

WESTSHORE ENVIRONMENTAL ASSESSMENT

REGIONAL DISTRICT OF CENTRAL OKANAGAN
SUBDIVISION ENVIRONMENTAL ASSESSMENT SERVICES

Prepared For:

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1.0 INTRODUCTION

Ecoscape Environmental Consultants Ltd. (Ecoscape) was retained by the Regional District of Central Okanagan (RDCO) to complete an overview environmental assessment (EA) of the Westshore Subdivision (Westshore). The purpose of the assessment was to refine the existing Aquatic Ecosystem and Terrestrial Development Permit (DP) areas, using a combination of publically available inventory data and field work to confirm the presence/absence of watercourses and other important habitat areas.

Westshore is located on the northwest side of Okanagan Lake approximately 45 km from downtown Kelowna (Figure 1). The approximately 127 hectare (ha) subdivision is on the uphill side of Westside Road and has approximately 528 parcels.

1.1 Background

Development within Westshore is guided by the Rural Westside Official Community Plan (OCP) (RDCO 2010). Aquatic Ecosystem DP areas were designated for the protection of watercourses, including streams, ponds, springs, wetlands, and lakes. The DP areas were established by the identification of possible watercourse locations using provincial Terrain Resource Inventory Mapping (TRIM) data, Sensitive Ecosystem Inventory (SEI) data and Sensitive Habitat and Inventory Mapping (SHIM) field surveys. Because the DP areas are meant as a flagging tool, all sites that could potentially contain watercourses were included. No field inspections and feature verification were carried during the 2010 OCP development as it was intended as a desktop exercise. The OCP then relied on Qualified Environmental Professionals (QEPs) to affirm the presence or non-presence of an actual watercourse.

The OCP set out to establish policy around defining riparian leavestrips, which included methods outlined in the provincial Riparian Areas Regulation (RAR). A leavestrip occurs adjacent to a watercourse and is intended to be left in a natural condition and untouched by development. If previously damaged, the leavestrip is to be restored or enhanced (RDCO 2010). The OCP clearly establishes leavestrip areas for creeks and wetlands that are fish bearing or connected by surface flows to fish bearing watercourses, as no less than 15 m measured from bank full width. The leavestrip for Okanagan Lake is also clearly defined based on shoreline sensitivity; ranging from 15 to 30 m. These leavestrip areas established by the OCP often times are more conservative than that set forth by the province.

Terrestrial DP areas were established based on the presence of Coniferous Woodland, Broadleaf Woodland, Grassland, Sparsely Vegetated, and Mature Forest Ecosystems identified through SEI (RDCO 2010). In Terrestrial DP areas, a development permit must be approved prior to land alteration or subdivision. Figure 1 depicts the existing Aquatic Ecosystem and Terrestrial DP areas within Westshore.



1.2 Project Objectives

RDCO planning staff have identified inefficiencies and challenges with the more conservative nature of existing Aquatic Ecosystem and Terrestrial DP areas that were identified in the OCP (RDCO 2010). For example, there are many DP areas that are flagged as Aquatic Ecosystem that do not actually have watercourses. This results in wasted time and money for both property owners and RDCO staff. This broad scale subdivision environmental assessment sets out to accomplish the following:

- Clarify the locations of aquatic features and determine whether they actually exist (e.g., Are the identified TRIM lines actually streams?);
- Recommend leavestrip setbacks from watercourses;
- Confirm the applicability of the Riparian Areas Regulation (RAR);
- Clarify if the ecosystem attributes that resulted in areas flagged as Terrestrial DP areas exist, or have been previously lost to development;
- Verify SEI classifications to ensure that data used for flagging DP Areas is accurate;
- Provide generic and site specific mitigation measures;
- Identify and refine areas where the DP areas are inaccurate; and
- Provide recommendations for how to use the EA information for new development proposals.

2.0 ENVIRONMENTAL ASSESSMENT

The following sections present the methods and results of the Westshore EA. Field work was conducted by Kyle Hawes, R.P.Bio. and Mary Ann Olson-Russello, R.P.Bio., Senior Natural Resource Biologists with Ecoscape, with support from Gisele Rehe, Planning Assistant with RDCO. Field investigations were conducted on November 13th, 16th, 2015 and January 21st, 2016. Mapping deliverables and GIS analysis was completed by Rachel Plewes, M.Sc. of Ecoscape.



2.1 Methods

To achieve the project objectives, the following methods were undertaken:

2.1.1 Fieldwork

- Field work was focused in areas where the existing Aquatic Ecosystem and Terrestrial DP areas are located.
- Field maps were developed that conveyed terrestrial ecosystem mapping (TEM) polygons (Haney and Iverson 2009), watercourse location information (TRIM, SHIM, wetlands) (Patterson *et al.* 2014), and existing Aquatic Ecosystem and Terrestrial DP areas.
- Background data files were also loaded into a hand held GPS for use in the field.
- Because private property access was not granted for this project, the full lengths of watercourses were not investigated. Rather, watercourse presence was determined by stopping at all locations where possible watercourses intersected roadways or public lands. At each intersection (pinpointed using the background file in the GPS), evidence of watercourse presence was investigated. Indicators of a watercourse included presence of standing or flowing water and presence of a defined channel (with or without water). The presence of broadleaf vegetation was also a good indication of the potential for a watercourse, but did not necessarily translate into a definitive surface water feature. If a watercourse was not encountered, it was crossed-off the field map at each road crossing.
- If a watercourse was encountered, its connection (i.e. by surface water flow) with Okanagan Lake or another fish-bearing watercourse was verified. In some cases, segments of a single watercourse were connected and hence are RAR applicable, while other segments of the same watercourse had discontinuous channel development and no direct surface water connection with Okanagan Lake. There were other instances where the extent of a watercourse was different than what was previously mapped. These feature changes were picked up using the GPS. The watercourse was then redrawn and the database was updated.
- Terrestrial features were also noted. These included confirmation of TEM classifications such as structural stage, levels of disturbance (e.g. weeds or changes to landscape since latest airphoto) and critical habitat features. Discrepancies in Terrestrial DP areas and SEI classifications were also noted in several cases and were marked as needing further investigation.



2.1.2 Data Processing

- Information collected in the field was incorporated into a GIS interface by either updating existing databases or redrawing features to more accurately reflect what was encountered on the ground. For example, the non-existent watercourses were removed from the database and updates to existing watercourse alignments were made.
- Where necessary, TEM classifications were updated and polygon boundaries redrawn.
- The revised TEM data was used to conduct an environmental sensitivity analysis (ESA), to refine development permit areas, and to develop relevant recommendations.
- Rather than cutting polygons at the subdivision study area extent, all TEM polygons that intersected the boundary were kept and mapping outputs intentionally showed the adjacent areas beyond the subdivision. The larger output area provides better ecological context with insights into viable wildlife movement corridors within and beyond the subdivision and it better addresses cumulative effects and provides information that may be valuable in the future, especially if residential development extends beyond the existing subdivision boundary.

2.1.3 Environmental Sensitivity Analysis

- The ESA was completed for each delineated TEM polygon that intersects the Westshore study area. Professional judgment was used to evaluate ecosystem polygons based on criteria including: provincial Conservation Data Center (CDC) status (i.e., Red or Blue listed), rare and endangered species occurrence potential, landscape condition (i.e., connectivity, fragmentation), successional status, regional rarity, critical and specialized habitat features, fragility, and relative biodiversity. A summary of defining criteria for each ESA rating is shown in Table 1.



Table 1. Summary of defining criteria used in the Environmental Sensitivity Analysis.

ESA Value	Defining Criteria
Very High (ESA 1)	Red or Blue listed intact woodland ecosystems of mature forest (structural stage 6), open water features (pond, marsh, etc.), and intact sparsely vegetated ecosystems (e.g. rocky bluff and rock outcrop ecosystems)
High (ESA 2)	Red or Blue listed intact woodland ecosystems with predominantly young forest (structural stage 5)
Moderate (ESA 3)	Recently modified woodland ecosystems (structural stage 3 or 4), or ecosystems with anthropogenic disturbance (rural, cultivated orchards and fields)
Low (ESA 4)	Anthropogenic disturbance with little or no possibility for recovery or rehabilitation (e.g. hardscaped areas such as parking lots)

- Ecosystem polygons were ranked using RDCO's ESA Stratification Criteria that was developed in part by the Environmental Advisory Commission, and is described below. Guidelines for the retention, mitigation, and compensation of ESAs is presented in Section 5.0:
 - I. Very High (ESA 1): ESA 1's contain rare physical features, plants and animals or are ecologically functioning natural systems. Various types of habitat will qualify on the basis of sensitivity, vulnerability, connectivity and biodiversity. All wetlands, high value foreshore, locally/regionally rare plant communities, animals and habitats will be considered as Very High. Areas given this rating are considered the highest priority for protection of ecosystem function and values and should be left undisturbed. Avoidance and conservation of Very High ESA designations should be the primary objective.
 - II. High (ESA 2): ESA 2's contain physical features, plants, animals and habitat characteristics which contribute toward the overall diversity and contiguous nature of the surrounding natural features. These will include Sensitive Ecosystems (SEI) as refined according to the ESA stratification criteria at the appropriate scale for the site. These may also include areas used to buffer ecological functions of Very High ecosystems. An area given this rank is of only slightly lower priority for protection of ecosystem function and values. Therefore, clear rationale and criteria for distinction between Very High and High values shall be provided.
 - III. Moderate (ESA 3): ESA 3's contain important features or remnant stands/sites with ecological value that are not identified in the Sensitive



Ecosystems Inventory as refined according to the ESA stratification criteria at the appropriate scale for the site and are not locally/regionally rare. The moderate ESA still contributes to the diversity and connectivity of the landscape, and may contain natural habitats, and some features of interest (e.g. tree patches, rock outcroppings, drainages and corridors).

