

ENVIRONMENTAL IMPACT ASSESSMENT OF THE CRESSMAN PROPERTY DEVELOPMENT: EAST BELLA VISTA NEIGHBOURHOOD

Prepared for:

DC Properties Ltd.
c/o New Town Services
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Kelowna, BC
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Project # 822-01.01

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Environmental Consultants Ltd.



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February 15, 2005

Reference: 822-01.01

DC Properties Ltd.
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1450 Pandosy Street
Kelowna, BC
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Attention: Mr. Keith Funk

Re: East Bella Vista Development Environmental Assessment

Summit Environmental Consultants Ltd. is pleased to provide the report for the above-noted project.

The proposed East Bella Vista Development has incorporated a number of the recommendations of Martin (1993) and the Natural Features Inventory (Clarke, et al., 1993), and the development footprint is primarily on areas that have been disturbed by historic and on-going land uses. For example, the proposed open space areas retain almost all of the cliffs and rocky outcrops that provide important habitat for snakes, bats, and certain flowering plants. The plan also calls for preservation of the only marsh on-site, preservation of the aspen copse near the "neck", creation of 30 m wide setbacks on the east side of Tassie Creek, and a detention pond to maintain runoff to pre-development levels. The areas of cliffs and steep slopes, the marsh and the aspen copse are the habitats with the greatest potential to contain the rare, threatened and endangered species that may be present on-site. We provide a list of recommended mitigation activities that, if implemented, will reduce the impacts of the proposed development.

The assessment and our conclusions are restricted to the effects of the proposed East Bella Vista Development only and did not consider the potential impacts of development within the entire East Bella Vista Highlands.

Please call if you have any questions.

Yours truly,

Summit Environmental Consultants Ltd.

Susan Stoddart, R.P.Bio.
Biologist

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1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

DC Properties Ltd. ("DC Properties") is planning to develop a residential community in the eastern part of the East Bella Vista Highlands area of Vernon, B.C., to be known as East Bella Vista Development (Figure 1.1). The property is currently zoned a mixture of A2 (small holdings) and RM2 (multiple housing residential). Planning for a residential development on this site began in 2001 with another proponent. Under Policy A9 of the City of Vernon Official Community Plan (OCP), known as Plan Vernon, an environmental impact assessment (EIA) is required to support consideration of the neighbourhood plan by City of Vernon Council. An EIA report was prepared under the direction of the original proponent in 2001. However, the original development proposal did not move forward and the City of Vernon did not complete the environmental review of that proposal. In 2004 DC Properties assumed control of the development site and prepared an updated development proposal that would retain the same general vision for the property as a residential community, but which involves some key changes in design.

In June 2004 DC Properties retained Summit Environmental Consultants Ltd. to complete an EIA of the proposed development on their behalf. This report presents the result of the EIA and provides recommendations for mitigation. It builds on the work completed by a number of previous investigators but includes new information.

1.2 PROJECT OBJECTIVES

The general objectives of this study are to identify potential environmental impacts of the proposed East Bella Vista Development ("the project") and provide recommendations to avoid or reduce any impacts that are identified. **Although land use planning has been completed for the entire East Bella Vista Highlands area ("the Highlands") this assessment report only addresses the project area and is limited to potential impacts on vegetation, wildlife and wildlife habitat, and aquatic resources from the East Bella Vista Development.** Figures 1.1, 3.1, 4.1, and 4.2 show the boundaries of the entire East Bella

Vista Highland area and the boundaries of the initial development area that is covered by this report.

Specific tasks completed to achieve the objectives are:

1. Assemble and review existing information on the site and adjacent areas;
2. Complete a field reconnaissance of the East Bella Vista Development area;
3. Describe the baseline environment, including known and potential occurrences of rare or endangered wildlife species;
4. Describe the proposed development;
5. Determine potential environmental impacts of the proposed development; and
6. Develop a mitigation strategy to avoid or minimise any identified environmental effects.

2.0 METHODS

The EIA was completed through a review of existing information (maps, reports, and databases) and two field reconnaissance surveys. Site reconnaissance for the original proposal was completed by Hugh Hamilton, P.Ag. and Martin Gebauer, R.P.Bio. in November, 2001. An additional site reconnaissance for this report was completed by Susan Stoddart, B.Sc., R.P.Bio. in July 2004. In addition to assessing potential impacts of the proposed development, the assessment sought to evaluate a number of potential concerns raised by the Ministry of Water, Land and Air Protection (MWLAP) in letters dated August 31, 2001 and February 7, 2002 (Latimer, 2001 and 2002 – See Appendix B) after the neighbourhood plan developed by the previous proponent had been referred to MWLAP for comment by the City of Vernon. Subsequent to the involvement of the previous proponent and prior to DC assuming control of the development site, a Sensitive Ecosystem Inventory (SEI) was completed for the Bella Vista - Goose Lake Range, which includes the project area (Iverson, 2002 and Sarell and Haney, 2003). The results of the SEI were considered in this report. Finally, the assessment considered comments provided by the North Okanagan Naturalists Club (Bailey, 2001) and the Allan Brooks Nature Centre Society (Clarke, 2001).

3.0 GENERAL SITE AND PROJECT DESCRIPTION

The project area is located about 1.7 km west of downtown Vernon at elevations ranging from about 410 m to 620 m above sea level. Bedrock is a complex mixture of sedimentary rocks (shale, sandstone, conglomerate, and limestone) and volcanic rocks (andesite and basalt flows) (Kidston, 1993). Soils on the rocky knoll (i.e. Turtle Mountain) on the eastern part of the site are predominantly Orthic Black soils of the Nickel Plate series, formed on colluvium (Ministry of Environment, 1978). They are somewhat thin (10 cm-100 cm over bedrock) with moderate to high coarse fragments and good drainage. Soils on the western side of the property are Armstrong series soils, formed on morainal deposits generally deeper than 100 cm. These are Orthic Black soils with moderate coarse fragments, good drainage, and slow perviousness.

Published agricultural land capability ratings for the property are primarily Class 6 – capable for grazing only, limited by topography and shallow bedrock (Canada Land Inventory, 1977).

