



Site Specific Floodplain Exemption Application

Referral Form – RDCK File F2305K

Date: January 30, 2024

You are requested to comment on the attached FLOODPLAIN EXEMPTION for potential effect on your agency's interests. We would appreciate your response WITHIN 30 DAYS (PRIOR TO March 1, 2024). If no response is received within that time, it will be assumed that your agency's interests are unaffected.

LEGAL DESCRIPTION & GENERAL LOCATION:

1076 Whatshan Forest Service Road, Electoral Area 'K'

PARCEL A (REFERENCE PLAN 834221) OF DISTRICT LOT 8170 KOOTENAY DISTRICT EXCEPT PLAN NEP19125 (PID: 005-712-700)

PRESENT USE AND PURPOSE OF APPLICATION:

The subject property is a 0.2 hectare site (Lot 1) that is part of a 34.6 hectare shared interest lot (Whatshan Resort). Presently there are three accessory structures and there is no existing dwelling on Lot 1.

In accordance with the RDCK Floodplain Management Bylaw No. 2080, 2009 the required Flood Construction Level (FCL) for Whatshan Lake is 652.3 metres G.S.C. and the required Floodplain Setback is 7.5 metres from the Natural Boundary.

The proposed one-family dwelling will meet the required Floodplain Setback but does not meet the FCL that is required by the RDCK Floodplain Management Bylaw No. 2080, 2009. The exemption being requested seeks to permit the construction of a one-family dwelling and detached garage with a dwelling unit on the second storey.

Based on the accompanying geotechnical report prepared by Skmana Creek Consulting, the existing FCL of 652.3 can safely be reduced to 642.75 metres G.S.C. in order to permit the construction of a one-family dwelling and a detached garage with a dwelling unit on the second storey.

AREA OF PROPERTY AFFECTED	ALR STATUS	ZONING	OCP
Entire shared interest Lot: 34.6 ha (85.5 acres)	N/A	Country Residential K (R2K)	Country Residential (R2)
Subject Site: 0.2 ha (0.5 acres)			

APPLICANT:

Aplin & Martin Consultants Ltd. (Angele Clarke)

OTHER INFORMATION: ADVISORY PLANNING AND HERITAGE COMMISSION PLEASE NOTE:

If your Advisory Planning and Heritage Commission plans to hold a meeting to discuss this application, please note that the applicants must be provided with an opportunity to attend such meeting, in accordance with Section 461, subsection (8) of the *Local Government Act*, which reads as follows:

"If the commission is considering an amendment to a plan or bylaw, or the issue of a permit, the applicant for the amendment or permit is entitled to attend meetings of the commission and be heard."

Please fill out the Response Summary on the back of this form. If your agency's interests are 'Unaffected' no further information is necessary. In all other cases, we would appreciate receiving additional information to substantiate your position and, if necessary, outline any conditions related to your position. Please note any legislation or official government policy which would affect our consideration of this permit.

**ZACHARI GIACOMAZZO, PLANNER
REGIONAL DISTRICT OF CENTRAL KOOTENAY**

- MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
- HABITAT BRANCH (Environment)
- FRONTCOUNTER BC (MFLNRORD)
- AGRICULTURAL LAND COMMISSION
- REGIONAL AGROLOGIST
- ENERGY & MINES
- MUNICIPAL AFFAIRS & HOUSING
- INTERIOR HEALTH, HBE TEAM
- SCHOOL DISTRICT NO.
- WATER SYSTEM OR IRRIGATION DISTRICT
- UTILITIES (FORTIS, BC HYDRO, NELSON HYDRO, COLUMBIA POWER)

REGIONAL DISTRICT OF CENTRAL KOOTENAY

DIRECTORS FOR:

- A B C D E F G H I J K

ALTERNATIVE DIRECTORS FOR:

- A B C D E F G H I J K

- APHC AREA 'K'
- RDCK FIRE SERVICES
- RDCK EMERGENCY SERVICES
- RDCK BUILDING SERVICES
- RDCK UTILITY SERVICES
- RDCK RESOURCE RECOVERY
- RDCK REGIONAL PARKS

INSERT COMMENTS ON REVERSE . . .

The personal information on this form is being collected pursuant to *Regional District of Central Kootenay Planning Procedures and Fees Bylaw No. 2457, 2015* for the purpose of determining whether the application will affect the interests of other agencies or adjacent property owners. The collection, use and disclosure of personal information are subject to the provisions of FIPPA. Any submissions made are considered a public record for the purposes of this application. Only personal contact information will be removed. If you have any questions about the collection of your personal information, contact the Regional District Privacy Officer at 250.352.6665 (toll free 1.800.268.7325), info@rdck.bc.ca, or RDCK Privacy Officer, Box 590, 202 Lakeside Drive, Nelson, BC V1L 5R4.

RESPONSE SUMMARY

FILE: F2305K APPLICANT: APLIN & MARTIN CONSULTANTS LTD. (ANGELE CLARKE)

Name:

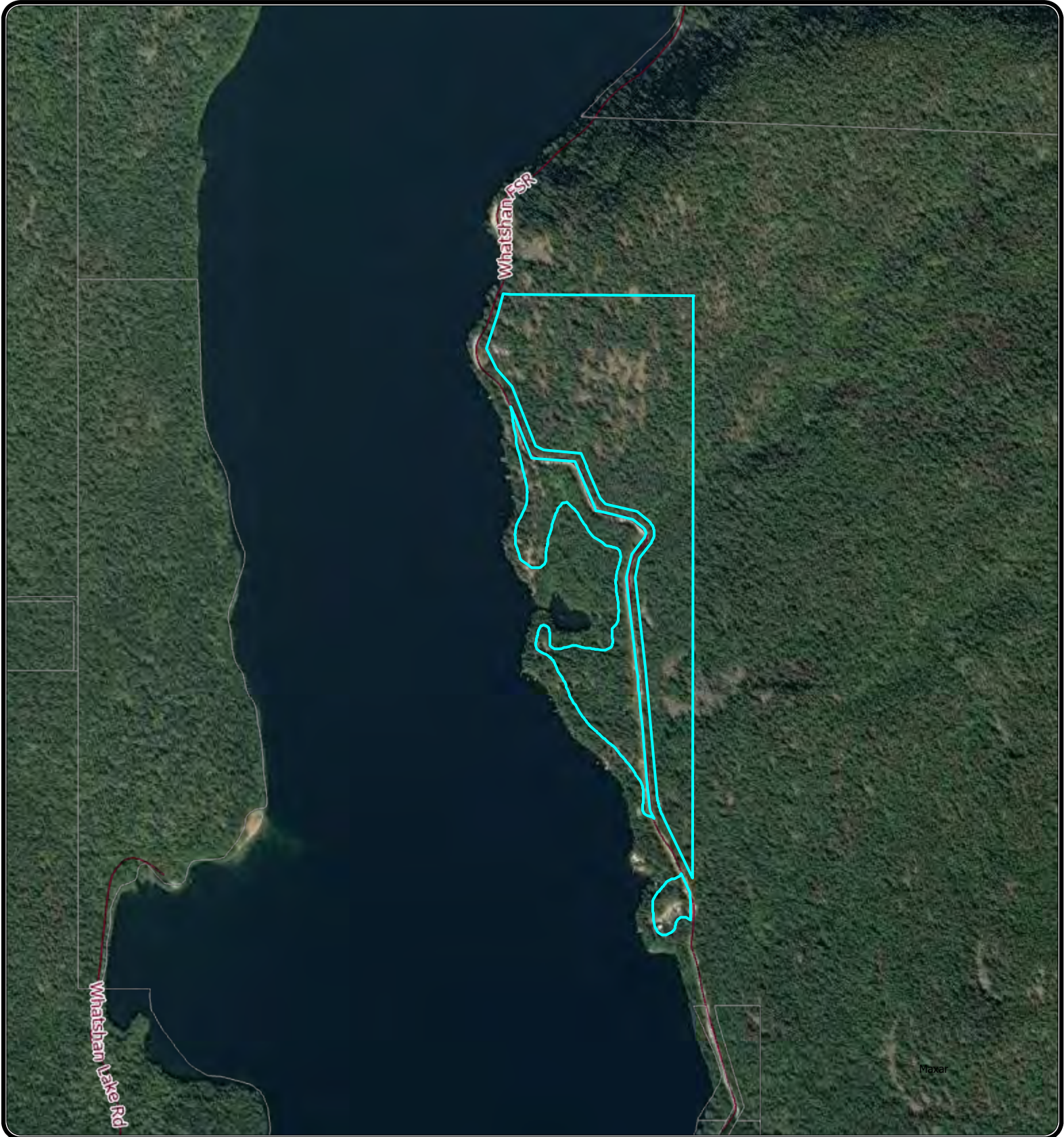
Date:

Agency:

Title:




RETURN TO: ZACHARI GIACOMAZZO, PLANNER
DEVELOPMENT AND COMMUNITY SUSTAINABILITY SERVICES
REGIONAL DISTRICT OF CENTRAL KOOTENAY
BOX 590, 202 LAKESIDE DRIVE
NELSON, BC V1L 5R4
Ph. 250-352-8190
Email: plandept@rdck.bc.ca

RDCK Map



REGIONAL DISTRICT OF CENTRAL KOOTENAY
Box 590, 202 Lakeside Drive,
Nelson, BC V1L 5R4
Phone: 1-800-268-7325 www.rdck.bc.ca
maps@rdck.bc.ca

Legend

-  Electoral Areas
-  RDCK Streets
-  Cadastre

Map Scale:

1:18,056

Date: December 12, 2023



The mapping information shown are approximate representations and should only be used for reference purposes. The Regional District of Central Kootenay is not responsible for any errors or omissions on this map.

RDCK Map



Maxar



REGIONAL DISTRICT OF CENTRAL KOOTENAY
 Box 590, 202 Lakeside Drive,
 Nelson, BC V1L 5R4
 Phone: 1-800-268-7325 www.rdck.bc.ca
 maps@rdck.bc.ca

Zoning Class

- Agriculture
- Environmental Reserve
- Open Space

Legend

- Parks and Recreation
- Residential 2
- Electoral Areas
- RDCK Streets
- Cadastre

Map Scale:

1:18,056

Date: December 12, 2023



The mapping information shown are approximate representations and should only be used for reference purposes. The Regional District of Central Kootenay is not responsible for any errors or omissions on this map.

RDCK Map






Maxar



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maps@rdck.bc.ca

Legend

-  Electoral Areas
-  RDCK Streets
-  Cadastre

Map Scale:

1:2,000

Date: January 30, 2024



The mapping information shown are approximate representations and should only be used for reference purposes. The Regional District of Central Kootenay is not responsible for any errors or omissions on this map.



December 12, 2023

AM File: 22-3101

Regional District of Central Kootenay
202 Lakeside Drive, Nelson BC, V1L 6B9

RE: Site Specific Floodplain Exemption for 1-1076 Whatshan Lake FSR

On behalf of our client, Aplin Martin Consultants Ltd. (Aplin Martin) is pleased to submit this application for a Site-Specific Floodplain Exemption to the Regional District of Central Kootenay (RDCK). Our application seeks relief from the Flood Construction Level specified for Whatshan Lake, which is 652.3 metres Geodetic Survey of Canada (GSC), to build 2.3 m lower at 650.0 metres GSC. The intention of the exemption is to facilitate development of a single-family home and detached garage with guest suite.

Property location: 1-1076 Whatshan Lake Forest Service Road (FSR) Regional District of Central Kootenay (RDCK) Region, BC

Legal description: Parcel A (Reference Plan 834221) of District Lot 8170, Kootenay District, Except Plan NEP19125

PID: 005-712-700

Property size: 0.51 acre or 0.21 hectares

Electoral Area: K - The Arrows Lake

OCP future land use: R2 - Country Residential

Zoning: R2K - Country Residential

We believe this application and its supporting documents provide the necessary information to satisfy RDCK's application requirements. In addition to our written rationale, we offer the following attachments:

1. Completed RDCK Flood Construction Level Application Form
2. Completed RDCK Site Disclosure Statement
3. Certificate of Title (accessed on December 5, 2023)
4. Geotechnical Report (Skmana Creek Consulting)
5. Geotechnical Investigation Report (GeoPacific Consultants)
6. Site Survey (Vector Geomatics)
7. Preliminary Site Plan
8. Preliminary Grading Impact Extents
9. Preliminary Grading Plan
10. Preliminary Architectural Drawings (Red Crayon Design)
11. Board Authorization (Whatshan Resorts)

Should you have questions or require clarification regarding any part of this application, please do not hesitate to contact us. Thank you for your consideration.

Sincerely,
APLIN & MARTIN CONSULTANTS LTD.

Mitchell Stykalo, Planner

Site Context

The subject property is a rural property located on Whatshan Lake which is west of Burton, BC and Mt Ingersoll. The parcel has approximately 300 ft of lakefront and the owners have 4/100 of a freehold interest in an 85-acre development. Community water is available on site and there is driveway access to Whatshan Lake Forest Service Road (FSR).

Surrounding Land Uses

North: Country Residential (R2)

East: Open Space (OS)

West: Environmental Reserve - Whatshan Lake (ER)

South: Country Residential (R2)



Figure 1: Location Map in RDCK West of Burton, BC

Legislative Framework and Applicable Policy

Under section 524 of the *Local Government Act (LGA)*, a local government may exempt a person from the application of a floodplain bylaw in relation to a specific building if the local government considers it advisable and either:

- Considers that the exemption is consistent with the Provincial Guidelines; or
- Has received a report that the land may be used safely for the use intended where such a report is certified by a person who is a professional engineer or geoscientist and experienced in geotechnical engineering.

Geotechnical Report – Skmana Creek Consulting Ltd.

Our client retained Skmana Creek Consulting Ltd. (Skmana) in Spring 2023 to complete a geotechnical report to support the flood construction level variance application. Skmana conducted a field review in April 2023 where they investigated the shoreline and subject property. Additionally, Skmana (2023) performed an erosion assessment to determine the maximum extent of expected erosion as a result of extreme wave action from Whatshan Lake. The report confirmed the subject site is suitable for the intended residential development if recommendations are abided by.

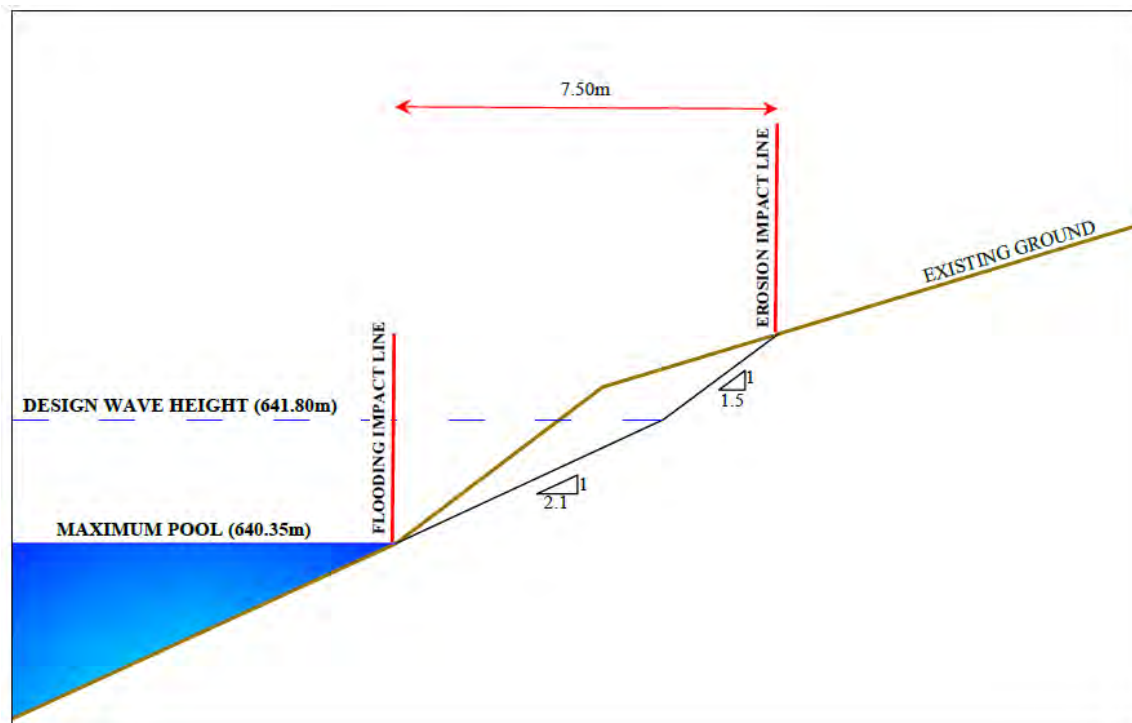


Figure 3: Erosion Impact Assessment Visual

Following the field review and erosion assessment, Skmana identified the recommended flood construction level at 641.8 metres, positioned 1.45 metres above the full pool level (640.35m), with a corresponding wave protection height of 1.45 metres. Skmana (2023) also determined a minimum setback of 7.5 metres is required based on the full extent of potential erosion occurring during full pool level on Whatshan Lake. The present setback, established by RDCK, is 15 metres from the high water level. Skmana recommended maintaining the previously established setback of 15 metres, in addition to amending the flood construction level to 641.8 metres, to minimize potential erosion impacts and ensure safe residential development on the site. For more details, the full geotechnical report is available as an attachment of this application.

Geotechnical Report – GeoPacific Consultants Ltd.

GeoPacific Consultants Ltd. (GeoPacific) were engaged by our client in Fall 2023 to complete a geotechnical investigation for the proposed residential development site. GeoPacific performed a field investigation in September 2023 which included detailed site reconnaissance and test pit sampling. Subsurface conditions and slope stability were examined to determine recommendations for site preparation and construction measures. GeoPacific recommended reviewing several technical aspects to ensure safe construction of the intended site occurs. This included reviewing the site stripping and site preparation works, compaction of engineered fill, and foundation subgrade prior to footing construction (GeoPacific, 2023). More details of the geotechnical investigation and recommendations can be found in the attached full report.

Recommendations

That the Electoral Area K Advisory Planning and Heritage Commission consider the Floodplain Exemption Application for the property located at 1-1067 Whatshan Lake to reduce the required Flood Construction Level for the Whatshan Lake Reservoir from 652.3 metres above mean sea level GSC datum to 650.0 metres. With the issuance of this application, the owner will register a restrictive covenant under Section 219 of the Land Title Act (Covenant secured against title) and of Section 56 of the Community Charter (Requirements for Geotechnical Reports) in favour of the Regional District of Central Kootenay on their property and adhere to it through development.

