

**MITIGATION OF IMPACTS TO WILDLIFE AND WILDLIFE
HABITAT FOR ADVANCED CONSTRUCTION CANDIDATE
PACKAGE 1 (SNC-LAVALIN LTD, DONALD TO ROTH CREEK
SEGMENT OF CACHE CREEK TO THE ROCKIES PROGRAM)**

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INTRODUCTION

In late September, 1998 Manning, Cooper and Associates (MCA) was retained by the Ministry of Transportation and Highways (MOTH) to provide ongoing assessments of wildlife and wildlife habitat sensitivities along the Trans Canada Highway corridor from Mt. Revelstoke National Park to Yoho National Park. The first phase of this project includes provision of an overview of wildlife and wildlife habitat sensitivities that will assist the early planning and design phase of potential highway upgrades (MOTH 1999). Subsequent work will include provision of mitigation measures for impacts to wildlife and wildlife habitat related to construction or improvements to new or existing TCH alignments.

This report provides background information, identifies key wildlife issues and provides recommendations to mitigate impacts to wildlife and wildlife habitat related to an advance construction candidate (ACC) near Donald. This ACC is referred to as Package 1 and is scheduled for construction in 1999. Preliminary design for Package 1 has been conducted by SNC-Lavalin Inc. and detailed design is currently being undertaken by InterCAD Resources Ltd. A brief report will be submitted when detailed design is approximately 75% complete as part of the environmental approval process.

STUDY AREA

The SNC-Lavalin design area included the TCH corridor from Donald to Kicking Horse Pass (Roth Creek). Highway segments included in the SNC-Lavalin design area, as defined in the MOTH's Corridor Management Plan (Urban Systems 1998), included Segment 0985 (LKI range 30.6 (approx.) to 56.06) and Segment 0990 (LKI range 0.0 to about 13.0). Package 1 is located just south of Donald (LKI range 31.640 to 35.350) and is shown on the Roll Plan dated 18 February 1999 produced by SNC-Lavalin. Draft design includes east and west bound passing lanes being added to an existing 2-lane highway. The eastbound passing lane will be 3.36 km in length; the westbound passing lane, 2.83 km in length. Construction will be by symmetrical widening, with a narrow median. Design highway speed is 100 km/h (SNC 1999).

METHODS

We assessed wildlife and wildlife habitat sensitivities in the Package 1 study area through a combination of reviews of existing literature and data (Blood 1982; Enkon 1997; Wells 1997; Acres International 1998; Conservation Data Centre (CDC) 1998), site visits, reviews of existing mapping (TRIM, NTS topographical, airphotos, biophysical mapping for ungulate winter range) provided by the design engineers or MOTH, and discussion with approved government agency personnel.

MOTH's Wildlife Accident Reporting System (WARS) database was reviewed to help identify "road-kill" hotspots along the TCH. The WARS database includes records of road-killed animals reported to MOTH by highways maintenance contractors or MOTH personnel. Data from 1988-1997 were included in the analysis. Animals reported tend to be large and conspicuous (moose, elk, deer, bears, coyotes, porcupines). Smaller animals and birds are seldom reported. Although the accuracy of WARS data are suspect because animals are likely misidentified, not reported consistently, and precise locations of kills are not recorded, general impressions of relative rates of road-kills for general areas were thought to be obtainable. Since road-kill hotspots became evident during a preliminary analysis, during site visits we attempted to correlate the WARS database with landscape features such as side valleys, wetlands, cliffs, winter range, river crossings, slope etc. that would help identify the boundaries of movement corridors.

Site visits were conducted on 9-10 November 1998, and 27 November 1998, and 14-15 December 1998. During site visits we drove the highway and documented noteworthy wildlife habitat features, assessed the landscape for potential movement corridors for large mammals such as ungulates and carnivores, recorded all wildlife observed, and mapped the extent of wetlands, riparian areas, and wildlife trees. We also walked certain areas (in December 1998) near Package 1 (Donald Bridge, CPR overpass at Donald, Donald Road) that were thought to be ungulate crossing sites and checked for signs of ungulates and presence of game trails.

