MASSE ENVIRONMENTAL
CONSULTANTS LTD.

KOOTENAY LAKE VILLAGE STRATA LOT 32
Riparian Assessment

Prepared for:
Regional District of Central Kootenay
202 Lakeside Drive,
Nelson BC, V1L 5R4

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ABBREVIATIONS

AHI: Aquatic Habitat Index
DBH: Diameter at Breast-Height
FIM: Foreshore Inventory Mapping
GSC: Geodetic Survey of Canada
HWM: High Water Mark
LWD: Large Woody Debris
FLNRORD: Forests, Lands and Natural Resource Operations and Rural Development
QEP: Qualified Environmental Professional
RAR: Riparian Area Regulation
RDCK: Regional District of Central Kootenay
ROW: Right of Way
SPEA: Streamside Protection and Enhancement Area
WDP: Watercourse Development Permit
ZOS: Zones of Sensitivity

1 INTRODUCTION

Masse Environmental Consultants Ltd. was retained by Paul Bowes – General Manager of Purcell Timber Frame Homes (Purcell) to conduct a riparian assessment for Kootenay Lake Village Strata Lot 32 (Strata Lot 32, District Lot 873, Kootenay District Plan, NES3286; PID: 027-785-122).

Proposed construction at Lot 32 will involve work within the 15 m Watercourse Development Permit (WDP) Area of Kootenay Lake, as defined in the Regional District of Central Kootenay Electoral Area 'E' Rural Official Community Plan Bylaw No. 2260, 2013.

A site visit was conducted on July 8, 2019 by Iraleigh Anderson A.Ag. to conduct a riparian assessment on the property. This assessment evaluates the existing conditions of the property and riparian areas, identifies habitat values, assesses potential environmental impacts, and recommends measures to protect environmentally sensitive areas during development. It is based on the following regulatory framework and best management practices documents:

- Electoral Area 'E' Rural *Official Community Plan Bylaw No. 2260, 2013*.
- British Columbia *Riparian Areas Regulation*
- Kootenay Lake Shoreline Management Guidelines
- British Columbia *Water Sustainability Act*
- General BMPs and Standard Project Considerations (Ministry of Environment)
- On the Living Edge: Your Handbook for Waterfront Living
- Develop with Care. Environmental Guidelines for Urban and Rural Land Development in British Columbia
- British Columbia Firesmart Homeowners Manual
- Riparian Factsheet No. 6 – Riparian Plant Acquisition and Planting
- BC Tree Replacement Criteria
- A Homeowner's Guide to Stormwater Management.

This report has been prepared by Iraleigh Anderson A.Ag., and reviewed by Sylvie Masse, MSc, RPBio.

I, Sylvie Masse, hereby certify that:

a) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the Fish Protection Act;
b) I am qualified to carry out this part of the assessment of the development proposal made by the developer;
c) I have carried out my assessment of the development proposal, and my assessment is set out in this Assessment Report; and
d) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

This report is prepared for the Regional District of Central Kootenay (RDCK) as a pre-condition of the issuance of a Building Permit. The submitted report shall be included in a Development Permit under section 920 of the Local Government Act and filed on title of the subject property.

The report has been prepared for and at the expense of the owner of the subject property. The Qualified Environmental Professionals (QEP) who prepared this report have not acted for, or as an agent(s) of the RDCK.

2 PROJECT OVERVIEW

2.1 Location

The subject property is located at the northeast end of Procter, BC, and is bordered by private properties to the northwest, Kootenay Lake to the northeast, and the Canadian Pacific Railway (CPR) Right of Way (ROW) to the south. The property covers ~1156 m^2 with 88 m of frontage on Kootenay Lake.

The project area is within the Interior Cedar Hemlock dry warm variant 1 (ICHdw1) biogeoclimatic subzone (MacKillop and Ehman 2016). This moist climatic region is characterized by very hot, moist summers; and very mild winters with light snowfall. Soils generally dry out in late summer for varying extents of time ranging from insignificant to extensive. Snowpacks are very shallow to shallow and of short duration and combined with the mild climate result in no significant soil freezing (MacKillop and Ehman 2016).

2.2 Existing Site Conditions

The property was created as part of the 182 ha Kootenay Lake Village (KLV) subdivision. The lot was modified and prepared for development into a series of small terraces and pathways protected by rock walls prior to purchase by the current owners. The lot contains a northeast facing building site which has been leveled between a steep talus slope below the CPR ROW and the rugged shoreline of Kootenay Lake (Photo 1 and Photo 2). A terrace has been hardscaped along a rock outcrop at the upper margin of the high water mark (HWM) in the northwest corner of the property below the building site (Photo 3 and Photo 4). This terrace is retained by a stacked rock wall and has been planted with non-native grasses. A second stacked rock wall protects a path heading southeast from the building site (Photo 5), which covers an area of ~60 m^2 and includes two small terraces (Photo 6). A partially buried black PVC pipe runs along the path (Photo 5). The building site, terraces, and path are all within the 15 m WDP area.

Photo 1. Overview of building site from CPR ROW.

Photo 2. Building site.

Photo 3. Greenspace terrace.

Photo 4. Rock wall supporting greenspace terrace.

Photo 5. Waterline down path southeast from building site.

Photo 6. Secondary building site along path.

2.3 Proposed Development

Proposed development on the subject property will have a 267 m^2 footprint including:

1. 144 m^2 two-storey home.
2. 54 m^2 two-storey garage.
3. 69 m^2 of patios, decks, stairs, walkways, and other areas of the site which will be modified and occupied.