SITE PLAN OF SITES 1, 2 AND 3 BEING A PART OF PARCEL A (REFERENCE PLAN 834221) OF DISTRICT LOT 8170 KOOTENAY DISTRICT EXCEPT PLAN NEP19125

PID: 005-712-700 (PARCEL A)
 CLIENTS: [REDACTED] AND [REDACTED]
 CIVIC ADDRESS: 1076 WHATSHAN LAKE ROAD, BC

HORIZONTAL COORDINATE SYSTEM: UTM 11 NAD83(CSRS)
 VERTICAL DATUM: CGVD28 (DERIVED FROM OBSERVATIONS PROCESSED USING THE CSRS-PPP ONLINE PROCESSING PROVIDED BY NATURAL RESOURCES CANADA)

FIELD SURVEY COMPLETED: APRIL 19, 2022

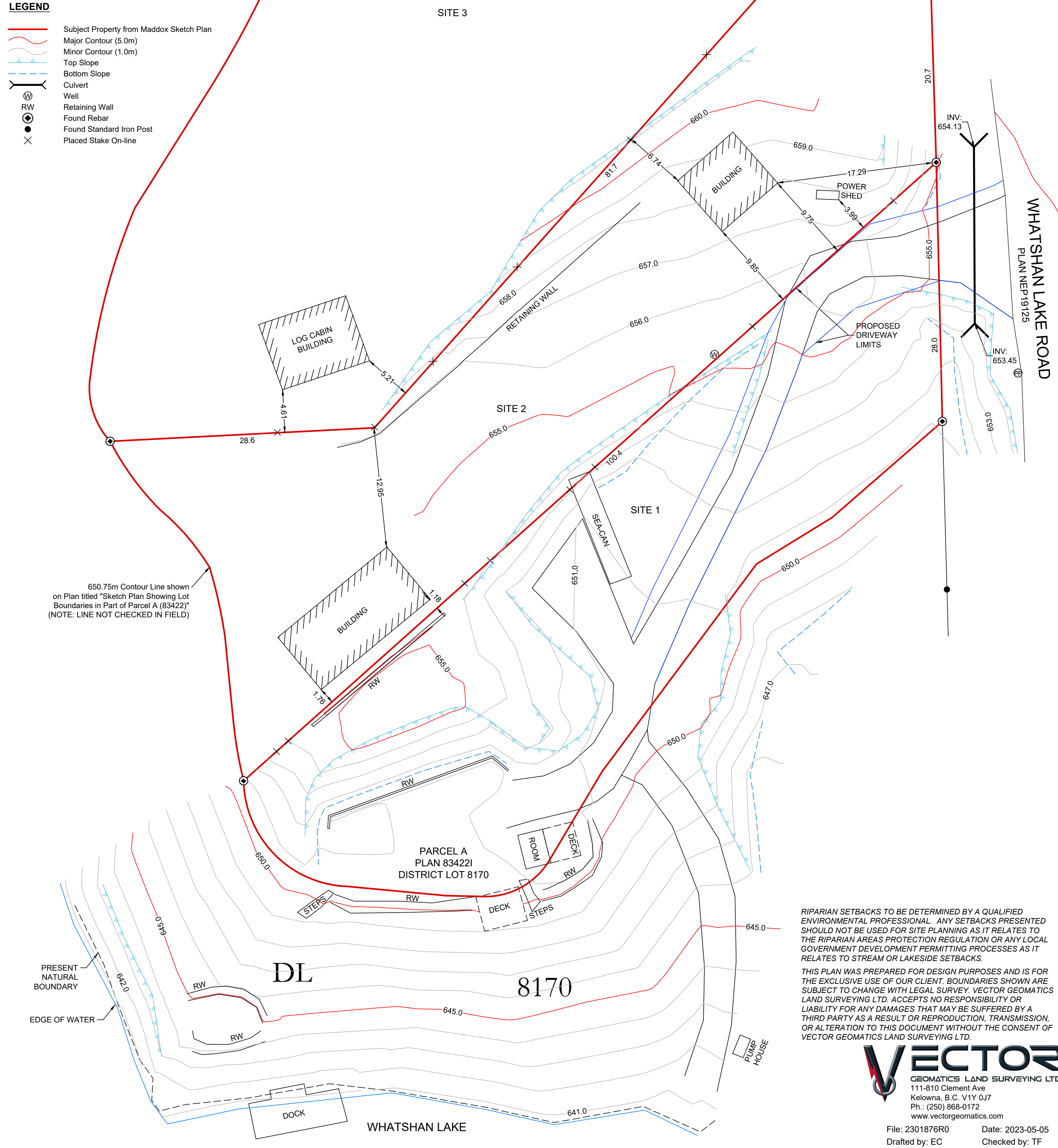
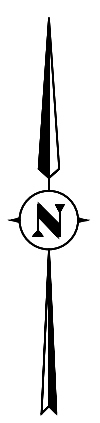
REFER TO THE CURRENT STATE OF TITLE FOR CHARGES, LIENS, AND INTERESTS AFFECTING THIS LAND.

SCALE 1:300



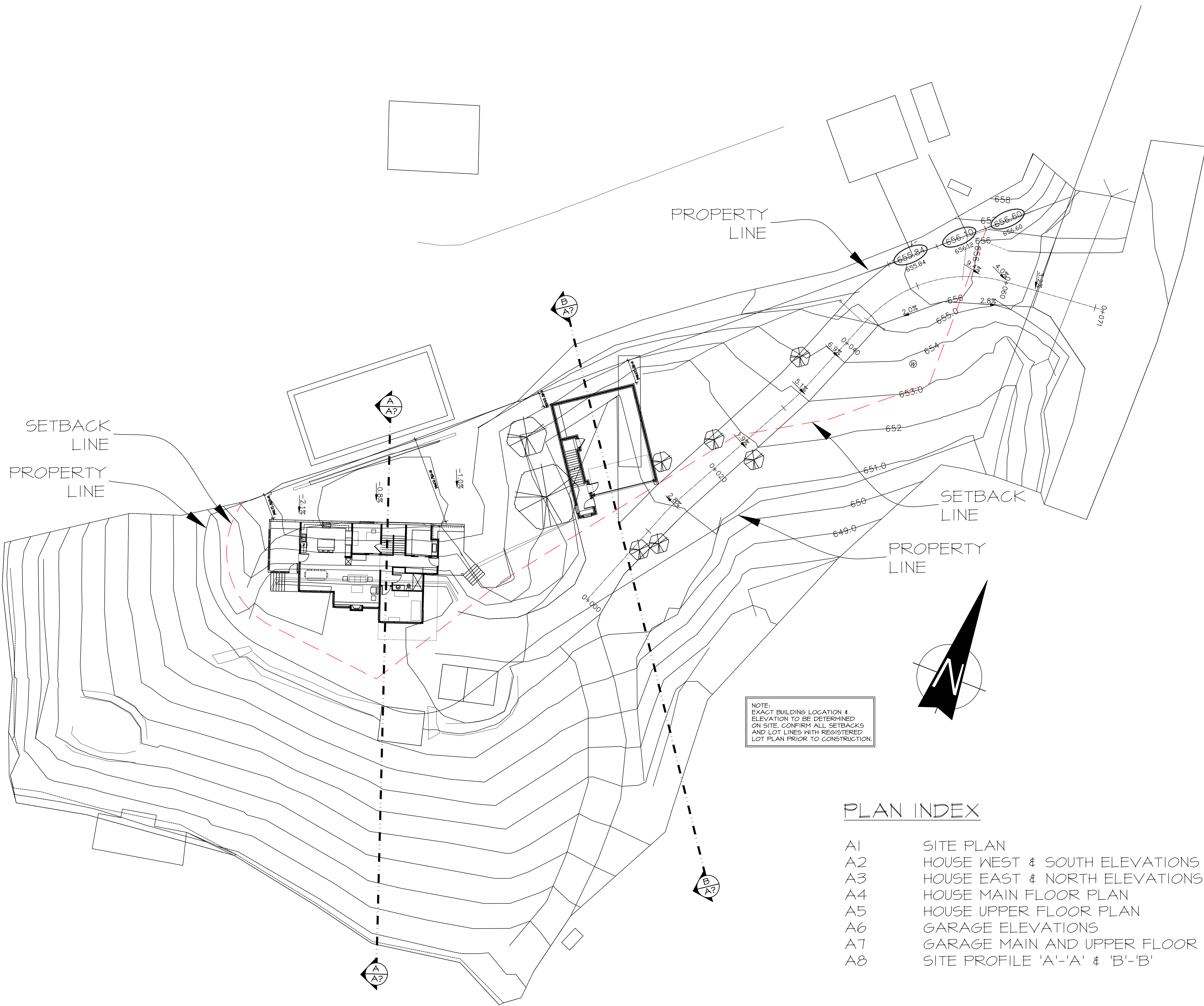
LEGEND

- Subject Property from Maddox Sketch Plan
- Major Contour (5.0m)
- Minor Contour (1.0m)
- Top Slope
- Bottom Slope
- Culvert
- Well
- Retaining Wall
- Found Rebar
- Found Standard Iron Post
- Placed Stake On-line



VECTOR
 GEOMATICS LAND SURVEYING LTD.
 111-810 Clement Ave
 Kelowna, B.C. V1Y 0J7
 Ph.: (250) 868-0172
 www.vectorgeomatics.com

File: 2301876R0 Date: 2023-05-05
 Drafted by: EC Checked by: TF



NOTE:
EXACT BUILDING LOCATION &
ELEVATION TO BE DETERMINED
ON SITE. CONFIRM ALL SETBACKS
AND LOT LINES WITH REGISTERED
LOT PLAN PRIOR TO CONSTRUCTION.

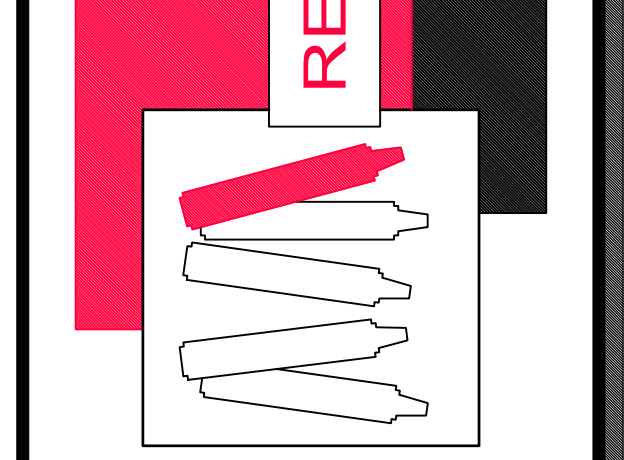
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- A1 SITE PLAN
- A2 HOUSE WEST & SOUTH ELEVATIONS
- A3 HOUSE EAST & NORTH ELEVATIONS
- A4 HOUSE MAIN FLOOR PLAN
- A5 HOUSE UPPER FLOOR PLAN
- A6 GARAGE ELEVATIONS
- A7 GARAGE MAIN AND UPPER FLOOR PLAN
- A8 SITE PROFILE 'A'-'A' & 'B'-'B'

PROJECT
PARCEL A WHATSHAN
LAKE ROAD
KOOTENAY DISTRICT, BC

SHEET TITLE
SITE PLAN

Interior Design & Consulting
redcrayondesign@shaw.ca
RED CRAYON DESIGN
10276 Beacon Hill Drive
Lake Country BC V4V 0A9
Ph. 250.368.0577 Fax 250.868.0583

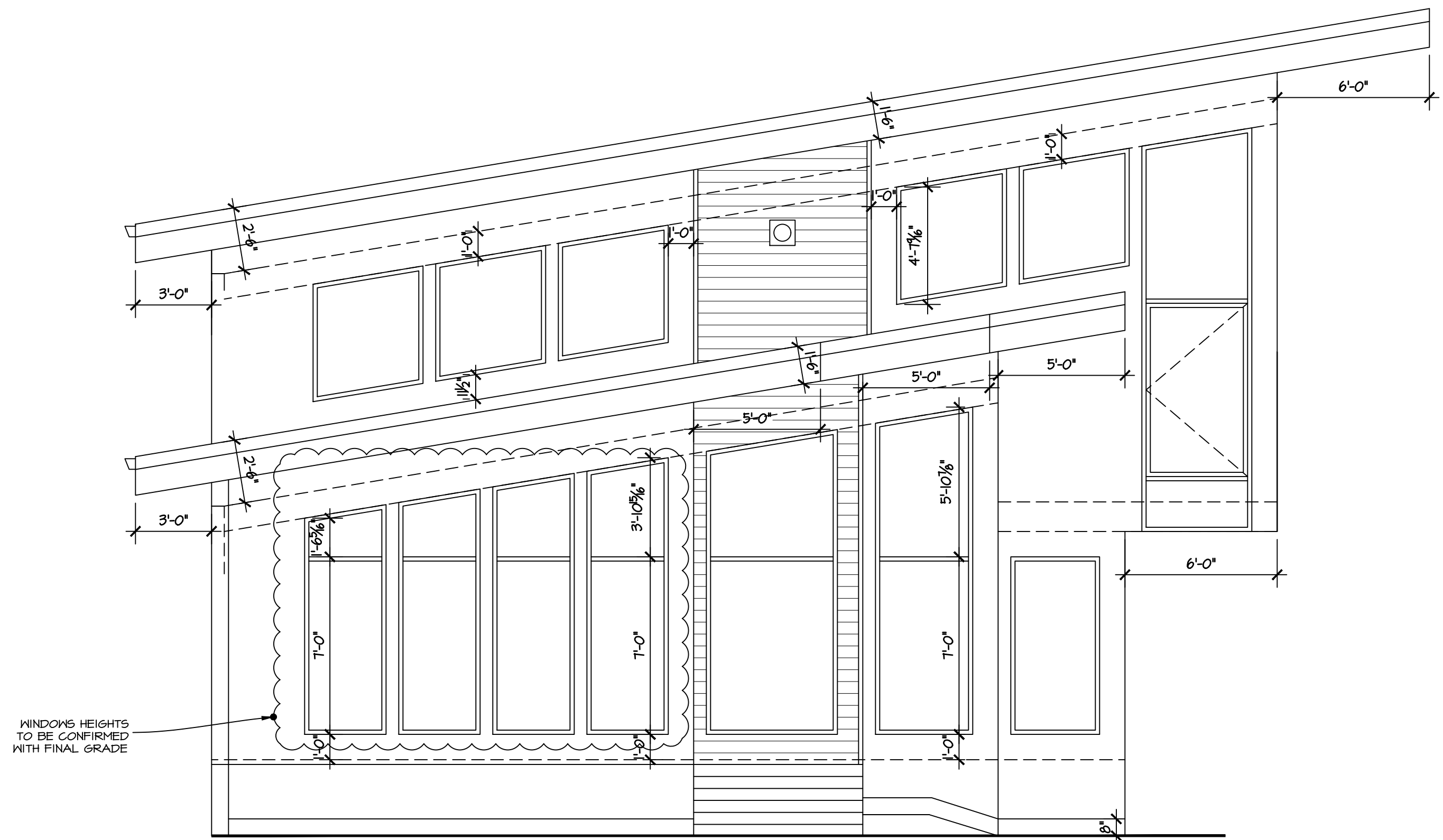


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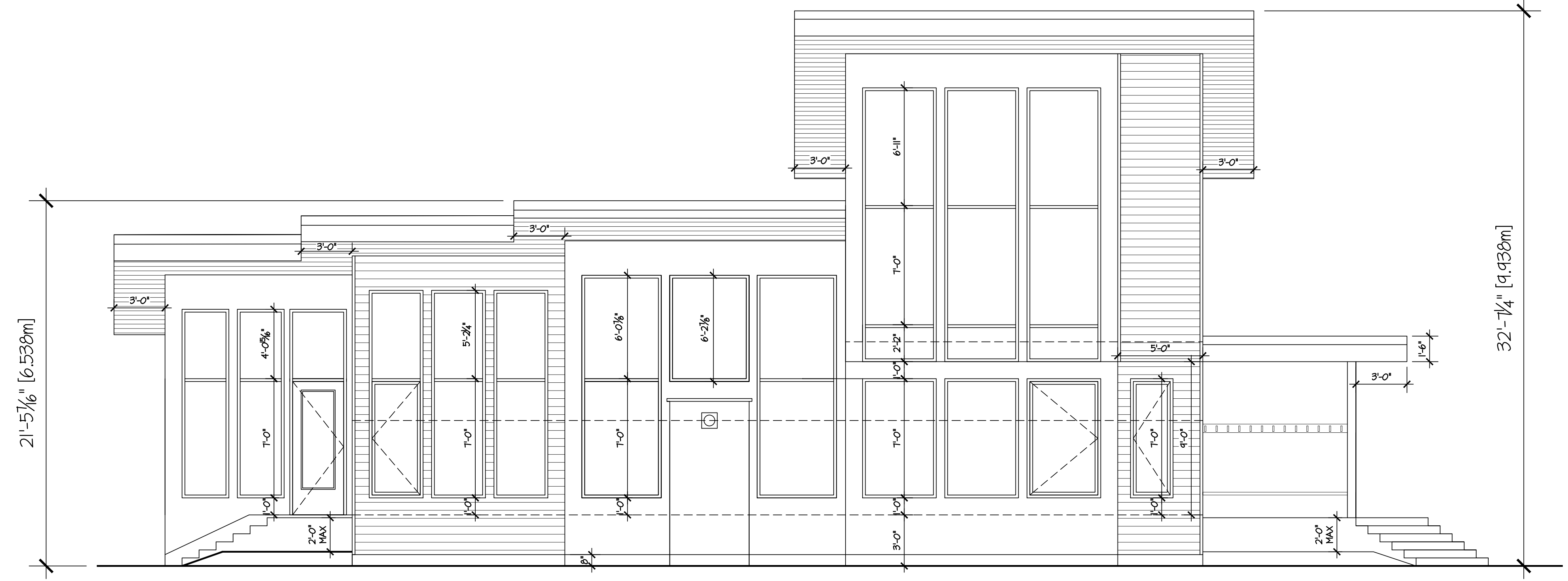
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DATE	12/06/2023		

SHEET NO.
A1



HOUSE WEST ELEVATION

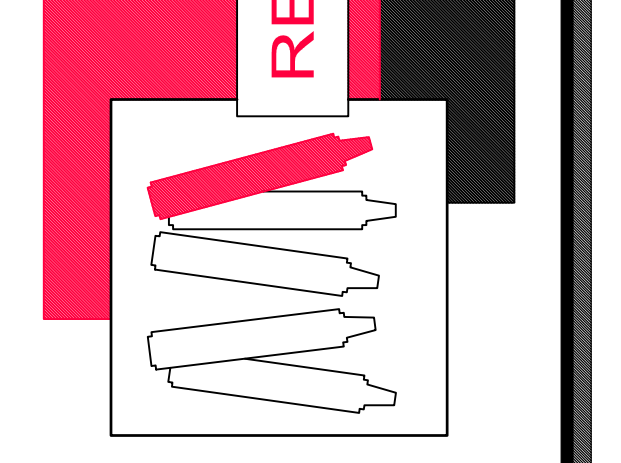


HOUSE SOUTH ELEVATION

PROJECT
 PARCEL A WHATSHAN
 LAKE ROAD
 KOOTENAY DISTRICT, BC

SHEET TITLE
 FRONT & RIGHT
 ELEVATION

Interior Design & Consulting
 redcrayondesign@shaw.ca
RED CRAYON DESIGN
 10276 Beacon Hill Drive
 Lake Country BC V4V 0A9
 Ph. 250.868.0577 Fax 250.868.0583

