



Basic Impact Analysis (BIA)

Monarch Creek Culvert Replacements

Yoho National Park

December 2015



Parks
Canada

Parcs
Canada

Canada

**1. PROJECT TITLE**

Monarch Creek Culvert Replacement and Bank Stabilization

2. PROJECT LOCATION

Kicking Horse Campground and Yoho Valley Road

3. PROJECT SITE(S)

Monarch Creek

4. PROPONENT

Parks Canada Agency

5. PROPONENT CONTACT INFORMATION

Michael.denotter@pc.gc.ca

6. PROJECT DATES

Planned commencement: 2016-10

Planned completion: 2017-01

7. INTERNAL PROJECT FILE #

2015-062Y

8. PROJECT DESCRIPTION

Two culverts in Monarch Creek were replaced between November 2014 and March 2015. Parks Canada is proposing to replace one existing culvert, designated as culvert two, located in Monarch Creek in the Kicking Horse Campground. Culvert two is located between the two culverts that were replaced in 2014. The existing culvert is undersized and has interrupted the flow of water, debris and bedload along the channel. This has led to local scour and deposition around the crossing structure. Monarch Creek has experienced significant bank erosion in the campground, the existing and previously undersized road culverts have contributed to channel instability. Without intervention, bank erosion along Monarch Creek is expected to continue (Streamworks, 2013).

The scope of the project includes:

- Site preparation activities including selective tree removal, utility preparations, installation of temporary stream isolation/diversion techniques, soil/topsoil stripping and temporary storage.
- If full stream isolation/diversion is required, fish salvage and relocation from the isolated areas will be conducted and block nets installed by qualified biologists.
- Decommissioning of existing culvert
- Construction of new culvert including excavation activities, cast in place concrete footings, rip rap and geotextile placement inside the open bottom arch culvert.
- Re-establishment of flows through the culvert and removal of block nets.
- Removal of kitchen shelter
- Rehabilitation and re-vegetation of the site.
- Bank stabilization will include heavy rock rip rap at the inlet and outlet of the culvert, as well as at the bank adjacent to the kitchen shelter, and live willow staking near the existing creek side kitchen shelter, and mid-channel boulder clusters.

The new culvert will be constructed in the same location as the existing culvert. Detailed culvert design specifications are included in Appendix A.

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Decommissioning of the existing culvert and installation of the new culvert will be undertaken in a manner that minimizes disturbance to the creek and riparian areas. Installation of sediment fencing and other erosion control devices, as well as for site rehabilitation activities will be put in place. Portable pumps may be required as needed to accomplish necessary creek isolation/diversion and dewatering activities. Grading and sub-grading preparation for the disturbed section of roads will be conducted using standard mechanized road-grading equipment. Compaction equipment and standard municipal paving equipment will also be used in resurfacing roads.

If and where possible, excavated materials that result from the removal of the existing culvert will be used in bank stabilization measures.

The culvert replacement is expected to occur in the fall or winter while the Yoho Valley Road and campground are closed for the winter season. The work will be conducted outside of the fish timing window for Monarch Creek and Kicking Horse River. The water level in the creek is very low during the winter months and may be partly or completely frozen. Isolation and diversion will be necessary if the water is not frozen. During the 2014/2015 replacements of culverts #1 and culverts #3 there was little to no surface water flow present.

9. VALUED COMPONENTS LIKELY TO BE AFFECTED

Aquatic and Hydrological Resources

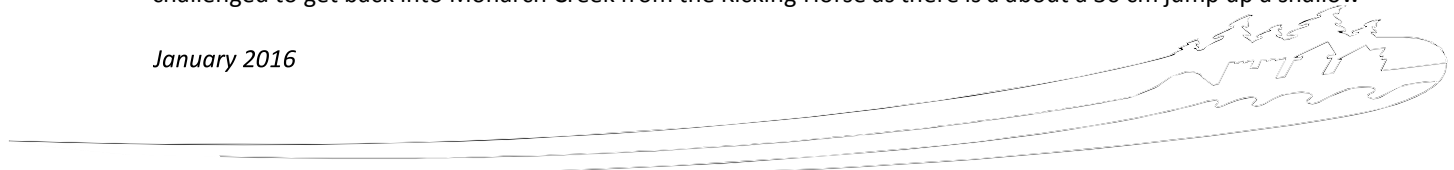
The Kicking Horse River supports several native fish species including Bull trout, Mountain Whitefish, Pygmy Whitefish and Sculpin. Introduced Brook trout and Rainbow trout are also present. Monarch Creek is a tributary to the Kicking Horse River and known to be fish bearing at the lower reach of the creek. The creek provides some rearing habitat and overwintering habitat in scour pools associated with existing culvert outlets (Streamworks, 2013). Prior to 2014 and 2015, fish were unlikely able to access the upstream scour pools at culvert #2 and #3 because culvert #1 had acute fish passage issues. However, post replacement works in 2014 and 2015, Parks Canada Aquatic staff confirmed fish presence was re-established between culvert #1 and #2 where Brook Trout were caught. However no fish were found above culvert #2.