- IV. Low (ESA 4): ESA 4's polygons contribute little or no value to the overall diversity of vegetation, soils, and terrain and wildlife characteristics of the area. These areas have generally experienced anthropogenic disturbances (e.g. a driveway or other approved land clearing but does not include land cleared for agriculture) with little or no possibility for recovery or rehabilitation.

2.1.4 Riparian Setback Determination

- Riparian setbacks or leavestrips were recommended for all identified watercourses.
- In addition, RAR setbacks were determined for all RAR applicable watercourses using the detailed assessment method (BC MOE 2006a). The RAR setbacks for creeks and springs were generated using bankfull width data collected during SHIM. If bankfull width information was not available, then a 1-m default width was used (i.e. for small unnamed springs/seeps/first order channels).
- Okanagan Lake setbacks were specified in the OCP (RDCO 2010) and were based on relative habitat use/value with respect to Kokanee. Accordingly, setbacks ranged from 15 – 30 m.

2.2 Ecosystem Classification

Westshore occurs within the Okanagan Very Dry Hot Interior Douglas-fir Variant (IDFxh1) biogeoclimatic zone, which is defined by the Biogeoclimatic Ecosystem Classification (BEC) program (Lloyd *et al.* 1990). Areas of the IDF zone are generally warm and dry, with long growing seasons and periodic droughts.

Polygons within and surrounding Westshore represent distinct habitat types based on vegetation cover and by adapting the nomenclature and site series used by TEM. Westshore was divided into 3 polygons representing four (4) distinct ecosystems. Figure 2 shows a spatial distribution of the TEM polygons and Table 2 summaries the ecosystem codes, site series, and provincial status of respective ecosystems.



Table 2. Ecosystem communities occurring within the Westshore Subdivision.

Ecosystem Code	Site Series	Site Series Name	Provincial Status ¹
DP	01	Douglas-fir/Ponderosa pine - Pinegrass	Blue
DS	07	Douglas-fir/Ponderosa pine - Snowberry - Spirea	Red
RW	-	Rural	-
SP	06	Douglas-fir/Ponderosa pine - Snowberry - Pinegrass	Blue

¹ Source: <http://www.env.gov.bc.ca/cdc/>

Blue: Of special concern. **Red:** Endangered or threatened.

Westshore consists of three coniferous woodland ecosystems that are Red or Blue listed, highlighting the rare ecosystems that characterize the area.

2.3 Terrestrial Community Types

Westshore is characterized by mature and young coniferous woodland. There are a couple of intact forest pockets that have been unaffected by development, but most of the area has a rural influence.

2.3.1 Coniferous Woodland

Coniferous woodland communities that occur within Westshore include the following ecosystem codes as outlined in Table 2: DP, DS and SP. Tree cover is generally dominated by interior Douglas-fir (*Pseudotsuga menziesii* var. *glauca*), and to a lesser amount ponderosa pine (*Pinus ponderosa*).



The understories are generally well-developed with a diverse mix of shrubs and herbaceous vegetation. Typical shrubs associated with these woodland ecosystems in drier, warmer aspect areas include common juniper (*Juniperus communis*), snowbrush (*Ceanothus velutinus*), mock orange (*Philadelphus lewisii*), soopolallie (*Shepherdia canadensis*), spreading dogbane (*Apocynum androsaemifolium*), oceanspray (*Holodiscus discolor*), and kinnikinnick (*Arctostaphylos uva-ursi*). In cooler, more



moist areas dominant shrubs include birch-leaved spirea (*Spiraea betulifolia*), Nootka rose (*Rosa nutkana*) Douglas maple (*Acer glabrum*), mountain alder (*Alnus incana*), Pacific willow (*Salix lucida*), and red raspberry (*Rubus idaeus*). Common woodland grasses and herbs include pinegrass (*Calamagrostis rubescens*), fescues (*Festuca* sp.), bluebunch wheatgrass (*Pseudoroegneria spicata*), arrowleaf balsamroot (*Balsamorhiza sagittata*), round-leaved alumroot (*Heuchera cylindrical*), aster (*Aster* sp.), daisy (*Erigeron* sp.), hawkweed (*Hieracium* sp.), wild strawberry (*Fragaria virginiana*), pussytoes (*Antennaria* sp.), rockcress (*Arabis* sp.), tarragon (*Artemisia dracunculus*), and woodsia fern (*Woodsia oregana*).

2.4 Aquatic Ecosystems

None of the ecosystems identified within the TEM data are associated with aquatic features. However there are aquatic ecosystems within or adjacent to Westshore including Okanagan Lake and an unnamed spring, both of which are discussed in the following sections.

2.4.1 Okanagan Lake

The southeastern corner of Westshore occurs adjacent to Okanagan Lake. The southern end of Foreshore Inventory and Mapping (FIM) Segment 180 extends along the Okanagan Lake shoreline where it intersects the Westshore study area. The FIM data described the segment as a gravel shore type with single family land use with medium levels (10-40%) of impact. The FIM data shows that approximately 80% of the segment remain in a natural state (Schleppe 2010), however the levels of impact are likely much higher. As an example, moorages across this segment occur at densities of about 46 per km (Schleppe 2010). This is much higher than the average moorage density for Okanagan Lake, and it is likely attributed to the segment occurring along Okanagan Indian Reserve #1, where moorage development is regulated differently.

The foreshore area has moderate slopes (5-20%) and the shore types were described as gravel with a wide littoral zone width (>50 m) (Schleppe 2010). Substrates were categorized as approximately 70% gravel, 20% cobble and 10% boulder. The riparian area has mature coniferous forest with sparse (<10%) shrub and moderate (10-50%) tree cover. The segment descriptions are generally consistent with the current state of the Okanagan Lake shoreline, other than the level of impact is higher than what is reported in the FIM.

Kokanee (*Oncorhynchus nerka*) are the fish species of primary concern with respect to shoreline development and aquatic habitat alteration along Okanagan Lake. A review of Kokanee shore spawning zones for Okanagan Lake (MFLNRO 2015) revealed that Westshore is located within a Kokanee No Colour Zone. The provincial No Colour Zone designation indicates that there has been no recent or historic observed kokanee shore spawning activity within this area (BC MoE 2009).



The Aquatic Habitat Index (AHI) current and potential ratings for the segment along Westshore are moderate and high (Schleppe 2010). The substrates adjacent to Westshore may provide suitable spawning, foraging and general living habitat for a number of fish species. Table 3 provides a list of native and non-native fish species documented to occur in Okanagan Lake.

Table 3. Species of fish found in Okanagan Lake (BC MFLNRO 2015)

Common Name	Scientific Name
Eastern Brook Trout	<i>Salvelinus fontinalis</i>
Burbot	<i>Lota lota</i>
Carp	<i>Cyprinus carpio</i>
Chiselmouth	<i>Acrocheilus alutaceus</i>
Cutthroat Trout	<i>Oncorhynchus clarki lewisi</i>
Kokanee	<i>Oncorhynchus nerka</i>
Lake Trout	<i>Salvelinus namaycush</i>
Lake Whitefish	<i>Coregonus clupeaformis</i>
Largescale Sucker	<i>Catostomus macrocheilus</i>
Leopard Dace	<i>Rhinichthys falcatus</i>
Longnose Dace	<i>Rhinichthys cataractae</i>
Longnose Sucker	<i>Catostomus catostomus</i>
Mountain Whitefish	<i>Prosopium williamsoni</i>
Northern Pikeminnow	<i>Ptychocheilus oregonensis</i>
Peamouth Chub	<i>Mylocheilus caurinus</i>
Prickly Sculpin	<i>Cottus asper</i>
Pumpkinseed	<i>Lepomis gibbosus</i>
Pygmy Whitefish	<i>Prosopium coulteri</i>
Rainbow Trout	<i>Oncorhynchus mykiss</i>
Redside Shiner	<i>Richardsonius balteatus</i>
Slimy Sculpin	<i>Cottus cognatus</i>
Yellow Perch	<i>Perca flavescens</i>

2.4.2 Unnamed Spring

An unnamed spring is located at the southeastern corner of Westshore and it maintains surface flow connection to Okanagan Lake. This aquatic feature was not previously documented during SHIM field surveys. It originates at the toe of slope approximately 40 m from Okanagan Lake. Surface flow is contained upslope of an access road, and then extends over a small walking path prior to connection with Okanagan Lake.



2.5 Rare and Endangered Plants

The British Columbia CDC was queried for potential occurrences of rare plants that may occur within Westshore. The search distribution was refined using the following criteria: Okanagan Ministry of Environment Region, Regional District of Central Okanagan, interior Douglas-fir Biogeoclimatic Zone, and anthropogenic, forest, lake, riparian and spring habitat types. The resulting list includes nine (9) potentially occurring rare vascular plant species (Table 4). The CDC does not list element occurrences of rare plants within the vicinity of Westshore, however they still may occur there.

Table 4. Summary of rare and endangered plants with the potential to occur within Westshore.		
Common Name	Scientific Name	Provincial Status ¹
blunt-sepaed starwort	<i>Stellaria obtusa</i>	Blue
cup clover	<i>Trifolium cyathiferum</i>	Red
false-pimpernel	<i>Lindernia dubia</i> var. <i>anagallidea</i>	Blue
giant helleborine	<i>Epipactis gigantea</i>	Blue
near navarretia	<i>Navarretia propinqua</i>	Red
obscure cryptantha	<i>Cryptantha ambigua</i>	Blue
peach-leaf willow	<i>Salix amygdaloides</i>	Red
red-rooted cyperus	<i>Cyperus erythrorhizos</i>	Red
Three-flowered waterwort	<i>Elatine rubella</i>	Blue

¹ Source: <http://www.env.gov.bc.ca/cdc/>

Blue: Of special concern. Red: Endangered or threatened.

