ESTAMONT ENVIRONMENTAL ASSESSMENT

REGIONAL DISTRICT OF CENTRAL OKANAGAN
SUBDIVISION ENVIRONMENTAL ASSESSMENT SERVICES

Prepared For:

REGIONAL DISTRICT OF CENTRAL OKANAGAN
ATTN: Margaret Bakelaar, Environmental/Land Use Planner
1450 KLO Road
Kelowna, BC
V1W 3Z4

Prepared By:

ECOSCAPE ENVIRONMENTAL CONSULTANTS LTD.
#102 – 450 Neave Court
Kelowna, BC
V1V 2M2

January, 2016

Ecoscape File No: 15-1626

TABLE OF CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

Ecoscape Environmental Consultants Ltd. (Ecoscape) was retained by the Regional District of Central Okanagan (RDCO) to complete an overview environmental assessment of the Estamont Subdivision (Estamont). 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.

Estamont is located on the northwest side of Okanagan Lake approximately 40 km from downtown Kelowna (Figure 1). The subdivision (~26 ha) occurs east of Westside Road and has approximately 116 parcels. Historically, Estamont was primarily a seasonal use (i.e. summer) neighborhood. More recently there has been an increase in permanent year-around residents.

1.1 Background

Development within Estamont 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 out 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 also set out to establish policy around defining riparian leavestrips. 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 Estamont.

1.2 Project Objectives

RDCO planning staff have identified inefficiencies and challenges with the 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 Estamont environmental assessment. 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 16 and 17, 2015 and January 21, 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, then 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 once back at the office.

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 Estamont study area. Professional judgment was used to evaluate ecosystem polygons based on criteria including: provincial Conservation Data Centre (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)
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 that 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 contribute little or no value to the overall diversity of vegetation, soils, and terrain and wildlife characteristics of the area. These areas generally represent anthropogenic features/areas (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 (MoE 2006). 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 springs/seeps/1st order channels). For Okanagan Lake, the setbacks were generated off of the approximate high water level (343 m contour).

- Okanagan Lake setbacks were specified in the Rural Westside OCP (RDCO 2010) and were based on relative habitat use by kokanee ranging from 10 – 30 m.

2.2 Ecosystem Classification

Estamont 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 Estamont represent distinct habitat types based on vegetation cover and by adapting the nomenclature and site series used by TEM. There are 15 polygons representing ten (10) distinct ecosystems that intersect the Estamont study area. 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 Estamont study area.

Ecosystem Code	Site Series	Site Series Name	Provincial Status[1]
CD	00	Black cottonwood/Douglas-fir - Snowberry - Red-osier dogwood	Red
CF	-	Cultivated Field	-
DP	01	Douglas-fir/Ponderosa pine - Pinegrass	Blue
DS	07	Douglas-fir/Ponderosa pine - Snowberry - Spirea	Red
DW	03	Douglas-fir - Ponderosa pine – Bluebunch wheatgrass – Pinegrass	Blue
RS	00	Western red cedar – Douglas-fir – False Solomon's Seal	Red
RW	-	Rural	-
RZ	-	Road Surface	-
SD	08	Hybrid white spruce – Douglas-fir – Douglas maple – Dogwood	Red
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.

Estamont contains several Red and Blue listed communities, highlighting the rare ecosystems that characterize the area. The listed communities are associated with coniferous and broadleaf woodland.

2.3 Terrestrial Community Types

The Estamont area is generally characterized by an expanse of mature and young coniferous forest with pockets of broadleaf woodland that occur intermittently along Okanagan Lake.

2.3.1 Coniferous Woodland

Coniferous woodland communities that extend across Estamont include the following ecosystem codes as outlined in Table 2: DP, DS, DW, RS, SD 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, wetter areas dominant shrubs include birch-leaved spirea (*Spiraea betulifolia*), Nootka rose (*Rosa nutkana*) Douglas maple (*Acer glabrum*), mountain alder (*Alnus in*cana), Pacific willow (*Salix lucida*), and red raspberry (*Rubus idaeus*). Common woodland 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*).

The RS community (Table 2) is unique compared with the other coniferous ecosystems. It occurs along the lower reaches of the Morden Creek corridor. It has a dense tree canopy of Western redcedar (*Thuja plicata*) and a sparsely developed shrub and herbaceous understory.

2.4 Aquatic Ecosystems

2.4.1 Okanagan Lake

Broadleaf woodland (Table 2: CD) can be found in areas with abundant water either from seepages, shallow ground water or surface water. The CD community is found along the foreshore of Okanagan Lake. It is a minor community due to the rural influence of residential lots along the Okanagan Lake foreshore. Historically these polygons would have been almost entirely cottonwood riparian.

This ecosystem is dominated by aquatic and hydrophilic vegetation that is adapted to saturated soils and periodic inundation. Tree cover in these areas typically includes black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) with occasional water birch and western redcedar. Riparian shrubs include red-osier dogwood (*Cornus stolonifera*) and willow (*Salix* spp.).

Estamont occurs along Okanagan Lake Foreshore Inventory and Mapping (FIM) Segments 185 and 186, which were described as gravel shore types with single family land use with high levels (>40%) of impact. Only approximately 15 to 20% of the segments remain in a natural state (Schleppe 2010). The area has steep slopes (20-60%) and the shore types were described as gravel with a moderate littoral zone width (10-50 m) (Schleppe 2010). Substrates were described as approximately 70% gravel, 20% cobble and 10% boulder (pictured). The riparian area has mature coniferous forest with moderate (10-50%) shrub and abundant (>50%) tree cover.

Moorages along the two FIM segments occur at densities of approximately 31 per km (Schleppe 2010). These segment descriptions are generally consistent with the current state of Estamont.

Kokanee (*Oncorhynchus nerka*) are the fish species of primary concern with respect to shoreline development and aquatic habitat alteration along Okanagan Lake, and the substrates along the Estamont shoreline include angular cobble that are preferred by shore spawning kokanee. A review of kokanee shore spawning zones for Okanagan Lake, revealed that Estamont is located within a kokanee Yellow zone. Approximately 70% of the Estamont shoreline is designated a Yellow zone. The provincial Yellow zone designation represents moderate to high value habitat that is required for the long term maintenance and recovery of kokanee (BC MoE 2009). 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.

The Aquatic Habitat Index (AHI) current and potential ratings for segments along Estamont are Moderate and High (Schleppe 2010). In addition to providing Kokanee shore spawning habitat, substrates adjacent to Estamont provide suitable spawning, foraging and general living habitat for a number of other 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	*Salvelinus fontinalis*
Burbot	*Lota lota*
Carp	*Cyprinus carpio*
Chiselmouth	*Acrocheilus alutaceus*
Cutthroat Trout	*Oncorhynchus clarki lewisi*
Kokanee	*Oncorhynchus nerka*
Lake Trout	*Salvelinus namaycush*
Lake Whitefish	*Coregonus clupeaformis*
Largescale Sucker	*Catostomus macrocheilus*
Leopard Dace	*Rhinichthys falcatus*
Longnose Dace	*Rhinichthys cataractae*
Longnose Sucker	*Catostomus catostomus*
Mountain Whitefish	*Prosopium williamsoni*
Northern Pikeminnow	*Ptychocheilus oregonensis*
Peamouth Chub	*Mylocheilus caurinus*
Prickly Sculpin	*Cottus asper*
Pumpkinseed	*Lepomis gibbosus*
Pygmy Whitefish	*Prosopium coulteri*
Rainbow Trout	*Oncorhynchus mykiss*
Redside Shiner	*Richardsonius balteatus*
Slimy Sculpin	*Cottus cognatus*
Yellow Perch	*Perca flavescens*

2.4.2 Urban Residential Springs and Creeks

Springs and creeks including Berry, Buchanan, Ewing Creek 2, Ewing Creek 3 and Morden Creek occur within the Estamont study area. Much of the lower bench along Nerie Road just upslope of Okanagan Lake is wet with shallow ground water and seepages. The documented watercourses range from natural drainages with well-developed channels and established riparian vegetation (i.e Morden Creek) to highly modified features (i.e. Buchanan, Ewing Creek 2), that have been ditched or piped between residential structures and roads. Some of the seepages and springs support pockets of cattail (*Typha latifolia*), but are confined to roadside ditches.

2.5 Rare and Endangered Plants

The CDC was queried for potential occurrences of rare plants that may occur within Estamont. 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 agriculture, forest, anthropogenic, lakes, riparian, springs and stream/river habitat types. The resulting list includes nine (9) potentially occurring rare plant species (Table 4). The CDC does not list element occurrences of rare plants within the vicinity of Estamont, however they still may occur there.

Table 4. Summary of rare and endangered plants with the potential to occur within Estamont.

Common Name	Scientific Name	Provincial Status[1]
blunt-sepaled starwort	*Stellaria obtusa*	Blue
cup clover	*Trifolium cyathiferum*	Red
false-pimpernel	*Lindernia dubia var. anagallidea*	Blue
giant helleborine	*Epipactis gigantea*	Blue
near navarretia	*Navarretia propinqua*	Red
obscure cryptantha	*Cryptantha ambigua*	Blue
peach-leaf willow	*Salix amygdaloides*	Red
red-rooted cyperus	*Cyperus erythrorhizos*	Red
three-flowered waterwort	*Elatine rubella*	Blue

1 Source: http://www.env.gov.bc.ca/cdc/
Blue: Of special concern. **Red:** Endangered or threatened.

2.6 Wildlife Species At Risk

Estamont 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 and Western Screech-owl (Fenger *et al.* 2006). As of December 2015, the CDC reports no occurrences of rare species that overlap the Estamont study area, however they could still occur.

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 Estamont (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 agriculture, forest, anthropogenic, lakes, riparian, springs and stream/river habitat types.

Table 5. Summary of species at risk with the potential to occur within Estamont.