In June, 2007 when the culvert #1 was measured at high water the culvert had a 25 cm hang height and water velocity speed inside the culvert of 3.23 m/s. At low water this velocity will be lower, but the hang height will be greater as the plunge pool will have less water.

Fish habitat quality is currently considered low to moderate within the project area due to ongoing streambank erosion, a channel that is a deposition zone for small rocks and gravel, little channel complexity and extremely shallow water depths in the 5 cm range, particularly during low flow conditions. In low water years there is little to no surface flow in the channel by December and the plunge pools have been observed to be frozen to the bottom during the cross section surveys. Bull trout, Mountain whitefish and Brook trout are all fall spawners. All three species are expected to spawn in the Kicking Horse River.

The Monarch Creek channel has been observed directly over several years and there is currently no suitable spawning habitat particularly Bull trout that are typically associated with the presence of ground water upwelling. In the locations where the substrates are the correct size the water velocity and depth are inappropriate. To confirm these observations, a spawning survey was carried out by Parks Canada Aquatic staff on October 20, 2014. No suitable spawning habitat was observed and no fish were present above the most downstream culvert. Fish were only present from the Kicking Horse River up to the bottom of the first culvert, confirming that this culvert is acting as a barrier. In anticipation of the culvert work being carried out starting in late October, all fish captured in the lowest section on October 20, 2014, were placed in the Kicking Horse River. At this low flow period fish will be challenged to get back into Monarch Creek from the Kicking Horse as there is a about a 30 cm jump up a shallow

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gravel bar from the main river channel to the entrance to Monarch Creek, without any suitable pool in the river to obtain jumping speed (Humphries, pers. comm).

Monarch Creek has established a slightly meandering, moderately aggraded, continuous riffle channel with cobble/gravel substrates moderately incised into a fluvial fan feature. Bankfull widths ranged from 6-15m and bank heights ranged from 1-2.5m. Average channel gradient was 6%. The creek is currently cutting into previously deposited substrate material and has a frequently mobile bed. Upstream of Yoho Valley Road the average channel gradient is 25% and substrate material increased to cobble/boulder (Streamworks, 2013).

The riparian vegetation along the banks of Monarch Creek within the campground is composed of mature fire suppressed coniferous forest. Riparian vegetation upstream of the Yoho Valley Road is more deciduous, consisting of alder and other pioneer species, indicating a more active channel/riparian interaction zone (Streamworks, 2013).

Periodic flooding along Monarch Creek in the campground has overtopped culverts and eroded banks. Recent flood events caused the loss of a pedestrian bridge, eroded campsites, and undermined riparian vegetation. Future flooding and bank recession may cause further loss of campground assets (Streamworks, 2013). Emergency works were conducted in July 2015 to repair subsidence of the campground road above culvert two due to short circuiting of water through a hole in the culvert walls.

Vegetation Resources

The project area is located within the Montane Ecoregion and is characterized by forests dominated by species such as Douglas fir and white spruce; aspen poplar; and grasslands. Specifically the project area is located within the Fireside Ecoregion. Vegetation at the existing culverts sites is sparse and disturbed.

No rare plants are known to exist at the sites.

Wildlife

Kicking Horse Campground is located within the Kicking Horse Pass Wildlife Corridor, the primary movement corridor between Banff and Yoho National Parks. It is a narrow corridor, bisected by the TransCanada Highway and Canadian Pacific Railway. It is one of the few passes across the continental divide that has gentle slopes and continuous forest cover, making it suitable for use as habitat and for movement by a wide range of terrestrial animals (MCSR, 2012). The campground is also important to ungulates in winter.

No Species at Risk are known to occupy the project area. The little brown myotis bat, SARA listed as schedule 1, endangered, has been observed at Cathedral Mountain Lodge, located adjacent to the Kicking Horse Campground (Wallis *et al.* 1996). It roosts under bark, in natural tree and rock cavities as well as in buildings.

Cultural Resources

The project area is located within the Kicking Horse Pass National Historic Site, designated in 1971. The reason for its designation was that the Canadian Pacific Railway (CPR) adopted it as their route through the Rockies (Parks Canada, 2007). Many Level 1 cultural resources exist in the historic site dating from construction of the railway between 1881 and 1909. The Kicking Horse Campground was established as the original campground for CPR during construction of the railway. A stone bake oven, located approximately 150m from the lower culvert to be replaced in the existing campground is classified as a Level 1 cultural resource. Several of the campground shelters are classified as Level II cultural resources. The residence located adjacent to the lower culvert near the campground kiosk is also considered a heritage building (Cairns, pers. comm; Taylor, 2000).