2.6 Wildlife Species At Risk

Westshore contains an assemblage of woodland and riparian communities which provide cover and refuge for a range of wildlife. Mature trees and snags provide nesting, roosting, and foraging habitat for cavity nesting species such as Lewis's Woodpecker (Fenger *et al.* 2006). The CDC reports a record of occurrence of American Badger (#74373) that was last sighted in 2012 which overlaps the Westshore study area.

The potential for occurrences of species at risk were identified in the context of provincial and national ranking systems. The provincial ranking system applies to species that have been assessed by the CDC. The national ranking system applies to species that have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The CDC was queried for potential occurrences of at risk wildlife with the potential to occur within Westshore (Table 5). The search distribution was refined using the following criteria: Okanagan Ministry of Environment Region, Regional District of Central Okanagan, Interior Douglas-fir



Biogeoclimatic Zone, and anthropogenic, forest, lake, riparian and spring habitat types.

Table 5. Summary of species at risk with the potential to occur within Westshore.				
Species Group	Common Name	Scientific Name	Provincial Status ¹	COSEWIC Listing ²
Amphibians	Great Basin spadefoot*	<i>Spea intermontana</i>	Blue	Threatened
	western toad*	<i>Anaxyrus boreas</i>	Blue	Special Concern
Birds	American avocet	<i>Recurvirostra Americana</i>	Blue	-
	American bittern	<i>Botaurus lentiginosus</i>	Blue	-
	California Gull	<i>Larus californicus</i>	Blue	-
	canyon wren	<i>Catherpes mexicanus</i>	Blue	Not At Risk
	barn swallow	<i>Hirundo rustica</i>	Blue	Threatened
	black swift	<i>Cypseloides niger</i>	Blue	Endangered
	burrowing owl	<i>Athene cunicularia</i>	Red	Endangered
	eared grebe	<i>Podiceps nigricollis</i>	Blue	-
	flamulated owl*	<i>Otus flammeolus</i>	Blue	Special Concern
	great blue heron	<i>Ardea herodias herodias</i>	Blue	-
	horned lark	<i>Eremophila alpestris merrilli</i>	Blue	Special Concern
	Lewis's woodpecker*	<i>Melanerpes lewis</i>	Blue	Threatened
	olive-sided flycatcher	<i>Contopus cooperi</i>	Blue	Threatened
	short-eared owl	<i>Asio flammeus</i>	Blue	Special Concern
	Swainson's hawk	<i>Buteo swainsoni</i>	Red	-
	western screech-owl	<i>Megascops kennicottii macfarlanei</i>	Red	Threatened
	white-throated swift	<i>Aeronautes saxatalis</i>	Blue	Special Concern
	yellow-breasted chat	<i>Icteria virens</i>	Red	Endangered
Invertebrates	Abbreviate pondsnail	<i>Stagnicola apicina</i>	Blue	-
	alkali bluet	<i>Enallagma clausum</i>	Blue	-
	black gloss	<i>Zonitoides nitidus</i>	Blue	-
	common sootywing	<i>Pholisora catullus</i>	Blue	-
	Emma's dancer	<i>Argia emma</i>	Blue	-
	Lance-tipped darner	<i>Aeshna constricta</i>	Blue	-
	lilac-bordered copper	<i>Lycaena nivalis</i>	Blue	-
	magnum mantleslug	<i>Magnipelta mycophaga</i>	Blue	Special Concern
	monarch	<i>Danaus plexippus</i>	Blue	Special Concern
	Nevada skipper	<i>Hesperia nevada</i>	Blue	-
	Olive clubtail	<i>Sylvilagus nuttallii</i>	Blue	Special Concern
	pale jumping-slug	<i>Hemphillia camelus</i>	Blue	-
	pronghorn clubtail	<i>Gomphus graslinellus</i>	Blue	-
	Rocky mountain ridged mussel	<i>Gonidea angulate</i>	Red	Endangered
	silky vallonina	<i>Vallonia cyclophorella</i>	Blue	-
	Sinuous snaketail	<i>Ophiogomphus occidentis</i>	Blue	-
	Twelve-spotted skimmer	<i>Libellula pulchella</i>	Blue	-
	Umbilicate sprite	<i>Promenetus umbilicatellus</i>	Blue	-
	vivid dancer	<i>Argia vivida</i>	Blue	Special Concern
	Western river cruiser	<i>Macromia magnifica</i>	Blue	-
Mammals	American badger*	<i>Taxidea taxus</i>	Red	Endangered
	Bighorn sheep*	<i>Ovis Canadensis</i>	Blue	-
	fisher	<i>Pekania pennant</i>	Blue	-
	fringed myotis	<i>Myotis thysanodes</i>	Blue	Data Deficient
	grizzly bear	<i>Ursus arctos</i>	Blue	Special Concern
	Northern bog lemming	<i>Synaptomys borealis artemisiae</i>	Blue	-



Species Group	Common Name	Scientific Name	Provincial Status ¹	COSEWIC Listing ²
	Nuttall's cottontail	<i>Sylvilagus nuttallii</i>	Blue	Special Concern
	Preble's shrew	<i>Sorex preblei</i>	Red	-
	spotted bat	<i>Euderma maculatum</i>	Blue	Special Concern
	Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	Blue	-
	western harvest mouse	<i>Reithrodontomys megalotis</i>	Blue	Special Concern
	western small-footed myotis	<i>Myotis ciliolabrum</i>	Blue	-
	white-tailed jackrabbit	<i>Lepus townsendii</i>	Blue	-
	wolverine	<i>Gulo gulo luscus</i>	Blue	Special Concern
Reptiles	Great Basin gopher snake	<i>Pituophis catenifer deserticola</i>	Blue	Threatened
	North American racer	<i>Coluber constrictor</i>	Blue	-
	painted turtle – intermountain- rocky Mountain population	<i>Chondestes grammacus</i>	Blue	-
	western rattlesnake	<i>Crotalus oreganus</i>	Blue	Threatened
	western skink	<i>Plestiodon skiltonianus</i>	Blue	Special Concern

¹ Source: <http://www.env.gov.bc.ca/cdc/>

Yellow: Not considered at risk. **Blue:** Of special concern. **Red:** Endangered or threatened.

² Source: <http://www.cosewic.gc.ca/>

Threatened: A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

Special Concern: A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Not at Risk: A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

Endangered: A wildlife species facing imminent extirpation or extinction.

Data Deficient : A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.

*Have a higher likelihood of occurring within Westshore

3.0 ENVIRONMENTAL IMPACT ASSESSMENT

The majority of Westshore has been subdivided into smaller residential lots, although many of them have yet to be developed. The coniferous woodland that occurs across the subdivision is either rare or of special concern, but the ecosystems have been downgraded in terms of environmental sensitivity, due to fragmentation and existing levels of anthropogenic disturbance in the form of roads and understory modification.

There are two pockets of steep slope, natural woodland which have not been intensely subdivided (Figure 2; polygons 2949 and 2943). Both sites are very steep with inward drainage and are not optimal for development. These areas act as important movement corridors and stepping stones for wildlife. The central polygon (2943) consists of young coniferous woodland with sporadic mature trees. The steep slopes form a significant gully feature that likely receives moisture year-around. The other pocket, which occurs along the western study area boundary, consists of mature coniferous forest. This pocket is unique in that it forms an inward draining bowl (i.e. there are steep slopes on all sides), and a well-developed assemblage of water birch has formed at the base of the bowl. Wildlife presence and movement through the study area is likely concentrated with the higher sensitivity polygons and within the undeveloped lots that occur throughout the subdivision.



Environmental effects documented within Westshore include the loss of mature coniferous woodland and hence wildlife movement corridors due to the expansion of road networks and increased development. These impacts at the subdivision level can seem insignificant, but when considered cumulatively across the Okanagan Valley, they become more tangible and problematic. It is expected that the desire to live and recreate in Westshore will increase with improved access through ongoing upgrades of Westside Road. As development expands, further loss of natural habitat is anticipated.




4.0 FINDINGS AND RECOMMENDATIONS

4.1 Environmentally Sensitive Areas

The Environmental Sensitivity Analysis (ESA) followed the methods outlined in Section 2.1.3. Figure 3 depicts the results of the ESA and Table 6 shows the breakdown of values by area (ha) and relative extents of coverage within Westshore. The ESA indicated that the majority of Westshore has a Moderate (93%) rating. A High rated polygon is located in the central portion of the study area and a Very High rated polygon is located along the western boundary of the subdivision. These areas represents intact mature and young coniferous woodland.



Table 6. Percent composition of ESAs that intersect the Westshore subdivision (128 ha).

ESA Value	ESA Area (ha)	Percent of Area (%)
 <p>Very High (ESA 1) mature coniferous woodland (inward draining water birch bowl)</p>	1.8	1
 <p>High (ESA 2) young coniferous woodland</p>	7.9	6
 <p>Moderate (ESA 3) woodland communities with rural/anthropogenic influence</p>	118.0	93
Low (ESA 4)	0	0



4.2 Recommended Changes to Development Permit Areas

The Aquatic Ecosystem DP areas were refined by only including field confirmed watercourses and broadleaf forest and riparian features that were mapped during the SHIM assessment. For the Westshore study area only one unnamed spring was confirmed, for this spring, a 1-m channel width was assumed and subsequently buffered (bank full width was not available). The areas within 30 m of the Okanagan Lake were also included to form the updated Aquatic Ecosystem DP area (Figure 5-0).

The Terrestrial DP areas were refined by incorporating Very High and High rated polygons from the ESA. Originally, terrestrial DP areas were developed using SEI data, but because there were classification errors within some of the polygons of interest, refined ESA values were used instead of SEI data. Figure 4 depicts the recommended changes to the Aquatic Ecosystem and Terrestrial DP areas.