Species Group	Common Name	Scientific Name	Provincial Status[1]	COSEWIC Listing[2]
Amphibians	Great Basin spadefoot*	*Spea intermontana*	Blue	Threatened
	western toad*	*Anaxyrus boreas*	Blue	Special Concern
Birds	American avocet	*Recurvirostra Americana*	Blue	-
	American bittern	*Botaurus lentiginosus*	Blue	-
	barn swallow*	*Hirundo rustica*	Blue	Threatened
	black swift	*Cypseloides niger*	Blue	Endangered
	burrowing owl	*Athene cunicularia*	Red	Endangered
	California Gull	*Larus californicus*	Blue	-
	canyon wren	*Catherpes mexicanus*	Blue	Not At Risk
	Eared grebe	*Podiceps nigricollis*	Blue	-
	flammulated owl*	*Otus flammeolus*	Blue	Special Concern
	great blue heron	*Ardea herodias herodias*	Blue	-
	horned lark	*Eremophila alpestris merrilli*	Blue	Special Concern
	lark sparrow	*Chondestes grammacus*	Blue	-
	Lewis's woodpecker*	*Melanerpes lewis*	Blue	Threatened
	olive-sided flycatcher	*Contopus cooperi*	Blue	Threatened
	short-eared owl	*Asio flammeus*	Blue	Special Concern
	Swainson's hawk	*Buteo swainsoni*	Red	-
	western screech-owl	*Megascops kennicottii macfarlanei*	Red	Threatened
	white-throated swift	*Aeronautes saxatalis*	Blue	Special Concern
	yellow-breasted chat	*Icteria virens*	Red	Endangered
Invertebrates	Abbreviate pondsnail	*Stagnicola apicina*	Blue	-
	alkali bluet	*Enallagma clausum*	Blue	-
	black gloss	*Zonitoides nitidus*	Blue	-
	common sootywing	*Pholisora catullus*	Blue	-
	Emma's dancer	*Argia emma*	Blue	-
	Lance-tipped darner	*Aeshna constricta*	Blue	-

Species Group	Common Name	Scientific Name	Provincial Status[1]	COSEWIC Listing[2]
	lilac-bordered copper	*Lycaena nivalis*	Blue	-
	magnum mantleslug	*Magnipelta mycophaga*	Blue	Special Concern
	monarch	*Danaus plexippus*	Blue	Special Concern
	Nevada skipper	*Hesperia nevada*	Blue	-
	Olive clubtail	*Sylvilagus nuttallii*	Blue	Special Concern
	pale jumping-slug	*Hemphillia camelus*	Blue	-
	pronghorn clubtail	*Gomphus graslinellus*	Blue	-
	Rocky mountain ridged mussel	*Gonidea angulate*	Red	Endangered
	silky vallonia	*Vallonia cyclophorella*	Blue	-
	Sinuous snaketail	*Ophiogomphus occidentis*	Blue	-
	Twelve-spotted skimmer	*Libellula pulchella*	Blue	-
	Umbilicate sprite	*Promenetus umbilicatellus*	Blue	-
	vivid dancer	*Argia vivida*	Blue	Special Concern
	Western river cruiser	*Macromia magnifica*	Blue	-
Mammals	American badger	*Taxidea taxus*	Red	Endangered
	Bighorn sheep*	*Ovis Canadensis*	Blue	-
	Fisher*	*Pekania pennant*	Blue	-
	fringed myotis	*Myotis thysanodes*	Blue	Data Deficient
	grizzly bear	*Ursus arctos*	Blue	Special Concern
	Northern bog lemming	*Synaptomys borealis artemisiae*	Blue	-
	Nuttall's cottontail	*Sylvilagus nuttallii*	Blue	Special Concern
	Preble's shrew	*Sorex preblei*	Red	-
	spotted bat	*Euderma maculatum*	Blue	Special Concern
	Townsend's big-eared bat	*Corynorhinus townsendii*	Blue	-
	western harvest mouse	*Reithrodontomys megalotis*	Blue	Special Concern
	western small-footed myotis	*Myotis ciliolabrum*	Blue	-
	white-tailed jackrabbit	*Lepus townsendii*	Blue	-
	wolverine	*Gulo gulo luscus*	Blue	Special Concern
Reptiles	Great Basin gopher snake*	*Pituophis catenifer deserticola*	Blue	Threatened
	painted turtle – intermountain- rocky Mountain population	*Chondestes grammacus*	Blue	-
	western rattlesnake	*Crotalus oreganus*	Blue	Threatened
	western skink	*Plestiodon skiltonianus*	Blue	Special Concern
	western yellow-bellied racer	*Coluber constrictor mormon*	Blue	Threatened

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 Estamont**

3.0 ENVIRONMENTAL IMPACT ASSESSMENT

The Estamont subdivision is highly developed, especially along the foreshore of Okanagan Lake. There are some undeveloped lots in the western portion of the subdivision with intact tree canopies and little to no understory disturbance, but generally the subdivision has substantial anthropogenic influence. A single linear TEM polygon (#2760; Figure 2), with Red and Blue listed coniferous woodland was noted as remaining natural in character. It is a sizable polygon that is ecologically functional and provides valuable wildlife habitat for a variety of native species, including those that are rare and endangered.

East/west wildlife movement to and from Okanagan Lake is probable along natural riparian corridors such as Morden Creek. Although a variety of wildlife will also be attracted to other springs and creeks, despite anthropogenic presence.

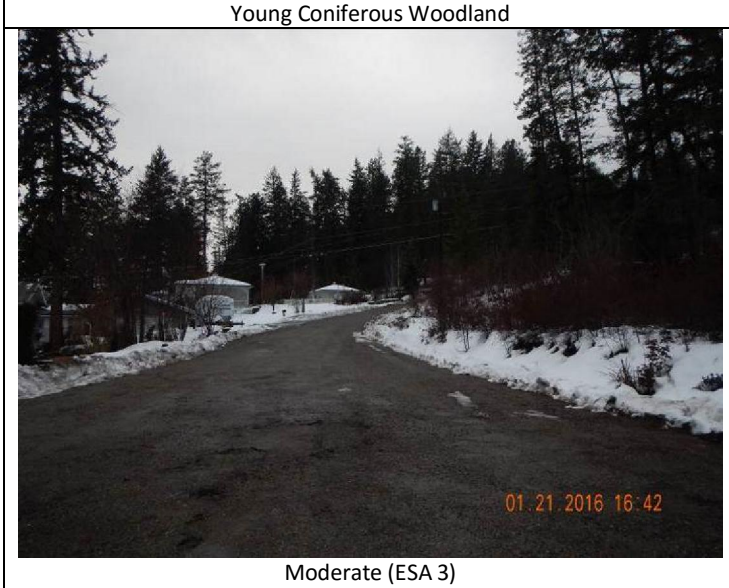
Environmental effects documented within Estamont include incremental loss of riparian vegetation and habitats especially along Okanagan Lake, the modification of watercourses in the form of re-routing, culverting and piping, the loss of wildlife movement corridors due to the expansion of road networks and increased development, an increased presence of non-native plants and the loss of mature coniferous forest that is critical for the survival of some rare and endangered species.

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 Estamont will increase with improved access through ongoing upgrades of Westside Road. As development expands, further loss of natural habitat is anticipated. Recreational pressures on the lakefront of Okanagan Lake will also increase, especially with the upscaling of residences and gentrification of summer homes.

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 the Estamont study area. The ESA indicated that the majority of Estamont has a Moderate (79%) ratings. A single High rated polygons is located within the southern half of the subdivision. This area represents contiguous, intact young coniferous woodland. Polygons with Very High ratings are located to the west and north of the study area.

Table 6. Percent composition of ESAs and representative photos within Estamont (26 ha).		
ESA Value	**ESA Area (ha)**	**Percent of Area (%)**
Very High (ESA 1) Mature Mixed Woodland	0.1	0
 High (ESA 2) Young Coniferous Woodland	5.3	21
 Moderate (ESA 3) Anthropogenic Influence	20.6	79
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. The bank full width of each confirmed watercourse was buffered by 30 m to form the edge of the Aquatic Ecosystem DP areas. In cases where bank full width data was not available, a 1-m channel width was assumed and subsequently buffered. The mapped extent of broadleaf forest (Figure 5-0), and areas within 30 m of the Okanagan Lake were also included to form the updated Aquatic Ecosystem DP area.

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 for respective polygons instead of SEI data. In cases where there was overlap between Aquatic and Terrestrial DP areas, Aquatic Ecosystem superseded that of Terrestrial. In some cases this resulted in small fragments of overhanging Terrestrial DP areas. Professional judgement was used to eliminate non-essential DP areas. Figure 4 depicts the recommended changes to the Aquatic Ecosystem and Terrestrial DP areas.

Field review and verification reduced the extents of the Aquatic Ecosystem and Terrestrial DP areas. There are 83 parcels that overlap with the two DP areas, compared to 112 parcels that overlapped previously.

4.3 Watercourse Setbacks and Policy

Figures 5-0 through 5-5 depict the watercourses that are present within Estamont, as well as pertinent riparian setbacks. Riparian Area Regulation setbacks were determined for all watercourses that are applicable under RAR and Recommended Setbacks / No Build Areas are shown for all identified watercourses.

It was not within the project scope to prescribe specific setbacks for all individual lots. Instead a 15 m setback was recommended for all watercourses. This blanket setback was chosen for two reasons. First, the fieldwork confirmed that a smaller setback of less than 15 m was not sufficient for all properties. Second, 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).

Despite the 15 m blanket setback, its acknowledged that for watercourses that are confined by a narrow channel or for seepages where there is no channel, a 15 m setback can be excessive, especially if the setback results in sterilization of the lot. For this reason, the 15 m setback can be reduced through a more detailed 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 Estamont 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 Estamont.