To provide input for an existing conditions report (ECR), our initial wildlife and wildlife habitat assessments were confined to about a 100 m wide corridor centred on the existing highway, except when new proposed alignments were brought to our attention by MOTH or SNC-Lavalin. Wildlife habitat sensitivity was rated after considering the habitat type, the extent of the habitat, the general quality of the habitat, the habitat's relative rarity within the study area and Region 3, and the species of wildlife known or thought likely to occur there.

In general, *high* sensitivity ratings were given to large and/or productive wetlands, significant riparian areas (very rare along the TCH corridor in this study area), known critical habitats for Red and Blue-listed wildlife, sites used for nesting by raptors (e.g., Bald Eagle, Osprey) and Great Blue Heron, ungulate mineral licks, high quality ungulate winter range, or documented sites for rare plants or plant communities. A *moderate* rating was given to small, fragmented, or less productive wetlands, small groups of wildlife trees, moderate quality ungulate winter range, and potential habitat for Red and Blue-listed wildlife. A *low* rating was given to very small and unproductive wetlands, relatively poor quality wildlife trees, and poor quality ungulate winter range. This information has been summarised in the draft Existing Conditions Report Wildlife Appendix in early 1999 (MOTH 1999).

Mitigation measures for potential impacts to wildlife and wildlife habitat were recommended based on the assessment of existing conditions (MOTH 1999), and anticipated impacts of construction.

RESULTS

Wildlife habitat

The uplands to the north of the TCH corridor in the Package 1 area include moderate quality ungulate winter range (MELP and SNC-Lavalin biophysical mapping), mainly for elk and deer. Moose winter range south of Donald tends to be on the west side of the Columbia River (Blood 1982), although moose also occur on the east side of the valley. Vegetation along the TCH corridor in the Package 1 area is typical of the Interior Cedar-Hemlock biogeoclimatic zone (ICH) as the ICH begins a transition into the drier Interior Douglas-fir (IDF) zone that begins near the Blaeberry River (Demarchi 1995).

Impacts to wildlife habitat in the Package 1 area are mainly related to an incremental loss of upland and ditch habitat through symmetrical widening of the TCH. In general, habitat concerns were considered to be relatively inconsequential on a local or regional scale. There were no high value wildlife habitats identified along the Package 1 area TCH construction corridor. No rare or endangered plant communities along the TCH alignment are on file with the CDC. However, a Red-listed plant, the Giant-hyssop (Douglas et al. 1998), might occur along the TCH Package 1 area as individuals had been found on the nearby Big Bend Highway (CDC 1999).

No wetlands or significant riparian areas occur. However, a narrow strip of trembling aspen and paper birch trees occur along the TCH RoW between LKI 31.9 and 32.05. These trees contain a few wildlife trees used by small woodpeckers and probably other cavity-nesting birds, but there are no high value wildlife trees present. In the Existing Conditions Report (MOTH 1999) we noted this site as a wildlife tree area and it was given a low relative sensitivity rating.

A number of seepages and/or very small creeks occur along the TCH between about LKI 31.3 and 32.1. These wet areas likely provide microhabitats for some small mammals, amphibians, and songbirds.

Wildlife movement corridors

Previous studies (Blood 1982; Enkon 1997; Wells 1997), existing data on road-killed animals (WARS 1999; ICBC 1999), local knowledge (D. Martin, B. Forbes, P. Wells pers. comm.), and site visits by MCA show that the Package 1 area is within a major wildlife movement corridor that runs north/south along the Columbia River valley. Movements of large mammals such as ungulates include general semi-annual north/south movements to and from winter and summer ranges, and local movements of summering

and wintering populations. Local movements across the TCH by ungulates occurs daily in this area. Movements of carnivores including bears, wolves, coyote, fox, and other furbearers are less well documented but as these species have a widespread distribution in the Columbia River valley, and tend to range widely, frequent encounters with the TCH corridor are inevitable.

WARS data suggest a relatively high rate of wildlife/vehicle collision hazard in the Package 1 area. We analyzed WARS data for the TCH from Kamloops to the Alberta border for the period 1988-1997 and found that the kill rate (about 3 animals/km/year) from Donald to Golden is among the highest along the TCH. WARS data suggested that an estimated 66 ungulates and bears were killed annually between Donald and Golden. WARS data and other wildlife studies (Blood 1982; Enkon 1997) suggest that moose and elk occur more frequently near Donald than they do near Golden, which raises the potential severity of collisions with vehicles compared to collisions with deer.