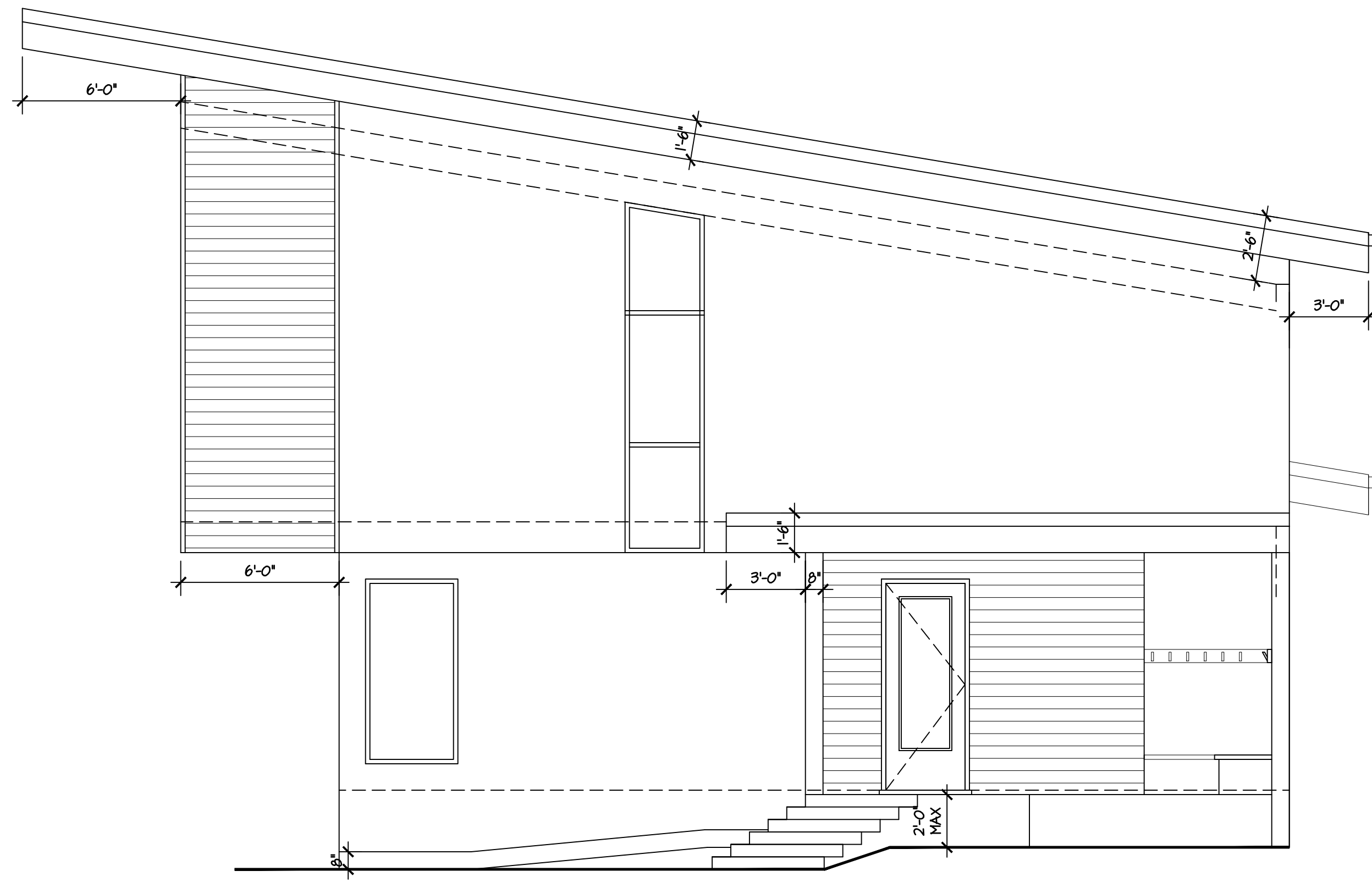


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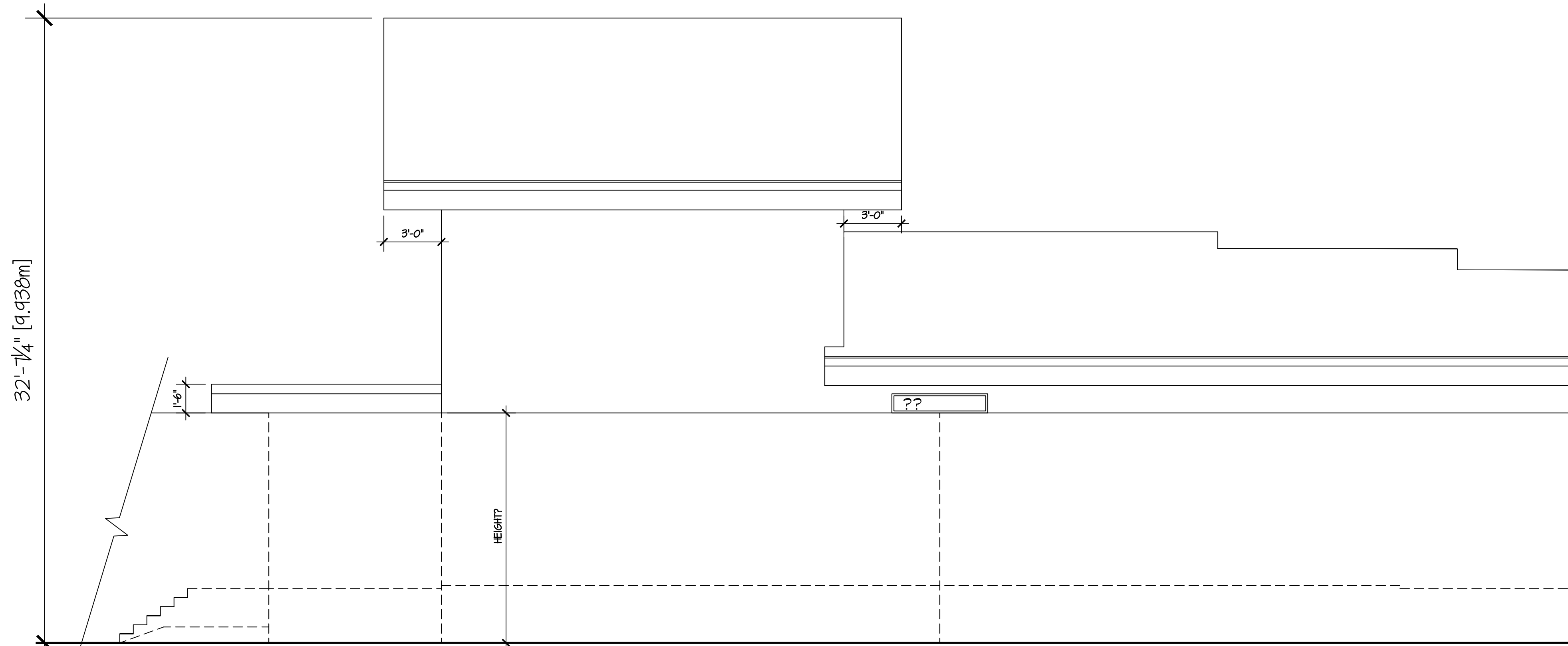
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DATE	NO.	BY	REVISION

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SCALE	AS NOTED	
DATE	12/06/2023	

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A2



HOUSE EAST ELEVATION

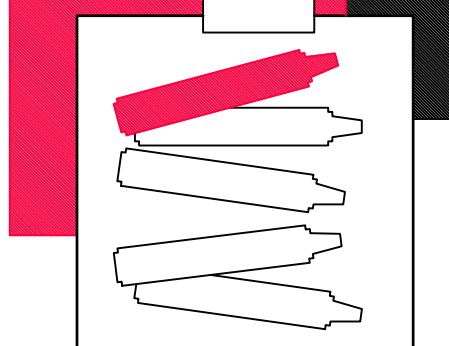


HOUSE NORTH ELEVATION

PROJECT
 PARCEL A WHATSHAN
 LAKE ROAD
 KOOTENAY DISTRICT, BC

SHEET TITLE
 REAR & LEFT
 ELEVATION

Interior Design & Consulting
 redcrayondesign@shaw.ca
RED CRAYON DESIGN
 10276 Beacon Hill Drive
 Lake Country BC V4V 0A9
 Ph. 250.868.0577 Fax 250.868.0583

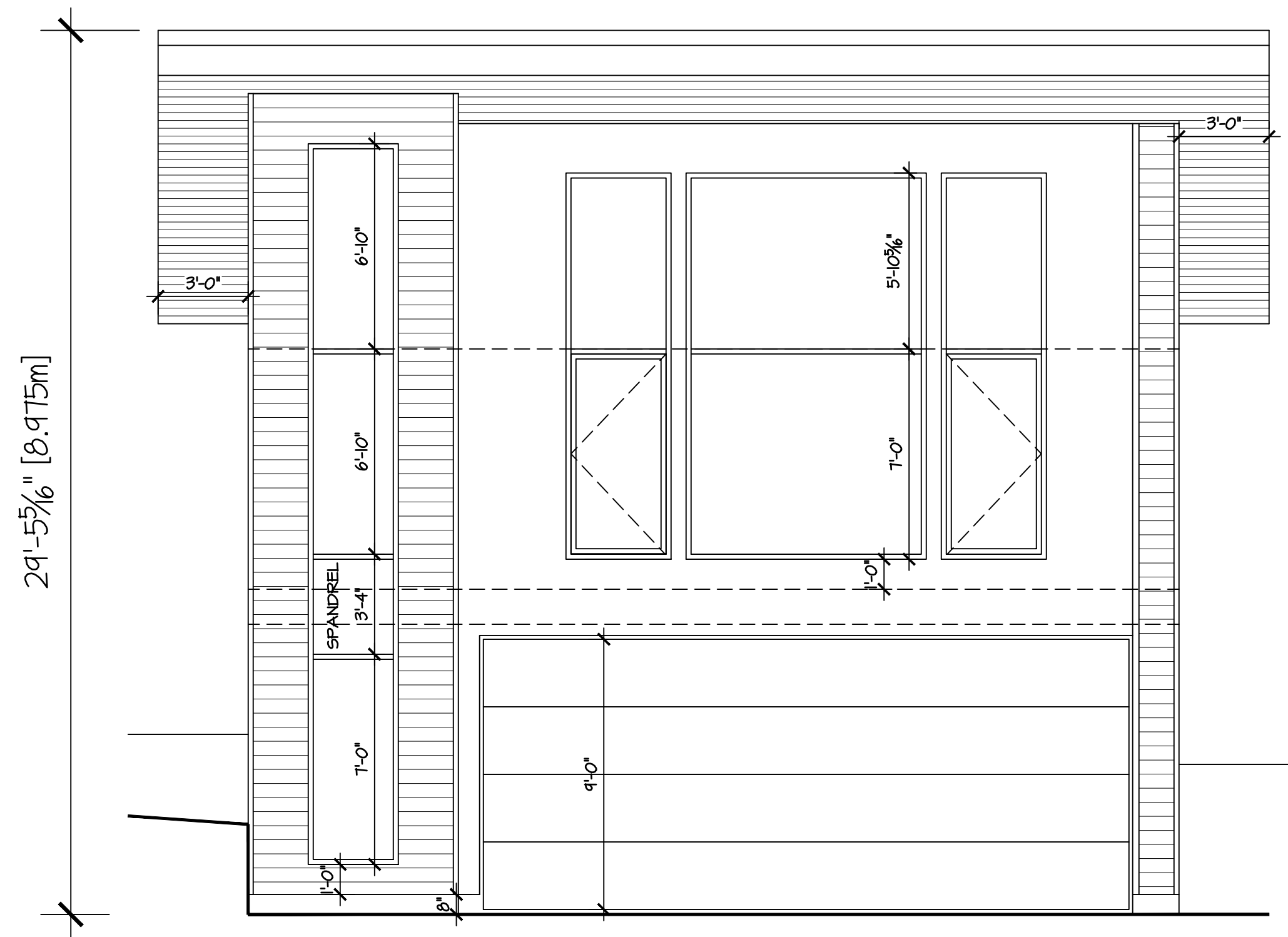


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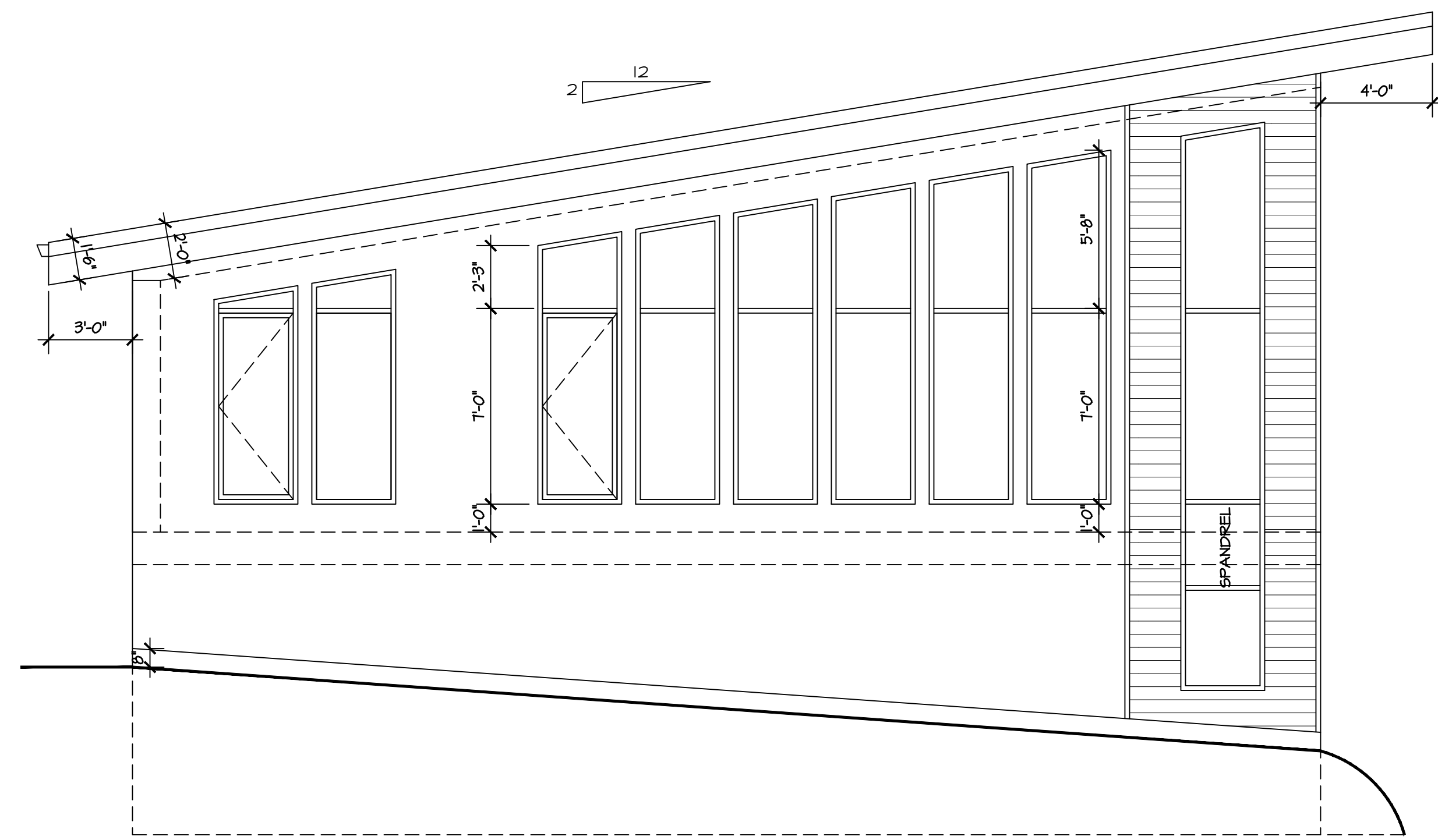
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DATE	12/06/2023		

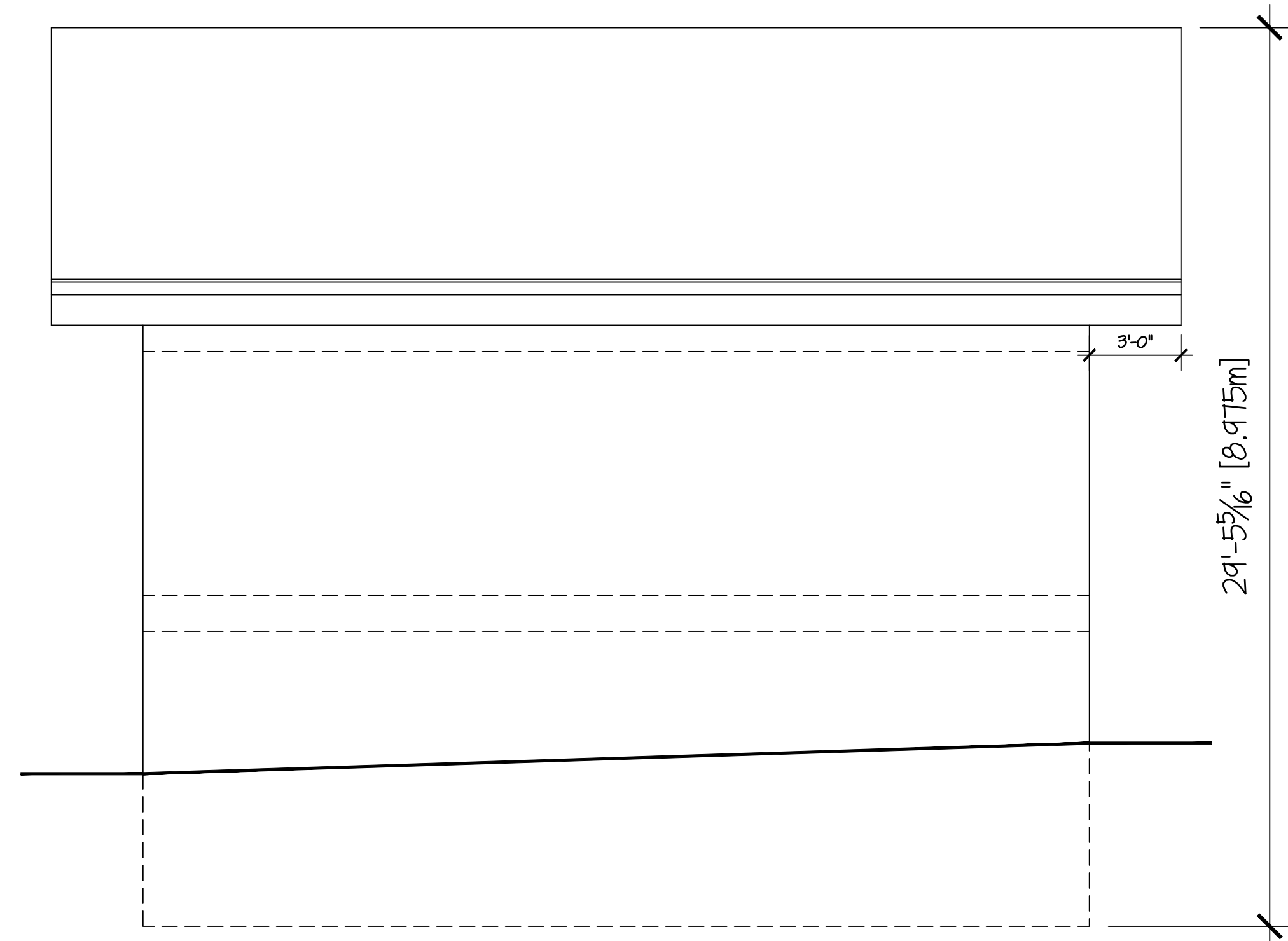
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A3



