VALLEY OF THE SUN 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

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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 of the Valley of the Sun Subdivision (Valley of the Sun). 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.

Valley of the Sun is located on the northwest side of Okanagan Lake approximately 35 km from downtown Kelowna (Figure 1). The subdivision (72 ha) occurs west of Westside Road and has approximately 146 parcels. Historically, Valley of the Sun 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 Valley of the Sun 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 or 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 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. 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 Valley of the Sun.

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 Valley of the Sun 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 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. 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 flow) with Okanagan Lake or other fish-bearing watercourse was verified. In some cases, segments of a single watercourse were connected and hence are RAR applicable, while other segments 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 Valley of the Sun 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 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 unnamed springs/seeps/first order channels).

2.2 Ecosystem Classification

Valley of the Sun 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 Valley of the Sun represent distinct habitat types based on vegetation cover and by adapting the nomenclature and site series used by TEM. There are 19 polygons representing fifteen (15) distinct ecosystems that intersect the 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 Valley of the Sun Subdivision.

Ecosystem Code	Site Series	Site Series Name	Provincial Status[1]
BM	00	Bulrush Marsh	Red
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
OW	-	Shallow open water	-
PB	02	Douglas-fir – Ponderosa pine – Bluebunch wheatgrass – Balsamroot	Red
PD	-	Pond	-
RW	-	Rural	-
RZ	-	Road Surface	-
SB	00	Selaginella – Bluebunch wheatgrass rock outcrop	-
SD	08	Hybrid white spruce – Douglas-fir – Douglas maple – Dogwood	Red
SP	06	Douglas-fir/Ponderosa pine - Snowberry – Pinegrass	Blue
WS	09	Willow – Sedge Wetland	Blue

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

Valley of the Sun contains numerous Red and Blue listed communities, highlighting the rare ecosystems that characterize the area. The listed communities are generally associated with coniferous and mixed woodland and marsh/wetland features. Pond (PD) Shallow Open Water (OW) and rock outcrop (SB) communities are not provincially listed (Table 2); however, these communities provide critical habitats for a variety of wildlife and the lack of designation does not diminish their ecological value.

2.3 Terrestrial Community Types

The Valley of the Sun study area is comprised of coniferous woodland that ranges from recently disturbed (due to fire) to mature. There is also a sparsely vegetated grassland ecosystem (SB; Table 2), along the northern study area boundary that makes up a small component of TEM polygon 2702 (Figure 2).

2.3.1 Coniferous Woodland

Coniferous woodland communities that extend across Valley of the Sun include the following ecosystem codes as outlined in Table 2: DP, DS, DW, PB, 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 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*).

On August 5, 1998, an 82.2 ha wildfire, believed to be lightning caused, encroached into the southern portion of the Valley of the Sun study area[1]. The landscape in this area is dominated by very shallow soils and bedrock outcrops and today, it remains largely untreed. Regeneration appears to be limited with tree saplings only intermittently occurring. The area of disturbance from the fire extends to the edge of the residential lots.

2.3.2 Sparsely Vegetated Areas

Sparsely vegetated communities (Table 2: SB) are typically associated with rock outcrop, cliff, talus and other dry, steep, or warm aspect sites (i.e., south and/or west facing) that receive little moisture and have shallow, well-drained soils. The Selaginella – Bluebunch wheatgrass rock outcrop ecosystem (SB) occurs on bedrock outcrops that are typically un-fractured and have low relief. Selaginella, moss and bunchgrasses dominate these sites, while trees and shrubs are uncommon. Herbs are mainly comprised of ground cover mosses and lichens, including rusty steppe moss (*Tortula ruralis*), cladonia (*Cladonia* spp.) and compact selaginella (*Selaginella densa*), with scattered pussytoes (*Antennaria* sp.), buckwheat, balsamroot, alumroot, lupine, and bunchgrasses.

There is only a single TEM polygon that has a component of this sparsely vegetated community; it straddles the northern boundary of the study area on the east side of the wetland complex (polygon 2702; Figure 2).

2.4 Aquatic Ecosystems

The TEM identified several aquatic ecosystems including cottonwood riparian (CD), shallow open water (OW), pond (PD), bulrush marsh (BM) and willow-sedge wetland (WS). Each of these communities is associated with a wetland complex that straddles

[1] UBC Okanagan. 2016. Fire history in the Okanagan. Firehistory.ok.ubc.ca

the northern study area boundary. In addition, the SHIM data identified a Broadleaf Forest polygon that is located near the centre of the study area (Figure 5-0).

2.4.1 Wetland Complex

The wetland complex that straddles the northern study area boundary consists of three interconnected marsh/shallow water wetlands that have a mix of submergent vegetation. The complex supports pockets of cattail (*Typha latifolia*), soft-stemmed bulrush (*Scirpus lacustris* ssp. *validus*), Baltic rush (*Juncus balticus*) and floating and submerged aquatic plants such as duckweed, bladderwort, water smartweed and pondweed (Potamogeton sp.)

The ponds are surrounded by a narrow band of tall shrub/swamp/low flood thicket and mixed forest riparian fringe (CD community) transitioning to upland coniferous forest. Broadleaf tree cover includes black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), trembling aspen (*Populus tremuloides*), water birch (*Betula occidentalis*) and Douglas maple (*Acer glabrum*). Riparian shrubs include red-osier dogwood (*Cornus stolonifera*) and willow (*Salix* spp.).

Marsh wetland ecosystems, represented in the Valley of the Sun, are uncommon within the IDFxh1 biogeoclimatic zone, and provide critical habitat for a rich assemblage of wildlife.

2.4.2 Unnamed Spring and Broadleaf Forest

During the SHIM fieldwork, a single broadleaf forest polygon was delineated near the centre of the Valley of the Sun (Figure 5-0). This polygon connects segments of the unnamed spring that flows east through the subdivision. Ecoscape understands that this polygon was delineated based on airphoto interpretation, as property access in 2007 was not granted to conduct SHIM in this area. It is possible that the spring has surface flow across this polygon, but it has not been field-confirmed.

2.4.3 Lambert Creek

Lambert Creek is the only creek system that occurs within Valley of the Sun. Its extents are restricted to the northeast corner of the study area. It originates from the wetland complex and flows downslope toward Okanagan Lake. Although the creek flows to Okanagan Lake (as indicated in the SHIM), segments of the creek below Westside Road did not have a defined channel. The creek is classified as ephemeral. However in some segments, a bank full width of up to 2.4 m was recorded (RDCO SHIM data 2006).

2.5 Rare and Endangered Plants

The British Columbia Conservation Data Centre (CDC) was queried for potential occurrences of rare plants that may occur within Valley of the Sun. 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, lakes, riparian, sparsely vegetated, spring and wetland habitat types. The resulting list includes fifteen (15) potentially occurring rare plant species (Table 3). The CDC does not list element occurrences of rare plants within the vicinity of Valley of the Sun, however they still may occur there.

Table 3. Summary of rare and endangered plants with potential to occur in Valley of the Sun.

Common Name	Scientific Name	Provincial Status[1]
blue vervain	*Verbena hastate var. scabra*	Blue
blunt-sepaled starwort	*Stellaria obtusa*	Blue
cup clover	*Trifolium cyathiferum*	Red
false-pimpernel	*Lindernia dubia var. anagallidea*	Blue
giant helleborine	*Epipactis gigantea*	Blue
hairy water-clover	*Marsilea vestita*	Red
near navarretia	*Navarretia propinqua*	Red
northern linanthus	*Leptosiphon septentrionalis*	Blue
obscure cryptantha	*Cryptantha ambigua*	Blue
oniongrass	*Melica bulbosa*	Blue
peach-leaf willow	*Salix amygdaloides*	Red
red-rooted cyperus	*Cyperus erythrorhizos*	Red
scalepod	*Idahoa scapigera*	Blue
short-flowered monkey-flower	*Mimulus breviflorus*	Blue
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

Valley of the Sun contains an assemblage of woodland, wetland, riparian and sparsely vegetated 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). The CDC reports no records of occurrence of rare or endangered species that overlap Valley of the Sun.

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 Valley of the Sun (Table 4). 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, lakes, riparian, sparsely vegetated, spring and wetland habitat types.

Table 4. Summary of wildlife species at risk with the potential to occur in Valley of the Sun.