The development area is located in the Interior Douglas fir biogeoclimatic zone, Okanagan very dry hot variant, grassland phase (IDFxb1a) (Lloyd et al., 1990). Within this biogeoclimatic zone, and in the project area, most trees are limited to moister areas, although there are occasional Ponderosa pine trees¹ in the drier areas. Plants typically present on the south facing slopes and areas with well-drained soils include big sagebrush, prairie rose, arrow-leaved balsamroot, bluebunch wheatgrass, and Idaho fescue. In moister sites, vegetation includes trembling aspen, wild rose, tall Oregon grape, and Kentucky bluegrass.

The project area and surrounding area form part of what is known as the North Okanagan grasslands. Historically, the project area was used for cattle grazing, a practice that has likely occurred for more than 80 years and continues today. Although no longer in use, there are several gravel pits and quarries in the project area as well as a number of old tracks and trails. Noxious weeds, most notably diffuse knapweed and sulphur cinquefoil, are abundant in the project area, most likely the result of transportation of seed stock by vehicles and cattle (Martin, 1993). Although the site is privately held, hikers routinely access the site from Alexis Park Road and Davison Road.

This assessment is based on conceptual plans for the East Bella Vista Development. The proposed development, illustrated in Figure 3.1, includes:

- Low-density multiple family housing (average density of 19 units/ha);
- One and two family residential (average density of 8 units/ha);
- Medium density housing including townhouse and apartments (average density of 35 units/ha);

¹ A species list with scientific names is provided in Appendix A.

- Parks and trails; and
- Open space areas to be left in a natural condition.

Proposed landscaping emphasizes xeriscaping (i.e. landscaping with native drought-tolerant plants), and the natural attributes of the property are expected to be emphasized in marketing. All areas within the Agricultural Land Reserve (ALR) will remain so.

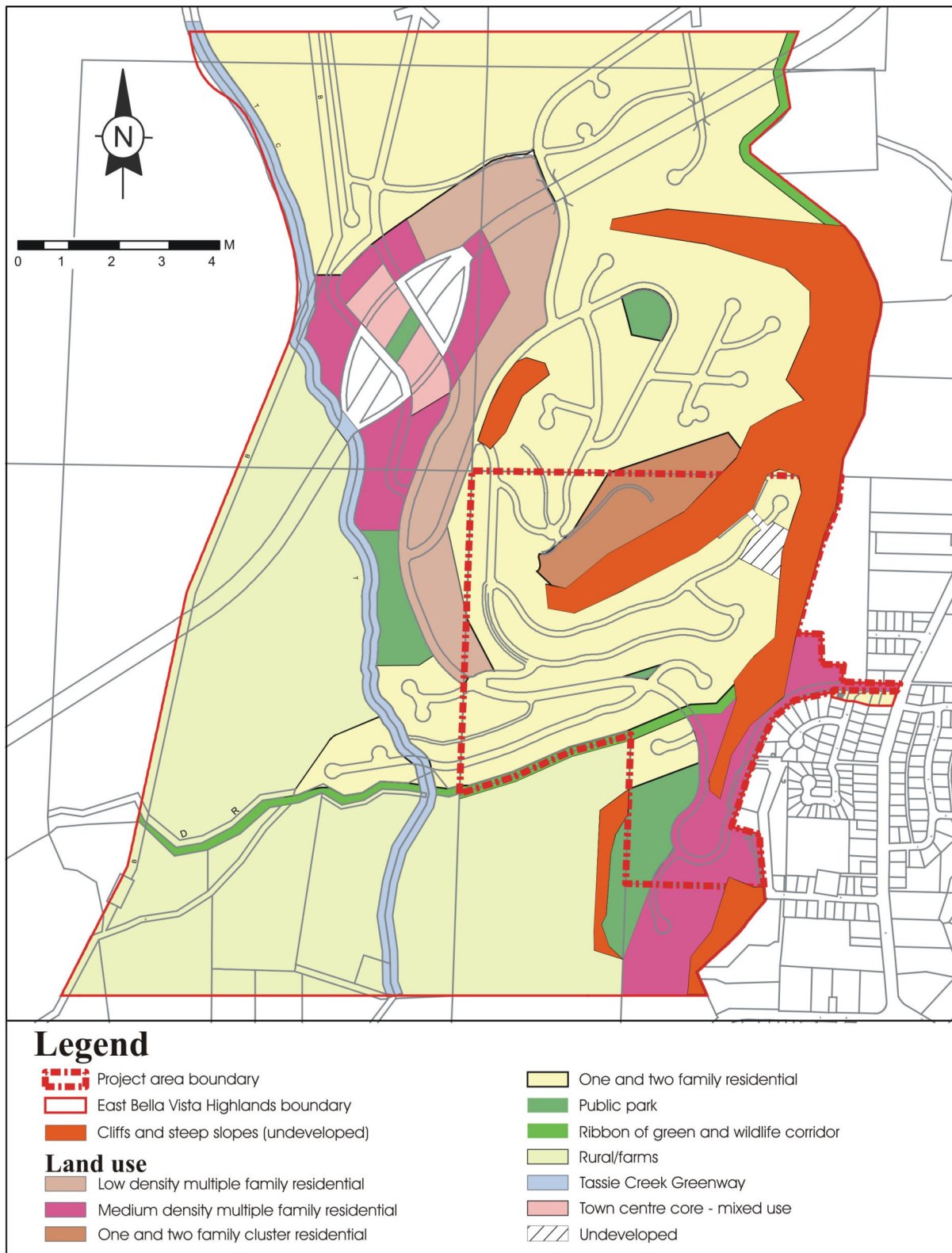


Figure 3.1. Conceptual plan for the East Bella Vista Development.