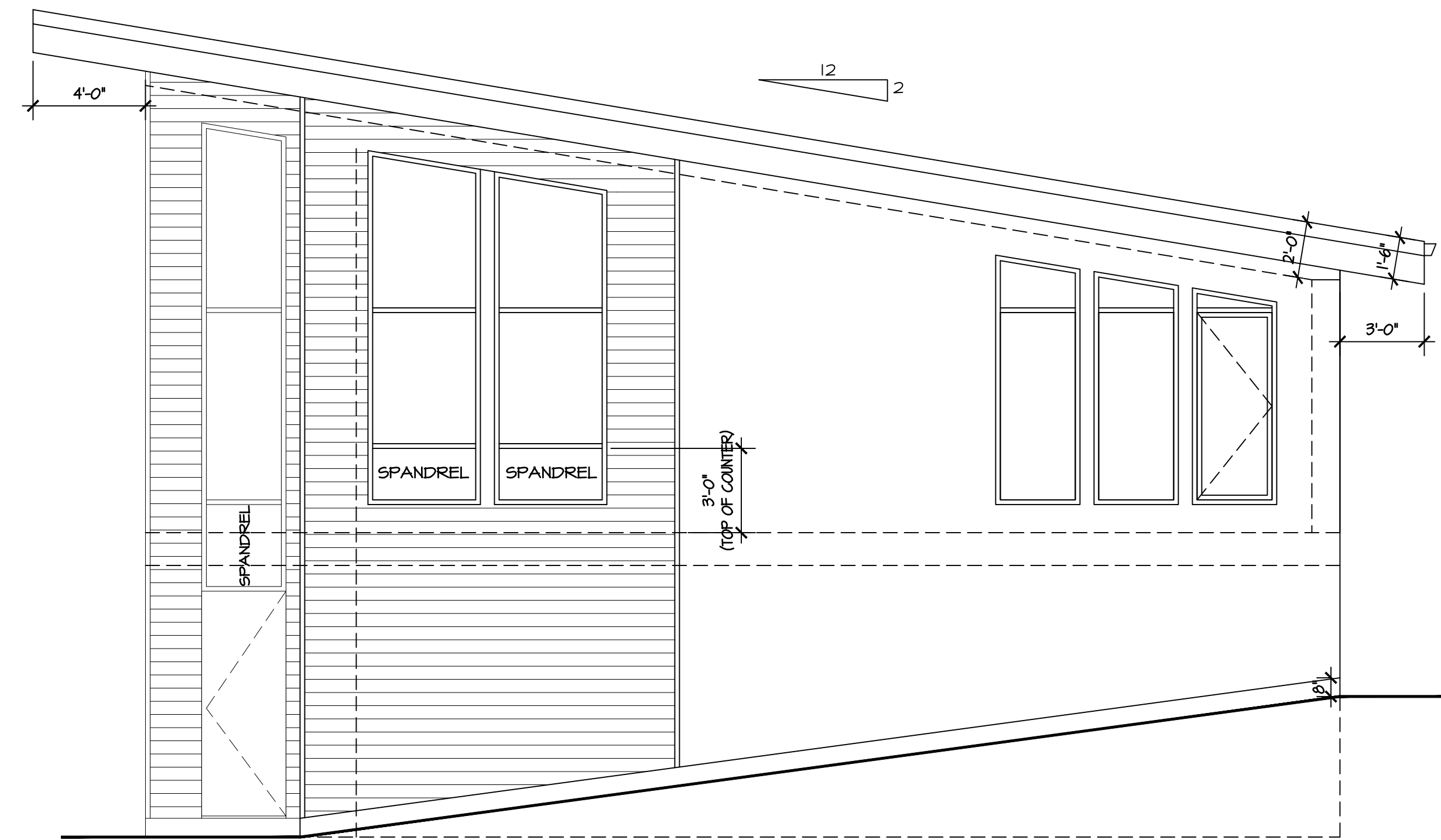
GARAGE SOUTH EAST ELEVATION



GARAGE SOUTH WEST ELEVATION



GARAGE NORTH WEST ELEVATION



GARAGE NORTH EAST ELEVATION

PROJECT
 PARCEL A WHATSHAN
 LAKE ROAD
 KOOTENAY DISTRICT, BC

SHEET TITLE
 CLERESTORY
 PLAN

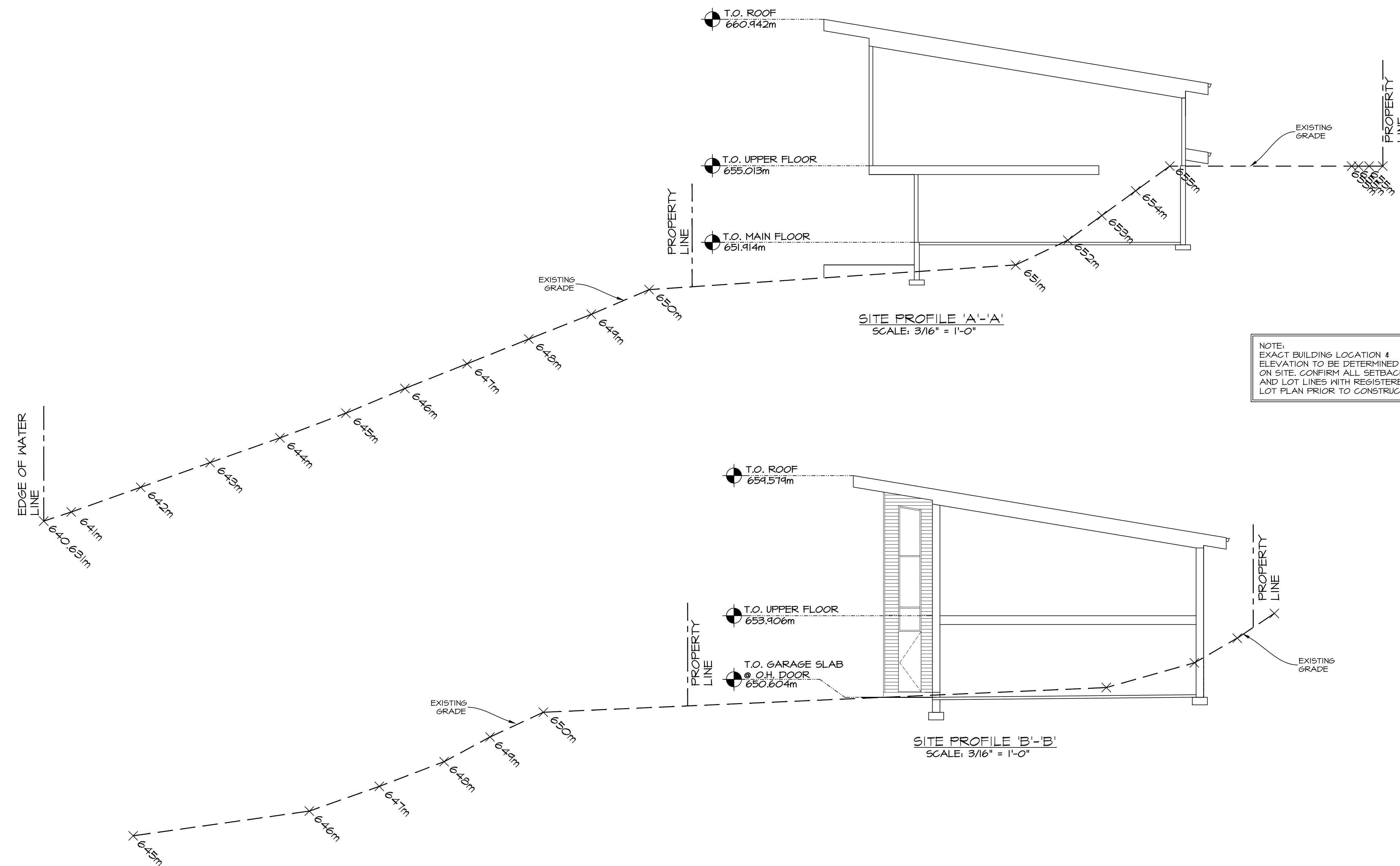
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DATE	12/06/2023		

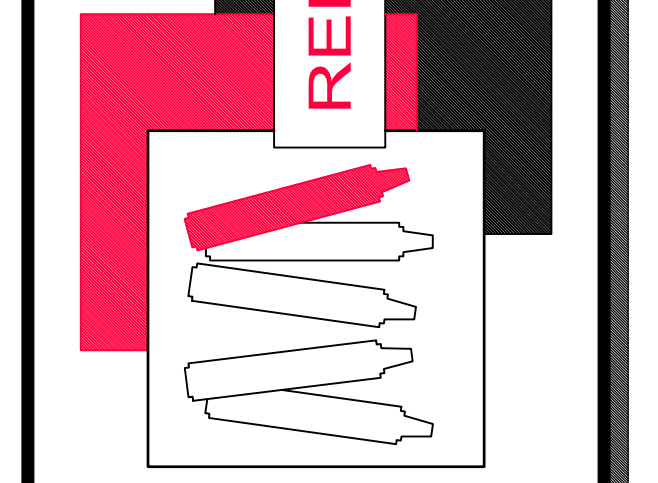
SHEET NO.
A6



PROJECT
 PARCEL A WHATSHAN LAKE ROAD
 KOOTENAY DISTRICT, BC

SHEET TITLE
 CROSS SECTION
 'A'-A' & 'B'-B'

Interior Design & Consulting
 redcrayondesign@shaw.ca
RED CRAYON DESIGN
 10276 Beacon Hill Drive
 Lake Country BC V4V 0A9
 Ph. 250.868.0577 Fax 250.868.0583



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SCALE	AS NOTED		
DATE	12/06/2023		

SHEET NO.
A8



Geotechnical Report

for a

Flood Construction Level Variance

#1 - 1076 Whatshan Lake FSR
Whatshan Lake, BC

January 18, 2024

Project Number: 2023-007
Distribution:
Client – 1 copy
Consultant – 1 copy





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1. Introduction

As per the request of [REDACTED] (the Owner), an erosion and flood assessment was performed on the property at Lot 1 - 1076 Whatshan Lake FSR in Whatshan, BC (the Lot). This assessment was performed to determine the potential to establish an alternate FCL and Setback while still maintaining suitable requirements for the safe development of the property.

The property is located on the east shore of Whatshan Lake approximately 100 kilometers east of Kelowna, BC. Figure 1 presents the location of the Lot and Figure 2 (see Appendix A) presents the Site Plan of the Lot. The co-ordinate position of the area is UTM 11N, 420,649m E, 5,532,235 m N.

The following are the results of our assessment and our recommendations.

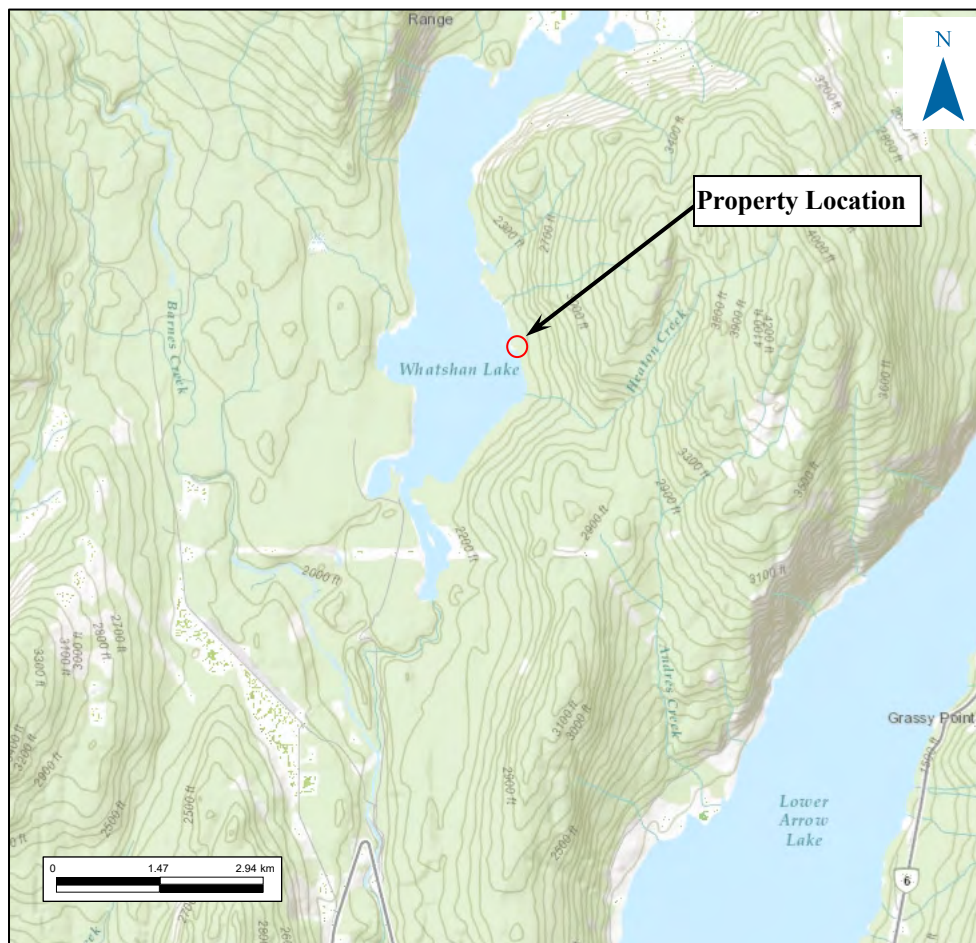


Figure 1 - Location Map

(Prov of BC iMap 2024)

2. Information Sources & Guidelines

To perform the natural hazards assessment, the following documentation and guidelines were utilized:

- Terms of Reference, Requirements for Professional Engineers / Geoscientists undertaking Geotechnical Reports / Flood Hazard Assessment Reports', Regional District of Central Kootenay (Nov 2009)
- Shore Protection Manual - US Army Corps of Engineers (1984).
- EGBC Professional Practice Guidelines - Natural Hazards Professional Practice Guidelines Legislated Flood Assessments In A Changing Climate In BC, Version 2.1 (Aug 2018)
- Flood Hazard Area Land Use Management Guidelines', Province of British Columbia, Ministry of Environment (May 2004)
- Whatshan Project Water Use Plan, BC Hydro (June 2005)

3. History

3.1. Water Licence

During the initial planning of the Whatshan Lake dam, BC Hydro was granted a conditional water licence in 1948 (Appendix B - Water Licence #C018525) for a proposed water storage of 220,000 acre-feet (271,400,000 m³), however, a maximum storage elevation was not specified at that time.

An amendment of the water licence was granted in 1956 (Appendix B - Water Licence #C023267) for a proposed water storage of 82,500 acre-feet (101,760,250 m³) with a maximum storage level of 2140 ft (652.30m) elevation.

In 1972 (Appendix B - Water Licence #C023267), the 1956 water licence was amended to remove a proposed diversion on Barnes Creek, however, the proposed storage volume and level was unchanged.

A final amendment was granted in 2005 (Appendix B - Water Licence #F120712) for a proposed water storage of 115,300,000 m³ (93,500 acre-feet) with a maximum storage level of 641.30m (2104 ft) elevation.

3.2. Flood Management Bylaw

To establish a mechanism for managing construction in proximity to waterbodies and floodplains, the Regional District of Central Kootenay (RDCK) established a Floodplain Management Bylaw (No. 1650) in 2004 (the Bylaw). This Bylaw was subsequently amended in 2009 (Floodplain Management Bylaw No. 2080).

Identified in Section 7.1 (b) (a) and Section 7.2 (l) and summarized in Schedule "C" of the Bylaw, the Flood Construction Level (FCL) for Whatshan Lake is defined as 652.30m (2140 ft) elevation and the setback is defined as 7.5m.

Within the Bylaw, the FCL for other waterbodies controlled by dams (Arrow Reservoir, Duncan Lake, Kootenay Lake, etc.) coincides with the full pool storage elevation established by their respective water licences. Consequently, it is believed the FCL of 652.30m specified for Whatshan Lake is in reference to

the full pool elevation defined in the storage water licence that was active from 1956 to 2005 (#C023267); which was current when the initial Bylaw was adopted in 2004 (bylaw No. 1650). However, it is speculated that when the Bylaw was amended in 2009, the new full pool elevation defined in the 2005 water licence amendment for Whatshan Lake of 641.30m (2104 ft) was overlooked and not reflected in the revised bylaw (bylaw No. 2080).

4. Field Review

To assess the characteristics of the shoreline and the Lot, a field review was performed. This investigation was performed on April 3, 2023 by Mr. Mike Walsh, P.Eng. of Skmana Creek Consulting Ltd.. The work comprised of a field assessment of the following areas:

- A foot traverse of the shoreline and;
- A foot traverse of the subject property.

During the field review, the slopes, soil conditions, and the site/slope drainage were examined with respect to its present and future potential for erosion. Basic measurements were made using an inclinometer and GPS. Local soil and rock characteristics were determined by inspection of slope exposures and shoreline.