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	-
	black swift	*Cypseloides niger*	Blue	Endangered
	California Gull	*Larus californicus*	Blue	-
	canyon wren	*Catherpes mexicanus*	Blue	Not At Risk
	common nighthawk	*Chordeiles minor*	Yellow	Threatened
	barn swallow	*Hirundo rustica*	Blue	Threatened
	black swift	*Cypseloides niger*	Blue	Endangered
	burrowing owl	*Athene cunicularia*	Red	Endangered
	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	-
	immaculate green hairstreak	*Callophrys affinis*	Blue	-
	Lance-tipped darner	*Aeshna constricta*	Blue	-
	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	-

Species Group	Common Name	Scientific Name	Provincial Status[1]	COSEWIC Listing[2]
	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
	Northern rubber boa	*Charina bottae*	Yellow	Special Concern
	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 Valley of the Sun**

3.0 ENVIRONMENTAL IMPACT ASSESSMENT

There is an east/west band of residential lots that extends across the central portion of the study area, with its northern edge encroaching into the wetland complex riparian communities. Many of the lots have not yet been developed; they remain natural in character with established tree canopies and presumably intact understories. Within these areas, mature forest communities that are red and blue listed remain and are in good condition. They are ecologically functional and provide valuable wildlife habitat for a variety of native species, including those that are rare and endangered. Many of the developed lots, on the other hand, appear to have had substantial clearing beyond the footprint of the residential structures.

The southern portion of the study area has been impacted by the 1998 wildfire and the forest structure is still predominately shrub. Shrubs within the burned area, including Saskatoon and snowbrush, provide important browse in an area regarded as high value winter range for mule deer and California bighorn sheep. Wildlife presence and movement is likely concentrated in the northern portion of the study area where ecosystems are intact and where the wetland complex attracts a variety of species. Wetland ecosystems in the Okanagan, especially those that are as extensive as the wetland complex in the Valley of the Sun have very high biodiversity value.

Environmental effects documented within Valley of the Sun include incremental loss of mature coniferous woodland, which is critical for the survival of rare and endangered species such as the Lewis's Woodpecker and Flammulated Owl. Two of the existing waterbodies (wetland complex and Lambert Creek) are fairly isolated from residential development pressures, although there is the potential for additional encroachment from neighboring undeveloped lots to the south of the wetland complex. The unnamed spring flows across a highly developed area; it is culverted below roads and will likely continue to be incrementally encroached upon as lots further develop. As a result there may be potential riparian vegetation removal and replacement with non-native horticultural plants and risk for invasive plant spread.

These impacts at the subdivision level can seem insignificant, but when considered cumulatively across the Okanagan Valley, they become tangible and problematic. It is expected that the desire to live and recreate in Valley of the Sun will increase with improved access through ongoing upgrades of Westside Road. As development expands, further loss of naturally occurring ecosystems 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 5 shows the breakdown of values by area (ha) and relative extents of coverage within the Valley of the Sun study area. The ESA indicated that the majority of Valley of the Sun has Moderate (75%) ratings. A grouping of Very High rated polygons is located along the northern study area boundary. This area represents the wetland complex, and intact mature coniferous woodland.

Table 5. Percent composition of ESAs that occur within the Valley of the Sun (72 ha).

ESA Value	ESA Area (ha)	Percent of Area (%)
 Very High (ESA 1) Wetland Complex	8.8	12
 High (ESA 2) Broadleaf Forest (Polygon 2694; Figure 2)	9.5	13
 Moderate (ESA 3) Rural Residential	53.7	75
Low (ESA 4)	0	0
Total	72	100

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 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 for respective polygons instead of SEI data. In cases where there was overlap between Aquatic and Terrestrial DP areas, Aquatic Ecosystems 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 resulted in similar Aquatic Ecosystem and Terrestrial DP areas as the original. There are 49 parcels that overlap DP areas, compared with 53 parcels that overlapped previously.

4.3 Watercourse Setbacks and Policy

Figures 5-0 through 5-5 depict the watercourses present within Valley of the Sun, as well as pertinent riparian setbacks. None of the identified watercourses adjacent to the subdivision are applicable under the RAR. However Recommended Setbacks / No Build Areas are shown for all identified watercourses.

It was not within the project scope to prescribe specific setbacks for individual lots. Instead a default setback was recommended for each watercourse. In most cases, the default setback is 15 m. 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 wetland complex at the north end of the study area is an exception. The default setback for this feature is 30 m. This enhanced setback was chosen for two reasons: First, the RAR 30 m shade setback, if applicable, would apply; and second, the significance of this feature warrants protection.

Despite the blanket setbacks defined for each watercourse, it is acknowledged that for watercourses that are confined by a narrow channel or for seepages where there is no

channel, the setback can be excessive, especially if the setback results in sterilization of the lot. In the case of the unnamed spring (Figures 5-2 through 5-4) that flows through the centre of the subdivision, the watercourse presence and alignment has not been determined due to restricted property access. For this reason, the presence of surface flow and appropriate setbacks will need to be determined on a lot by lot basis.

The blanket setbacks identified in this report can be reduced through a more detailed assessment by a Qualified Environmental Professional (QEP), assuming any reductions are consistent with the RAR and the Rural Westside OCP (RDCO 2010). If there is desire to encroach into the blanket setback, 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 Valley of the Sun 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 Valley of the Sun.

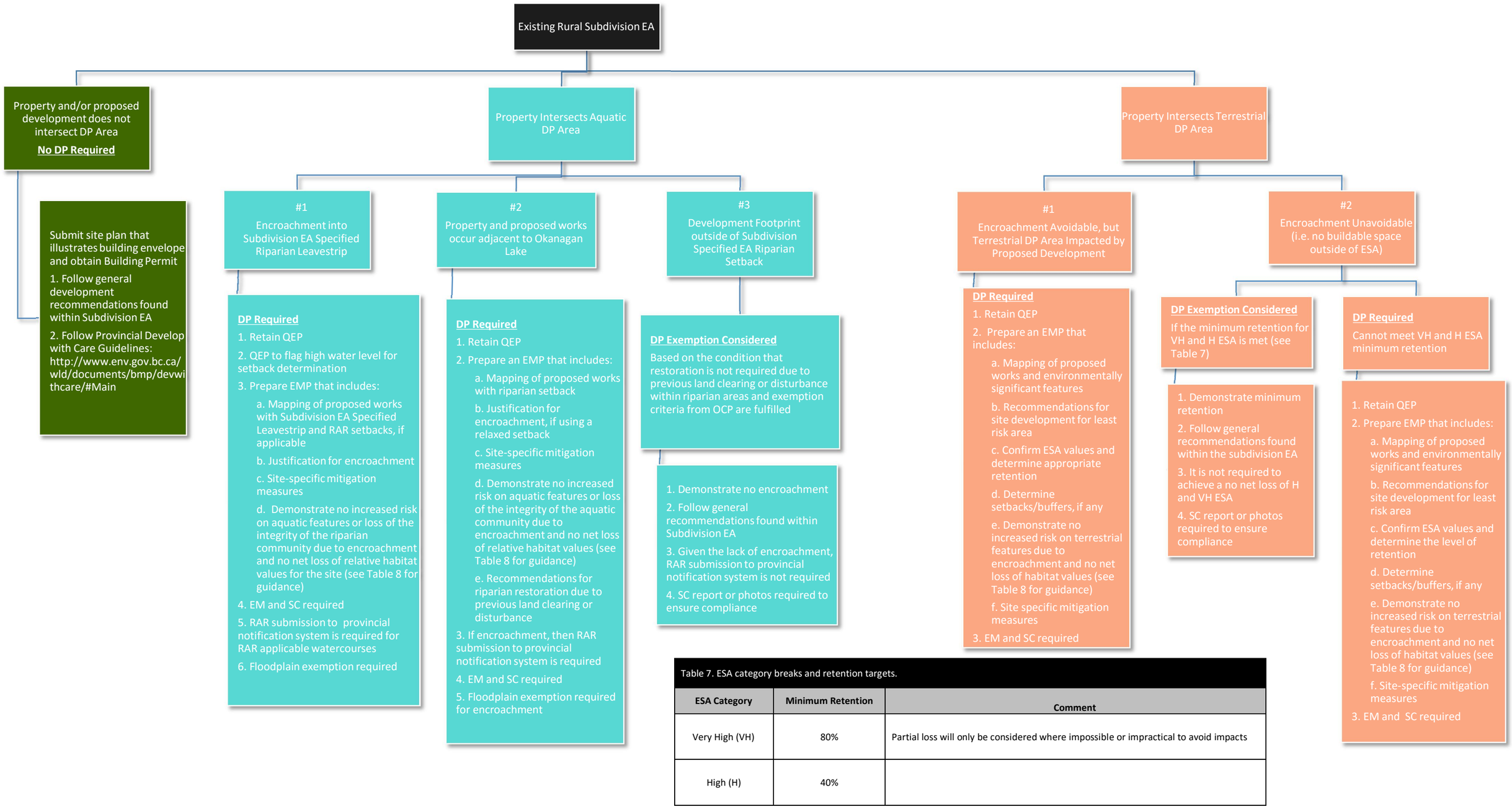

Table 7. ESA category breaks and retention targets.