4.0 ENVIRONMENTAL ASSESSMENT

4.1 TERRESTRIAL ECOSYSTEMS, VEGETATION AND WILDLIFE

4.1.1 Baseline Environment

As noted above, the development area is located within the IDFxh1a biogeoclimatic phase, which is often referred to as the North Okanagan Grasslands. It is mostly comprised of shrub-steppe and shrubland habitats, with a few small copses of deciduous trees. These copses of trees and thickets of shrubs have high biodiversity values due to their relative rarity within the project and general area. Approximately two-thirds of the East Bella Vista Development area would be categorized as moderately to heavily disturbed from the invasion of noxious weeds, aggregate extraction, and off-road vehicle travel. Nevertheless, portions of the site are reasonably good examples of the North Okanagan grasslands. A small marsh is located in a low area above the east-facing cliffs. Vegetation within the marsh is comprised largely of great bulrush and other aquatic plants, although a large weeping willow is located on the marsh edge. Although small, the marsh functions as a wet “island” within a generally very dry environment, and thus, like the copses of trees and thickets of shrubs, contributes to the overall biodiversity of the East Bella Vista Development area. The marsh, cliffs and steep slopes, and the aspen copse are shown on Figure 4.1.

A number of reconnaissance-level biological surveys have previously been completed on the site and adjacent areas. Martin (1993) categorized the East Bella Vista Development area as a “fairly typical example” of the IDFxh1a, but noted the amount of disturbance from its natural state. Plant species identified, in addition to the ones noted in Section 3.0, included brittle prickly pear, desert parsley, saskatoon, Douglas maple, hawthorn, chokecherry, and longhorn plectritus. Martin (1993) identified several areas in good ecological condition, notably steep east and southeast facing slopes, steep rock cliffs, a copse of saskatoon and Douglas maple in the northwest part of the East Bella Vista Development area, and the marsh. A field reconnaissance completed specifically for this assessment confirmed that a significant proportion of the open shrub-steppe areas in the East Bella Vista Development area is

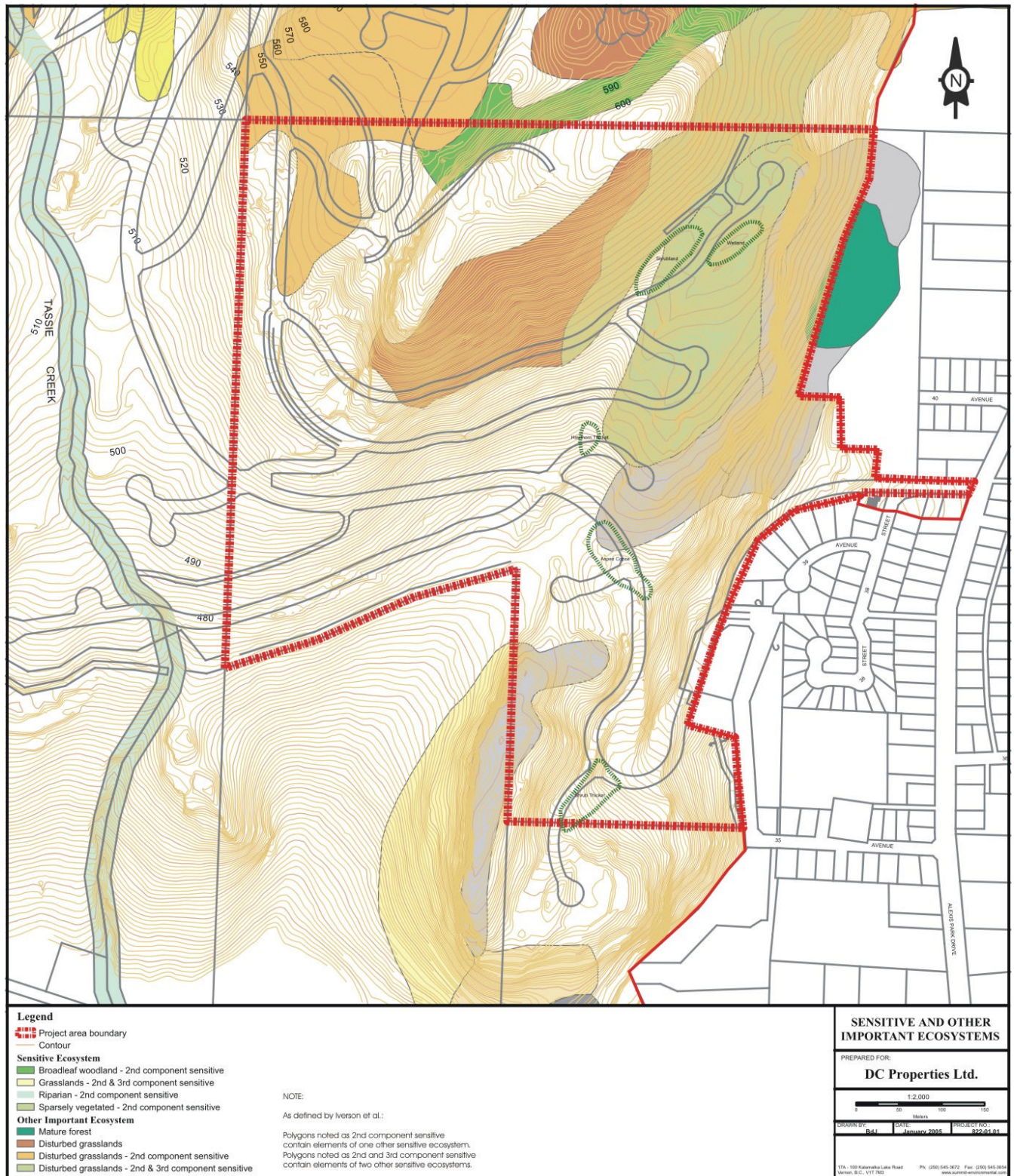
disturbed with high densities of invasive weeds, but vegetation plots have not been completed.

A natural features inventory completed for the Greater Vernon Parks and Recreation Department (GVPRD) included the Turtle Mountain area, although the report authors did not visit the site and relied on views from nearby areas and general knowledge of the North Okanagan Grasslands (Clarke, et al., 1993). They note that the cliffs and talus slopes offer habitat that is locally uncommon and that a number of rare, threatened and endangered animals *could* be present based on the site's characteristics, including western harvest mouse, great basin spadefoot toad, western rattlesnake, Swainson's hawk, and others. The actual presence or absence of those species was not confirmed.

