REGIONAL DISTRICT OF NORTH OKANAGAN

Extract from the Minutes of a Meeting of the

Board of Directors

Held on

Wednesday, March 16, 2022

Electoral Areas "B" & "C" Official Community Plan Amendment / Zoning Amendment Application
OKANAGAN GONDOLA LTD. c/o C. JAMES, DIALOG DESIGN [File No. 21-1055-B-OR]
Highway 97, Electoral Area "B"

That the application to amend the Electoral Area "B" and "C" Official Community Plan Bylaw No. 2626, 2014 by changing the land use designation of a portion of the property legally described The Fractional N 1/2 of Sec 36, Twp 14, ODYD, Except Plans B826, 37599 & H823 and located at Highway 97, Electoral Area "B" from Large Holding to Commercial be supported in principle and staff be directed to prepare an Official Community Plan Amendment Bylaw for First Reading only; and further,

That the application to amend the Regional District of North Okanagan Zoning Bylaw No. 1888, 2003 by changing the zoning of a portion of the property legally described The Fractional N 1/2 of Sec 36, Twp 14, ODYD, Except Plans B826, 37599 & H823 and located at Highway 97, Electoral Area “B” from Large Holding (L.H) to Recreation Commercial (C.5) be supported in principle and staff be directed to prepare a Zoning Amendment Bylaw for First Reading only; and further,

That the referral process outlined in the Planning Department report dated February 18, 2022 be considered appropriate consultation for the purpose of Sections 475 and 476 of the *Local Government Act*; and further,

That in accordance with Section 477 of the *Local Government Act*, the Official Community Plan Amendment Bylaw be considered in conjunction with the Regional District of North Okanagan’s Financial Plan and the Regional Solid Waste Management Plan; and further,

That Second Reading of the proposed Official Community Plan and Zoning Amendment Bylaws be withheld until:

1. comments have been received from: RDNO Community Services (Parks) department, First Nations, City of Vernon, and the Ministry of Transportation and Infrastructure; and,
2. the applicant has held a Public Information Meeting in accordance with the Public Information Meeting Guide; and
3. the applicant has provided confirmation in writing from a qualified professional Geotechnical Engineer that the subject property is safe for the intended use; and,

4. the applicant has submitted a hydrogeological study to determine the impacts, if any, of the proposed development on the water supply of existing users in the surrounding area and the underlying aquifer; and,
5. the applicant has submitted a study prepared by a professional Geotechnical Engineer which evaluates the subject property and provides recommendations for potential on-site septic sewage disposal associated with the proposed development; and further,

That Final Adoption of the proposed Official Community Plan and Zoning Amendment Bylaws be considered in conjunction with consideration of a Commercial, Environmentally Sensitive Lands, and Riparian and Swan Lake Development Permit associated with the proposed development; and further,

That Final Adoption of the proposed Official Community Plan and Zoning Amendment Bylaws be withheld until:

1. the applicant has obtained approval from the Agricultural Land Commission for any proposed non-farm use of those portions of the subject property within the Agricultural Land Reserve, any non-farm use of private roads in the ALR, and road construction in the ALR if applicable; and,
2. the applicant has registered a covenant against the title of the property legally described as The Fractional N 1/2 of Sec 36, Twp 14, ODYD, Except Plans B826, 37599 & H823 and located at Highway 97, Electoral Area “B” that would:
    a. prohibit subdivision of the lands unless and until access to the subject property is provided by a public road other than Highway 97; and,
    b. restrict the range of uses permitted on the subject property to those which are proposed as part of the subject application or as defined by the Board of Directors.

REGIONAL DISTRICT OF NORTH OKANAGAN

Extract from the Minutes of a Meeting of the Board of Directors

Held on
Wednesday, December 14, 2022

Bylaw 2926 - Electoral Areas "B" and "C" Official Community Plan Amendment
Bylaw 2927 - Zoning Amendment
OKANAGAN GONDOLA LTD. c/o C. JAMES, DIALOG DESIGN [File No. 21-1055-B-OR]
Highway 97, Electoral Area "B"

Moved and seconded
That Official Community Plan Amendment Bylaw No. 2926 which proposes to change the Electoral Areas “B” and “C” Official Community Plan land use designation of a 100.44 ha portion of the property legally described as The Fractional N 1/2 of Sec 36, Twp 14, ODYD, Except Plans B826, 37599 & H823 and located at Highway 97, Electoral Area “B” from Large Holding to Commercial be given Second Reading; and further,

That Zoning Amendment Bylaw No. 2927 which proposes to change the zoning of a 100.44 ha portion of the property legally described as The Fractional N 1/2 of Sec 36, Twp 14, ODYD, Except Plans B826, 37599 & H823 and located at Highway 97, Electoral Area “B” from the Large Holding (L.H) zone to the Recreation Commercial (C.5) zone be given Second Reading; and further,

That a Public Hearing for Bylaw Nos. 2926 and 2927 be withheld until the Board of Directors have received:

1. a Traffic Impact Study which has been accepted by the Ministry of Transportation and Infrastructure;
2. a written response from the Okanagan Indian Band following their review of the proposal;
3. information to address water supply issues related to the proposed commercial use and wildfire protection;
4. information about how the impact of road access to mid and upper lift stations and potential reservoirs would be addressed.

CARRIED

Moved and seconded
That the Public Hearing for Bylaw Nos. 2926 and 2927 be delegated to the Electoral Area Advisory Committee under Section 231 of the Local Government Act.

CARRIED

Moved and seconded
That Final Adoption of Bylaw No. 2926 and Bylaw No. 2927 be withheld until the applicant has made suitable arrangements with the Regional District of North Okanagan to secure a 5 m wide corridor on the property for a future public trail.

CARRIED

REGIONAL DISTRICT OF NORTH OKANAGAN

BYLAW No. 2926, 2022

A bylaw to amend Electoral Areas "B" and "C" Official Community Plan Bylaw No. 2626, 2014 and amendments thereto.

WHEREAS pursuant to Section 472 [Authority to adopt a bylaw] of the *Local Government Act*, the Board of the Regional District of North Okanagan may, by Bylaw, adopt one or more official community plans;

AND WHEREAS the Board has enacted the *"Electoral Areas "B" and "C" Official Community Plan Bylaw No. 2626, 2014"* as amended to provide a statement of objectives and policies to guide decisions on planning and land use management, within the area covered by the plan;

AND WHEREAS, pursuant to Section 460 [Development approval procedures] of the *Local Government Act*, the Board must, by bylaw, define procedures under which an owner of land may apply for an amendment to an Official Community Plan and must consider every application for an amendment to the plan;

AND WHEREAS the Board has enacted the "*Regional District of North Okanagan Development Application Procedures and Administrative Fees Bylaw No. 2677, 2018"* as amended to establish procedures to amend an Official Community Plan, a Zoning Bylaw, or a Rural Land Use Bylaw, or to issue a Permit:

AND WHEREAS the Board has received an application to amend the Official Community Plan designation;

NOW THEREFORE, the Board of the Regional District of North Okanagan in an open meeting assembled, hereby **ENACTS AS FOLLOWS**:

CITATION

1. This Bylaw may be cited as **"*Electoral Areas "B" and "C" Official Community Plan Amendment Bylaw No. 2926, 2022*"**.

AMENDMENTS

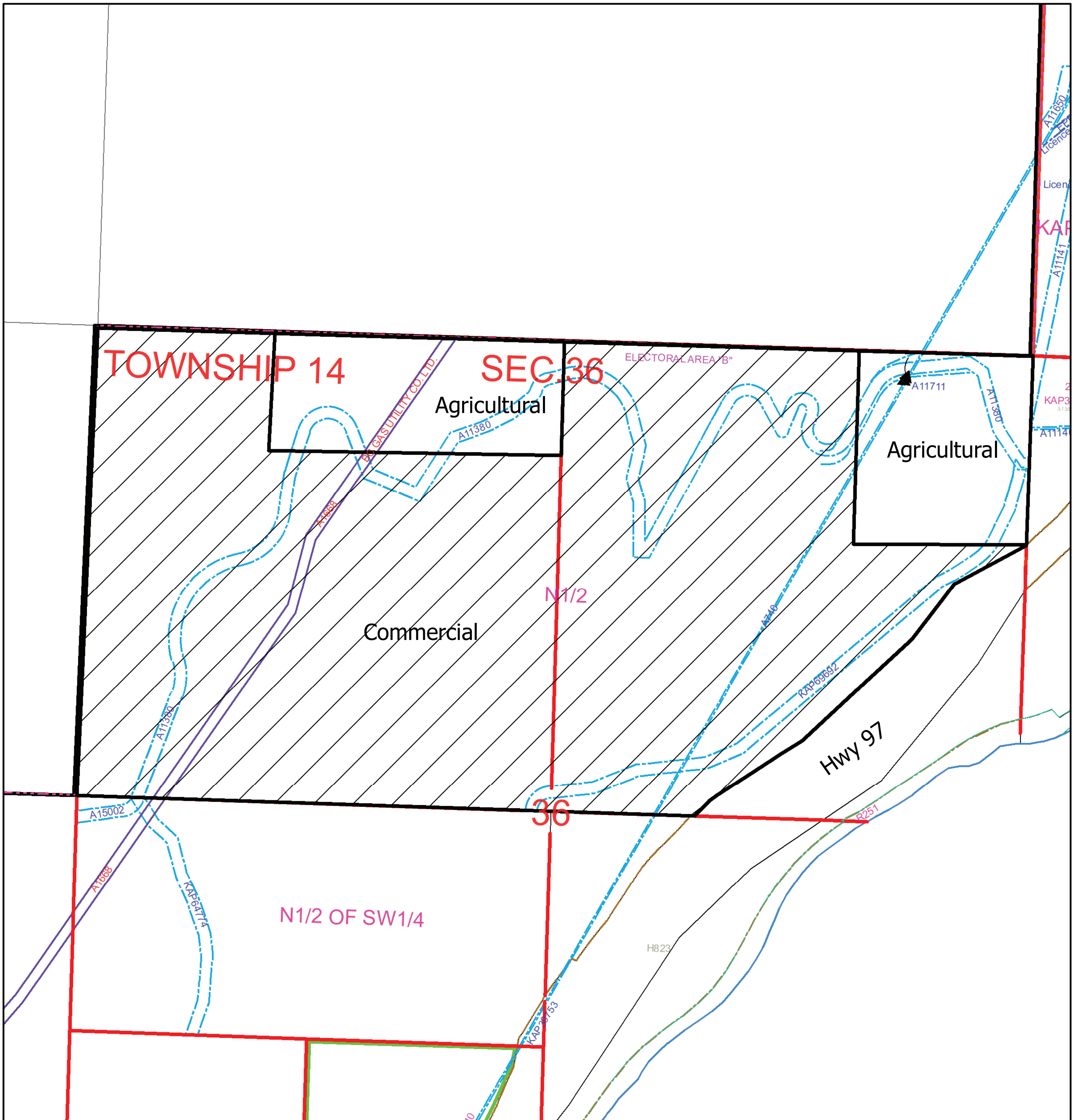
2. The Official Community Plan marked Schedule "B" attached to and forming part of the Electoral Areas "B" and "C" Official Community Plan Bylaw No. 2626, 2014 and amendments thereto is amended by changing the land use designation of a 100.44 ha portion of the property legally described as The Fractional North 1/2 of Section 36 Township 14 ODYD Except Plans B826, 37599 And H823 and located at Highway 97, Electoral Area "B" from ***Large Holding*** to ***Commercial*** as shown on the attached Schedule "A" attached to and forming part of the this Bylaw.

Read a First Time	this	20th	day of	April, 2022
Bylaw considered in conjunction with the Regional District Financial Plan and Waste Management Plan	this	20th	day of	April, 2022
Read a Second Time	this	14th	day of	December, 2022

Advertised on	this	day of	, 2023
	this	day of	, 2023
Delegated Public Hearing held	this	day of	, 2023
Read a Third Time	this	day of	, 2023
ADOPTED	this	day of	, 2023

Chair

Deputy Corporate Officer



REGIONAL DISTRICT NORTH OKANAGAN

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SCHEDULE "A" to accompany the Regional District North Okanagan Electoral Areas "B" and "C" Official Community Plan Amendment Bylaw No. 2926, 2022.

Area redesignated from Large Holding to Commercial shown as .....

I hereby certify this to be a true and correct copy of SCHEDULE "A" attached to and forming part of the Electoral Areas "B" and "C" Official Community Plan Amendment Bylaw No. 2926, 2022.

Dated at Coldstream, BC this ________ day of ____________________ , 2022

____

Corporate Officer

REGIONAL DISTRICT OF NORTH OKANAGAN

BYLAW No. 2927, 2022

A bylaw to rezone lands and amend the Zoning Map attached to the Regional District of North Okanagan Zoning Bylaw No. 1888, 2003 to change a zone designation

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WHEREAS pursuant to Section 479 [Zoning bylaws] of the *Local Government Act*, the Board of the Regional District of North Okanagan may, by Bylaw, divide the whole or part of the Regional District into zones, name each zone, establish boundaries for the zones and regulate uses within those zones;

AND WHEREAS the Board has created zones, named each zone, established boundaries for these zones and regulated uses within those zones by Bylaw No. 1888, being the *"Regional District of North Okanagan Zoning Bylaw No. 1888, 2003"* as amended;

AND WHEREAS, pursuant to Section 460 *[Development approval procedures]* of the *Local Government Act*, the Board must, by bylaw, define procedures under which an owner of land may apply for an amendment to a Zoning Bylaw and must consider every application for an amendment to the bylaw;

AND WHEREAS the Board has enacted the *"Regional District of North Okanagan Development Application Procedures and Administrative Fees Bylaw No. 2677, 2018"* as amended to establish procedures to amend an Official Community Plan, a Zoning Bylaw, or a Rural Land Use Bylaw, or to issue a Permit:

AND WHEREAS the Board has received an application to rezone property;

NOW THEREFORE, the Board of the Regional District of North Okanagan in open meeting assembled, hereby **ENACTS AS FOLLOWS**:

CITATION

1. This Bylaw may be cited as "***Zoning Amendment Bylaw No. 2927, 2022***".

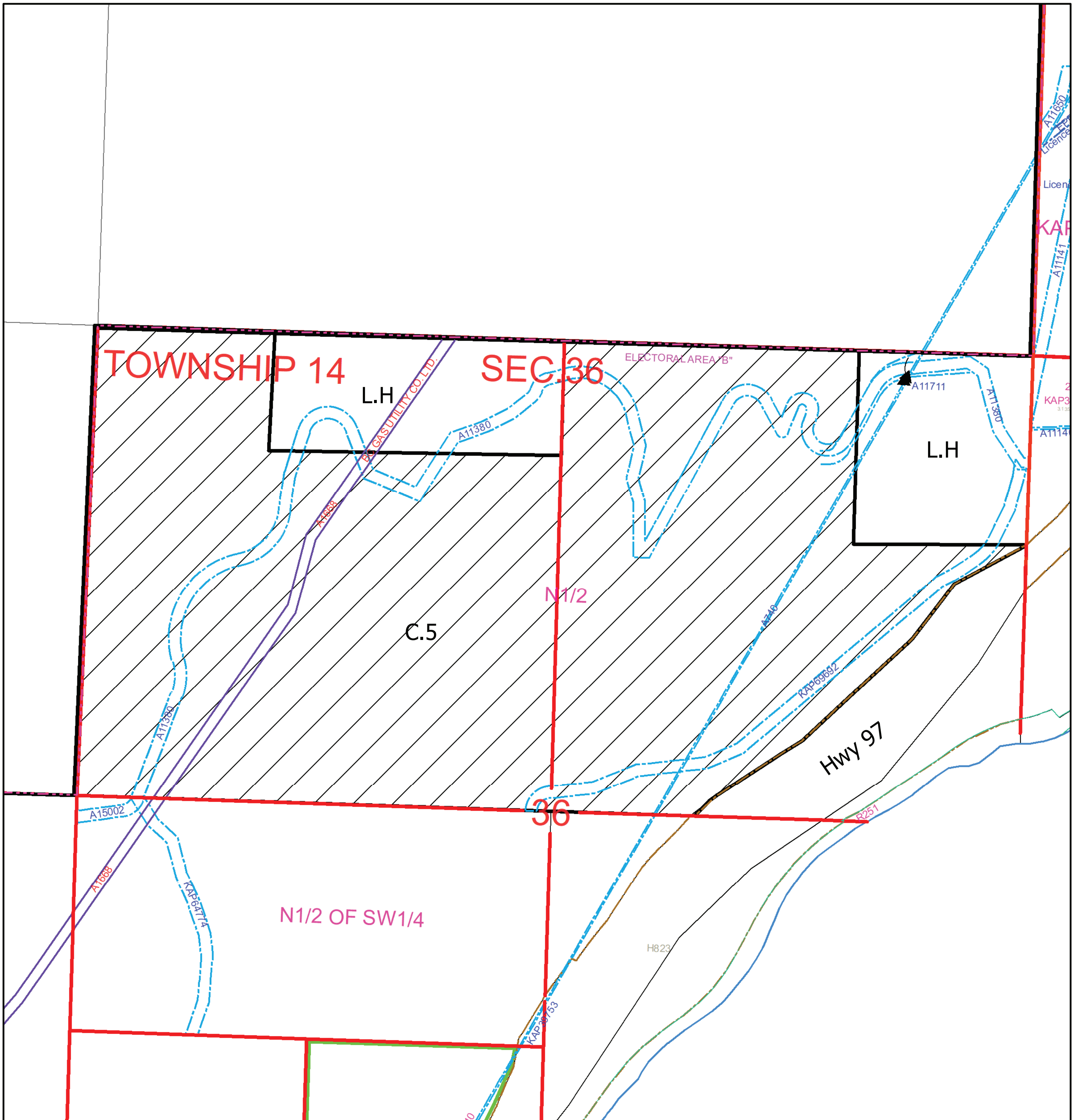
AMENDMENTS

2. The zoning of a 100.44 ha portion of the property legally described as The Fractional North 1/2 of Section 36 Township 14 ODYD Except Plans B826, 37599 And H823 and located at Highway 97, Electoral Area "B" is hereby changed on Schedule "A" of the *Regional District of North Okanagan Zoning Bylaw No. 1888, 2003* from the ***Large Holding [L.H]*** zone to the ***Recreation Commercial [C.5]*** zone as shown on the attached Schedule "A" attached to and forming part of the this Bylaw.