We analyzed WARS data by km and correlated all existing data from reports with impressions from our site visits to the Package 1 area. Our analysis suggests a high potential for large mammal/vehicle collisions (about 3 animals/km/year) between LKI 30.6 and 31.6; a relatively low collision potential (< 1 animal/km/year) between LKI 31.6 and 33.6; and a very high collision potential (about 4 animals/km/year) between LKI 33.6 to 35.4) (MOTH 1999).

Highway accident statistics (ICBC 1999) show that between 1991-1995 there were 43 vehicle accidents between LKI 30.5 and 35.5, 6 of which were attributed to "wild animals".

Along the first km south of the Donald Bridge(LKI 30.6 to 31.6) and just north of the Package 1 construction area, snow tracking in December confirmed significant crossings of the TCH by deer through the CPR underpass (Enkon 1997; MCA unpub. data). and near LKI 31.4 (Enkon 1997). We have little specific data on crossings of the TCH in the Package 1 construction area between LKI 31.5 and 35.5, except for WARS and ICBC data, but assume that movements of large mammals across the TCH are in general relatively frequent. Data associated with the CPR, however, suggest a major crossing near LKI 34.0; up to 10 moose and 40 elk are killed on the railway near there annually (P. Wells pers. comm.). Further research is needed to determine exactly where animals tend to cross the TCH there.

DISCUSSION

Mitigation of negative impacts should be considered in terms of impacts on wildlife and wildlife habitat. Impacts on wildlife are mainly related to direct mortality of animals by collision with vehicles, and the less-direct but equally important potential impact on seasonal or daily movements of animals.

Mitigation of vehicle/animal collision and negative effects on movements

The primary wildlife-related issue for Package 1 is the risk of collision with large mammals and the larger scale impact on movements of large mammals. Package 1 is situated in an area with relatively high numbers, for the TCH program area, of road-killed animals (WARS 1999) as it is located within ungulate and carnivore winter range and summer range, and is within a broad movement corridor for ungulates, bears, and other wildlife that runs north/south along the Columbia River valley.

The occurrence rate of animal-vehicle collisions is primarily a function of three factors: density of animals, traffic volume, and traffic speed. With increases in traffic volumes (for example, traffic volumes on the TCH through Banff are currently rising by 3% annually; Edmonton Journal 1995) and the faster design speeds of modern highways (an increased collision rate with elk in BNP was attributed to a larger highway with increased traffic speeds; Woods 1988), there will continue to be an increase in the frequency and severity of animal-vehicle collisions unless mitigation measures are taken.

The Package 1 area has relatively more collisions with elk and moose than deer, compared to areas closer to Golden (WARS 1999). Collisions with larger animals are more dangerous than collisions with smaller animals. Since elk and moose are three and four times heavier than mule deer, respectively, collisions with these larger ungulates cause more property damage and injuries to vehicle occupants than collisions with deer. Reported vehicle repair costs from ICBC in the 1980s were twice as high for collisions with moose compared to collisions with deer (Economic Planning Group of Canada 1986).

Fencing Systems

Fencing of highway right-of-ways is generally acknowledged as the most effective way to reduce or prevent animal-vehicle collisions, despite the high initial capital investment. Ungulate exclusion fencing has been used successfully to prevent animal-vehicle collisions on the Okanagan Connector (Merritt to Peachland) (Keystone 1995), Phase II Coquihalla Highway (Merritt to Kamloops) (B. Harper pers. comm.), and the Trans-Canada Highway (TCH) in Banff National Park (e.g., Woods 1990; Clevenger

1998a,b). To be effective, both sides of the highway needs to be fenced and fencing must be properly installed and adequately maintained.

Although fencing works well at keeping some animal species, especially ungulates, off of highways and reducing collisions (up to 95% effective in Banff National Park-Woods 1990, J. Woods pers. comm.), it may not be effective for species like bears (which can dig under or climb over; Guy Woods pers. comm.). More importantly, impacts on movements caused by fencing are apparent. For example, a period of learning is required before wildlife recognize fencing and "train" themselves to move along fence lines and use provided crossings (Keystone 1995). Some individual moose in the Okanagan Connector area, changed movement patterns as parts of the population adjusted to a more restricted home range (Keystone 1995).