Field review and verification reduced the extents of Aquatic Ecosystem DP areas, while resulting in an increase in Terrestrial DP areas. There are approximately 39 parcels that overlap with the two DP areas, compared with 45 parcels that overlapped previously.

4.3 Watercourse Setbacks and Policy

Figures 5-0 and 5-1 depict the watercourses present within Westshore. Riparian Area Regulation setbacks, as well as a Recommended Setback / No Build Area was determined for the unnamed spring and for Okanagan Lake.

It was not within the project scope to prescribe specific setbacks for individual lots. Instead a default setback was recommended. For the unnamed spring, a default setback of 15 m was recommended. The 15 m setback is consistent with the Rural Westside OCP, which has clearly established leavestrip areas for creeks and wetlands that are fish bearing or connected by surface flows to fish bearing watercourses, as no less than 15 m measured from bank full width (RDCO 2010).

The default setback for Okanagan Lake is 20 m, which is also consistent with the Rural Westside OCP for an Orange Zone. Both of these recommended setbacks are greater than the provincial RAR setbacks. Despite the blanket setbacks, it is acknowledged that for watercourses that are confined by a narrow channel or for seepages where there is no channel, the recommended setback can be excessive, especially if the setback results in sterilization of a lot. For this reason, the recommended setback can be reduced through a more detailed site specific assessment by a Qualified Environmental Professional (QEP). If there is desire to encroach, then a QEP will need to determine the most appropriate setback and provide justification for the possible relaxation.



4.4 Environmental Permitting for Future Development

This overview EA for Westshore is meant to streamline the environmental permitting requirements for future development within the subdivision. Figure 6 depicts a flow chart that outlines several permitting paths dependent on a) if the proposed development is located within or outside of Aquatic and Terrestrial DP areas, and b) whether the development encroaches into recommended setbacks or is located within High and Very High ESAs.



Figure 6. Implementation Plan for Future Development in Westshore.

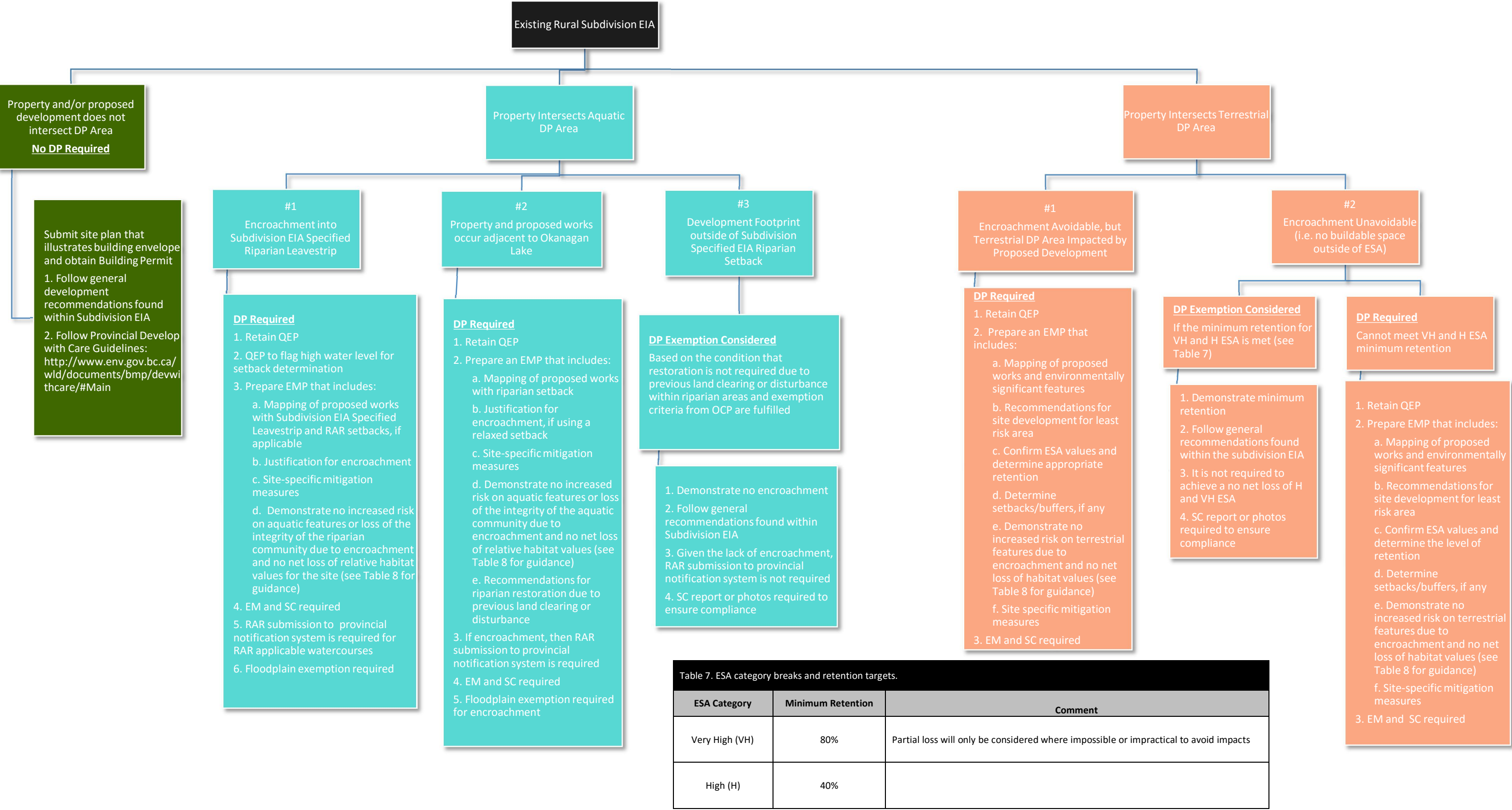


Table 7. ESA category breaks and retention targets.		
ESA Category	Minimum Retention	Comment
Very High (VH)	80%	Partial loss will only be considered where impossible or impractical to avoid impacts
High (H)	40%	

¹ DP – development permit; EIA – environmental impact assessment; EMP – environmental management plan; EM – Environmental Monitor; ESAs – environmentally sensitive areas; QEP – Qualified Environmental Professional; OCP – official community plan; SC – substantial completion report prepared by the EM/QEP that confirms the development extents and mitigation, effectively protected the integrity of the specified setback area and completion of proposed works were fulfilled as planned.

² RAR submission to the provincial notification system is required for all RAR applicable watercourses (those connected by surface flow to a fish bearing waterbody), when the proposed development encroaches into the Subdivision EIA specified riparian leavestrip. If the proposed development stays outside of the leavestrip, then a RAR upload is not required, even if the property occurs within 30 metres of a RAR applicable watercourse.

³The minimum retention of ESA catigories (Table 7), is only relevant to determine if a DP exemption may be considered. If the proponent seeks to develop an area that results in reduced area retention from the minimum range, then a QEP will assess the site at a finer spatial scale and determine the relative position that the site occupies in the ESA spectrum, to rationalize a reduced retention area. Areas of the highest value within each category will have greater overall area retention targets to help ensure that development planning takes the relative value into consideration and each polygon has a limit to development (refer to Table 8 for guidance to determine no net loss).

The guiding principles of Avoid, Mitigate, and Enhance apply to proposed development in environmentally sensitive areas (i.e. High and Very High ESAs and within the recommended riparian setbacks). The principles are generally described as follows.

1. **Avoid:** Development proposals should seek to avoid areas of High and Very High environmental sensitivity (ESA 1 and ESA 2).
2. **Mitigate:** If circumstances prevent avoidance of development within an environmentally sensitive area, proven mitigation measures must ensure the least possible amount of environmental damage during development.
3. **Enhance:** Habitat and ecosystem enhancement consists of improvements to the remaining natural or sensitive areas found on the property to ensure ecological integrity and function is maintained and/or improved. Enhancement should be site-specific and prescribed to increase the relative habitat value of the site. Examples of enhancement include large woody debris placement, invasive plant management, inclusion of bird boxes to increase cavity nesting opportunities, planting of native species within disturbed areas and an overall increase in structural heterogeneity and biodiversity potential.

Table 8 provides a relative habitat value rating for natural ecosystems and for anthropogenic features. It is provided as guidance for one way to objectively achieve a no net loss of habitat value or increased risk on aquatic and terrestrial features due to encroachment. When encroachment is proposed, the relative habitat value of a property could be determined before and after development. If the value is reduced due to encroachment, then enhancement of the remaining natural ecosystems should be undertaken to improve the environmental conditions on site and to achieve a no net loss in relative habitat value.



Table 8. Relative habitat value ratings for discreet vegetation types (communities) and anthropogenic features occurring in the RDCO Northwest Side.