Read a First Time	this	20th	day of	April, 2022
Read a Second Time	this	14th	day of	December, 2022
Advertised on	this		day of	, 2023
	this		day of	, 2023
Delegated Public Hearing held	this		day of	, 2023

Read a Third Time	this	day of	, 2023
Approved by Minister of Transportation and Infrastructure *(Transportation Act s. 52(3))*	this	day of	, 2023
ADOPTED	this	day of	, 2023

Chair	Deputy Corporate Officer



REGIONAL DISTRICT NORTH OKANAGAN

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SCHEDULE "A" to accompany the Regional District North Okanagan Zoning Amendment Bylaw No. 2927, 2022.

Area rezoned from the Large Holding (L.H) zone to the Recreation Commercial (C.5) zone shown as .....

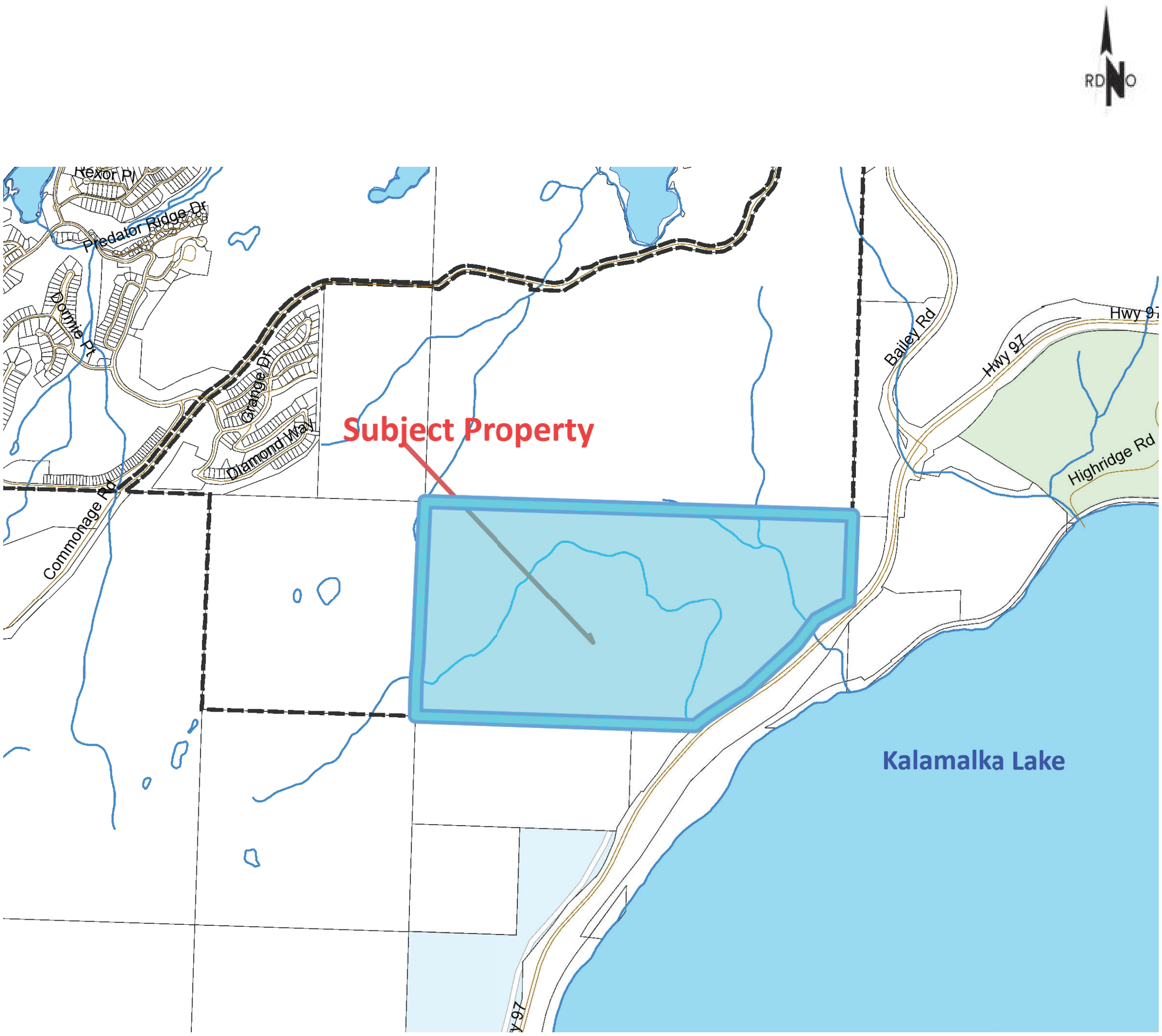
I hereby certify this to be a true and correct copy of SCHEDULE "A" attached to and forming part of theRegional District North Okanagan Zoning Amendment Bylaw No. 2927, 2022.

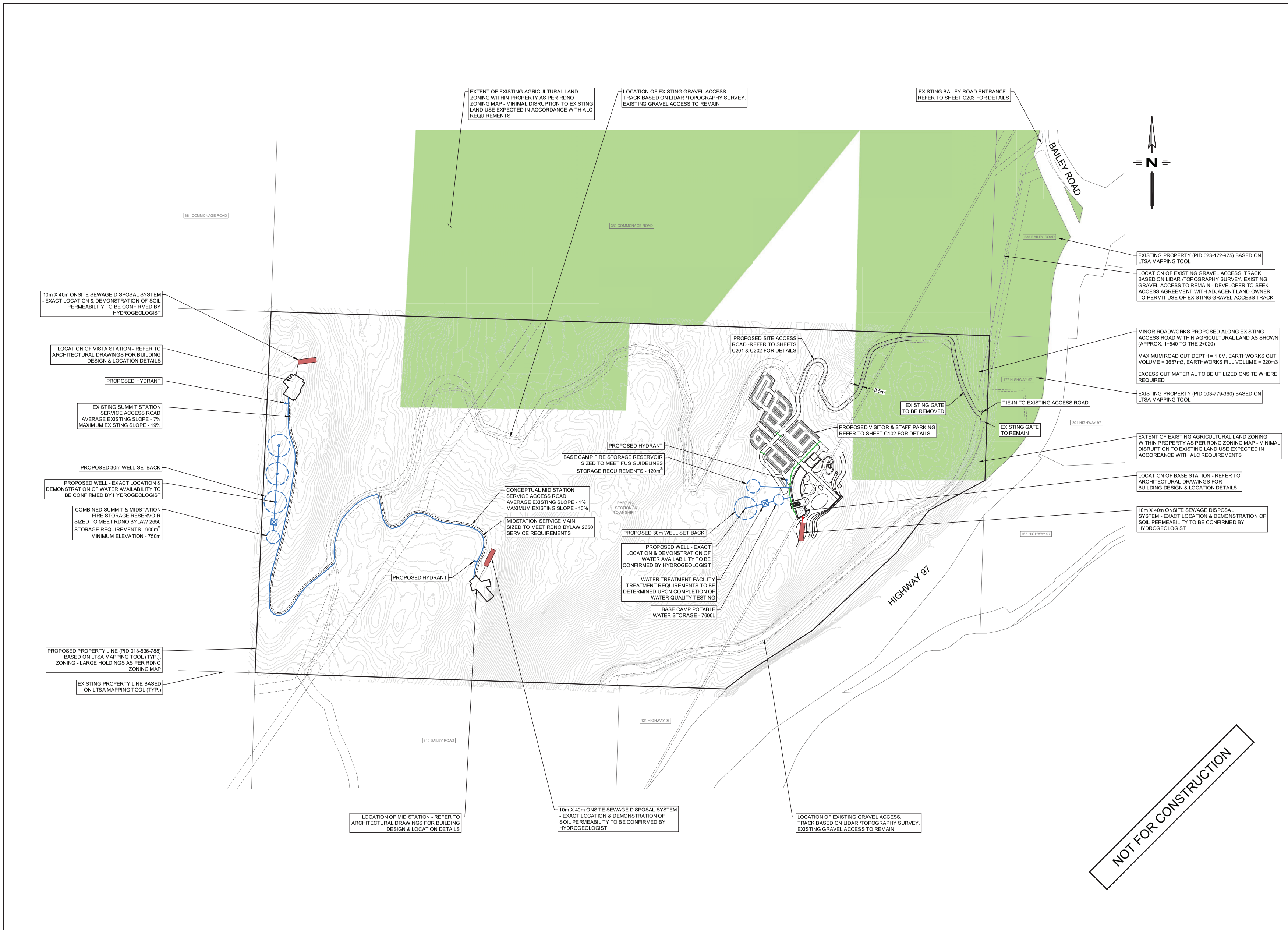
Dated at Coldstream, BC this ________ day of ___________________ , 2022

____
Corporate Officer

SUBJECT PROPERTY MAP
OCP / REZONING

File: 21-1055-B-OR
Location: Highway 97





LEGEND

HYDRO/TELEPHONE POLE
HYDRO/TELEPHONE POLE C/W DAVIT
TELEPHONE POLE
HYDRO POLE
HYDRO POLE C/W TRANS.
POST TOP STREET LIGHT
GUY
SANITARY MANHOLE
STORM MANHOLE
CATCHBASIN
FIRE HYDRANT
GATE VALVE
SANITARY SEWER
STORM SEWER
WATERMAIN
GAS
DITCH
DECIDUOUS/EVERGREEN
HEDGE

SANITARY MANHOLE
STORM MANHOLE
CATCHBASIN
GATE VALVE
FIRE HYDRANT
SANITARY SEWER
STORM SEWER
WATERMAIN
SWALE
INLET/OUTLET HEADWALL
END CAP
WHEEL CHAIR RAMP
DRIVEWAY LETDOWN

DISCLAIMER:
THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND UTILITY LOCATIONS AND REPORT ALL ERRORS AND OMISSIONS PRIOR TO COMMENCING WORK.

DRAWINGS ARE NOT TO BE SCALED

NO.	DATE YEAR/MM/DD	DESCRIPTION	BY	APP'D
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
A	2023/01/13	ISSUED FOR REVIEW	PAH	BTL

REVISIONS

DESIGN	FDS
DRAWN	PAH
DATE	2023/01/13
CHECKED	FDS

SEAL

PERMIT No.: 1001279

SCALES: 0 40 80 120 160 Meters
Horiz. 1:4000

LAWSON ENGINEERING LTD.
825C LAKESHORE DRIVE W
PO BOX 106 SALMON ARM, BC V1E 4N2
P: (250) 832-3220

Ridge North America

OKANAGAN GONDOLA
BAILEY ROAD
VERNON, BC

CONCEPTUAL WATER SERVICING PLAN

PROJECT No. 234-3

SHEET 1 OF 1

DWG. No. C101

REV. No. A

Ridge NORTH AMERICA

Suite 200, 215 Lawrence Avenue
Kelowna, BC
V1Y 6L2

June 28, 2023

Regional District of North Okanagan
9848 Aberdeen Road
Coldstream, BC V1B 2K9

Attn: Greg Routley, Jennifer Miles, Bob Flemming

Re: Okanagan Gondola Food & Beverage offering as it relates to water consumption

Hi Greg,

This letter is to express that is our intent to reduce our water usage onsite. We will exclude any comprehensive food and beverage options that require offsite water.

1) We will only provide a grab and go, food truck, farmers market style of food offering at this time.

    a. We will not offer a full-service restaurant until we can demonstrate to the Regional District of North Okanagan that we have suitable road access to the summit station water storage location that will be feasible for water truck access

    b. and/ or we have a permanent water connection to the Greater Vernon Water infrastructure

Kind regards,

Sean Wilson
Development Manager
Ridge North America

Salmon Arm Office
825C Lakeshore Drive West
PO Box 106
Salmon Arm, BC V1E

Kamloops Office
1648 Valleyview Drive
Kamloops, BC V2C 4B5

Revelstoke Office
200 Campbell Ave
Suite 200
Revelstoke, BC V0E 2S0

MEMORANDUM

Thursday, June 22, 2023

TO: Rav Soomal, Vice President of Operations, Ridge North America
FROM: David Sonmor, P.Eng, Civil Engineer, Lawson Engineering Ltd.

SUBJECT: Access road to upper gondola site

Dear Mr. Rav Soomal,

At the request of Mr. Sean Wilson, Lawson Engineering (LEL) have produced the following memo meant to address concerns over water supply raised by the Regional District of the North Okanagan (RDNO) in the following ways:

- Demonstrate conceptual access road slopes of 10% or less for water truck access.

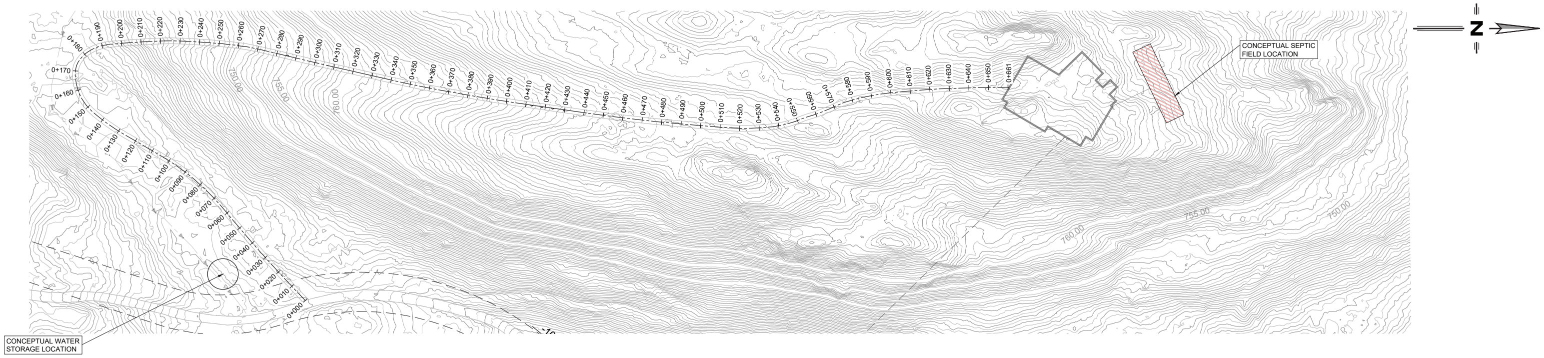
At the request of Mr. Sean Wilson and Mr. Rav Soomal, LEL have performed a conceptual access road center line profile for the proposed upper gondola station that has been attached to this memo.
Based on this conceptual review, it is in LEL's opinion that, maintaining access to the upper gondola site with road centerline slopes of 10% or less and centerline cut/fill depths ranging up to 7.0 m is feasible. LEL note that further design efforts as well as geotechnical review will be required at future design phases and that the attached center line profiles are meant to be for demonstration purposes only and do not constitute a finalized design alignment. During detailed design it is suggested that areas of cut and fill exceeding 3m be reviewed in order to reduce grading requirements. LEL note that a geotechnical assessment will be required prior to detailed design of the upper access road in order to determine maximum allowable cut/fill slopes. In the event that upon Geotech review, the conceptual cut/fill requirements are deemed infeasible, LEL have included a conceptual water storage location adjacent to the main access road. water from this storage unit would be pumped to the summit station by way of piped conveyance located within the extents of the conceptual summit station access road with pump sizing and pipe layout to be determined at the detailed design phase.