The LLYK cultural resource manager will be consulted. A Request for Cultural Resource Impact Assessment will

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be submitted. Valued resources will be adequately protected, if so deemed, while striking a balance with conservation of natural ecological processes and roadway improvement objectives within the existing footprint.

If determined necessary by the CRIAR or BIA, any archeological or cultural sites will be clearly marked and all reasonable precautions will be taken to protect these sites. In some cases this may also include an area around the site as a buffer zone. This information will come from the archeology field survey / site review.

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Visitor Experience- Public Facilities and Services

The project area is located within the Kicking Horse Campground and along Yoho Valley Road, both of which are seasonally open to the public from approximately May to mid October.

The waterline which supplies water to the Monarch Creek campground was relocated when culvert #1 was replaced to now be outside of the new culvert footing so it will not get damaged if there is any debris flowing in the creek. This is typically drained at the end of the camping season to prevent freezing. A septic field system servicing the campground is located approximately 30m from the upper culvert located along Yoho Valley Road. A buried septic tank exists in front of the staff residence building on the grassy area.

10. EFFECTS ANALYSIS

The majority of the work and undertakings will be restricted to previously disturbed and developed areas within the campground. The work area will include the area around culvert two, and creek locations in the vicinity of the culvert intake and outlet. To address ongoing erosion issues, a rock protection wall with overhanging vegetation plantings are planned along the eroded bank.

Aquatic and Hydrological Resources

The culvert replacement is intended to improve aquatic conditions for native fish species and the hydrology of Monarch Creek. The new culvert has been designed by hydrological engineers taking into account recommended design flows (9 m³/s) to provide the capacity for passage of substantial peak flows, coarse sediment and woody debris. The culvert will be constructed with durable materials and improve conditions for fish passage. The new culvert will be wider, open bottom arch corrugated steel 3050 x 1350 x 3 mm thick with a concrete footing.

The following potential impacts to aquatic resources are identified:

The project will require in-stream work outside of approved fish timing windows and excavation of habitat to install the culverts and associated design features such as substrate rip rap. In the short term, the work could cause adverse effects primarily by increasing sediment load within the creek. Sediment can bury fish eggs and food sources, such as invertebrates. It can also change the characteristics of the creek by infilling pools and riffles which can possibly affect the quality of the habitat. Suspended sediments can also clog and abrade fish gills and mucous membranes, causing suffocation or injury (Chillibeck *et al*, 2005).

During construction of the culverts and placement of additional rock substrate, the potential exists to entrap fish and result in injury or mortality. In-stream construction activities will temporarily (for only 1-2 weeks) block fish movement but these localized effects can be minimized (See following Section 11 on Mitigation strategies) and in the long term are mitigated by increased access to upstream habitats once culverts are installed.

During construction activities, sediment and other deleterious substances have the potential to be released through installation and removal of the stream isolation, excavating and decommissioning/installing the culvert, refueling, leaks, exposed grease or accidental spills from equipment operating in and around the creek. Wet concrete or leachate from uncured concrete from the cast in place culvert footings can come into contact with waterbodies and is toxic to fish and their prey due to its high alkalinity.

There will be a temporary reduction in fish habitat when the scour pool downstream of the lower culvert is filled as a result of culvert replacement activities and immediately before the installation of the new culvert and deeper plunge pool replacement habitat. The other plunge pools associated with the scour pools at the upper culverts that will be filled are unlikely accessible to fish because of the velocity barrier at the lower culvert and they freeze in some years. The replacement of the culvert will allow fish access to the entire stream channel within the campground. The temporary and localized reduction in plunge pool habitat at the lower culvert is also expected to

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be completely offset by future creek restoration activities along a 35m section of the bank located within the campground (between the two culvert replacements). The north bank of the channel where the kitchen shelter is, will be stabilized through the placement of Rip Rap, willow staking and erosion control blankets to deflect energy from eroding bank during high flows, promote pool scour in the channel, recruit floating woody debris and add instream cover for fish habitat. Reshaped bank areas will also be replanted with native riparian species to stabilize the new bank and protect it from unravelling (Streamworks, 2013). With implementation of the creek restoration activities and culvert replacements, fish habitat is expected to be improved from moderate to high quality. Banks will be stabilized through willow plantings along the top of the protected bank to provide root stability and overhang into the channel to provide potential additional benefits to fish habitat by providing cover for refuges, and potential foraging habitat nutrient inputs.

Localized removal or trimming of riparian vegetation may also be required for equipment access to install the new culvert and rock weir.

Wildlife

Construction activities have the potential to temporarily disturb and displace wildlife. Improper handling of garbage and food waste can lead to wildlife habituation and human wildlife conflicts. Work will occur outside of amphibian, bird and bat breeding/nesting periods.

