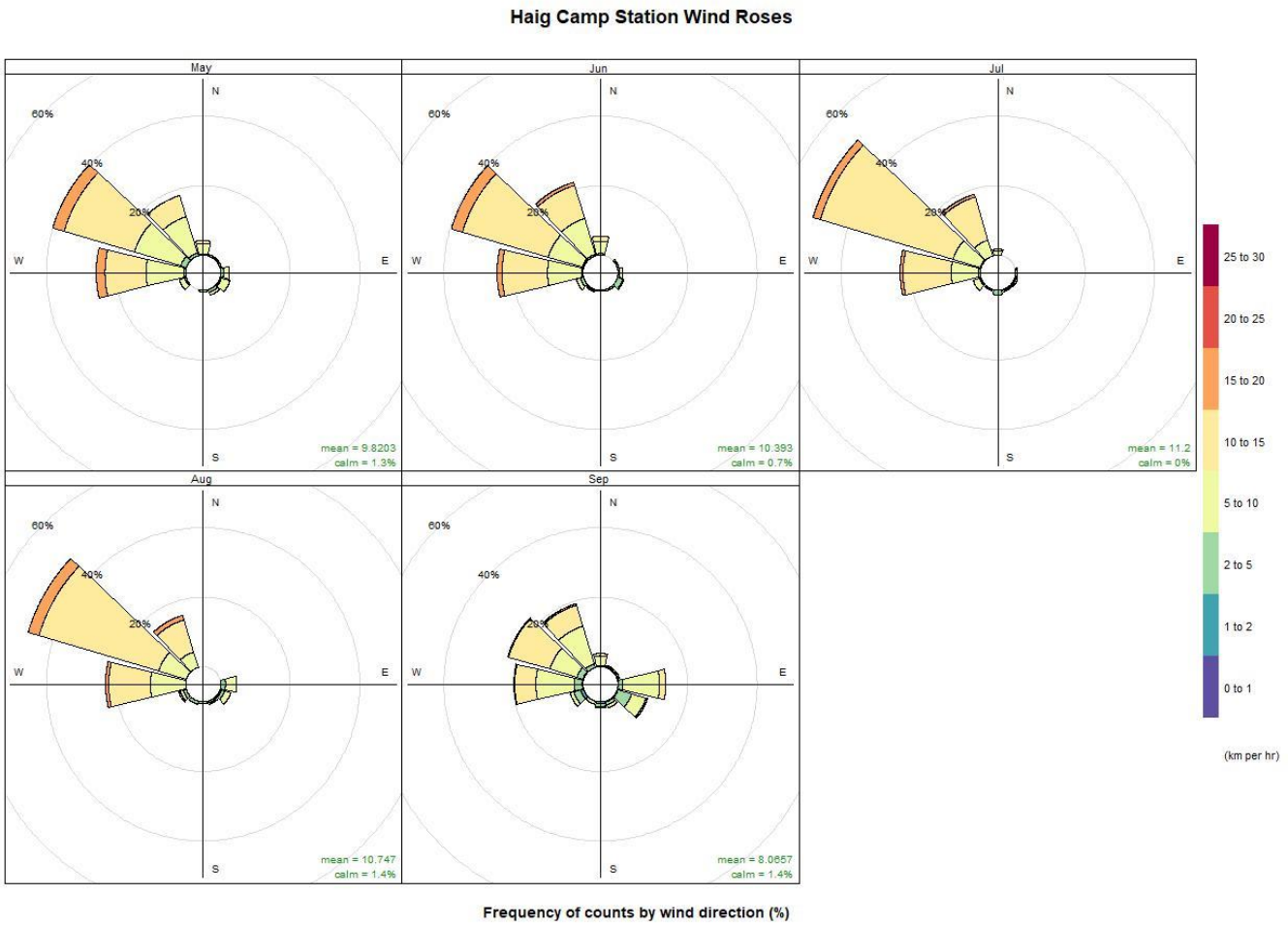

Figure 9. Windrose diagram for nearest BCWS station.

4.1.8 Canadian Forest Fire Danger Rating System

The National Canadian Forestry Service developed the Canadian Forest Fire Danger Rating System (CFFDRS)[21] to assess wildfire danger and potential wildfire behaviour. Fire Danger Classes provide a relative index of how easy it is to ignite a wildfire and how difficult control is likely to be. A network of fire weather stations is maintained throughout the province during the fire season by the MFLNRORD, and the recorded data are used to determine fire danger represented by Fire Danger Classes on forest lands within/around a community. The fire danger information can be obtained from the BCWS and is most commonly to monitor fire weather, restrict high risk activities when appropriate, and to determine hazard ratings associated with bans and closures. This data is updated daily to provide a daily estimate of the wildfire danger.

The BC *Wildfire Act*[22] and *Wildfire Regulation*[23] specify responsibilities and obligations with respect to fire use, prevention, control, and rehabilitation, and restrict high risk activities based on Fire Danger Classes. The five Fire Danger Classes are defined as follows:

- **Class 1 (Very Low)**: Fires are likely to be self-extinguishing and new ignitions are unlikely. Any existing fires are limited to smoldering in deep, drier layers.
- **Class 2 (Low)**: Creeping or gentle surface fires. Ground crews easily contain fires with pumps and hand tools.
- **Class 3 (Moderate)**: Moderate to vigorous surface fires with intermittent crown involvement. They are challenging for ground crews to handle; heavy equipment (bulldozers, tanker trucks, and aircraft) are often required to contain these fires.
- **Class 4 (High)**: High-intensity fires with partial to full crown involvement. Head fire conditions are beyond the ability of ground crews; air attack with retardant is required to effectively attack the fire's head.
- **Class 5 (Extreme)**: Fires with fast spreading, high-intensity crown fire. These fires are very difficult to control. Suppression actions are limited to flanks, with only indirect actions possible against the fire's head.

[21] Natural Resources Canada. Canadian Wildland Fire Information System: Canadian Forest Fire Danger Rating System (CFFDRS). https://cwfis.cfs.nrcan.gc.ca/background/summary/fdr
[22] Wildfire Act, S.B.C. Chapter 31 2004. https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/04031_01
[23] See: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/11_38_2005

Analysing the average wildfire danger classes during fire season summarizing how frequently an area experiences conditions where wildfire can ignite, spread rapidly, and pose suppression challenges. Figure 10 summarizes the average number of extreme and high wildfire danger days during fire season months. Most days in wildfire season have a low or moderate wildfire danger, but high wildfire danger days are typical, particularly in peak wildfire season in July. This indicates that during peak wildfire season suppression may be challenging, and require significant resources. Extreme conditions, where fire suppression success is unlikely, occur infrequently.

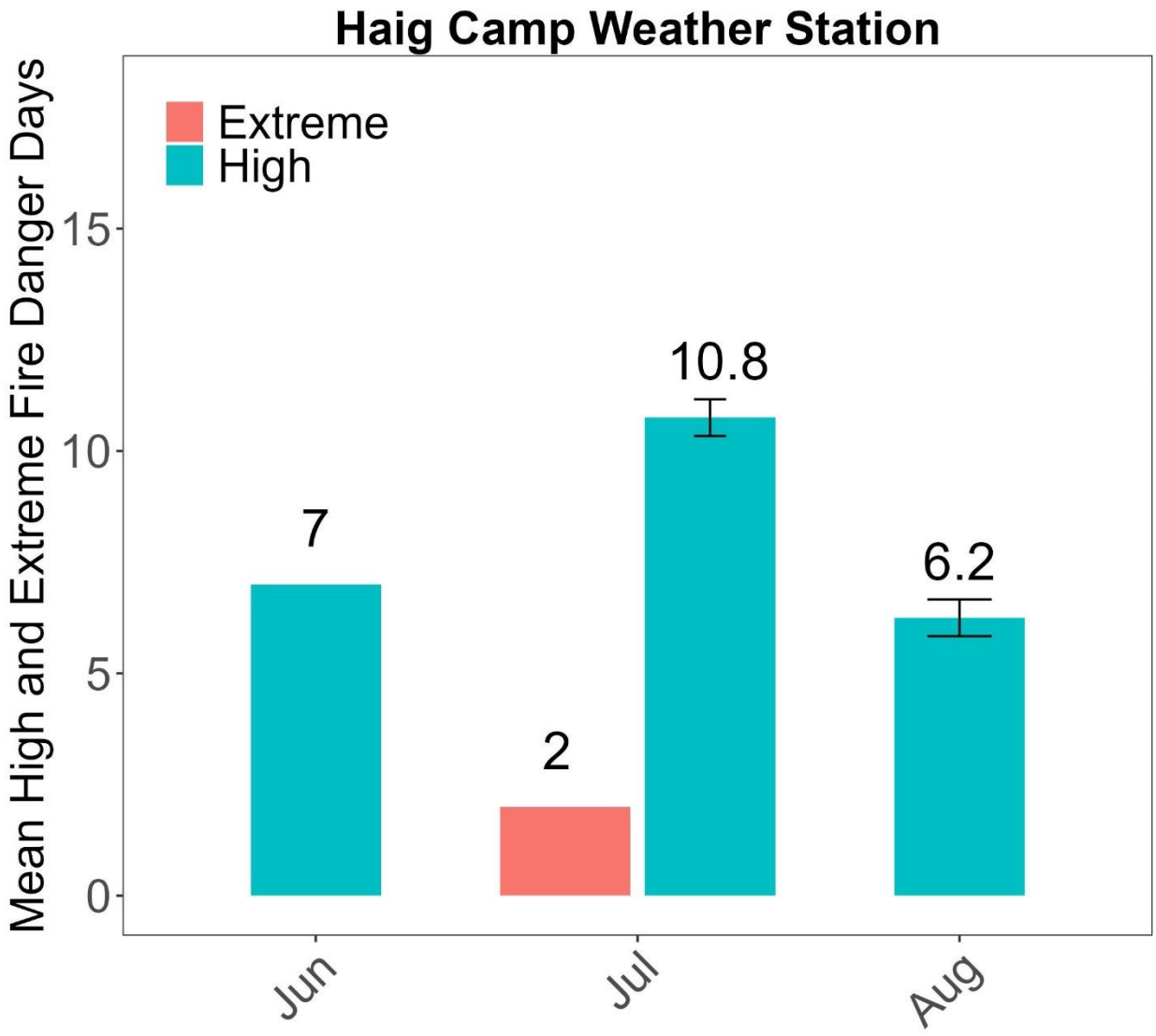

Figure 10. Average fire season danger days at the nearest BCWS station to the AOI.

4.2 Wildfire Threat

Establishing wildfire threat for an area involves synthesizing the previously discussed factors of wildfire behaviour to predict potential wildfire threat. This process starts with the Provincial Strategic Threat Analysis (PSTA), which is then refined and ground truthed at the community scale to accurately determine the Local Wildfire Threat. Refining the PSTA requires synthesizing updated local fuel types, weather for the community, and local topography. All CWRP's follow a local wildfire threat assessment process outlined by the BC Wildfire Service, using the Wildfire Threat Assessment Guide[24] and supplemental guidance.[25]

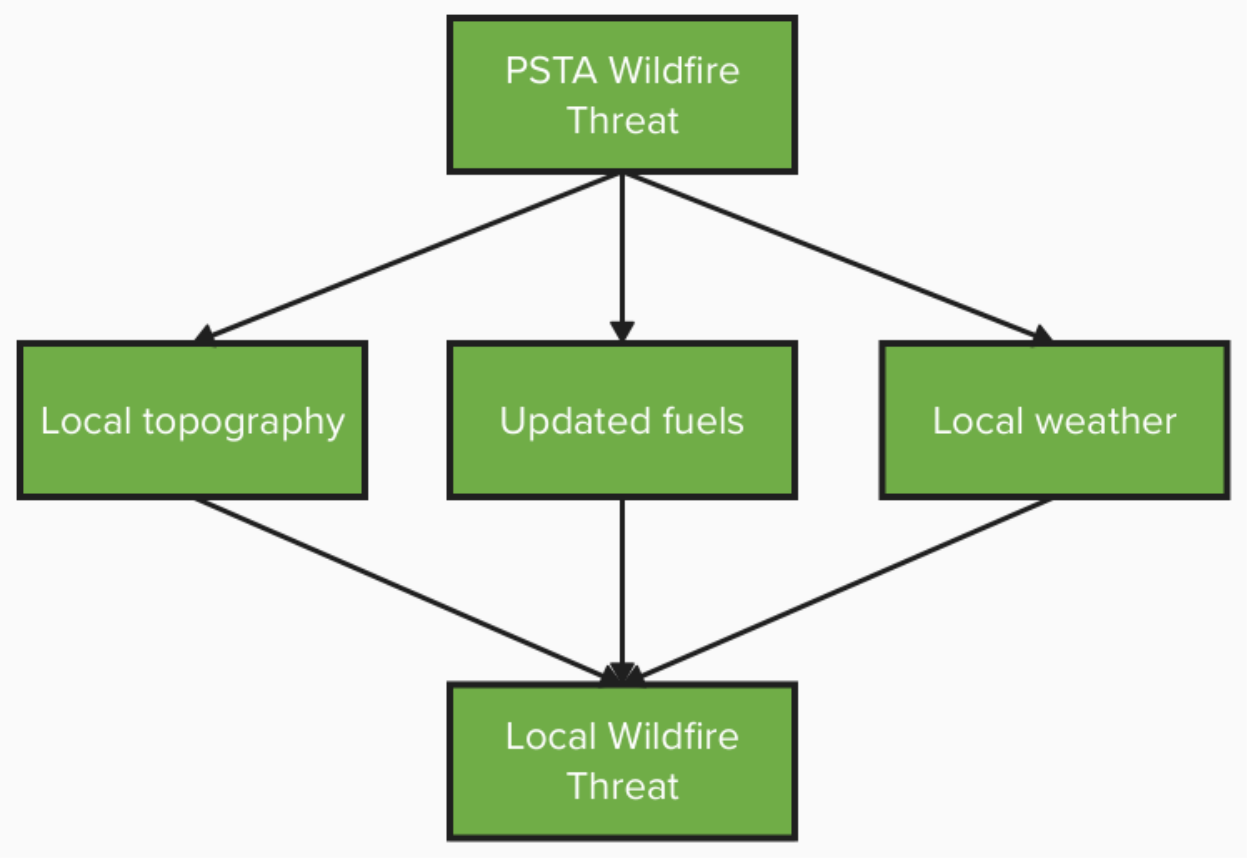

Figure 11. Local wildfire threat process summary.

[24] See: https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/prevention/fire-fuel-management/fuels-management/2020-wildfire-threat-assesment-guide-final.pdf
[25] See: https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/prevention/fire-fuel-management/fuels-management/2020_determining_wildfire_threat_and_risk_at_a_local_level.pdf

4.2.1 Provincial Strategic Threat Analysis

The Provincial Strategic Threat Analysis (PSTA) is a spatial dataset developed by the BC Wildfire Service to assess and predict potential wildfire threat and risk to values, utilizing three inputs including forest fuel types, spotting potential, and fire occurrence density. The PSTA is generated at a provincial scale, and is a static model of wildfire threat that is updated annually. The PSTA uses remotely derived inputs, with no ground truthing. Similarly, the PSTA does not include local weather conditions for identifying wildfire threat for a specific community. The PSTA is useful as an initial starting point for wildfire threat assessment at a community scale, but requires refinement for a specific community through the CWRP process to accurately guide wildfire risk mitigation actions. Often the PSTA is out of date, or relies on out of data, and often does not reflect current conditions within and around a community.