We trust that this memorandum adequately addresses any questions raised by the district as they relate to the water demands of the proposed development. If you have any other questions or concerns please feel free to contact the undersigned at your earliest convenience.
Best Regards,

Lawson Engineering Ltd.
Permit Number: 1001279

Prepared by:

David Sonmor, P.Eng.
Project Engineer
dsonmor@lawsonengineering.ca



LEGEND

- HYDRO/TELEPHONE POLE
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- TELEPHONE POLE
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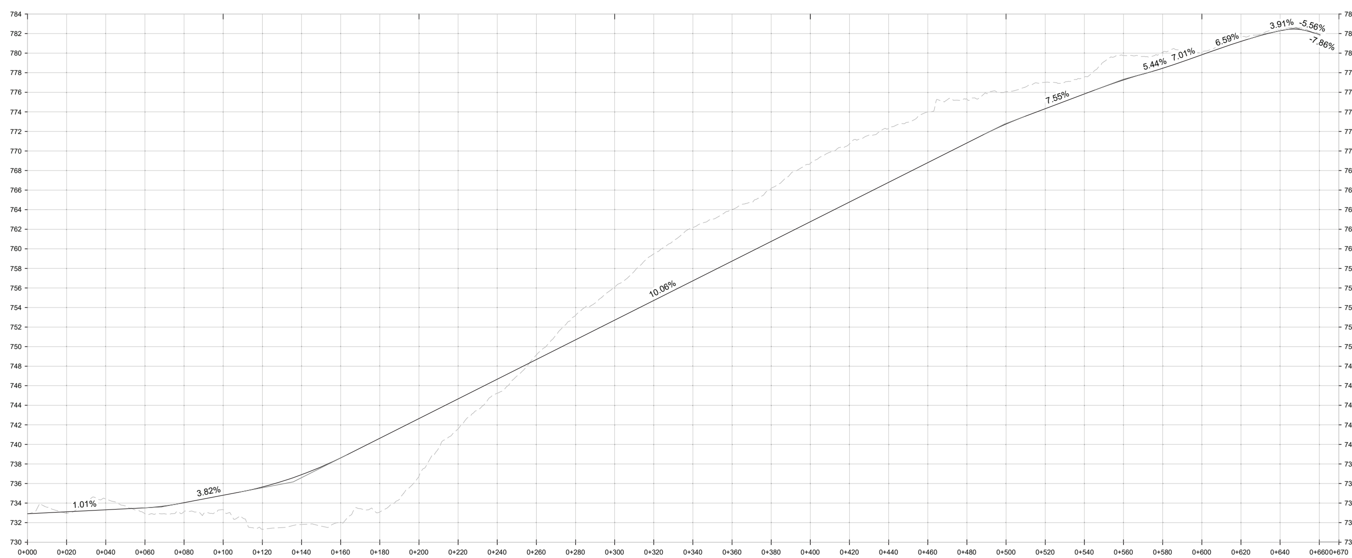

NOT FOR CONSTRUCTION

DISCLAIMER:
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DRAWINGS ARE NOT TO BE SCALED

NO.	DATE YEAR/MM/DD	DESCRIPTION	BY	APP'D
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A	2023/06/19	ISSUED FOR DISCUSSION	JJN	FDS

REVISIONS

DRAFT (ISSUED FOR DISCUSSION)

SEAL

DESIGN	FDS
DRAWN	JJN
DATE	2023/06/19
CHECKED	FDS

PERMIT No.: 1001279

SCALES: 0 1250 2500 3750 5000 Meters
Horiz. 1:1250

LAWSON ENGINEERING LTD.
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PO BOX 106 SALMON ARM, BC V1E 4N2
P: (250) 832-3220

Ridge North America

OKANAGAN GONDOLA
BAILEY ROAD
VERNON, BC

SERVICE ROAD
ACCESS FEASIBILITY
PLAN/PROFILE

PROJECT No. 234-3

SHEET 1 OF 1

DWG. No. C101

REV. No. A

PLOT June 22, 2023 COMPUTER-1-Z:\PROJECTS\2341\3 - OKANAGAN GONDOLA\1 - CIVIL ENGINEERING\DRAWINGS\1 - DESIGN\234-3 - OKANAGAN GONDOLA - PRELIM ROAD PROPOSALS.DWG (XREF-DWG-NAMES)

Okanagan Gondola Wildfire Mitigation Strategy

April 1, 2023

Prepared for:

Okanagan Gondola Ltd.
3701 Finch Road
Kelowna, BC
V4N 1N4

Prepared by:

John Davies, RPF
Senior Wildland Fire Specialist
Forsite Consultants Ltd.
330 – 42nd Street SW
PO Box 2079
Salmon Arm, BC, V1E 4R1
(Contact Email)
250-540-3473

FORSITE
Forest Management Specialists

FORSITE
Forest Management Specialists

4/1/2023

Okanagan Gondola Ltd

3701 Finch Rd

Kelowna, BC

V4N 1N4

Subject: Okanagan Gondola Wildfire Mitigation Strategy

Dear Sean Wilson:

I am pleased to submit this report as requested that outlines wildfire risk mitigation strategies for your development south of Vernon, BC.

The objective of this report is to provide an overview of mitigation strategies that can be implemented during the design, planning and implementation of your project, as well as post development through time, that should result in a lower level of wildfire risk than without these strategies. A second phase with more prescriptive forest fuel management treatments can be developed, and implemented, once building and structural footprints are located on the ground.

The recommendations within this report are national or international standards, scientifically sound and have proven effective during wildfire response operations to reduce structural ignition potential, fire rate of spread, or fire behaviour intensity.

After submission of this report to you for review, I am encouraged to hear you are fully committed to the implementation of the provided recommendations. Doing so will not only risk reduce your development but also provide an excellent model on FireSmart development and for public education on wildfire prevention.

If you have any questions regarding this report or our recommendations, please do not hesitate to contact John Davies, RPF at 250-540-3473 or jdavies@forsite.ca.

Yours truly,

John Davies, RPF #4267
Sr Wildland Fire Specialist

Forsite Consultants Ltd.

Contents

List of Figures

1 Executive Summary

The development of a Gondola tourist attraction is being proposed on the development site. This will consist of a main entrance building, and potentially two other facilities at mid station and the summit station. The site on which these values will be located is located within ecosystems where wildfire is a natural occurrence. The introduction of values within these ecosystems will introduce wildfire risk.

FireSmart is a nationally recognized wildfire risk reduction program that has been in existence for decades. It provided guidelines for developing buildings and developments that can minimize the impacts of wildfire on structural values. The program focusses on the use of non-combustible or fire-resistant external building materials, building design that reduces the opportunity for ember ignition, landscaping that does not support combustion in proximity of structures and the manipulation of natural fuels such that only low intensity wildfire can exist where treatments occur.

Several recommendations, with follow up actions, are being made pre-development that will contribute to the creation of risk reduced development. They are summarized below.

Recommendation #1

- Follow FireSmart guidelines and principles as they pertain to building construction (design and materials), landscaping design and materials. Ensure ongoing and seasonal maintenance of building in an ignition resistant state.

Follow Up Action #1

- A review of building and landscaping design should be completed by a wildland fire professional or Local FireSmart Representative to ensure FireSmart guidelines have been incorporated.
- Develop an ongoing seasonal maintenance program/checklist to ensure buildings and interface zones are maintained in a non-combustible or low fuel state.
- Post construction, conduct a home assessment on the finished buildings.

Recommendation #2

- Follow FireSmart guidelines and principles as they pertain to the first three Ignition Zones (up to 30m from buildings/structures). Ensure ongoing and seasonal maintenance of building in a fire-resistant state as described in FireSmart.

Follow Up Action #2

- A review of landscaping design within the first three Ignition Zones should be completed by a wildland fire professional or Local FireSmart Representative to ensure they are being developed according to the FireSmart guidelines for these zones.
- Develop an ongoing seasonal maintenance program/checklist to ensure buildings and interface zones are maintained in a non-combustible or low fuel state.
- Post construction, conduct a home assessment on the zones to ensure they meet FireSmart guidelines.

Recommendation #3

- Complete and implement a professionally signed/sealed fuel management prescription for all Zone 3 locations around buildings/structures as deemed necessary by a wildland fire professional to create a zone that will only support a low intensity wildfire.

Follow Up Action #3

- Prior to development, create a fuel management prescription that will recommend treatment of Zone 3 such that stand, and surface fuels are altered to only allow for a low intensity surface fire.
- Implement the prescription concurrent/prior to development and have the final condition signed off as complete by the prescribing forester.
- Post treatment, conduct a threat assessment form to demonstrate the reduced hazard.

Recommendation #4

- Develop a wildfire response plan that provides guidance to staff on how to respond in the event of an ignition and fire on site.

Follow Up Action #4

- Upon completion of a response plan, ensure staff are trained to implement the plan and that all equipment is appropriately located and tested prior to the fire season.

2 Statement of Qualifications

The opinions and discussion contained in the enclosed report are based on my accumulated experience in wildland fire management in Western Canada since 1993. My education includes a Bachelor of Science in Forestry (BSF) specialising in Resource Management. I have been a Registered Professional Forester in good standing with the Forest Professionals of BC (FPBC) since 2004.

My work and professional experience related to wildfire preparedness, prevention, operations, and management includes:

- Ten years with the BC Wildfire Service with the Rapattack program, six years on the fireline as a fire fighter and four years as Helicopter Operations Technician (air attack).
- Twenty years self employed as a wildfire management consultant (Davies Wildfire Management & Frontline Operations Group) focused on all aspects of wildland fire management: community wildfire risk reduction, fuel hazard abatement, prescribed burning, suppression training, construction site wildfire risk reduction planning and training, as well as international work in providing a heli-tack training course and a fire preparedness and prevention project in Sumatra, Indonesia for a major forest products firm;
- Fifteen years providing contract fire fighting crews to the BC Wildfire Service (BCWS), accumulating 25 years of working on the fireline.
- Sessional instructor since 2021 for BC Institute of Technology for their 'Role of Fire in the Ecosystem (Faculty of Ecological Restoration).
- Co-author for the initial provincial standard system for assessing wildfire threat in the Wildland-Urban Interface (WUI) in 2008 and the subsequent update in 2012.
- Current member of the Joint Working Group FPBC and BCWS Community of Practice for Wildland Fire and Fuel Management.
- Lead author and signing professional of more than 10 Community Wildfire Protection Plans (CWPP).
- facilitation of over 12 FireSmart Community Recognition projects as a trained Local FireSmart Representative.
- Frequent presenter and speaker at wildland fire management and FireSmart conferences.

3 Introduction to Wildfire & Mitigation Measures

To understand how the recommendations in this report will help mitigate wildfire risk to the proposed development, and to the adjacent lands, it is important to understand the fire ecology of the local ecosystems, the fundamentals of fire behaviour and how well-planned treatments can both promote the natural state of the ecosystems while modifying fire behaviour and the associated wildfire risk.

3.1 WILDFIRE ECOLOGY

The forested and grassland ecosystems of the Okanagan Valley evolved with wildfire as the primary natural disturbance factor (Bunnel, 1995). The occurrence of wildfire is part of the successional path of these ecosystems and, in some ecosystems, essential to forest regeneration. Wildfire as part of the historic disturbance regime provided heterogeneity in composition and successional states across forested ecosystems, playing a role in maintaining ecosystem function and providing variety in habitat to meet the needs of various wildlife species (Klenner et al., 2008).

Wildfire in these ecosystems has historically occurred through two sources: natural and anthropogenic. The Okanagan Valley lies solidly within a well-established lightning belt, has a climate that produces environmental conditions that support both the ignition of wildfires and, when appropriate, the large scale and rapid spread of these wildfires. Typically lightning caused wildfires are unpredictable: they may not occur for many years, or decades (sometimes longer), might only spread on a small scale due to environmental or fuel conditions, could occur anywhere and may burn erratically and, by current social definitions, be catastrophic in their impact (Wierzchowski et al., 2002).

Anthropogenic fires, ignited by First Nations peoples, have been occurring in the Okanagan Valley since time immemorial; such a timeline that these fires should be considered part of the natural development of the ecosystems (Black et al., 2005). Intentional ignitions would have been strategic in their intended desires and outcomes: primarily the improvement of habitat, browse resources for important game species, and plant health. Through consistent burning for habitat enhancement and creation, First Nations would have maintained and changed vast areas of the Okanagan Valley with their ongoing use of fire (Black et al., 2005; Blackstock & McAllister, 2004). They also would have created or enhanced resilience of stands to absorb wildfire, further shaping the Okanagan valley ecosystems.

Broadly speaking, the Okanagan forested ecosystems can be stratified into two main ecological categories regarding the role played by wildfire: stand replacing and stand maintaining.

Lower elevation ecosystems dominated primarily by Ponderosa Pine (PP) and Interior Douglas-fir (IDF) zones) would be classified as being maintained by wildfire. Grasslands would also fall into this category. The upper elevation zones of Engelmann Spruce-Subalpine fir (ESSF) and Montane Spruce (MS) would fall into the stand replacing category.

PP and IDF zones would historically experience low intensity and frequent wildfire. The low intensity would have been a resultant effect of the frequency (and, therefore, low fuel loads) and the frequency a result of the warm, dry weather conducive to frequent ignitions and spread, as well as the burning of First Nations for habitat and sustenance. Frequent burning would keep surface fuel loading low, remove conifer regeneration that contributed to the spread of a surface fire to the crowns of the trees, and, therefore, the density of large overstory stems that existed on the landscape. The effect would be well spaced, low density stands that could only support low intensity surface fire (Bunnell, 1995).

As such, these ecosystems had both a high resilience to fire, and adaptations that required fire disturbance. The tree species generally found within these ecosystems (Ponderosa pine [*Pinus ponderosa*], Lodgepole pine [*Pinus contorta var. latifolia*], and Douglas fir [*Pseudotsuga menziesii*]) have thick barked fire-resistant stems with high crowns and cones that require high heat to release their seeds (serotinous cones). They co-evolved with low intensity fires as a regular disturbance, and in some cases require them to fulfill their life cycle (Swift & Ran, 2012).

Conversely, the upper elevations, being cooler and wetter would only infrequently experience conditions conducive to ignition and were likely burned less often by First Nations due to their location. These infrequent wildfire starts, and less anthropogenic burning would allow for significant fuel build up between wildfires. This higher fuel loading would assist the spread of wildfire and the potential for high intensity and large-scale stand destroying wildfires. This evolutionary history resulted in homogenous forest communities, with large areas (hundreds of hectares or more) of stands with similar ages and species composition (Swift & Ran, 2012).