Soils and Landforms

There is potential for soil damage and rutting as a result of equipment access to project sites, as well as soil loss as a result of wind or water erosion of disturbed soils. Loss of organic matter in soil also reduces nutrient content and water holding capacity and increases vulnerability to wind and water erosion. Repeated equipment travel along a route can also result in soil compaction (an alteration of soil structure affecting the substrate's water holding capacity, levels of aeration, microbial diversity and overall productivity). Compacted soils are vulnerable to water erosion. Vegetation associated with compacted soils is not only vulnerable to direct trampling from equipment, but also from the limited capability of compacted soils to provide the moisture and nutrient regime necessary for survival, which in turn impedes site rehabilitation.

Improper excavation and backfilling can result in loss of topsoil and/or loss of soil structure due to topsoil and subsoil mixing, as well as slope instability, ground subsidence and/or ground surface mounding/frost heave.

Cultural Resources

Replacement of the culvert is not expected to reveal any significant archaeological artifacts as the construction sites has been repeatedly worked at over the last 3 decades without identification of artifacts. Additionally, culvert replacement is not expected to disturb previously undisturbed soils for example due to substantially widening or deepening areas to allow for culvert installation. Park staff, and staff from MMM Consulting (who are providing construction supervision services) and construction crews will be briefed prior to construction on the possibility that construction could reveal artifacts and on the actions to be taken if they are found. Measures to be taken if archaeological artifacts are encountered are described in Section 11 (below). Work is not expected to impact the stone bake oven or other heritage buildings within the campground as these sites are located > 50 m from the culvert construction site. Parks staff will establish temporary barriers (wooden trestle's) adjacent to heritage sites to identify "no access" areas and these areas will be communicated to construction crews prior to and during construction to ensure that heavy equipment operations avoid these areas.

Visitor Experience- Public Facilities and Services

Work will be completed when the road and campground are closed to the public to avoid disrupting visitors. Construction also poses little risk due to dewatering. Potential effects of excavation on on-site septic fields and utilities are also considered to be minimal as they are also located away from the construction sites.





11. MITIGATION MEASURES

The following measures will be implemented in order to protect environmental and cultural resources:

Aquatic and Hydrological Resources

An Environmental Protection Plan will be developed by the contractor outlining erosion and sediment control measures, stream isolation/diversion techniques including appropriate contingency measures for unexpected water flow (e.g. extra pumps, hoses, generators), dewatering methods and locations, off-road equipment access, emergency spill response procedures, hazardous materials, temporary storage and staging areas and location of temporary washroom facilities.

Install effective sediment and erosion control measures before starting work to prevent the entry of sediment into the watercourses. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

The culvert replacement work will occur in the dry with isolation measures taken to minimize construction activities that impact water quality. Low flow conditions are anticipated at the time of year for which works are scheduled, however if flow volume is sufficient, Parks Canada staff will conduct downstream water quality monitoring during concrete pouring activities. Park staff shall define reference conditions by sampling water from a site on Monarch Creek located upstream of the construction. A downstream, potentially exposed site, will be established 50 to 100 m downstream of the construction. The downstream site will be monitored to assess the potential effects of construction. The effects of construction on water quality shall be determined as the difference in measurements taken upstream of the construction and measurements observed at the downstream site. The contractor shall adopt every reasonable measure to reduce increases in water turbidity and changes in water pH. However, construction is expected to alter both of these water chemistry measures over short time frames and at locations immediately adjacent to each culvert.

For the protection of aquatic life, the Canadian Council of Ministers of the Environment (1987) identify a maximum increase in water turbidity measured in nephelometric turbidity units (NTU) of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period) under clear water flow conditions. This threshold has been advocated for the Province of British Columbia (Caux et al. 1997; <http://www.env.gov.bc.ca/wat/wq/BCguidelines/turbidity/turbidity.html#tab1>). However, management actions in response to exceedances in the 8 NTU threshold over a 24 h period, are not described. By contrast, water quality standards and management responses to increases in water turbidity for the State of Oregon depend on the intensity and duration of the exceedances in turbidity occurring during highways project (See Table below). Given that Parks Canada does not currently have an agreed upon set of standards to maintain water quality during highway construction efforts especially those aimed at reconnecting and restoring streams, we have adopted guidelines identified in the State of Oregon, as an interim approach.

Under guidelines defined for Oregon, an exceedance will trigger a discussion between parks staff and the construction contractor to:

- i) improve the effectiveness of existing sediment control structures, or
- ii) temporarily cease construction activities until water turbidity and pH levels improve, or
- iii) deploy additional measures (e.g., water diversion and water isolation measures) to reduce water turbidity, or
- iv) cease construction temporarily.