More worrisome is the impact on species that may shy away from highways and fencing systems. In Banff National Park, the use of crossing structures to allow passage across the TCH through fenced areas is quite low for Grizzly Bears (Clevenger 1998b, Gibeau and Herrero 1998; J. Woods pers. comm.). Wolves also may avoid crossing the TCH in fenced areas and may even run 20-30 km to the end of the fence line before crossing, rather than use provided crossings; although some individuals do use crossing structures (Clevenger 1998b; Leeson 1996). Caribou avoid highways and fences more so than any other ungulate (J. Woods pers. comm.); therefore, where caribou occur the choice to fence or not fence becomes much more complicated.

Considerable savings in the cost of fence installation can be obtained through early preparation and planning during highway grade development (Harper and Loughheed 1988). A fencing RoW should be developed that is accessible, clean of clearing and grubbing debris, smooth enough to reduce problems with gaps under the fence, and wide enough to accommodate fencing equipment and roll out the 2.5 m fence. In practice, this ROW can essentially be a cat-track placed along the boundary of the TCH RoW, and may have a negligible additional cost.

To be effective, fencing in Package 1 must be part of an overall strategy to minimize wildlife/vehicle collisions along the corridor, particularly in areas where human safety is also at issue. Fencing must begin and end at sites that act as natural barriers. For example, the Columbia River crossing at the Donald Bridge and the Blaeberry River could be effective endpoints. Any fencing system must also include coordination with the CPR where the rail line occurs in proximity to the TCH, as it is essential to avoid having animals running along a fence line next to the railway and exposing them to being killed by trains. Fencing options for wildlife throughout the Mount Revelstoke National Park to Yoho National Park TCH corridor require a thorough analysis and assessment. MCA is currently conducting this assessment, to be completed by 31 July 1999.

Animal Crossing Structures

Any system of animal exclusion fencing should also include provisions for allowing animals to move across the highway in order to prevent disruption of migration routes and movement patterns. These include overpasses, underpasses, culverts, and one-way escape gates (Woods 1990; Clevenger 1998a). Retrofitted installation of highway underpasses can be twice as expensive as those installed during initial construction of a highway. Preliminary design for Package 1 includes provision for a crossing structure. The Roll Plan dated 18 February 1999 shows candidates for culvert-style crossings at LKI 32.16 and LKI 33.6. The feasibility of these locations for crossing structures are currently being evaluated. Potential for placing a crossing structure under or over the CPR is also being evaluated.

Highway underpasses have been shown to be effective for a variety of animal species, including large ungulates, and cougar (Foster and Humphrey 1995), and smaller furbearers (Knight 1998). Extended bridges, with room for bears and ungulates to move underneath, and culvert-style underpasses have been used in upgraded highways in Banff (Woods 1988), Florida (Sargent 1998) and Colorado (Lofholm 1998).

One issue is that large ungulates are reluctant to use confining structures (Reed et al. 1975). In Banff, wide (about 15 m) and relatively low (about 4 m) culverts seem effective for deer, but elk favour larger culverts, about 6 m high (Woods 1988). More recent data from Banff N.P. show that deer and elk use 4 m high open span underpasses, 4 m culverts, and bridge overpasses (A. Clevenger 1998b). However, in general, a larger crossing structure is better than a smaller one.

Locations of crossing structures for large mammals in Package 1 must be evaluated in the context of existing structures and the potential for new structures elsewhere along the TCH corridor. For example, the existing TCH bridge over the Columbia River at Donald, the overpass over the CPR, and the bridge over the Blaeberry River provide large and potentially very good crossing structures for all ungulates, bears, and other wildlife.

In the Package 1 area, moose are of concern and larger underpasses may be required. However, recent data from the Okanagan Connector show that culverts as small as 4 m diameter will be readily used by moose, if they are placed in a site where moose tend to cross naturally and there is little human disturbance (Keystone unpub. data). For example, one 4m culvert, placed in a natural movement corridor, was used by 34 moose and experienced only an 8% refusal rate by moose that approached the culvert then turned away. This 8% refusal rate is significantly lower than an average of 27% for all wildlife at all crossing structures in the Okanagan Connector (Keystone unpub.data), which shows that moose may readily use culverts as low as 4 m diameter as long as the structure is properly located. For Package 1, we have recommended culvert crossing structures to be a minimum of 5 m in diameter.