The tree species within this zone are typically of a form that retains its lower branches and has narrow, dense canopies. This form aids the spread of a fire both vertically (from the ground to the crown) and horizontally (through the canopy) and, therefore, can promote the complete removal of the canopy and, usually, mortality of the whole stand. Such high intensity fires create post fire conditions that are open with minimal to no vegetative competition that again favours regeneration of a very dense stand; perpetuating development of wildfire prone stands (Swift & Ran, 2012).

The images below show a stand, similar to a valley bottom stand in the Okanagan, suffering the impacts of fire exclusion. Due to the absence of fire, conifer regeneration establishes and grows to eventually infill between the veteran trees. This process transitions a once patchy, open to moderately open stand with no to low fuel continuity to a dense stand with vertical and horizontal fuel continuity.

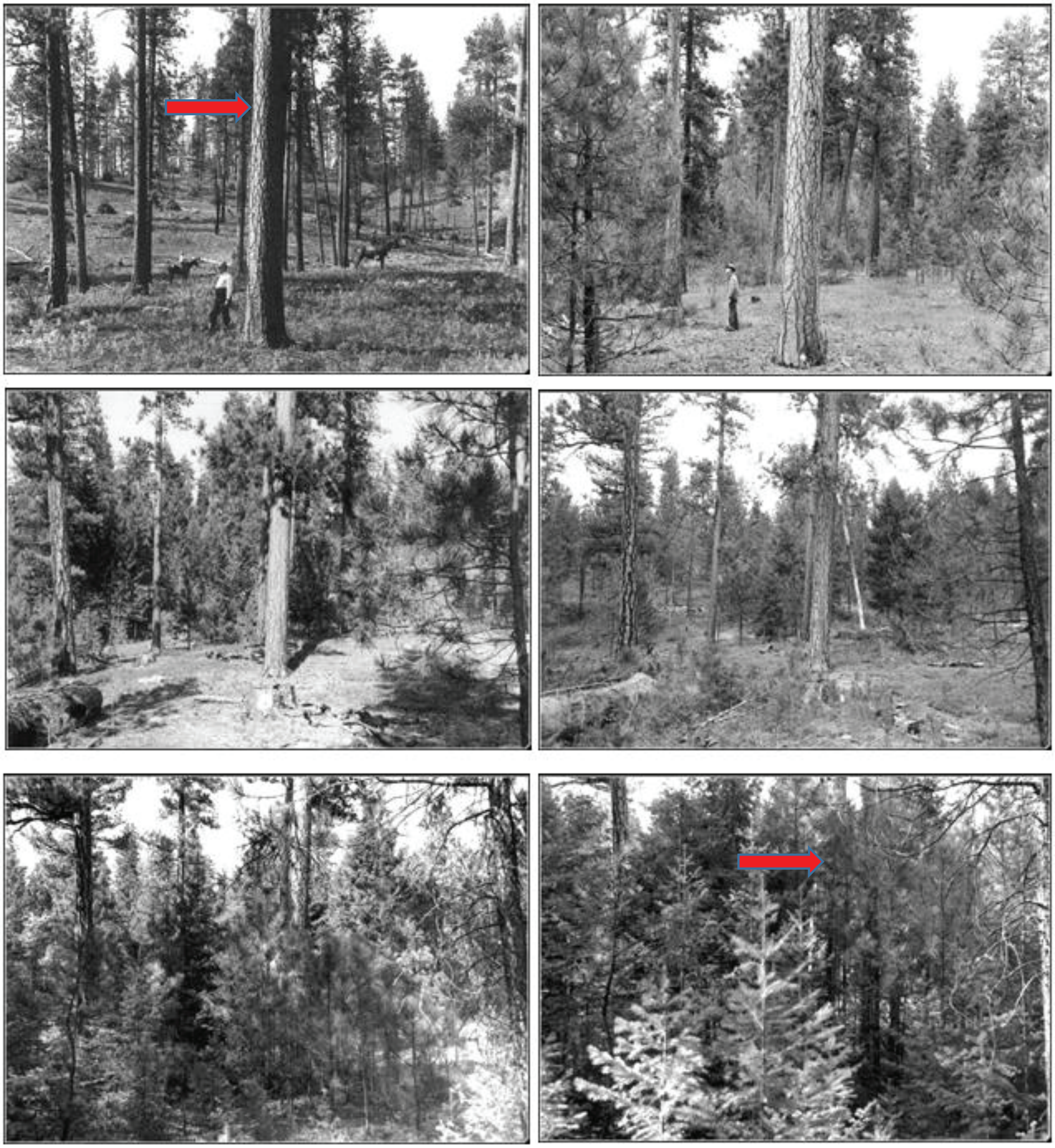

Figure 1. Historical photos showing stand densification due to fire absence.

The fire suppression and ingrowth associated with the above process results in a transition from a low to moderately intense surface fires to extremely intense and difficult to control crown fires, illustrated below. It is these intense and out of control crown fires that typically pose the biggest risk to communities and infrastructure.

Figure 2. A low intensity surface fire typical of discontinuous fuels in an open stand as compared to a crown fire associated with dense, continuous fuels resulting from fire exclusion. Photos by Frontline Operations.

3.2 WILDFIRE RISK

Risk is generally and broadly defined as Probability x Consequence (Perseus, 2021; Scott et al., 2013). It follows that we can only have a consequence to a fire if we have something that will be negatively impacted by the occurrence of that fire, generally something of value to society, the economy, or the ecosystem. Usually these values are structural, such as homes, facilities or other buildings or structures upon which the community or government relies. However, there are also other values that are not structural to which wildfire poses a risk:

- Cultural values associated with First Nation history and current use.
- Biological and natural values (habitat, sensitive ecosystems, water, etc.)
- Recreational and visual values (trails, campsites, views, etc.)

When a wildfire can negatively impact something upon which we place a value, a wildfire risk exists. This risk can increase if the value is in a state or condition where the probably of such a fire occurring is high. The impact of a wildfire and the likelihood of it occurring are what result in the level of wildfire risk in that location. Obviously, this risk can vary through space and time as environmental and anthropogenic conditions change over time or are altered by human intervention.

3.3 FIRE BEHAVIOUR

Wildland fire behavior is influenced by the interaction of three factors: fuel, weather, and topography. Collectively, these factors contribute to the intensity and rate of spread of a wildfire.

3.3.1 Wildfire Fuels

Wildfire fuel refers to any organic biomass involved in combustion and are often described in terms of size – *fine fuels* and *coarse fuels*. Fine fuels are classified as any organic, structured debris less than 7 cm in diameter. Organic material > 7 cm in diameter are considered coarse fuels and these are usually woody materials. Fine fuels ignite more easily and spread fire faster than coarser fuels (like kindling in a campfire) but usually have a quick burn out rate. Fine fuels, due to their size, are very susceptible to environmental changes (e.g., relative humidity, wind, precipitation, etc.) and this affects their availability for ignition and combustion. Coarse fuels are more difficult to ignite, burn at slower rates for longer durations but can sustain intense fires. Given their size, only the outer perimeter is affected by the immediate weather conditions. However, over time, these large pieces dry out and season and become wholly available for combustion. For any given fuel, the more that exists, the more continuous it is, and the drier it is, the higher the intensity the fire it will support (BC Wildfire Service, 2020).

Wildfire fuels are arranged in to four broad layers of the fuel complex – ground, surface, ladder, and crown (or aerial) fuels. These fuel layers are shown in the diagram below.

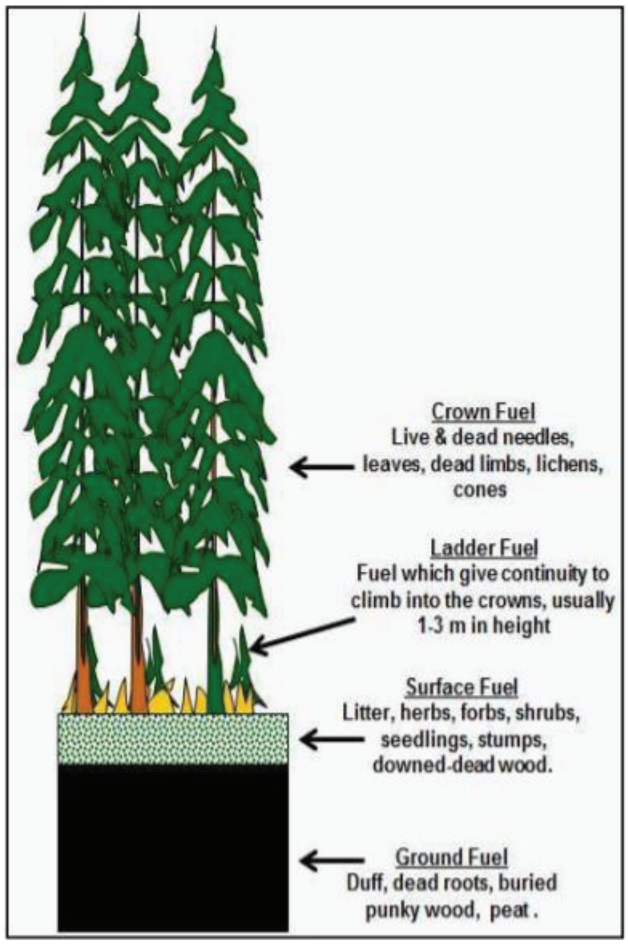

Figure 3. Fuel layer diagram, from (BC Wildfire Service, 2020).

Ground fuels are contained within the duff layer, the decomposing, non-discernable organic layer between the surface litter and the soil mineral horizon. These fuels are usually non-discernable, have no structure, sustain a slow rate of combustion, but can burn through time with minimal oxygen.

The surface fuel layer is all organic fuel above the duff layer, the material you would walk on or over, and is sometimes considered to extend 2m above the surface. Surface fuels have structure and are discernable in their origin (leaves, needles, twigs, cones, etc.) and includes flammable low-lying shrubs and small trees. These shrubs and small trees, as well as the lower branches of larger trees, may act as *ladder fuels* that can carry fire from the surface fuel layer into the canopy layer. Surface fuels can support low intensity to extreme intensity fires, depending on fuel loading and moisture content.

Crown fuels are the portions of trees that form the overhead canopy of the stand. They can produce the highest-ranking intensity of fires, contribute to long distance fire spread (spotting), and are difficult, dangerous, and costly to suppress. These fires are dependent on the combination of foliar moisture content, adequate horizontal canopy fuel continuity and loading, and support from surface fire intensity beneath for growth and spread.

3.3.2 Fire Weather

Wildfire behaviour is dependent on four weather conditions: temperature, precipitation, wind, and relative humidity. All these components affect fuel moisture content, which in turn dictates fuel availability for ignition and combustion, and potential fire behaviour. The quick summary below indicates how each weather component individually affects fire behaviour.

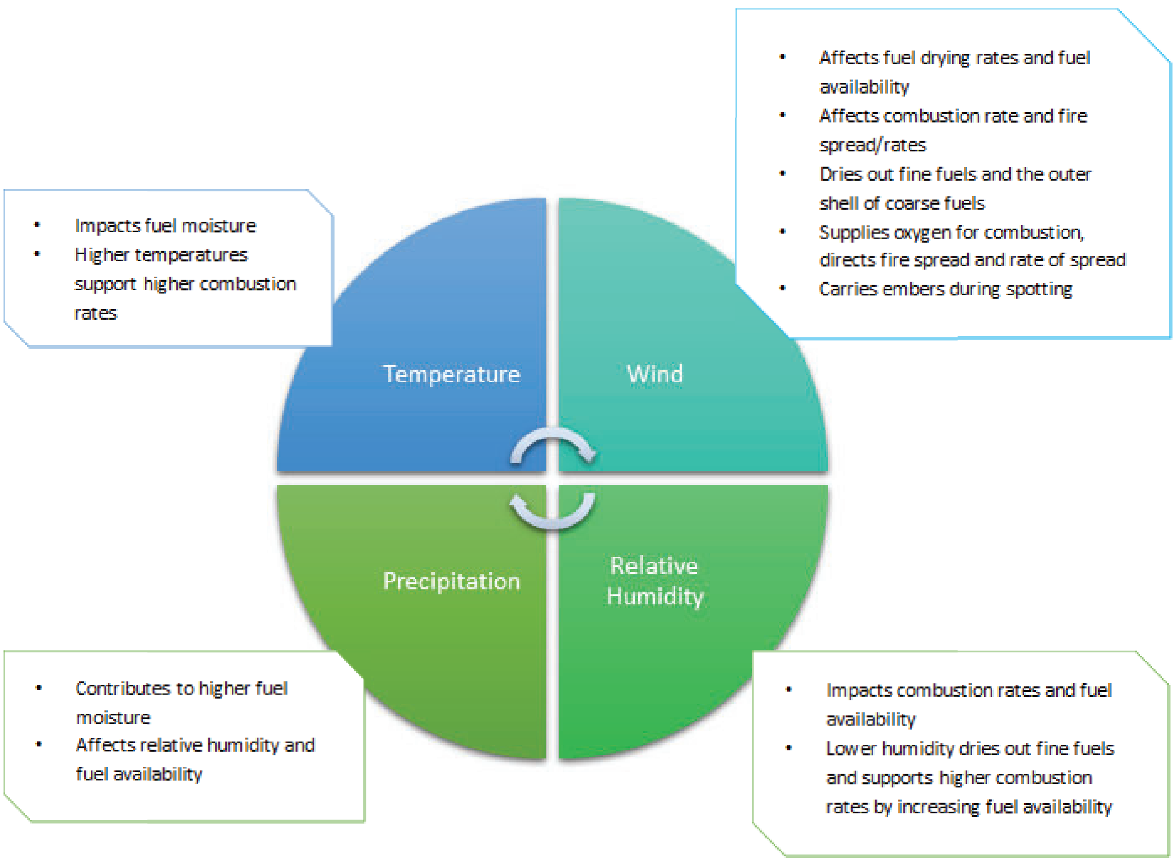

Figure 4. Fire weather condition impact summary.

How these weather attributes interact to drive fire behaviour is illustrated in the diagram below, from Natural Resources Canada (2021).

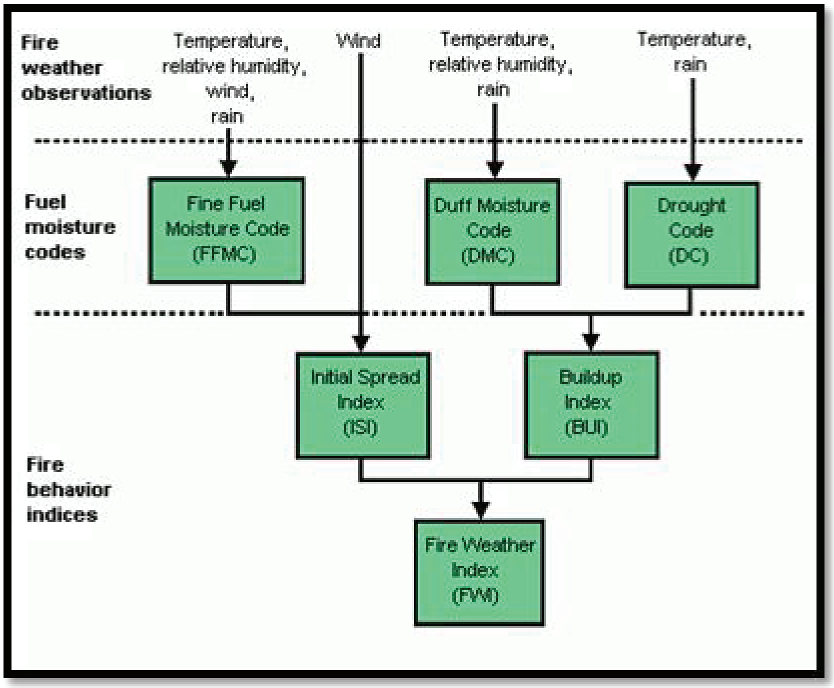

Figure 5. Data inputs to model fire behaviour indices.

Fuel moisture codes provide a rating on the moisture content of each input, where the fine fuel moisture code relates to litter and other cured codes and relates to ease of ignition and flammability of fine fuels. The duff moisture code relates to moisture content of loosely compacted organic layers, relating to fuel consumption in moderate duff layers and medium woody materials. The drought code relates to moisture content of deeper, compact organic layers, indicating seasonal drought effects on forested fuels and indicating the amount of smouldering in deep duff layers and larger logs (NRCAN, 2021).