MONITORING USING A TURBIDITY METER		
ALLOWABLE EXCEEDANCE TURBIDITY LEVEL	REQUIRED AT 1 ST MONITORING INTERVAL	ACTION REQUIRED AT 2 ND MONITORING INTERVAL
0 to 5 NTU above background	Continue to monitor every 4 hours	Continue to monitor every 4 hours
5-29 NTU above background	Modify controls and continue to monitor every 4 hours	Stop work after 8 hours at 5-29 NTU above background*
30-49 NTU above background	Modify controls and continue to monitor every 2 hours	Stop work after 2 hours at 30-49 NTU above background
50 NTU or greater	Stop Work	Stop Work
*Work stops after two consecutive readings within this turbidity range.		

In terms of water pH, the Canadian Council of Ministers of the Environment (1987) identified a range in pH of 6.5 to 9.0 for the protection of aquatic life (CCME 1987). Changes in water pH could occur due to establishing concrete culvert footings, although changes in water pH are expected to be very minor (i.e., < 0.25 of a pH unit) and of short duration (several hours). Background water pH values in Monarch Creek likely range between 7.0 and 7.5. Variance in water pH levels of 1 pH unit compared to upstream reference conditions will initiate discussions between Parks staff and the contractor on how to minimize changes in water pH.

If flow in the creek at the time of construction supports fish presence, Parks Canada Aquatic staff will electrofish the creek below the lowest culvert, and temporarily install a fence to keep fish from gaining access to the bottom of the work area. If any fish are observed as the isolation area is drained during construction, they will be salvaged and relocated downstream below the block net. Parks Canada will establish a fish net approximately 50 to 100 m downstream of the park entrance culvert to minimize upstream migration of fish into the construction site. This site will also serve as the downstream water quality monitoring site during construction.

Water intakes or outlet pipes shall be screened to prevent entrainment or impingement of fish, as per the Department of Fisheries and Oceans (DFO) guidelines for Freshwater Intake End of Pipe Fish Screen (1995).

Clean rock will be used for the culvert rip rap. Prior to redirecting flows into the new culverts, substrate and any rock embankment material will be washed in place and sediment-laden water will be pumped to nearby natural depressions or a constructed settling basin. The redirection of flows will be carried out slowly to allow any potential sediment-laden water to be pumped to the designated settling basin or vegetated areas prior to water entering Monarch Creek. Isolation techniques will be carefully removed by hand to minimize sedimentation.

Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. The contractor is to prepare a waste management plan and is required to have construction waste bins on site. The contractor is to use measures to prevent deleterious substances such as new concrete, sediment, hazardous materials, paint, fuels, lubricants, and preservatives from entering the watercourse. All hazardous and toxic materials shall be stored at least 100 m from a watercourse and in appropriate containment.

The contractor shall provide drip and spill containment for any portable generators and equipment used or parked overnight on site, as permitted by the ESO. Generators shall be stored 30 m from the river with an impermeable containment. Equipment is to arrive on site clean and free of contaminants and soil that could be contaminated





with weed seeds. The contractor shall inspect equipment for fluid/leaks daily and maintained in good working order.

Fuelling will be done at least 100m away from the creek with the use of slip tanks. Spill kits will be used while fuelling. An appropriately sized spill kit will be stored on site at all times.

All concrete forms will be tight fitting to prevent the release of concrete and excess water from contaminating water or soils. All water displaced from concrete forms during pouring or curing of concrete, or water used for facilitating curing, will be collected and treated at facilities off site or in accepted facilities within the park as directed by the ESO.

Do not use pressurized air to clean out uncured concrete from vehicles, equipment, or forms within 100 m of a watercourse. Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into accepted facilities on site as approved by the ESO.

Concrete mixer truck washout must be contained in an approved facility with wash products moved back to the concrete batching yard for disposal.

Equipment access points to the creek will be designated to minimize the area that is disturbed.

Trees and vegetation slated for removal will be flagged by Parks Canada. Vegetation to be retained on site will be protected from equipment or root damage.

Vegetate all disturbed areas by planting and seeding with native shrubs and grasses. Salvaged vegetation may be replanted, if possible.

Live staking in disturbed areas around the culverts will be conducted by environmental professionals. Topsoil, seeding and willow cuttings will be placed around the culvert by the contractor after works are completed as part of the bank stabilization measures. Wherever possible, suitable cuttings will be harvested locally in areas that are disturbed either by roadway, powerline, or railway maintenance activities. If there is insufficient time remaining in the growing season, the site should be stabilized and vegetated the following spring. The Parks Canada approved native seed mix to use at this site is attached in Appendix B.

Monarch Creek will be monitored by Parks Canada Aquatic staff to determine culvert effectiveness in terms of fish access, water levels and velocities and fish habitat use. The presence of any fish above the bottom culvert will be an improvement over the current situation.

All other 'Measures to Avoid Causing Harm to Fish and Fish Habitat' outlined by DFO will be implemented as applicable. See Appendix C for the list of measures.