Site plans drafted by Purcell are provided in Appendix 2. The current plans have been revised from the original to reduce the proposed home/garage footprint from 232 m^2 to 198 m^2. The potential footprint of associated landscaping is unknown. Note that proposed work on the home may involve work below the HWM and would require an application for Notification and/or Approval under Section 11 of the BC *Water Sustainability Act.*

2.4 Services and Site Drainage

The home will be connected to a community septic system via a buried line exiting the property along the driveway to the northwest. The septic tank will be located northwest of the home (Appendix 2). Drinking water will be provided by a well located northwest of the home (Appendix 2). Electrical service will also be provided via a line along the northwest driveway. The precise locations of the well, septic tank, and buried lines will be determined during construction and situated to avoid removal of additional vegetation.

3 REGULATORY REVIEW

3.1 Streamside Protection and Enhancement Area

To determine whether the 15 m WDP setback from the High Water Mark (HWM) of Kootenay Lake aligns with Riparian Area Regulation (RAR) criteria, a detailed assessment of the subject property was conducted to calculate the Streamside Protection and Enhancement Area (SPEA) setbacks. Results for the Zones of Sensitivity (ZOS) and SPEA are presented in Table 1, and on the SPEA map in Figure 1. As per the RAR, the large woody debris (LWD), and litter ZOS were plotted 15 m inland from the HWM. The Shade ZOS was plotted 30 m south of the HWM. The SPEA setback is determined based on the ZOS with the greatest width. Therefore, within the subject property the SPEA ranges from 15-22 m from the HWM and generally encompasses the entire lot.

Prior modification and rocky character of the site makes it difficult to precisely delineate the HWM based on soil characteristics and the presence of terrestrial vegetation (see HWM definition below). In the absence of a clearly defined HWM, the SPEA and the WDP will be measured from the surveyed natural boundary (Figure 1).

The BC Riparian Areas Regulation (BC 2015) defines the High Water Mark as follows:

"**High Water Mark**" means the visible high water mark of a stream where the presence and action of the water are so common and usual, and so long continued in all ordinary years, as to mark on the soil of the bed of the stream a character distinct from that of its banks, in vegetation, as well as in the nature of the soil itself, and includes the active floodplain"

"Stream" includes any of the following that provides fish habitat:
(a) a watercourse, whether it usually contains water or not;
(b) a pond, lake, river, creek or brook;
(c) a ditch, spring or wetland that is connected by surface flow to something referred to in paragraph (a) or (b).

Table 1. Results of detailed RAR assessment.

Feature Type	SPVT[1]	Zones of Sensitivity			SPEA
		LWD	Litter fall	Shade	
Lake	TR	15 m	15 m	12-22 m	**15-22 m**

[1] SPVT: site potential vegetation type (TR-tree)

3.2 Kootenay Lake Shoreline Management Guidelines

The Kootenay Lake Foreshore Inventory Mapping (FIM) and the Kootenay Lake Shoreline Management Guidelines documents (EEC 2016, KLP 2018) were used to help determine site specific risk for riparian habitat, Ktunaxa Nation cultural values, and archaeological resources along the shoreline. The property evenly straddles two FIM segments (segment numbers 213 and 214). To be conservative, the attributes of the more sensitive segment are reported. Table 2 provides the environmental and archaeological risk results identified in the FIM along the shoreline of the property.

Table 2. Environmental and archaeological risk results.

Aquatic Habitat Index Rating (AHI)	Aquatic Sensitivity	Archaeological Risk	Enhanced Engagement Required
High	Yes	Red	Yes

The subject property is located within an Enhanced Engagement area and may require further consultation with the Ktunaxa Nation. The engagement requirements will be determined through a consultation process with the Ministry of Forests, Lands Natural Resource Operations and Rural Development (FLNRORD) and the Ktunaxa Nation.

The subject parcel was also flagged as a red (high) archaeological risk; however, assessment of archaeological risk is beyond the scope of this report. For further information please consult the Kootenay Lake Shoreline Management Guidelines (KLP 2017).