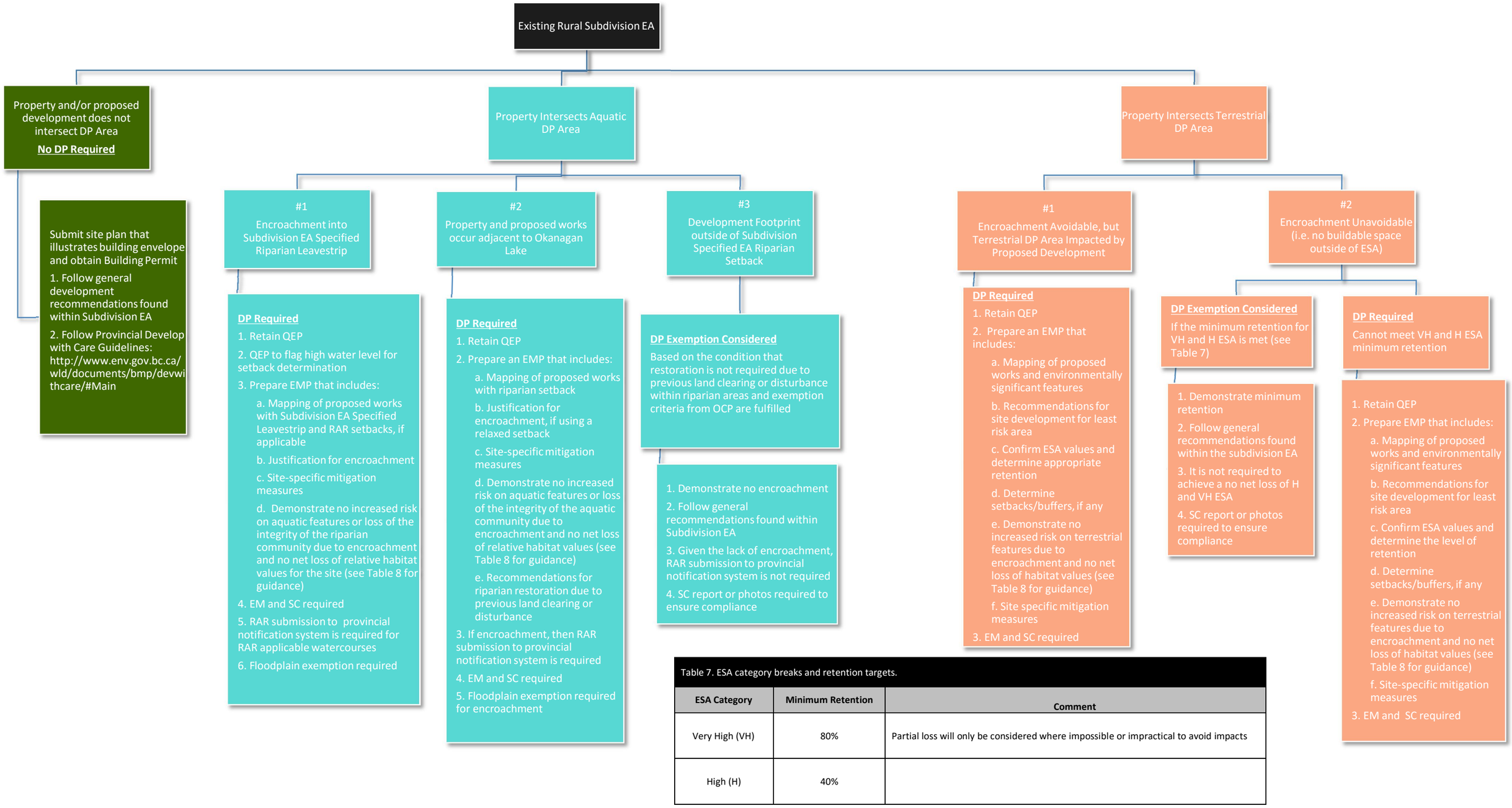


Table 7. ESA category breaks and retention targets.

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; EA – environmental 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 EA 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. RDCO will not issue a DP until the RAR assessment has been accepted by the Province.

[3].The 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 Estamont 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):	15
Representative Photos:	 Highly developed shoreline of Okanagan Lake adjacent to Estamont  Remnant moorage structure

Private concrete boat launch

Discussion, Recommendations and Specific Mitigation Measures:

Lakefront properties within Estamont occur along a Yellow shoreline sensitivity zone that is identified in the Rural Westside OCP (RDCO 2010). The leavestrip for yellow zones is 15 m from the Okanagan Lake high water level. This setback is consistent with RAR, as large woody debris and litterfall apply to all Estamont lakefront properties (Figure 5-0). The RAR shade setback (30 m due south) is not applicable.

The Yellow 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 along the Estamont shoreline, 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. Historic kokanee spawning numbers are shown along Estamont in Figure 5-0.

The riparian setbacks, 15 m as defined by the OCP and RAR, are consistent along the entire Estamont lakefront. Despite the defined setbacks, there are numerous recreational and residential structures that substantially encroach. Most of these structures are likely grandfathered, but the precedent for constructing homes close to the Okanagan Lake high water level has been set. Many environmental infractions were also noted and include: placement of concrete below the high water level, beach grooming and importation of sand, nonconforming dock structures and patios, constructed groins and riparian vegetation removal.

Estamont Lakefront residents would benefit from a stewardship program that details Best Practices for waterfront living. Specific regulations pertinent to lakefront properties are included within the Development Based Recommendations and Mitigation Section 4.5.

Table 9-2. Recommendations pertaining to Estamont watercourses: Berry Spring.	
Watercourse Name:	Berry Spring
Corresponding Figure Number:	5-1
RAR Applicable:	No
RAR Setback (metres), if applicable:	-
Recommended Setback / No Build Zone (metres):	15
Representative Photos:	
Discussion, Recommendations and Specific Mitigation Measures: Berry Spring is an ephemeral watercourse that has a defined 20 m channel with a bankfull width of 1.39 m (as determined during SHIM). It occurs within 8624 Westside Road, which is a rural developed property. A residence is located approximately 20 m to the southeast of the watercourse. A fairly extensive intact, mature broadleaf trembling aspen forest has established around the spring. At the time of the SHIM, there was evidence of water extraction in the form of a well. A blanket 15 m setback is shown for the spring (Figure 5-1), however maintaining the full extent of the broadleaf forest is preferred. Ideally, there will be no further encroachment into the defined aquatic DP area in this location.	

Table 9-3. Recommendations pertaining to Estamont watercourses: Buchanan Spring.	
Watercourse Name:	Buchanan Spring
Corresponding Figure Number:	5-2
RAR Applicable:	Yes
RAR Setback (metres), if applicable:	10
Recommended Setback / No Build Zone (metres):	15
Representative Photos:	 Buchanan Spring where it is piped into a roadside ditch along Nerie Road  Another location where Buchanan Spring flows into the ditch along Nerie Road

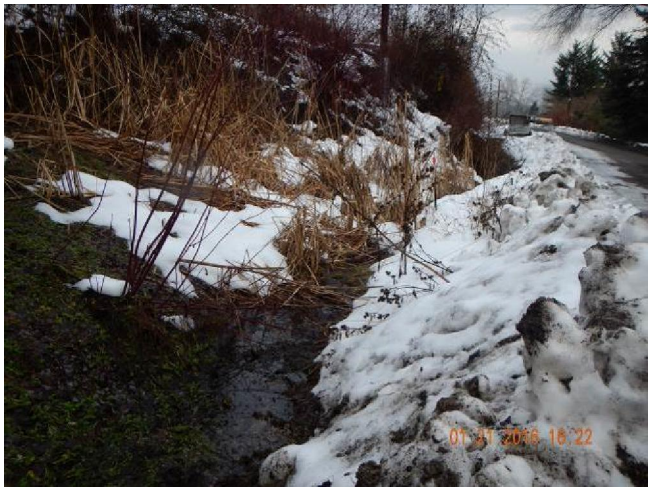
Buchanan Spring where it flows along Nerie Road

Discussion, Recommendations and Specific Mitigation Measures:

The Buchanan Spring watercourse alignment determined during SHIM is shown in Figure 5-2. It appears that modifications to the watercourse alignment may have occurred since the SHIM was undertaken. For example, it may be that flows from Buchanan Brook 1-1 have been piped beneath the upslope residence, and now discharges to the ditch along Nerie Road (photo 1 above).

The recommended 15 m setback is likely excessive for Buchanan Spring, but given that it is flowing through a well-developed portion of the subdivision, it is recommended that a QEP further investigate the exact alignment of the watercourse and determine appropriate setbacks for individual properties. Actual setbacks along this watercourse could range from 2-15 m, depending on if the water is ditched or flowing through a natural area.

Given the level of residential development and the overall modifications to Buchanan Spring, enhancement in the form of native vegetation plantings is recommended to mitigate impacts.

Table 9-4. Recommendations pertaining to Estamont watercourses: Ewing Creek 2.	
Watercourse Name:	Ewing Creek 2
Corresponding Figure Number:	5-3
RAR Applicable:	Yes
RAR Setback (metres), if applicable:	10
Recommended Setback / No Build Zone (metres):	15
Representative Photos:	 Ewing Creek 2 where it is ditched along Nerie Road  Ewing Creek 2 where it is piped at the end of Nerie Road

Ewing Creek 2 upslope of Okanagan Lake

Discussion, Recommendations and Specific Mitigation Measures:

Ewing Creek 2, also known as Lawrence Spring Creek is an ephemeral system that extends through a rural residential area and has been highly modified (i.e. ditched along Nerie Road). The watercourse is spring fed and the ground is largely saturated and unstable in areas surrounding the defined channel. SHIM identified a bankfull width as 1.6 m and noted a young broadleaf forest of Douglas maple and waterbirch surrounding the creek. During the field work for this project, it was noted that riparian vegetation has been cleared to the edge of channel in certain areas.

The creek location shown on Figure 5-3 is the alignment that was delineated during SHIM, but it was confirmed that modifications to the creek alignment have been made. For this reason, it is advisable that a QEP further investigate the watercourse location within individual properties and determine appropriate setbacks to suite the condition of the site. Actual setbacks along this watercourse could range from 2-15 m, depending on if the water is ditched or flowing through a natural area.

Table 9-5. Recommendations pertaining to Estamont watercourses: Ewing Creek 3.	
Watercourse Name:	Ewing Creek 3
Corresponding Figure Number:	5-4
RAR Applicable:	Yes
RAR Setback (metres), if applicable:	10
Recommended Setback / No Build Zone (metres):	15
Representative Photos:	 Ewing Creek 3 where it has been piped to the foreshore of Okanagan Lake  Cottonwood riparian that occurs adjacent to the confluence of Ewing Creek 3 and Okanagan Lake
Discussion, Recommendations and Specific Mitigation Measures: Ewing Creek 3 is an ephemeral watercourse with direct connection to Okanagan Lake. It is currently piped to the Okanagan Lake foreshore (see above photo). It is natural in some areas and culverted/piped in others. The bankfull width was estimated at 0.69 m, with portions of the creek surrounded by mature mixed woodland that includes Douglas maple and waterbirch.	

The blanket 15 m recommended setback / no build zone could likely be reduced with little impact to the creek on some properties where the creek is confined to a narrow channel. However, the RDCO ideally will work to daylight the creek and to achieve riparian habitat gains, where possible. A Qualified Environmental Professional should be engaged to confirm watercourse location, and provide / justify a reduced setback where appropriate.

Table 9-6. Recommendations Pertaining to Estamont Watercourses: Morden Creek.	
Watercourse Name:	Morden Creek
Corresponding Figure Number:	5-5
RAR Applicable:	Yes
RAR Setback (metres), if applicable:	10
Recommended Setback / No Build Zone (metres):	15
Representative Photos:	 Morden Creek upslope of Ewings Landing Road  Morden Creek below Ewings Landing Road
Discussion, Recommendations and Specific Mitigation Measures: Morden Creek is ephemeral and occurs within a gully-like feature that supports a young canopy of Western red cedar. Below Ewings Landing Road just upslope from Okanagan Lake the channel becomes less defined and is braided. SHIM documented a bankfull width of 0.93 m where the channel extends through Estamont. Morden Creek is RAR applicable as there is intermittent surface flow that connects to Okanagan Lake. The RAR setback based on the bankfull width is 10 m. The recommended setback/no build zone is 15 m from the high water level of	

Morden Creek to ensure that development is setback from the top of bank of the gully feature. A Qualified Environmental Professional should be engaged to confirm watercourse location, and provide / justify a reduced setback where appropriate.