The PSTA stratifies vegetated areas into wildfire threat classes of extreme, high, moderate, or low. Private land is not evaluated in the PSTA. Non-fuel areas such as alpine tundra or water are considered no threat due to the lack of vegetation. Table 8 summarized the PSTA wildfire threat for the WUI, and Figure 12 shows where those areas are located within the WUI.

The PSTA wildfire threat for the District of Hope and surrounding WUI is generally high. This indicates that during typical peak wildfire weather conditions, wildfires are probably to have high intensities and be challenging to manage. The areas of highest wildfire threat are outside Hope, but within the WUI, and are found on steep terrain with coniferous forests. This is supported by the observed wildfire history, where the 2022 Flood Falls Trail wildfire displayed extreme fire behaviour, and took several days before BCWS and local fire department staff were able to control.

Table 8. PSTA Wildfire Threat within the WUI of the District of Hope AOI.

PSTA Threat Class	Area in WUI (hectares)	% of total area in WUI	Associated fire behaviour
Extreme	467.7	5%	Rapidly spreading, high intensity wildfire. Wildfire suppression success unlikely.
High	3831.5	39%	Rapidly spreading, high intensity wildfire, wildfire suppression effectiveness limited.
Moderate	2229.2	22%	Moderate intensity wildfire with lower spread rates, high likelihood of wildfire suppression success.
Low	99.5	1%	Low intensity wildfire with very low spread, very high likelihood of wildfire suppression success.
Non-fuel (water)	975.3	10%	n/a
No data (private land)	2358.6	24%	Wildfire behaviour for private land is not included in the PSTA.

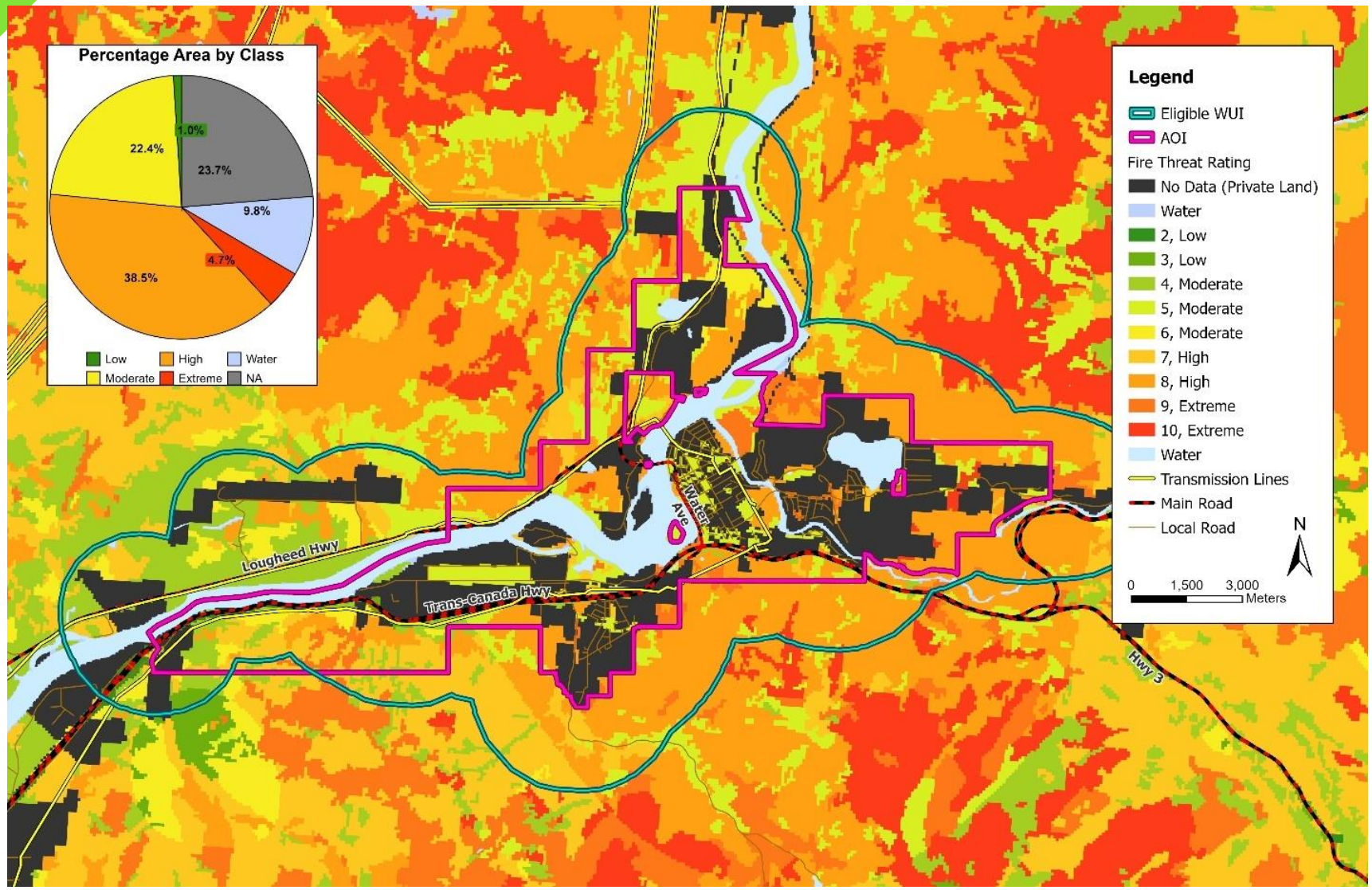

Figure 12. The PSTA wildfire threat for the District of Hope and Surrounding WUI.

4.2.2 Local Wildfire Threat Assessment

The PSTA data above has been refined through a technical process incorporating higher resolution data of topography, accurate and verified fuel types, and local weather conditions. The PSTA has failed to account for the effects of the 2022 Falls Lake Trail wildfire, which removed much of the fuel within its perimeter and is thus a much lower wildfire threat then depicted in the PSTA. The details of this technical process are described in Appendix C: Local Wildfire Risk Assessment, and the results are summarized below and in Figure 13. Note that under the terms of CRI grant funding, private land is not included in this assessment.

The local wildfire threat assessment identifies most of the forested areas in and around Hope as having a moderate or high wildfire threat. Wildfire threat is generally higher on steeper slopes, particularly south facing slopes. Given that fuel typing is relatively homogenous throughout the WUI, steep slopes are the main factor influencing wildfire threat. The findings of the local wildfire threat assessment are largely consistent with the PSTA wildfire threat assessment.

A moderate wildfire threat indicates that during the hottest and driest weather conditions of fire season, vigorous surface fire is likely, but crown fire is unlikely. Wildfires will spread, and can grow to a moderate size, but suppression success is likely. However, it is important to note that a wildfire considered small may still be several hectares, or tens of hectares, before being contained by fire suppression agencies. These fires can cause significant local impacts despite their small size and reduced intensity.

In the areas of high wildfire threat, crown fire is possible, and suppression will be challenging. These fires may grow to a large size, and display high wildfire intensities and fire behaviour. These wildfires will cause large ember showers, and if these spread into the community, structures will be at risk of involvement.

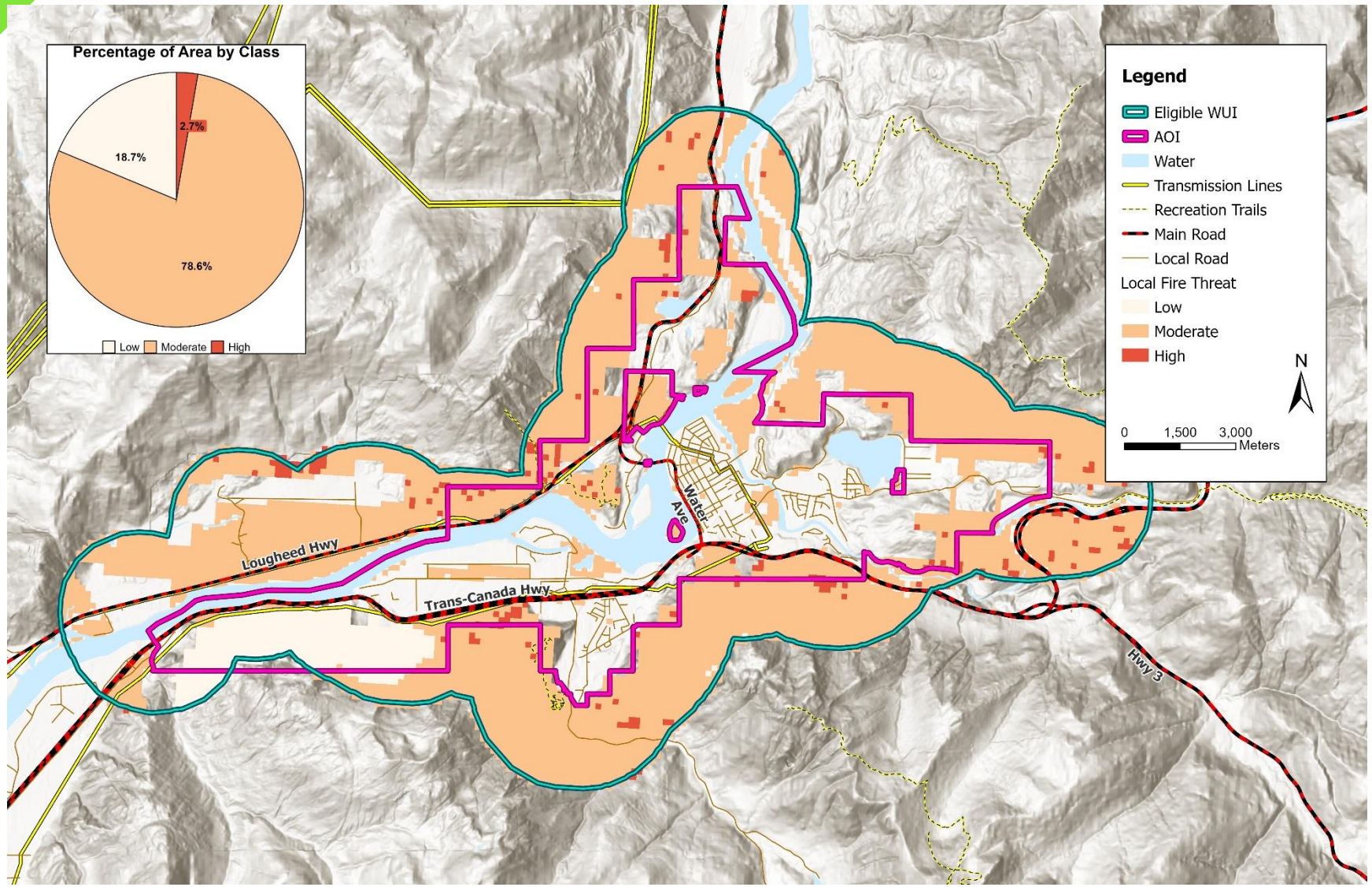

Figure 13. Local wildfire threat for Hope and surrounding WUI.

4.3 Wildfire Risk

Wildfire risk consists of the probability of severe wildfire, combined with the potential consequences of that wildfire. The local wildfire threat assessment detailed above identifies the probability of severe wildfire. Consequence of wildfire is established by identifying where community values are located, and creating distance buffers around values to determine locations where wildfire could have the highest impact. Wildfire risk combines wildfire threat with proximity to structures to identify the areas of highest concern within a community. The technical process for determining wildfire risk is described in Appendix C: Local Wildfire Risk Assessment. Note that under the terms of CRI grant funding, private land is not included in this assessment.

Wildfire threat and consequence in the context of wildfire risk can have a complex, and at times, unintuitive relationship. For example, a structure very near fuels of moderate wildfire threat may have a very high wildfire risk. In contrast, an area with extreme wildfire threat, but several kms away from any structure, will have minimal wildfire risk. Wildfire risk therefore allows us to focus wildfire risk mitigation activities on the areas of highest wildfire risk within a community to prioritize mitigation activities.

The wildfire risk within the AOI and WUI for the District of Hope is primarily moderate, with some areas of high wildfire risk. The wildfire risk is fairly homogenous, and drops off in the periphery of the WUI where forests are separated from the nearest values. Although these areas may be high wildfire threat, they are separated from the nearest community values. Further, the threat on these areas is largely slope driven, and wildfires will move upslope and away from the community.

The moderate wildfire risk indicates that large, landscape wildfires are unlikely to occur within the community. Hope has numerous fuel breaks in and around the WUI, including the Fraser and Coquihalla Rivers, several highway ROWs, the Trans Mountain ROW, and the CN and CP ROWs. These fuel breaks disrupt fuel continuity, and will limit landscape wildfire spread into the community. The primary concern within Hope is large wildfires, particularly on steep slopes on the periphery and outside of the WUI, generating large embers that may spot into the community. Embers may land in the community, starting small wildfires on or near values. Although the BCWS and DHVFD will be able to quickly action any spot fires, if these are widespread, suppression resources will be strained. FireSmart principles are extremely effective at limiting the impacts of embers on vegetation and structures within the AOI and WUI.

The best wildfire risk mitigation for the wildfire risk profile in Hope is promoting and ensuring FireSmart principles are integrated and widespread in the community. FireSmart structures are much more resilient to ember showers, and suppression success is much higher when there is widespread FireSmart compliance within a community.

4.4 Hazard, Risk, and Vulnerability Assessment

A Hazard, Risk, and Vulnerability Analysis (HRVA) is an assessment undertaken by local governments in British Columbia as part of their efforts to develop an Emergency Management Plan. This process results in a report which rates different kinds of disasters and emergencies by their likelihood and consequence, and deals with similar concepts to wildfire threat (the potential for a disaster to occur) and wildfire risk (the consequences of that potential disaster). At the time of producing this CWRP, the District of Hope was in the process of updating their Emergency Plan, which will include an updated HRVA.