Wildlife

Limit activities to daylight hours.

Maintain all worksites in a clean and tidy condition, free from the accumulation of waste materials, debris and other litter. Dispose of garbage in bear proof containers or remove daily from the site. Ensure crews have received wildlife safety training.

Notify Banff Dispatch at (403) 762-1473 immediately about any dens, litters, nests, carcasses/road kills, carnivore activity or encounters on or around the site, particularly potential problem and/or habituated wildlife.

Store hazardous chemicals (e.g. antifreeze) that might be attractants in animal proof containers.

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Soils and Landforms

When selecting staging areas, use previously disturbed sites wherever possible. Designate and clearly delineate staging areas, keeping them as compact as possible to reduce the area of disturbance and limit soil compaction.

Salvage and store any topsoil and duff separately from subsoil and other construction materials for re-use during site reclamation. Store soil stockpiles in already disturbed areas where possible and a minimum of 2 m from embankments, slumps and water bodies to prevent material loss. Ensure excavated material does not damage or bury plant material that is to be retained on the site or in adjacent areas.

Cultural Resources

Based on the summer 2016 archeological survey conducted by archeologist (Adam Kanatakis) it was determined that no resources require protection at the culvert replacement sites. The following general archaeological requirements will be followed for this Project:

1. Project work areas will be restricted to the current roadway ROW and inside the established boundaries of defined staging or stockpiling areas.
2. The valued archeological site 394T in the proximity will be protected by flagging the boundary of the work area to prevent unintentional disturbance.
3. Construction will be stopped if "new find" artifacts or features are encountered and the LLYK FU ESO will be notified immediately. The ESO will contact the CRM Advisor and/or the Terrestrial Archeology project contact for direction.

Visitor Experience- Public Facilities and Services

Do not dewater onto identified septic fields.

Repave any damaged pavement from equipment operation.

Protect the waterline at the lower culvert site from damage. Repair any damaged Parks Canada assets or utilities.

Keep the gate on Yoho Valley Road closed at all times to prevent public entry.

12. CONSIDERATION OF THE NEED FOR PUBLIC PARTICIPATION & ABORIGINAL CONSULTATION

12 a) Indicate whether opportunity for public participation should be offered:

☒ No ☐ Yes

If yes, provide a simple rationale, describe the process used to involve participants and summarize comments received. Refer to results of other relevant consultations that addressed the same project (for example, in the context of management planning).

12 b) Indicate whether there is a requirement for Aboriginal Consultation in relation to project impacts:

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X No

____ Yes

10

If yes, provide a rationale including references to legal or other advice, describe the process used and summarize the outcomes.

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**13. EFFECT SIGNIFICANCE**

Provided the above mitigation measures are implemented, residual impacts to aquatic resources and vegetation resources are expected to be negligible to low in magnitude and significant adverse effects are not anticipated.

14. SITE Surveillance

Site surveillance will be conducted. During the environmental briefing the ESO will identify construction activities that can only be conducted when the ESO is present.

15. SPECIES AT RISK MONITORING

There is no species at risk monitoring required for this project.

16. SARA NOTIFICATION

Not applicable.

17. EXPERTS CONSULTED

Include Parks Canada experts. Add as many entries as necessary for the project.

Department/Agency/Institution: Parks Canada Agency	Date of Request: 2014-10-20 and 2016-05-24
Expert's Name: Shelley Humphries	Title: Aquatic Specialist
Contact Information: Shelley.humphries@pc.gc.ca	
Expertise Requested: Fish Habitat Assessment/Aquatic Resources	
Response: Incorporated into the EIA report	

18. DECISION

Taking into account implementation of mitigation measures outlined in the analysis, the project is:

☒ not likely to cause significant adverse environmental effects.


☐ likely to cause significant adverse environmental effects.

19. SIGNATURES AND APPROVAL

EA Author *(Add additional signature blocks for multiple authors as required)*

Name: Rachelle Ormond	Date:
Position: Environmental Assessment Scientist	
Signature:	

Decision Approval

Name: Alex Kolesch	Date: October 24, 2016
Position: Manager, Integrated Land Use Planning and Policy	
	



20. REFERENCE LIST

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21. ATTACHMENTS LIST

N/A

22. ADDITIONAL CONSIDERATIONS / COMMENTS

Culvert replacement projects do not require review by DFO provided:

- No new fill placed below the High Water Mark
- Channel realignment is not required
- No narrowing of the channel
- No complete obstruction of fish passage during timing windows
- Provides for fish passage if restricted by existing structure
- Work can be done in isolation of flowing water (for installation and removal of culverts)

For Dewatering and Pumping, no DFO review is required if the use of temporary dams and pumps or diversion channels for construction site isolation purposes

- Can avoid killing fish
- Can restore site back to existing condition

The project is not expected to cause Serious Harm to Fish following application of mitigation measures outlined above and by following DFO's 'Measures to Protect Fish'. It is anticipated that the project will improve aquatic and fish passage conditions in Monarch Creek and will have a positive effect on ecological integrity of the park. The value of this creek to the ecosystem is more likely to be off channel escape and rearing habitat during the high water period when the Kicking Horse River has high turbidity due to glacial inputs. Its

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value as winter habitat is lower as the channel does freeze to the bottom, however, at this time the Kicking Horse River has high winter habitat values.