The initial spread index provides an indication of the expected rate of fire spread and is based on wind speed and fine fuel moisture code inputs. The buildup index is a rating of total fuel available for combustion and is based on both the duff moisture code and the drought code. The overall fire weather index is a rating of fire intensity, providing a general index of fire danger based on the numeric output (NRCAN, 2021).

The Fire Weather Index output is an estimation of potential fire intensity. Therefore, the more extreme the weather inputs (high temperatures and wind, low precipitation, and relative humidity), the more extreme the outputs (i.e., more intense fires). It stands to reason than that, where these extreme weather conditions can exist (such as the Okanagan) and when the materialize seasonally, the higher the probability of intense fires, fuel loading permitting.

3.3.3 Topography

The elements of topography that impact fire behaviour are slope, aspect, elevation, and shape as per the following summary (Hirsch, 1996):

- Slope: steeper slopes contribute to higher rates of spread due to pre-heating of fuels.

- Aspect: south and western slopes receive diurnal and season sunlight sooner, and dry out quicker in the day/season, than northern/eastern slopes and, as such, fuel availability is affected.
- Elevation: lower slopes dry out sooner in the day and season and stay so longer and have higher temperatures than higher elevations, which also contributes to fuel availability.
- Shape: draws, saddles, ridges, and mountain tops affect fire rate of spread and direction.

3.4 WILDFIRE RISK MITIGATION

3.4.1 Fuel Management

Wildfire behaviour is the result of three main components – weather, topography, and fuel. Fuel management alters the fuel component, which is arguably the easiest to manipulate through human involvement. Fuel management consists of altering the structure, species, and composition, of forest fuels such that there are less fuels available for combustion and, subsequently, less intense fire behaviour. Much as you would remove fuel from a campfire to make it less intense, fuel management targets the reduction of fuel loading in three layers to reduce fire intensity.

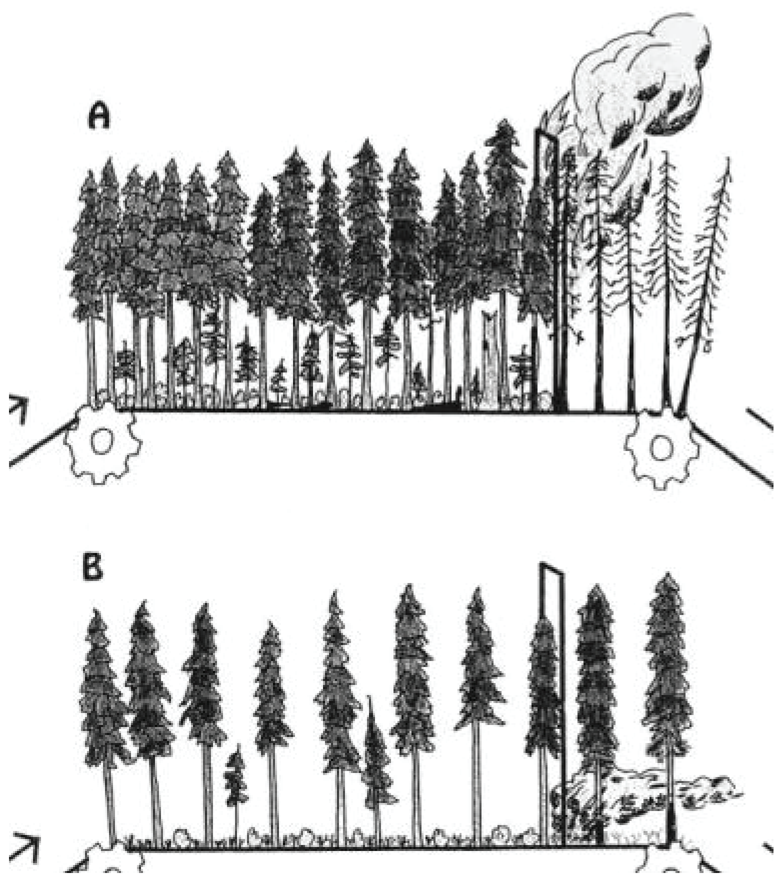

Figure 6. Illustration of fuel management alterations to a forested stand, and subsequent impacts on fire behaviour. Adapted from Agee et al., 2000.

Treatments can involve the following techniques for addressing the fuel loading in these layers:

Surface Fuels

- Fuels are usually reduced through either burning or complete removal from the site. They can also be made less of a hazard through altering their structure by masticating, chipping or mulching and spreading them on site such that they are more compressed, don't dry out as quickly and decompose sooner.

Ladder Fuels

- Reduced or removed manually or mechanically from the lower part of the tree (or by the brushing of vegetation) to such a height that they will not transfer a fire from the surface to crown. Once removed they become part of the surface fuel loading to be abated.

Crown Fuels

- Fuel reduction in this layer can only occur through the removal of whole trees (and their crowns) from the stand. This requires hand or mechanical falling of the stems to a certain residual density that crown fire initiation or propagation is lowered. Once felled, these stems become part of the surface fuel loading that needs to be addressed.

Any combination of addressing the fuels in these layers, or all three, should result in a lowered fuel loading and reduced intensity in associated fire behaviour. How intensely each layer is treated is dependent on the:

1. desired future ecosystem condition.
2. acceptable level of fire behaviour for the site; and,
3. the level of risk deemed acceptable or required to protect the value(s) in question (where value protection is the goal).

Fuel management can have multiple objectives and be undertaken at a range of temporal and spatial scales.

3.4.2 Treatment Scale (FireSmart vs Landscape)

FireSmart© is a national program designed to assist private landowners and local governments with the protection of residential, commercial, or industrial structural values, with the goal of reducing or eliminating the ignition potential and/or combustibility of those structures (FireSmart Canada, 2021). The program is focussed on altering attributes (forest and structure) out to 100m from the structure. As such, small scale fuel management projects that occur within 100m of structures, or the wildland-urban interface (WUI), as defined by where human values interface with natural fuels, are referred to as FireSmart projects. These projects work to protect structures from ignition, reduce fire behaviour, and provide a safe location for fire fighters. These projects are generally small in nature (couple hectares or less) but may extend for some linear distance along a perimeter interface, but only rarely extend beyond the 100m recommended FireSmart distance from structures. (FireSmart, 2003)

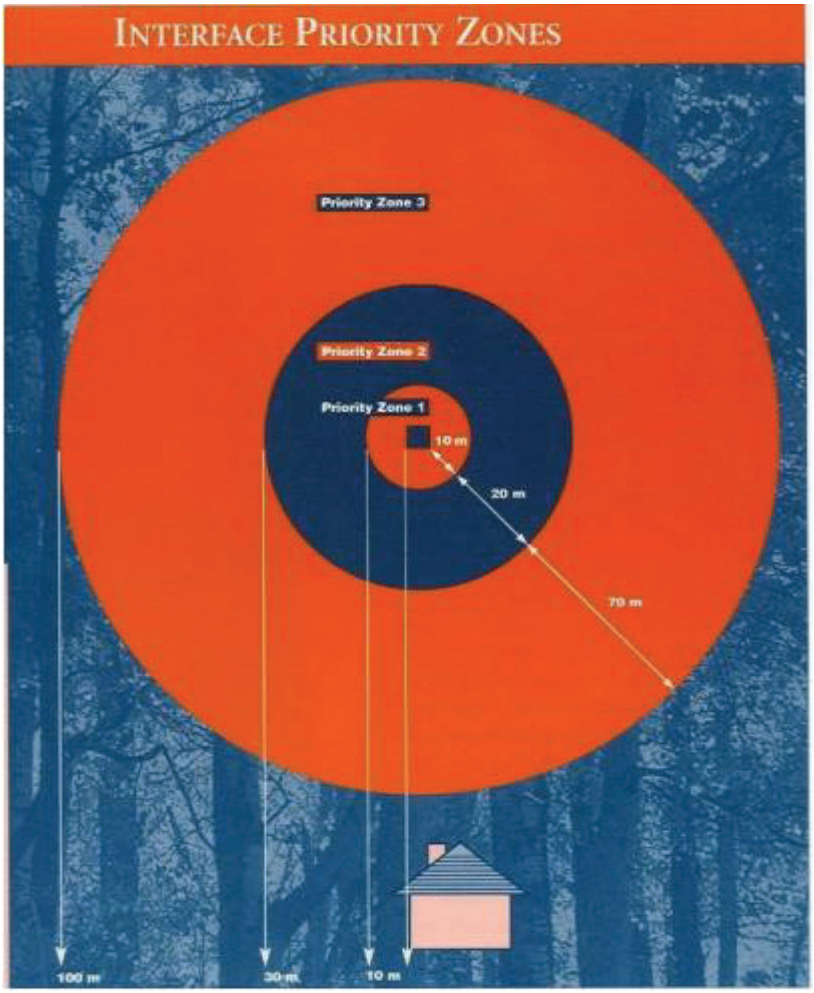

Figure 7. FireSmart Treatments are focussed from the house outwards to a distance of 100m. Adapted from Walkinshaw et al., 2012.

When fuel management activities begin to extend beyond a FireSmart distance and move towards being tens of hectares (or larger) in size, they become landscape level fuel breaks. The intention of fuel breaks is not to stop a fire, but rather to provide a safe location from which suppression tactics can be undertaken and to interrupt fire flow such that impacts are minimized (FireSmart, 2023). These breaks can vary in size, should be tailored to the landscape in which they are constructed, and will require maintenance over time (Agee et al., 2000). Such large-scale projects will require more extensive planning, field work, consultation, consideration of natural values and during implementation, the use of heavy machinery (usually logging contractors) to ensure cost effectiveness and practical application of the associated prescription. In BC, where these large-scale projects occur on unceded land crown land, they require signed and sealed professional prescriptions, and approval from the local forest district to allow for timber to be harvested or otherwise destroyed.

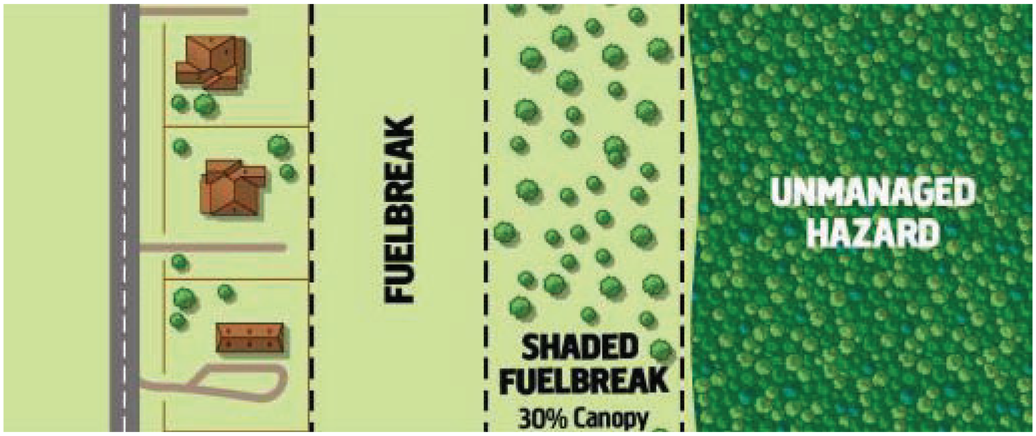

Figure 8. Schematic of a landscape level fuel break consisting of complete fuel removal ('fuel break') and partial removal ('shaded fuelbreak'). From Tasmania Fire Service (2016).

3.5 LANDSCAPE LEVEL SHADED FUEL BREAKS

3.5.1 Objectives

As discussed, these ecosystems developed with wildfire as a key ecological disturbance and a part of the ecosystem (Daust & Price, 2013). With the introduction of forest management policies and procedures focussed on timber production, alongside the implementation of fire suppression and repression of First Nation traditional burning, our landscapes have undergone a change from fire resilient forests – heterogenous, uneven-aged, well spaced, patchy, and open – to dense, non-resilient forests. The issue, summarized as too much fuel on the landscape, has led to a rapid growth in the frequency and intensity of wildfires in much of BC and certainly in the Okanagan.

Landscape level shaded fuel breaks, where some level of canopy cover is retained, (hereafter simply referred to as fuel break) target the reduction in volume and continuity of forest stands at a significant enough spatial scale such to reduce wildfires from being aggressive, high-intensity crown and surface fires to manageable, low-intensity surface fires within the treated area (Mooney, 2007). Landscape level fuel breaks utilize the same three main strategies as smaller scale fuel management projects:

1. reduce crown fuel density,
2. remove of ladder fuels; and,
3. decrease in surface fuels.

3.5.2 Descriptions

The reduction of all three fuel components (crown fuel density, ladder fuels, and surface fuels) can have significant impacts on wildfire intensity and scale. When crown fires burn into these treated areas the reduced crown fuel density causes the fire to dop from the overhead canopy into the surface fuel layer. This greatly reduces the danger and difficulty of suppression as crown fires are the most intense, can only be actioned by aircraft and can contribute to ember showers that ignite spot fires beyond the head of the fire, potentially into communities. Once the fire has become a surface fire, it is reliant on fuels upon the ground to spread. Through surface fuel abatement, less fuel is available and the fire intensity if further reduced. This change in fire type (crown to surface) and reduction in intensity is what fire service professionals rely on to be able to successful suppress and/or control a wildfire (Agee et al., 2000; Mooney, 2007).

The images below show several examples of shaded landscape level fuel breaks within the Okanagan Valley.

Figure 9. Landscape level fuel breaks within the Okanagan Valley. Clockwise: Big White Ski Resort (Snow Pines), Mt Baldy Resort, June Springs Rd (South Kelowna) and Peachland (Munro FSR).

In the examples above, it is evident that there is consistent crown fuel separation and surface fuel loading is light. These attributes directly affect fire intensity, assisting fire service professionals with their suppression tactics.

It has been shown that, when these treatments are strategically located adjacent to communities or values, are of large enough scale, and of sufficient intensity, they can significantly impact fire flow and intensity. A good example is the Wallow fire (Arizona, 2011). This intense fire burned into a landscape level fuel break and, upon doing so, decreased in intensity such that suppression tactics were successful. The image below shows where the Wallow fire crested the height of land and burned towards the homes downslope (black, dead trees). Where it entered the treated area, the trees are red (still dead but from surface scorch and not a crown fire) and then become green closer to the homes (surface fire only) (Bostwisk et al., 2011).

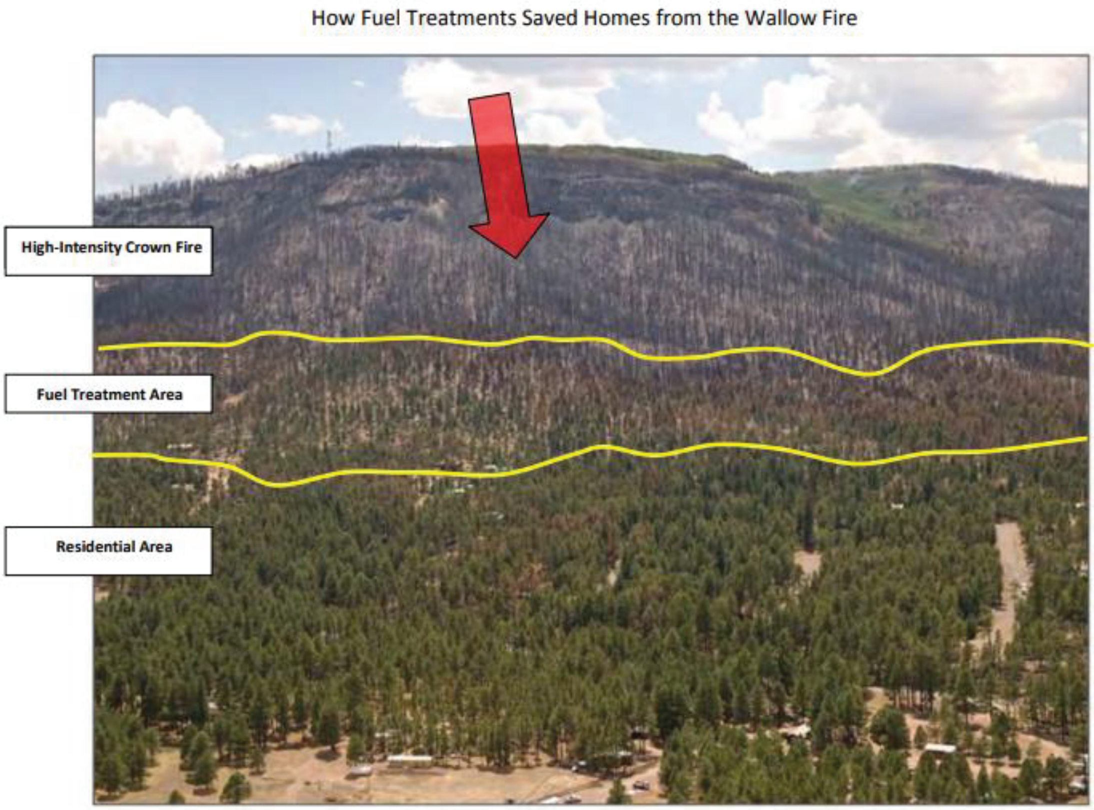

Figure 10. Landscape level fuel breaks used at the 2011 Wallow fire. From Bostwick et al., 2011.