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 must not be included in the mixture.

- In accordance with the regional noxious weed control bylaw (#179) weed infestations should be controlled 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 Estamont 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 Okanagan.

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 Estamont.
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 **highly** applicable to many of the lots within Estamont 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 reduce overall development impacts in Estamont.

- Most lots within Estamont 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. Because of their reduced sensitivity, 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 stone 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 Estamont 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
ECOSCAPE ENVIRONMENTAL
CONSULTANTS LTD.

Mary Ann Olson-Russello, M.Sc., R.P.Bio.
Senior Natural Resource Biologist
Direct Line: (250) 491-7337 ext. 205

Kyle Hawes, R.P.Bio.
Senior Aquatic Biologist
Direct Line: (250) 491-7337 ext. 203

Attachments: References
Figures

REFERENCES

BC Ministry of Environment (BC MOE). 2005. Best Management Practices for Raptor Conservation during Urban and Rural Land Development in British Columbia. Prepared by: Mike W. Demarchi, MSc, RPBio and Michael D. Bentley, LGL Limited environmental research associates. Prepared for: B.C. Ministry of Environment Ecosystem Standards and Planning Biodiversity Branch. March, 2005.

BC Ministry of Environment (BC MOE). 2006a. Riparian Areas Regulation Assessment Methods. Available on-line: http://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/fish-fish-habitat/riparian-areas-regulations/rar_assessment_methods.pdf.

BC Ministry of Environment (BC MOE). 2006b. Best Management Practices for Lakeshore Stabilization. Accessed on-line: http://www.env.gov.bc.ca/wld/documents/bmp/BMPLakeshoreStabilization_WorkingDraft.pdf

BC Ministry of Environment (BC MOE). 2006c. Best Management Practices for Hazard Tree and Non-hazard Tree Limbing, Topping or Removal. Available on-line: http://www.env.gov.bc.ca/wld/documents/bmp/BMPTreeRemoval_WorkingDraft.pdf

BC Ministry of Environment (BC MOE). 2009. Okanagan Region Large Lakes Foreshore Protocol. Available on-line: http://www.env.gov.bc.ca/okanagan/esd/ollp/ollp.html.

BC Ministry of Environment (BC MOE). 2013. Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia. A companion document to Develop with Care (2012). Accessed on-line: http://www.env.gov.bc.ca/wld/documents/bmp/raptor_conservation_guidelines_2013.pdf

BC Ministry of Environment (BC MOE). 2014a. Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia. Accessed on-line: http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare/

BC Ministry of Environment (BC MOE). 2014b. Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia. A companion document to Develop with Care. Accessed on-line: http://www.env.gov.bc.ca/wld/documents/bmp/HerptileBMP_complete.pdf

Chilibeck, B., C. Chislett, and G. Norris. 1992. Land Development Guidelines for the Protection of Aquatic Habitat. Habitat Management Division of the Department of Fisheries and Oceans and the Integrated Management Branch of the Ministry of Environment, Lands and Parks. 129 pp.

Fenger, M., T. Manning, J. Cooper, S. Guy, and P. Bradford. 2006. Wildlife and Trees in British Columbia. Lone Pine Publishing, Edmonton, AB. 336 pp.

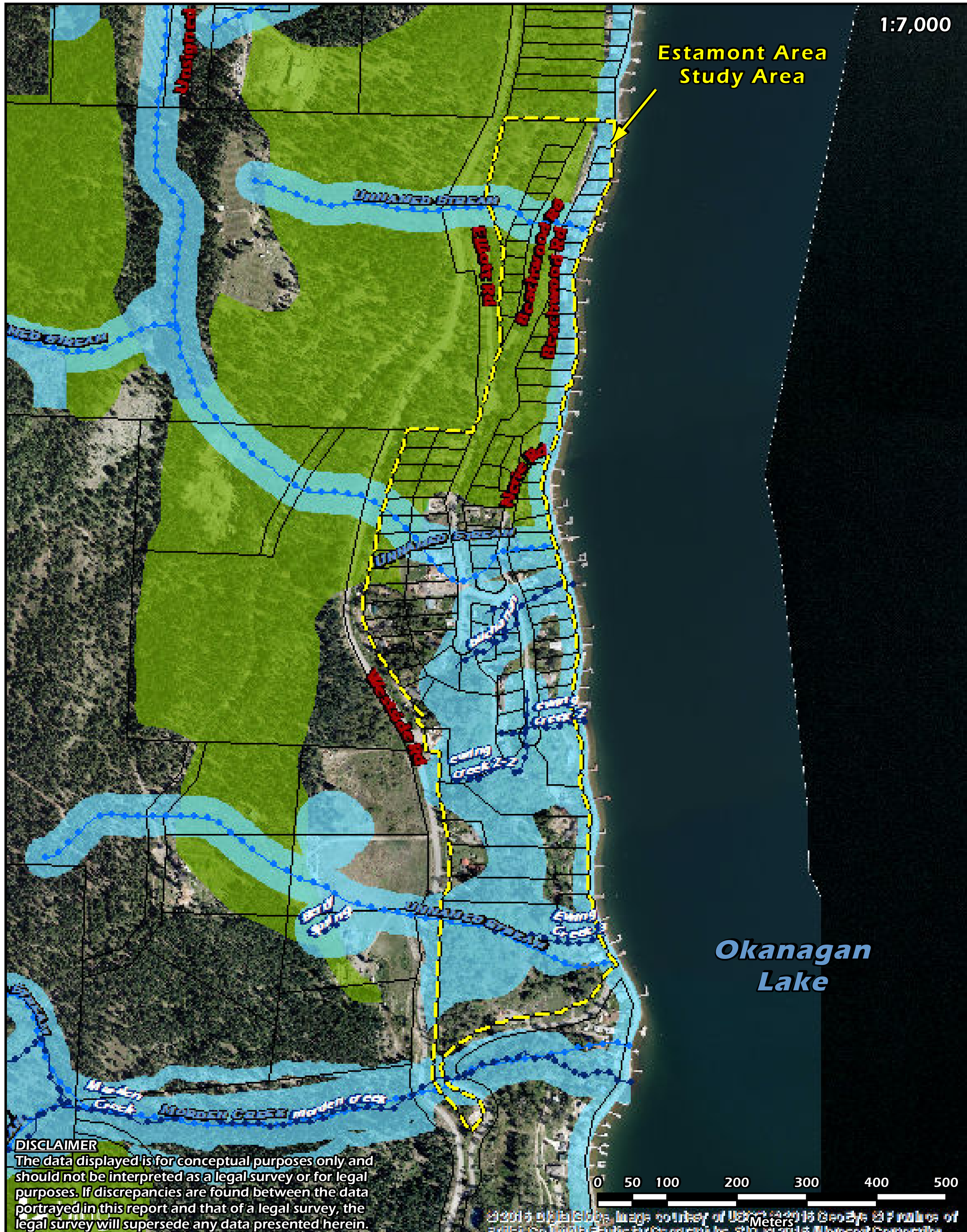
Haney, A. and Iverson, K. 2009. Conservation Analysis and Updated Ecosystem Mapping for the Central Okanagan Valley: Central Okanagan, South Slopes, Kelowna, Ellison and Joe Rich Project Areas. Prepared for: Okanagan Collaborative Conservation Program. Prepared by: Ophiuchus Consulting and Iverson & MacKenzie Biological Consulting Ltd. March 2009.

Lloyd, D., K.Angove, G. Hope, and C. Thompson. 1990. A guide to site identification and interpretation for the Kamloops Forest Region. Land Management Handbook No. 23. February, 1990. BC Ministry of Forests.

Patterson A., D. Drieschner, R. Wagner, and K. Hawes. 2014. Okanagan Wetlands Strategy: Phase 1: Outreach, Data Collection, Prioritization and Mapping. Prepared by: Ecoscape Environmental Consultants Ltd. Prepared for: Okanagan Basin Water Board. Ecoscape File No. 13-1159.

Regional District of Central Okanagan (RDCO). 2010. Rural Westside Official Community Plan Bylaw No. 1274. Adopted: December 13, 2010, Revised April 28, 2014.