Group	Qualifier	Comment	Relative Habitat Value
Wetland	1-3 veg forms	low structural heterogeneity	0.8
	4-6 veg forms	moderate structural heterogeneity	0.9
	≥7 veg forms	high structural heterogeneity	1
Treed Coniferous	Structural Stage 4	relatively eve-aged pole sapling	0.5
	Structural Stage 5	low relative structural heterogeneity	0.6
	Structural Stage 6	moderate relative structural heterogeneity	0.8
	Structural Stage 6-7	high relative structural heterogeneity	0.9
Tall Shrub	Natural	low flood, seepage areas, riparian thickets, etc.	0.7
Treed Riparian/Broadleaf	Natural	black cottonwood stands	1
Grassland	Natural		0.9
Building	Urban/Rural		0
Road	Urban/Rural	paved or gravel	0
Retaining Wall	Urban/Rural		0
Trail/Path	Rural	semi-pervious	0.1
Exposed Soil	Disturbed		0.1
Shoreline Armouring	Modified	e.g. rip rap	0.2
Turf	Urban/Rural	grass/herb lawns - mowed	0.1
Landscape - Shrub	Urban/Rural	non-native horticultural varieties/landscaping	0.2
Treed - Landscape	Urban/Rural	native understory strata generally absent and consisting of turf and landscaping	0.5
Beach	Disturbed	groomed recreational swimming beach	0.2
Pasture/Field	Agriculture		0.3
Row Crops	Agriculture		0.2
Orchard	Agriculture		0.4
Shoreline Armouring/Bioenginerring	Urban/Rural	rock with large woody debris	0.4

Relative Habitat Value considers biodiversity and production



4.5 Specific Recommendations by Watercourse




Table 9-1. Recommendations pertaining to Westshore watercourses: Okanagan Lake.	
Watercourse Name:	Okanagan Lake
Corresponding Figure Number:	5-0
RAR Applicable:	Yes
RAR Setback (metres), if applicable:	15
Recommended Setback / No Build Zone (metres):	20
Representative Photos:	 <p>Example of existing building along Okanagan Lake at Westshore.</p>
<p>Discussion, Recommendations and Specific Mitigation Measures:</p> <p>The very southwestern corner of the Westshore study area includes an Aquatic DP area associated with Okanagan Lake and an unnamed spring. Lands south of the Westshore boundary occur in RDCO and lands to the north occurs within Okanagan Indian Reserve #1 (see Figure 5-0). Lakefront properties south of the Westshore study area occur along an Orange shoreline sensitivity zone that is identified in the Rural Westside OCP (RDCO 2010). The leavestrip for orange zones is 20 m from the Okanagan Lake high water level. This setback is 5 m greater than the RAR setback, which is defined as 15 m due to large woody debris and litterfall (Figure 5-0). The RAR shade setback (30 m due south) is not applicable.</p> <p>The Orange shoreline sensitivity zone identified in the OCP was created in part based on the number of documented spawning kokanee and the kokanee zones developed for Okanagan Lake. Yellow kokanee zones, which are located approximately 550 m north of the Westshore study area, represent moderate to high value habitat that is required for the long term maintenance and recovery of kokanee. Yellow zones were identified as locations where spawning aggregations of 50 or fewer fish were observed in recent years (2001-2008) or where documented historic spawning activities with aggregations of less than 1000 fish were recorded.</p> <p>There is currently only one building along the shoreline within the Westshore study area; this building is located outside of the setbacks for Okanagan Lake, but is within the recommended 15 m setback from the unnamed spring (see Table 9.2). There are numerous properties to the north of the Westshore study area that substantially encroach, however, these properties are outside of RDCO jurisdiction. For future development along the lakefront at Westshore the specific regulations pertinent to lakefront properties within Section 4.6, Development Based Recommendations and Mitigation should be adhered to.</p>	



Table 9-2. Recommendations pertaining to Westshore watercourses: Unnamed Spring.

Watercourse Name:	Unnamed Spring
Corresponding Figure Number:	5-1
RAR Applicable:	Yes
RAR Setback (metres), if applicable:	10
Recommended Setback / No Build Zone (metres):	15
Representative Photos:	 <p>Unnamed Spring located in the southeastern corner of the study area.</p>  <p>Unnamed Spring upslope of the access road.</p>
<p>Discussion, Recommendations and Specific Mitigation Measures:</p> <p>An unnamed spring flows for about 50 m within the most southeastern corner of the study area and discharges to Okanagan Lake. The spring originates near the toe of slope and is confined upslope of a small access road that leads to lakefront properties within the Okanagan Indian Reserve #1. The spring was identified during fieldwork for this project and its location was delineated using a hand held GPS. Bank full width data was not available, therefore a 1 m channel width was used to generate setbacks. The RAR setback was determined to be 10 m due to large woody debris and litterfall. The RAR shade setback does not apply.</p> <p>The recommended default setback / no build zone for the unnamed spring is 15 m. This setback is consistent with the OCP for watercourses with a surface flow connection to a fish bearing watercourse. There is currently development within the setback, including the access road and the metal building shown in Table 9-1.</p>	

4.6 Development Based Recommendations and Mitigation

Mitigation measures and Best Management Practices (BMPs) to minimize environmental impacts that are often associated with residential development are summarized below.

4.6.1 General Mitigation Measures

- Prior to any disturbance, sensitive environmental features (watercourses / ESAs) should be clearly defined by a QEP and subsequently surveyed by a qualified land surveyor such that site plans incorporate these features designated for protection. Following the survey, the setback boundary and development footprint must be delineated prior to construction using brightly coloured snow fence.
- In the event that land and/or natural vegetation is disturbed or damaged beyond the limits of disturbance, these areas should be restored and/or replanted with plant material indigenous to the area under the direction of the EM.
- The release of fine sediments, construction debris or other substances deleterious to the terrestrial environment or to aquatic habitats (e.g., gasoline) must be prevented at all times during construction activities.
- Ensure that onsite machinery is in good operating condition, clean and free of leaks, excess oil, or grease.
- Spill containment kits appropriate for the number of machines onsite must be kept readily available in case of the accidental release of a deleterious substance to the environment. Any spills of a toxic substance of reportable quantities must be immediately reported to the Provincial Emergency Program 24 hour hotline at 1-800-663-3456. The spill kit must be appropriate for addressing spills of hydrocarbons in waterbodies.
- Wherever possible, trees with high wildlife value, such as veteran trees and large snags, should be conserved. Hazardous trees with wildlife value within the vicinity of the construction works should be assessed by a certified Wildlife/Danger Trees Assessor to determine levels of risk. Alternatives to falling wildlife trees may include topping or other modifications to improve safety while retaining habitat value.



- Existing native trees that occur within the riparian setbacks of identified watercourses or Okanagan Lake should be retained to maintain existing ecological values. Tree removal within a riparian setback, if deemed to be hazardous, will trigger the provincial tree replacement criteria, provided below.

Table 10. Tree replacement criteria

Trees to be removed	Replacement/Compensation tree requirements	
Diameter at Breast Height	Quantity	Size (min. height)
DBH < 151 mm	2	1.5 m (or 4 shrubs)
152 mm-304 mm	3	1.5 m
305 mm-456 mm	4	2.0 m
457 mm-609 mm	6	2.0 m
610 mm-914 mm	8	2.0 m
DBH > 914 mm	individual approval	individual criteria

Source: Department of Fisheries and Oceans Canada (2006)
Ministry of Environment Lands and Parks (1996)

- Prior to the removal or limbing of trees during the avian nesting season (April 1 – July 31), a nest survey to ensure there are no active nests must be undertaken by a QEP.
- If active nests are found within the clearing limits, a buffer will be established around the nest until such time that the environmental monitor can determine that the nest has become inactive. The size of the buffer will depend on the species and nature of the surrounding habitat. Buffer sizes will generally follow provincial BMP guidelines or other accepted protocols (e.g., Environment Canada). In general, a minimum 20 m buffer will be established around songbird nests or other non-sensitive (i.e., not at risk) species.

4.6.2 Invasive Plant Management

- Prevention of the spread of invasive plant species can be achieved by limiting disturbance to soils and native vegetation. Clearing limits should be conservative. All disturbed areas must be restored with native plantings or grass seeding. Grass seed must be Canada Agricultural Grade #1 to minimize weed seed counts. The grass seed mix used must be appropriate for the site conditions. Fodder species such as clover and alfalfa should not be included in the mixture.
- In accordance with the Regional Noxious Weed Control Bylaw (#179) weed infestations should be identified and controlled by property owners with regular manual removal of weeds (e.g., mowing, pulling). The use of pesticides/herbicides must be avoided when in proximity to watercourses.



4.6.3 Lake Front Properties

- No works can occur below the 343 m elevation of Okanagan Lake without having a Provincial Water Act Section 9 Notification/Approval application submitted, approved, and in the possession of the property owner and contractor prior to any instream works. Dredging or placement of fill below the lake high water level must not occur at any time.
- Fueling or vehicle maintenance must not occur within 30 m of the high water level of Okanagan Lake.
- No beach grooming, addition of sand, removal of cobbles/boulders, or removal of riparian vegetation should occur at any time.
- Demolition and construction materials must not be stored on the beach over native substrates to avoid compaction.

4.6.4 Erosion and Sediment Control

- Erosion and sediment control are particularly important when construction works occur adjacent to watercourses (e.g. Okanagan Lake, streams). Mitigation measures are generally based upon provincial BMPs and other specifications and include the following principles:
 - Construction works should be conducted during periods of low flow with little forecasted precipitation;
 - Works should be suspended during periods of heavy rain.
 - Natural drainage patterns should be maintained;
 - Existing native vegetation should be retained;
 - Stormwater and surface runoff should be directed away from exposed soils within the construction area;
 - Sediment-laden water should not be directed to any surface water feature, wetland, or other drainage system, including municipal storm sewer;
 - Slopes should be stabilized as soon as possible;
 - Other erosion and sediment control measures (described below) should be implemented, inspected, maintained, and/or replaced as required to provide appropriate mitigation.
- The Okanagan Lake shoreline adjacent to Westshore has the potential to support kokanee spawning. It is imperative that sediment laden water does not flow down slope into Okanagan Lake foreshore areas.
- Surface flows should be directed away from the construction site to avoid the degradation of water quality. If flows cannot be directed offsite and surface



waters become turbid from flowing over exposed soils, the sediment-laden waters should be conveyed to a sediment trap or sump located at a low point of the construction site, but outside any riparian setbacks. The trap or sump should be of sufficient capacity to collect waters and allow for infiltration and settling of fine materials prior to discharge.