The Canadian Pacific Railway (CPR) right-of-way closely parallels the TCH through Package 1. The existence of a major kill zone on the CPR right-of-way, known as

the "boneyard", which occurs near LKI 34.0 (P. Wells pers. comm.), suggests that an overpass crossing structure of the TCH and CPR may be warranted. The feasibility and design of such a structure is currently being investigated. Discussions have been initiated with CPR regarding coordination of crossing structures.

Smaller tunnels and culverts have also been designed for use by amphibians in many localities. Non-perched culverts suitable for fish passage would be appropriate for amphibians in the Package 1 area. Routine placement of such culverts where needed for drainage would aid passage of amphibians and possibly other small wildlife. We are assuming that culverts recommended by the MoTH Fisheries Consultant will be satisfactory for wildlife in the Package 1 area.

Warning Signs

Beyond the obvious public relations value and liability considerations, conventional warning signs or lighted/animated warning signs have minimal effect on reducing accident rates or vehicle speed (Romin and Bissonette 1996). A system of temporary warning signs associated with reduced speed limits, erected during the period of maximum collision potential, might reduce the frequency and severity of ungulate collisions. However, it is unlikely that the signs would significantly influence motorist behaviour (Lehnert and Bissonette 1997). On the Okanagan Connector, it was felt that static wildlife signs were at least slightly effective and worth the cost of installation and maintenance (Keystone 1995). We recommend that the MoTH ensure that static wildlife signs are installed and maintained within Package #1.

Barriers

The presence of concrete roadside and median barriers may exacerbate the potential for collisions between wildlife and vehicles because they partially conceal animals from motorist's view, may act as a barrier to animal movement, and animals jumping over the barrier might do so directly into the path of oncoming traffic.

For smaller wildlife (e.g., furbearers, rodents, amphibians, reptiles, lagomorphs), concrete median and roadside barriers impede movements across the highway. For these species, scuppers large enough to facilitate passage should be incorporated into the design of the barrier. Scuppers, with cutouts along the bottom of 25 cm high and 100 cm wide would be appropriate.

Preliminary design (18 Feb 1999) for Package 1 includes placement of concrete roadside barriers with scuppers on the south side of the alignment. To facilitate passage of small wildlife, CRBs with scuppers should account for at least 20% of the barriers, or 1 every 5th barrier. Median barriers are not forecast to be needed until about 2020.

Highway Landscaping

Vegetation and topography along highway right-of-ways can influence the location that animals choose to cross the road (Romin 1994; Matthews 1998). Highway vegetation can attract wildlife species to the right-of-ways, greatly increasing the probability of collisions with vehicles. Therefore, reducing the forage quality of revegetated cuts or slopes can minimize the use of such areas by wildlife.

In areas of British Columbia where wildlife attraction to highway RoWs is an issue, legumes can be removed from hydro-seed mixtures (A. Planiden pers. comm.). For the interior seed mix, this would involve removing red clover and the two species of alfalfa. Other species in the interior formula include crested wheatgrass, slender wheatgrass, and fall rye. Fall rye may attract deer and bear which feed on the seed heads, however, the species always dies out after 3 years. The seed mixture on the Vancouver Island Highway Project was not modified for wildlife (it had 5% clover) and deer and elk now feed within the highway RoW. All hydro-seeding is now conducted by MOTH subcontractors. Off-the-shelf mixtures are likely being applied to many right-of-ways (A. Planiden pers. comm.), and rather than the standard mixtures designed by MOTH, special provisions for the contract should stipulate the seed mix be carefully designed to reduce the attraction of cuts and fills to foraging ungulates and bears.

Potential mitigation of impacts on wildlife habitat

Impacts of wildlife habitat are relatively insignificant compared to issues related to mortality of large mammals and highway safety, and the impact on movement of large mammals. However, mitigation or conservation of habitat values may be required related to loss of roadside habitat, siting of borrow or waste sites, or if rare plants or plant communities are found. In addition, habitat enhancements for other wildlife may be possible related to the construction of box culverts for fish passage or for wildlife crossing structures.