4.1. Site Description

Surficial geology maps were not available for the general area; therefore, site information is based on site observation and an aerial image review. The surficial deposits along the shoreline and on the Lot are a result of glacial and post glacial actions. The surficial soils observed along the shoreline and the upper property are a consequence of morainal and glacial outwash deposition and comprise of silty sand and gravel with abundant rounded cobbles and occasional boulders to 600mm. These deposits were generally noted to be compact to dense throughout the site.

In the vicinity of the Lot, the gradient of the shoreline exposed below the high water level (HWL) has a consistent slope of 24° - 26° from horizontal and comprised of surficial cobbles up to 300mm diameter underlain by dense sandy gravel. The terrain above the HWL varies from 15° to 18° and comprised of moderately treed terrain with a silty sand, gravel and cobble surface.

The slope directly above the HWL has some noted erosion which is likely caused by wave action and retrogressive surficial sloughing. The west facing slope had been augmented through the placement of rip rap armouring (400 - 750mm ϕ) and it is understood that similar rip rap armouring has been placed on the southwest facing slope since the site review. No further erosion or slope movement was noted in the upslope terrain or in the orientation of the trees.

4.2. Lot Description

The Lot is bordered on the eastern boundary by the Whatshan FSR, to the north by strata lot 2, to the south by Crown land and to the west and by Whatshan Lake (see Figure 2 - Appendix A).

5. Flood & Erosion Assessment

5.1. Flood Elevation

The Bylaw defines the Designated Flood Level as the observed water elevation as a consequence of a flood event with a 200 year recurrence interval. In addition, the Bylaw further defines for a watercourse controlled by a major dam, the level shall be set on a site specific basis. As Whatshan Lake is controlled by the operation of a dam structure, we have used the following approach to determine a proposed Designated Flood Level:

- Determine the design Full Pool Elevation of Whatshan Lake to establish the maximum lake level under normal operating conditions and;
- Perform a flood flow analysis for inflow into Whatshan Lake to determine the incremental level increase caused by a 200 year flood event.

This approach conservatively assumes that a 200 year flood event occurs when Whatshan Lake is at full pool.

Although BC Hydro compiles flow monitoring for the operation of the Whatshan Lake power system, a full historic record of this information is not publicly available. As such, we performed a regional analysis using published provincial hydrology data for the area and compared the result to the aggregated flow information published by BC Hydro for Whatshan Lake inflow.

An estimate of the 10 and 100 year flood flow for the Whatshan drainage was developed using the flood hydrology isoline mapping produced by the BC Ministry of Environment (Figure 3 - Appendix C). The isoline mapping information was adjusted to apply to the Whatshan Lake drainage using the methodology outlined by the province (Ahmed, 2020) to determine a 10 and 100 year flood flow for the site. These lower return period flood flows were extrapolated using a log analysis to approximate a 200 year flood flow for the site. Table 1 and Figure 4 (Appendix C) presents the compiled flood - frequency information.

Regional Analysis Flood Return Period (years)	Flood Flow (m³/sec)
10	94.3
100	125.2
200	137.2

Table 1 - Whatshan Lake Flood-Frequency
from Regional Analysis

A graphic published by BC Hydro (BC Hydro, 2005) of the historic inflows on Whatshan Lake from 1974 to 1999 indicates a 10 year flood of approximately 82 m³/sec (Figure 5 - Appendix C); implying the estimation from the regional analysis is reasonable and conservative.

Further to the results of the regional analysis, the estimated flood flow was increased by an additional 10% to account for the impacts of climate change on extreme flood flows, as recommended in Section 3.4 of Appendix G of EGBC Flood Assessment Guidelines (2018). Consequently, the Designated Flood Flow into Whatshan Lake is estimated to be:

Flood Return Period (years)	Climate Adjusted Flood Flow (m ³ /sec)
200	150.9

Table 2 - Whatshan Lake Flood-Frequency

As the impoundment of flow into Whatshan Lake is controlled by spilling at the dam overflow, determination of the Designated Flood Level is a function of the rate of flood discharge at the dam. To determine the lake elevation during a flood event, BC Hydro has published the rating curve for the spill discharge facilities (see Figure 6 - Appendix C). Based on this curve, it indicates at an inflow of 150 m³/sec, the lake elevation could be maintained at approximately 641m. Consequently, if a 200 year flood event were to occur during full pool (641.30m elev.), the dam would be capable of maintaining this lake level without additional surcharge (freeboard). As a result, the Designated Flood Level can be set as the dam's full pool elevation, 641.30m.

5.2. Erosion Assessment

As the Lot is adjacent to Whatshan Lake, some shoreline erosion has been, and will continue to be experienced. As such, an erosion assessment was performed to establish the probable maximum extent of expected erosion as a consequence of extreme wave action on the lake.

As the predominant shoreline erosion is caused by wind-wave action, an assessment was performed using the methodologies developed by the US Army Corp of Engineers (1984).

To establish the maximum erosion as a consequence of wave action at the site, an estimate of the design maximum wind speed was developed using the closest Environment Canada weather station with historic wind data located at the Hugh Keenleyside Dam (ID #1141457), approximately 70km from the Lot (Table 3 - Appendix C).

Based on a review of the historic wind data, it was observed that the maximum winds essentially always prevail from the west, which is a consequence of the east-west orientation of the relatively steep and narrow mountain valley that the Hugh Keenleyside dam weather station resides in. Conceptually, as the lake shoreline along the Lot trends north-south, the westerly maximum wind would develop waves that would strike the property shoreline at a perpendicular angle, maximizing the erosional affects. However, it is unknown if the Whatshan Lake valley is of sufficient east-west width to develop and sustain such wind conditions from the west. Nevertheless, to develop a conservative analysis, it was assumed that the maximum historic wind speed is possible and occurs at a perpendicular orientation to the shoreline

Based on the terrain and wind data as well as the lake bathymetry (BC, 1980), the information utilized to perform the erosion assessment is outlined in Table 4.

Wind speed	69 km/h
Fetch length	1400 m (SW)
Lake depth	27.5 m
Shoreline slope	2.1H : 1V

Table 4 - Wave Assessment parameters

Using this information, the wave *setup* was determined to be 0.15m and the wave *runup* height was 1.30m; creating a **Wave Protection Height** of approximately **1.45m**.

6. Recommendations

6.1. Flood Construction Level

Based on the conservative determination of the *Wave Protection Height* of 1.45m, it would be reasonable to propose amending the Flood Construction Level for the Lot to an elevation equivalent to 1.45m above the full pool level of the reservoir or, 642.75m elevation.

6.2. Setback Requirement

The present shoreline along the property is susceptible to erosion due to wave action as evidenced by the current erosion observed above the reservoir full pool elevation. In addition to this, further erosion driven by waves generated by extreme wind may develop more significant erosion occurrences. Based on observation of the existing erosion areas above the high water, it was determined that the wave eroded surface matches the grade of the shoreline surface below the HWL; approximately 2.1H:1V. Above the wave eroded surface, the slope becomes undermined and retrogressively erodes upslope due to the oversteepened face. This area of erosion above the wave height was observed to be approximately 1.5H:1V.

Reviewing the existing terrain in the context of the erosion grades outlined above, the maximum extent of erosion along the shoreline is projected to be less than 7.5m. Figure 8 illustrates this circumstance.

Based on the full extent of potential erosion driven by extreme waves occurring during full pool, a minimum setback of approximately 7.5m would be required.

Consequently, based on the present *setback* of 7.5m from the high water level, established by the RDCK (Section 7.2 (1) of the Bylaw), it would be reasonable to maintain this setback distance to govern future property development.

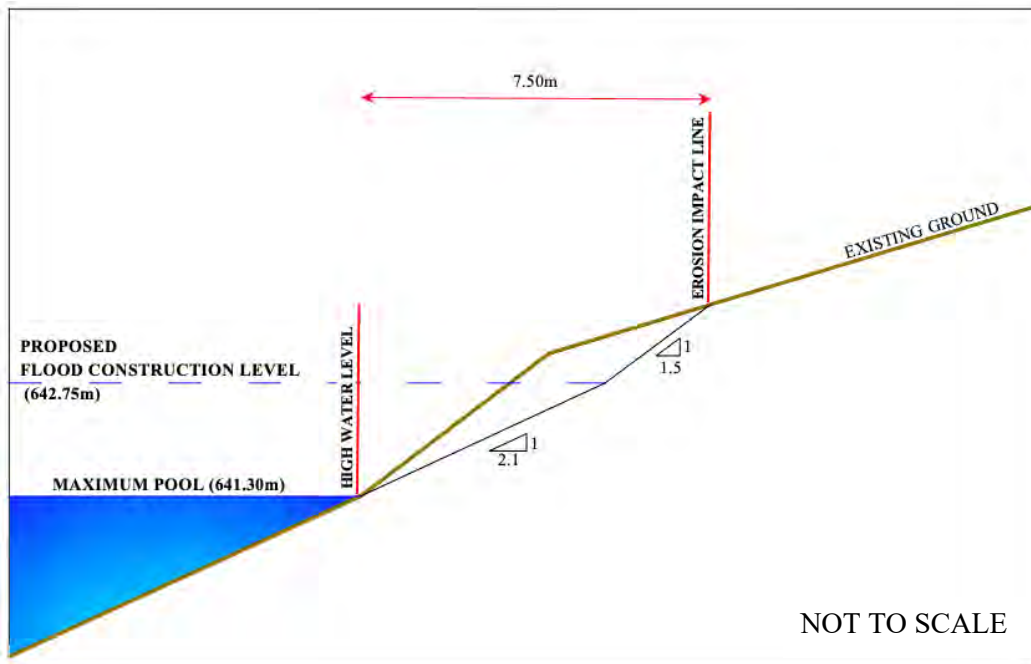


Figure 8 - Flood Control Level & Setback

7. Conclusion

The present FCL of 652.30m governing development on the Lot is 11m above the maximum 641.30m storage level licenced for the Whatshan Lake reservoir. As discussed in Section 3.2, it is believed the present FCL is in reference to an old water storage licence completed in 1956 by BC Hydro for a contemplated dam design that was not constructed. An amendment to this water storage licence was completed by BC Hydro in 2005 for the dam that was constructed and the water storage licence was approved for 641.30m. However, subsequent to the amendment of the water storage licence by BC Hydro, the FCL for Whatshan Lake was not updated by the RDCK.

It is understood that the current lower boundary of the property defined by the 650.75m elevation contour (Maddox, 1990) is well above both the proposed amended FCL and, the 7.5m setback from the HWL (see Figure 2 - Appendix A). This circumstance demonstrates that the entirety of the Lot should be available for development without flood protection restrictions. However, recognizing the original shoreline lot boundary was established based on the legal Plan 83422I completed to reflect the flooding limits of the superseded conditional reservoir flood elevation (652.30m elev.), there is the theoretical potential that the shoreline lot boundary could be amended in the future to the registered reservoir flood elevation (641.3m elev.). Consequently, it is recommended instead of extinguishing the flood protection requirements on the lot as they fall outside of the lot boundary, the FCL for the Lot should be amended to recommended 642.75m elevation and the required setback outlined in the Bylaw be maintained at 7.5m.

Based on the analysis performed for this study and subject to the proposed Flood Construction Level and Setback requirements, it can be concluded that the Lot will be safe for its intended use as a residential site.

It must be understood that the requirements in this report are intended to define the impact of erosion on the shoreline of the Lot. In the event that erosion does occur due to wave action during full reservoir, these requirements will not completely eliminate erosion and some damage may occur to the foreshore and

property. This damage may comprise of, but not be limited to, the erosion of slopes and land, the flooding of property and, the deposition of silt/sand/gravel and wood.

The information, interpretations and recommendations presented in this report are solely with respect to strata Lot 1 at 1076 Whatshan Forest Service Road in Whatshan, BC.

The recommendations proposed in this report are based on the observations made during the review of the site. If there are any significant variations from the conditions described in this report, an additional site review should be performed to provide amendments to the original recommendations.

This report and the recommendations contained within were developed in accordance with generally accepted engineering practice. No additional warranty is either expressed or implied.

We acknowledge that the report is prepared for the benefit of the Regional District of Central Kootenay as a pre-condition to the issuance of a Site Specific Exemption from the provisions of Floodplain Management Bylaw 2080, 2009 under Section 524 of the Local Government Act, and any conditions in this report shall be included in a Restrictive Covenant under Section 219 of the Land Title Act and filed against the title of the subject property.

This report has been prepared for and at the expense of the owner of the subject property and we have not acted for or as an agent of the Regional District of Central Kootenay in the preparation of the report.

8. Closure – Report Use and Limitations

This report is prepared for the exclusive use of [REDACTED] and his designated representatives and may not be used by other parties without the written permission of Skmana Creek Consulting Ltd.. The Regional District of Central Kootenay may also rely on the findings of this report.

If the development plans change, or if during construction soil conditions are noted to be different from those described in this report, Skmana should be notified immediately in order that the geotechnical recommendations can be confirmed or modified, if required. Further, this report assumes that field reviews will be completed by Skmana during construction.

It should be noted that the recommendations and comments provided in this geotechnical report are based on a limited surficial site observation. Subsurface conditions at other locations could vary and the actual extent of foreshore disturbance could be substantially different from anticipated values.

The use of this report is subject to the conditions on the Report Interpretation and Limitations sheet which is included with this report (Appendix E). The reader's attention is drawn specifically to those conditions, as it is considered essential that they be followed for proper use and interpretation of this report.

The geotechnical aspects of the final lot development should be reviewed by this office prior to tendering and construction, to determine that the intent of this report has been satisfied. In cases where this recommendation is not followed, Skmana's responsibility is limited to interpreting accurately the surficial information encountered at the site, at the time of their determination or measurement during the preparation of the Report.

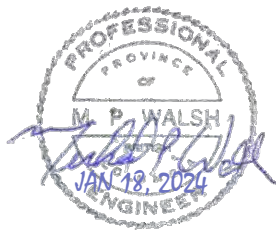
Where conditions encountered at the site differ significantly from those presented in this report, it is a condition of this report that Skmana be notified of any changes and be provided with an opportunity to review and revise the recommendations within this report. The material in this report reflects Skmana's best judgment and professional opinion in light of the information available to it at the time of preparation. Any use which a third party makes of this report or any reliance on or decision to be made based on it are the responsibility of such third parties. Skmana accepts no responsibility for damages, if any, suffered by any third party as a result of decision made or action based, or lack thereof, on this report. No other warranty is made, either expressed or implied.

Soil conditions described in this report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond observed locations and can be affected by annual, seasonal, and meteorological conditions.

The report and assessment have been carried out in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering profession currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. The discussion and recommendations presented above are based on limited field investigation, boreholes, and inferences from surficial features. Inherent variability in surface and subsurface conditions may create unforeseen situations.

We trust that this report meets your needs and if you should require additional information or review, please feel free to contact myself.

Regards,



Mike Walsh, P.Eng.
Senior Geotechnical Engineer
Skmana Creek Consulting Ltd.

Permit To Practice #1003145

References

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- BC Government (1956). Water Licence #C023267
- BC Government (1980). Ministry of Environment. Bathymetry Map of Whatshan Lake. Scale: 1:12,000
- BC Government (2005). Water Licence #F120712
- BC Hydro (2005). Whatshan Project Water Use Plan.
- Environment Canada (2015). Climate Normal for Hugh Keenleyside Dam, Castlegar, BC 1971-2010
- Maddox, W.E. (1996). Sketch Showing Lot Boundaries in Part of Parcel A (83422I) of D.L. 8170, K.L.D.
- Regional District of Central Kootenay (2004). Floodplain Management Bylaw No. 1650, 2004.
- Regional District of Central Kootenay (2009). Floodplain Management Bylaw No. 2080, 2009.
- US Army Corps of Engineers (1984). Shore Protection Manual
- Vector Geomatics Lan Surveying Ltd. (2022). Part of Parcel A (Reference Plan 83421I) of District Lot 8170 Kootenay Land District Except Plan NEP19125



Appendix A - Site Plan

**SITE PLAN OF SITE 1 BEING A PART OF
PARCEL A (REFERENCE PLAN 834221) OF
DISTRICT LOT 8170 KOOTENAY DISTRICT
EXCEPT PLAN NEP19125**

PID: 005-712-700
CLIENT: WALT STANLEY
CIVIC ADDRESS: 1076 WHATSHAN LAKE ROAD, BC

HORIZONTAL COORDINATE SYSTEM: UTM 11 NAD83(CSRS)
VERTICAL DATUM: CGVD28 (DERIVED FROM OBSERVATIONS PROCESSED USING THE
CSRS-PPP ONLINE PROCESSING PROVIDED BY NATURAL RESOURCES CANADA)

FIELD SURVEY COMPLETED: SEPTEMBER 21, 2022

REFER TO THE CURRENT STATE OF TITLE FOR CHARGES, LIENS, AND INTERESTS
AFFECTING THIS LAND.