FIGURES



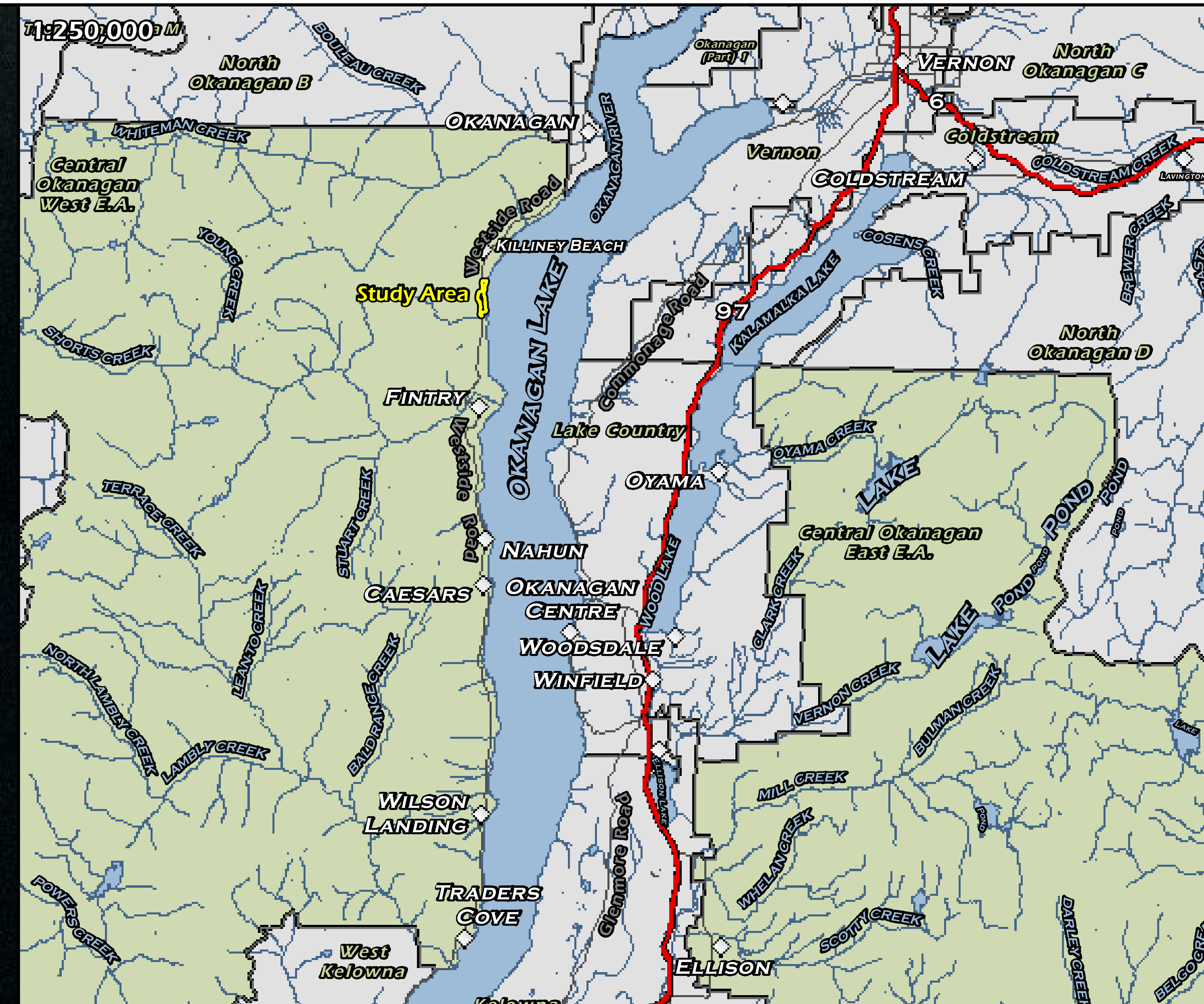


FIGURE 1: ESTAMONT AREA

Site Location and Existing Aquatic with Terrestrial Development Permit Areas

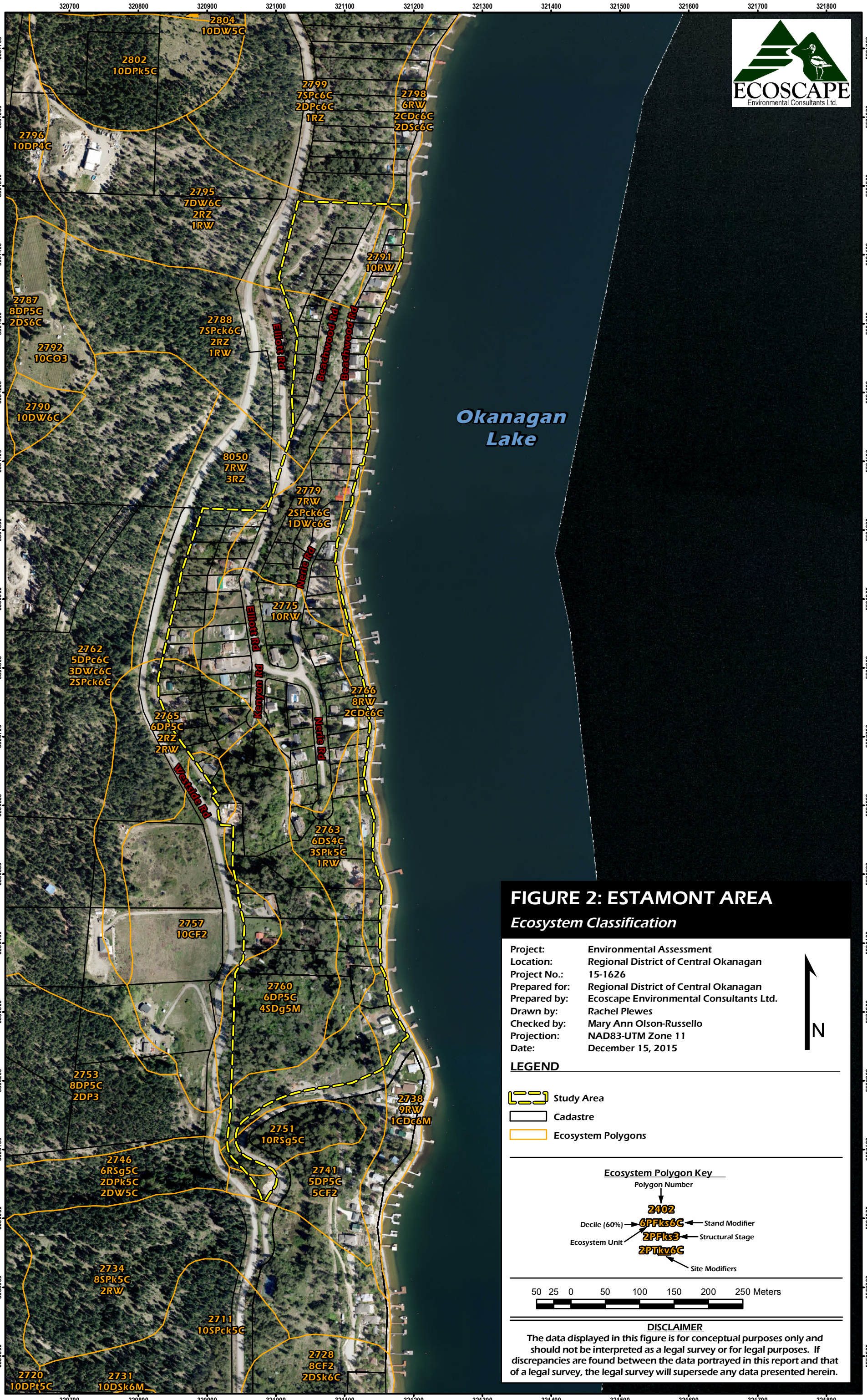
Project:	Environmental Assessment
Location:	Regional District of Central Okanagan
Project No.:	15-1626
Prepared for:	Regional District of Central Okanagan
Prepared by:	Ecoscape Environmental Consultants Ltd.
Drawn by:	Rachel Plewes
Checked by:	Mary Ann Olson-Russello
Projection:	NAD83-UTM Zone 11
Date: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

N

ECOSCAPE
Environmental Consultants Ltd.

LEGEND

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



ECOSCAPE
Environmental Consultants Ltd.

FIGURE 2: ESTAMONT AREA

Ecosystem Classification

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

N

LEGEND

- Study Area
- Cadastre
- Ecosystem Polygons

Ecosystem Polygon Key

Polygon Number: 2402

Decile (60%): 6PFks6C — Stand Modifier

Ecosystem Unit: 2PFks3 — Structural Stage

2PTkv6C — Site Modifiers

50 25 0 50 100 150 200 250 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 3: ESTAMONT AREA

Environmental Sensitivity Analysis

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 2, 2015

ECOSCAPE
Environmental Consultants Ltd.

N

LEGEND

- '99' Ecosystem Polygon Number
- Watercourses
- Study Area

Environmental Sensitivity Analysis Rating

- Very High (ESA 1)
- High (ESA 2)
- Moderate (ESA 3)
- Low (ESA 4)

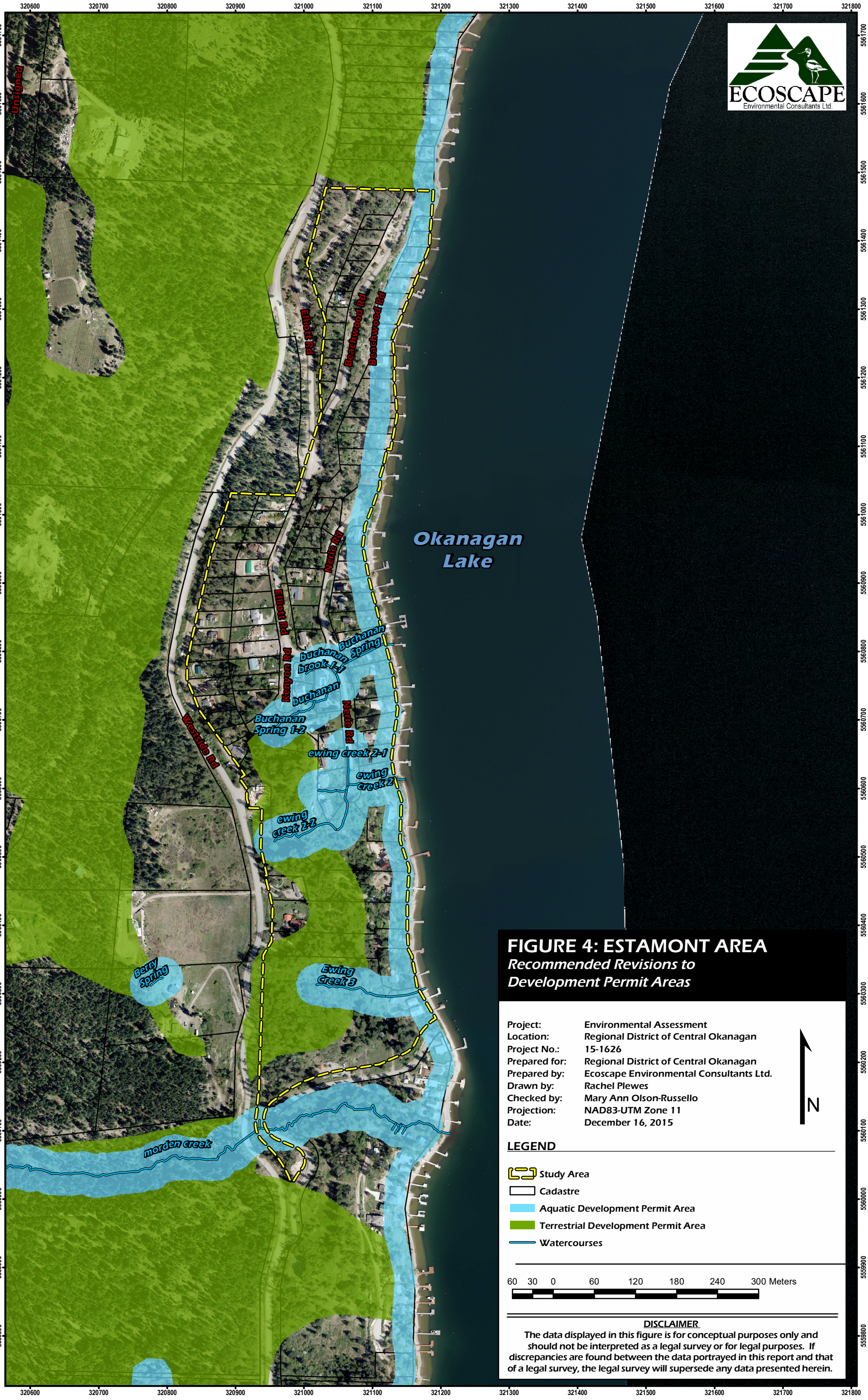
0 50 100 200 300 400 Meters

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.