The Sensitive Ecosystem Inventory (SEI) completed for the Bella Vista – Goose Lake Range identified two "sensitive ecosystems"² and one "important ecosystem"³ within the East Bella Vista Development area (Iverson, 2002). The sensitive ecosystems identified were the Sparsely Vegetated and Broadleaf Woodland ecosystems. The only "important ecosystem" identified by the SEI is the "Disturbed Grassland" ecosystem. These ecosystems are described in Table 4.1 below and are shown on Figure 4.1.

2 Sensitive ecosystems are defined in the SEI as one of seven ecosystem types that are ecologically fragile or are provincially rare, and are relatively unmodified by human influences.

3 Other important ecosystems are partially defined in the SEI as modified ecosystems that provide many natural values including wildlife habitat, wildlife corridors, buffers between developed areas and sensitive ecosystems, and sources of potential recruitment for some sensitive ecosystems.



(Map polygons from Iverson, 2002 superimposed on proposed road network)

Figure 4.1. Location of Sensitive Ecosystems, Other Important Ecosystems and natural features of the project area.

Table 4.1. Sensitive and other important ecosystems present in the East Bella Vista Development area.

Sensitive Ecosystem	Ecosystem Description¹
Sparsely Vegetated	This ecosystem occurs on sites where exposed bedrock or rocks limit the places where vegetation can grow. They include cliffs, rock outcrops and talus slopes with sparse shrub or grass/herb cover. Many of these ecosystems are rare and their coarse or shallow soils make them sensitive to disturbance. They provide important habitat for bats, snakes, and raptor nests.
Broadleaf Woodlands	This ecosystem occurs on sites where the climax vegetation includes a broadleaf overstory. This ecosystem occurs in moister areas and is similar to riparian ecosystems but usually does not include waterbodies. In the project area the broadleaf ecosystem is comprised of aspen copses (thickets) located in broad, moist depressions within grassland areas. Aspen copses provide cover, food and nesting habitat for many species, including those that are cavity nesters.
Other Important Ecosystem	
Disturbed Grasslands	Disturbed grasslands still provide many of the important habitat values associated with grasslands but they have some weeds (20 to 50% noxious weeds) or have lost many climax grassland species. Given the very limited extent of remaining grasslands, these are important sites for grassland restoration and maintenance of many grassland values including habitat for many rare and endangered species.

¹ Descriptions taken from Iverson, 2001

It is important to note that disturbed grasslands, as defined in the SEI, are unlikely to recover on their own without intensive restoration activities. That is, without active weed removal, replanting with native vegetation, limiting access and other activities these areas would remain disturbed, and possible become more disturbed (e.g. weed propagation) over time. It is also important to note that, while providing valuable information on the ecological resources in the Bella Vista – Goose Lake Range area, the SEI is not a regulatory document.

The SEI project also included habitat summaries, species-habitat modeling and habitat suitability⁴ mapping for ten wildlife species considered at risk in B.C. (Sarell and Haney, 2003). These species are a subset of the large number of rare or endangered wildlife that *potentially* occur in the Bella Vista – Goose Lake Range. The species considered are listed in Table 4.2.

Table 4.2. Rare or endangered wildlife considered in the Bella Vista – Goose Lake Range SEI.

Scientific Name	Common Name	Prov. Status ¹	COSEWIC Status ²
<i>Spea intermontana</i>	Great Basin Spadefoot	Blue	Threatened
<i>Crotalus oreganos</i>	Northern Pacific Rattlesnake	Blue	-
<i>Pituophis catenifer</i>	Gopher Snake	Blue	Threatened
<i>Buteo swainsoni</i>	Swainson's Hawk	Red	-
<i>Numenius americanus</i>	Long-billed Curlew	Blue	Special Concern
<i>Otus kennicotti macfarlanei</i>	Interior Western Screech-owl	Red	Endangered
<i>Icteria virens</i>	Yellow-breasted Chat	Red	Endangered
<i>Spizella breweri breweri</i>	Brewer's Sparrow	Red	-
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	Red	-
<i>Taxidea taxus</i>	Badger	Red	Endangered

¹ Provincial Status: Blue-listed species are considered to be Vulnerable in British Columbia. Vulnerable taxa are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Red-listed species have or are candidates for Extirpated, Endangered, or Threatened status in British Columbia. Extirpated taxa no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction. Threatened taxa are likely to become endangered if limiting factors are not reversed.

² Committee on the Status of Wildlife in Canada (COSEWIC) status:
 Endangered = facing imminent extirpation in Canada or extinction
 Threatened = likely to become endangered in Canada if limiting factors are not reversed
 Special Concern = particularly sensitive to human activities or natural events

⁴ Suitability is the ability of the habitat in its current condition to support a species.

The habitat suitability maps presented in the SEI concur with observations made during field work in that the highest value habitats for these species within the East Bella Vista Development area are found in pockets of different habitats, specifically:

- the marsh;
- thickets of shrubs located in draws and gullies. Notable examples include a diverse pocket of Saskatoon, hawthorn, common snowberry, and tall Oregon grape just west of the marsh, and a thicket on the southern boundary;
- steep rock cliffs, some with significant caves and crevices; and
- the copse of trembling aspen located on the eastern edge of the East Bella Vista Development area where the property narrows and a collector road is proposed (Figure 4.1). This area is referred to as “the neck”.
-

A search of the B.C. Conservation Data Centre database of rare element occurrences was commissioned for this assessment. The request asked for all records within four kilometres of the centre of the East Bella Vista Development site (UTM coordinates 337300 E, 5571400 N). The results indicated the presence of six red-listed plants, six blue-listed plants and one red-listed vertebrate animal (Table 4.3). The CDC search did not find any records of red or blue-listed plant communities.