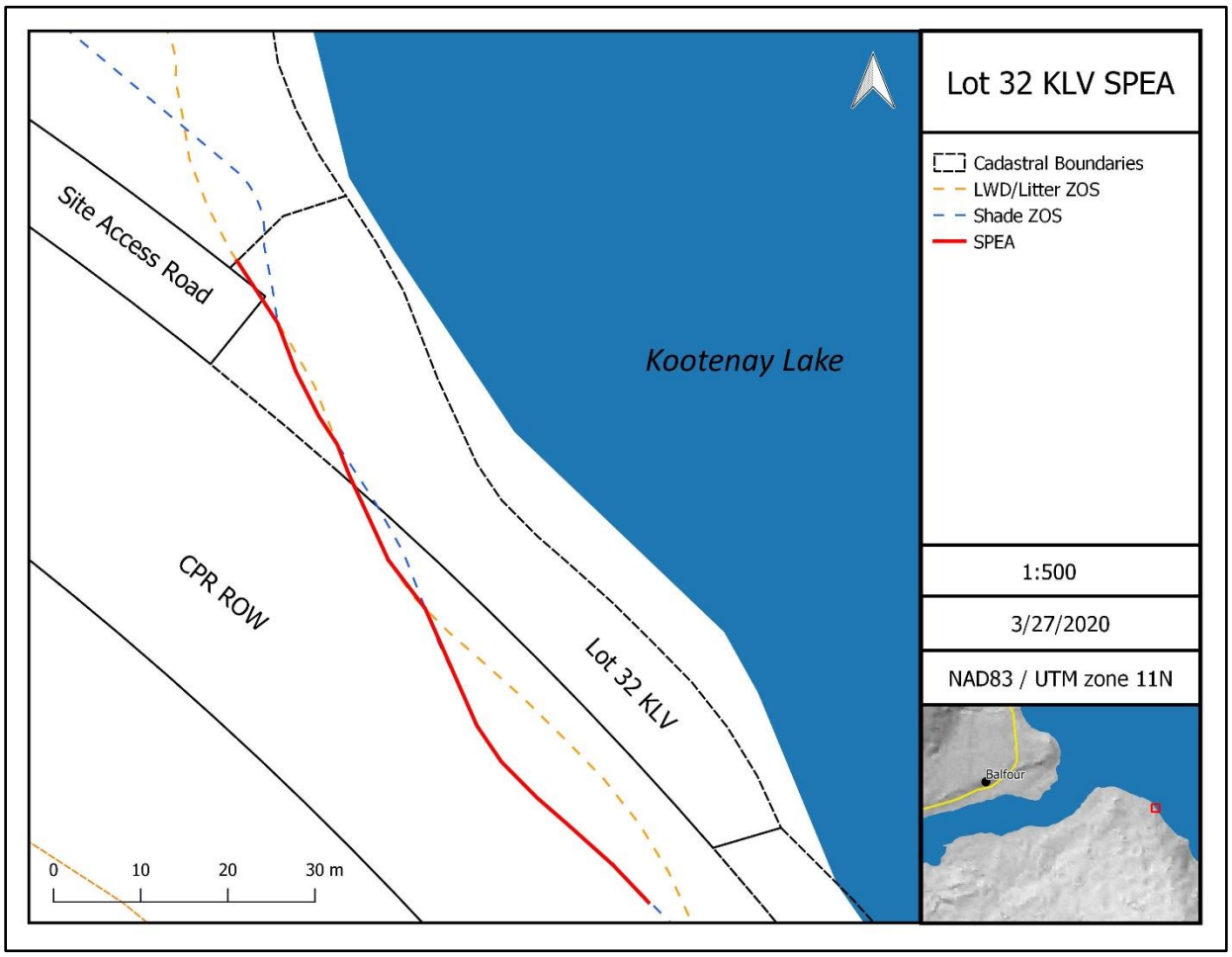

Figure 1. SPEA Setback Map.

4 RESOURCES

4.1 Fish and Fish Habitat

The shoreline in front of the property is primarily a bedrock outcrop covered in angular boulders, which provide cover for juvenile fish (Photo 7). A small gravel beach is present between the bedrock outcroppings (Photo 8). Slopes range from 35% on the outcrops to 3% on the beach. Sparse herbaceous and shrubby vegetation is present on and above the rock outcrops, but no submerged or hydrophytic vegetation was observed. Foreshore Inventory Mapping indicates that this segment of foreshore is a potential Kokanee (*Oncorhynchus nerka*) shore spawning area (EEC 2016). Kokanee shore spawning occurs in areas with pea-sized gravels, groundwater seepage, and sufficient water depth.

Photo 7. Angular boulders over bedrock.

Photo 8. Gravel beach and bedrock outcrops.

4.2 Riparian Vegetation

The riparian area within the property is disturbed and colonized throughout by non-native plant species. The upland margin of the property is a steep talus slope which leads up to the disturbed CPR ROW. Vegetation on this slope includes mature Douglas fir (*Pseudotsuga menziesii*), and a few western larch (*Larix occidentalis*) trees. Scattered Douglas fir and red osier dogwood (*Cornus stolonifera*) are present throughout the property; however, herbaceous cover has mostly been removed and replaced with non-native grasses and weeds. The predominance of rock outcrops throughout the parcel indicate that tree cover has likely always been sparse; however, it is likely that riparian vegetation was removed when the building lot was cleared. Three young Douglas fir and one mature larch were retained around the building site (Table 3). The rocky shoreline is sparsely vegetated with native forbs and grasses. A list of all plant species observed on site is presented in Table 4.

Table 3. Summary of trees retained on the building site.

Species	Number	DBH (cm)	Comments
Douglas fir	2	15	below building site
Douglas fir	1	20	below building site; dieback at top
western larch	1	20/40	above building site; two trunks

Table 4. Plant species list.