Okanagan Lake

Elliott Rd
Beachwood Rd
Beachwood Rd
Nerle Rd
Elliott Rd
Kenyon Rd
Nerle Rd
Westside Rd
Unsigned
Buchanan Spring
buchanan brook 1-1
buchanan
Buchanan Spring 1-2
ewing creek 2-1
ewing creek 2
ewing creek 2-2
Berry Spring
Ewing Creek 3
morden creek


320600
320700
320800
320900
321000
321100
321200
321300
321400
321500
321600
321700
321800
5561700
5561600
5561500
5561400
5561300
5561200
5561100
5561000
5560900
5560800
5560700
5560600
5560500
5560400
5560300
5560200
5560100
5560000
5559900
5559800
ECOSCAPE
Environmental Consultants Ltd.
Unsigned
Elliott Rd
Beachwood Rd
Beachwood Rd
Okanagan Lake
Nerle Rd
Elliott Rd
Kenyon Rd
Buchanan Spring
buchanan brook 1-1
buchanan
Buchanan Spring 1-2
Nerle Rd
Westside Rd
ewing creek 2-1
ewing creek 2
ewing creek 2-2
Berry Spring
Ewing Creek 3
morden creek
FIGURE 4: ESTAMONT AREA
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
N
LEGEND
Study Area
Cadastre
Aquatic Development Permit Area
Terrestrial Development Permit Area
Watercourses
60 30 0 60 120 180 240 300 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.

ECOSCAPE
Environmental Consultants Ltd.

Kokanee Count=200

Kokanee Count=250

Kokanee Count=200

Ministry of Environment - Kokanee Yellow Zone

Yellow Zone - 15 m Setback

Kokanee Count=250

Kokanee Count=200

Kokanee Count=200

Kokanee Count=900

Riparian Areas Regulation Assessment Area (30.0 m)

Broadleaf Forest

Elliott Rd
Beachwood Rd
Beachwood Rd
Nerle Rd
Elliott Rd
Kenyon Rd
Westside Rd
Nerle Rd
Buchanan Spring
buchanan brook 1-1
buchanan
Buchanan Spring 1-2
ewing creek 2-1
ewing creek 2
ewing creek 2-2
Berry Spring
Ewing Creek 3
morden creek

FIGURE 5-0: ESTAMONT AREA

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 2, 2015

N

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

SHIM Identified

- Broadleaf Forest

Official Community Plan (OCP): Shoreline Sensitivity Zone

- Red Zone- Setback 30 m
- Orange Zone- Setback 20 m
- Yellow Zone - Setback15 m

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)

80 40 0 80 160 240 320 Meters

DISCLAIMER

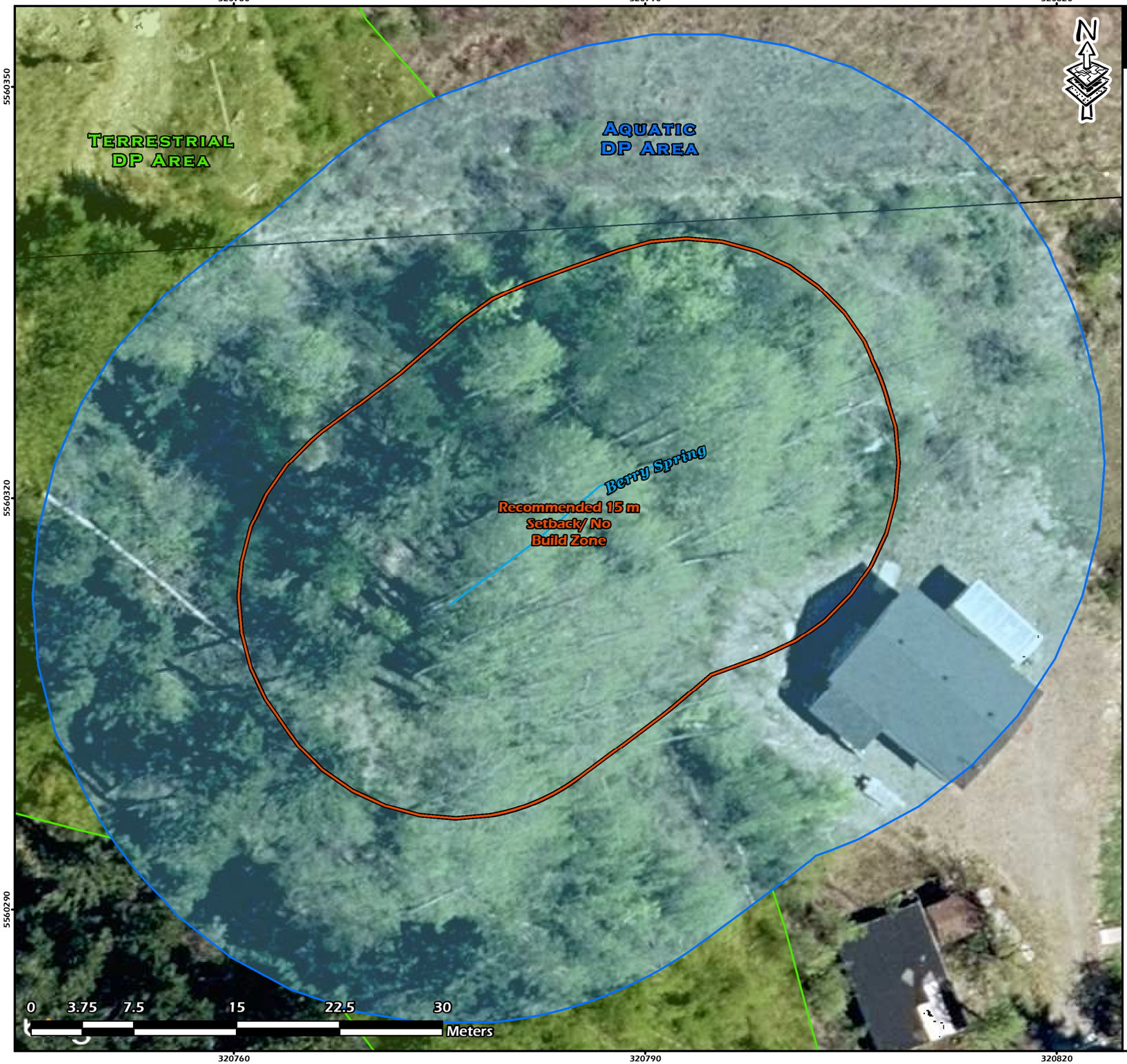
The data displayed in this figure is for conceptual purposes only and should not be interpreted as a legal survey or for legal purposes. If discrepancies are found between the data portrayed in this report and that of a legal survey, the legal survey will supersede any data presented herein.

FIGURE 5-1: ESTAMONT AREA

Aquatic Features and Riparian Setbacks

Mapsheet: 1

Watercourse: *Berry Spring*



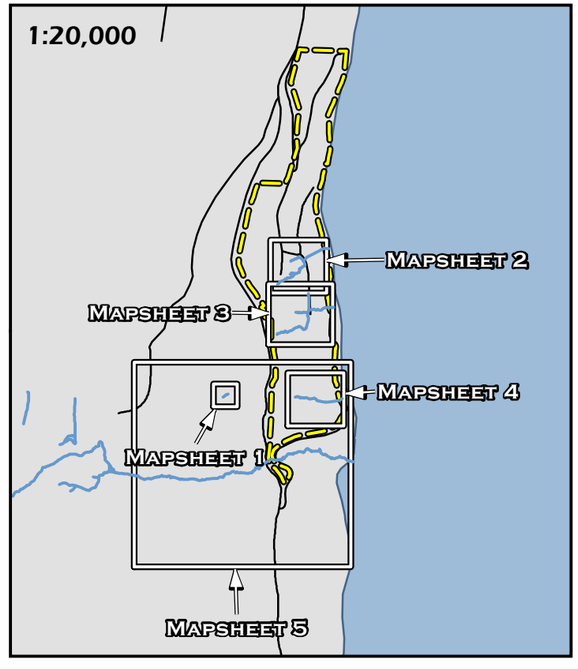
LEGEND

- Stream Centerline
- Cadastre
- Recommended 15 m Setback/ No Build Area
- Aquatic Development Permit Area
- Terrestrial Development Permit Area

RAR Features (if Applicable)

- Zone of Sensitivity - Shade
- Zone of Sensitivity - Large Woody Debris
- Zone of Sensitivity - Litterfall
- Streamside Protection and Enhancement Area (SPEA)