None of the species in Table 4.2 have been confirmed to occur within the East Bella Vista Development area. Most of the plants in Table 4.3 occur on moist to wet sites, which suggest they would only present near the marsh and Tassie Creek. Development is not planned within these areas. In addition to the species listed in Table 4.2 and 4.3, there are several additional rare or endangered species that could occur in the project area. As a detailed plant and wildlife inventory was not conducted as part of this assessment, it cannot be stated conclusively that red or blue-listed plants, animals, or plant communities are absent from the project area, only that no record has been submitted.

Wildlife species observed during field visits included mule deer (a group of six were seen near the west boundary of the Turtle Mountain Uplands area, plus numerous tracks and pellet groups), coyote, northern pocket gopher, and ten bird species (Appendix A). This list of wildlife is not exhaustive and many more species are likely to use the area. For example, Christmas Bird Count data indicates there are additional bird species that frequent the project area (Bodkin, pers. comm., 2005).

Table 4.3. Rare element occurrences within four kilometres of the centre of the project site (CDC, 2004).

Species	Common Name	Status	Preferred Habitat ¹
Vascular Plants			
<i>Azolla mexicana</i>	Mexican Mosquito Fern		Sloughs and pools
<i>Berula erecta</i>	Cut-leaved Water-Parsnip	Red	Wet to moist shorelines, streambanks, ditches, and open areas
<i>Carex amplifolia</i>	Bigleaf Sedge	Blue	Moist meadows, swamps and bogs
<i>Carex hystricina</i>	Porcupine Sedge	Blue	Swamps, shorelines and wet meadows
<i>Cuscuta pentagona</i>	Field Dodder	Blue	Parasitic, especially on Legumes
<i>Cyperus erythrorhizos</i>	Red-rooted Cyperus	Red	Moist to wet lakeshores
<i>Cyperus squarrosus</i>	Awned Cyperus	Blue	Moist to wet, often sandy sites
<i>Epipactis gigantea</i>	Giant Helleborine	Blue	Moist streambanks, calcareous fens, marshes and swamps, and around hot springs
<i>Impatiens aurella</i>	Orange Touch-me-not	Blue	Moist streambanks and meadows
<i>Marsilea vestita</i>	Hairy Water-clover	Red	Inundated lake margins
<i>Salix amygdaloides</i>	Peach-leaf Willow	Red	Moist to mesic floodplains and lakeshores
<i>Verbena hastata</i> var. <i>scabra</i>	Blue Vervain	Red	Moist to wet ditches, meadows and marshes
Vertebrate Animal			
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	Red	Breed in dry, moderately open grasslands, avoiding areas with extensive shrub cover

¹ Information sources include Douglas et al. (2002) and Fraser et al. (1999).

4.1.2 Potential Impacts

The footprint of the proposed neighbourhood plan has been designed in such a way as to take into account the previous suggestions of Martin (1993) to preserve a number of ecological values, specifically the marsh, cliffs and talus slopes, and several areas of steep slopes. As a result, most of the proposed development is slated to take place on shrub-steppe areas that are generally already disturbed. Although the disturbed areas could be restored to a more natural state through active intervention (e.g. weed removal, reclamation of trails, etc.), they are unlikely to return to a natural state on their own.

To determine the extent of footprint impacts from the proposed development, we determined the proportion of each sensitive ecosystem overlaid by proposed development. We understand that lots containing portions of the cliffs and steep slope areas will be bound by a "no build" covenant to protect these areas and that "no-build" covenants will also apply to areas near the aspen copse and connector area near the neck.

Table 4.4 summarizes the extent of footprint impacts. It is important to note that these impacts assume the footprint is comprised of the entire area designated for development. Therefore the estimates in Table 4.4 are conservative and the spatial extent of the impacts will likely be lower than indicated. Only 5.2 ha out of a total project area of 44.8 were identified as containing sensitive ecosystems in the SEI. Of that area, approximately 2.9 ha of sensitive ecosystem is zoned for development.

Table 4.4. Proportion of Sensitive Ecosystems and Other Important Ecosystems to be developed.

Ecosystem Type	Total Area (ha) (% of total area)	Area to be Developed ² (ha)	Proportion of ecosystem to be Developed (%)
"Sensitive Ecosystem" (SE)¹			
Sparsely Vegetated	4.7 (10.5%)	2.4	51
Broadleaf Woodland ³	0.5 (1.1%)	0.5	100
"Other Important Ecosystem" (OIE)¹			
Disturbed Grasslands	11.6 (25.9%)	7.8	68
Not designated as SE or OIE	28.0 (63%)	26.7	95
Total Area	44.8 (100%)	37.4	83.5

¹ As defined in Iverson, 2001

² The areas in this column do not include cliffs and steep rocky slopes where no development will occur.

³ The polygon for this OIE does not include the aspen copse referred to in this report and is a portion of a much larger polygon identified as Broadleaf Woodland that extends outside of the project area.

In their August 31, 2001 and February 7, 2002 letters, MWLAP identified several concerns with respect to wildlife habitat. Each is discussed in turn below.

The potential for development to isolate the marsh, limiting the movement of terrestrial animals to the open spaces that will be maintained on site. The marsh is currently a considerable distance from any other wetland, pond, or watercourse and there is likely low probability that amphibians move far from the marsh on a regular basis. However, other wildlife species would access the marsh as a source of water, and some connection to both upslope and downslope areas would be beneficial. The current plan shows a road ending in a cul-de-sac just north of the marsh, but the road to the south stops about 40 m from the marsh. Thus a connection to the cliffs and steep slopes to the east of the marsh area is feasible. Following review of a draft version of this report, DC Properties has committed to creation of a 30 m wide connection between the marsh and the steep area to the east where no development is planned. Figures 3.1 and 4.2 shows the proposed location of this connection. DC Properties has also committed to retention of an undeveloped corridor connecting the marsh to upslope areas to the west. Although the access road will cross this connecting area

(Figures 3.1 and 4.2), retention of natural vegetation between the pond and upslope areas will provide connectivity between habitat types. This connection may be of particular importance to the Great Basin Spadefoot toad as moderate and high value living habitat is located south and west of the marsh (Iverson, 2004). As part of the connecting corridor to the west, a dry culvert should be placed under the road to facilitate small animal movement.