Common Name	Scientific Name	Common Name	Scientific Name
Trees		**Herbaceous and Low Shrubs**	
Douglas-fir	*Pseudotsuga menziesii*	great mullein	*Verbascum thapsus*
western larch	*Larix occidentalis*	horseweed	*Conyza canadensis*
western redcedar	*Thuja plicata*	kinnikinnick	*Arctostaphylos uva-ursi*
Tall Shrubs		lady fern	*Athyrium filix-femina*
Bebb's willow	*Salix bebbiana*	northern water horehound	*Lycopus uniflorus*
black gooseberry	*Ribes lacustre*	oxeye daisy	*Leucanthemum vulgare*
dog rose	*Rosa canina*	quackgrass	*Elymus repens*
Douglas maple	*Acer glabrum*	ribwort plantain	*Plantago lanceolata*
European mountain-ash	*Sorbus aucuparia*	self-heal	*Prunella vulgaris*
mountain alder	*Alnus incana*	small bedstraw	*Galium trifidum*
Nootka rose	*Rosa nutkana*	sowthistle species	*Sonchus sp.*
paper birch	*Betula papyrifera*	spotted knapweed	*Centaurea stoebe*
red raspberry	*Rubus idaeus*	spotted saxifrage	*Saxifraga bronchialis*
red-osier dogwood	*Cornus stolonifera*	sweet-scented bedstraw	*Galium triflorum*
saskatoon	*Amelanchier alnifolia*	tufted vetch	*Vicia cracca*
soopolallie	*Shepherdia canadensis*	twinflower	*Linnaea borealis*
thimbleberry	*Rubus parviflorus*	violet	*Viola sp.*
water birch	*Betula occidentalis*	wall lettuce	*Mycelis muralis*
Herbaceous and Low Shrubs			western cliff fern
bull thistle	*Cirsium vulgare*	western polypody	*Polypodium hesperium*
Canada bluegrass	*Poa compressa*	yarrow	*Achillea millefolium*
cheatgrass	*Bromus tectorum*	yellow clover	*Trifolium aureum*
Columbia River mugwort	*Artemisia lindleyana*	yellow salsify	*Tragopogon dubius*
common harebell	*Campanula rotundifolia*	yellowdevil hawkweek	*Hieracium glomeratum*
creeping bentgrass	*Agrostis stolonifera*	**Mosses**	
dandelion species	*Taraxacum sp.*	pipecleaner moss	*Rhytidiopsis robusta*
Dewey's sedge	*Carex deweyana*	red-stemmed feathermoss	*Pleurozium schreberi*
Eaton's aster	*Symphyotrichum eatonii*	rockmoss	*Racomitrium sp.*
fescue	*Festuca sp.*		

4.3 Wildlife

4.3.1 Reptiles and Amphibians

The talus slopes and outcrops along the foreshore may provide habitat for northern alligator lizards (*Elgaria coerulea*) and garter snakes (*Thamnophis spp.*). The subject property and surrounding areas provide no breeding habitat, and very limited upland foraging habitat for amphibians.

4.3.2 Birds

Bohemian waxwings (*Bombycilla garrulus*) were the only birds observed during the site survey, however, the subject property is likely visited by other songbirds, waterfowl, and raptors particularly during the spring breeding season. No stick nests were observed, though the mature Douglas-fir above the property provides potential perching and nesting sites for raptors.

4.3.3 Mammals

The talus slope may provide habitat for yellow-bellied marmots (*Marmota flaviventris*); however, their presence was not confirmed. The steep rocky topography and sparse vegetation cover likely limit larger mammals from regularly occupying the property.

4.4 Species at Risk

A 10 km buffer around the subject property was used to query BC Conservation Data Center records using the CDC iMap tool. Based on this query, three species at risk occurrences are known within the 10 km buffer around the project area. These include white sturgeon (*Acipenser transmontanus*), western skink (*Plestiodon skiltonianus*) and wild licorice (*Glycyrrhiza lepidota)*. None of these species are likely to occur on the property. The lack of documented species at risk identified in the data queries does not preclude the presence of a species at risk from an area. Given the time of year, and the scope of this assessment it is impossible to rule out the presence of species at risk on and near the subject property.

4.5 Archaeological Resources

Kootenay Lake is part of the traditional territory of the Sinixt, Okanagan and Ktunaxa First Nations and archaeological evidence is documented at multiple shoreline sites. A review of archaeological resources on this property is outside the scope of this report.

5 IMPACT ASSESSMENT

The proposed development will involve construction of a two storey home and garage with ~267 m^2 of the footprint occurring entirely within the SPEA (summarized in Section 2.3). The house and associated structures will be constructed up to a minimum of 7.7 m of the HWM of Kootenay Lake on previously created terraces. The riparian habitat has previously been disturbed from clearing of vegetation and infilling of rock and gravel to create the building sites, terraces and pathways. Impacts from the proposed development will permanently remove at least 198 m^2 of potential riparian vegetation within the SPEA, and it is likely that the additional 4 trees retained around the building site may be removed (Table 3). Potential impacts of the loss of riparian vegetation on terrestrial and aquatic species are described in this section. Section 7 outlines a plan to mitigate for impacts from the permanent loss of potential riparian vegetation.

5.1 Wildlife Impacts

Permanent removal of potential riparian vegetation will contribute to cumulative local losses of wildlife habitat associated with the development of Kootenay Lake Village and other regional land modification. At least 4 trees (Table 3) will likely be removed during construction. Removal of mature trees reduces cover and perching opportunities for songbirds and raptors within the riparian area.

5.2 Aquatic Impacts

Permanent removal potential riparian vegetation within the SPEA will decrease riparian vegetation functions which maintain the health and productivity of aquatic ecosystems, including future loss of large woody debris recruitment, shade potential and water temperature regulation and nutrient input including litter fall and insect drop.

The property was previously altered by the developer to prepare for development. Past alterations include the creation of terraces and retaining walls. Some of the retaining walls may have been constructed below the HWM and have created vertical structures that can impact juvenile fish movements along the foreshore. The rock wall consists of different size angular rocks which provide some interstitial space that could be used for cover by fish. No additional works are currently proposed below the HWM.

6 MEASURES TO PROTECT THE INTEGRITY OF SPEA

This section provides measures to protect the integrity of the SPEA as described in RAPR, as well as recommended best management practices.

6.1 Danger Trees

Overall tree cover on site is sparse and the rocky substrate may be a challenging growing environment for some species. One Douglas fir on the building site was noticeably dead at the apex, but otherwise sound. This may be the result of drought, damage during lot clearing, or armillaria (*Armillaria ostoyae*) infection. If armillaria infection is present, then the health of nearby trees will likely decline over time. No hazard trees were observed. A certified danger tree assessor has not surveyed the site as a part of this assessment. There is no indication that further danger tree assessment is required.