- Mapsheets
- Study Area
- Lake
- Roads



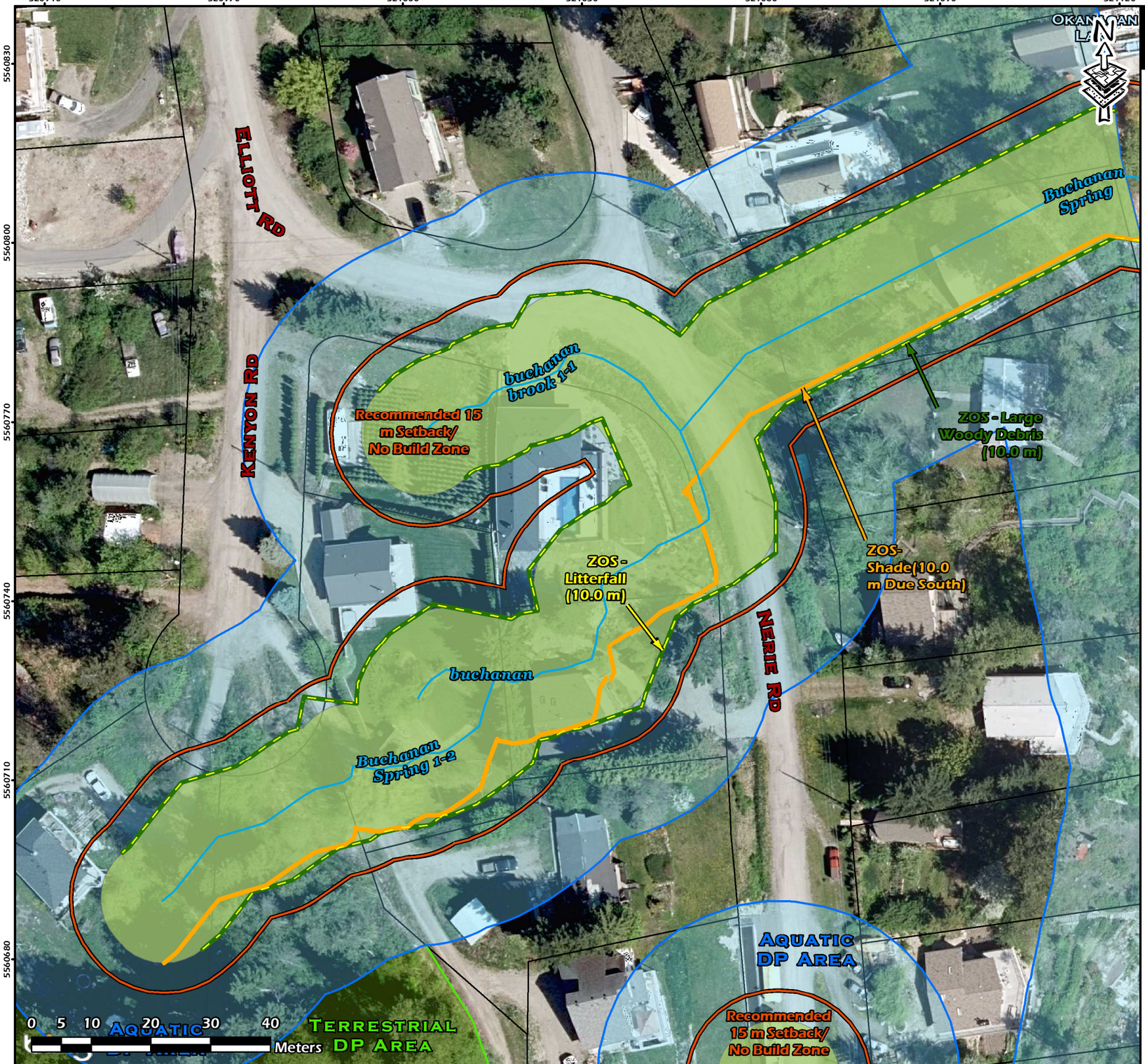
1:300

FIGURE 5-2: ESTAMONT AREA

Aquatic Features and Riparian Setbacks

Mapsheet: 2

Watercourse: *Buchanan Spring*



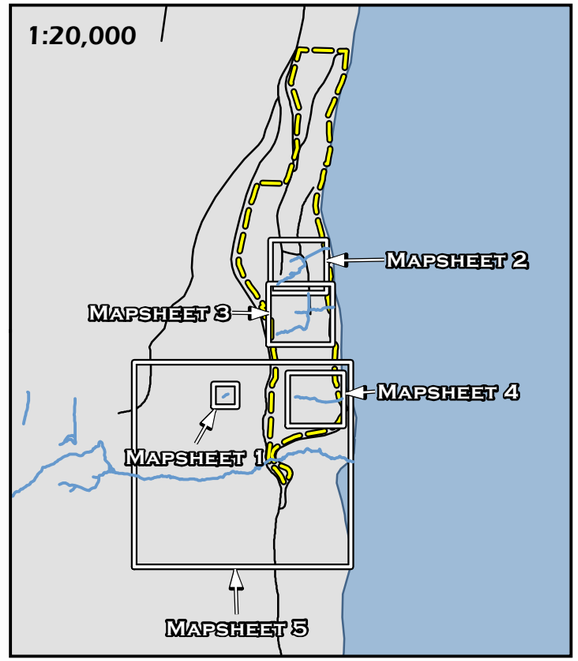
LEGEND

- Stream Centerline
- Cadastre
- Recommended 15 m Setback/ No Build Area
- Aquatic Development Permit Area
- Terrestrial Development Permit Area

RAR Features (if Applicable)

- Zone of Sensitivity - Shade
- Zone of Sensitivity - Large Woody Debris
- Zone of Sensitivity - Litterfall
- Streamside Protection and Enhancement Area (SPEA)

- Mapsheets
- Study Area
- Lake
- Roads



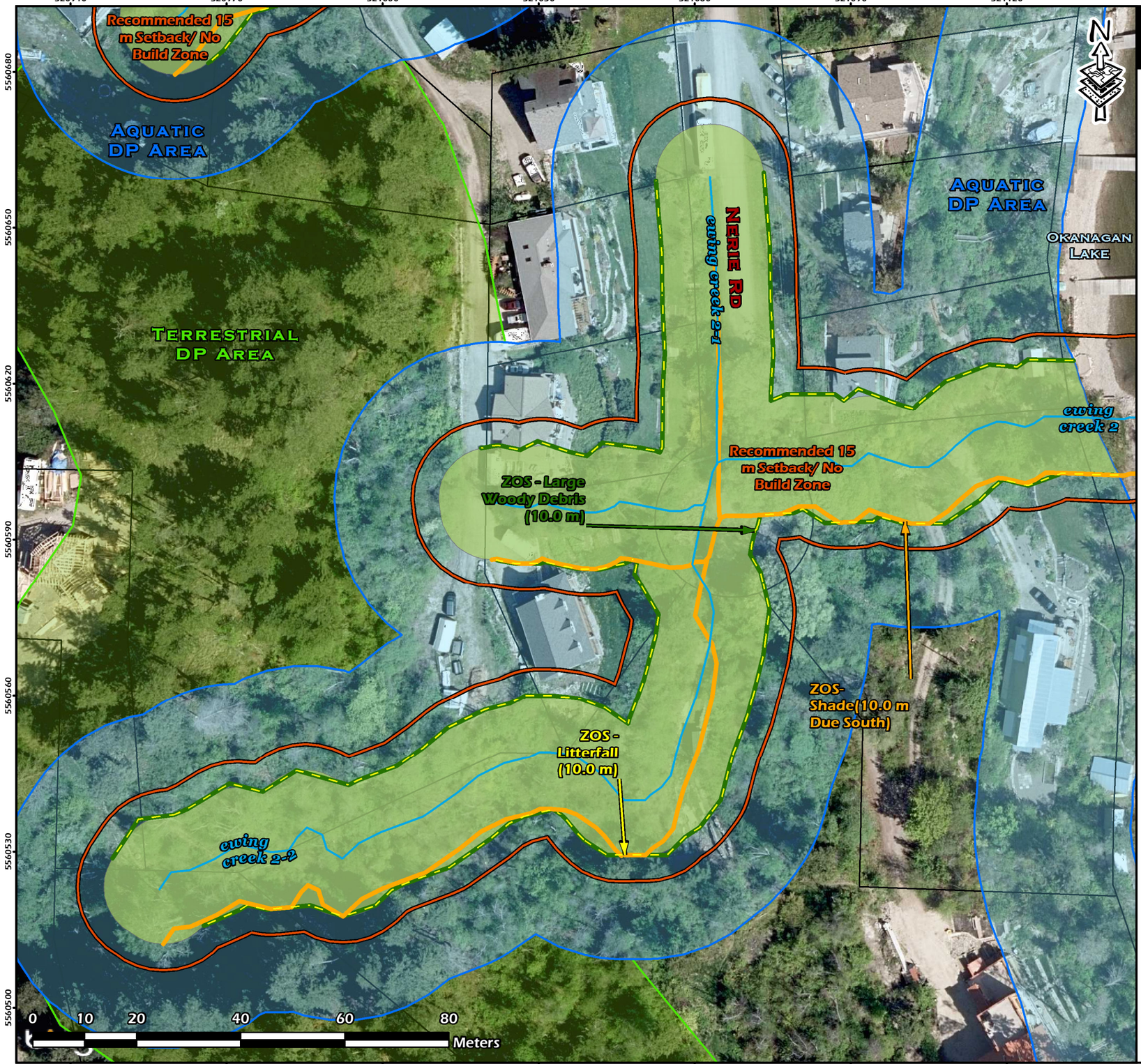
1:700

FIGURE 5-3: ESTAMONT AREA

Aquatic Features and Riparian Setbacks

Mapsheet: 3

Watercourse: *ewing creek 2*



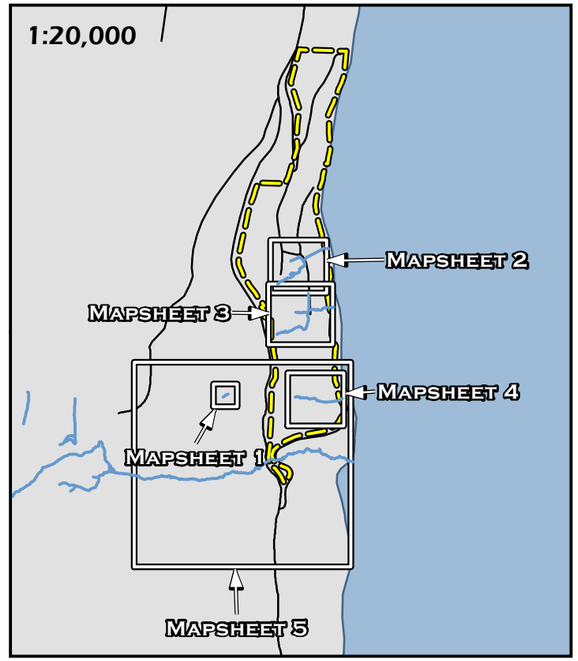
LEGEND

- Stream Centerline
- Cadastre
- Recommended 15 m Setback/ No Build Area
- Aquatic Development Permit Area
- Terrestrial Development Permit Area

RAR Features (if Applicable)

- Zone of Sensitivity - Shade
- Zone of Sensitivity - Large Woody Debris
- Zone of Sensitivity - Litterfall
- Streamside Protection and Enhancement Area (SPEA)