LEGEND

- Subject Property from Maddox Sketch Plan
- Major Contour (1.0m)
- Minor Contour (0.2m)
- Top Slope
- Bottom Slope
- Culvert
- Well
- Retaining Wall
- Found Rebar
- Found Standard Iron Post

EXISTING
FLOOD CONSTRUCTION LEVEL
652.30m ELEV

EXISTING 7.5m SETBACK LINE

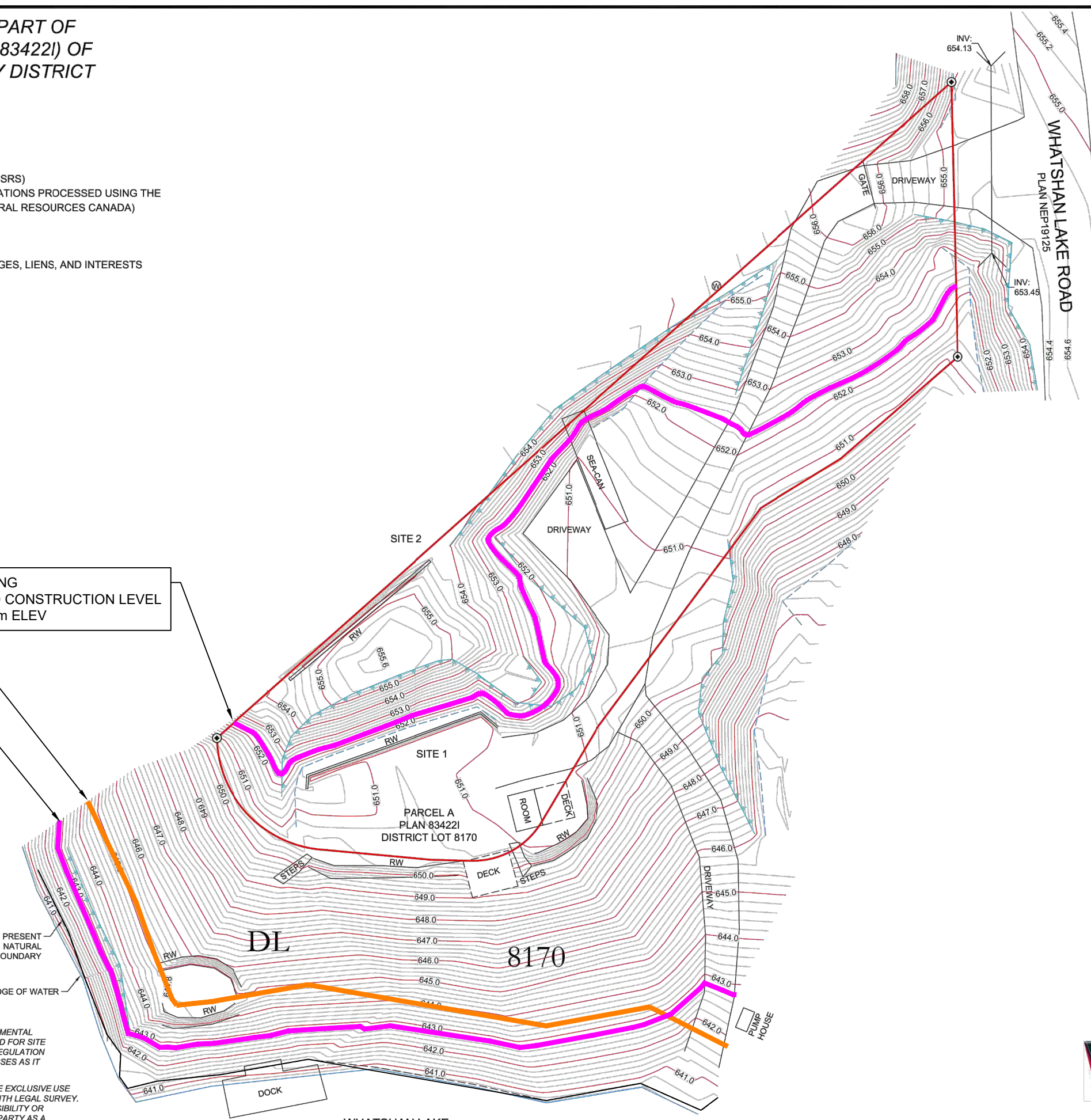
PROPOSED
FLOOD CONSTRUCTION LEVEL
642.75m ELEV

PRESENT
NATURAL
BOUNDARY

EDGE OF WATER

RIPARIAN SETBACKS TO BE DETERMINED BY A QUALIFIED ENVIRONMENTAL
PROFESSIONAL. ANY SETBACKS PRESENTED SHOULD NOT BE USED FOR SITE
PLANNING AS IT RELATES TO THE RIPARIAN AREAS PROTECTION REGULATION
OR ANY LOCAL GOVERNMENT DEVELOPMENT PERMITTING PROCESSES AS IT
RELATES TO STREAM OR LAKESIDE SETBACKS.

THIS PLAN WAS PREPARED FOR DESIGN PURPOSES AND IS FOR THE EXCLUSIVE USE
OF OUR CLIENT. BOUNDARIES SHOWN ARE SUBJECT TO CHANGE WITH LEGAL SURVEY.
VECTOR GEOMATICS LAND SURVEYING LTD. ACCEPTS NO RESPONSIBILITY OR
LIABILITY FOR ANY DAMAGES THAT MAY BE SUFFERED BY A THIRD PARTY AS A
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File: 2201755R0 Date: 2022-10-04
Drafted by: EC Checked by: TF



Appendix B – Water Licence Information



1948 Water Licence #C018526

PROVINCE OF
BRITISH COLUMBIA

Water Rights Branch

DEPARTMENT OF
LANDS AND FORESTS

CONDITIONAL WATER LICENCE

BRITISH COLUMBIA POWER COMMISSION of Victoria, B.C., is

hereby authorized to **store** water as follows:—

- (a) The sources of the water-supply ~~is~~ are Whatshan Lake and Barnes Creek.
- (b) The point of **storage** is located as shown on the attached plan.
- (c) The date from which this licence shall have precedence is 26th February, 1948.
- (d) The purpose for which the water is to be used is as set out in Conditional Water Licence No. **18525**
- (e) The maximum quantity of water which may be stored is 220,000 acre feet per annum and such additional quantity as the Engineer may from time to time determine should be allowed for losses.
- (f) The period of the year during which the water may be stored is the whole year.
- (g) The land upon which the water is to be used and to which this licence is appurtenant is as set out in Conditional Water Licence No. **18525**
- (h) The works authorized to be constructed are **dam,**

and they shall be located approximately as shown on the attached plan.

- (i) The construction of the said works ^{has already been} ~~shall be~~ commenced ~~on or before the~~ ~~day~~ ~~of~~ ~~10~~ and shall be completed and the water beneficially used on or before the 31st day of December 1955.

ENTERED ON
Map No. <u>5119</u>
By <u>[Signature]</u>

[Signature]
Deputy Comptroller of Water Rights.

File No. 0167228

Date issued June 1, 1948

Licence No. **18526**



WATER RIGHTS BRANCH
DEPARTMENT OF LANDS AND FORESTS

ORDER

WATER ACT

Section 13

File No. 0167228

The provisions of the B. C. Water Act having been complied with and being satisfied that no person's rights will be affected, I hereby extend the time for the completion of the works and for making beneficial use of the water authorized under Conditional Water Licence No. 18526, Whatshan Lake and Barnes Creek, to the 31st day of December, 1958.

W. A. Ker,
Deputy Comptroller of Water Rights.

DATED at Victoria, B. C.,

this 15th day of August, 1956.



Geotechnical Report
Flood Construction Level Variance
#1 - 1076 Whatshan Lake FSR, Whatshan, BC

21

1956 Water Licence #C23267

British

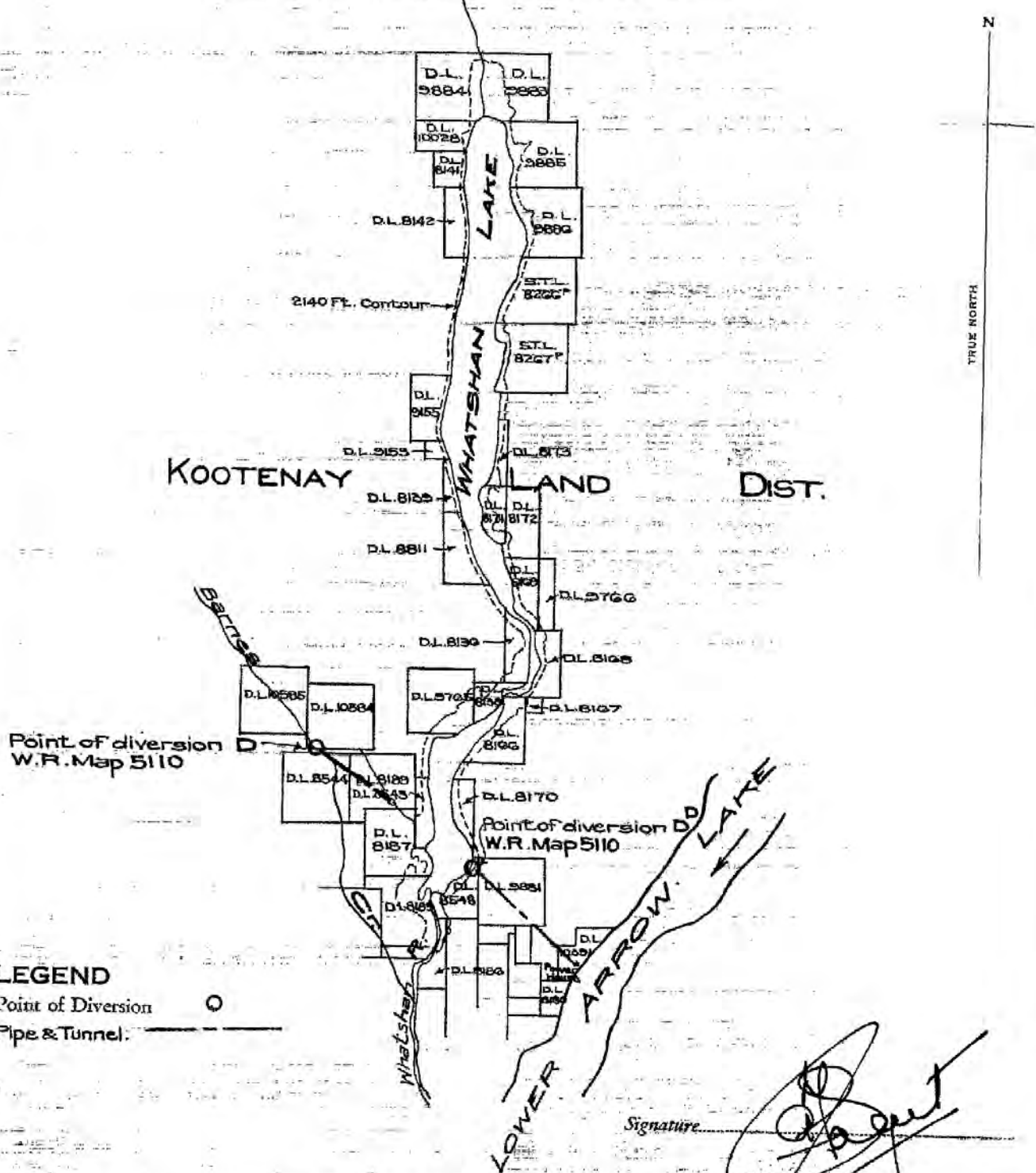


Columbia

To accompany Conditional Licence No. 23267

NELSON WATER DISTRICT

Scale: 2 Miles to 1 Inch



LEGEND

Point of Diversion

Pipe & Tunnel

Signature

Date 1st Nov 1986

EXHIBIT "A"

For Storage see C.L. 18526
For R/W see C.L. 18525

C.L. 23267
File 0167228



DEPARTMENT OF LANDS, FORESTS, AND WATER RESOURCES
WATER RESOURCES SERVICE
WATER RIGHTS BRANCH
VICTORIA, B.C.

ORDER

WATER ACT

Sections 15 and 21

FILE NO. 0167228

In the matter of Conditional Water Licence 23267 which authorizes the diversion of water from Whatshan Lake and Barnes Creek for power purpose.

Having received an application for Change of Works and a signed abandonment of the Barnes Creek source of water-supply, and being satisfied that no person's rights will be injuriously affected I hereby amend Clauses (a), (b), (h) and (i) of the said licence to read as follows:

(a) The source of water-supply is Whatshan Lake.

(b) The point of diversion is located as shown on the attached amended plan.

(h) The works authorized to be constructed are diversion structure, tunnel, powerhouse, turbine, generator and associated works which shall be located approximately as shown on the attached amended plan.

(i) The construction of the said works has been commenced and shall be completed and the water beneficially used on or before the 31st day of December, 1973.

Dated at Victoria, B.C. this 1st day of August, 1972.

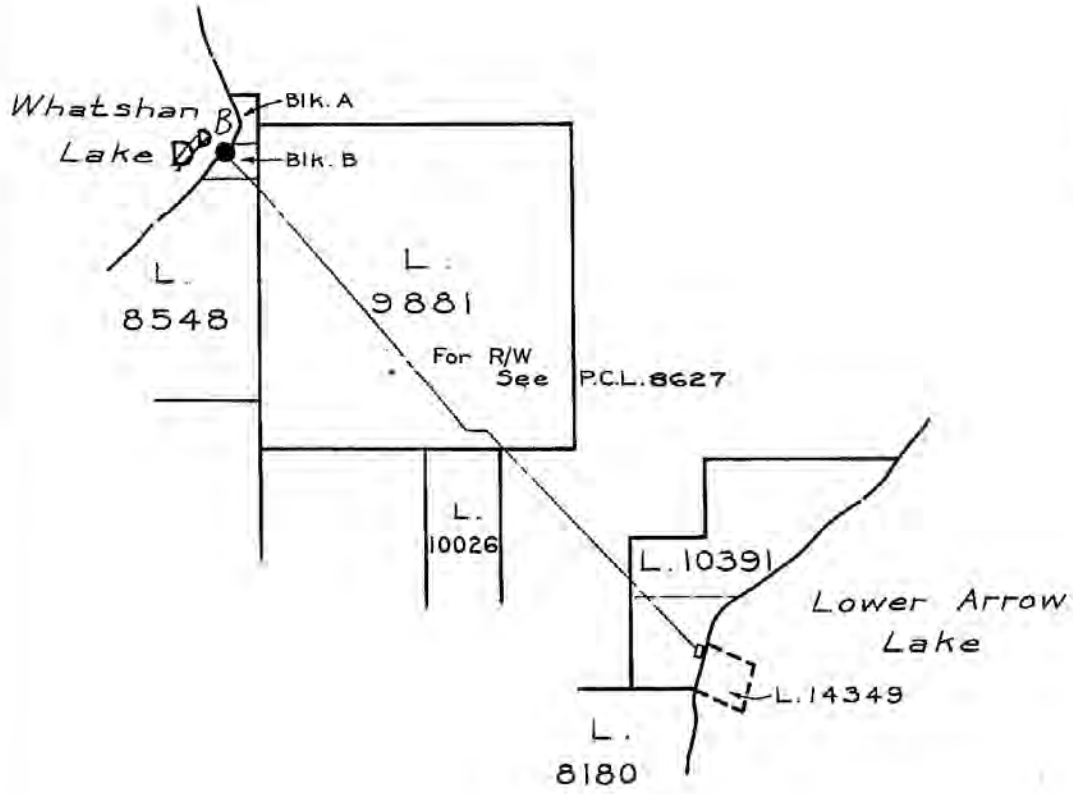
A handwritten signature in cursive script that reads 'A.K. Sutherland'.

A.K. Sutherland,
Deputy Comptroller of Water Rights.



NELSON WATER DISTRICT
KOOTENAY DISTRICT

Scale: 40 Chains to 1 Inch



LEGEND

- Point of Diversion ●
- W.R. Map
- Pipe

5HT 82.E.100.1.4 (WR 5110AA)

Signature: *AK Sutherland*

Date Iss. Aug. 1972
 Amended C.L. 23267
 File 0167228



2005 Water Licence #F120712



Province of British Columbia *Water Act*

FINAL WATER LICENCE

British Columbia Hydro and Power Authority is hereby authorised to store and use water as follows:

- a) The stream on which the rights are granted is Whatshan River and the reservoir is Whatshan Lake.
- b) Whatshan Lake Reservoir and the site of the dams which create the reservoir are located at PD25324 and PD25326 as shown on the attached plan.
- c) The date from which this licence shall have precedence is February 26, 1948.
- d) The purpose for which this licence is issued is storage. The storage purpose supports the power purpose at the Whatshan Generating Station authorised under Final Water Licence 120711.
- e) Conditions for the storage of water in Whatshan Lake Reservoir are as follows:
 - i) The water may be stored in the reservoir between elevations of 634.4 metres, the minimum operating level for power generation, and 641.3 metres, the full supply level, measured at the dam using the local datum.
 - ii) The volume of water authorized to be stored between the minimum operating level and the full supply level under this licence is estimated to be 115.3 million cubic metres.
 - iii) Surcharging the reservoir above the full supply level, drafting the reservoir to the full supply level and drafting the reservoir below the minimum operating level shall be done in accordance with the Operation, Maintenance, and Surveillance Manual.
- f) Water may be collected into storage, held in storage, and used throughout the whole year.

- g) This licence is appurtenant to the undertaking as set out in clause (g) of Final Water Licence 120711, Whatshan Generating Station.
- h) The authorised works are concrete dam at PD25324 and earth filled saddle dam at PD25326 located as shown on the attached plan.
- i) This licence is issued in substitution of Conditional Water Licence 18526.



Pieter J. Bekker.
Deputy Comptroller of Water Rights

File: 0167228

Date Issued: *July 14, 2005* Final Licence 120712



Province of British Columbia

Water Act

Order
Water Act
Section 88

File No. 0167228

WHEREAS British Columbia Hydro and Power Authority (BC Hydro, the licensee) is the operator of the Whatshan River hydroelectric system, in respect of which it holds Final Water Licences 120711 and 120712; and

WHEREAS the licensee has submitted the Whatshan Project Water Use Plan, which recommends changes to the operations and enhancement works of the Whatshan Project and which is intended to provide benefits to fisheries habitat, wildlife habitat and recreation; and

WHEREAS BC Hydro has engaged in public consultation to determine values for system parameters and to develop operating procedures that may provide fisheries, wildlife and recreation benefits as described above;

WHEREAS I have accepted the Whatshan Project Water Use Plan dated June 15, 2005; and

WHEREAS the Whatshan Project Water Use Plan proposes a monitoring programme to determine whether operating the facility in accordance with the parameters and procedures of the Whatshan Water Use Plan will provide the expected benefits;

I HEREBY ORDER THAT:

1. The licensee shall, except for the purpose of maintenance of facilities, regulate the Whatshan Lake Reservoir to be at or above the following minimum elevations:
 - a) 639.10 metres from May 15 to June 14
 - b) 640.35 metres from June 15 to October 1
 - c) 636.50 metres the remainder of the year.
2. Within 4 months of the date of this order, the licensee shall submit, for approval by the Comptroller, plans for the modification of the existing boat launch ramp at Inonoaklin Recreation Site to enable boat access to the reservoir when the reservoir elevation is as low as 636.50 metres. Upon

receiving, from the Comptroller, approval of the plans and leave to commence construction, the licensee shall modify the boat launch in accordance with the approved plans.