6.2 Windthrow

There is little windthrow risk to the SPEA because no significant clearing of timber is proposed. It is unlikely that the proposed construction activities on site will increase the windthrow risk to trees in or near the SPEA. A full assessment of windthrow risk by a Registered Professional Forester (RPF) was not completed as part of this survey, and there is no apparent evidence that such an assessment is required.

6.3 Slope Stability

No slope stability hazard indicators were observed during the site visit; however, the area of proposed development was assessed by WSA Engineering in 2010 in preparation for the application for a site-

specific exemption to the *Floodplain Management Bylaw 2080* setbacks. This report has been reviewed by the RDCK and the exemption was granted in 2011.

Further assessment of geotechnical hazard is beyond the scope of this report, and any such assessment should be led by a P.Geo, or P.Eng.

6.4 Protection of Trees and Vegetation in the SPEA

Protection of remaining trees and other vegetation in the SPEA can be achieved by implementing the following measures:

- Locate the proposed house and associated structures on previously created terraces and rock outcrops to minimize additional disturbance to riparian vegetation. Install the septic tank, well, and all buried utilities in a way that does not require vegetation removal or disturb root systems of existing trees. All vegetation outside of the construction footprint should be preserved to ensure the redevelopment of a functioning riparian ecosystem within the SPEA.
- The four trees located near the building site should be retained if possible (Table 3). If they cannot be retained, then they should be replaced according to the ratios in the BC Tree Replacement Criteria (MELP 1996).
- Limit landscaping to the minimum footprint necessary to allow foot traffic between the home, garage, beach and driveway.
- Staging and access should only occur in previously disturbed areas of the site.
- A QEP should visit the site with the construction contractor prior to development to identify areas of vegetation to be retained.
- In addition to marking vegetation retention areas with flags and/or fencing, the QEP may make other recommendations regarding material handling and equipment storage to ensure that remaining riparian vegetation is not impacted.
- No pollutants should be allowed to contaminate the soil around trees in the SPEA.

6.5 Encroachment

As the development will occur almost entirely within the SPEA, further encroachment of areas beyond the proposed home/garage footprint should be avoided to preserve the function of remaining riparian vegetation, and to promote re-establishment of riparian vegetation recommended in the Mitigation Plan in Section 7. The rugged character of the property generally precludes further encroachment and the landowner should ensure that no additional riparian vegetation is removed.

6.6 Sediment and Erosion Control

Soil disturbance during construction involves the risk of erosion and sediment releases. The following mitigation measures should be implemented to reduce the risk of sediment input to Kootenay Lake:

- Amount of soil disturbance should be kept to a minimum.
- During construction surface runoff should be controlled and directed away from exposed soils.
- Install sediment fence where necessary to prevent migration of soils from the building site.

- In the event of heavy rainfall, additional mitigation measures such as ditching or covering soils may be required to ensure turbid wastewater does not leave the construction site.
- Turbid wastewater from the construction site is not to be directly discharged into Kootenay Lake.
- Remaining SPEA vegetation should not be used to filter sediment laden water.
- Soil should be safely stockpiled in a manner that eliminates the possibility of erosion and sediment transport. Ideally, stockpiles should be located at least 30 m from Kootenay Lake and covered with tarps to prevent erosion and establishment of invasive weeds if they are left for greater than two months. If stockpiles cannot be located at least 30 m from Kootenay Lake, then alternate measures may be taken to absolutely prevent erosion and sedimentation.
- Disturbed soils should be revegetated as soon as possible after construction.

6.7 Stormwater Management

The proposed development will result in a marginal increase in the total impervious area of the property from surfaces such as driveways and roof tops. The following mitigation measures will help decrease stormwater impacts:

- Minimize impervious surfaces (e.g. permeable driveway, pathways, patios etc.) by incorporating materials which limit surface runoff and promote infiltration. (See Homeowner's Guide to Stormwater Management. MV n.d. and Stormwater Planning: A Guide for British Columbia (May 2002).
- Maintain greenspace and vegetated swales. A landscape architect should be consulted to design site specific stormwater management solutions which will minimize surface runoff from the final home site.
- Rainwater collected on roofs should not be allowed to form surface runoff. Downspouts should direct rainwater into suitable landscape features which can absorb and utilize runoff rather than discharging it directly to Kootenay Lake (MV n.d.)
- A landscape architect should be consulted to design site specific stormwater management solutions which will minimize surface runoff from the final home site.
- Stormwater discharges must meet the *Water Sustainability Act* or any other application legislation.

6.8 Floodplain Concerns

Development of Kootenay Lake Village Lot 32 within the 15 m *Floodplain Management Bylaw 2080* setback was granted a site-specific exemption by the RDCK in 2011. Modifications to the floodplain have previously been completed on the property and no further flood related works (i.e. diking, beach modification, etc.) are proposed.

6.9 Scheduling of Environmentally Sensitive Activities

Under the provincial *Wildlife Act* it is unlawful to disturb nesting birds, nests, and eggs. In order to avoid potential impacts to breeding songbirds, any clearing of vegetation within the subject property should occur within the least risk work period for nesting birds (August 15- March 31).

6.10 Protection of Fish Habitat

Development of the property should protect fish habitat by:

- Limit beach modification and preserve foreshore vegetation and boulders which provide fish habitat during periods of inundation.
- Adhere to sediment, stormwater, and waste management best practices outlined in this report to ensure that there is no release of deleterious materials into Kootenay Lake.
- If vertical retaining walls are modified or constructed below the HWM then the areas in front of the walls should be complexed with boulders and/or large woody debris to provide additional cover for juvenile fish.
- If instream works are required, including any work below the HWM, it must be approved under Section 11 of the *Water Sustainability Act* and a QEP should be present to ensure proper isolation of construction work from aquatic habitat.