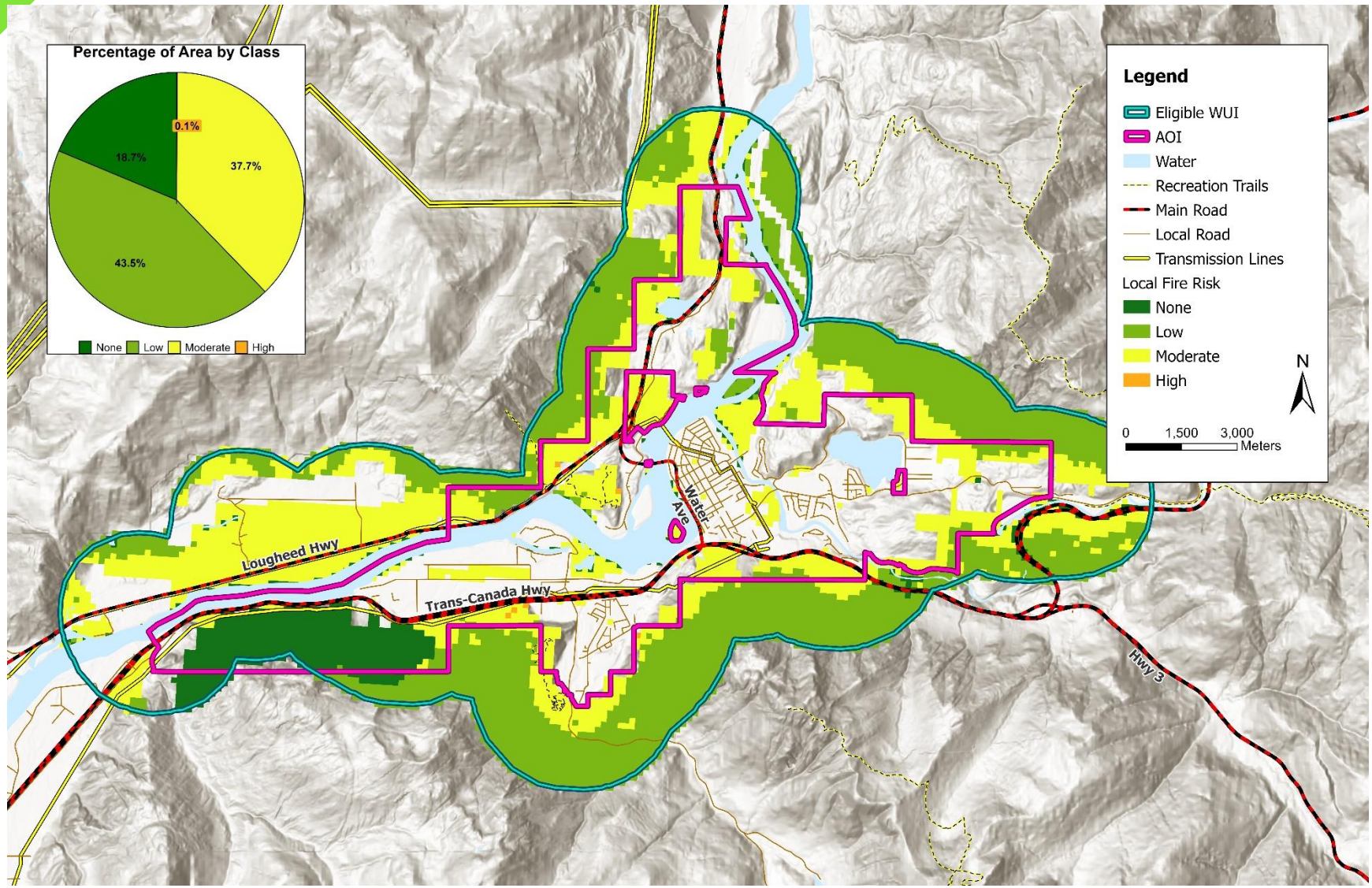

Figure 14. Local wildfire risk for Hope and surrounding WUI.

5 Disciplines of FireSmart

The following sections of this Community Wildfire Resiliency Plan (CWRP) provide a series of actions recommended to reduce wildfire risk to the District of Hope. These recommended actions are provided and contextualized through the lens of FireSmart. FireSmart is the national program for building resilience to wildfire in interface communities. Each province has a committee, all of which are coordinated though the Federal FireSmart Canada program. FireSmart is designed for a wide array of audiences, from first responders to community members. The actions recommended in this CWRP are categorized into the seven disciplines of FireSmart:

1. Education
2. Vegetation Management
3. Legislation and Planning
4. Development Considerations
5. Interagency Cooperation
6. Cross-training
7. Emergency Planning

Each discipline is addressed individually in this CWRP as an independent section. Each section begins with an overview of the discipline and relevant information, such as current and planned work. Pertinent recommended actions are discussed in each section, and summarized at the end of each section. The Action Plan section combines all these recommendations, with added detail on timelines, leader(s), metrics for success, and any other relevant notes.

There are also three key components of FireSmart programming in BC that overarch all the FireSmart disciplines: CWRPs, Community FireSmart and Resiliency Committees (CFRCs), and FireSmart Coordinators. These key components of FireSmart are crucial to action implementation and FireSmart programming delivery, and thus overarch all seven of the FireSmart disciplines. These components are discussed in this section below. This section also introduces the key concepts of FireSmart programming, all of which are discussed throughout the seven disciplines sections.

5.1 Concepts of FireSmart

The goal of FireSmart is to create communities that are resilient to wildfire. This does not mean eliminating wildfire, but rather limiting the impacts wildfire has on an area. The primary focus in FireSmart is protecting critical values in a community, such as home and critical infrastructure. FireSmart therefore takes a values outward approach to limit wildfire impacts.

During an interface wildfire, structures can be involved through several ignition pathways. The first is direct flame, when wildfire in vegetation is directly in contact with the structure. The second is through convective heat, when a wildfire is near, usually within 10m, and the heat is sufficient to cause autoignition. The third pathway is through ember ingress, where embers travel through the air from the main body of a wildfire and involve a structure. These embers, which can travel several kilometers, can accumulate on combustible services or enter through structure openings, and cause the ignition of the structure. Building structures that are resilient to wildfire requires proactively mitigating these three pathways to ignition.

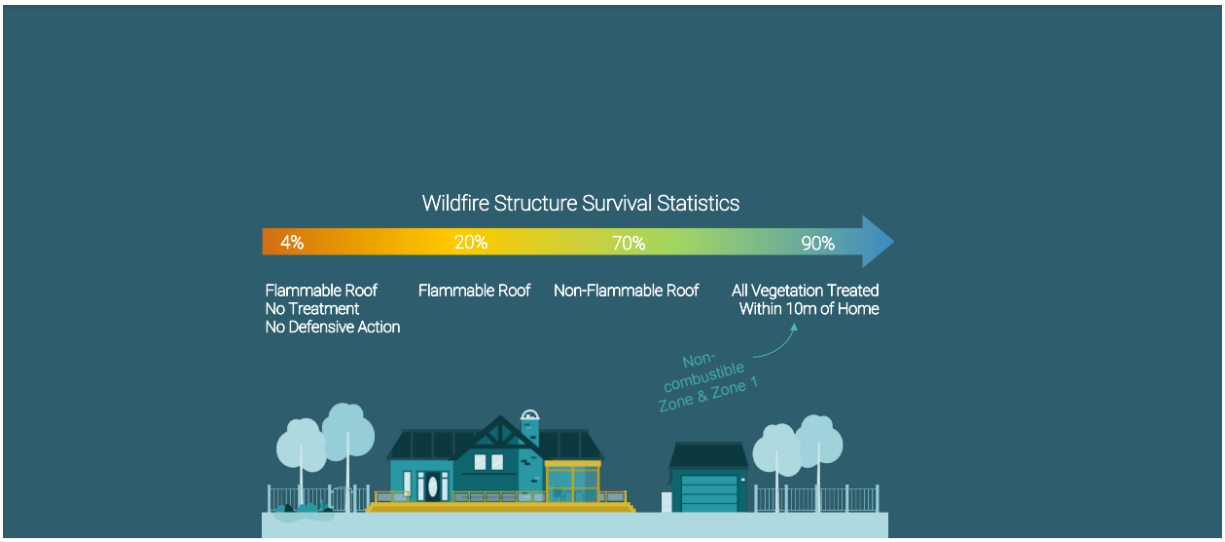

Figure 15. Benefits of FireSmart within 10 meters of structures. FireSmart compliance within 10 meters of structures can significantly increase the likelihood of home survival in the event of a wildfire. Graphic from FireSmart Canada (www.firesmartcanada.ca).

Ember spotting is the primary method by which wildfires involve structures. Thousands of embers can accumulate on a single structure, and cause combustion when they are penetrating a structure, or causing ignition on combustible materials used in construction of that structure.

FireSmart divides the structure and surrounding area into three separate zones. Risk mitigation activities in each of these zones are designed to prevent the pathways to ignition associated with these zones.

Figure 16. The Home Ignition Zone. Graphic from FireSmart Canada (www.firesmartcanada.ca)

The Immediate Zone includes the structure and the area within 0-1.5m surrounding the structure. The primary goal of mitigation in this zone is to prevent ember caused ignition for the structure, and to prevent wildfire from spreading to directly adjacent the structure. FireSmart principles should be integrated into the construction of the structure, to ensure it is as resistant to ignition as possible. No combustible materials, such as wooden fences or planter beds, vegetation, or bark mulch, should be present within 1.5m of the building exterior. A 15cm inflammable ground to siding clearance should be established. Complying with FireSmart guidelines will limit the structures exposure to ember, radiant, and convective pathways to ignition.

The Intermediate Zone refers to the area within 1.5 and 10m from the structure. The primary goal of this area is to limit wildfire from establishing in combustible materials or vegetation near the home, and expose the structure to radiant or convective ignition. This area is primarily focused on ensuring the landscaping in this zone is suitable, and includes both vegetation and hardscape materials. Only fire-resistant vegetation should be present in this zone, with no conifers or coniferous vegetation. No combustible materials such as firewood piles, combustible detached structures, combustible fences, or combustible decorative features should be present in this zone.

The Extended Zone refers to the area within 10 and 30m from the structure. The primary goal of this area is to reduce the intensity of a wildfire. Flammable vegetation should be limited in density and continuity. This can be done through selective tree removal, tree pruning, debris management, and surface vegetation clean up. Reducing wildfire intensity in this zone will limit the structure to exposure to radiant heat.

5.2 Foundations of FireSmart

The three foundational components of FireSmart that underpin the seven disciplines are the CWRP, the FireSmart Coordinator role, and the Community FireSmart and Resiliency Committee (CFRC). These key components should be present in any community aiming to build resilience to wildfire: A CWRP outlines a strategic vision to building wildfire resilience, while the FireSmart Coordinator and CFRC provide the support required to implementing that plan.

The Community Resiliency Investment (CRI) program, as of 2023, has created two streams for accessing funding for wildfire risk mitigation activities. The allocation-based stream of this program provides streamlined and rapid access to funding for communities that have the three foundational components of FireSmart in place. Communities without these three foundational FireSmart component can access funding through an alternative application-based funding stream, however this is more complex and less certain. CRI strongly encourages all communities to prioritize the CWRP, FireSmart Coordinator role, and the CFRC for building community resilience to wildfire.

5.2.1 Community Wildfire Resiliency Plans

CWRPs are the foundation to building wildfire resiliency in communities in BC. These plans use a FireSmart lens to produce a vision and roadmap for reducing the wildfire risk in a community. These plans provide recommended actions for building resiliency to wildfire, with important advice on implementation.

This CWRP is an important first step for building wildfire resiliency for the District of Hope. However, wildfire risk is not static, and neither are our communities. Similarly, wildfire risk mitigation activities will also impact wildfire risk and the vulnerabilities present in a community. Therefore, this CWRP must be maintained and periodically revised. This should consist of an annual review of the CWRP Action Plan, identified actions implemented, as well as lessons learned through that implementation process. There should also be a complete review and update of the CWRP every five years. This should consist of updated wildfire risk modelling based on new wildfire threat analysis, and incorporating any wildfire risk mitigations implemented.

5.2.2 FireSmart Coordinator

Building resiliency to wildfire in a community and navigating the various disciplines of FireSmart is a complex process, challenging for both community leaders and residents. While the community is intended to provide leadership and expertise in navigating FireSmart, local government leaders often lack the time and FireSmart knowledge required. The FireSmart Coordinator role is a role fulfilled by a dedicated staff member with both local knowledge of the community and knowledge of the FireSmart program. The FireSmart Coordinator provides local leadership on FireSmart initiatives, as well as a resource available to the community for assessments, plans, and mitigation works.

The District of Hope currently has a full-time FireSmart Coordinator embedded in the Fire Department. This position has been in place since early 2024, and has provided a robust suite of FireSmart services to the community, all of which are discussed within the relevant sections of this CWRP. The District of Hope FireSmart Coordinator's role is to identify and pursue funding for FireSmart activities, personally deliver FireSmart programming, and also support and collaborate on any wildfire resiliency projects in the region. This FireSmart Coordinator was instrumental in supporting the development of this CWRP, by obtaining the required grant funding, and supporting the development of the CWRP itself. It is critical that the District of Hope FireSmart Coordinator position is continually funded, staffed, and maintained, as this position is key to ensuring the actions embedded in this CWRP are implemented.

5.2.3 Community FireSmart and Resiliency Committee

A CFRC a regional body that brings together the various actors in FireSmart and wildfire resiliency in the local area. This can include representatives from neighbouring governments, fire departments, FLNRO, the BCWS, and other important groups. CFRC's are intended to be broad, high-level committees for coordinating planning and sharing knowledge across a region. The framework is designed to be as flexible as possible, to meet the community and regions needs and capacity.

The District of Hope is one actor that is part of a regional network of groups aiming to build wildfire resiliency. The FireSmart Coordinator is responsible for collaborating with regional actors such as the FVRD, local First Nations, local fire departments, and other important stakeholders. The District of Hope is one of the more active communities in the region, with an active FireSmart program and multiple initiatives in place. As such, Hope will likely need to take the lead for developing a regional CFRC that will include the multiple actors within the local region. Fortunately, the District FireSmart Coordinator already has strong existing relationships with the key important actors for building wildfire resilience. Formalizing these relationships into regularly scheduled meetings to discuss ongoing wildfire resiliency work, explore opportunities for collaboration, and sharing experiences will ensure long term success of regional wildfire resiliency activities. Key actors to include in the regional CFRC are:

- District of Hope Fire Smart Coordinator
- FVRD FireSmart/Emergency Coordinator
- Chawathil Nation representative
- Union Bar Nation representative
- Yale Nation representative
- BC Wildfire Service local representative

It is important to note that CFRCs may evolve and expand as wildfire resiliency programs evolve and expand. Future stakeholders may join the CFRC, or the region may broaden to include other actors. By building a flexible framework, schedule, and process for the CFRC, new actors and join and participate.

Table 9. FireSmart foundation action recommendations.

Recommended Action	Description
1	Read and understand the wildfires risk and the key factors that drive wildfire risk, as identified in this CWRP.
2	Review CWRP annually. Assess implementation status of the included recommended actions, and note any significant community or wildfire environment changes that may impact wildfire risk and risk mitigation activities.
3	Formally update CWRP five years from publication.
4	Maintain the FireSmart Coordinator role.
5	Establish a regional CFRC.

6 Education

The education FireSmart discipline focuses on communicating wildfire risk and wildfire resilience information to all the members of a community. Every member of a community, from residents to land managers and elected officials, has a shared responsibility for wildfire resilience. The responsibilities for wildfire risk mitigation vary, but an understanding of wildfire risk and resilience are of importance to all community members. The ultimate goal of the education FireSmart discipline is to create an understanding of wildfire risk, which can in turn empower residents to act within their capacity to build community resilience.

The recommended actions for FireSmart education are numerous and broad; community education is challenging, and requires multiple different avenues to reach community members. These actions are tailored to reflect the District of Hope context, and provide both passive and active opportunities for engagement.

Active education involves specific events, conversations, and presentations that meet residents and provide information and access to tool. Active education is most successful when leveraging pre-existing community gatherings to add on a FireSmart education component. For example, setting up a booth with FireSmart education materials and staff at a community gathering. Leveraging pre-existing events removes barriers by meeting people where they are already gathering, rather than asking them to make time for specific events. However, specific FireSmart events are also important as they provide a focussed venue for FireSmart education. This may include a community FireSmart meeting, presentation, or open house, where residents can access materials and ask questions of FireSmart experts.

Passive education involves providing access to FireSmart educational materials that resident can access on their own schedule. This may involve a specific webpage on the District of Hope website with FireSmart material, or providing brochures with FireSmart materials at regular community gathering places such as the Municipal office, community centres, or libraries. Passive materials should also aim to create opportunities for active engagement, such as advertising FireSmart events, or providing contact information for a FireSmart expert to provide additional information.

6.1 Current Status

The District of Hope's FireSmart program is a new initiative, having launched in early 2024. However, this program has quickly developed, with a primary focus on education. The Hope FireSmart program, led by the FireSmart Coordinator housed in the Hope Fire Department, leads a variety of initiatives in the community to promote FireSmart.