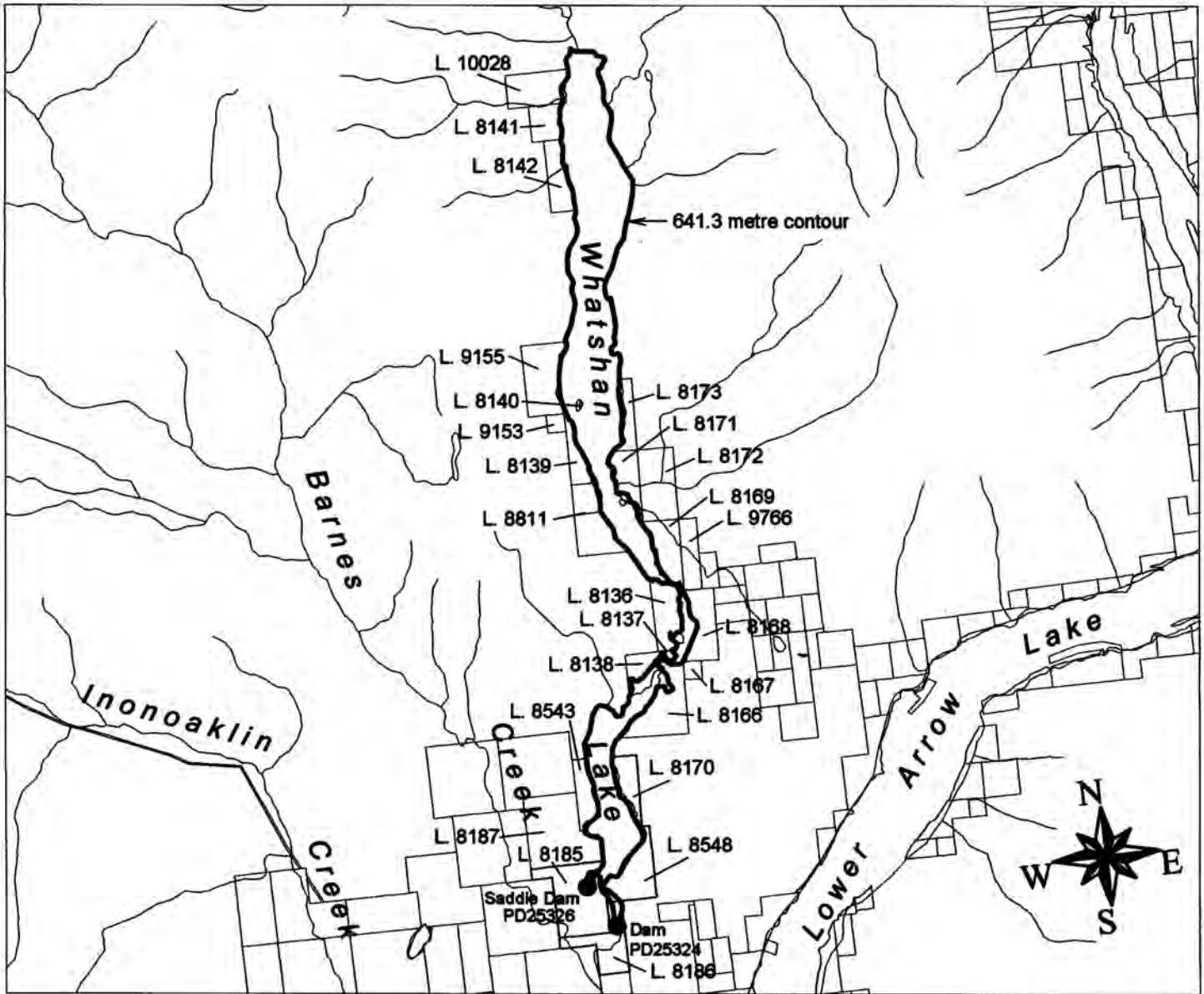
3. Within four months of the date of this order, the licensee shall submit to the Comptroller, plans for an assessment of habitat complexing potential and rainbow trout population monitoring in Reach 3 of the Whatshan River. Upon a two year review by the licensee of this information, the licensee shall provide the Comptroller with plans for habitat complexing and, if so directed by the Comptroller, proceed with construction of the habitat complexing and continued population monitoring.
4. The licensee shall submit a monitoring plan, within four months of the date of this order, for acceptance by the Comptroller, outlining:
 - a) details of monitoring the effects of revised operations on littoral habitat and associated effect on wildlife, and
 - b) details of a study to locate archaeological sites within the reservoir between the elevations of 634.4 and 641.3 metres.
5. The licensee shall implement monitoring in accordance with the monitoring plan accepted by the Comptroller of Water Rights under (3) and (4) above, and shall provide an annual monitoring report to the Comptroller.
6. The licensee shall include with its annual monitoring reports to the Comptroller of Water Rights, any effect of reservoir operations on archaeological resources within Whatshan Lake Reservoir based on the results of archaeological studies that may be carried out by the licensee from time to time.
7. With respect to the maintenance and provision of records the licensee must:
 - a) Keep records of
 - i) Whatshan Lake reservoir elevations;
 - ii) Generating station discharge and
 - iii) Discharge from Whatshan Dam into Whatshan River.
 - b) Provide a written report to the Comptroller of Water Rights on or before February 1 of each year summarizing the records from the previous calendar year; and
 - c) Provide on request of the Comptroller of Water Rights records collected under 7.a.
8. The licensee may operate the works in an alternate manner in the event of an emergency, dam safety requirement, or an extreme hydrological event.

9. All emergency operations or other deviations from operations ordered above shall be reported to the Comptroller of Water Rights in a timely manner.

Dated at Victoria, B.C., this 14th day of July, 2005.



Pieter J. Bekker
Deputy Comptroller of Water Rights



WATER DISTRICT:
PRECINCT:
LAND DISTRICT:

**NELSON
BURTON CITY
KOOTENAY**

Signature:

T. Bellin

Date:

July 14, 2005

LEGEND:

Scale:

1:140,000

Point of Diversion:



Map Number:

WR 82E.100.1.2

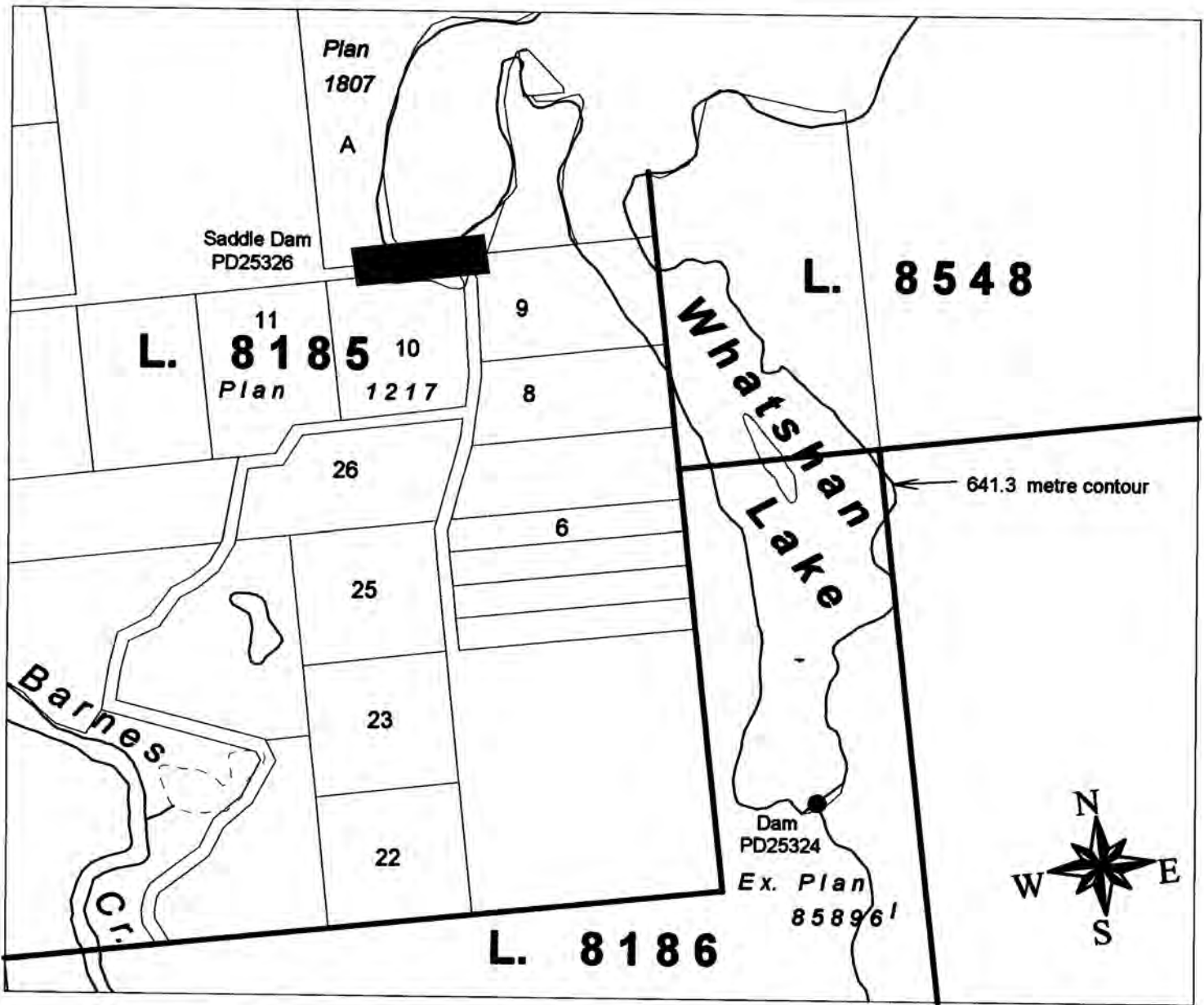
Permit over Crown Land:



F.L. 120712 for C.L. 18526

File 0167228

P.C.L. 25271



WATER DISTRICT:
PRECINCT:
LAND DISTRICT:

NELSON
BURTON CITY
KOOTENAY

Signature: *VB Barber*
Date: July 14, 2005

LEGEND:

Scale:
Point of Diversion:
Map Number:
Permit over Crown Land:

1:10,000
●
WR 82E.100.1.2
█

F.L. 120712 for C.L. 18526
File 0167228
P.C.L. 25271



Appendix C - Flood & Erosion Analysis Information

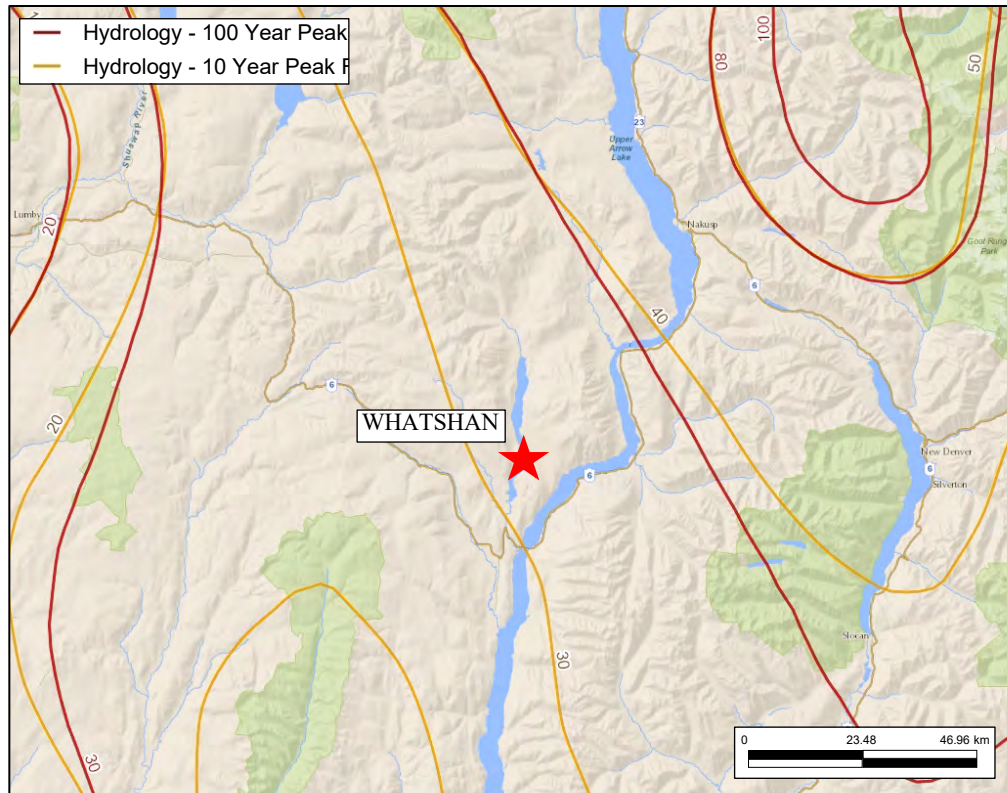


Figure 3 - Flood Hydrology Isoline Mapping

(BC Govt, 2024)

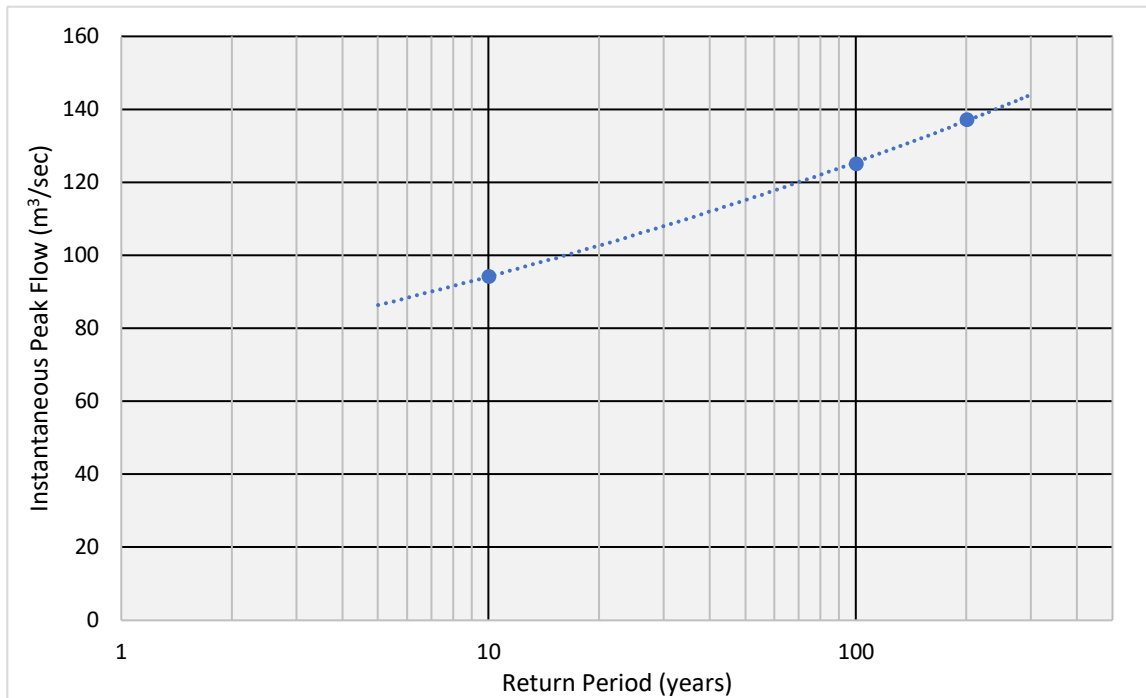


Figure 4 - Flood - Whatshan Lake Inflow Frequency Analysis

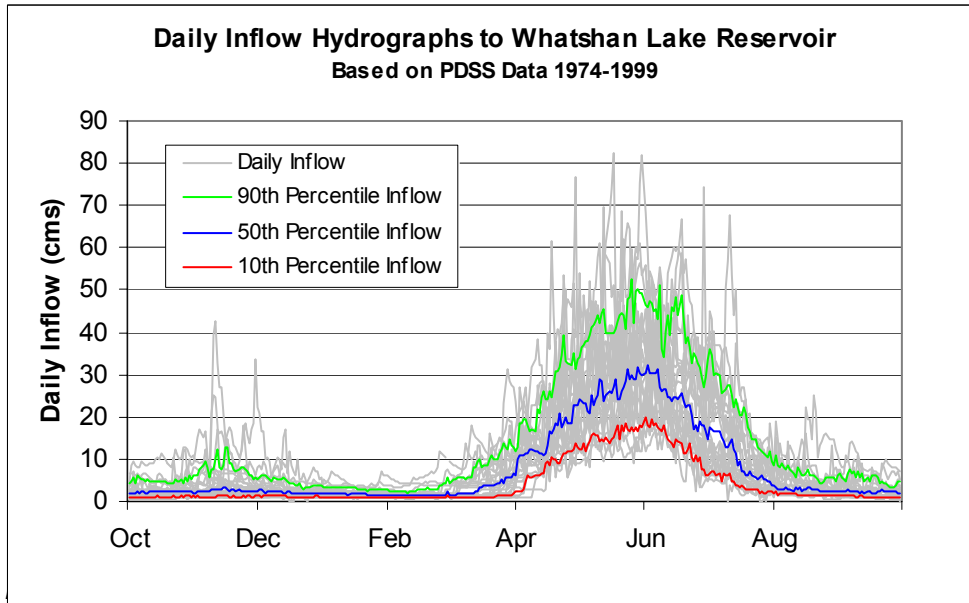


Figure 5 - Whatshan Lake Inflow Flood-Frequency

(BC Hydro, 2005)

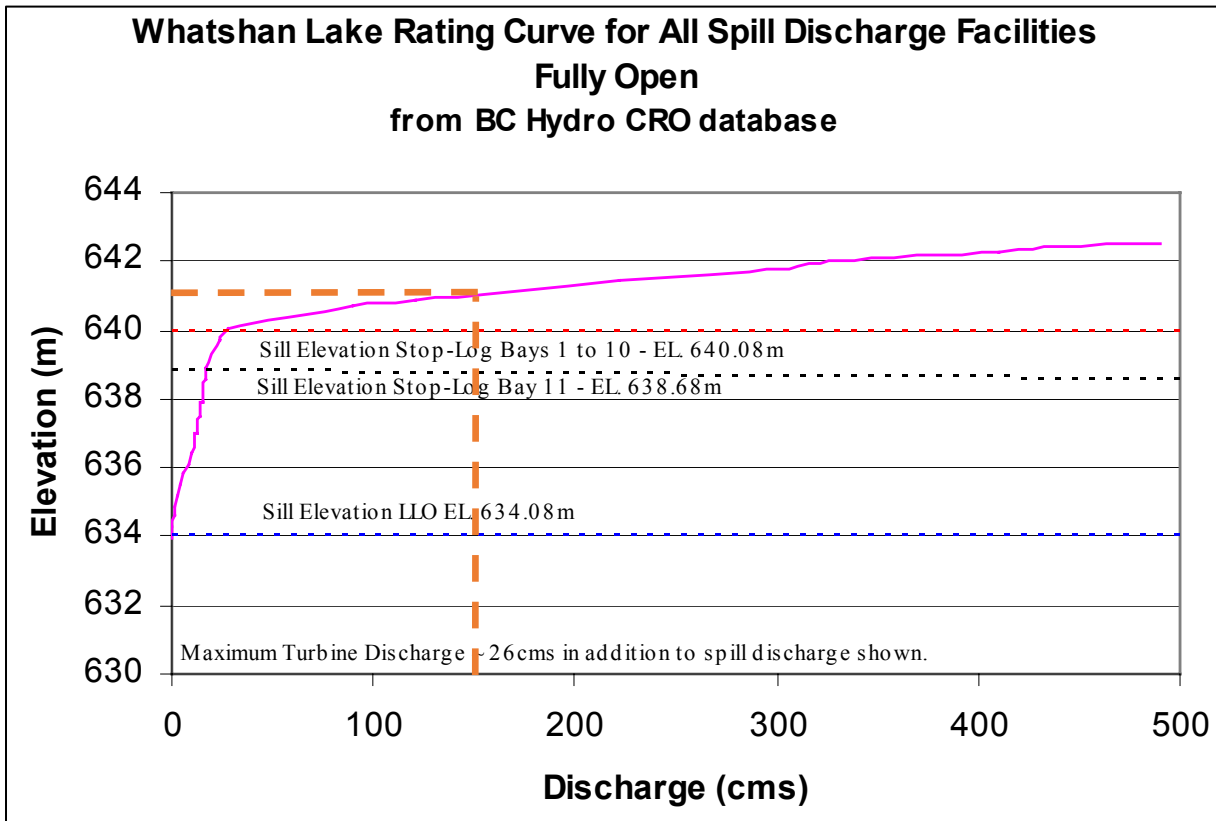


Figure 6 - Whatshan Lake Dam Rating Curve

(BC Hydro, 2005)