Loss of roadside habitat

Roadside habitat along Package 1 is of relatively low value for wildlife. Although the construction footprint for Package 1 will be relatively small, if we assume an additional 12 m is required for symmetrical widening of this package (which is roughly 3.7 km in length), then about 4.4 ha of habitat will be lost. We recommend that habitat be enhanced at other sites within the project area, where the value to wildlife, is higher rather than enhancing habitat along the Package 1 corridor.

Borrow or Waste Site Location

Evaluation of the impact on wildlife of any borrow or waste sites remains to be completed, as they have yet to be identified. These sites may have significant impacts on aquatic, wetland, or riparian habitats, or on significant ungulate winter ranges. The MOTH geotechnical consultants are currently scoping locations for borrow and waste, and are attempting to use existing sites wherever possible. All borrow and waste sites would be subject to the same environmental protection provisions as the TCH corridor, including sediment management and erosion control.

Modification of Highway Structures

Some highway structures are used for nesting and roosting wildlife. For example, roughening the underside of concrete box culverts has been used to make it easier for bats to attach themselves, and encourage their continued use of these sites. There may also be some opportunity for off-site enhancements at bridge structures. Other opportunities for habitat enhancements for non-target wildlife will likely also become apparent for wildlife crossing structures.

Salvaging and Translocating Significant Botanical Resources

There is potential for rare plants to occur along the TCH RoW in the Package 1 area (see Existing Conditions Report for wildlife). Late spring/early summer surveys are required to identify rare plants or rare plant communities. For many vascular plants, transplantation may be the most viable option, but other methods of conservation may be required. Conservation options for rare plants and/or communities will be addressed by a rare plant specialist, immediately upon discovery.

RECOMMENDED MITIGATION MEASURES

A number of mitigation measures are recommended for the Package 1 construction area. These are highlighted in Table 1.

Table 1. Recommended mitigation measures for Package 1.

Impact	Mitigation	Action
Wildlife collisions, highway safety	Wildlife fencing	Defer fencing but acquire and pre-construct RoW for fencing
Wildlife collisions, highway safety	Crossing structures	Plan for culverts (5 m diameter or greater) and/or overpasses to be located at appropriate sites. Initiate discussion with CPR re crossing structure location and impact. Conduct assessment for crossing structure/fencing needs for entire SNC-Lavalin project area.
Wildlife collisions, highway safety	Warning signs	Design more effective wildlife signage and place at appropriate sites
Wildlife collisions, highway safety	Concrete roadside barriers with scuppers	Plan for 20% concrete roadside barriers to have scuppers measuring about 25 cm high by 100 cm wide
Attraction of wildlife to RoW	Landscaping	Adjust seed mix to remove clover, alfalfa, or other legumes
Biodiversity	Rare plants	Survey for and translocate rare plants
Roadside loss of habitat	Potential for off-site mitigation	Provide enhancement at high value habitat sites rather than low value roadside habitat
Loss of habitat from borrow or waste sites	Location dependent, potential for offsite mitigation	Subject to same environmental provisions as TCH RoW

FIELD WORK TO BE CONDUCTED IN 1999

A number of inventory and assessment tasks will be undertaken in the late spring and early summer of 1999 along the TCH corridor and Package 1 area. General wildlife inventory will focus on 1) rare and endangered wildlife species (Red and Blue List) or Identified Wildlife that may occur along the corridor, 2) locally or regionally significant

populations of birds, small mammals, reptiles, or amphibians, and 3) further assessment of locally important wildlife habitat. Inventory will occur from May through mid July. This program will also include discussions with knowledgeable professional biologists, naturalists, trappers, and appropriate personnel in MOTH, MELP, and MOF.

An inventory of rare plants and rare plant communities along the TCH corridor, including Package 1, will be conducted in late spring and early summer 1999. If rare plants or plant communities are found, a conservation plan will be developed to best maintain current biodiversity values.

An assessment of fencing and wildlife crossing options along the TCH corridor from Donald to Kicking Horse Canyon will also be conducted this spring and early summer. This assessment will provide the context for recommendations for potential crossing structures and fencing at any specific site.

After borrow and waste sites have been identified, an assessment of their impact on wildlife and wildlife habitat will be conducted.

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