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 7 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 7. 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 8-1. Recommendations pertaining to Valley of the Sun watercourses: Lambert Creek.	
Watercourse Name:	Lambert Creek
Corresponding Figure Number:	5-1
RAR Applicable:	No, not where Lambert Creek occurs adjacent to Valley of the Sun
RAR Setback (metres), if applicable:	-
Recommended Setback / No Build Zone (metres):	15
Representative Photos:	 Lambert Creek below Westside Road where there is no defined channel (other than area of scour immediately below the outfall, which is likely exacerbated by road runoff).

Discussion, Recommendations and Specific Mitigation Measures:

Lambert Creek is the only creek system that occurs within Valley of the Sun and barely extends into the northeast corner of the study area. It originates from the wetland complex and flows downslope toward Okanagan Lake. Lambert Creek is classified as ephemeral, but in some locations, has bank full widths of up to 2.4 m (RDCO SHIM data 2006). Ecoscape investigated the creek downslope of Westside Road. At this location there was no defined channel and no riparian vegetation. Based on this finding we have assumed that Lambert Creek is discontinuous and therefore the creek segments that occur adjacent to Valley of the Sun are not RAR applicable. It is recommended that the entire Lambert Creek alignment be ground truthed during the growing season to better ascertain which areas have surface flow connection and defined channels.

Table 8-2. Recommendations Pertaining to Valley of the Sun watercourses: Unnamed Spring.	
Watercourse Name:	Unnamed Spring (Aka unknown stream 1 and unknown stream 2)
Corresponding Figure Number:	5-2 through 5-4
RAR Applicable:	No
RAR Setback (metres), if applicable:	-
Recommended Setback / No Build Zone (metres):	15 (but see discussion below)
Representative Photos:	 Unknown spring east of Alpine Road  West end of the culvert below Alpine Road
Discussion, Recommendations and Specific Mitigation Measures: The SHIM data identified the unnamed spring that occurs west of the study area, but due to property access limitations the SHIM data collection stopped just west of the study area boundary. Trim data was then used to estimate the location of the watercourse through the study area upstream and downstream of the broadleaf forest polygon (see Figures 5-0, 5-3 and 5-4). Because this watercourse was amalgamated from different sources it appears as three different names. Unnamed spring is displayed in Figure 5-2 and accurately shows the location of the watercourse,	

unnamed spring 1 is displayed in Figure 5-3 and the alignment was estimated using TRIM (it has not been field confirmed) and unnamed spring 2 was also estimated from TRIM data (Figure 5-4). During the field work for this project, Ecoscape did confirm the location of where the unnamed spring 2 goes to ground and that is accurately reflected in Figure 5-4. Because of the limited property access, a broadleaf forest polygon was delineated using airphoto interpretation and that polygon extent is equal to the extent of the Aquatic Ecosystem DP area, where the alignment of the watercourse could not be determined.

The default recommended setback for this watercourse is 15 m. However, a qualified environmental professional should be engaged on a lot by lot basis to determine watercourse presence and location, and to critically evaluate if the 15 m setback is appropriate.

Table 8-3. Recommendations pertaining to Valley of the Sun watercourses: Wetland Complex.	
Watercourse Name:	Wetland Complex
Corresponding Figure Number:	5-5
RAR Applicable:	No
RAR Setback (metres), if applicable:	-
Recommended Setback / No Build Zone (metres):	30
Representative Photos:	 One of the ponds in the wetland complex  Trembling aspen riparian fringe that surrounds the wetland complex

Wetland complex (SHIM photo 2006)

Discussion, Recommendations and Specific Mitigation Measures:

The wetland complex acts as the headwaters of Lambert Creek. This feature is not RAR applicable, as segments of Lambert Creek downstream of the wetland complex are discontinuous preventing surface flow connection to Okanagan Lake. Ecoscape delineated the high water level of the wetland complex using airphoto interpretation and recommends a 30 m setback / no build zone. Given the rarity and importance of this unique feature, residential encroachment is discouraged to maintain the ecological integrity of this feature.

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.

- 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 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 9. 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 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 Erosion and Sediment Control

- Erosion and sediment control are particularly important when construction works occur adjacent to watercourses (e.g. wetlands, creeks). 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.

- 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 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.

4.6.4 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.

4.6.5 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 10. 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 Valley of the Sun.
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.
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:

- It is recommended that an additional SHIM survey be undertaken on Lambert Creek to better ascertain which areas have surface flow connection and a defined channel.

- If property access can be obtained along the unnamed spring that flows through the centre of the subdivision, a SHIM survey in this area may reduce the extent of the Aquatic DP area.

6.0 CLOSURE

This report has been prepared for the RDCO and considers the existing site conditions of the Valley of the Sun 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

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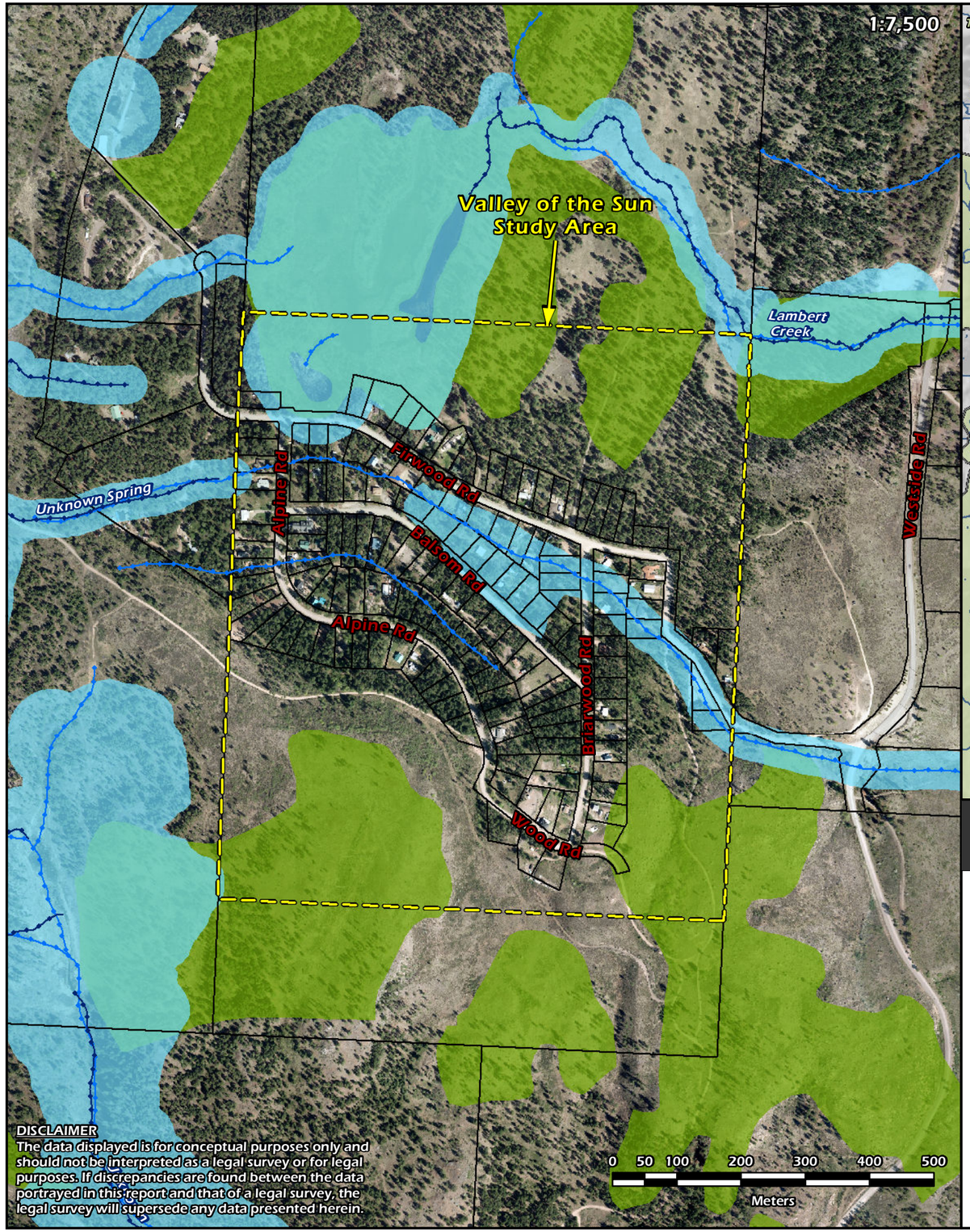
FIGURES