CASTLEGAR BCHPA DAM * BRITISH COLUMBIA												
Latitude:	49°20'36"	Longitude:	117°46'28"	Elevation:	435m							
Climate ID:	1141457	WMO ID:		TC ID:								
1971 to 2000 Canadian Climate Normals station data												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Speed (km/h)	14	12.6	12.4	12.8	12.4	12.3	12.3	12.2	11.8	12.3	12.2	13.7
Most Frequent Direction	E	E	E	W	W	E	E	W	W	E	E	E
Maximum Hourly Speed (km/h)	63	63	61	68	64	69	64	64	64	63	60	60
Date (yyyy/dd)	1989/ 31	1975/ 20	1972/ 06	1978/ 11	1976/ 13	1985/ 20	1976/ 26	1986/ 19	1974/ 26	1988/ 26	1986/ 24	1979/ 14
Direction of Maximum Hourly Speed	W	W	W	W	W	W	W	W	W	W	SW	W

Table 3 - Hugh Keenleyside Dam Historical Wind Data

(Environment Canada, 2023)

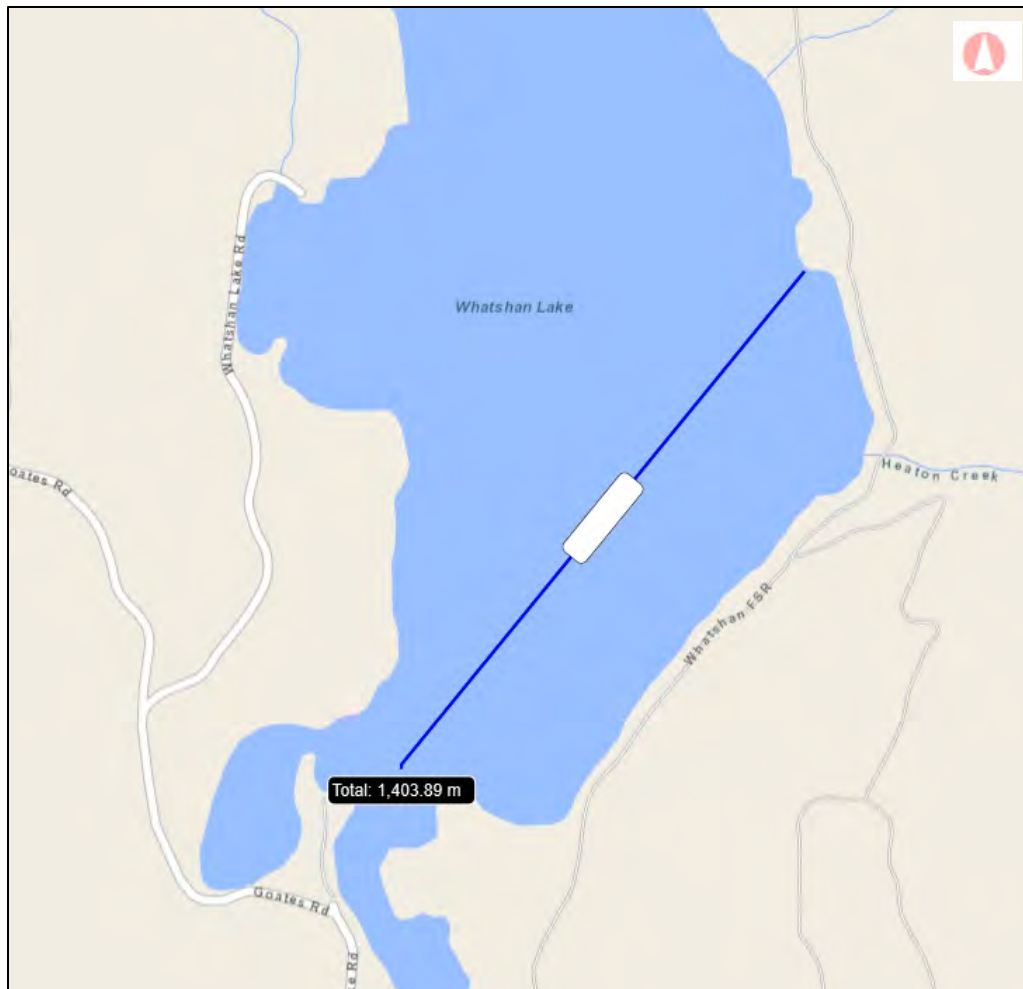


Figure 7 - Lake Fetch Distance

(BC iMap, 2023)



Appendix D - Photos



Photo 1 - Shoreline looking north



Photo 2 - Shoreline on north end with rip rap



Photo 3 - Slope above HWL



Photo 4 - slope below propert
boundary



Photo 5 - slope material in
eroded slope above HWL



Appendix E - Limitations

REPORT INTERPRETATION AND LIMITATIONS

1. STANDARD OF CARE

Skmana Creek Consulting Ltd. (Skmana) has prepared this report in a manner consistent with generally accepted engineering consulting practices in this area, subject to the time and physical constraints applicable. No other warranty, expressed or implied, is made.

2. COMPLETENESS OF THIS REPORT

This Report represents a summary of paper, electronic and other documents, records, data and files and is not intended to stand alone without reference to the instructions given to Skmana by the Client, communications between Skmana and the Client, and/or to any other reports, writings, proposals or documents prepared by Skmana for the Client relating to the specific site described herein.

This report is intended to be used and quoted in its entirety. Any references to this report must include the whole of the report and any appendices or supporting material. Skmana cannot be responsible for use by any party of portions of this report without reference to the entire report.

3. BASIS OF THIS REPORT

This report has been prepared for the specific site, development, design objective, and purpose described to Skmana by the Client or the Client's Representatives or Consultants. The applicability and reliability of any of the factual data, findings, recommendations or opinions expressed in this document pertain to a specific project as described in this report and are not applicable to any other project or site, and are valid only to the extent that there has been no material alteration to or variation from any of the descriptions provided to Skmana. Skmana cannot be responsible for use of this report, or portions thereof, unless we were specifically requested by the Client to review and revise the Report in light of any alterations or variations to the project description provided by the Client.

If the project does not commence within 18 months of the report date, the report may become invalid and further review may be required.

The recommendations of this report should only be used for design. The extent of exploration including number of test pits or test holes necessary to thoroughly investigate the site for conditions that may affect Construction costs will generally be greater than that required for design purposes. Contractors should rely upon their own explorations and interpretation of the factual data provided for costing purposes, equipment requirements, construction techniques, or to establish project schedule.

The information provided in this report is based on limited exploration, for a specific project scope. Skmana cannot accept responsibility for independent conclusions, interpretations, interpolations or decisions by the Client or others based on information contained in this Report. This restriction of liability includes decisions made to purchase or sell land.

4. USE OF THIS REPORT

The contents of this report, including plans, data, drawings and all other documents including electronic and hard copies remain the copyright property of Skmana. However, we will consider any reasonable request by the Client to approve the use of this report by other parties as "Approved Users."

With regard to the duplication and distribution of this Report or its contents, we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of this Report by those parties. The Client and "Approved Users" may not give, lend, sell or otherwise make this Report or any portion thereof available to any other party without express written permission from Skmana. Any use which a third party makes of this Report – in its entirety or portions thereof – is the sole responsibility of such third parties. SKMANA CREEK CONSULTING LTD. ACCEPTS NO RESPONSIBILITY FOR DAMAGES SUFFERED BY ANY PARTY RESULTING FROM THE UNAUTHORIZED USE OF THIS REPORT.

Electronic media is susceptible to unauthorized modification or unintended alteration, and the Client should not rely on electronic versions of reports or other documents. All documents should be obtained directly from Skmana.

5. INTERPRETATION OF THIS REPORT

Classification and identification of soils and rock and other geological units, including groundwater conditions have been based on exploration(s) performed in accordance with the standards set out in Paragraph 1.

These tasks are judgmental in nature; despite comprehensive sampling and testing programs properly performed by experienced personnel with the appropriate equipment, some conditions may elude detection.

As such, all explorations involve an inherent risk that some conditions will not be detected.

Further, all documents or records summarizing such exploration will be based on assumptions of what exists between the actual points sampled at the time of the site exploration. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of and accept this risk.

The Client and “Approved Users” accept that subsurface conditions may change with time and this report only represents the soil conditions encountered at the time of exploration and/or review. Soil and ground water conditions may change due to construction activity on the site or on adjacent sites, and also from other causes, including climactic conditions.

The exploration and review provided in this report were for geotechnical purposes only. Environmental aspects of soil and groundwater have not been included in the exploration or review or addressed in any other way.

The exploration and Report is based on information provided by the Client or the Client’s Consultants, and conditions observed at the time of our site reconnaissance or exploration. Skmana has relied in good faith upon all information provided. Accordingly, Skmana cannot accept responsibility for inaccuracies, misstatements, omissions, or deficiencies in this Report resulting from misstatements, omissions, misrepresentations or fraudulent acts of persons or sources providing this information.

6. DESIGN AND CONSTRUCTION REVIEW

This report assumes that Skmana will be retained to work and coordinate design and construction with other Design Professionals and the Contractor. Further, it is assumed that Skmana will be retained to provide field reviews during construction to confirm adherence to building code guidelines and generally accepted engineering practices, and the recommendations provided in this report. Field services recommended for the project represent the minimum necessary to confirm that the work is being carried out in general conformance with Skmana’s recommendations and generally accepted engineering standards. It is the Client’s or the Client’s Contractor’s responsibility to provide timely notice to Skmana to carry out site reviews.

The Client acknowledges that unsatisfactory or unsafe conditions may be missed by intermittent site reviews by Skmana. Accordingly, it is the Client’s or Client’s Contractor’s responsibility to inform Skmana of any such conditions.

Work that is covered prior to review by Skmana may have to be re-exposed at considerable cost to the Client. Review of all Geotechnical aspects of the project are required for submittal of unconditional Letters of Assurance to regulatory authorities. The site reviews are not carried out for the benefit of the Contractor(s) and therefore do not in any way effect the Contractor(s) obligations to perform under the terms of his/her Contract.

7. SAMPLE DISPOSAL

Skmana will dispose of all samples 3 months after issuance of this report, or after a longer period of time at the Client’s expense if requested by the Client. All contaminated samples remain the property of the Client and it will be the Client’s responsibility to dispose of them properly.

8. SUBCONSULTANTS AND CONTRACTORS

Engineering studies frequently requires hiring the services of individuals and companies with special expertise and/or services which Skmana Creek Consulting Ltd. does not provide. These services are arranged as a convenience to our Clients, for the Client’s benefit. Accordingly, the Client agrees to hold the Company harmless and to indemnify and defend Skmana Creek Consulting Ltd. from and against all claims arising through such Sub consultants or Contractors as though the Client had retained those services directly. This includes responsibility for payment of services rendered and the pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. These conditions apply to specialized sub consultants and the use of drilling, excavation and laboratory testing services, and any other Sub consultant or Contractor.

9. SITE SAFETY

Skmana Creek Consulting Ltd. assumes responsibility for site safety solely for the activities of our employees on the jobsite. The Client or any Contractors on the site will be responsible for their own personnel. The Client or his representatives, Contractors or others retain control of the site. It is the Client’s or the Client’s Contractors responsibility to inform Skmana of conditions pertaining to the safety and security of the site – hazardous or otherwise – of which the Client or Contractor is aware.

Exploration or construction activities could uncover previously unknown hazardous conditions, materials, or substances that may result in the necessity to undertake emergency procedures to protect workers, the public or the environment. Additional work may be required that is outside of any previously established budget(s). The Client agrees to reimburse Skmana for fees and expenses resulting from such discoveries. The Client acknowledges that some discoveries require that certain regulatory bodies be informed. The Client agrees that notification to such bodies by Skmana Creek Consulting Ltd. will not be a cause for either action or dispute.

FLOOD ASSURANCE STATEMENT

Note: This statement is to be read and completed in conjunction with the current Engineers and Geoscientists BC *Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC* (“the guidelines”) and is to be provided for flood assessments for the purposes of the *Land Title Act*, *Community Charter*, or the *Local Government Act*. Defined terms are capitalized; see the Defined Terms section of the guidelines for definitions.

To: The Approving Authority

Date: January 18, 2024

Regional District of Central Kootenay

202 Lakeside Dr., Nelson, BC, V1L 5R4

Jurisdiction and address

With reference to (CHECK ONE):

- Land Title Act* (Section 86) – Subdivision Approval
- Local Government Act* (Part 14, Division 7) – Development Permit
- Community Charter* (Section 56) – Building Permit
- Local Government Act* (Section 524) – Flood Plain Bylaw Variance
- Local Government Act* (Section 524) – Flood Plain Bylaw Exemption

For the following property (“the Property”):

Lot 1 - 1076 Whatshan Lake FSR in Whatshan, BC

Legal description and civic address of the Property

The undersigned hereby gives assurance that he/she is a Qualified Professional and is a Professional Engineer or Professional Geoscientist who fulfils the education, training, and experience requirements as outlined in the guidelines.

I have signed, sealed, and dated, and thereby certified, the attached Flood Assessment Report on the Property in accordance with the guidelines. That report and this statement must be read in conjunction with each other. In preparing that Flood Assessment Report I have:

[CHECK TO THE LEFT OF APPLICABLE ITEMS]

- 1. Consulted with representatives of the following government organizations:
Regional District of Central Kootenay & Province of British Columbia
- 2. Collected and reviewed appropriate background information
- 3. Reviewed the Proposed Development on the Property
- 4. Investigated the presence of Covenants on the Property, and reported any relevant information
- 5. Conducted field work on and, if required, beyond the Property
- 6. Reported on the results of the field work on and, if required, beyond the Property
- 7. Considered any changed conditions on and, if required, beyond the Property
- 8. For a Flood Hazard analysis I have:
 - 8.1 Reviewed and characterized, if appropriate, Flood Hazard that may affect the Property
 - 8.2 Estimated the Flood Hazard on the Property
 - 8.3 Considered (if appropriate) the effects of climate change and land use change
 - 8.4 Relied on a previous Flood Hazard Assessment (FHA) by others
 - 8.5 Identified any potential hazards that are not addressed by the Flood Assessment Report
- 9. For a Flood Risk analysis I have:
 - 9.1 Estimated the Flood Risk on the Property
 - 9.2 Identified existing and anticipated future Elements at Risk on and, if required, beyond the Property
 - 9.3 Estimated the Consequences to those Elements at Risk

FLOOD ASSURANCE STATEMENT

10. In order to mitigate the estimated Flood Hazard for the Property, the following approach is taken:

- 10.1 A standard-based approach
- 10.2 A Risk-based approach
- 10.3 The approach outlined in the guidelines, Appendix F: Flood Assessment Considerations for Development Approvals
- 10.4 No mitigation is required because the completed flood assessment determined that the site is not subject to a Flood Hazard

11. Where the Approving Authority has adopted a specific level of Flood Hazard or Flood Risk tolerance, I have:

- 11.1 Made a finding on the level of Flood Hazard or Flood Risk on the Property
- 11.2 Compared the level of Flood Hazard or Flood Risk tolerance adopted by the Approving Authority with my findings
- 11.3 Made recommendations to reduce the Flood Hazard or Flood Risk on the Property

12. Where the Approving Authority has not adopted a level of Flood Hazard or Flood Risk tolerance, I have:

- 12.1 Described the method of Flood Hazard analysis or Flood Risk analysis used
- 12.2 Referred to an appropriate and identified provincial or national guideline for level of Flood Hazard or Flood Risk
- 12.3 Made a finding on the level of Flood Hazard or Flood Risk tolerance on the Property
- 12.4 Compared the guidelines with the findings of my flood assessment
- 12.5 Made recommendations to reduce the Flood Hazard or Flood Risk

- 13. Considered the potential for transfer of Flood Risk and the potential impacts to adjacent properties
- 14. Reported on the requirements for implementation of the mitigation recommendations, including the need for subsequent professional certifications and future inspections.

Based on my comparison between:

[CHECK ONE]

- The findings from the flood assessment and the adopted level of Flood Hazard or Flood Risk tolerance (item 11.2 above)
- The findings from the flood assessment and the appropriate and identified provincial or national guideline for level of Flood Hazard or Flood Risk tolerance (item 12.4 above)

I hereby give my assurance that, based on the conditions contained in the attached Flood Assessment Report:

[CHECK ONE]

- For subdivision approval, as required by the *Land Title Act* (Section 86), “that the land may be used safely for the use intended”:
[CHECK ONE]
 - With one or more recommended registered Covenants.
 - Without any registered Covenant.
- For a development permit, as required by the *Local Government Act* (Part 14, Division 7), my Flood Assessment Report will “assist the local government in determining what conditions or requirements it will impose under subsection (2) of this section [Section 491 (4)]”.
- For a building permit, as required by the Community Charter (Section 56), “the land may be used safely for the use intended”:
[CHECK ONE]
 - With one or more recommended registered Covenants.
 - Without any registered Covenant.
- For flood plain bylaw variance, as required by the *Flood Hazard Area Land Use Management Guidelines* and the *Amendment Section 3.5 and 3.6* associated with the *Local Government Act* (Section 524), “the development may occur safely”.
- For flood plain bylaw exemption, as required by the *Local Government Act* (Section 524), “the land may be used safely for the use intended”.

FLOOD ASSURANCE STATEMENT

I certify that I am a Qualified Professional as defined below.

January 18, 2024

Date

Prepared by

Michael Walsh, P.Eng.

Name (print)



Signature

3038 Allegro Mews

Address

Kelowna, BC V1V 2K3

250-801-5325

Telephone

mike@skmana.ca

Email



Permit To Practice #1003145
(Affix PROFESSIONAL SEAL here)

If the Qualified Professional is a member of a firm, complete the following:

I am a member of the firm

Skmana Creek Consulting Ltd.

and I sign this letter on behalf of the firm.

(Name of firm)