Connectivity. North to south connectivity within the Highlands is currently provided in the plan by the 30 m setback along Tassie Creek and by the park and open space along the site's eastern boundary. Connection of open space in the eastern portion to the western portion of the project area (and the remainder of the Highlands) is provided by the Ribbon of Green Trail and a "connector" at the top of the neck. The connector is 20 m wide and will connect the undeveloped eastern portion of the project area to the western portion of the Highlands. The connector will also protect the aspen copse located northeast of the neck. As noted above, the conceptual plan currently shows this area as zoned for housing. However, we understand that "no-build" covenants will be in place to protect this "connector". The connector should be thickly planted with native trees and shrubs. Planting as much of the fill area as possible with native shrubs can further enhance connectivity at this location. Thorny shrubs should be planted close to the trail in this area to discourage human access into the aspen copse and the connector. With the exception of the underpass, the proposed trail will be located beside this connector, resulting in a 30 to 32 m wide corridor that wildlife can use.

The proposed "ribbons of green" trail is approximately 10 m to 12 m wide, and extends along the eastern boundary of the project area, under the connector road, and along the southern boundary of the project area to its western edge. An underpass is proposed for the trail where it crosses the road, and it is likely that wildlife would also use the underpass, especially at night. The proposed trail will provide a corridor connecting the eastern and western portions of the Highlands.

Roads and Small Animal Mortality. Many of the areas in the project area with high potential for snake hibernacula to be present are to be left as open space and retain connection to

grassland areas where foraging would take place (i.e. the east-facing slopes located north of the East Bella Vista Development area). As noted above, a pedestrian underpass is planned for the “neck” area and animals are also expected to make use of it. In general, reptiles, amphibians, and small mammals will also make use of culverts to pass under roads, particularly if located where roads cross natural draws with shrub cover. A road is planned for the north side of the marsh. A culvert should be installed under the road at this location to facilitate wildlife travel (see Figure 4.2). Where feasible, additional culverts should be installed beneath roads to facilitate small animal travel. Possible locations are shown on Figure 4.2.

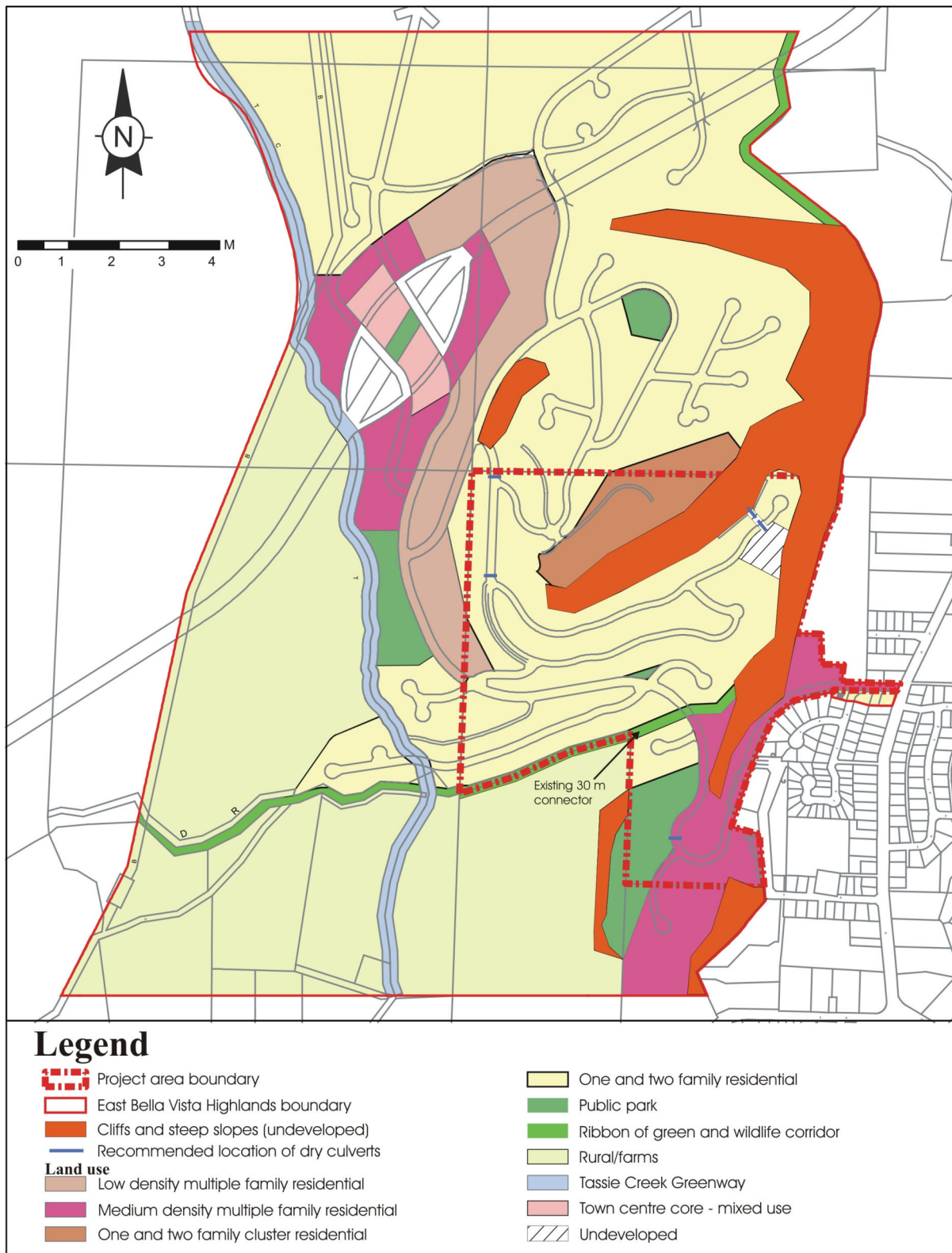


Figure 4.2. Proposed location of connectors and dry culverts.