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Appendix A Culvert Design Drawings

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Appendix B Native Seed Mix for FR1 and FR3 Ecosites

Alpine bluegrass (*Poa alpina*) (10%),
Northern wheatgrass ("Elbee" or *Elymus lanceolatus*) (25%),
Slender wheatgrass (*Agropyron trachycaulum*) (10%),
Broad-glumed wheatgrass (*Agropyron violaceum* "Montaineer") (15%),
Mountain brome (*Bromus carinatus*) (15%),
Rocky mountain fescue (*Festuca saximontana*) (25%).



Appendix C DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat

Timing

- Time work in water to respect timing windows to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed.
- Minimize duration of in-water work.
- Conduct instream work during periods of low flow, or at low tide, to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.
- Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.

Site Selection

- Design and plan activities and works in waterbody such that loss or disturbance to aquatic habitat is minimized and sensitive spawning habitats are avoided.
- Design and construct approaches to the waterbody such that they are perpendicular to the watercourse to minimize loss or disturbance to riparian vegetation.
- Avoid building structures on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in erosion and scouring of the stream bed or the built structures.
- Undertake all instream activities in isolation of open or flowing water to maintain the natural flow of water downstream and avoid introducing sediment into the watercourse.

Contaminant and Spill Management

- Plan activities near water such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, or other chemicals do not enter the watercourse.
- Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance and keep an emergency spill kit on site.
- Ensure that building material used in a watercourse has been handled and treated in a manner to prevent the release or leaching of substances into the water that may be deleterious to fish.

Erosion and Sediment Control

Develop and implement an Erosion and Sediment Control Plan for the site that minimizes risk of sedimentation of the waterbody during all phases of the project. Erosion and sediment control measures should be maintained until all disturbed ground has been permanently stabilized, suspended sediment has resettled to the bed of the waterbody or settling basin and runoff water is clear. The plan should, where applicable, include:

- Installation of effective erosion and sediment control measures before starting work to prevent sediment from entering the water body.
- Measures for managing water flowing onto the site, as well as water being pumped/diverted from the site such that sediment is filtered out prior to the water entering a waterbody. For example, pumping/diversion of water to a vegetated area, construction of a settling basin or other filtration system.
- Site isolation measures (e.g., sediment boom or sediment curtain) for containing suspended sediment where in-water work is required (e.g., dredging, underwater cable installation).
- Measures for containing and stabilizing waste material (e.g., dredging spoils, construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby waterbodies to prevent re-entry.
- Regular inspection and maintenance of erosion and sediment control measures and structures during the course of construction.
- Repairs to erosion and sediment control measures and structures if damage occurs.





- Removal of non-biodegradable erosion and sediment control materials once site is stabilized.

Shoreline Re-vegetation and Stabilization

- Clearing of riparian vegetation should be kept to a minimum: use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction. When practicable, prune or top the vegetation instead of grubbing/uprooting.
- Minimize the removal of natural woody debris, rocks, sand or other materials from the banks, the shoreline or the bed of the waterbody below the ordinary high water mark. If material is removed from the waterbody, set it aside and return it to the original location once construction activities are completed.
- Immediately stabilize shoreline or banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through re-vegetation with native species suitable for the site.
- Restore bed and banks of the waterbody to their original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient that does not obstruct fish passage should be restored.
- If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, then ensure that appropriately-sized, clean rock is used; and that rock is installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.
- Remove all construction materials from site upon project completion.