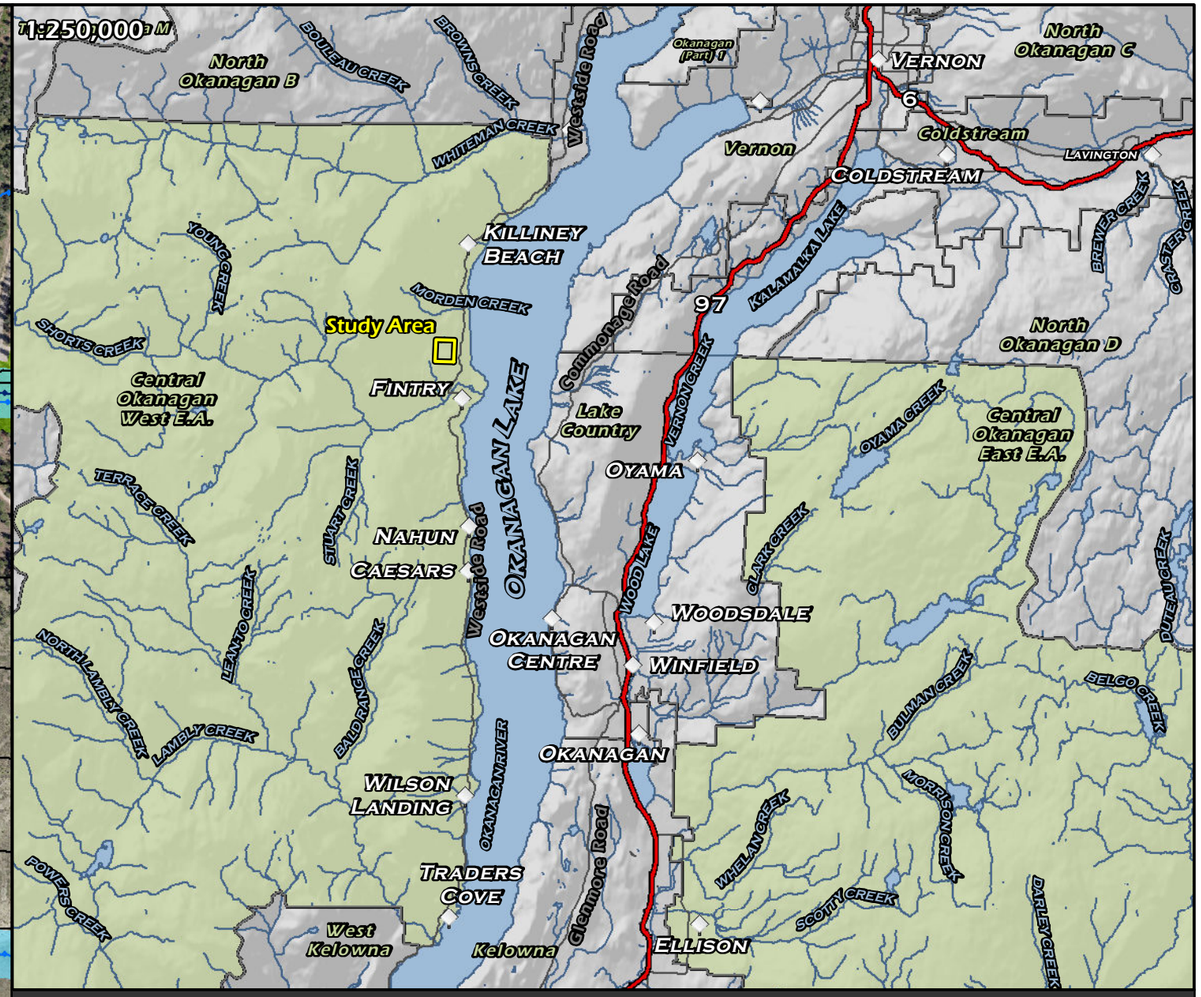


FIGURE 1: VALLEY OF THE SUN

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

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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.

2718
6CF2
2RW
2DP4C

2715
6SPk6C
4DW6C

2714
7DP5C
3DPk5C

2719
6SPks6C
3WBrs2bwk
1CWw3b

2720
10DPt5C

2701
5WS3
3DS6M
2CD6M

2704
10CF2

2711
10SPck5C

Ewings Rd

2708
5BM2b
5PD

2709
6PD
4BM2b

2703
10CF2

2702
8PBrv6C
2SB2a

2698
7DW6C
3SPc6C

2700
5DWc6C
4DPck5C
1RZ

2707
10DS6M

2705
6OW
4BM2b

8040
5DP5C
5RW

Westside Rd

2697
9DPck5C
1RZ

2687
7DPc5C
3RW

Firwood Rd

2695
8SPc5C
2RW

Alpine Rd

2691
8DP5C
1RZ
1RW

Balsam Rd

2694
9SD6M
1RW

2690
10RW

2686
10RW

Alpine Rd

Briarwood Rd

2679
6DP3
2DPk3
2DS3

Wood Rd

2683
9DP3
1RZ

2681
7DWk5C
3DPs3

2663
5DWc3
3SPck3
2DPck5C

8039
8DSk5M
2DPk5C

2682
8DWrs3C
2SPs3C

2675
5DWrs3
5DP3

2680
10DWrs3

2677
10DS5C

2646
4SPc5C
4DPc5C
2DWr5C

2664
8DP4C
2DS4C

2664
8DP4C
2DS4C

2664
8DP4C

bing™

FIGURE 2: VALLEY OF THE SUN

Ecosystem Classification

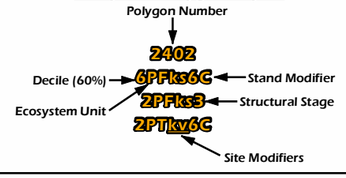
Project:	Environmental Assessment
Location:	Regional District of Central Okanagan
Project No.:	15-1626
Prepared for:	Regional District of Central Okanagan
Prepared by:	Ecoscape Environmental Consultants Ltd.
Drawn by:	Rachel Plewes
Checked by:	Mary Ann Olson-Russello
Projection:	NAD83-UTM Zone 11
Date: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