- Other erosion control measures may include: slope drains and interceptor ditches, grass seeding, rock, mulch, and tarps. Sediment control measures that may be employed include check dams, erosion control fabrics and logs, sumps and sediment traps, and rip-rap. Hay bales and straw are not desirable mitigation measures based on the potential to disperse non-native and invasive plant seeds.
- Silt fence will be installed along the construction limits between the construction area and sensitive terrestrial or aquatic environments. The silt fence should mitigate the risks associated with surface runoff and sediment transport and provide a visual barrier delineating the disturbance boundary. Fencing will be staked into the ground and trenched a minimum of 10 cm to prevent flow underneath the fence, as per the manufacturer's specifications.
- Silt fencing will be monitored on a daily basis and any damages or areas where the integrity and function of the fencing has been compromised will be repaired or replaced immediately. Silt fence must remain in place until the completion of the project. Once construction is finalized, sediment and erosion control measures must be promptly removed and properly disposed. Other equivalent sediment and erosion control measures may include check dams (e.g., rock or sand bag) to slow flows along drainage channels and ditchlines, sumps, or other settling areas for turbid waters.
- The release of silt, sediment, sediment-laden water, or any other deleterious substances into any ditch, watercourse, or storm sewer system must be prevented at all times. The recommendations for sediment and erosion control outlined in the Land Development Guidelines for the Protection of Aquatic Habitat (Chilibeck *et al.* 1992) should be used for reference.
- Exposed soils along slopes must be stabilized and covered using coconut matting, geotextile fabric, poly sheeting, tarps, or other suitable materials to reduce the potential for erosion resulting from rainfall, snowmelt, seepage, or other unexpected causes.
- Excess materials, overburden, and other cut and fill materials should not be stockpiled or deposited over steep slopes, over areas of shallow soils and sparsely vegetated ecosystems, or within 30 m of a watercourse, except within designated fill placement areas or as directed by an environmental monitor. Excavated fill should be stockpiled on tarps in order to minimize impacts to the



riparian area. Stockpiles should be covered with poly sheeting or tarps or surrounded with silt fencing to prevent sediment from being conveyed down slope to watercourses, particularly during rain events. Material not required for backfill must be transported offsite and disposed of appropriately.

- Adjacent roadways to construction sites must be kept clean and free of fine materials. Sediment accumulation upon the road surfaces must be removed (i.e., swept or scraped) and disposed of appropriately.
- Sediments, debris, concrete, concrete fines, or wash water associated with pouring of the concrete must not come into contact with watercourses or be discharged within 30 m of a watercourse. Equipment and tools used for concrete works must be washed offsite away from any watercourses and the concrete cast must remain inside sealed formed structures until cured.
- Cuts and fills with site grading and disturbance with the development footprint must be minimized, in order to limit the exposure of groundwater.

4.6.5 Air Quality and Greenhouse Gas Reduction

Dust control can be achieved by reducing the spatial extents and amount of time that soils are exposed to construction activities. Reducing traffic speed and volume can also reduce dust concerns. Surface and air movement of smoke and dust during project activities can be mitigated through preventive measures and design criteria.

- Exposed soils should be watered as required to suppress dust. Sediment-laden runoff water must not be conveyed to adjacent drainages/watercourses. Oil and other petroleum products should not be used for dust suppression. Alternative dust suppressants must be approved by the EM prior to application.
- Idle time of construction equipment and contractor vehicles should be kept to a minimum to reduce the release of greenhouse gases. The contractor should inform and educate employees and sub-contractors on the importance of minimizing idling time and develop guidelines to direct the practice of reducing unnecessary idling.
- Alternate energy sources should be considered during development of the site, such as solar panels and ground source heating and cooling. Other options for greenhouse gas reducing features include rainwater recycling systems, landscaping with native species, and utilizing water efficient products.



4.6.6 Operational

- Pools and hot tubs must not be discharged into adjacent watercourses. Alternatively, pool water must be dechlorinated, prior to a slow release to a vegetated area in order to avoid the potential for surface runoff entering adjacent watercourses.
- Personal items (e.g. vehicles, equipment, etc.) should not be stored within the riparian setback.



4.7 Best Management Practices and Guidelines

A variety of BMPs and Guideline documents have been released by regulatory bodies that pertain to land development within British Columbia. Details found within these documents provide information that supplements what is presented here, and these documents should be consulted throughout future construction works. The following table provides a list of BMPs and guidelines, as well as their respective applicability to works that may be proposed in the future.

Table 11. Summary of BMPs and guidelines that are applicable to development in the Northwest Side of Okanagan Lake.		
BMP or Guideline	Target Species Group and/or Habitat Feature	Applicability
Rural Westside OCP (RDCO 2010)	Terrestrial and Aquatic DP areas	Overarching guideline for development in Westshore.
Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia. (BC MOE 2014a)	Regionally Sensitive Species Terrestrial Aquatic Riparian	This document is applicable because it comprises any form of land development.
Best Management Practices for Lakeshore Stabilization (BC MOE 2006b)	Aquatic Riparian	This BMP is applicable to some areas within Westshore that are on steep slopes adjacent to riparian features. In several cases, steep slopes are accompanied by seepage, which increases the risk of releasing sediment and non-point source pollution into Okanagan Lake.
Land Development Guidelines for the Protection of Aquatic Habitat (Chilibeck et al. 1992)	Aquatic	This BMP is highly applicable to lots adjacent to riparian features.
Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (BC MOE 2013)	Raptors	Terrestrial ecosystems comprised of mature coniferous and mixed woodlands make this BMP applicable.
Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia (BC MOE 2014b)	Amphibians and Reptiles	Ecosystems comprised of aquatic habitats, rocky outcrops and forested areas make this BMP applicable.
Best Management Practices for Hazard Tree and Non-Hazard Tree Limbing, Topping or Removal (BC MOE 2006c)	Terrestrial Aquatic	This BMP is applicable for tree removal.



4.8 Environmental Monitoring

An Environmental Monitor (EM) should be retained to monitor residential construction within DP areas in order to document compliance with best management practices, mitigation measures, and other recommendations and to provide guidance for implementation of operational best practices (e.g., erosion and sediment control) during construction. The EM will be an appropriately qualified environmental professional authorized to halt construction activities should an incident arise that is causing undue harm (unforeseen or from lack of due care) to terrestrial, aquatic or riparian ecosystems. In the event that greater disturbance occurs due to unforeseen circumstances, the EM will recommend further measures to protect/restore the natural integrity of the site. Typical monitoring schedules are provided below:

- A pre-construction meeting should be held between the EM and the contractor(s) undertaking the work to ensure a common understanding of the mitigation measures and best practices required for the project.
- Construction activities should be monitored on a monthly basis and more regularly during high risk activities (e.g. concrete pours, large material excavations) until the completion of the project.
- Regular monitoring reports will be submitted to the primary contractor, property owner, and relevant regulators. Once construction is complete a substantial completion site visit and report will be undertaken by the EM.



5.0 OTHER CONSIDERATIONS

The following are recommended measures that could be undertaken to better inform the Aquatic Ecosystem DP areas and to reduce overall development impacts.

- A SHIM survey of the unnamed spring should be undertaken, as SHIM data has yet to be collected for this watercourse.
- Most lots within Westshore have a moderate environmental sensitivity due to anthropogenic influence of adjacent roads and/or development. This includes previously developed lots and those that have yet to be developed. Undeveloped lots remain natural in character and consist of rare coniferous ecosystems. Development within moderate areas does not trigger a DP. Landowners should retain as much forest canopy as possible, and clear cutting of lots should be highly discouraged. By retaining trees, the rural form and character of the subdivision is preserved, smaller groupings of trees act as a stepping stones of remnant habitat for wildlife and the rare woodland ecosystems are not entirely lost within the subdivision.



6.0 CLOSURE

This report has been prepared for the RDCO and considers the existing site conditions of the Westshore neighbourhood area with respect to terrestrial and aquatic ecosystems and intrinsic ecological values. Ecoscape has prepared this report with the understanding that all available information on the past, present, and proposed conditions of the site have been disclosed. RDCO has acknowledged that in order for Ecoscape to properly provide the professional service, Ecoscape is relying upon full disclosure and accuracy of this information.

If you have any questions or comments, please contact the undersigned at your convenience.

Respectfully Submitted
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FIGURES