Fish Protection

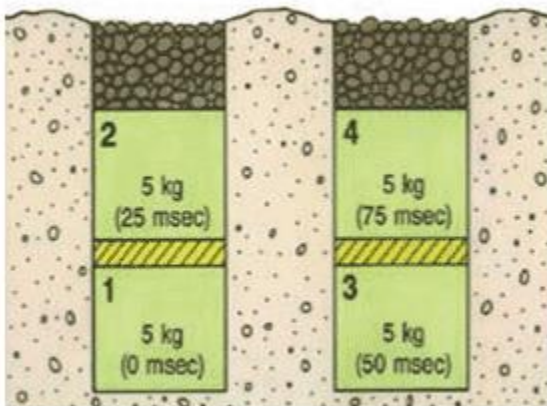
- Ensure that all in-water activities, or associated in-water structures, do not interfere with fish passage, constrict the channel width, or reduce flows.
- Retain a qualified environmental professional to ensure applicable permits for relocating fish are obtained and to capture any fish trapped within an isolated/enclosed area at the work site and safely relocate them to an appropriate location in the same waters. Fish may need to be relocated again, should flooding occur on the site.
- Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself.
 - In freshwater, follow these measures for design and installation of intake end of pipe fish screens to protect fish where water is extracted from fish-bearing waters:
 - Screens should be located in areas and depths of water with low concentrations of fish throughout the year.
 - Screens should be located away from natural or artificial structures that may attract fish that are migrating, spawning, or in rearing habitat.
 - The screen face should be oriented in the same direction as the flow.
 - Ensure openings in the guides and seals are less than the opening criteria to make "fish tight".
 - Screens should be located a minimum of 300 mm (12 in.) above the bottom of the watercourse to prevent entrainment of sediment and aquatic organisms associated with the bottom area.
 - Structural support should be provided to the screen panels to prevent sagging and collapse of the screen.
 - Large cylindrical and box-type screens should have a manifold installed in them to ensure even water velocity distribution across the screen surface. The ends of the structure should be made out of solid materials and the end of the manifold capped.
 - Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially where there is debris loading (woody material, leaves, algae mats, etc.). A 150 mm (6 in.) spacing between bars is typical.
 - Provision should be made for the removal, inspection, and cleaning of screens.
 - Ensure regular maintenance and repair of cleaning apparatus, seals, and screens is carried out to prevent debris-fouling and impingement of fish.
 - Pumps should be shut down when fish screens are removed for inspection and cleaning.





- Avoid using explosives in or near water. Use of explosives in or near water produces shock waves that can damage a fish swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae.
 - If explosives are required as part of a project (e.g., removal of structures such as piers, pilings, footings; removal of obstructions such as beaver dams; or preparation of a river or lake bottom for installation of a structure such as a dam or water intake), the potential for impacts to fish and fish habitat should be minimized by implementing the following measures:
 - Time in-water work requiring the use of explosives to prevent disruption of vulnerable fish life stages, including eggs and larvae, by adhering to appropriate fisheries timing windows.
 - Isolate the work site to exclude fish from within the blast area by using bubble/air curtains (i.e., a column of bubbled water extending from the substrate to the water surface as generated by forcing large volumes of air through a perforated pipe/hose), cofferdams or aquadams.
 - Remove any fish trapped within the isolated area and release unharmed beyond the blast area prior to initiating blasting
 - Minimize blast charge weights used and subdivide each charge into a series of smaller charges in blast holes (i.e., decking) with a minimum 25 millisecond (1/1000 seconds) delay between charge detonations (see Figure 1).
 - Back-fill blast holes (stemmed) with sand or gravel to grade or to streambed/water interface to confine the blast.
 - Place blasting mats over top of holes to minimize scattering of blast debris around the area.
 - Do not use ammonium nitrate based explosives in or near water due to the production of toxic by-products.
 - Remove all blasting debris and other associated equipment/products from the blast area.

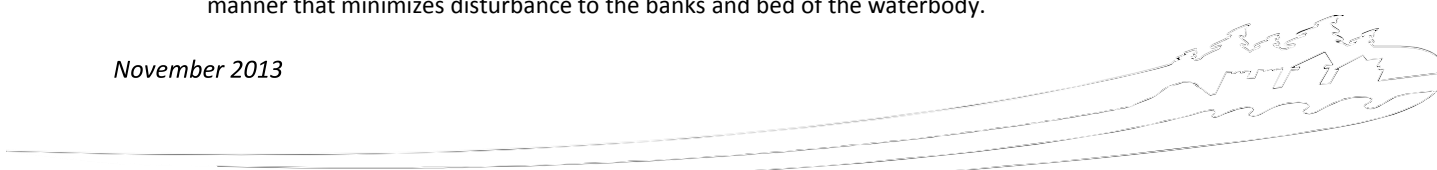
Figure 1: Sample Blasting Arrangement



Per Fig. 1: 20 kg total weight of charge; 25 msecs delay between charges and blast holes; and decking of charges within holes.

Operation of Machinery

- Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds.
- Whenever possible, operate machinery on land above the high water mark, on ice, or from a floating barge in a manner that minimizes disturbance to the banks and bed of the waterbody.





- Limit machinery fording of the watercourse to a one-time event (i.e., over and back), and only if no alternative crossing method is available. If repeated crossings of the watercourse are required, construct a temporary crossing structure.
- Use temporary crossing structures or other practices to cross streams or waterbodies with steep and highly erodible (e.g., dominated by organic materials and silts) banks and beds. For fording equipment without a temporary crossing structure, use stream bank and bed protection methods (e.g., swamp mats, pads) if minor rutting is likely to occur during fording.
- Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.