N

LEGEND

- Study Area
- Cadastre
- Ecosystem Polygons

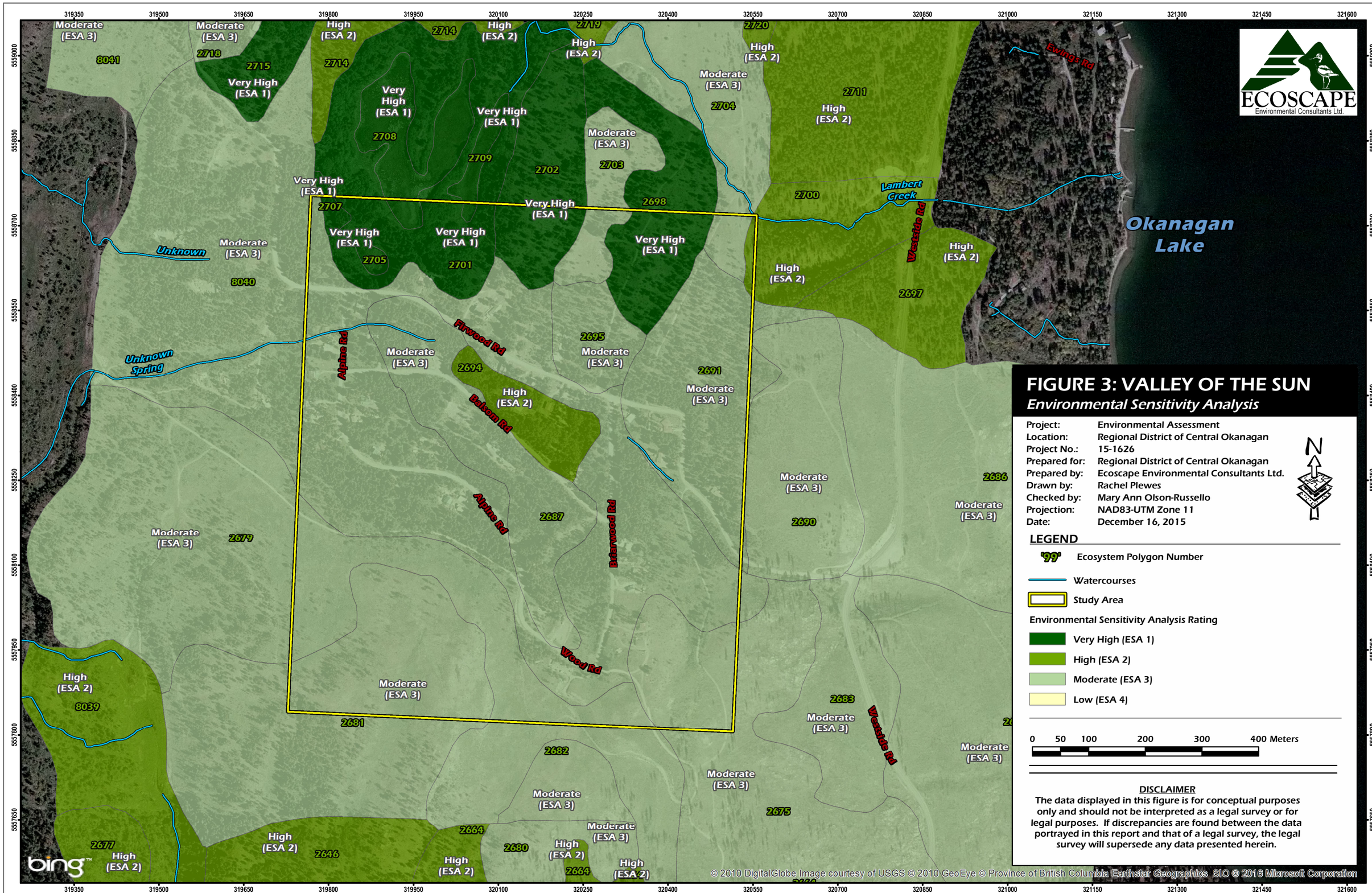
Ecosystem Polygon Key



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.



ECOSCAPE
Environmental Consultants Ltd.

FIGURE 3: VALLEY OF THE SUN

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 16, 2015

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

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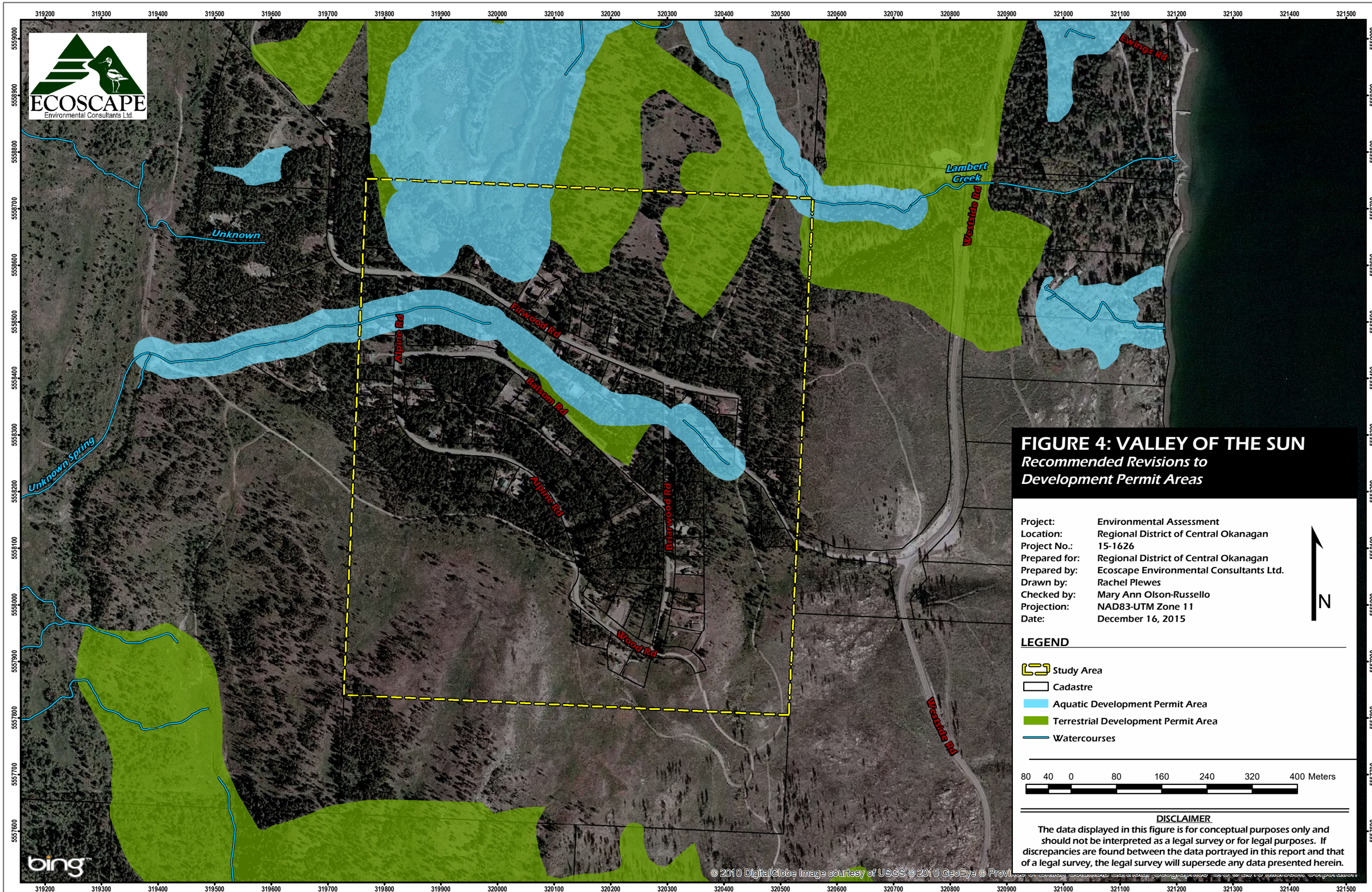


FIGURE 4: VALLEY OF THE SUN

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

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.