- Mapsheets
- Study Area
- Lake
- Roads



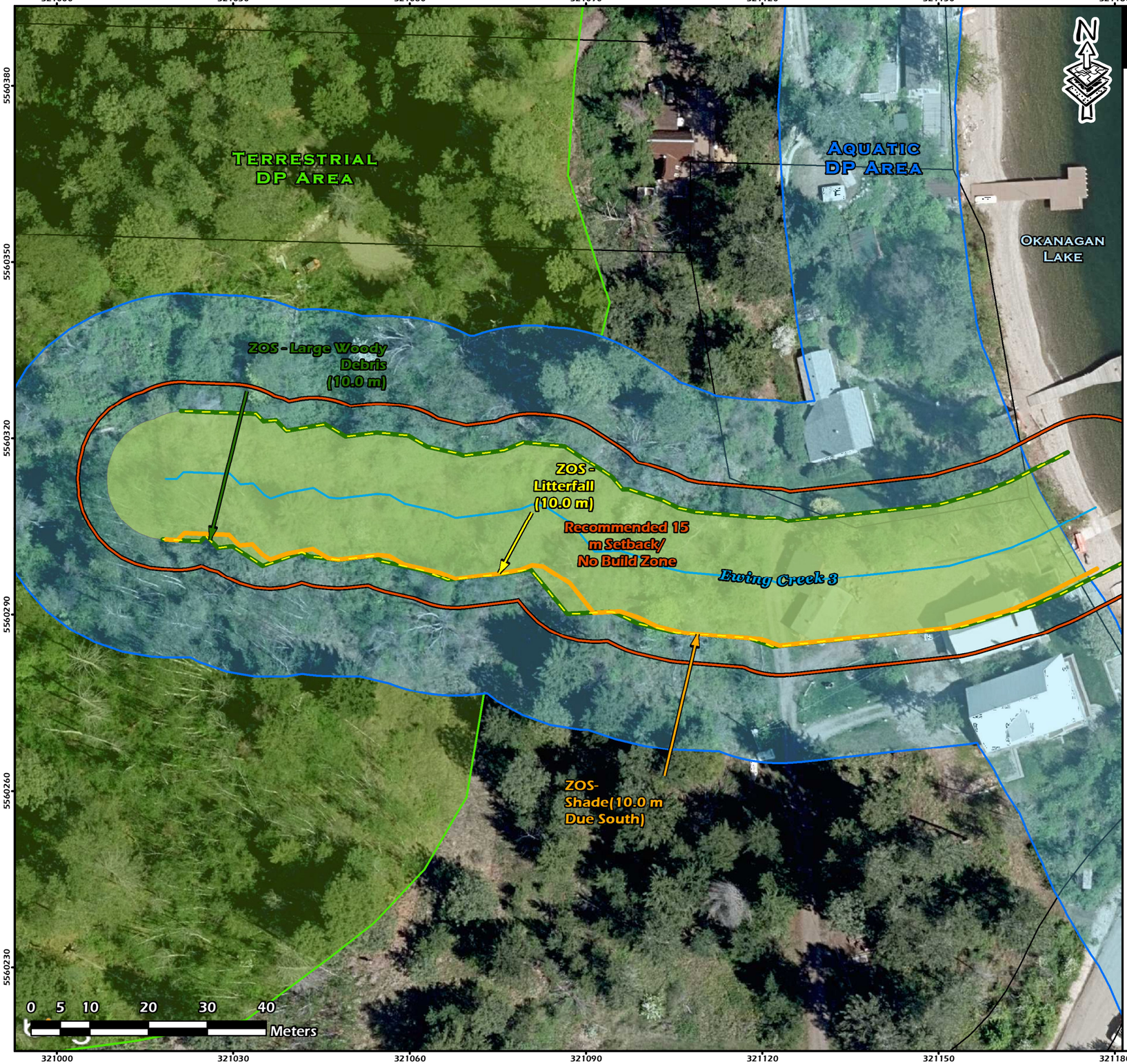
1:800

FIGURE 5-4: ESTAMONT AREA

Aquatic Features and Riparian Setbacks

Mapsheet: 4

Watercourse: *Ewing Creek 3*



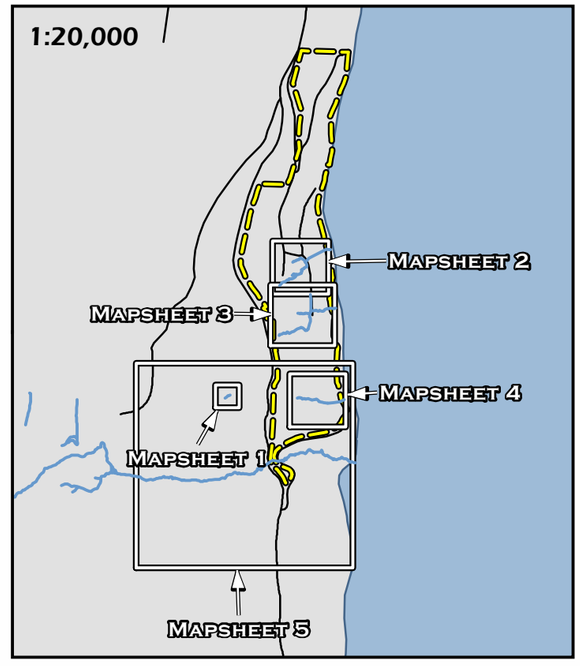
LEGEND

- Stream Centerline
- Cadastre
- Recommended 15 m Setback/ No Build Area
- Aquatic Development Permit Area
- Terrestrial Development Permit Area

RAR Features (if Applicable)

- Zone of Sensitivity - Shade
- Zone of Sensitivity - Large Woody Debris
- Zone of Sensitivity - Litterfall
- Streamside Protection and Enhancement Area (SPEA)

- Mapsheets
- Study Area
- Lake
- Roads



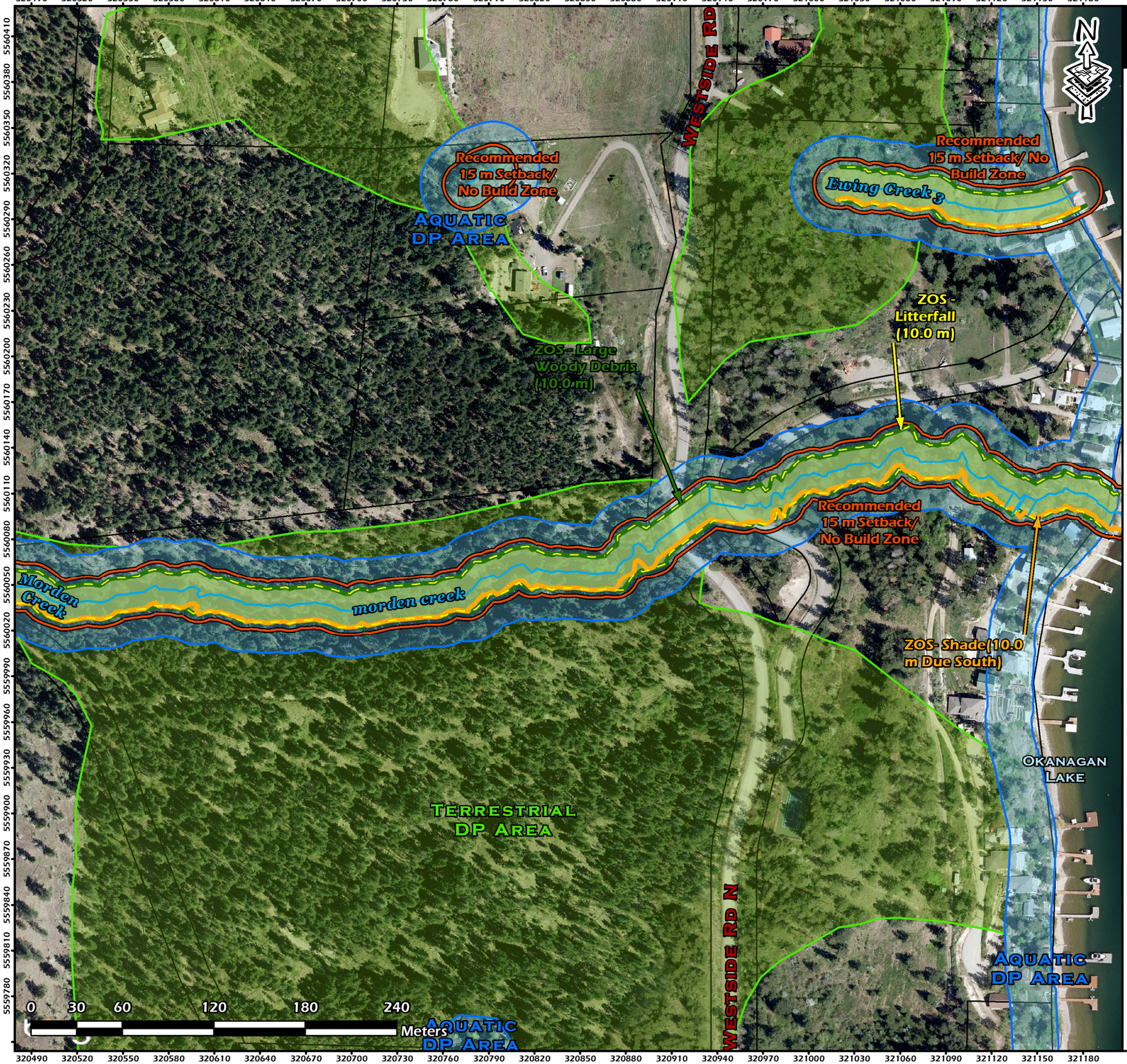
1:700

FIGURE 5-5: ESTAMONT AREA

Aquatic Features and Riparian Setbacks

Mapsheet: 5

Watercourse: *morden creek*



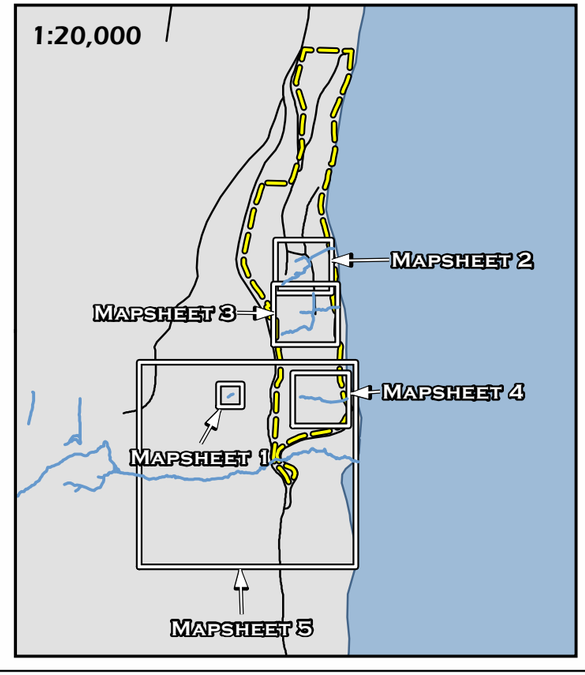
LEGEND

- Stream Centerline
- Cadastre
- Recommended 15 m Setback/ No Build Area
- Aquatic Development Permit Area
- Terrestrial Development Permit Area

RAR Features (if Applicable)

- Zone of Sensitivity - Shade
- Zone of Sensitivity - Large Woody Debris
- Zone of Sensitivity - Litterfall
- Streamside Protection and Enhancement Area (SPEA)

- Mapsheets
- Study Area
- Lake
- Roads



1:2,700