The Hope FireSmart Coordinator currently makes a specific effort to join popular community events, such as Hope Brigade Days. Joining these existing events provides an opportunity for Hope residents to interact with the FireSmart team and access FireSmart materials in an informal setting. These types of casual interactions are extremely productive, as they create space for educational conversations and make FireSmart materials more approachable. In support of this, the Hope FireSmart has a library of FireSmart promotional materials, including banners, posters, signs, and other educational materials. Hope also has access to an Ember mascot costume, which is extremely effective in creating engagement in children, creating further opportunities for the public to learn about FireSmart.

The development of this CWRP was accompanied by a public engagement session in late October 2024. This session was well attended by interested members of the public. Integrating educational opportunities with specific projects is extremely effective, as it ties FireSmart education into active wildfire resiliency projects in the region. By providing specific and targeting information, residents can learn how FireSmart efforts on their part can contribute to the overall resiliency of the community.

In addition to active engagement, the District of Hope provides opportunities for residents to access FireSmart information at their own leisure via a dedicated page[26] on their website. This allows residents to access FireSmart principles, with links to the FireSmart website, and also contact information for the FireSmart Coordinator. FireSmart services, such as home assessments and the FireSmart Rebate Program, can also be requested through this website. These services are discussed in more detail in Section 8.

[26] See: https://www.hope.ca/p/firesmart

6.2 Action Planning

The Education discipline of FireSmart is the most diverse, requiring multiple different initiatives, both active and passive, to reach community members. Successful education programming typically requires capacity, which is best developed through the FireSmart Coordinator position discussed in the previous section. The FireSmart Coordinator, or an equivalent staff member, will be responsible for developing and rolling out the education initiatives below.

FireSmart education should be conducted annually, planning out the various initiatives as part of campaign to build community awareness. Developing an annual strategic education plan ensures the events and initiatives are coordinated, taking advantage of seasonal trends and regular community gatherings. Once a plan is in place, it can be revisited each year, reducing repeated planning effort each year.

Active Education

The first step of Education is to ensure community leaders and members can access and understand this CWRP. The CWRP is a large and complex technical document, and is unlikely to be read in full by all members of the community. As such, a summary overview should be provided to community leaders and members. This should include the Executive Summary, the Action Plan, and the wildfire risk map within this CWRP.

The District of Hope should continue to create active opportunities for engagement within the community. This can consist of continued dedicated FireSmart events, or continuing to join other community gatherings. These events are often most effective when paired with other FireSmart initiatives. For example, fuel management can be accompanied by public education events that not only discuss the specific project, but how it ties in with broader wildfire resiliency initiatives in Hope. The information session that accompanied the development of this CWRP is an example of coordinating a specific resiliency project with the promotion of FireSmart.

Community clean-up days are events where the District of Hope can provide both support for FireSmart activities on community members property and debris disposal. This often involves renting a chipper and bin trucks for debris, and disposing free of charge for residents. Clean-up days can occur simultaneously with FireSmart events to provide educational opportunities while also reducing wildfire risk.

Passive Education

It is important to provide educational opportunities that community members can access on their own schedule. The District of Hope's existing FireSmart webpage provides an excellent community resource for passive FireSmart education. This webpage should be updated with information from this CWRP and a brief summary, or possible the CWRP in its entirety as a link. FireSmart education can also be posted or made available at other community gathering places, such as the Municipal Hall, the public library, or the recreation centre (in collaboration with the FVRD).

Wildfire hazard signs are effective at community the daily wildfire hazard throughout fire season. During periods of particularly high wildfire danger, this communicates the need for caution by the general public to prevent wildfire ignitions. These signs can be installed at high traffic areas, such as highway exits or intersections. These signs require updating whenever wildfire danger changes.

Specific wildfire resiliency initiatives in that occur in the community should integrate educational materials. For example, educational signage can be installed at future fuel management projects upon completion to explain the goals and strategies of the project. This can also be used at any District owned facilities that comply with FireSmart guidance, to identify the key components that of the structure that decrease vulnerability. Providing examples of fuel management or FireSmart construction provides real world examples for residents that can be integrated into their FireSmart journey.

Table 10. FireSmart Education action recommendations.

Recommended Action	Description
6	Provide summary of CWRP to community leaders and interested members.
7	Continue to join community events with FireSmart booths and resources.
8	Include FireSmart education events when planning large wildfire resiliency projects.
9	Plan community clean-up days to assist in landscaping and FireSmart maintenance for homes in the community.
10	Maintain FireSmart website on the District of Hope website. Regularly update this webpage.
11	Provide FireSmart resources at key community information points.
12	Install and maintain wildfire hazard sign at a highly visible community location.
13	Include educational signage with FireSmart or wildfire resiliency activities, such as fuel management areas or critical infrastructure that has been mitigated.

7 Legislation and Planning

Legislation and regulation are potential tools for reducing wildfire risk on public land. Provincial and Federal Acts and Regulations can provide means for local governments and First Nation governments to implement wildfire risk reduction. These are differentiated from development specific bylaws and regulations that may be present in a community, which are discussed in the following section on Development Considerations.

7.1 Current Status

7.1.1 Federal Acts and Regulations

Several key Federal Acts that may be relevant within the District of Hope are the *Fisheries Act*[27], the *Species at Risk Act*,[28] and the *Migratory Birds Convention Act.*[29]

The Federal *Fisheries Act* is in place to provide a framework for the management and control of fisheries in Canada, as well as conservation and protection of fish and fish habitat. Any wildfire prevention and mitigation treatments that could impact fish or fish habitat, including riparian areas will need to adhere to the legal requirements of this Act.

The *Species at Risk Act* is federal legislation designed to prevent species from extinction and/or extirpation in Canada and provide recovery strategies for extirpated, endangered, and threatened species, as well as prevent species of concern from becoming threatened or endangered. The CWRP treatments and recommendations will need to consider species at risk and follow the requirements and prohibitions set out in SARA. Any land management should consider the environmental values at risk section to identify any species at risk, and include measures for ensuring compliance with the *Species at Risk Act.*

The *Migratory Birds Convention Act* protects most species of birds in Canada. This law contains regulations to protect birds, their nests and eggs from disturbance. This includes direct disturbance through hunting, wood harvesting, and commercial use, as well as indirect disturbance that may impact bird activities. Any land management activity that has potential to disturb birds protected under this Act must include measures for compliance with the Act. This is particularly important during summer nesting season, when bird populations are highest throughout BC.

[27] *Fisheries Act*, *Revised Statutes of Canada* 1985, c F-14. https://laws-lois.justice.gc.ca/eng/acts/f-14/
[28] *Species at Risk Act, Statutes of Canada* 2002, c. 29. https://laws.justice.gc.ca/eng/acts/s-15.3/
[29] *Migratory Birds Convention Act, Statutes of Canada* 1994 c.22. https://laws.justice.gc.ca/eng/acts/M-7.01/

7.1.2 Provincial Acts and Regulations

Three provincial acts and regulations are particularly relevant for wildfire risk mitigation: the *BC Building Act and Regulation*[30], the *BC Open Burning and Smoke Control Regulation*[31], and the *BC Wildfire Act and Regulation.*[32] The *Forest and Range Practices Act* is also relevant for larger scale wildfire risk mitigation work, and its relevance is described in more detail in the Vegetation Management Section.

The *BC Building Act* creates a series of technical building requirements for buildings in BC. This also sets training and qualification requirements for building officials. Many of these requirements are designed to limit the spread of structure fire within a structure, however there are no provisions for limiting interface wildfire spreading to a structure.

BC Open Burning Smoke Control Regulation (OBSCR) covers open burning of wood debris (vegetative material) to manage smoke and fine particulate matter from contributing to poor air quality. OBSCR has requirements that pertain to burning for community wildfire risk reduction. The OBSCR requires anyone conducting an open burn for wildfire risk reduction to submit the plan to a director, to give notification to the community about the burn plan, that a ventilation forecast is "good" or "fair", and that the burn is completed within a day. The District of Hope has a specific bylaw in place regulating open burning in addition to OBSCR. This is discussed below.

BC *Wildfire Act* and *Wildfire Regulation* sets out legal responsibilities and obligations in BC that are enforceable during bans and restrictions. This Act and regulations could impact this CWRP recommendations and treatments when a provincial fire ban is in effect. *The Wildfire Act* also limits industrial activities during periods of elevated wildfire danger based on the risk of ignition of those activities. These acts and regulations can be superseded by a local bylaw or regulation. The District of Hope Fire Bylaw outlines some requirements for abatement of hazardous vegetation, discussed below.

[30] *Building Act, Statutes of British Columbia* 2015 c. 2.
https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/15002
[31] *BC Environmental Management Act: Open Burning Smoke Control Regulation BC Reg 152/2019, Statutes of British Columbia* 2003, BC Reg 152/2019.
https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/152_2019/
[32] *BC Wildfire Act*, Statues of British Columbia 2004 c. 31.
https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/04031_01

7.1.3 Municipal Bylaws

The District of Hope has numerous bylaws that apply within its jurisdictional boundaries. The two most pertinent to wildfire resiliency relate to open burning, outlined in the Fire Bylaw[33], and tree removal, outlined in the Tree Protection Bylaw[34].

The Fire Bylaw outlines requirements for burning that must be complied with on all properties within the District. The Fire Chief can prohibit all types of burning during periods of high wildfire hazard. Burning on commercial and industrial areas requires a permit, and burning must confirm to the provincial OBSCR. The Fire Chief can also identify areas of accumulated vegetation that may pose a hazard to the community, and require disposal of this debris to a level acceptable to the Fire Chief. Any vegetation management or FireSmart activities that produce vegetation debris should carefully consider the Hope Fire Bylaw if burning is considered as a method for debris disposal.

The District of Hope Tree Protection Bylaw outlines measures for the protection and preservations of trees, and outlines requirements for tree cutting permits. Tree removal for the purposes of FireSmart or vegetation management may require a tree cutting permit in certain cases, issued by the Municipal Engineer. This bylaw is complex, with several exemptions; FireSmart vegetation management on residential lots may only require a bylaw in specific situations, such as when trees planned for removal are on steep slopes, or near ravines and watercourses. Larger scale vegetation management for wildfire risk reduction may also require a permit.

[33] District of Hope, Bylaw No. 1006, 1998. *Fire Bylaw 1998.*
[34] District of Hope, Bylaw No. 20, 1995. *Tree Protection Bylaw 1995.*

7.2 Action Planning

The District of Hope's Fire Bylaw provides provisions for requiring removal of hazardous vegetation material when it constitutes a hazard to the community. This is typically an issue during land clearing for development, which result in significant accumulations of hazardous material. Land developers should be made aware of these requirements prior to development occurring.

The District's tree management bylaw does not include any specific provisions for tree removal for wildfire risk reduction. This may result in confusion and added complexity when property owners wish to implement FireSmart vegetation management principles on their property. Similarly, no provisions in this tree management bylaw are made for larger scale vegetation management for wildfire risk reduction on private land. This District should explore including specific guidelines in a future update for the tree management bylaw, or develop internal guidance for the issuing of permits in these situations. The overall aim should be clarifying this bylaw as it relates to tree removal for the purposes of building community resiliency to wildfire.

Table 11. FireSmart Legislation and Planning action recommendations.

Recommended Action	Description
14	Inform developers of potential fire hazards and requirements of the Fire Bylaw when land clearing is required for development.
15	Update tree management bylaw with guidelines for removing vegetation to reduce wildfire risk.

8 Development Considerations

Development decisions, such as land use types, structure density, road patterns, and other considerations, shape the built and natural environments. These decisions can bring lasting impacts to the WUI and wildfire risk by affecting public and first responder safety and survivability of homes, critical infrastructure, and other community features. Considering these factors early in the development process can reduce wildfire risk to life safety and property.

8.1 Current Status

The District of Hope manages the use of land within Hope's jurisdictional boundaries through the Zoning Bylaw and the Official Community Plan (OCP). These community planning tools shape and influence the way the community develops, and can integrate principles of FireSmart to build overall wildfire resiliency in Hope.

The Hope zoning bylaw[35] contains detailed provisions for land use in Hope. This includes required setbacks, maximum building size, and types of use. There are no specific regulations or guidelines for conformance with FireSmart principles, such as required setbacks from vegetation. However, this is typical for communities in BC, as zoning bylaws are an imperfect tool for this purpose. Zoning does not account for the actual characteristics of the adjacent vegetation and its wildfire risk, thus using zoning to stipulate FireSmart setbacks may include properties that have minimal wildfire hazard. Even if targeted accurately, zoning may create a significant burden on properties that currently lack a potential required setback.

The Official Community Plan[36] for the District of Hope contains provisions relating to protecting development within the community from natural hazards. Objective 6.5 in this OCP is to "regulate development in areas with natural hazards in order to mitigate risk".[37] This Objective is primarily focussed on flood and erosion hazards, and geotechnical hazards. Achieving this objective in the context of those hazards is furthered through development permit areas (discussed below in Action Planning). Although no specific policies or development permit areas specific to wildfire are included to meet this objective, policy 6.5.1 does identify a need for expanding the knowledge of local hazards to improve land use decisions. The information contained in this CWRP is consistent with and furthers this policy and objective.

[35] District of Hope Bylaw No. 1324, 2012. *Zoning Bylaw (consolidated 2024)*
[36] District of Hope Bylaw 1434, 2018. *Integrated Official Community Plan (2018).*
[37] District of Hope Bylaw 1434, 2018, pp 51.

The District of Hope owns and operates several structures and facilities, most of which are identified as critical infrastructure within this CWRP. As the manager of these facilities, the District is responsible for ensuring these structures are resilient to wildfire. Reducing the vulnerability of critical infrastructure to wildfire increases the resilience of the community to wildfire. This requires FireSmart assessments of these locations, and implementing mitigation actions to reduce their vulnerability. The District's FireSmart Coordinator has begun this process by conducting and documenting FireSmart Critical Infrastructure Assessments, aiming for completion of these assessments in 2025. These assessments have also included Critical Infrastructure that is not directly managed by the District, thus mitigation activities must be coordinated with the relevant owner or manager. Mitigation activities are planned once these assessments are complete.

Table 12 summarizes the FireSmart Critical Infrastructure Assessments that have been completed by the FireSmart Coordinator. Each component is scored individually, with a low score being <21, moderate being 21-29, and high exceeding >30. These scores indicate the vulnerability of the structure to wildfire, and the component scores are aggregated to provide a total score that follows the same scoring parameters. Thus, an assessed structure will be scored as vulnerable to wildfire if there are key vulnerabilities in any component of the structure. We have provided a summary of recommendations for key mitigation actions, but the specific assessments should be reviewed for completed details.

Table 12. Summary of completed critical infrastructure assessments.