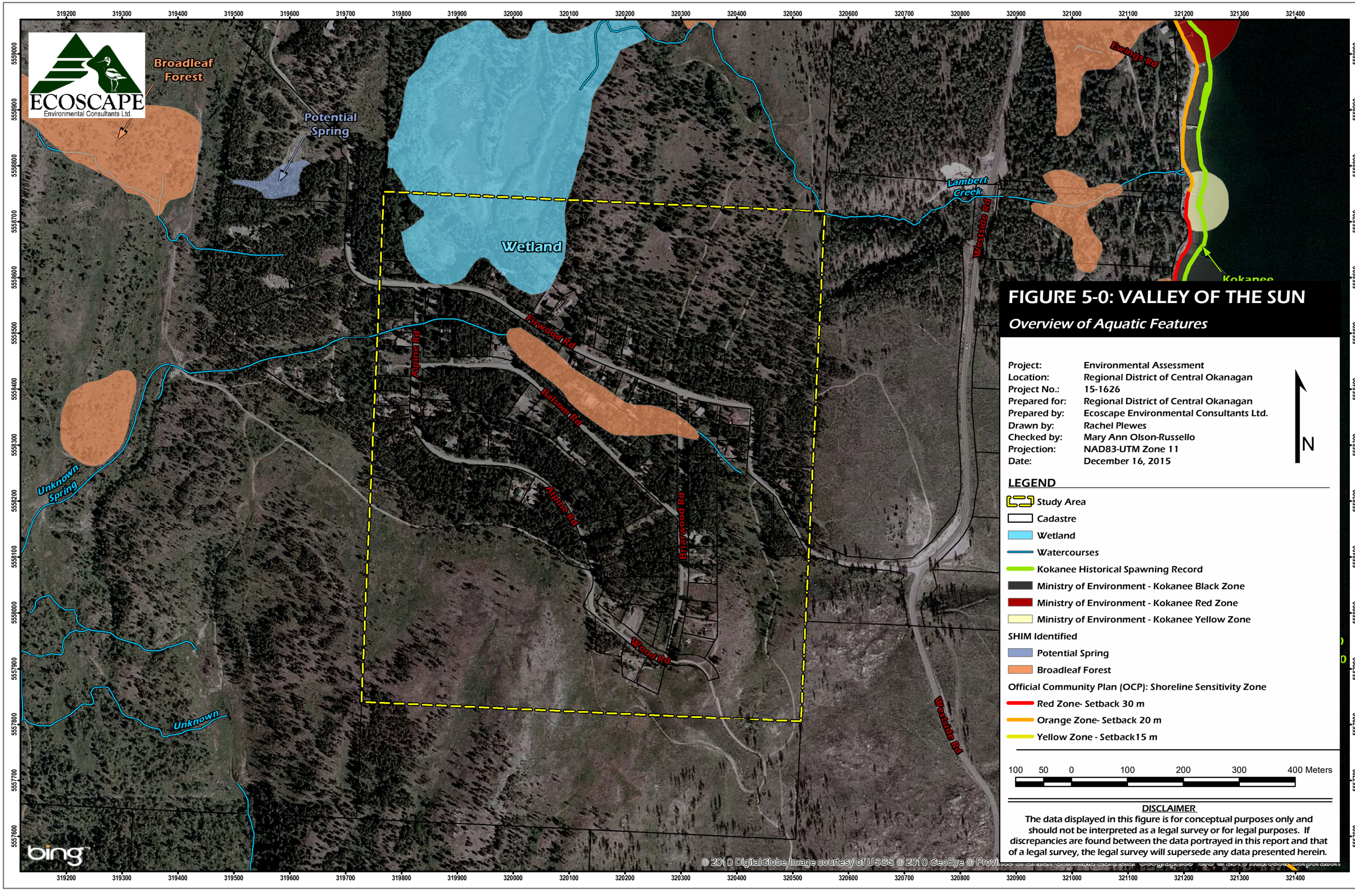


FIGURE 5-0: VALLEY OF THE SUN

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

N

LEGEND

- Study Area
- Cadastre
- Wetland
- 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

- Potential Spring
- Broadleaf Forest

Official Community Plan (OCP): Shoreline Sensitivity Zone

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

100 50 0 100 200 300 400 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.

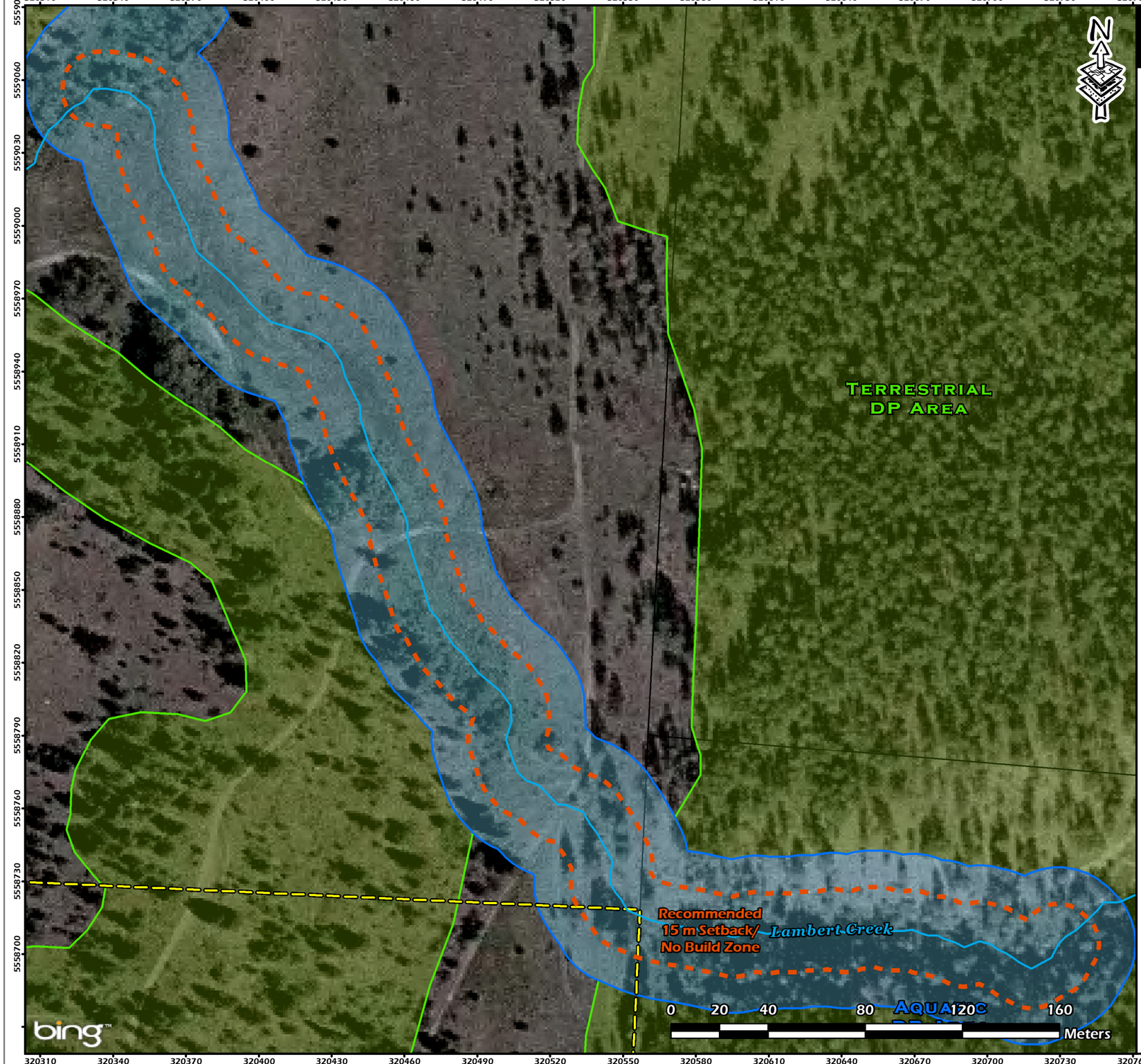
FIGURE 5-1: VALLEY OF THE SUN

Aquatic Features and Riparian Setbacks

Mapsheet: 1

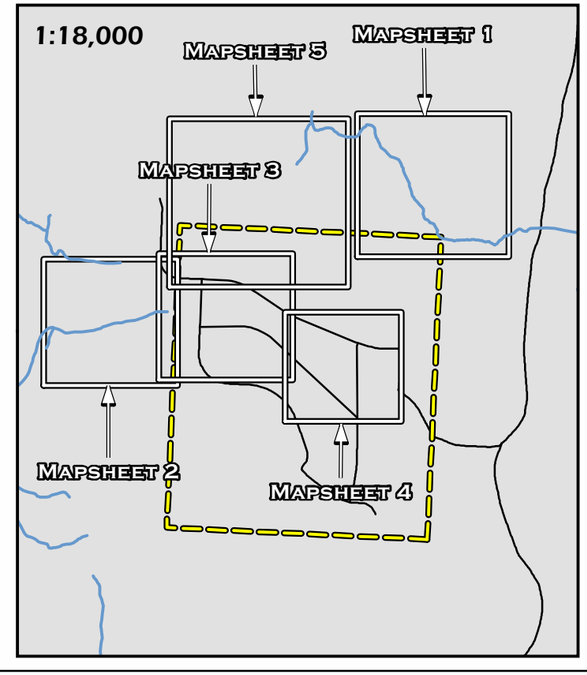
Watercourse:

Lambert Creek



LEGEND

- Stream Centerline
- High Water Level (Pond)
- Cadastre
- Recommended 15-30 m Setback/ No Build Area
- Broadleaf Forest (SHIM Identified)
- Aquatic Development Permit Area
- Terrestrial Development Permit Area
- Mapsheets
- Study Area
- Roads



1:1,700

FIGURE 5-2: VALLEY OF THE SUN

Aquatic Features and Riparian Setbacks

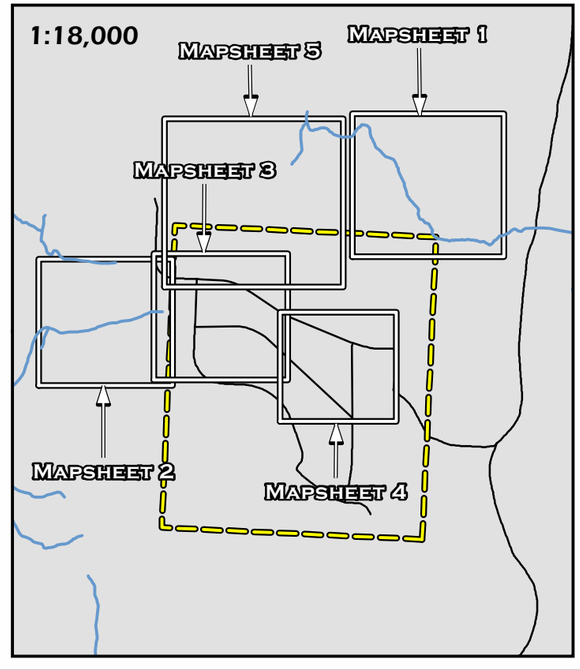
Mapsheet: 2

Watercourse:

Unnamed Spring

LEGEND

- Stream Centerline
- High Water Level (Pond)
- Cadastre
- Recommended 15-30 m Setback/ No Build Area
- Broadleaf Forest (SHIM Identified)
- Aquatic Development Permit Area
- Terrestrial Development Permit Area
- Mapsheets
- Study Area
- Roads



1:1,500

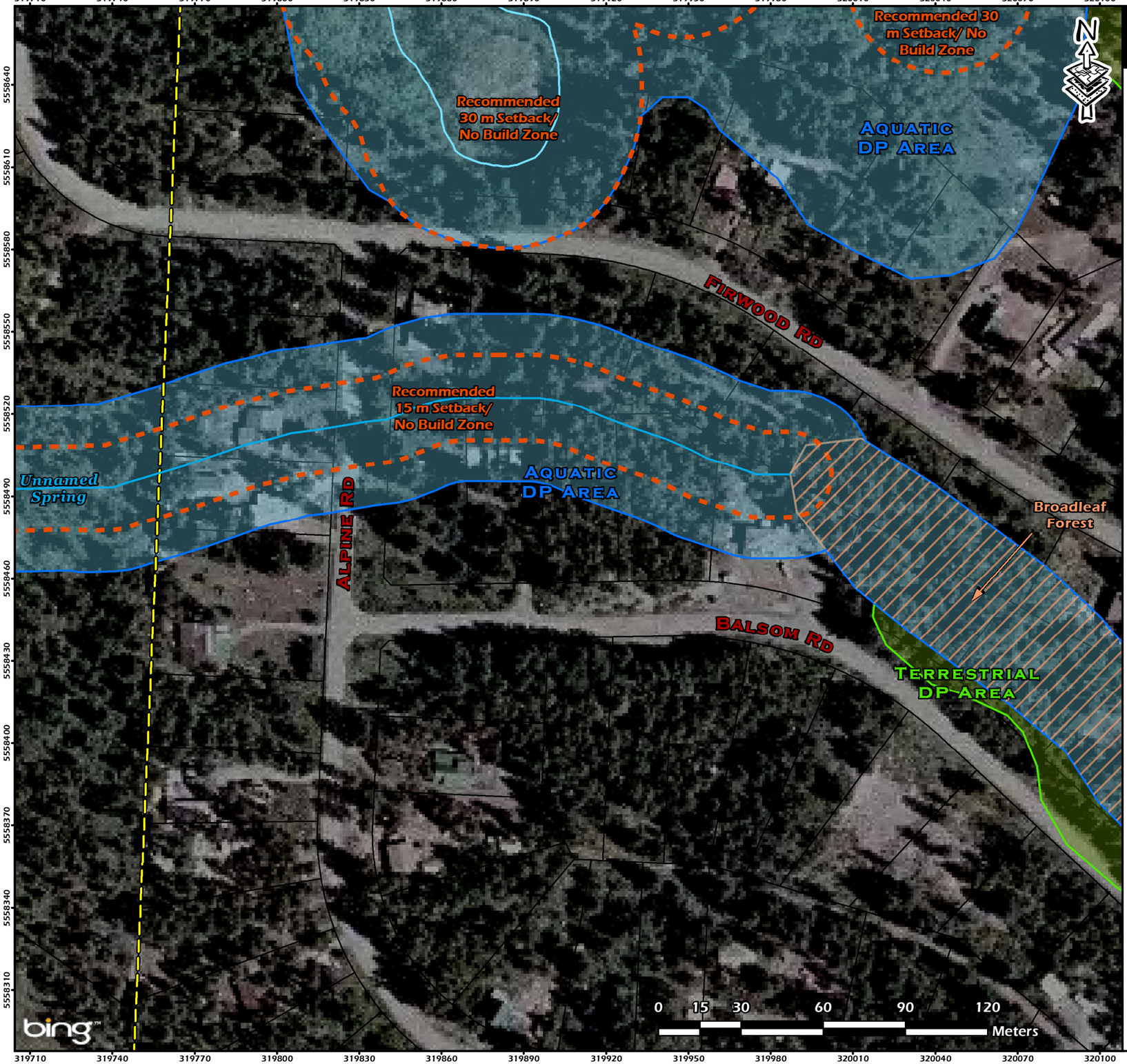
FIGURE 5-3: VALLEY OF THE SUN

Aquatic Features and Riparian Setbacks

Mapsheet: 3

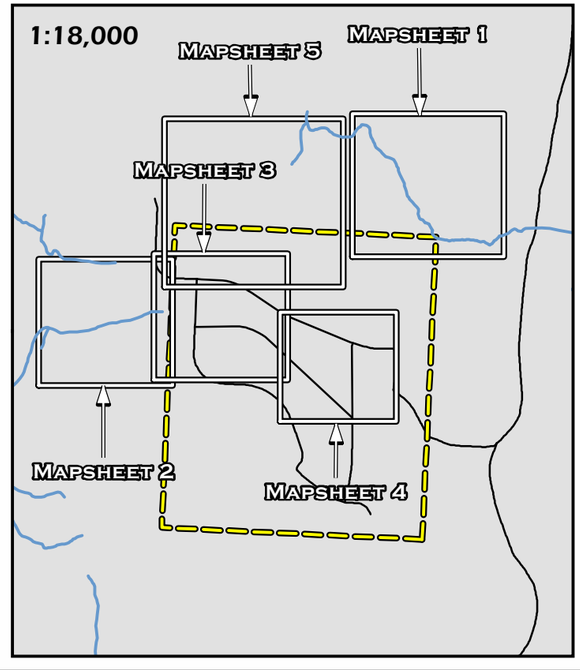
Watercourse:

Unnamed Spring 1 and Broadleaf Forest



LEGEND

- Stream Centerline
- High Water Level (Pond)
- Cadastre
- Recommended 15-30 m Setback/ No Build Area
- Broadleaf Forest (SHIM Identified)
- Aquatic Development Permit Area
- Terrestrial Development Permit Area
- Mapsheets
- Study Area
- Roads