6.11 Construction Waste Management

All construction waste generated on site must be taken off site and re-used, recycled or disposed of at proper facilities. Construction personnel should ensure the site is kept clean and to prevent litter from escaping the site. Food wastes generated on site should be removed daily so it does not become a wildlife attractant.

Concrete will be used in the construction of foundations. Fresh concrete and concrete laden water is caustic and toxic to aquatic organisms. The following precautions should be taken when handling concrete to ensure the protection of fish habitat:

- Concrete waste should be collected and disposed of at an approved disposal site.
- Washing of equipment used during concrete work should occur at a designated location at least 30 m away from any waterbody where wash water will not drain directly into the water. If this is not possible then lined trays should be used to collect all concrete waste and washwater to ensure it does not enter Kootenay Lake.

6.12 Management of Equipment and Fuel/Lubricant Materials

The most likely source of any contaminant is from equipment or vehicles used or stored on-site, either during fueling or from unanticipated leaks or the failure of a hydraulic hose. In order to minimize the likelihood and impact of a spill within the riparian area, ensure that:

- Each piece of heavy equipment will be equipped with its own spill response kit.

- All staff will be familiar with the use of spill kits and their contents. The contents of the kits will be replaced immediately after use.
- Equipment will be stored at least 30 m away from Kootenay Lake and secondary containment will be utilized to capture any potential spills or leaks.

6.13 Invasive Plant Management

Construction activities can potentially increase prevalence of invasive plant species which can out-compete native riparian vegetation, causing damage to habitat and ecosystem function. The following mitigation measures are recommended in order to reduce the establishment and proliferation of invasive plant species on site:

- All equipment should be thoroughly washed and inspected before entering the project site to prevent the import of new invasive plant seeds and root fragments.
- Amount of vegetation clearing, and soil disturbance should be minimized.
- All exposed soils should be re-vegetated immediately following construction.

7 MITIGATION PLAN

The Shoreline Management Guidelines for Kootenay Lake outlines general principles for shoreline development in order to achieve a "No Net Loss" of habitats present. The principle is achieved by applying the following mitigation options: 1. Avoidance of environmental impacts; 2. Minimizing unavoidable impacts; 3. On-site restoration; and 4. Offset residual impacts that cannot be minimized through compensation (KLP 2018).

The avoidance of environmental impacts is not possible during development of Lot 32 as the entire footprint is within the SPEA. The RDCK has indicated the lot should be developed and the Rural Affairs Commission have previously issued a site site-specific exemption to the *Floodplain Management Bylaw 2080* setbacks to allow construction within 15 m of the HWM. Offsetting the residual impacts through compensation in a similar ecosystem is also not possible as the RDCK does not have a program for offsite habitat enhancement works to offset residential developments. Therefore, a combination of minimizing further impacts to the SPEA and implementing on-site restoration are the only options, however due to the small size and location of the lot within the riparian area "No Net Loss" will not be achieved.

In order to minimize further impacts to the SPEA the best management practices outlined in section 6 should be adhered to. Although on-site restoration opportunities are limited on the property, the pathway extending southeast of the building site could be restored to native riparian vegetation (Photo 5). The pathway is approximately 60 m^2, and could be successfully revegetated with native plants by implementing the following recommendations:

- Remove plastic pipe and gravel fill and de-compact the area. Avoid future construction of utilities or residential infrastructure in this area to promote natural riparian function.
- Replace gravel with a growing medium suitable for plant growth. Organic matter and other amendments may be required to promote survival and establishment of plantings.

- Plant at least 40 native shrubs and 5 native trees the 60 m^2 restoration area. Use species listed in Table 5 which are known to occur in the local area and provide the necessary riparian function. Additional native tree or shrub species could be substituted under direction from a QEP. Plantings which do not survive should be replaced to ensure that long term establishment of the target quantity of native trees and shrubs is achieved.
- Plant stock should be a minimum of 4" potted stock.
- Direction from a qualified landscaper will increase the likelihood of success. Ensure the objective of the restoration is to naturalize the riparian area and not create a landscaped garden.
- Planting should not occur during periods of hot dry weather unless they are irrigated daily.
- Regularly irrigate new plantings during the plant establishment period, minimum 3 years.
- In addition to restoring riparian vegetation along the southeast pathway all disturbed areas around the home and any landscape features should be planted entirely with native plant species such as those listed in Table 5.
- Replanting of riparian and upland vegetation around the proposed buildings should adhere to principles of rural residential fire protection (for more information see the FireSmart Homeowner's Manual MFLNRO N.D.).
- All locally adapted native wildflower species listed in Table 5 are available from the Kinseed nursery (www.kinseed.ca) and are preferable to seeds collected or grown outside the region. Trees and shrubs listed in Table 5 are available from Sagebrush Nursery in Oliver (https://sagebrushnursery.com), or Tipi Mountain Native Plants (http://tmnp.tipimountain.com/) near Kimberley.

Table 5. Native plants for revegetation.

Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Trees		**Wildflowers**	
cottonwood	*Populus trichocarpa*	Atkinson's coreopsis	*Coreopsis tinctoria*
Douglas-fir	*Pseudotsuga menziesii*	Canada goldenrod	*Solidago lepida*
grand fir	abies grandis	common yarrow	*Achillea millefolium*
lodgepole pine	*Pinus contorta*	Douglas' aster	*Symphyotrichum subspicatum*
paper birch	*Betula papyrifera*	field mint	*Mentha arvensis*
western redcedar	*Thuja plicata*	fringed loosestrife	*Lysimachia ciliata*
Shrubs		large-leaved lupine	*Lupinus polyphyllus*
beaked hazelnut	*Corylus cornuta*	mountain sneezeweed	*Helenium autumnale*
Bebb's willow	*Salix bebbiana*	nodding onion	*Allium cernuum*
black gooseberry	*Ribes lacustre*	pearly everlasting	*Anaphalis margaritacea*
Douglas maple	*Acer glabrum*	purple dragonhead	*Physostegia parviflora*

mountain alder	*Alnus incana*	purple meadowrue	*Thalictrum dasycarpum*
Nootka rose	*Rosa nutkana*	rosy pussytoes	*Antennaria rosea*
red raspberry	*Rubus idaeus*	round leaved alumroot	*Heuchera cylindrica*
red-osier dogwood	*Cornus stolonifera*	silverleaf phacelia	*Phacelia hastata*
saskatoon	*Amelanchier alnifolia*	spikeline goldenrod	*Solidago simplex*
soopolallie	*Shepherdia canadensis*	wild bergamot	*Monarda fistulosa*
thimbleberry	*Rubus parviflorus*	wild licorice	*Glycyrhiza lepidota*
water birch	*Betula occidentalis*	yellow mountain-avens	*Dryas drummondii*
Grasses			
bluebunch wheatgrass	*Pseudoregeneria spicatum*	Idaho fescue	*Festuca idahoensis*
bluejoint	*Calamagrostis canadensis*	junegrass	*Koeleria macrantha*
giant wild rye	*Elymus cinereus*	Richardson's needlegrass	*Stipa richarsonii*

8 ENVIRONMENTAL MONITORING

Environmental monitoring of construction activities by a QEP may be required at the discretion of the RDCK to ensure the Environmental Best Practices outlined in this report are followed. Further effectiveness monitoring of mitigation measures may also be required. The following indicators of success of riparian plantings should be documented:

- Plant composition includes only trees and shrubs from Table 5, or other species as advised by QEP.
- Establishment of 40 shrubs and 5 trees within the 60m^2 revegetation area after 3 full years would be a reasonable indication that the mitigation plan has been successfully completed.

9 CONCLUSION

The proposed 198 m^2 footprint of the home and garage at Lot 32 is within the 15 m WDP and 15-22 m SPEA of Kootenay Lake. Recommended mitigation measures include minimizing losses of potential riparian vegetation, restoring disturbed areas with native plant species and revegetating a 60 m^2 area with native trees and shrubs to partially offset the permanent loss of potential riparian vegetation to the extent possible on this lot.

10 CLOSURE

I, Sylvie Masse, certify that I am qualified to carry out this assessment; and that the assessment methods under the Regulation have been followed; and that, in my professional opinion:

(i) if the development is implemented as proposed, or

(ii) if the streamside protection and enhancement areas identified in the report are protected from the development, and

(iii) if the developer implements the measures identified in the report to protect the integrity of those areas from the effects of the development,

then there will be no harmful alteration, disruption or destruction of natural features, functions and conditions that support fish life processes in the riparian assessment area.

Prepared by:

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Reviewed by:

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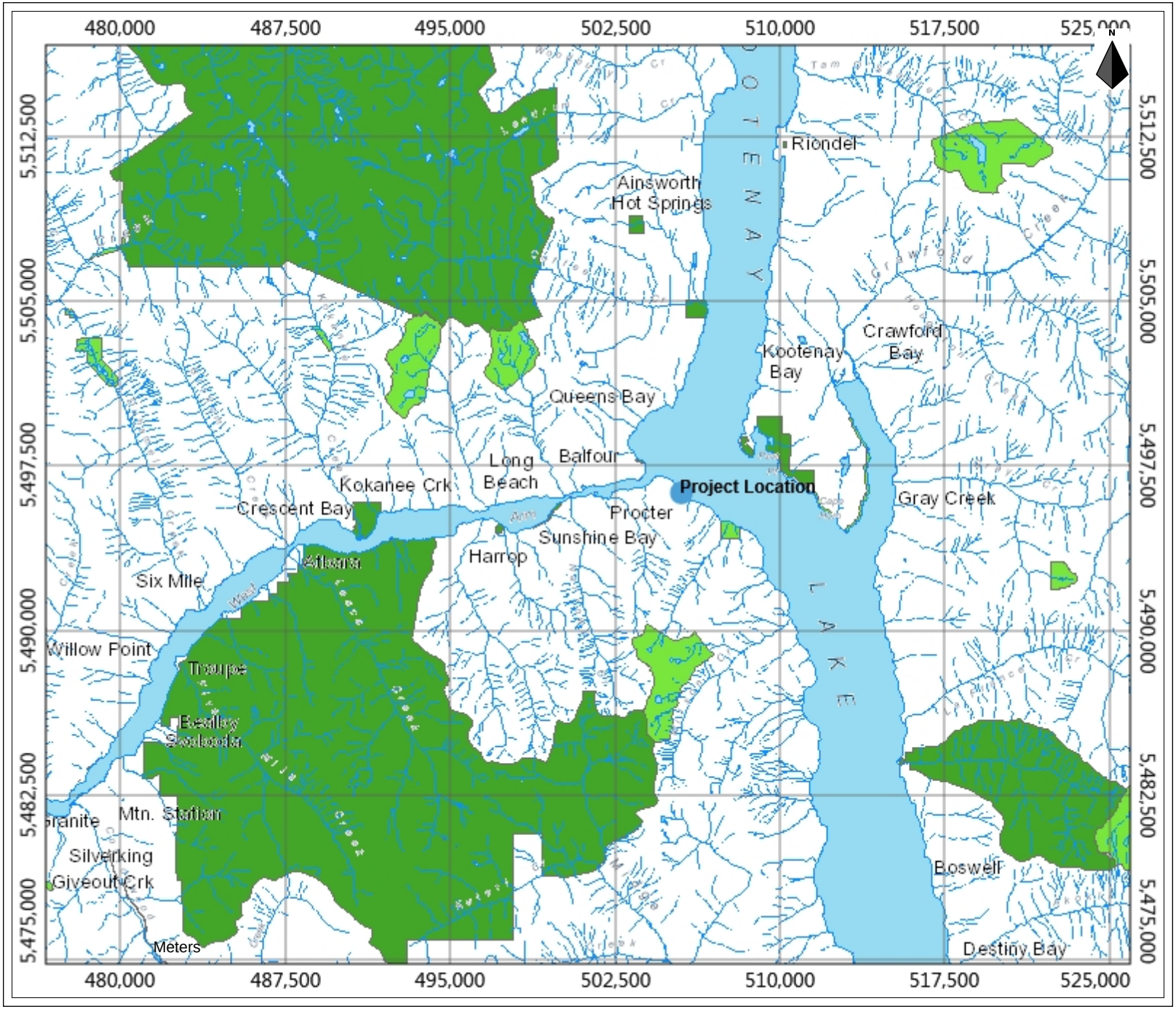
APPENDIX 1
LOCATION MAP