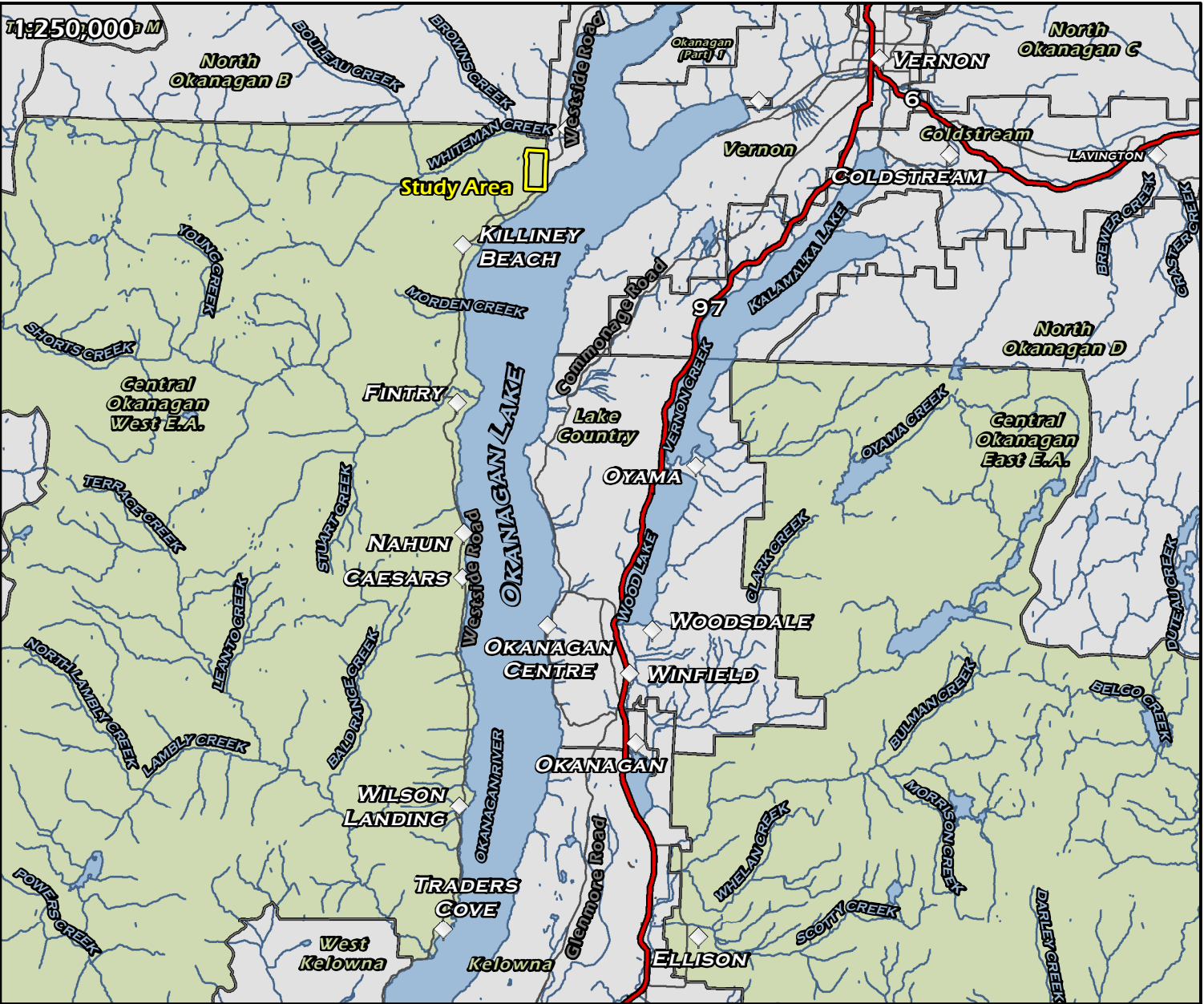


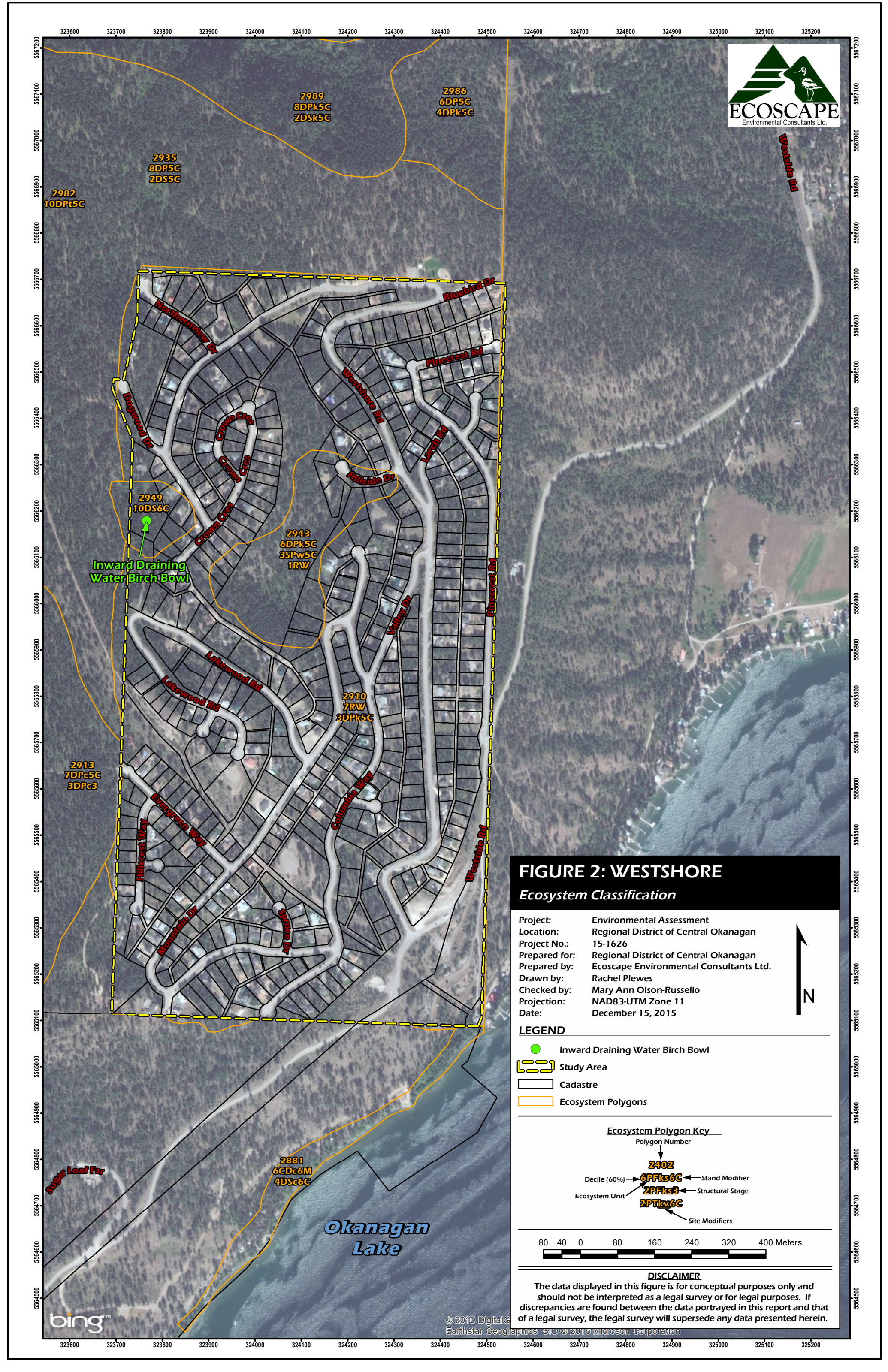
FIGURE 1: WESTSHORE
Site Location and Existing Aquatic with Terrestrial Development Permit Areas

Project: Environmental Assessment
Location: Regional District of Central Okanagan
Project No.: 15-1626
Prepared for: Regional District of Central Okanagan
Prepared by: Ecoscape Environmental Consultants Ltd.
Drawn by: Rachel Plewes
Checked by: Mary Ann Olson-Russello
Projection: NAD83-UTM Zone 11
Date: December 15, 2015



LEGEND

- | | | |
|--------------------|--|--------------|
| Study Area | Cadastre | SHIM Stream |
| Places | Regional District Central Okanagan | TRIM Streams |
| Major Highway | Lake | |
| Major Roads | Existing Aquatic Development Permit Area | |
| Municipal Boundary | Existing Terrestrial Development Permit Area | |