A successful example of an Okanagan landscape level fuel break is located due West of the Gondola site along Westside Rd, behind Westshore Estates. Fuel management work was completed in 2020 by the Okanagan Indian Band (OKIB) and was tested by the White Rock Lake fire in August of 2021. The image below shows the fire having burned intensely as it moved towards the landscape fuel break and then eventually burned out within the fuel break before it reached the homes.

Figure 11. Landscape level fuel break (within red line) around Westshore Estates in the North Okanagan.

4 Methodology

A preliminary site reconnaissance (recee) was completed for the area of interest on 31 March 2023 by the author. This consisted of a walk through of the proposed main building site to assess the site and complete threat assessment work, and a drive up the existing road more an overview assessment of the topography and stand types. Site conditions were snow free at the lower elevations with some lingering snow loading remaining at higher elevations. Weather was clear and sunny, and access was good throughout the site for the intended purpose of the recee.

Established and recognized methods for assessing wildfire and wildland urban interface (WUI) hazards were used for the purposes of this report. These methods are consistent with the requirements for professional practice of a Registered Professional Forester with the Association of BC Forest Professionals (ABCFP, 2013).

4.1 WILDLAND URBAN INTERFACE WILDFIRE THREAT ASSESSMENT

The Wildland Urban Interface Wildfire Threat Assessment (Morrow, et al., 2013) was developed to specifically assess wildfire hazard characteristics within the WUI1. The Morrow et al. assessment method characterises the immediate wildfire environment and how it relates to the location of the WUI values. A more recent assessment methodology has been developed by the

[1] The original Morrow et al. assessment tool has since been adapted by the BCWS into the current Wildfire Threat Assessment (BC Wildfire Service, 2016), in part "to help validate, qualify or ground truth the PSTA (Provincial Strategic Threat Analysis) threat rating…" which differs from the original intent of the Morrow et al. assessment.

BCWS that seeks to include validation of the Provincial Strategic Threat Assessment layer. The former is more appropriate for site level assessments, while the latter is better suited for landscape level assessments as part of a larger fire management strategy.

The Wildland Urban Interface Wildfire Threat Assessment (WUI Threat Assessment) worksheet is organized into two components: the wildfire environment (fuel, weather, and topography); and the structural characteristics of the value for which the threat is being assessed.

One initial WUI Threat Assessment plots was completed (**Error! Reference source not found.**) immediately below the proposed main building location. The completed assessment worksheet and plot photos are provided in Appendix 2.

5 Results & Discussion

5.1 WILDFIRE BEHAVIOUR THREAT CLASS

The Wildland Urban Interface Wildfire Threat Assessment begins with an assessment of fuel characteristics and then proceeds to weather factors and topography. Should the fuel rating not exceed 29 points there is no need to proceed with the remainder of the assessment and the Wildfire Behaviour Threat Class will be rated as Low.

The Wildfire Behaviour Threat Class components for the threat assessment plot completed at the site of the main building location are summarized in the figure below.

Component	Subcomponent	Plot #1
Wildfire Behaviour Threat Class	Fuel (155 points)	55
	Weather (30 points)	30
	Topography (55 points)	42
	Wildfire Behaviour Threat Score (240 points)	127
	Wildfire Behaviour Threat Class	High
WUI Wildfire Threat Class	Structural (55 points)	50
	WUI Wildfire Threat Class	Extreme
Total Wildfire Threat Score (295 points)		177

Figure 12. Summary of the WUI Threat Assessment worksheets completed at the location of the main building.

5.2 WILDLAND URBAN INTERFACE THREAT CLASS

The structural component of the Wildland Urban Interface Wildfire Threat Assessment that produces the Wildland Urban Interface Threat Class is only assessed if the previous Wildfire Behaviour Threat Class is High or Extreme, as was the case in this situation. Subsequently, the WUI Threat Class was assessed to be 50 (Extreme).

5.3 GENERAL SITE OBSERVATIONS & NOTES

In addition to the formal Wildland Urban Interface Threat Assessment plots, a recce of the property was completed. The intent was to gain an understanding of the topography, stand type, fuel loading, and other site attributes that could contribute to fire behaviour or pose access issues for fire response.

5.3.1 Stand Type and Conditions

As is typical of lower elevation sites within the North Okanagan, this site is dominated by a mix of Ponderosa Pine (*Pinus ponderosae; P*) and Douglas-fir (*Pseudotsuga menziesii*; Fd). Also present, in minor amounts dispersed across the area, was Trembling Aspen (*Populus tremuloides*; Act). Douglas-fire and Ponderosa Pine are coniferous species (evergreens) that readily burn. Trembling Aspen is a deciduous species (loses its leaves in winter) and does not readily burn in wildfire and can impede fire growth and rate of spread during most parts of the fire season.

The forest stands on site were of varying age classes (young regeneration to mature or veteran trees) and forest structure (ground to crown fuels) that is typical of these fire excluded ecosystems. Additionally, stand density varied from open and moderately open forest to dense forest. The figure below shows the stands present on site.

Figure 13. Typical stand structures found in the project area.

Structures of the type seen on site are both favourable (open forest) to not favourable (dense forest) to fire behaviour and spread. Open forest stands have gaps in the distance between trees and, therefore, tend to slow or lessen fire spread directly horizontally between trees or cohorts (groups) of trees but can still allow vertical spread of fire within a cohort. Dense stands have continuous vertical and horizontal fuel and can allow spread of wildfire throughout the stand. Both stand types lend themselves well to fuel management treatment with the goal being to remove horizontal and vertical continuity with the stand to reduce fire behaviour and impede or slow fire spread.

Forest health was generally very good on the site, and therefore that was little standing dead and dying overstory that will contribute to higher fire behaviour.

5.3.1.1 Wildlife Tree Retention

Several dead standing trees of significant size were noted that showed signs of wildlife use. These should NOT be considered fuel hazards and, where safe to do so, should be retained as they are valuable habitat attributes on the landscape (see below examples).

Figure 14. A high value wildlife tree that is not considered a fuel hazard and should be retained.

5.3.2 Surface Fuel Type and Loading

Woody fuels noted on site were light to moderate and were horizontally inconsistent across the site. Minor inclusions of moderate loadings were noted, and these tended to be within the denser stand types where stem exclusion had resulted in mortality and stem fall-down. The primary carrier of surface fire across this unit will be the natural vegetation complex beneath the stand and in the open forest gaps. Vegetation noted on site was typical of these ecosystems: varying bunch grasses, pine grass (*Calamagrostis rubescens*), snowberry (*Symphocarpus*), Saskatoon berry (*Amelanchier* alnifolia) and Oregon grape (*Mahonia* qquifoloium) with occurrences of herbs such as Arrowleaf Balsamroot (*Basamorhiza* sagittata) that were just starting to sprout.

Of these species, the grasses and snowberry will contribute the most to fire behaviour, growth, and rate of spread across the site. This vegetation is not such that it can be treated other than complete removal or through maintenance (mowing/cutting) but it also is a fuel that burns out quickly and, as such, contributes more to rate of spread than fire intensity.

5.3.2.1 Coarse Woody Debris

Large woody debris (>25 cm diameter) is referred to as Coarse Woody Debris (CWD) in forestry/fire related work. This debris is a valuable habitat resource on the landscape as it provides food and shelter to a variety of insects and wildlife especially the larger, more rotten the piece. The figure below shows a high value CWD found on the site.

Fig 15. An example of a piece of high value CWD found on the project site.

CWD is also generally in a deficit within the dry forest types of the Okanagan valley. Striking a balance between conserving and retaining this value with fuel hazard reduction is an important endeavor. The image below shows valuable CWD but rather than an individual piece, it is a pile and, therefore, could contribute to higher fire behaviour, or suppression challenges, than the individual piece above.

Fig 16. An example of a jackpot of CWD that should potentially be treated or spread out.

Brown et al. (2003) states that 1.2-5.0 kg/m2 is an appropriate range to balance the values of CWD with fire behaviour within these dry forest type.

CWD retention and recruitment on the project site should occur where the opportunity exists and where it won't contribute risk to buildings or pose suppression challenges. The location and levels should be covered in the fuel management prescription.

5.3.3 Topography

Topography affects fire behaviour through slope steepness and aspect (direction slope is facing). The site has many benches and draws on site, with some of the slopes between the benches and in the draws approaching 45% plus. Such slopes can contribute to high fire intensity and rate of spread. Similarly, steep slopes exist within some draws, however, these are often accommodated by deciduous stands (aspen), and some appear to be water colleting sites, which can impede or slow fire growth.

Aspect of the site is mostly east facing with some slopes, and the lower elevation area near Hwy 97 have a slight south aspect. Southern to western aspects are the driest aspects and typically experience the highest fire behaviours as fuels on these aspects dry out sooner in the season and receive the most sunshine/heat throughout the fire season.

Topography is not an attribute that can be altered in risk mitigation, but it can be accounted for in fuel treatment prescriptions through more intensive or larger scale treatments.

5.3.4 Access

The ability to access a site for fire response can directly impact the success of such response. Areas with easy access will allow first responders easier and quicker access to the site for response and raise the chances of successful attacking an ignition on site or a fire that moves onto the site.

It was noted that an existing gravel road transects the site from Hwy 97 to the western boundary. This road provides easy across to the site across the elevational gradient. Several benches and old roads off this gravel road would ease access away from the road. There was nothing noted on site that ground crews from BCWS would find difficult to respond to in the area.

5.3.5 Water Access

No streams were noted on site although several culverts existed beneath the gravel road transecting the site. It is likely that these are for ephemeral streams (seasonal) or to allow road ditches to drain below the road. A few riparian features were noted in draws but none of these would have been adequate for fire response and may not even exist outside freshet.

Water tanks or storage facilities are noted as part of the development and it will be these that will need to provide water for fire response.

5.3.6 Wildland Fire Response

The project site is located immediately adjacent to the BCWS Vernon Fire Zone base (Predator base). This location houses several 3-person Initial Attack crews and one 20-person Unit Crew. It also has a helicopter based on site during the fire season that is equipped with a water bucket. Response time for crews from Predator base would be within minutes.

The proximity of Okanagan Lake is an excellent water resource for bucketing helicopters or the provincial Fire Boss air tankers (water skimmers), usually located in Kamloops or Penticton. The short turn around time between Okanagan Lake and the project site would help contribute to an effective aerial suppression response (as seen in past fires in Kalamalka Park).

6 Recommendations for Wildfire Mitigation

6.1 FIRESMART

Increasingly, research and post-fire disaster reviews (e.g., Cohen & Saveland, 1997) are indicating that the most important factors that influence the survivability of a structure during a WUI fire are the structure's characteristics and its immediate surroundings (Cohen, 2000) (Blanchi & Leonard, 2008) (Cohen, 2008). During high-intensity crown fire experiments in the Northwest Territories (Cohen & Butler, 1998), findings indicated that at distances of 30m or more between a wood paneled structure and adjacent high-intensity crown fire in a C-2 fuel type, there was insufficient radiant heat to ignite the structure. In fact, Butler and Cohen (1998) found that the critical distance for sufficient radiant heat transfer to ignite a structure may only be 10m, however they concluded that a 30m distance would incorporate a conservative margin.

It is important to point out the differences in fuel type between the Butler and Cohen crown fire experiments (C-2 Black Spruce) and the fuel type on this site (C-7 Ponderosa Pine/Douglas-fir), because these two fuel types have different fire behaviour characteristics. Stand structure is considerably different, whereby C-2 fuel has greater vertical continuity (i.e., ladder fuels (branches etc.) that extend down to the forest floor), and C-7 typically has less vertical continuity. Vertical continuity has a direct relationship to the probability of crown fire initiation – crown fires are more probable and occur at a much lower threshold in C-2 fuel types than in C-7.

Of particular importance to the ignitability of a structure is its resilience to embers accumulating on or in the structure itself, or onto combustible material immediately adjacent to the structure (Blanchi & Leonard, 2008) (Calkin, et al., 2014) (Moritz, et al., 2014). Wood roofs, wood decks, stacked firewood, certain landscaping materials and plants, unscreened openings into a structure etc. can all be ideal locations for the accumulation of embers during a wildfire. These embers can in turn ignite the structure itself, likely leading to the destruction of the structure.

Direct flame contact on a structure is another important factor in structure survivability during a wildfire. Effectively "disconnecting" structures from the surrounding fuels is an important hazard mitigation measure. This includes ensuring that improvements, such as wooden fences or sheds, do not act as a pathway for fire to transfer from wildland fuels (such as cured grass) onto a nearby or connected structure. Commonly used landscaping materials and plants, such as bark mulch, ornamental cedar hedges and junipers, can also facilitate direct flame contact on a structure if used near the structure itself.

The FireSmart program offers proven guidance on the design, retrofit, or ongoing maintenance to mitigate wildfire threats to buildings and property. The combination of adequate non-combustible and defensible space (15) around a structure that is built with fire resistant roofing and cladding and has openings into the building envelope properly screened to prevent ember accumulation, are foundational principles of FireSmart and improve the survivability of structures in the wildland urban interface.

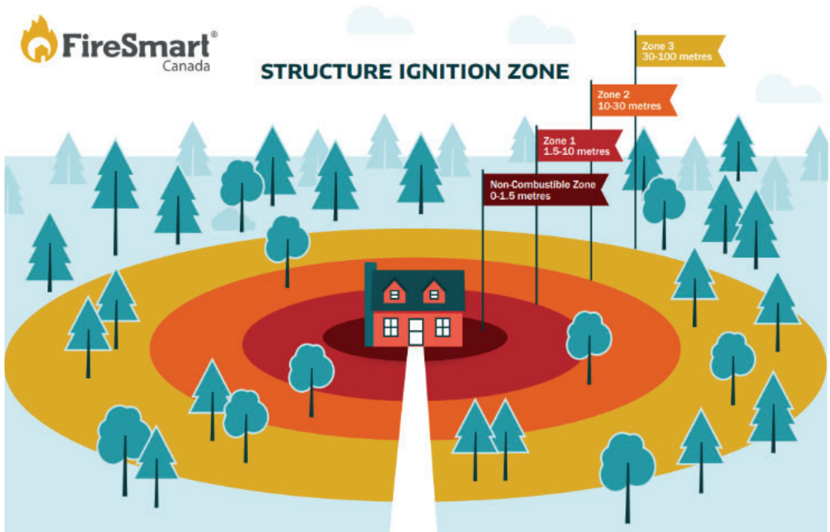

Fig 17. FireSmart structure ignition zones provides a straightforward model for managing igntion potential.

6.1.1 Building and Landscaping Design

Recommendation #1

Follow FireSmart guidelines and principles as they pertain to building construction (design and materials), landscaping design and materials. Ensure ongoing and seasonal maintenance of building in an ignition resistant state.

Buildings that are designed following FireSmart guidelines will greatly reduce the ignitability of the structures. Through appropriate building design, the developer can develop structures that are resistant to wildfire. This includes building with non-combustible siding and roofing materials. Such materials are resistant to flames and combustion and will greatly reduce the opportunity for building ignition that can lead to combustion of the building.