Critical Infrastructure	Component Score					Total Score	Recommendation
	Critical Building	Critical Structure	Immediate Zone	Intermediate Zone	Extended Zone		
East Kawkawa Lake Reservoir	30	36	0	60	50	176	Fill in cracks to reduce ember ingress; remove flammable vegetation (conifers, surface debris) within 10m of structure; thin forest within 10-30m of structure
Fire Hall 1	70	0	0	0	0	70	Fill in cracks to reduce ember ingress
Fire Hall 2	80	0	30	60	30	200	Fill in cracks to reduce ember ingress; keep roof and gutters clean and free of debris; remove flammable vegetation; (conifers, surface debris) out to 30m from structure; thin out trees and/or prune them to 2m+ off the ground
Fire Hall 3	70	30	0	60	30	190	Fill in cracks to reduce ember ingress; keep roof and gutters clean and free of debris; consider replacing utility poles/structures with non-combustible options where possible; remove flammable vegetation (conifers, surface debris) out to 10m from structure; maintain vegetation and prune trees to 2m+ off the ground
Fraser Canyon Hospital	200	0	30	0	60	290	Fill in cracks to reduce ember ingress; keep roof and gutters; clean and free of debris; keep eaves clean and consider closing them in; install 3mm mesh in vents to reduce ember ingress; treat siding with a flame resistant treatment; replace windows with thermal or multi-pane glass and install doors made of non-combustible materials; remove combustible materials from within 1.5m of the structure; maintain vegetation and prune trees to 2m+ off the ground from 10-30m away from the structure

High School/Reception Centre	130	0	30	60	15	235	Fill in cracks to reduce ember ingress; keep roof and gutters clean and free of debris; keep eaves clean and consider closing them in; install 3mm mesh in vents to reduce ember ingress; replace windows with thermal or multi-pane glass and install doors made of non-combustible material; keep underside of decks clean, build decks and balconies using non-combustible materials free of gaps and sheath; maintain vegetation and prune trees to 2m+ off the ground from 10-30m away from the structure
North Silver Creek Reservoir	30	30	0	60	30	150	Replace critical components with those made of fire and heat resistant materials; remove flammable vegetation (conifers, surface debris) out to 10m from structure; maintain vegetation and prune trees to 2m+ off the ground from 10-30m away from the structure
RCMP Detachment	60	0	30	60	30	180	Keep roof and gutters clean and free of debris; replace windows with thermal or multi-pane glass and install doors made of non-combustible material; remove combustible materials and vegetation from within 1.5m of the structure; remove flammable vegetation (conifers, surface debris) out to 10m from structure; maintain vegetation and prune trees to 2m+ off the ground from 10-30m away from the structure
Thacker Reservoir	30	60	30	90	50	260	Consider replacing utility poles/structures with non-combustible options where possible; replace critical components with those made of fire and heat resistant materials; remove combustible materials and vegetation from within 1.5m of structure; remove flammable vegetation (conifers, surface debris) out to 10m from structure; maintain vegetation and prune trees to 2m+ off the ground from 10-30m away from the structure

Town Hall-EOC	160	0	30	0	20	220	Fill in gaps to reduce ember ingress; keep roof and gutters clean and free of debris; keep eaves clean and consider closing them in; install 3mm mesh in vents to reduce ember ingress; replace windows with thermal or multi-pane glass and install doors made of non-combustible material; remove combustible material and vegetation from within 1.5m of the structure; maintain vegetation and prune trees to 2m+ off the ground from 10-30m away from the structure
Waste Water Treatment Plant	56	6	0	30	30	122	Consider replacing gutters with those made of non-combustible material; keep roof and gutters clean and free of debris; fill in gaps to reduce ember ingress; replace utility poles/structures with non-combustible options where possible; remove flammable vegetation (conifers, surface debris) out to 10m from structure; maintain vegetation; prune trees to 2m+ off the ground from 10-30m away from the structure
Works Yard	143	0	30	120	30	323	Fill in gaps to reduce ember ingress; keep roof and gutters clean and free of debris; replace windows with thermal or multi-pane glass and install doors made of non-combustible material; remove combustible materials and vegetation from within 1.5m of structure; keep flammable substances and combustible materials stored in an ember resistant storage structure and/or 10m+ away from the structure; outbuildings should be FireSmart to the same standards as the primary structure; remove flammable vegetation (conifers, surface debris) out to 10m from structure; maintain vegetation and prune trees to 2m+ off the ground from 10-30m away from the structure

8.2 Action Planning

There are two key types of actions the District of Hope can take to improve community resilience to wildfire. The first is to ensure the critical infrastructure owned and managed by the District is resilient to wildfire. The second is to use planning tools to influence private property within the District's boundaries to build resilience to wildfire.

Critical Infrastructure

The District of Hope should build off its existing FireSmart Critical Infrastructure Assessments by mitigating identified deficiencies. The District should immediately prioritize the critical infrastructure that is crucial to wildfire response, such as the Fire Hall, EOC, and water infrastructure. These should be additionally prioritized based on the level of effort and cost to mitigate identified deficiencies; typically, vegetation management is extremely effective at reducing vulnerability, and significantly cheaper than building retrofits. The District should also review any planned infrastructure upgrades at assessed facilities to integrate FireSmart principles into these upgrades.

It is important that the District of Hope continue Critical Infrastructure FireSmart Assessments for any critical infrastructure that has not been assessed. The District currently plans to complete these assessments in future years, dependant on funding. Any deficiencies identified within these future assessments should also be mitigated.

Often it is more practical and cost effective to integrate FireSmart principles at the construction stage when developing new infrastructure. The District of Hope should develop an internal policy and direction for any proposed infrastructure that requires compliance with FireSmart guidelines. This will ensure new critical infrastructure is resilient to wildfire when constructed, and avoid costly retrofits or mitigation activities in the future. Critical Infrastructure FireSmart Assessments should be completed on all new critical infrastructure.

Wildfire Development Permit Area

A majority of the community values within the District of Hope are located on private land. There are limited tools for local governments to directly manage private property to reduce wildfire risk without voluntary participation and investment by the land owners. The District can support these efforts through their FireSmart program, but has a limited ability to enforce or require compliance with FireSmart guidelines on private property. Instead, the District can influence wildfire resilience on private property using planning tools to influence development. These planning tools can be used to guide development within the community, much of which occurs in the wildland-urban interface, to build overall community resilience to wildfire.

The wildfire development permit area (DPA) is a tool used by many communities in BC to reduce wildfire risk and build community resilience to wildfire. This introduces an additional permitting process for certain activities on private land, such as subdivision or building construction. Development permit areas are very common in municipalities in BC, and through wildfire DPAs are less common, they are becoming more and more widely adopted as a tool for reducing wildfire risk on private land.

The wildfire DPA permitting process creates a mechanism to ensure that new development is aligned with FireSmart principles, resulting in structures and properties that are more resilient to the risk of wildfire. In doing so, the wildfire DPA ensures that not only are these specific parcels will have a lower wildfire risk post development, the likelihood of wildfire spreading into and through a community is also reduced. Wildfire DPAs must be aligned with objectives and policies within the Official Community Plan, and often are inserted into the OCP as part of a bylaw amendment.

Wildfire DPAs consist of an area of land within the municipality, as well as a set of guidelines that apply to parcels included within that area. Guidelines identify what activities will trigger the need for a wildfire development permit. Applicants must then comply with guidelines, which ensure the proposed development will incorporate FireSmart principles. The area is typically identified by proximity of parcels to areas of high wildfire risk, coordinated with the wildfire risk assessment within a CWRP. It is important to note that the areas identified in a community, the guidelines, and the process will vary for each community, as theses wildfire DPA components must fit with the overall community planning context.

The District of Hope can explore establishing a wildfire DPA to address areas of higher wildfire risk within the community. This DPA will identify guidelines and areas where it applies, based on the findings of this CWRP, as well as the broader community and planning context. Importantly, this process should carefully review the OCP for the District of Hope to identify any gaps with existing objectives and policies, and also how a wildfire DPA may interact with other policies and objectives. Due to the wildfire DPAs close relationship with the OCP, the most efficient time to create a wildfire DPA may be as part of the next OCP update, tentatively planned for 2025.

Table 13. FireSmart Development Consideration action recommendations.

Recommended Action	Description
16	Complete FireSmart Assessments for all Critical Infrastructure identified in this CWRP.
17	Complete mitigation actions identified in the FireSmart Assessments for all Critical Infrastructure.
18	Develop policy for including FireSmart building materials and landscaping for construction or renovation of District owned facilities.
19	Investigate developing a wildfire development permit area to address wildfire risk on private land.
20	20. Develop guidelines for new construction to ensure compliance with FireSmart principles.

9 Interagency Cooperation

It takes the collaborative efforts of multiple stakeholders working together to achieve a fire resilient community. These people include the local fire departments, local government staff, elected officials, First Nations representatives, industry representatives and provincial government residents in and around the AOI. Individually, representatives of these groups are responsible to their own organizations, but all of the stakeholder organizations are dependent upon each other for regional wildfire resilience. Interagency Cooperation includes collaboration between staff and community members, community forests, local forestry companies, as well as with external representatives like FNESS, BCWS, and Regional District representatives.

9.1 Current Status

The District of Hope has developed close relationships with important regional actors, including the Yale and Popkum Fire Departments via mutual aid agreements. The District is fortunate to be part of a web of related actors that are working collaboratively to reduce wildfire risk in the region. This CWRP was developed in collaboration with the BCWS, who providing valuable technical support and expertise. The BCWS maintains the Haig Firebase, located just outside Hope, and staff from this base provided local, expert knowledge on the wildfire risk in and around the community. Additionally, the BCWS is working to develop a Wildland Urban-Interface Wildfire Risk Reduction plan for the crown land surrounding Hope, with a proposed final completion of April 2026. The BCWS also provides support for Hope led FireSmart initiatives, with close ties to the District of Hope Fire Department and its FireSmart program.

The Fraser Valley Regional District (FVRD) leads FireSmart initiatives throughout the regional district, which includes most property immediately outside the District and the surrounding First Nations Reserves. The FVRD was engaged throughout the development of this CWRP, providing support and sharing information regarding their FireSmart programming in the region.

Local First Nations communities and reserves are found within and near Hope. These groups were identified and contacted early on in the project to build relationships and explore opportunities for collaboration. This includes the Yale First Nation, the Union Bar First Nation, and the Chawathil First Nation. These groups can and are pursuing their own, independent wildfire resiliency planning processes, and have expressed interest in future collaboration with other groups.

9.2 Action Planning

The District of Hope is well positioned for interagency cooperation, with strong and productive relationships with key actors in the region. However, most of these relationships are one on one, rather than as one coordinated body. Formalizing these relationships in a Community FireSmart and Resiliency Committee (CFRC) is crucial to ensuring information and collaboration occurs with all group working on wildfire resiliency indicatives in the area. The roles, structure, and objectives for the CFRC are outlined in Section 5 of this CWRP.

The existing Mutual Aid Agreements are critical to ensuring adequate resource availability in the event of a large wildfire. It is important to maintain these relationships.

It may be suitable for the District to establish multiple CFRCs for various audiences and groups in and around the community. As discussed in Section 5, a regional CFRC is recommended for collaboration at the regional scale for the areas in and around Hope. The purpose of this CFRC is to share wildfire resiliency planning activities being undertaken by each group, and explore options for coordination and collaboration. It is recommended that the FireSmart Coordinator for the District of Hope participate and/or lead this regional CFRC.

A second, Hope specific CFRC could be established for District of Hope specific groups. This CFRC would be much more localized to the District of Hope, and consist of local stakeholders for building wildfire resilience. This could include representatives from various municipal departments, local interest groups, and local industry. The purpose of this CFRC is to identify local concerns and initiatives, and facilitate collaboration at that level. Key items of local concern can be forwarded at this CFRC, then brought to the regional CFRC. This will ensure that this CFRC can focus on Hope wildfire resiliency activities and concerns, while the regional CFRC can remain focused at the regional level. This CFRC should be chaired and lead by the District of Hope FireSmart Coordinator, who can then act as a liaison with the regional CFRC.

Table 14. FireSmart Interagency Cooperation action recommendations.

Recommended Action	Description
21	Maintain Mutual Aid Agreements with adjacent fire suppression agencies.
22	Maintain relationships with key regional wildfire resiliency actors, including the FVRD, local First Nations, and the BCWS.
23	Establish a Hope specific CFRC with local stakeholders.
24	Send key District FireSmart staff to the annual BC Wildfire Resiliency and Training Summit.

10 Cross-Training

Wildland-Urban Interface resiliency planning and incident response draw on many different professions who do not typically work in wildfire environment. Cross-training of fire fighters, public works staff, utility workers, local government administration, planning and logistics staff, and other key positions will help support the development of comprehensive and effective wildfire risk reduction planning and activities, as well as a safe and effective response.

Cross-training ensures that firefighters and first responders within the community are trained in both structural and basic wildfire suppression[38]. For communities within the WUI it is important that professionals are well trained to ensure proper response to fire. Some training programs available are:

- Basics wildland fire training
- Structure protection training
- Incident Command System training
- Local FireSmart Representative training
- FireSmart Home Partners Mitigation Specialist training
- FireSmart Neighbourhood Champion workshop

10.1 Current Status

The District of Hope Volunteer Fire Department (DHVFD) is the primary fire response agency in Hope. DHVFD consists of three fire halls, staffed by a mix of five full-time and fourteen volunteer/paid on call firefighters. Members are trained to the interior standard as per the BC Office of the Fire Commissioner playbook. DHVFD members have a high level of wildfire specific training, with all members receiving Wildfire Structure Protection Program training, which includes wildfire specific courses S-100, ICS-100, and S-185. In addition, ten members are trained as engine bosses, one officer qualified as a structure defence task force leader, and three members with wildfire structure protection 115 certificates. This training is supplemented by hands on wildfire experience, as many members have been deployed to large wildfire incidents through the provincial interagency agreement.

DHVFD maintains close relationships with the BCWS, primarily with local staff at the BCWS Haig Base just outside Hope. These relationships have been built and maintained through response to wildfire incidents in the local area, and various cross-training exercise. This fire base represents a tremendous local resource for building training and expertise within DHVFD. Additionally, DHVFD conducts training with nearby fire suppression agencies, such as Agassiz Fire Department.

[38] See: https://firesmartbc.ca/discipline/cross-training/

10.2 Action Planning

DHVFD staff should continue to maintain their wildfire training standard for all members, and continue to deploy staff to provincial wildfire incidents. These programs could both be expanded, although this may be challenging due to ongoing capacity issues. Should DHVFD acquire a structure protection unit, as recommended in the Emergency Planning section of this CWRP, dedicated training exercises should be developed for all DHVFD members.

There is a close relationship between cross-training and emergency response. Cross-training with other agencies builds relationships and response systems that can assist with a seamless unified response in the event of a wildfire in Hope. This is particularly important with neighbouring agencies with Mutual Aid Agreements with DHVFD, the Yale and Popkum Fire Departments. Although these relationships are currently quite strong, formalizing them into regular, scheduled, and structured exercises will maintain and enhance these relationships. This is crucial with BCWS, as much of their fire suppression staff are seasonal employees, and staff frequently redeploy to different fire bases. DHVFD should host annual table-top wildfire response exercises with response partners including the BCWS, Yale Fire Department, Popkum Fire Department, FVRD emergency management personnel, and the Chawathil First Nation. This will also have the added benefit of addressing seasonal wildfire readiness, and highlighting specific concerns in advance of wildfire season.

Table 15. FireSmart Cross-Training action recommendations.

Recommended Action	Description
25	Maintain current wildfire training standard for DHVFD members.
26	Continue to deploy DHVFD staff to provincial wildfire incidents.
27	Host annual table-top wildfire exercise and wildfire readiness exercise with regional wildfire response partners.

11 Emergency Planning

Community preparations for a wildfire emergency requires a multi-pronged approach. Individuals and agencies need to be ready to react by developing plans, mutual-aid agreements, resource inventories, training and emergency communication systems. All of these make it possible for a community to respond effectively to the threat of wildfires as a whole.

The Community Wildfire Resiliency Plan (CWRP) is closely related to Emergency Plans, which are high level plans outlining the local government's response procedures for various scenarios. An Emergency Management Plan is beneficial in coordinating response efforts and increasing efficiency and effectiveness of communications and evacuations in the event of an emergency. An emergency management plan should focus on emergency preparedness, response activities, and recovery.