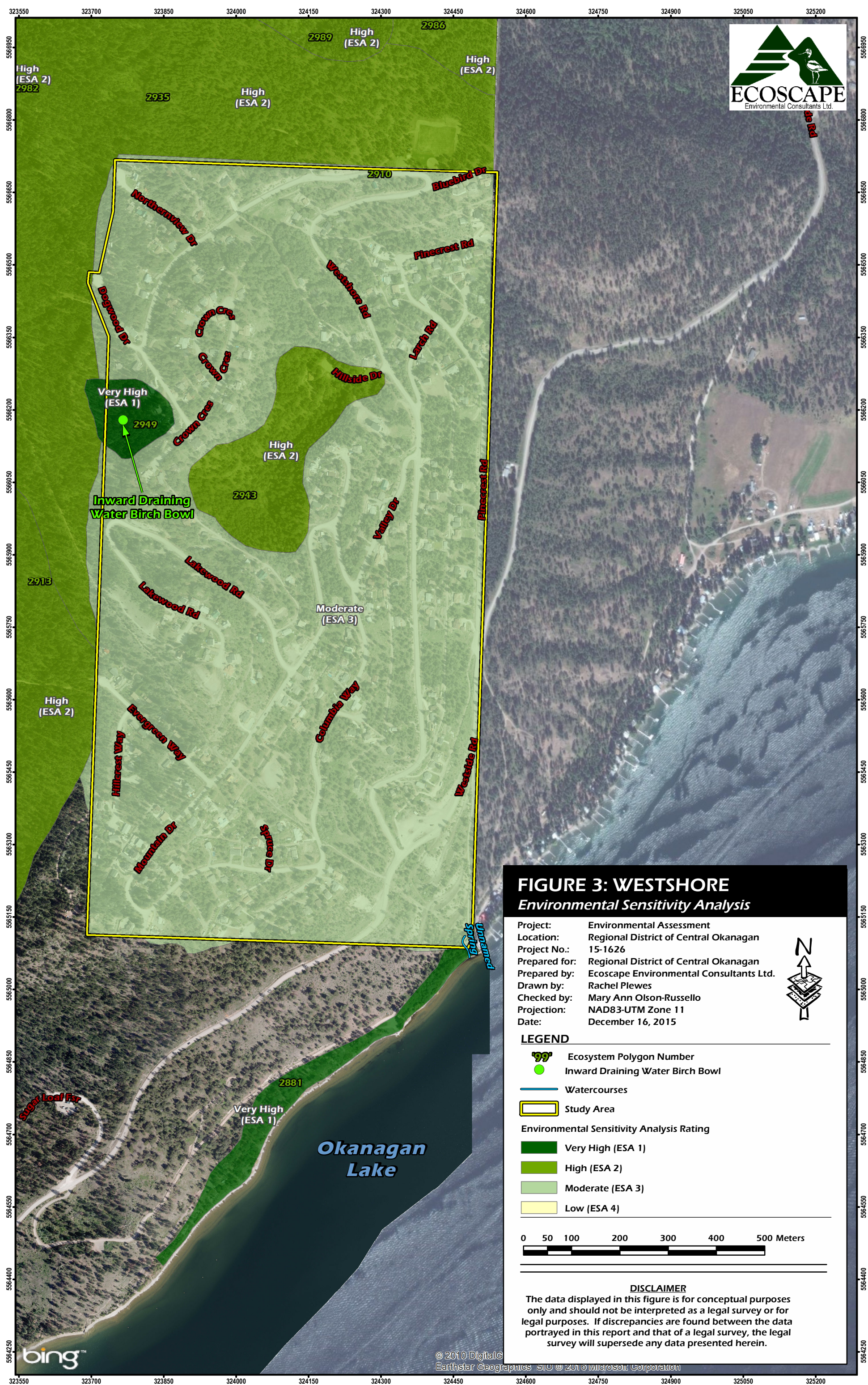




FIGURE 4: WESTSHORE
*Recommended Revisions to
Development Permit Areas*

Project:	Environmental Assessment
Location:	Regional District of Central Okanagan
Project No.:	15-1626
Prepared for:	Regional District of Central Okanagan
Prepared by:	Ecoscape Environmental Consultants Ltd.
Drawn by:	Rachel Plewes
Checked by:	Mary Ann Olson-Russello
Projection:	NAD83-UTM Zone 11
Date:	December 16, 2015



LEGEND

- Study Area
- Cadastre
- Aquatic Development Permit Area
- Terrestrial Development Permit Area
- Watercourses

80 40 0 80 160 240 320 400 Meters

DISCLAIMER
The data displayed in this figure is for conceptual purposes only and should not be interpreted as a legal survey or for legal purposes. If discrepancies are found between the data portrayed in this report and that of a legal survey, the legal survey will supersede any data presented herein.

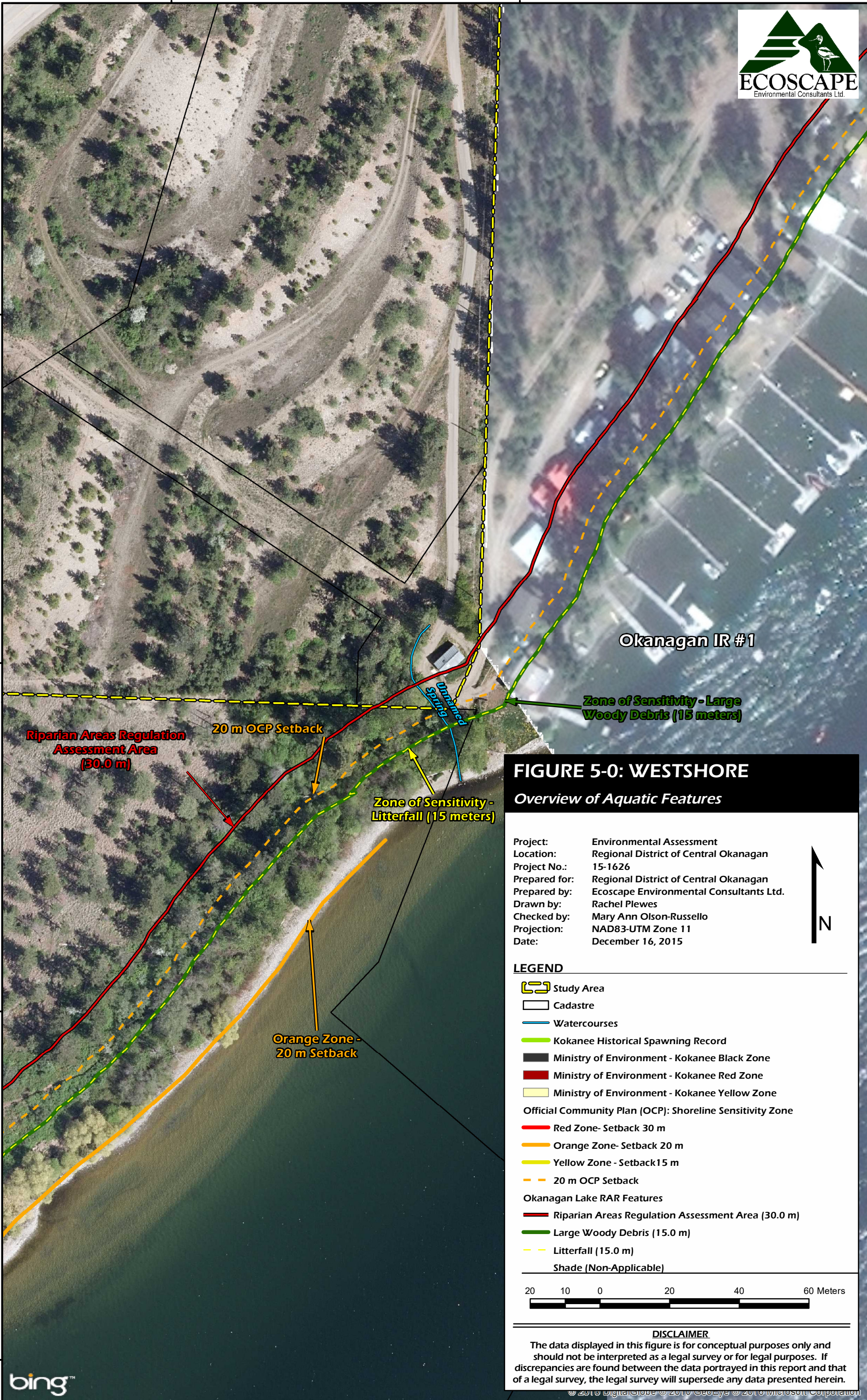


FIGURE 5-0: WESTSHORE
Overview of Aquatic Features

Project:	Environmental Assessment
Location:	Regional District of Central Okanagan
Project No.:	15-1626
Prepared for:	Regional District of Central Okanagan
Prepared by:	Ecoscape Environmental Consultants Ltd.
Drawn by:	Rachel Plewes
Checked by:	Mary Ann Olson-Russello
Projection:	NAD83-UTM Zone 11
Date:	December 16, 2015



LEGEND

	Study Area
	Cadastre
	Watercourses
	Kokanee Historical Spawning Record
	Ministry of Environment - Kokanee Black Zone
	Ministry of Environment - Kokanee Red Zone
	Ministry of Environment - Kokanee Yellow Zone
Official Community Plan (OCP): Shoreline Sensitivity Zone	
	Red Zone- Setback 30 m
	Orange Zone- Setback 20 m
	Yellow Zone - Setback 15 m
	20 m OCP Setback
Okanagan Lake RAR Features	
	Riparian Areas Regulation Assessment Area (30.0 m)
	Large Woody Debris (15.0 m)
	Litterfall (15.0 m)
	Shade (Non-Applicable)

20 10 0 20 40 60 Meters

DISCLAIMER
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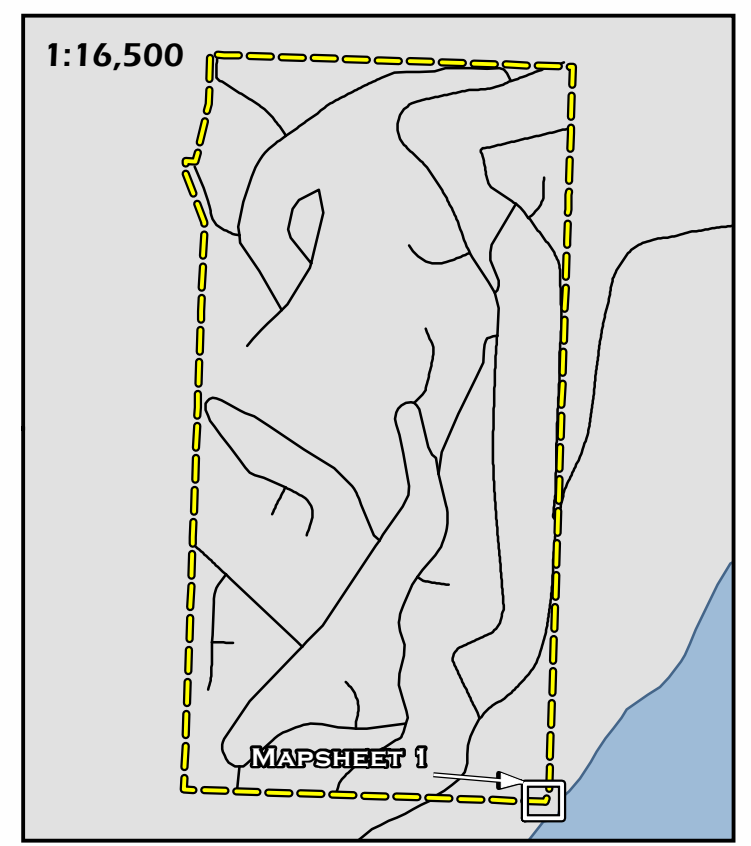
FIGURE 5-1: WESTSHORE
Aquatic Features and Riparian Setbacks

Mapsheet: 1

Watercourse: *Unnamed Spring*

LEGEND

- | | |
|---|------------|
| Stream Centerline | Mapsheets |
| Cadastre | Study Area |
| Recommended 15 m Setback/ No Build Area | Lake |
| Aquatic Development Permit | Roads |
| Terrestrial Development Permit | |
| RAR Features (if Applicable) | |
| Zone of Sensitivity - | |
| Zone of Sensitivity - Large Woody | |
| Zone of Sensitivity - | |
| Streamside Protection and Enhancement Area (SPEA) | |



1:400