Ongoing and seasonal maintenance will be required to ensure that buildings remain resistant prior to, and throughout, the fire season. This includes cleaning out gutters and other crevices, vents, or other areas where needles and flammable material can collect. Doing so will reduce the opportunity for embers to land in flammable material and cause an ignition that can lead to combustion of the roof.

The FireSmartBC guidelines can be found at this link: https://firesmartbc.ca

Follow Up Action #1

A) A review of building and landscaping design should be completed by a wildland fire professional or Local FireSmart Representative to ensure FireSmart guidelines have been incorporated.
B) Develop an ongoing seasonal maintenance program/checklist to ensure buildings and interface zones are maintained in a non-combustible or low fuel state.
C) Post construction, conduct a home assessment on the finished buildings.

Note: It is understood that the developers may have a 'living roof' on the main building. If this will consist of flammable material, then roof top irrigation system or sprinkler system should be incorporated into the design to maintain the roof in a 'green' and low ignition state or otherwise be able to water the roof down in the event of a wildfire. A response plan should be designed that includes the use of these sprinklers during a wildfire.

Recommendation #2

Follow FireSmart guidelines and principles as they pertain to the first three Ignition Zones (up to 30m from buildings/structures). Ensure ongoing and seasonal maintenance of building in a fire-resistant state as described in FireSmart.

6.1.2 Ignition Zone Design

Manipulating the state of fuels within the four zones surrounding building or structures will either eliminate the opportunity for a fire to occur or greatly reduce the fire behaviour that will be experienced within a zone. These zones occupy concentric circles of varying distances around a value. These zones may need to be expanded where slope will act to increase flame length (see FireSmart guidelines for further information).

Non-Combustible Zone (0-1.5m): this should be a zone that does not allow combustion to occur. Landscaping within this zone should consist of non-combustible material (rocks, concrete, etc.) such that a fire cannot ignite or be sustained in this zone. Bark mulch, wood chips or other such material should NOT be used in this zone.

Zone 1 (1.5-10m): any plants or landscaping material located in this zone should be fire-resistant. This includes low growing, fire-resistant species that are well spaced. Species that will accumulate woody or combustible debris should be avoided. Bark mulch, wood chips or other such material should NOT be used in this zone.

Zone 2 (10-30m): conifers can remain within this zone, but they should be spaced at least 3m apart (farther on slopes) such that there is no horizontal continuity between trees. This will help eliminate the opportunity for a wildfire to get into the tree crown and move between tree crowns. These stems should also be pruned to at least 2-3m in height (but no more than 50% of the tree crown) and no flammable landscaping material should be placed beneath these residual stems. Natural accumulation of material should be monitored and managed accordingly to maintain in a low fuel state.

Follow Up Action #2

A) A review of landscaping design within the first three Ignition Zones should be completed by a wildland fire professional or Local FireSmart Representative to ensure they are being developed according to the FireSmart guidelines for these zones.

B) Develop an ongoing seasonal maintenance program/checklist to ensure buildings and interface zones are maintained in a non-combustible or low fuel state.

C) Post construction, conduct a home assessment on the zones to ensure they meet FireSmart guidelines.

6.1.3 Zone 3: Fuel Management Prescription & Implementation

Recommendation #3

Complete and implement a professionally signed/sealed fuel management prescription for all Zone 3 locations around buildings/structures as deemed necessary by a wildland fire professional to create a zone that will only support a low intensity wildfire.

Ignition Zone 3 consists of 30 to 100m from buildings/structures. Within this zone, fuel conditions should be such that they will only support a low intensity fire. These conditions can be created through fuel management treatment regimes, such as tree thinning, pruning and surface fuel abatement. Typically, these conditions usually consist of well-spaced overstory trees, high crown bases and low surface fuel loading. Achieving these conditions is done through a reduction in tree overstory density, the pruning of lower branches on residuals, and the removal of existing surface fuels and activity fuels (fuels introduced during treatment). The resultant effect is a low fuel condition that will only support a low intensity wildfire.

The figures below show an example of a stand on site and a post-treatment picture of a similar type of stand elsewhere that was treated to a low fuel condition.

Figure 18. Examples of an untreated stand (top) and the more open condition of a treated stand (bottom).

Follow Up Action #3

A) Prior to development, create a fuel management prescription that will recommend treatment of Zone 3 such that stand, and surface fuels are altered to only allow for a low intensity surface fire.
B) Implement the prescription concurrent/prior to development and have the final condition signed off as complete by the prescribing forester.
C) Post treatment, conduct a threat assessment form to demonstrate the reduced hazard.

6.1.4 Wildfire Response Plan

Recommendation #4

Develop a wildfire response plan that provides guidance to staff on how to respond in the event of an ignition and fire on site.

Given that the project area is outside the Vernon Fire Protection District, it would be prudent to create a wildfire response plan for the development area both during construction (for fire season) and once the development is operational and open to the public.

This would include a plan as to how employees will respond to an ignition on site while awaiting assistance from the BCWS, muster station locations and fire response equipment, training for staff to safely respond to a wildfire, water delivery or transport, and an evacuation plan for staff and visitors.

Follow Up Action #4

Upon completion of a response plan, ensure staff are trained to implement the plan and that all equipment is appropriately located and tested prior to the fire season.

6.1.5 Education

Upon completion of the development, the site should become a model of a FireSmart development, presenting both an opportunity to showcase FireSmart to visitors but also to educate them on the program.

This education should also extend to informing the public of the risk of ignition recreation can pose in these ecosystems and that visitors have a duty to help manage this risk through responsible recreating (i.e., smoking in designated areas, appropriate disposal of cigarette butts, reporting of ignitions, etc.). Appropriately located signage will also help the staff manage and lower risk of ignition.

7 Conclusion

The Gondola project site is located within an ecosystem where wildland fire is a natural occurrence. As such, wildfire risk will exist once values are located on the site. The integration of FireSmart guidelines in the design and planning of the buildings and landscaping, as well as the implementation of fuel management treatments should produce a development that is resilient to wildfire and create conditions within treated areas where only low intensity wildfire can occur.

A wildfire response plan, proper staff training and appropriately located response equipment, will help create and maintain a development environment that is risk reduced. Public education opportunities on FireSmart and wildfire prevention will be readily visible to visitors with proper signage and promotion.

Through the developers indicated commitment to implementing the recommendations, this project can be a model development within the North Okanagan.

8 Appendix A: Threat Assessment & Photos

WILDLAND URBAN INTERFACE WILDFIRE THREAT ASSESSMENT WORKSHEET ☒ Pre-treatment ☐ Post-treatment

Plot #: 1	Community: South of Vernon
Assessor: J Davies	Geographic Location/Street Name: Gondola Site – Hwy 97 + Bailey Rd
Date: 31 March 23	GPS/UTM: 50°10' 38.09 N x 119° 21' 27.50 W
Photos: 0 #	Land Ownership: ☐ Crown ☒ Private ☐ I.R. Other (specify):

#	COMPONENT / Subcomponent: Fuel	A	B	C	D	E	Score
1	Duff Depth and Moisture Regime (cm)	0–<2 1	2–<5 Dry Zonal Wet 5 3 1	5–<10 Dry Zonal Wet 10 6 2	10–20 Dry Zonal Wet 12 8 4	>20 Dry Zonal Wet 15 10 5	3
2	Surface Fuels Continuity (% cover)	<20 0	20–40 2	41–60 3	61–80 4	>80 5	0
3	Vegetation Fuel Composition	Moss, Herbs, Irrigated Crops, Low Flammability Weeds 1	Herbs, Deciduous Shrubs 2	Lichen, Conifer Shrubs 3	Pinegrass, Juniper 4	Sagebrush, Bunchgrass, Antelope Brush, Scotch Broom 5	5
4	Fine Woody Debris Continuity (<=7cm) (% cover)	<1 coverage 1	Scattered, ≤10 coverage 5	10–25 coverage 7	>25 coverage, <10 cm deep 10	>25 coverage, >10 cm deep 15	5
5	Large Woody Debris Continuity (>7cm) (% cover)	<1 coverage 1	Scattered, <10 coverage 2	10–25 coverage 5	>25 coverage, not elevated 7	>25 coverage, partially elevated 10	2
6	Live and Dead Coniferous Crown Closure (%)	<20 2	20–40 5	41–60 10	61–80 15	>80 10	5
7	Live Deciduous Crown Closure (%)	>80 or <40% coniferous crown closure 0	61–80 2	41–60 3	20–40 4	<20 5	5
8	Live and Dead Conifer Crown Base Height (m)	5+ or <20% conifer crown closure 0	3–5 5	2–<3 7	1–<2 10	<1 15	10
9	Live and Dead Suppressed and Understory Conifers (stems/ha)	0–500 1	501–1000 5	1001–2000 10	2001–4000 20	>4000 30	10
10	Forest Health (% of dominant and co-dominant stems)	Standing Dead and Partly Down <5 or <20 stems/ha 0	Standing Dead and Partly Down 5–25 5	Standing Dead and Partly Down >25–50 10	Standing Dead and Partly Down >50–75 20	Standing Dead and Partly Down >75 30	5
11	Continuous Forest/Slash Cover within 2km (%)	0–20 0	21–40 3	41–60 5	61–80 7	>80 10	5/55
						Sub Total /155*	

#	Weather	A	B	C	D	E	Score
12	Biogeoclimatic Zone	AT, Irrigated 1	CWH, CDF, MH Dry Zonal Wet 5 3 1	ICH, SBS, ESSF Dry Zonal Wet 10 7 3	IDF, MS, SBPS, CWH ds1 & ds2, BWBS, SWB – Dry Zonal Wet 15 10 5	BG, PP 15	15
13	Historical Wildfire Occurrence (by BCWS Fire Zone)	G5, R1, R2, G6, V5, R9, V9, V3, R5, R8, R7 1	[illegible] 5	[illegible] 8	K1, K5, K3, C2, C3, N5, K6, N4, K7, N2 10	N7, K4, [illegible] 15	15/30
						Sub Total /30	

#	Topography	A	B	C	D	E	Score
14	Aspect (>15% slope)	North 0	East 5	<16% slope all aspects 10	West 12	South 15	15
15	Slope (%)	<16 1	16–29 and max score for North slopes 5	30–44 10	45–54 12	>55 15	10
16	Terrain	Flat 1	Rolling 3	Sloped terrain, minor low relief draws 5	Consistent slope, deep draws or shallow gullies 7	Consistent slope, deep gullies 10	7
17	Landscape/Topographic Limitations to Wildfire Spread	<5 ha isolated forest land 1	North and/or east aspects dominate, wildfire spread restricted from South and/or West 2	Mountainous terrain, broken topography, regular aspect and slope changes, multiple restrictions to wildfire spread, large water bodies 5	Rolling terrain, minor water bodies, minimal aspect and slope changes, minor restrictions to wildfire spread 10	Continuous, consistent topography, No restriction to wildfire spread 15	10/42

FUEL, WEATHER AND TOPOGRAPHY — Sub Total /55; WILDFIRE BEHAVIOUR THREAT SCORE 127 /240**

#	Structural	A	B	C	D	E	Score
18	Position of Structure/Community on Slope	No Structures Values within 2 km 0	Bottom of slope, valley bottom 5	Mid-slope bench/land, elevated valley, <15% slope 10	Mid-slope continuous, >15% slope 12	Upper 1/3 of Slope 15	10
19	Type of Development	No Structures Values within 2 km 0	Perimeter Interface, no inclusions 3	Perimeter Interface, with inclusions 5	Intermix >1 structure/ha 8	Intermix <1 structure/ha, Infrastructure 10	10
20	Position of Assessment Area Relative to Values	No Structures Values within 2 km 0	Above >500 200–500 <200 m 1 10 20	Side-hill >500 200–500 <200 m 1 12 25	Flat/Rolling >500 200–500 <200 m 1 12 25	Below >500 200–500 <200 m 1 15 30	30/50

WILDLAND URBAN INTERFACE WILDFIRE THREAT SCORE 50 /66

TOTAL WILDFIRE THREAT SCORE 177 /306

*Proceed only if Fuel sub total is >25.

** Proceed to Structural component only if Wildfire Threat Behaviour Score is >95 for untreated polygons.

Wildfire Behaviour Threat Class (check applicable class)

Low	0–40	☐
Moderate	41–95	☐
High	96–148	☒ 127
Extreme	>148	☐

Wildland Urban Interface Threat Class (check applicable class)

Low	0–13	☐
Moderate	14–26	☐
High	27–39	☐
Extreme	>39	☒ 50

Last Updated: January 24, 2013

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DEVELOPMENT SERVICES PRELIMINARY BYLAW COMMUNICATION

Ministry of Transportation and Infrastructure

Your File #: 21-1055-B-OR-Okanagan Gondola
eDAS File #: 2021-06130
Date: Mar/30/2023

Okanagan Gondola
c/o Regional District of North Okanagan
9848 Aberdeen Road
Coldstream, British Columbia V1B 2K9
Canada

Re: Proposed Rezoning Bylaw for:

PID: 013-561-235. Part N 1/2 Section 36, Township 14, ODYD, Land District 41, Except Plan B826, 37599, H823

The Ministry of Transportation and Infrastructure has been working with the developer, the ALC and Crown Lands to co-ordinate the fulfillment of the requirement to provide greater legal assurance on the easement access to Bailey Rd. The situation was unique and presented numerous unexpected challenges that proved onerous to all parties involved. Therefore, condition #2 of our previous letter dated Feb 2, 2023 has been modified. The new list of requirements appears below.

Preliminary Approval is granted for the rezoning for one year pursuant to section 52(3)(a) of the *Transportation Act*, subject to the following conditions:

1. Submission of a suitable Stormwater Management Plan (SWMP), prepared by a Professional Engineer registered to practice in British Columbia, showing all calculations and rationale supporting how drainage will be mitigated onsite. The development proposal shows a number of trails covering the property which have a high likelihood of intercepting overland sheet flow, concentrating it and directing it to new locations. The developer is responsible to ensure that the volume and velocity of post development runoff reaching the ditches along Highway 97 does not exceed the pre-development rates. The SWMP must accommodate the 100yr flood event and add factors for climate change.

2. Registration of a suitably worded covenant, in the name of His Majesty the King in Right of the Province of British Columbia as represented by the Minister of Transportation and Infrastructure, stating that no direct access to Highway 97 will be obtained. The developer's lawyer may contact me for sample wording and must have a draft approved by this office prior to registration.

3 . The developer must apply for and receive a Commercial Access Permit for the driveway connecting to Bailey Rd.

If you have any questions please feel free to call Desiree Lantenhammer at (778) 943-0151.

Yours truly,

Desiree Lantenhammer
Development Services Officer

Salmon Arm Office
825C Lakeshore Drive West
PO Box 106
Salmon Arm, BC V1E 4N2

Kamloops Office
1648 Valleyview Drive
Kamloops, BC V2C
4B5

Revelstoke Office
200 Campbell Ave
Suite 200
Revelstoke, BC V0E 2S0

MEMORANDUM

Friday, February 24, 2023

TO: Rav Soomal, Vice President of Operations, Ridge North America
FROM: David Sonmor, P.Eng, Civil Engineer, Lawson Engineering Ltd.

SUBJECT: Okanagan Gondola Site Servicing (Water Servicing & Fire Protection)

Dear Mr. Rav Soomal,

At the request of Mr. Sean Wilson, Lawson Engineering (LEL) have produced the following memo meant to address concerns over water supply raised by the Regional District of the North Okanagan (RDNO) in the following ways:

- Illustrate conceptual locations for both potable and non potable water storage for 3 development areas (Base Camp, Mid Station, & Summit Station) within the proposed development including conceptual road access for supplementary offsite source.
- Update FUS fire flow calculations based on updated FUS documentation and updated design criteria.
- Provide LEL recommended option for site water servicing (both potable and fire)

This memo is meant to be read in conjunction with previous memos produced by LEL titled "Okanagan Gondola Site Servicing (Water Servicing & Fire Protection)" and dated August 11, 2022 and September 15, 2022.