11.1 Current Status

The District of Hope's emergency program is founded in the Emergency Response and Recovery Plan (ERRP). This plan provides the structure and guidelines for establishing the Emergency Operations Centre (EOC), as well as the policies and procedures for responding to an emergency in Hope. It is important to note that at the time of writing this CWRP, the provincial government has introduced new legislation[39] (the *Emergency and Disaster Management Act*) to replace the previous *Emergency Program Act*[40]. This updated legislation has increased the responsibilities of local governments to include mitigation, preparation, response, and recovery, while previous legislation was largely focussed on emergency response. As such, the District plans to update their ERRP in 2025 to reflect these new changes.

The District's ERRP identifies interface wildfire as a potential emergency scenario that will require activation of the EOC. Although the probability of this scenario is not identified, the required roles and specific needs of wildfire response are identified. This includes the need for close collaboration with response partners, including the Fraser Valley Regional District and other agencies.

The District of Hope also maintains a general evacuation plan. This plan divides the community into various zones, which acknowledges the various community scales challenges to evacuation. These local access constraints present the biggest barrier to evacuation in Hope, as at a large scale there are ample evacuation routes via the four highways that intersect within on near the District.

[39] *Emergency and Disaster Management Act, Statutes of British Columbia* 2023 c. 37. https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/23037
[40] *Emergency Program Act, Statutes of British Columbia* 1996 c. 111. https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/00_96111_01

Emergency alerts, orders, and rescinding of orders and alerts for residents within Hope are provided through various means, including radio, website, social media, and door knocking. Additionally, Hope uses Alertable, an app-based system that provides email, text message, or phone call notifications in the event of an emergency. This program is voluntary, and requires users sign up.

Figure 17. Alertable app can be accessed at https://alertable.ca/signup/?site=BC24

In the event of wildfire, the District of Hope Volunteer Fire Department (DHVFD) will play a key role in wildfire response. As discussed in the Cross-Training section of this CWRP, DHVFD has a high training standard and level of experience in wildfire. The department is well provisioned with structural fire suppression equipment, with three fire halls and eight fire suppression vehicles. However, DHVFD has minimal wildfire specific equipment. Additionally, there are numerous areas within the District with limited or minimal access to water infrastructure. There are recruitment challenges, with the department operating well below compliment. DHVFD's mutual aid agreement with Yale and Popkum Fire Departments help enhance emergency response, allowing the DHVFD to call on additional nearby resources if necessary.

11.2 Action Planning

The District of Hope plans to update their ERRP in 2025. This presents an opportunity to integrate the key findings from this CWRP. This CWRP has identified areas and critical infrastructure of elevated risk to wildfire, that can aid in wildfire response. For example, in the event of wildfire occurring near vulnerable critical infrastructure identified in this CWRP, the EOC can prioritize these areas for protection. This is particularly important for critical infrastructure that is required to support wildfire response, such as the District's Fire Halls.

Some critical infrastructure is necessary for supporting wildfire response, such as the EOC, water pumps and reservoirs, or other emergency services. Electricity supply may be compromised by wildfire, through trees falling on powerlines, or by BC Hydro proactively shutting off utility lines to prevent future ignitions. Critical infrastructure may have limited effectiveness during power shutdowns if it lacks a backup power supply or generator. Most of the critical infrastructure in Hope does have backup generators, however some critical infrastructure, particularly water infrastructure, may lack backup generators. Therefore, it is recommended that the revised ERRP assess the backup power supply for critical infrastructure that is necessary for wildfire response. This should include an assessment of the duration backup power can supply the critical infrastructure during a power outage.

Wildfire suppression required specialized equipment and training that is often lacking in small, local fire departments, that primarily focus on structure fire. Hope is fortunate that the DHVFD members train to a high wildfire training standard, and have significant wildfire suppression experience. However, the lack of dedicated wildfire equipment for structure protection limits response capabilities. A structure protection unit (SPU) is a crucial resource for protecting structures in the event of a wildfire. SPU's consist of an enclosed trailer, fully stocked with sprinklers, hoses, pumps, and accessories necessary for protecting structures from wildfire. Acquisition of an SPU will allow more effective wildfire response, by providing the necessary resources for DHVFD to adequately utilize the training and experience of their members. Acquiring and fully complementing and SPU usually takes 2-3 years, with a phased approach to gradually acquire equipment.

Type 1 SPU

Type 2 SPU

Figure 18. Structure protection units. Source: BC Wildfire Service.

Water supply is crucial for both wildfire suppression and proactive protection of assets when a wildfire approaches. The District of Hope has a complex water supply system, with varying hydrant service level, all using a variety of different water systems with complex interactions. The 2019 District of Hope Water Master Plan outlines the capabilities of these systems, however this document may be out of date, and is also largely directed at structural fire water needs. Wildfires are often much larger than structural wildfires, and require considerably more water for suppression. A community water delivery analysis for wildfire suppression would assist in wildfire preparedness planning, and may also feed into the previously discussed CWSSP.

Emergency management requires ensuring community member are notified of a potential incident as soon as possible. The Alertable system is a valuable resource for emergency notifications, however this program is voluntary and as such may have limited uptake. The District of Hope should continue to promote residents sign up and participate in this program.

The wildfire risk within the District of Hope varies, with certain neighbourhoods much more vulnerable to wildfire risk. In particular, neighbourhoods like Thacker Mountain, Kawkawa Lake, Langstrom Road, and Silver Creek have much higher wildfire risk than the downtown area due to their proximity to forests, and the higher density of forest mixed throughout. As such, wildfire response will be different in these neighbourhoods. A Community Wildfire Structure Protection Plan (CWSSP) is a standalone document that guides structure protection at the community scale. CWSSP enhances wildfire response by integrating the neighbourhood specific challenges and priorities in a wildfire, which in turn will enhance wildfire response. These documents are very specific for areas within the community, and provide valuable information for wildfire response. For example, water sources by type, volume, and location are provided within each neighbourhood. It is recommended that the District of Hope develop a CWSSP to aid in wildfire response.

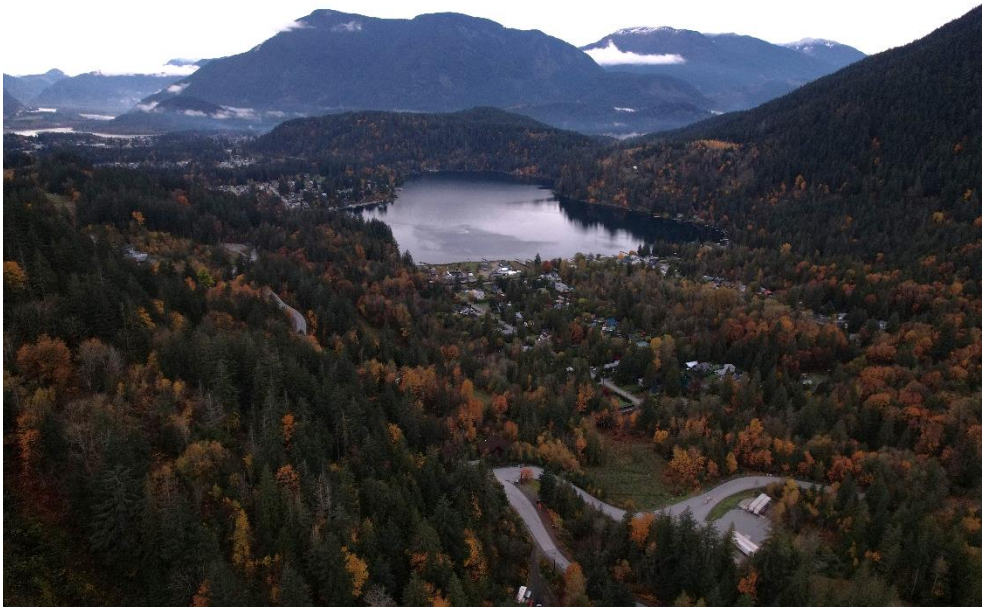

Photo 10. Kawkawa Lake Neighbourhood.

Table 16. FireSmart Emergency Planning action recommendations.

Recommended Action	Description
28	Integrate findings from this CWRP into updated Emergency Response and Recovery Plan.
29	Assess backup power supply for critical infrastructure that is necessary for supporting wildfire response.
30	Acquire a complete structure protection unit for the District of Hope Fire Department.
31	Conduct a community water delivery analysis for wildfire suppression for the District's water supply network.
32	Continue to promote and support resident participation in the Alertable emergency alert system.
33	Develop a Community Wildfire Structure Protection Plan for the District of Hope.

12 Vegetation Management

The general goal of vegetation management is to reduce the potential wildfire intensity and ember exposure to people, infrastructure, structures and other values through manipulation of both the natural and cultivated vegetation that is within or adjacent to a community. A well-planned vegetation management strategy that is coordinated with development, planning, legislation and emergency response wildfire risk reduction objectives can greatly increase fire suppression effectiveness and reduce damage and losses to structure and infrastructure.

Fuel management, also referred to as vegetation management or fuel treatment, is an important element of wildfire risk reduction within the WUI. This work requires extensive planning, and proper training to achieve the desired results. The relationship that District of Hope and BCWS could build upon would be the collaborative fuel management work that will be ongoing for years to come.

Vegetation management within and around the community can be accomplished through two different activities, residential scale FireSmart landscaping and fuel management treatments.

Residential scale FireSmart landscaping consists of the removal, reduction, or conversion of flammable plants (such as landscaping for residential properties, parks and open spaces) in order to create more fire-resistant areas in FireSmart zones. The scale of this work is small, both in terms of the total area and the intensity of treatment required. This work is generally lead by the property owner on a voluntary basis, with the local government providing FireSmart assessments, reference material, and broad guidance. These FireSmart assessments can be upscaled to the neighbourhood level, providing opportunities for neighbours to work together to achieve neighbourhood resilience to wildfire through the FireSmart Canada Neighbourhood Recognition Program.[41]

[41] https://firesmartcanada.ca/programs/neighbourhood-recognition-program/

Fuel management treatment involves the manipulation or reduction of fuels to reduce the rate of spread and head fire intensity, and enhance the likelihood of successful suppression, usually outside of the FireSmart zones. This is completed using heavy equipment or manual work to remove, prune, and dispose of hazardous vegetation, or through prescribed burning. This type of project is at a large scale, ranging from a few hectares up to several hundred hectares. Fuel management typically occurs on public land, and is led by local, provincial, or First Nation governments to proactively reduce wildfire risk to communities.

Given the scale of the work, detailed planning is required for fuel management treatments. This planning work is completed through a fuel management prescription, developed by a Registered Professional Forester. The fuel management prescription outlines objectives for fuel management, strategies to achieve those objectives, and wildfire behaviour modelling to rationalize those objectives and strategies. This fuel management prescription is then implemented over several months or years by third party contractors, often with qualified professional supervision. Upon completion, a post-treatment assessment is required to confirm wildfire risk reduction objectives have been met.

Photo 11. Photo left is a high risk forest prior to fuel management. Photo right is the same forest, with fuel management implemented to reduce wildfire risk.

12.1 Current Status

Residential scale FireSmart landscaping is facilitated by the District of Hope FireSmart program by providing FireSmart assessments free of charge to residents. There is fairly high uptake on these assessments, which also provide an opportunity for education for residents. The District has also facilitated neighbourhoods interested in FireSmart Canada Neighbourhood Recognition, by providing neighbourhood FireSmart Assessments for nearly ten neighbourhoods within the District.

Fuel management planning in BC can be led by various actors, including the province, local First Nations, municipal governments, utility providers, and even large private land owners. The province leads fuel management planning on crown land through the wildfire risk reduction program, which consists of Wildfire Risk Reduction Tactical Plan[42] process. These plans identify areas of crown land for fuel management. No such plan currently exists for the crown land in and around the WUI for the Hope CWRP. Similarly, no areas of crown land within the WUI have been managed to reduce wildfire risk. A tactical plan may be created within the next 2-3 years, which may result in fuel management in the Hope WUI.

Municipal governments and First Nations can also manage fuel to reduce wildfire risk on their managed land, as well as crown land that abuts their land. However, within Hope, the surrounding WUI and First Nation land, no fuel management has occurred or is currently proposed. The Chawathil First Nation is currently finalizing their CWRP, which may lead to fuel management activities within their land.

The Cascade Lower Canyon Community Forest (CLCCF) tenure overlaps with the WUI for the Hope CWRP. This community tenure holder has identified areas for potential fuel management within the WUI. These areas were reviewed in the creation of this CWRP, and synergies with Hope activities are explored below.

Fuel management is extremely challenging in the District of Hope and surrounding area, due to the steep, rocky terrain. This has been a primarily limitation for fuel management by all regional actors. This limits options not only for operations, but also for transporting and disposing of debris produced through fuel management. In many cases, fuel management may not be effective for wildfire risk reduction, and may also not be cost-effective in contrast with other wildfire resiliency activities.

[42] See: https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/prevention/fire-fuel-management/fuels-management/crown_land_wildfire_risk_reduction_planning_guide_2023_2024_final.pdf

12.2 Action Planning

On private land, FireSmart activities are led by the property owner, with the District's role to provide support and guidance. This support can consist of assessments to guide vegetation management, which is a service currently offered by the District's FireSmart program and should be continued. The District can continue to financially support these activities through the rebate program, which can fund 50% of the activity cost up to $5,000. These costs are eligible for reimbursement via the UBCM CRI Program (2025). The District can also continue to support neighbourhoods by facilitating assessments and activities to achieve FireSmart Canada Neighbourhood Recognition.

A particular challenge in the District is the aging population, as discussed in 3.3. Seniors, people with limited mobility, and other vulnerable populations require additional assistance in performing FireSmart vegetation management. The District can provide labour for completing FireSmart activities, and be reimbursed for those costs via the UBCM CRI Program (2025).

Removing and disposing of vegetation debris created through FireSmart management on private land is often a challenge. These activities can produce significant quantities of debris, and should be disposed of off-site to ensure wildfire risk remains reduced. The District can provide a service for debris disposal to offset the costs, or to facilitate disposal. Tipping fees, or community green waste bins, can be provided to residents that are completing FireSmart activities. This is typically administered by requiring residents display a FireSmart assessment from the District to ensure waste has been produced through FireSmart activities. Alternatively, the District can organize community chipping days in neighbourhoods, where a chipper and bin truck are provided to residents for debris disposal.

Photo 12. Debris produced through FireSmart activities on private land.

Wildfire threat and risk within the CWRP WUI are primarily driven by steep slopes. Highest risk areas are those with coniferous fuels on these steep slopes. Fuel management on steep slopes is very challenging, and on the steepest slopes is not possible due to safety challenges. In contrast, the vegetation surrounding Hope is similar, with coastal coniferous forests. One major factor that varies within these forests is the density of dying or stressed vegetation, which can often increase wildfire threat as dead material accumulates on forest floors. As such, the focus of vegetation management should be in strategic locations where operations are feasible and can also dovetail with other wildfire resiliency activities. This may include education, through fuel management demonstration projects. These fuel management projects include an educational component, with the goal of demonstrating FireSmart vegetation management principles to the public. Fuel management may also focus on protecting critical infrastructure, which will benefit emergency response. Several candidate locations have been identified in Figure 19 and Table 17 below, with a brief summary of wildfire threat and potential constraints.

The CLCCF is a major actor in forest management within the Hope WUI. The CLCCF has collaborated with the District in creation of this CWRP, providing area of potential fuel management within their tenure. Several of the treatment areas proposed for this CWRP have been designed to link with these candidate areas, and collaborative fuel management may be an option to reduce wildfire risk. Wherever possible, the District should collaborate with regional partners through the Community FireSmart and Resiliency Committee in cross-jurisdictional fuel management planning.

Photo 13. Treatment Unit KWKW is a proposed linear fuel break along the base of the slope in the rear right of this photo.