Project Location

Legend

- Streams
- Lakes (Mid Scale)
- ParksAndTenures
  - Park
  - Recreation Site or Reserve
  - Wildlife Management Area

Notes

Map Details

202 Lakeside Drive
Nelson, BC
1-800-268-7325
http://www.rdck.ca

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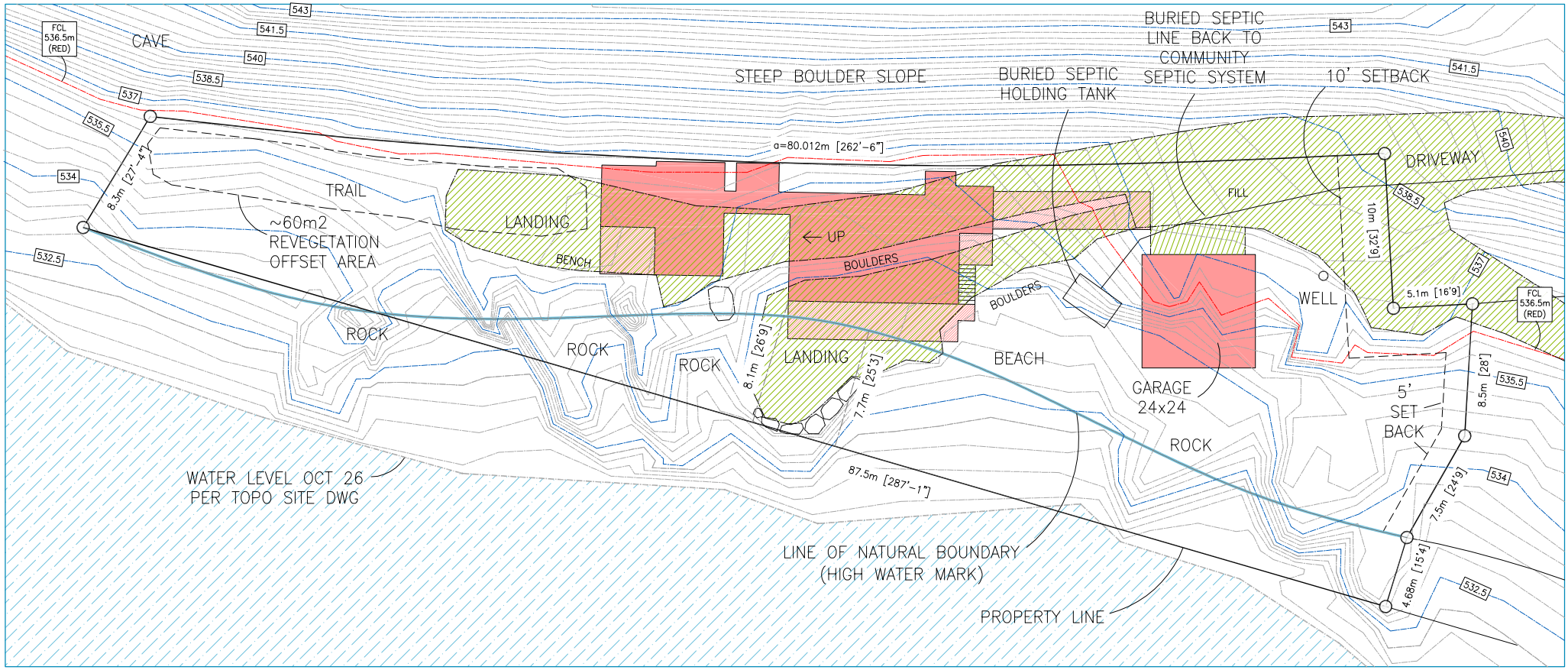
Date Plotted: 7/16/2019

APPENDIX 2
SITE PLAN



STRATA LOT 32 D.L. 973
PLAN NES3286 PID 027-785-122
(KOOTENAY LAKE VILLAGE)
AREA E RDCK

purcell TIMBER FRAME HOMES

RAMOS-CASH

SITE PLAN

MAR 20/20