1:1,500

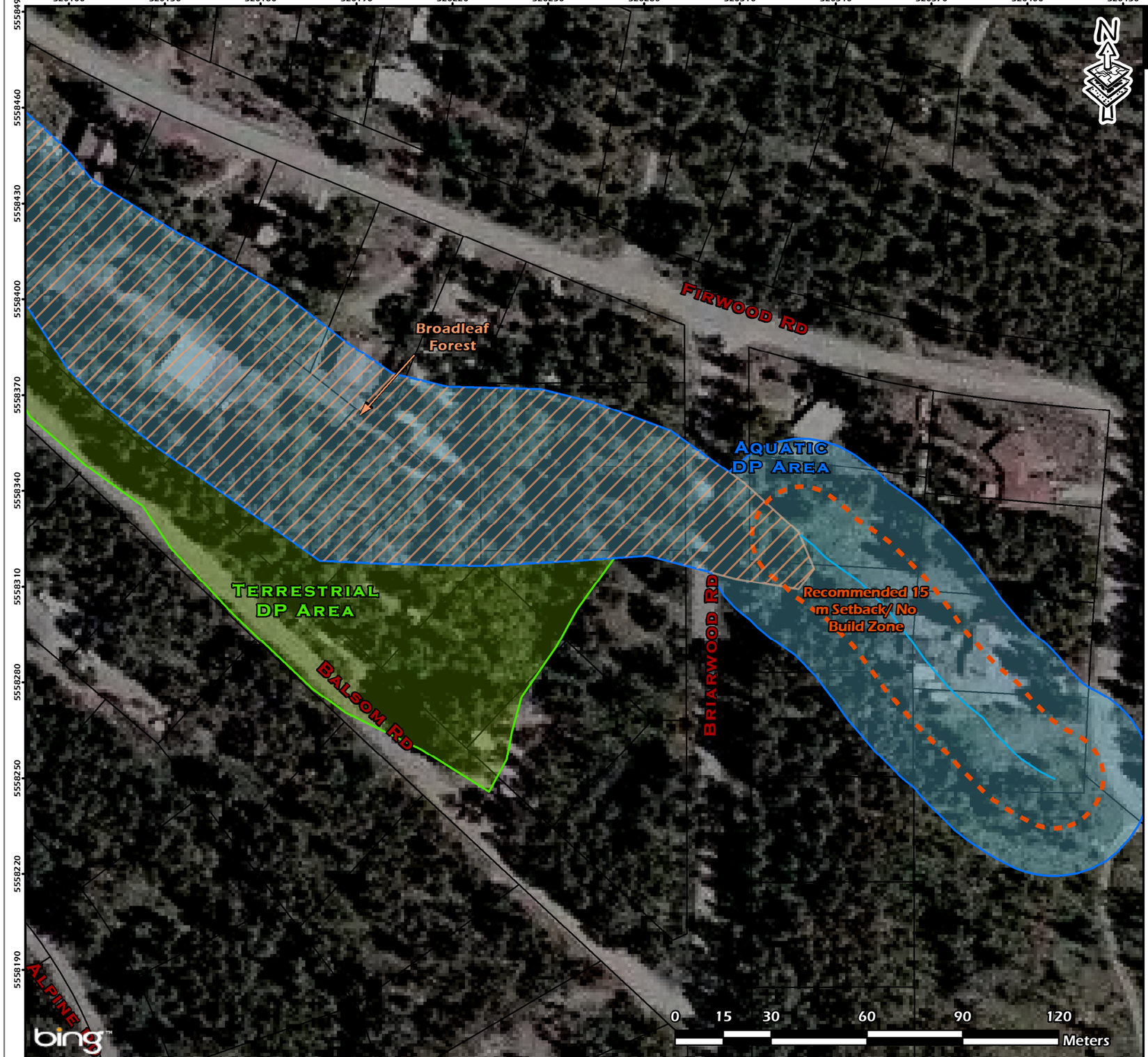
FIGURE 5-4: VALLEY OF THE SUN

Aquatic Features and Riparian Setbacks

Mapsheet: 4

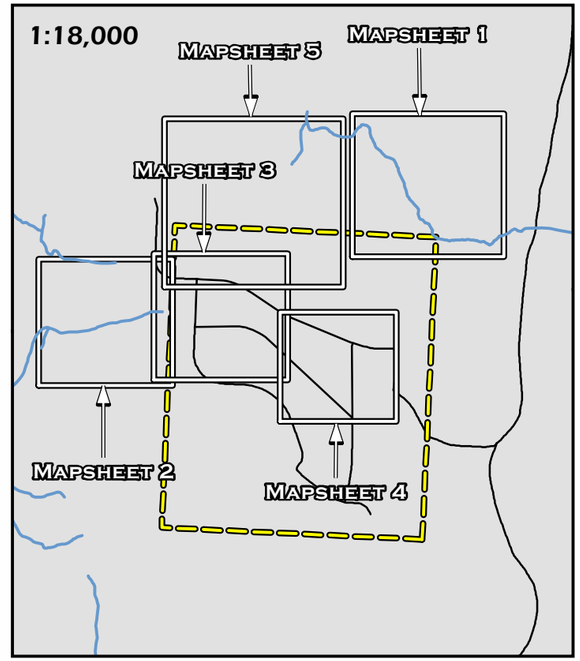
Watercourse:

Unnamed Spring 2



LEGEND

- Stream Centerline
- High Water Level (Pond)
- Cadastre
- Recommended 15-30 m Setback/ No Build Area
- Broadleaf Forest (SHIM Identified)
- Aquatic Development Permit Area
- Terrestrial Development Permit Area
- Mapsheets
- Study Area
- Roads



1:1,300

FIGURE 5-5: VALLEY OF THE SUN

Aquatic Features and Riparian Setbacks

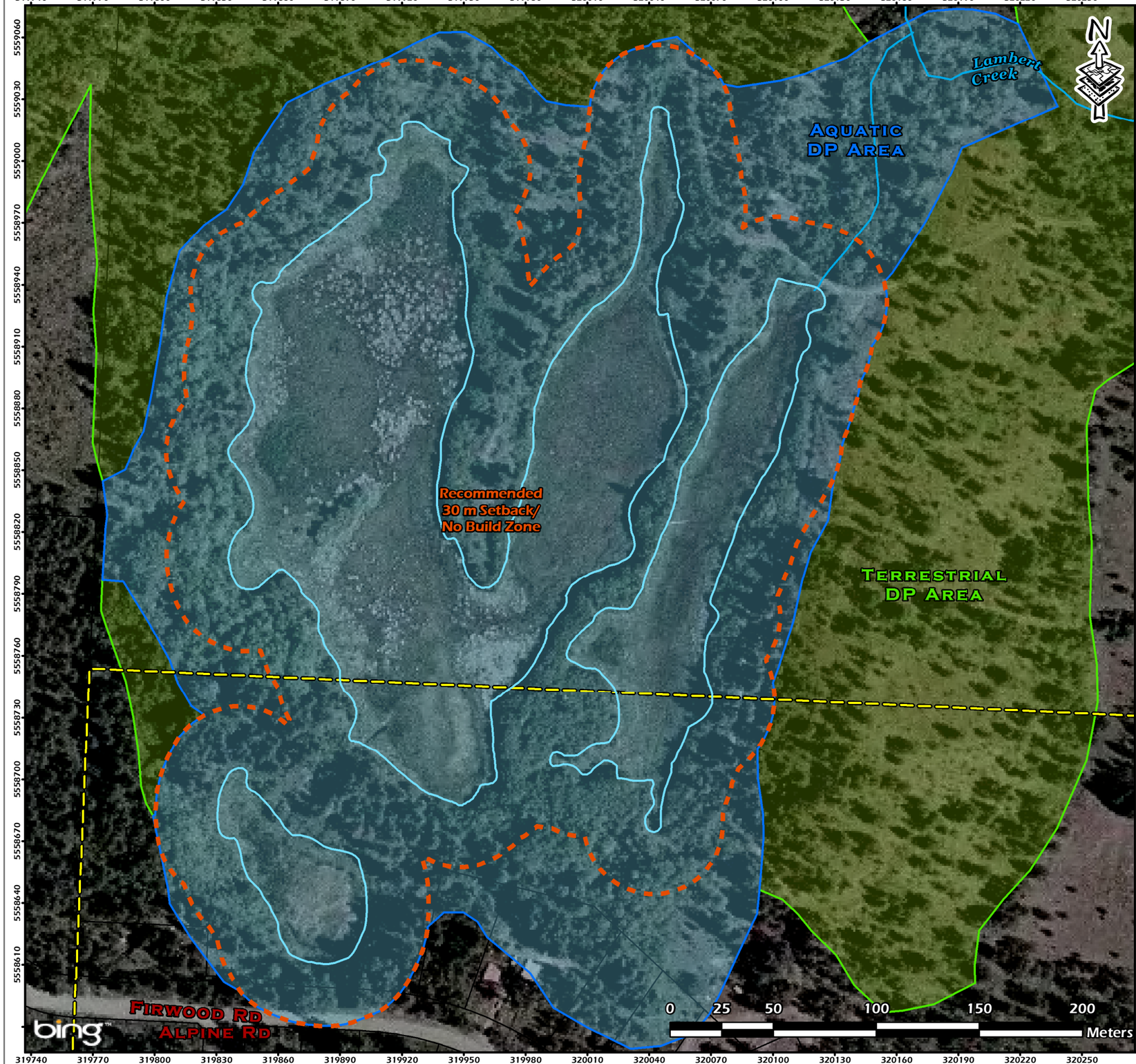
Mapsheet: 5

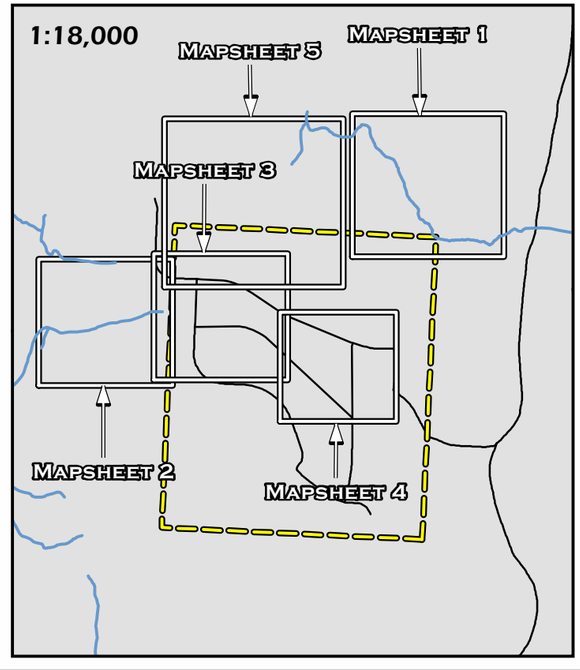
Watercourse:

Wetland

LEGEND

- Stream Centerline
- High Water Level (Pond)
- Cadastre
- Recommended 15-30 m Setback/ No Build Area
- Broadleaf Forest (SHIM Identified)
- Aquatic Development Permit Area
- Terrestrial Development Permit Area
- Mapsheets
- Study Area
- Roads





1:2,000