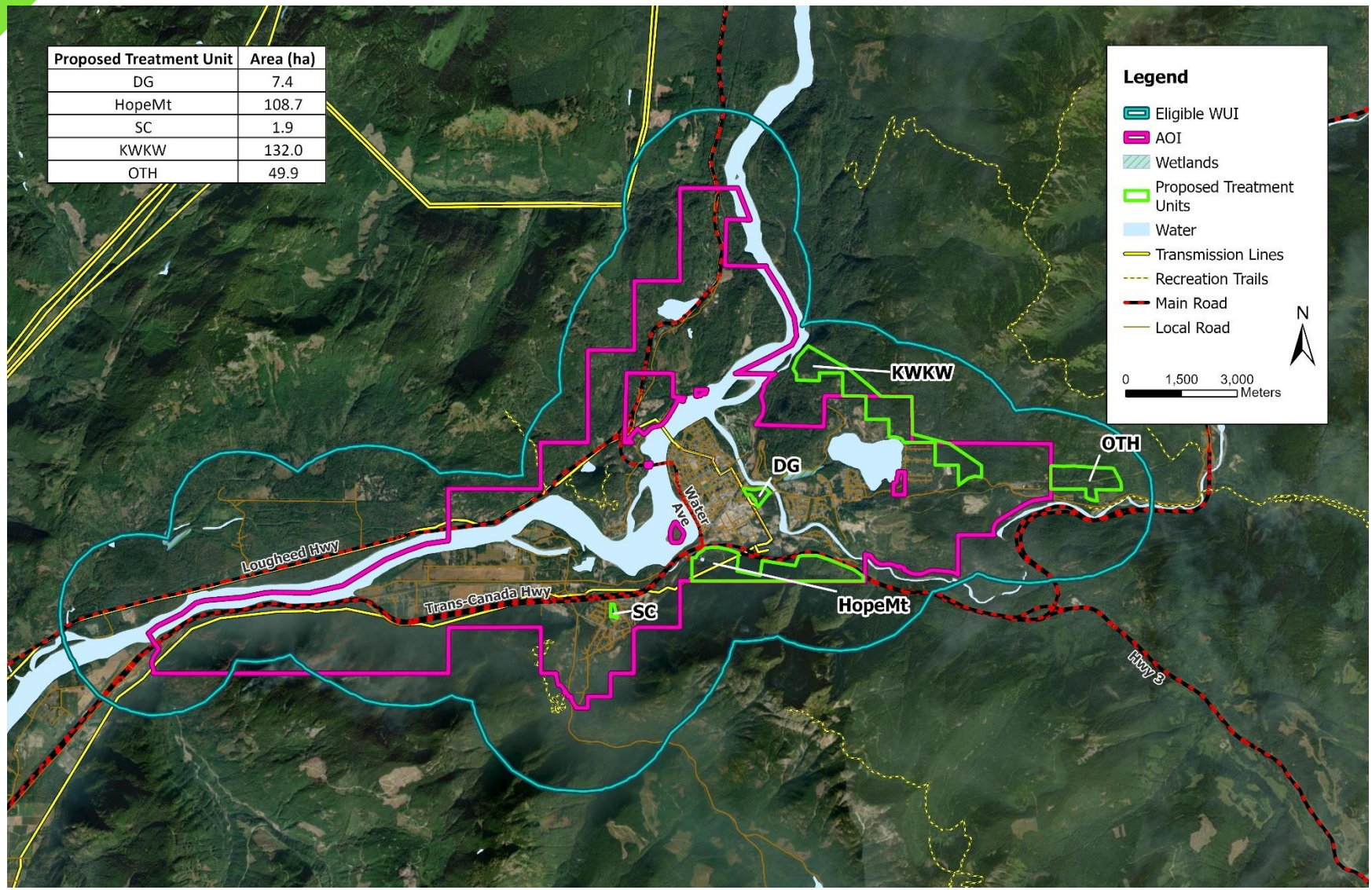

Figure 19. Fuel management areas.

Table 17. Vegetation management areas.

FTU #	Total Area (ha)	Treatment Type / Objective	Local Fuel Threat (Hectares)			Overlapping Values / Treatment Constraints	Treatment Rationale
			Extreme / High	Mod	Low		
DG	7.4	Demonstration		4.4		• Blue listed invertebrate (Trowbridge's Shrew), Red listed invertebrate (Johnson's Hairstreak) • Adjacent Coquihalla River • Irregular border with private land north.	This area has a high proportion of dead overstory trees, which will add considerable fuel loading as they fail. Currently a park with a disc-golf course, treatment will reduce wildfire hazard while demonstrating FireSmart vegetation management principles. May be suitable for a BCWS, crew-led project.
HopeMt	108.7	Fuel Break	6.8	101.9		• WHA (spotted owl) adjacent • OGMA adjacent • Required access over pipeline ROW, possible weight restrictions • Surrounds private parcel • Blue listed invertebrate (Trowbridge's Shrew), Red listed invertebrate (Johnson's Hairstreak), Blue listed ecological community (HwFd - Fd/Electrified Cat's Tail Moss Dry Sub maritime 1) • Variable slopes, steep in some locations	High wildfire threat area. Treatment will protect critical infrastructure, and also reduce the ignition risk for a wildfire that will rapidly spread up slopes to south.
SC	1.9	Demonstration		1.9		• Blue listed ecological community (HwFd - Fd/Electrified Cat's Tail Moss Dry Sub maritime 1) • Neighbour's private land north and east, linear borders.	Fuel loading and wildfire risk is moderate, however this area is used as an outdoor classroom for the adjacent school. Treatment can integrate FireSmart vegetation management principles with outdoor educational programming.

FTU #	Total Area (ha)	Treatment Type / Objective	Local Fuel Threat (Hectares)			Overlapping Values / Treatment Constraints	Treatment Rationale
			Extreme / High	Mod	Low		
KWKW	132.0	Fuel Break	1.8	130.2	0.1	• Small OGMA overlap • WHA (spotted owl) adjacent Blue listed ecological community (HwFd - Fd/Electrified Cat's Tail Moss Dry Sub maritime 1) • Limited access: must cross pipeline ROW, bisected by old skid road with multiple washouts • Steep terrain throughout • Likely geotechnical concerns • Overlaps with CLCCF tenure	This treatment would act as a fuel break to wildfires approaching community from the east, as well as to prevent wildfires from running upslope north. Treatment would likely focus on areas around the skid trail that bisects unit. Due to constraints, the final treatment boundaries will vary from the boundaries proposed here, based on a detailed field assessment. This treatment is coordinated with CLCCF tenure and their areas for wildfire fuel mitigation.
OTH	49.9	Fuel Break	3.6	46.3		• WHA • Steep slopes • Bisected by pipeline ROW • Overlaps with CLCCF Tenure	This treatment would act as a fuel break to wildfires approaching community from the east, as well as to prevent wildfires from running upslope north. Due to constraints, the final treatment boundaries will vary from the boundaries proposed here, based on a detailed field assessment. This treatment is coordinated with CLCCF tenure and their areas for wildfire fuel mitigation. Opportunities for CLCCF to link this treatment unit and "KWKW" though activities within their tenure.

Table 18. FireSmart Vegetation Management action recommendations.

Recommended Action	Description
34	Continue to provide FireSmart home assessment services to residents of Hope.
35	Support neighbourhoods in pursing FireSmart Canada Neighbourhood Recognition.
36	Continue rebate program for residents within Hope to support FireSmart mitigation activities on private land.
37	Develop program for providing labour to residents that are unable to perform FireSmart activities.
38	Develop program for facilitating green waste disposal for debris produced through FireSmart activities on private land.
39	Host annual chipping days to facilitate disposal of waste from FireSmart activities on private land.
40	Develop fuel management prescriptions for areas identified in this CWRP.
41	Implement fuel management prescriptions for areas identified in this CWRP.

Appendix A: Glossary of Terms

Term	Description
Aerial fuels	Also known as crown fuels, the main canopy of the forest dominated by needles, leaves, and smaller branches.
Area of Interest	The AOI for a CWRP includes all the area that lies within the municipal boundary, regional district boundary, or First Nations land including First Nation reserve land, land owned by a Treaty First Nation (as defined by the Interpretation Act) within treaty settlement lands, or land under the authority of an Indigenous National Government boundary.
Biogeoclimatic Ecosystem Classification (BEC) System	A hierarchical system for classifying ecosystems in BC based on the typical climax vegetation, incorporating the ecological effects of climate and soil.
Candling	When the foliage of a single tree or clump of trees ignites. Also referred to as torching.
Coarse fuels	Larger fuels (greater than 7cm diameter) that are ignite less rapidly, but can sustain combustion for much longer once ignited.
Community FireSmart and Resiliency Committee (CFRC)	A committee for stakeholders in wildfire resilience at a community or regional scale. This committee provides a forum for sharing information, collaboration, and sharing of resources.
Community Resiliency Investment Program (CRI)	Commonly abbreviated to CRI, this program provides grant funding to communities for initiatives to reduce wildfire risk.
Community Wildfire Protection Plan (CWPP)	The predecessor format for community wildfire planning to Community Wildfire Resiliency Plans. Although similar in goals and objectives, CWPPs varied in format and focus.
Community Wildfire Structure Protection Plan (CWSPP)	A CWSPP outlines specific operational suppression strategies for protecting community structures in various wildfire scenarios.
Coniferous	Plants that produce cones to reproduce, typically with needle or scale foliage that remains year-round (evergreen). Typically much more flammable than deciduous trees.
Critical Infrastructure (CI)	Assets owned by the Provincial government, local government, public institution (such as health authority or school district), First Nation or Treaty First Nation that are essential to the health, safety, security or economic wellbeing of the community and the effective functioning of government, or assets identified in a Local Authority Emergency Plan Hazard, Risk & Vulnerability and Critical Infrastructure assessment.
Crown fire	Fire that occurs primarily in the aerial fuels of a forest. Crown fires have the highest intensity and spread of all types of wildfire and are very challenging to suppress. Crown fires are almost always accompanied by a ground and surface fire. Can be intermittent, where only individual trees or group of trees aerial canopies are involved, or continuous, where the entire flame front is consuming the aerial canopies of all trees.
DBH	Diameter of a tree at breast height, approximately 1.4m above the ground.
Deciduous	Plants that do not produce cones, typically leaf bearing. Typically less flammable than coniferous trees.
Defensible space	A buffer created between a structure and combustible materials. Increased defensible space reduces vulnerability of a structure to wildfire.
Extended zone	FireSmart zone that includes the area between 10m and 30m from the structure.

Term	Description
Fine fuels	Small diameter fuels (grass, needles, twigs, etc) that ignite rapidly and are consumed rapidly.
Fire break	A gap in vegetation/fuel continuity that will limit fire spread. Not to be confused with fuel break, which are vegetated, but with lower flammability vegetation to reduce fire spread and intensity.
Fire exclusion	A phenomenon where human land management has resulted in ecosystems departing from their natural or historic fire regime.
Fire regime	Describes the typical frequency, intensity, and size of wildfire within an ecosystem under natural conditions.
Fire resistive	Defined in the DoS Wildfire Hazard DPA as "materials resistant to fire, such as stucco, metal, brick, rock, stone, lumber treated for fire resistance, and cementitious products (including hardiplank), but excludes, without limitation, untreated wood, aluminum, and vinyl products."
FireSmart	A nationwide program for supporting homeowners, land managers, local and provincial governments, and industry to increase resilience to wildfire in the wildland-urban interface. Often used as a verb to describe the implementation of mitigation measures that increase wildfire resilience.
FireSmart coordinator	A local expert in FireSmart principles.
Fuel	Any combustible material. In the context of wildfire, this refers to vegetation.
Fuel break	A barrier or disruption in fuel continuity that reduces the ability of a wildfire to spread. Not to be confused with fire break; fuel breaks are typically vegetated with fuel that is less flammable, while fire breaks lack combustible vegetation.
Fuel management	Modifying forest structure to reduce the wildfire threat, typically through reducing horizontal and vertical continuity of fuels within the forest.
Fuel Management Prescription (FMP)	A detailed plan that outlines strategies and objectives to reduce wildfire risk in a specific forested area, ranging from two, to several hundred, hectares.
Fuel management implementation	The process where vegetation is physically modified to reduce wildfire risk, following a fuel management prescription.
Fuel type	Fuel types are defined under the Canadian Forest Fire Behavior Prediction (CFFBP) System and are represented by certain forest characteristics.
Ground fire	Fire that occurs primarily in the ground fuels, consuming roots and organic soil. Ground fires can burn deeply for long periods, presenting challenges for suppression.
Ground fuels	Vegetation found within or below the forest floor, such as roots or organic soil.
Home ignition zone	The area that extends 30m in each direction from a home or structure. Further subdivided into the Immediate (0-1.5m from structure), Intermediate (1.5-10m from structure, and Extended Zone (10-30m from structure).
Immediate zone	FireSmart zone that includes the structure, as well as the area within 1.5 m surrounding the structure.
Initial attack	The first actions taken to manage a wildfire immediately after detection.
Interface fire	Wildfires that involve or may involve structures.
Intermediate zone	FireSmart zone that includes the area between 1.5m and 10m from the structure.
Ladder fuels	Fuels found above the surface fuels but below the aerial crown fuels, such as intermediate trees and branches. These fuels provide continuity between crown fuels and surface fuels.
Natural Disturbance Type (NDT)	A system for classifying ecosystems in BC by the types, severity, and frequency of natural disturbance in the absence of human interventions.

Term	Description
Mutual aid	A process where fire response agencies can respond to fires outside their normal jurisdiction, facilitated through mutual aid agreements between agencies.
Prescribed fire	The intentional use of wildfire as a tool, often to reduce wildfire threat or for other ecological benefits.
Primary forest	Often called old-growth forest, this is forest that has remained undisturbed for an extended period. Old growth is typically defined as over 140 years old in the interior of BC, and over 250 years old on the coast of BC.
Provincial Strategic Threat Assessment (PSTA)	A province wide assessment of wildfire threat, conducted at a provincial scale. The PSTA provides multiple datasets that can be used to predict wildfire behaviour at a landscape scale. Inaccuracies are common at a local or community scales.
Second growth forest	Forest regenerating from relatively recent disturbance, such as wildfire or harvesting. This is typically used to refer to forests growing after large scale tree removal through forestry operations.
Slash	Debris remaining from large scale vegetation removal, such as land clearing or forest harvesting.
Spotting	A phenomenon where a wildfire spreads wind carried embers beyond the main body of a wildfire. These embers can enter structures and cause interface fire, as well as start new wildfires separate from the main wildfire body.
Spot fire	A fire created through ember spotting, separated from the main fire area.
Surface fire	Fire that occurs primarily in surface fuels. Usually accompanies a ground fire.
Surface fuels	Vegetation found on or near the forest floor, such as grass, woody debris, moss, or herbs.
Values at Risk (VAR)	The human or natural resources that may be impacted by wildfire. This includes human life, property, critical infrastructure, high environmental and cultural values, and resource values.
Wildfire	An unplanned fire that is driven by combustion of vegetation.
Wildfire danger	Often called wildfire hazard or fire danger, this term describes the potential for severe wildfire at a moment in time, usually summarized daily during wildfire season.
Wildfire risk	A measurement of the probability of severe wildfire combined with the consequences of wildfire.
Wildfire season	Often used to refer to the period in BC of highest wildfire frequency and severity, beginning April 1 and ending September 30.
Wildfire threat	The ability of a wildfire to ignite, spread, and consume organic material (trees, shrubs, and other organic materials) in the forest. The major components used to define wildfire threat are fuel, weather, and topography, also known as the wildfire environment.
Wildland-Urban Interface (WUI)	Also known as WUI, any area where combustible vegetation is adjacent or near structures or communities. Consists of the wildland-urban interface or wildland-urban intermix. Interface is where developed communities have a clearly defined boundary between forests and developed areas. Intermix is where the boundary lacks a clearly defined boundary.