The following reference material has been used in the production of this memo:

- "*Water Supply for Public Fire Protection A Guide to Recommended Practice in Canada*" Produced by Fire Underwritters Survey and dated 2020.
- "*Okanagan Gondola Conceptual Master Plan*" dated September 10, 2021.

1) Fire Protection

a. Fire Storage calculation

Since the issuance of the original august 11th memo produced by LEL addressing fire flow requirements for the proposed development, the Fire Underwritters Survey (FUS) has released their updated 2020 guidelines in final, non draft format. LEL's initial fire flow and fire storage requirement calculations were reviewed against the new guidelines and updated accordingly. In addition, and through discussion with the developer, LEL have reviewed the use of Type I Fire Resistive Construction, Type II Noncombustible Construction, Type IV-A Mass Timber Construction, and waterless fire suppression methods throughout the proposed development. Table 1.1 below outlines resulting flow and storage requirements based on an assumed C value of 0.6. Further to the use of waterless fire suppression on site, it is in LEL's opinion that waterless fire suppression technology does not meet the requirements laid out for automatic sprinkler protection and therefore has not been used in the below FUS calculated flow requirements. Adjusted FUS fire flow calculations are as follows:

- Base Camp:
  - With an assumed C value of 0.6 representing Type I Fire Resistive Construction, no sprinkler system, and a minimum spacing between structures of 30m, all base camp structure flow requirements can be reduced to the FUS recommended minimum for commercial construction of 2,000 L/min or 33 L/sec.
  - With an assumed C value of 0.8 representing both Type II Noncombustible Construction and Type IV-A Mass Timber Construction, no sprinkler system, and a minimum spacing between structures of 30m, the base camp gondola and retail ticketing structures were determined to be the governing structures with flow requirements reduced to 3,000 L/min or 50 L/sec.

- Mid Station
  - With an assumed C value of 0.6 representing Type I Fire Resistive Construction, no sprinkler system, and a minimum spacing between structures of 30m, the ampitheatre was determined to be the governing mid station structure with flow requirements reduced to 3,000 L/min or 50 L/sec.
  - With an assumed C value of 0.8 representing both Type II Noncombustible Construction and Type IV-A Mass Timber Construction, no sprinkler system, and a minimum spacing between structures of 30m, the ampitheatre was determined to be the governing structure with no adjustment to flow requirements from LELs original memo.

- Summit Station
  - With an assumed C value of 0.6 representing Type I Fire Resistive Construction, no sprinkler system, and a minimum spacing between structures of 30m, the event venue was determined to be the governing structure with flow requirements remaining unchanged at 3,000 L/min or 50 L/sec.
  - With an assumed C value of 0.8 representing both Type II Noncombustible Construction and Type IV-A Mass Timber Construction, no sprinkler system, and a minimum spacing between structures of 30m, the summit station gondola and event venue structures were determined to be the governing structures with flow requirements remaining unchanged at 3,000 L/min or 50 L/sec.

DEVELOPMENT AREA	FIRE FLOW (L/Sec)	FLOW DURATION (hrs)	STORAGE REQUIRED (m^3)
Base Camp	33	1.0	120
Mid Station	50	1.25	225
Summit Station	50	1.25	225

Table 1.1 – Fire Underwriter Survey flow requirements at C=0.6

By utilizing type I fire resistive construction methods for all onsite structures total storage for the purpose of fire suppression may be reduced from 945 m^3 to 570 m^3 for a total reduction in fire storage requirements of approximately 40%. All volumes and flows calculated for domestic use remain unchanged. The above noted fire flow and storage requirement calculations have assumed each structure has a 30m perimeter that is clear of all neighboring structures, trees, and deadfall.

2) LEL Recommended Conceptual Servicing Option

As discussed in LEL's august 11 2022 memo, under an assumed sustainable well yield of 0.25 L/sec, adequate water supply to meet the MDD requirements of the proposed development may be achieved on site through the use of multiple drilled wells and local storage. Storage volume requirements and construction costs could be reduced through the use of a single reservoir servicing all 3 development areas, however due to the summit station being located on a peak or local high point within the subject area, additional pumping would likely be required.

It is in LEL's opinion that, at the conceptual design level, the most feasible water supply option is a series of wells located at or near each storage area with water supply supplemented by offsite sources when required for fire suppression. A single reservoir constructed to meet RDNO bylaw 2650 could provide both potable and fire services to both the mid and summit stations while separate fire and potable water storage could service the base station. The shared summit and mid station reservoir would be filled with potable water only. All storage facilities will require pumps capable of providing the required pressure and flow rates. The mid station could be serviced by a single gravity main running beneath both the existing and proposed access roads. Treatment requirements for potable water are unknown at this time and should be reviewed upon completion of water quality testing. It is in LEL's opinion that consideration should be given to oversizing the shared summit/mid station reservoir to meet bylaw 2650 requirements in order to reduce or eliminate future infrastructure upgrade requirements in the event that a connection to the GVW system is made available. Locations of reservoirs and water servicing infrastructure shown on drawing C101 are conceptual only and subject to change upon completion of an onsite test well drilling program.

Vehicular access to both the mid and summit stations will likely rely on existing road networks. An existing dirt road traverses the site from the north east to the south west. Access roads to the mid and summit stations would likely follow existing offroad vehicle trails tying into the existing dirt road at the south west corner of the subject property. both existing and conceptual service access road alignments to the mid and summit stations have been included in drawing C101 "Conceptual Water Servicing Plan". The conceptual mid station access road alignment has an average slope of approximately 1% and a maximum slope of approximately 10%. The existing summit station access road alignment has an average slope of approximately 7% and a maximum slope of approximately 19%. Further design is required to confirm access road alignment and final slopes, however at the conceptual stage, emergency vehicle access to both the mid and summit stations at a maximum grade of 12% appears feasible.

A conceptual layout of storage locations and access roads has been included in drawing C101.

We trust that this memorandum adequately addresses any questions raised by the district as they relate to the water demands of the proposed development. If you have any other questions or concerns please feel free to contact the undersigned at your earliest convenience.

Best Regards,

Lawson Engineering Ltd.
Permit Number: 1001279

Prepared by:

David Sonmor, P.Eng.
Project Engineer
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"This correspondence will not be construed so as to prejudice, limit, or derogate from any rights, claims or interests in respect of any Aboriginal title, rights and interests of Okanagan or Syilx Nation recognized and affirmed under Section 35 of the Constitution Act, 1982 and nothing in this letter indicates acceptance by Okanagan of federal or provincial Crown jurisdiction over ownership of land, water or other resources within the Territory."

February 23, 2023

Attention: Paul Deutsch, Founder

Ridge North America

215 Lawrence Ave

Kelowna, B.C. V1Y 6L2

Email: deutsch@ridgenorthamerica.ca

Dear Mr. Deutsch,

RE: Ridge North America Update

We write on behalf of Okanagan Indian Band ("OKIB") to acknowledge receipt of Ridge North America's funding contribution of $27,345.00 to support the reviews for Archaeology, Environmental and Legal support.

We appreciate the continued efforts with Ridge North America for meaningful consultation and engagement with Okanagan Indian Band ("OKIB") on Ridge North America's proposed gondola project the project (the "Project"). This proposed activity is within OKIB's Area of Interest within the Okanagan Nation's Territory, and the lands and resources are subject to our unextinguished Aboriginal Title and Rights.

In order to provide more detailed feedback and engage in meaningful consultation on this Project we require support for our internal capacity. Without sufficient capacity support, we will be unable to meaningfully engage in consultation on this referral. This Project takes place within an area covered by Syilx Aboriginal title.

This funding will be used for some or all the following activities with respect to this Project:

- Archaeology Review: $8,560.00
- Environmental Review: $2,960.00
- Legal Support: $15,825.00

We have an open dialogue with Ridge North America, and we continue our due diligence and project review. The project is on going and the Archaeological review will occur when the consultant and weather conditions are favourable. The Environmental Review is pending, and we will continue to work with our consultant. We will keep you informed as to the work progresses.

liml?mt/thank you,

Colleen Marchand,

Director Territorial Stewardship Division

Okanagan Indian Band

Your File #: 21-1055-B-OR-Okanagan Gondola
eDAS File #: 2021-06130
Date: Feb/02/2023

Regional District of North Okanagan
9848 Aberdeen Road
Coldstream, British Columbia V1B 2K9
Canada

Re: Proposed Rezoning Bylaw for:

PID: 013-561-235. Part N 1/2 Section 36, Township 14, ODYD, Land District 41, Except Plan B826, 37599, H823

The Ministry of Transportation and Infrastructure (MoTI) has an accepted Traffic Impact Assessment (V06 dated Jan 24, 2023). This report confirms that the development traffic will not have a significant impact to the function of the Highway 97 and Bailey Rd intersection. No intersection improvements will be required at this location.

MoTI is continuing discussions regarding the identified illumination warrant at the Commonage Rd and Bailey Rd intersection. More info to come regarding this aspect.

MoTI will be sending notifications to all applicable First Nations regarding the pending decision on the rezoning. We have made the decision to send notifications rather than full consultations as we can now confirm there will not be any changes occurring on road right-of-way of Highway 97. We do not expect any response to these notifications.

MoTI has received sufficient proof that the subject property is not within an area identified by the Government of Canada as having high probability of UXO findings. The related condition has been removed from the list.

The following 3 conditions are the remaining items to be satisfied prior to MoTI's approval of the rezoning.

1. Submission of a suitable Stormwater Management Plan (SWMP), prepared by a Professional Engineer registered to practice in British Columbia, showing all calculations and rationale supporting how drainage will be mitigated onsite. The development proposal shows a number of trails covering the property which have a high likelihood of intercepting overland sheet flow, concentrating it and directing it to new locations. The developer is responsible to ensure that the volume and velocity of post development runoff reaching the ditches along Highway 97 does not exceed the pre-development rates. The SWMP must accommodate the 100yr flood event and add factors for climate change.

2. The access between Bailey Rd and the subject property must be either 1) dedicated as ROAD, a minimum of 20m in width, to the Ministry of Transportation and Infrastructure or 2) the easement modified to add that it cannot be released without permission of the Ministry of Transportation and Infrastructure.

   Note: this condition has changed as the option to modify the easement was added.

3. The developer must apply for and receive a Commercial Access Permit for the driveway connecting to Bailey Rd.

   Note: the W-7 signs recommended in the TIA will be a requirement under this access permit.

If you have any questions please feel free to call Desiree Lantenhammer at (778) 943-0151.

Yours truly,

Desiree Lantenhammer, BSc
Development Services Officer

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MEMORANDUM

Wednesday, April 05, 2023

TO: Rav Soomal, Vice President of Operations, Ridge North America
FROM: David Sonmor, P.Eng, Civil Engineer, Lawson Engineering Ltd.

SUBJECT: Okanagan Gondola Site Servicing (Potable Water Supply – Onsite Sources Only)

Dear Mr. Rav Soomal,

At the request of Mr. Sean Wilson, Lawson Engineering (LEL) have produced the following memo meant to address concerns over water supply raised by the Regional District of the North Okanagan (RDNO) in the following ways:

- Outline potential site development options with a demand less than 21,000 L/day

This memo is meant to be read in conjunction with previous memos produced by LEL titled "Okanagan Gondola Site Servicing (Water Servicing & Fire Protection)" and dated August 11, 2022 and September 15, 2022.

The following reference material has been used in the production of this memo:

- "*Water Supply Feasibility Assessment Okanagan Gondola Development, Vernon, BC"* Produced by Western Water Associates Ltd. and dated March 15 2022.
- "*Okanagan Gondola Conceptual Master Plan*" dated September 10, 2021.
- BC Plumbing Code 2018 Division B Sections 2.2.10.6 & 2.6.1.6

In previous memos issued by Lawson Engineering (LEL), final buildout of the proposed Okanagan Gondola development was reviewed, and a conceptual site demand calculated. The following identifies a potential final buildout option, inclusive of washroom facilities only, that is anticipated to reduce water demand on site in an effort to maintain a self sufficient model for final buildout. At the conceptual design stage, it is in LEL's opinion that, by restricting water services to washroom use only and assuming a maximum of 1,000 visitors daily, it is feasible to reduce total water demand on site to less than 21,000 L/day. Note that the above accounts for visitor and staff potable water use only and that water required for fire suppression and irrigation were excluded from this memo. Further to the above, LEL recommend the use of ultra high efficiency fixtures through out the proposed development. Table 1.1 below outlines BC Plumbing code fixture flow rates for all assumed site amenities.

BC PLUMBING CODE DIVISION B SECTIONS 2.2.10.6 & 2.6.1.6				
Fixture	Flow	Unit	Uses per visitor	Water consumption per visitor (L)
Toilet	6	L/flush	2	12
Sink (hot)	1.9	L/minute	2 minute	3.8
Sink (cold)	1.9	L/minute	2 minute	3.8
TOTAL				**19.6**

Table 1.1 – BCPC Fixture Flow Rates

Under an assumed sustainable well yield of 21,000 L/day and through the elimination of all water consuming amenities, with the exception of washroom facilities, combined with the utilization of ultra high efficiency bathroom fixtures, it is in LELs opinion that the proposed development could feasibly support up to 1,000 visitors daily.

We trust that this memorandum adequately addresses any questions raised by the district as they relate to the water demands of the proposed development. If you have any other questions or concerns please feel free to contact the undersigned at your earliest convenience.

Best Regards,

Lawson Engineering Ltd.
Permit Number: 1001279

Prepared by:

David Sonmor, P.Eng.
Project Engineer
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MEMORANDUM

Wednesday, April 05, 2023

TO: Rav Soomal, Vice President of Operations, Ridge North America
FROM: David Sonmor, P.Eng, Civil Engineer, Lawson Engineering Ltd.

SUBJECT: Okanagan Gondola Site Servicing (Potable Water Only – Offsite Trucking Requirements)

Dear Mr. Rav Soomal,

At the request of Mr. Sean Wilson, Lawson Engineering (LEL) have produced the following memo meant to address concerns over water supply raised by the Regional District of the North Okanagan (RDNO) in the following ways:

- Outline assumed requirements for offsite water supply

This memo is meant to be read in conjunction with previous memos produced by LEL titled "Okanagan Gondola Site Servicing (Water Servicing & Fire Protection)" and dated August 11, 2022 and September 15, 2022.

The following reference material has been used in the production of this memo:

- "*Water Supply Feasibility Assessment Okanagan Gondola Development, Vernon, BC"* Produced by Western Water Associates Ltd. and dated March 15 2022.
- "*Okanagan Gondola Conceptual Master Plan*" dated September 10, 2021.

In previous memos issued by Lawson Engineering (LEL), final buildout of the proposed Okanagan Gondola development was reviewed and a conceptual site demand calculated. Table 1.1 below outlines truck haul requirements to meet the conceptual demand calculated in LELs memo dated August 11, 2022. Note that Table 1.1 accounts for visitor and staff potable water use only and that water required for fire suppression and irrigation were excluded from this memo.

At the conceptual design stage, and with an assumed onsite sustainable well yield of 21,000 L/day, it is in LEL's opinion that the proposed gondola development will require approximately 4 fully loaded tandem axle water trucks supplied from offsite sources per day in order to meet demand. Further to the above, it is LEL's opinion that onsite storage capacity should be increased to account for breaks in supply, and allow for bulk import to occur during restricted hours in order to avoid peak visitor traffic.

Truck Type	Single Axle 	Tandem Axle 
Common Capacity	2,000 USGal (7,500L)	3,000 – 5,000 USGal (11,250 – 18,750L)
Assumed Capacity	2,000 USGal (7,500L)	4,000 USGal (15,000L)
Assumed Supply from On Site Sources	21,000L	21,000L
Conceptual Water Demand	76,820L	76,820L
Total Water Import Required	55,820L	55,820L
Rounds Per Day	8	4

Table 1.1 – Water Supply Requirements from Offsite Sources

We trust that this memorandum adequately addresses any questions raised by the district as they relate to the water demands of the proposed development. If you have any other questions or concerns please feel free to contact the undersigned at your earliest convenience.

Best Regards,

Lawson Engineering Ltd.
Permit Number: 1001279

Prepared by:

David Sonmor, P.Eng.
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