The design of these culverts should be customized to the access needs of the wildlife species expected to use them. For example, the use of barriers or low fencing systems may be useful in guiding some species to the tunnel entrance (as suggested by Latimer, 2002). Also, access culverts should be buried to about one-third to one half of the culvert depth and filled with soil to ground level. This will provide a natural substrate that will be more suitable for small animal travel than corrugated pipe.

4.1.3 Mitigation Strategy

Recommended steps to minimize effects on terrestrial habitat values are as follows:

- As planned, preserve the marsh as open space. No surface runoff should be directed into the marsh and the existing native plants should be maintained. Buffers of about 10-15 m should be maintained around the marsh with native vegetation. Gaps in the buffers should be planted with thorny native species (e.g., hawthorn, wild rose) to limit human access, except perhaps to a specially designed viewing platform;
- As planned, create a 30 m wide connector between the marsh and the cliffs and steep slopes to the east as well as a corridor between the marsh and the upslope areas to the west, as shown on Figures 3.1 and 4.2. A low fence is suggested as a way to discourage human access into the connector (unless the neighbouring property line already has a fence);
- For the road located north of the marsh, a partially buried culvert should be installed to facilitate small mammal travel (Figure 4.2). Other partially buried culverts should be installed at locations where roads cross natural draws and gullies. Design of these access points should include features that direct animals to the tunnel entrance (e.g. barriers or low fencing structures);
- As planned, create a 20 m to 30 m wide connector including a large portion of the aspen copse in "the neck". Unvegetated areas in this connector and fill areas alongside the

connector road should be thickly (≥ 1 plant/m²) planted with native trees and shrubs (provided they do not form a hazard for drivers);

- The trail underpass at “the neck” should be as wide as possible;
- Existing mature Ponderosa pine on the site should be preserved if at all feasible;
- Where reasonable, existing thickets of saskatoon, hawthorn, and snowberry should be retained. If it is necessary to remove any such thickets, opportunities should be sought to plant these species in draws and gullies in the open space areas (e.g., in areas where grazing may have reduced shrub cover);
- Emphasize the use of native plants in landscaping of common areas, and encourage native plants in the landscaping of private property (Note: The target market for the development is understood to be people over 50 years of age. These people are expected to be receptive to xeriscaping because of its lower maintenance requirements compared to irrigated lawns and gardens);
- Land activities should not occur during the sensitive nesting period of birds between 01 April and 31 July. All active bird nests are fully protected under the B.C. *Wildlife Act* and it is an offence to destroy nests occupied by a bird, its eggs or its young. Development can only proceed within this period if a survey has concluded that no nests are present; and
- Finally, prior to finalizing detailed development plans, plant and wildlife surveys should be conducted in areas to be developed in April or May, 2005. Although no development is planned in areas with the highest potential to contain rare and endangered species (i.e. the marsh, cliffs and steep slopes, and the aspen copse), it is possible that rare and endangered species are present in the remainder of the project area. Information collected during the surveys can be used to refine the mitigation strategies outlined here.

4.2 AQUATIC RESOURCES

4.2.1 Baseline Environment

There are no streams within the East Bella Vista Development area. The nearest creek is Tassie Creek which flows in a south to north direction and is located just west of the proposed development (Figure 1.1). While the development area does not extend to Tassie Creek, the creek is included in the surrounding area (i.e. East Bella Vista Highlands) that will be assessed at a later date. This creek is ephemeral, flowing only during storm events and during spring freshet. Downstream of the study area Tassie Creek flows through residential and commercial areas until it reaches Vernon Creek near the sewage treatment plant. The 300 m long section of Tassie Creek south of Davison Road has an average gradient of about 18%. From Davison Road to the north property boundary the average channel gradient is about 7%.

There are no records of fish presence in Tassie Creek in the FishWizard database (BC Fisheries and Fisheries and Oceans Canada. 2004). Fish are unlikely to be present anywhere north of Bella Vista Road due to the ephemeral nature of the stream, the lack of headwater lake, and steep gradients south of the project area.

Vernon Creek, located approximately 750 m south of the East Bella Vista Development area, is a fish-bearing stream. Species known to occur in Vernon Creek include Burbot, Carp, Kokanee, Northern Pikeminnow, Prickly Sculpin, Rainbow Trout, Redside Shiner, Sculpin, and Sucker (BC Fisheries and Fisheries and Oceans Canada. 2004).

As described above, there is one wetland within the project area (Figure 4.1). It is a marsh that is about 2,000 m² (0.2 ha) in size, including the riparian zone. The maximum area of open water is about 600 m² and standing water is rare during the summer months. Groundwater likely remains close to the surface, however, given the observed vigor of the bulrush in the marsh.

4.2.2 Potential Impacts

As noted above, the proposed development does not encroach on Tassie Creek. However, conceptual plans for the Highlands includes a 30 m riparian buffer along each bank of Tassie Creek. The proposed 30 m setback is more than adequate to protect existing riparian values and avoid direct impacts to riparian function.

The default riparian setback for Tassie Creek under the new Riparian Areas Regulation (RAR) of the *Fish Protection Act* is 30 m. This setback exceeds that required to protect riparian functions associated with large woody debris (e.g. bank stability and channel morphology), shading, and food and nutrient input. However, the RAR assessment methodology defaults to 30 m setbacks for the protection of the filtering capacity of the riparian areas.

Native vegetation is expected to become re-established in the set-back after development in the natural/open space areas because of the anticipated reduction in grazing pressure. This should result in a net improvement in riparian function (i.e., shade, litter) compared to baseline conditions. While a walking trail is proposed for the Tassie Creek corridor (Figure 3.1), within the 30 m setback, the trail can be designed to avoid impacts to the filtering capacity of creekside vegetation.

Potential impacts on the marsh and recommended mitigation measures are presented in Section 4.1.

At present about half of the East Bella Vista Development Area drains towards the east while the remainder (23.32 ha) drains towards the southwest. The proposed stormwater drainage plan for the East Bella Vista Development area will result in a small increase in the area of the site that drains towards the southwest (to 28.27 ha).