Appendix B: Home Ignition Zone

Figure 20. FireSmart home ignition zone.

Appendix C: Local Wildfire Risk Assessment

Step 1: FireLandTT Modelling and Mapping

FireLandTT Overview

FireLandTT or the **Fire Landscape Threat Tool** is a landscape scale fire behaviour, threat, and risk modelling tool which leverages the predictive power of the Canadian Forestry Fire Danger Rating system[43], the Fire Behaviour Prediction System[44], and the semi-empirical Crown Fire Initiation and Spread (CFIS)[45] to predict wildfire risk at the landscape scale. This tool incorporates a multitude of fire, wind, fuel, and topography models linked together to predict wildfire behaviour outputs over a range of conditions

FireLandTT Inputs

Burn Probability (BP), **Head Fire Intensity** (HFI), and **Rate of Spread** (ROS) are important variables to consider when evaluating the potential wildfire threat and risk of a given area. These variables determine where the greatest potential fire behaviour might occur and where suppression resources should be focused. FireLandTT wildfire modelling tool generates BP, HFI, and ROS outputs by iterating over a range of weather conditions generated based on local weather and heterogenous to site specific conditions to produce the relative wildfire behaviour on a cell-by-cell basis. These iterations are then aggregated for a chosen landscape to generate understanding of the highest potential wildfire risk. While the model does not simulate wildfire spread, it does iterate over real and fine scale heterogenous weather conditions specific to each cell and includes assessments of specific stand physical attributes like canopy fuel loads, canopy base height, and canopy bulk density. These attributes are critical to assessing crown fire behaviour potential, and thus assessments of wildfire threat and risk. This differs from other wildfire threat methodologies, such as the PSTA, by simulating the physical vegetation on the landscape, as well as the range of potential intensities of the wildfire. It differs from Monte Carlo simulation based spread models such as BurnP3, by linking to semi-empirical models of fire behaviour, CFIS [46], and including heterogenous weather and stand conditions.

[43] Van Wagner, C. E. and Picket, T.L. 1985. "Equations and FORTRAN program for the Canadian forest fire weather index system." Forestry Technical Report No. 33. Ottawa, Environment Canada, Canadian Forestry Service, Petawawa National Forestry Institute.
[44] B.M. Wotton, B.M; Alexander, M.E; Taylor, S.W. 2009. *Updates and Revisions to the 1992 Canadian Forest Fire Behaviour Prediction System.* Information Report GLC-X-10. Sault Ste. Marie, Natural Resources Canada, Great Lakes Forestry Centre.
[45] Alexander, Martin E.; Cruz, Miguel G.; Lopes, A.M.G. 2006. "CFIS: a software tool for simulating crown fire initiation and spread." *Proceedings of 5th International Conference on Forest Fire Research*, 27-30 November 2006. Amsterdam, The Netherlands: Elsevier B.V. pp. 1-13.
[46] Alexander et al, 2006.

Major inputs to the program include digital elevation models, historical spatial ignition patterns, Vegetation Resource Inventory (VRI) Data, fire weather data and fuel type (Fire Behaviour Prediction System, FBP) datasets. In addition, the program's estimates are improved using interpolated wind grids, historical fire event weather, interpolated fire weather data, predicted fuel structural and moisture condition data – all of which help better describe the landscape conditions conducive to fire behaviour and best contextualize the regional impact of fire on nearby communities. Results from FireLandTT allows for wildland-urban interface (WUI) areas to be assessed relative to the larger landscape, and understand potential interactions and landscape patterns of fire threat. Table 19 summarized key inputs for FireLandTT.

Table 19. FireLandTT model inputs and methods for deriving wildfire risk.

Input	Description	Secondary Inputs
Ignition Likelihood Maps	Mapped surface of ignition probability based on biophysical and anthropomorphic input variables fitted to a random forest classification model for both Human and Lightning	Historical Ignition Data from BCWS
Crown Fire Probability Grids	Mapped surface of crown fire probability as produced from CFIS modelling at the landscape scale.	Uses VRI input polygon data to model forest canopy structure data and fuel moisture indices. Those variables along with wind, surface fire behaviour, and environmental variables are fed into the modelling system to predict probability of crown fire activity.
Weather Station Data	Fire weather list of individual stations or mean of all station data within AOI	Last 16 years of weather data: 2009-2024. Used to create surfaces of fire weather indices at 90th percentile.
Surface Fuel Consumption Grids	Produced as intermediate outputs from fire behaviour prediction system runs and fed into CFIS or modelled through the use of equations from W.J de Groot et al 2009[47].	Surface fuel consumption is integral to predicting the intensity of surface fires burning in a cell and thus the likelihood that those surface fires will achieve crowning activity.
Canopy Structure Data	Surfaces of modelled canopy structure data for use in CFIS model. Models from Cruz et al. 2012[48] and inputs from MOF VRI data.	Using VRI polygon data on canopy closure, forest type, basal area, stem density, and tree height to predict canopy base height, canopy bulk density, and canopy fuel load. These inputs feed into CFIS.
Forest Structure Data	Used to modify fuel types with tree health data	Percent dead fir and percent conifer in M-1/2 fuels

[47] de Groot, W.J.; Pritchard, J.M.; Lynham, T.J. 2009. "Forest floor fuel consumption and carbon emissions in Canadian boreal forest fires." *Canadian Journal of Forest Research*. 39(2): 367-382.
[48] Cruz, M.G.; Alexander, M.E. 2012. "Evaluating regression model estimates of canopy fuel stratum characteristics in four crown fire-prone fuel types in western North America." *International Journal of Wildland Fire* 21(2):168-179.

Input	Description	Secondary Inputs
Environmental Variables	Surfaces of foliar moisture content, fine fuel moisture content (FMC), and 90th percentile weather indices for build up index (BUI), Fire Weather Index (FWI), Initial Spread Index (ISI), and wind speed.	90th percentile indices are generated form fire weather list. Environmental conditions for fine fuel moisture are predicted from equations in Wotton and Beverly 2007[49] and FMC is predicted from Alexander at al. 2009[50].

The FBP fuel types used in FireLandTT as a spatial data set require field verification as the spatial data may not capture all recent landscape changes and/or may be inaccurate within particular areas of interest. Reconnaissance was conducted and any inconsistencies between field observations and the spatial data set were corrected using field-derived shapefiles of true fuel types. The fuel type layer was vectorized to merge polygonal changes and then reverted to a raster layer to be implemented in FireLandTT.

FireLandTT Outputs

FireLandTT outputs are in the form of raster cell grids, where each cell grid represents a given area (e.g., 50 m grid resolution means that each square on the map represents 2500 square meters). Chosen cell resolution is determined by a variety of factors including, but not limited to; the scale of historical fire behaviour patterns, potential computational load, data quality, landscape size, and forest/fuel/landscape structural patterns, but frequently range between 50 and 200m, allowing for relatively fine scale analysis of fire behaviour patterns. These outputs are:

- Mean weighted Head Fire Intensity (HFI) (kw/m)
- Mean weighted Rate of Spread (ROS) (m/min)
- Relative ignition likelihood (%)
- Probability of Crown fire occurrence (%)

Rate of Spread and Head Fire Intensity

Both HFI and ROS outputs are essential elements to describing wildfire behaviour and the level of difficulty in successful suppression efforts. To generate assessments of mean HFI and ROS, FireLandTT is run on the landscape over nine different binned wind direction grids, to assess fire behavior from every potential wind direction encountered by a particular area of interest. After processing of all available station data within a particular area, domain winds are generated for each station and for all stations together to get the mean and 90th wind speed for eight directions (0, 45, 90, 135, 180, 225, 270, and 315). Depending on the study area, the fire behavior analyst makes the assessment about which station to use or whether to use the mean of all available station data to best assess fire weather for that particular landscape. Furthermore, the mean and 90th percentile wind speeds for catastrophic fire weather wind environments are extracted by selecting for wind speed and direction around ignition

[49] Wotton, B. M., and J. L. Beverly. 2007. "Stand-specific litter moisture content calibrations for the Canadian Fine Fuel Moisture Code." *International Journal of Wildland Fire*, v. 16 (4): 463-472.
[50] Wotton et al, 2009.

periods of all past fire events for data available. The 90th percentile wind speed for ten days on either side of an ignition is selected for and the mean wind direction pulled. This 90th percentile speed and mean direction is then added to the domain winds list, resulting in the model using nine total wind speed and direction values. These values are then interpolated and modeled through the use of the WindNinja software to create wind direction and speed grids for all angles. These grids are run through FireLandTT's modeling process to produce wildfire behavior outputs for each modeled direction at the 90th percentile values for all fire weather indices.

Producing final surfaces of HFI and ROS involves weighted sum of produced HFI and ROS surfaces to assess the fire behavior based on the most probable input data. Probability fields are generated for each wind direction based on how common it is to that particular landscape and then each fire behavior output surface (both HFI and ROS) are weighted by that wind direction probability before summing 9 surfaces to get the mean weighted HFI and ROS for all wind directions. This both gives a broad assessment of wildfire threat from all wind domains and encapsulates the most likely threats based on the prominent wind fields for the region.

Ignition Likelihood and Crown Fire Probability

Relative ignition probability of a wildfire occurring in each area is based on the ignition history of a given landscape and leverages machine learning to predict ignitions based on biophysical variables and anthropomorphic activities. An ignition map is built for each cause (both human and lightning) after data cleaning. To determine ignition data to include in the maps, the fire behavior analysts assesses ignition distributions by season to determine if seasonal stratification is necessary. Major input variables for the human model are based on important activities which would impact ignition likelihood (eg. roads), while the lightning models are built off physical variables and weather indices. Models are trained on a total of 400 trees in a random forest classification model and tuned to find the best fit model as measured through accuracy. Final models are then use to predict ignition likelihood and fit on the surface of the AOI. Final ignition likelihood maps are produced as a mean of all input ignition maps, which could be anywhere from two to six ignition maps.

FireLandTT outputs are then produced as a relative value for any given cell on the landscape. Since some areas and forest types are more prone to fire ignitions and spread, relative probability gives a better assessment of the potential risk for a given landscape as opposed to an absolute value. Based on historical ignitions points this approach generates ignition likelihood maps which are then linked to our semi-physical model CFIS to produce burn probability surfaces. CFIS's probability of crown fire occurrence metric is produced using wind speed, canopy data (CBH and CBD), surface fuel consumption results from the fire behaviour prediction system and environmental variables like DMC, FFMC, and fine fuel moisture content[51]. We run this model at the landscape scale using input VRI polygons as the processing level and generate the probability of crown fire occurring in that stand. Like rate of spread and head fire intensity, this method runs CFIS at all nine wind direction bins and then weights its mean result by probability of that wind direction occurring before producing one map of crown fire probability. These values are standardized and then averaged with the ignition likelihood surfaces to generate a burn probability surface akin to other modelled burn probability outputs. The underlying assumption is that

[51]Alexander et al, 2006.

spatial ignition likelihood and the probability of crowning surfaces act as a proxy for effective burn probability mapping. This method both incorporates ignition likelihood and the probability of a crown fire occurring based on surface fire behaviour, wind, forest structure, and environmental indices, giving a cell-by-cell assessment of burn probability. This approach contextualizes any given location in an area of interest to the broader landscape and helps better inform decision: land managers can prioritize threatened areas with higher relative burn potential rather than highest absolute burn potential.

The FLTT outputs are raster cell grid maps, and each cell in the grid can be overlayed with HFI, BP, and ROS to determine multiple aspects of fire threat within a single grid cell area. Each grid cell identifies:

1. The mean weighted ROS in metres per minutes
2. The mean weighted HFI in kilowatts per metre (kW/m)
3. The burn probability in a cell

Step 2: Wildfire Threat Mapping

Overall wildfire threat can be quantified by combining FLTT ouput raster cell grid maps together for each grid cell by giving a range of values a score. The scores for each component are obtained by binning a range of values as shown below in Table 20.

Note: The range applied for head fire intensity is based on the PSTA scoring system[52], and rate of spread intervals were derived from the National categorization from Natural Resources Canada[53]. Relative probability scoring is tailored to each area of interest using R-generated data analyses, which identifies outliers to remove possibly erroneous maximum values. The analyses then define equal interval breaks based on every tenth percentile using the newly calculated maximum probability.

Table 20. Scoring system for FLTT components

Score	Median HFI (kw/m)	Score	Relative Probability (%)	Score	Median Rate of Spread (m/min)
0 (nonfuel)	0	0 (nonfuel)	0	0 (nonfuel)	0
1	0.01 – 1,000	1	> 0 to 10th percentile	1	> 0 – 1
2	1,000.01 – 2,000	2	> 10th to 20th percentile	2	> 1 – 3
3	2,000.01 – 4.000	3	> 20th to 30th percentile	3	> 3 – 6
4	4,000.01 – 6,000	4	> 30th to 40th percentile	4	> 6 – 10
5	6,000.01 – 10,000	5	> 40th to 50th percentile	5	> 10 – 14
6	10,000.01 – 18,000	6	> 50th to 60th percentile	6	> 14 – 18
7	18,000.01 – 30,000	7	> 60th to 70th percentile	7	> 18 – 20
8	30,000.01 – 60,000	8	> 70th to 80th percentile	8	> 20 – 22
9	60,000.01 – 100,000	9	> 80th to 90th percentile	9	> 22 – 25
10	> 100,000	10	> 90th percentile and all outliers	10	> 25

[52]See: https://catalogue.data.gov.bc.ca/dataset/bc-wildfire-psta-head-fire-intensity
[53] See: https://cwfis.cfs.nrcan.gc.ca/ha/fbnormals?type=ros&month=7

The final output of spatially mapped wildfire threat is the result of taking the three scores of each important component of wildfire threat (BP, ROS, and HFI) and utilizing the weighted sum equation:

Wildfire Threat = (Head Fire Intensity Score*0.3) + (Rate of Spread Score*0.3) + (Probability of Burn Score*0.4)

The assigned weights for each score represent the importance of that component influencing the overall wildfire threat. All scores range between 0 and 10, with 0 representing non-fuel areas (i.e., no chance of a fire occurring), 1 representing the lowest threat level, and 10 representing the highest threat level. Final wildfire threat is reclassified into four possible rankings using the PSTA ranking system[54]:

Table 21. Scores and threat rating.

Scores given equal interval	Overall, Threat Rating
> 8 – 10	4 (Extreme)
> 6 – 8	3 (High)
> 3 – 6	2 (Moderate)
> 0 – 3	1 (Low)
0	0 (No Threat)

[54]See: https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/prevention/fire-fuel-management/fuels-management/2020_determining_wildfire_threat_and_risk_at_a_local_level.pdf

Step 3: Values at Risk Mapping

Values at risk include all built values such as homes, structures, and critical infrastructure. Values at risk locations are obtained using existing spatial sources and consulting with the local community, conducted as part of the CWRP development process. After obtaining all value spatial information, a proximity analysis is conducted to determine how close each grid cell from Steps 1 and 2 is to these values. Table 22 shows the scoring schemes used for proximity to values for each cell.

Table 22. Proximity to values scoring.

Score	Proximity to Values (m)
0	2000 +
1	1000 - 2000
2	501 - 1000
3	201 - 500
4	0 - 200