The drainage plan include construction of a detention pond in the southeast corner of the East Bella Vista Development area that has been sized to maintain post-development flows to pre-development levels. If this is done there will be no change in the size of peak flows in Tassie

Creek and negligible potential for increased channel scour. The detention pond will also reduce sediment concentrations in storm runoff that might otherwise be transported to Tassie Creek and onto Vernon Creek.

MWLAP has expressed concern that the detention pond could “concentrate many contaminants” (Latimer, 2001: p. 3). The area of the development that will drain to the proposed detention pond will be all low-density housing. Thus any contaminants in stormwater would tend to be those associated with residential developments, primarily sediment and small amounts of hydrocarbons and lawn chemicals. Hydrocarbons and many common lawn chemicals are biodegradable, suggesting little potential for concentration to levels toxic to wildlife in the detention pond given the drainage area involved. Nevertheless, as pointed out in the MWLAP letter, there could be some benefit in incorporating infiltration capacity into the stormwater system where soils are adequate for this purpose (i.e. infiltration chambers, where feasible). From a water quality perspective this would enhance the settling of sediment and thus reduce the potential for contaminant transfer since chemicals tend to bind with fine sediment. Regular maintenance of catchbasins and sumps would be needed to minimize sediment remobilization.

Additional activities that would reduce the amount of contaminants reaching the detention basin should be considered. These include:

- Including a sediment forebay in the design of the detention basin. This would enable sediment to be easily trapped and cleaned out on occasion;
- Minimizing the are of impervious surfaces throughout the site; and
- Educating homeowners on the impacts of fertilizers and herbicides/pesticides, and placing the “yellow fish” symbol on catch-basins.

4.2.3 Mitigation Strategy

Recommended mitigation steps to minimize the potential for effects on aquatic biota and off-site water quality are as follows:

- As planned, maintain 30 m wide buffers to Tassie Creek. The proposed trail should be on the outer edge of the set-back;
- As planned, the storm system should be designed to maintain post-development flows to pre-design levels. Ideally the system would include some infiltration and sediment trapping capacity (such as a sediment forebay) to minimize the risk of contaminant transfer off-site;
- A sediment and erosion control plan should be developed and implemented during construction of the development. This plan should follow the guidelines in Land Development Guidelines for the Protection of Aquatic Habitat (Chilibeck et al., 1992), adapted to site conditions. Key elements of the sediment control procedures would include installing temporary fencing or equivalent to ensure that the 30 m setback along Tassie Creek is not disturbed, use of silt fences across natural drainage paths when upslope soils are disturbed, minimizing the area of exposed soils at any one time, and revegetating disturbed areas as soon as possible;
- The area of impervious surfaces should be minimized; and
- The developer should consider educating homeowners on the impacts of fertilizers and herbicides/pesticides.

5.0

CONCLUSIONS AND RECOMMENDATIONS

The East Bella Vista Development Neighbourhood Plan has incorporated a number of the recommendations of Martin (1993) and the Natural Features Inventory (Clarke, et al., 1993), and the development footprint is primarily on areas that have been disturbed by historic and on-going land uses. The proposed open space areas retain almost all of the cliffs and rocky outcrops that provide important habitat for snakes, bats, and certain flowering plants. The plan also calls for preservation of the only marsh on-site, preservation of the aspen copse near the “neck”, creation of 30 m wide setbacks on the east side of Tassie Creek, and a detention pond to maintain runoff to pre-development levels. The areas of cliffs and steep slopes, the marsh and the aspen copse are the habitats with the greatest potential to contain the rare, threatened and endangered species that may be present on-site (see Section 4.2.1). Some of the areas that will be developed include ecosystems defined as sensitive in the Bella Vista – Goose Lake Range SEI. This includes 2.4 ha of Sparsely Vegetated ecosystem and 0.5 ha of Broadleaf Woodland.

Following are the key recommendations to minimize the environmental impacts of the proposed development. Other recommendations are provided in Sections 4.1.3 and 4.2.3.

1. As planned, maintain a 30 m wide connection between the marsh and the slopes below it to the east and retention of an undeveloped corridor connecting the marsh to upslope areas to the west. To facilitate small animal movement from the marsh area to the west, a dry culvert should be placed under the road to facilitate small animal movement.
2. The marsh should be left in a natural condition and a buffer should be retained. Weeds should be manually removed from the buffer area and any areas lacking shrub cover should be planted with thorny species to discourage human access.
3. The aspen copse near the “neck” should be protected and a minimum 20 m wide connector retained along the trail. Thickly plant native shrubs on fill areas and along the ribbon of green trail in the area.
4. Wherever reasonable, mature trees and thickets of tall shrubs should be preserved.

5. Wildlife and plant surveys should be conducted in areas where development is proposed. If rare or endangered species are present then this mitigation strategy should be refined to reflect their presence.
6. A number of partially buried culverts should be installed beneath collector roads where the roads cross dry gullies to facilitate passage by small animals. Use of barriers or low fencing systems should be considered to direct animals to the tunnel entrances.
7. The landscaping scheme for common areas should use native, drought-tolerant plants and xeriscaping should be promoted among individual homeowners. A terrestrial ecologist should be included in the landscape design process to help select plants and identify opportunities for site restoration.
8. Where soil conditions allow, incorporate on-site infiltration capacity into the stormwater system and maintain the system accordingly.
9. A detailed erosion and sedimentation control plan for construction should be put in place prior to site development.
10. A qualified environmental professional should be retained to assist with detailed site planning to ensure that the areas designated for conservation are protected.

If implemented, these mitigation strategies will significantly reduce the impacts of the proposed development. **This conclusion is restricted to the effects of the proposed East Bella Vista Development only and does not consider the potential impacts of development within the entire East Bella Vista Highlands.** As noted by most other commentators, other developments are proposed for private lands within the North Okanagan Grasslands, and the cumulative impact of habitat loss is a serious concern. The only protected area of North Okanagan Grasslands is Kalamalka Lake Provincial Park, although other areas (e.g., portions of Okanagan IR #1) are unlikely to be developed in the near future.

6.0

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