MINISTRY OF TRANSPORTATION AND INFASTRUCTURE – HWY 97 CACHE CREEK CULVERT REPLACEMENT

ENVIRONMENTAL MANAGEMENT PLAN

August 14, 2023

URBAN SYSTEMS

501 121-5th Avenue
Kamloops BC, V2C 1A2

PREPARED FOR:

Ministry of Transportation and Infrastructure
PO Box 9850 Stn Prov Govt
Victoria, BC V8W 9T5

Attention: Joanna Cowper, Environmental Coordinator, MOTI

PREPARED BY:

Urban Systems Ltd.
501 121-5th Avenue,
Kamloops, BC V2C 6G4
T: 250.374.8311

Prepared by:

Mathieu Lizee, B.Sc., B.I.T.
Environmental Consultant

Reviewed by:

Rhonda Maskiewich, MCIP, RPP., R.P. Bio
Environmental Planner

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CONTENTS

Appendices

1.0 INTRODUCTION

1.1 Background

Flooding of Cache Creek in the southern interior of BC has occurred numerous times in recent years. In the spring of 2023, a particularly disastrous flood event occurred causing evacuation orders in the Village of Cache Creek, Hwy closures, culvert failures and significant erosion within the creek. A series of three culverts pass the flow of Cache Creek in its lowest reach from east to west in the Village until it confluences with the Bonaparte River. These culverts are of particular concern and include the following, starting at the downstream end of the reach:

- Hwy 97 culvert, referred to as Crossing 1 – C1
- Cache Creek Inn culvert, referred to as Crossing 2 – C2
- Quartz Road culvert, referred to as Crossing 3 – C3

The Ministry of Transportation and Infrastructure (MOTI) is working in collaboration with the BC Ministry of Forests, Fisheries and Oceans Canada, the Village of Cache Creek, and the Bonaparte Indian Band to mitigate against future flooding events, as well as to improve fish passage and habitat quality in Cache Creek, by replacing and/or removing these culverts. Combining the three crossings into a single project is under review.

This Environmental Management Plan (EMP) has been created to minimize and mitigate the effects of negative environmental impacts caused during the construction of the project and to satisfy applicable regulatory requirements for work in and about Cache Creek. This EMP will provide mitigation and monitoring measures that will be carried out by the Proponent and the Contractor during construction.

1.2 Project Location

The project area is separated into 3 distinct locations within the Village of Cache Creek:

C1 - Highway 97 Crossing – Cache Creek crosses under Hwy 97 through an existing culvert located approximately 120 m north of the junction of Hwy 97 and the Trans-Canada Hwy. This is the furthest downstream site on the creek.

C2 - Cache Creek Inn Culvert – the existing culvert at C2 is located under the Cache Creek Inn and its associated parking lot, approximately 40 m upstream of C1.

C3 - Quartz Rd Crossing – the culvert and Quartz Road were completely washed out during the 2023 freshet. C3 is the furthest upstream site in the project area and is approximately 185 m from C1.

Figure 1.1 in Appendix A indicates the approximate project limits and the locations of the existing crossings.

1.3 Proposed Works

The project consists of three crossing locations as described above. However, only C1 is in the design phase, and construction is to be started early in 2024 and be substantially completed before the 2024 freshet. Included in the C1 location are private utilities that were disrupted during the flooding in 2023. The Village's watermain and a Fortis gas conduit will be re-buried beneath the creek bed within the Hwy 97 right-of-way on the west side of the stream. The private utilities work will be constructed in advance of the C1 work which is anticipated to be in the Fall of 2023. As part of works at C1, the highway stormwater

system will need to be reconfigured with a new alignment, mechanical water treatment, and outlet configuration.

At the time of writing this report, the Urban Systems team and the Ministry of Transportation and Infrastructure team are in the process of incorporating two additional culverts upstream of C1, the Cache Creek Inn culvert (C2), and the Quartz Rd crossing (C3). There is hydrotechnical risk if C2 and C3 are not replaced in conjunction with C1. Combining the three crossings into a single project is under review.

C1 – Hwy 97 Crossing - a 1900 mm x 2400 mm diameter culvert currently exists allowing Cache Creek to flow beneath the highway. However, this culvert is undersized for high flows, particularly during freshet, which has repeatedly resulted in overland flooding and erosion. To resolve this issue, a 12 m long clearspan bridge is being designed to replace the culvert. To accommodate the bridge structure and hydraulic capacity requirements, widening and re-profiling of approximately 80 m of the creek channel is required. To mitigate working within the stream channel, a Habitat Enhancement Plan is included in the C1 works. If the other two projects proceed, this will be expanded to include those areas.

C2 - Cache Creek Inn Crossing - The existing culvert under the Cache Creek Inn and associated parking lot is to be removed and the stream is to be daylighted. This will require acquisition of a portion of the Cache Creek Inn property, demolition of a part of the Cache Creek Inn and excavation of the culvert. Realignment of the creek is anticipated as well as riprap armoring and environmental enhancements to improve fish habitat. As of the date of this report, a final decision on C2 has not been made.

C3 - Quartz Rd - The Village of Cache Creek has begun preliminary design for the replacement of the culvert crossing under Quartz Rd. The Quartz Road Crossing project will replace the current culvert crossing with a clearspan bridge approximately 185 m upstream of the Hwy 97 crossing project. As of the date of this report, a final decision to include C3 in the MOTI project has not been made.

To complete these works with the least impact to fish species and aquatic habitat in the creek, the construction plan will retain as many mature trees and other vegetation within the riparian area of the existing creek channel as possible. However, retention of any trees will be dependent on the hydrotechnical analysis report which is currently in process. A qualified environmental professional will be present on-site during construction works to advise on the removal of trees. Furthermore, temporary spawning deterrents will be installed downstream of the Hwy 97 crossing to reduce the risk of fish egg deposition in the work area. These deterrents will be installed in early August of 2023 by staking snow fencing into select locations on the creek substrate to decrease fish access to spawning gravel and deter spawning activities in Cache Creek. Using spawning deterrents will decrease the chances of construction activities impacting fish eggs or fry in the creek. A Spawning Deterrent Plan is included in Appendix B.

1.4 Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) must be prepared by the Contractor's Environmental Monitor (EM) a minimum of 15 workdays prior to mobilization to the site. The CEMP will detail project construction methods and specifics on how effects to the environmental will be avoided and or minimized.

All personnel on-site will be aware of and knowledgeable about the CEMP contents. The Contractor's CEMP will include all elements relevant to the scope and duration of the work including, but not limited to:

- A clear description of how the work will comply with the environmental protection requirements of the Contract, including, but not limited to, the Standard Specifications, Special Provisions, and Environmental Approvals.
- A summary that clearly demonstrates the Contractor's understanding of the specific environmental issues involved with the work, including Environmental Approvals.
- A description that demonstrates the Contractor's understanding of Ministry/Contractor responsibilities.
- Contact names, positions and telephone numbers of individuals responsible for elements of the plan and Environmental Agency contacts.

1.5 Communication

The Contractor's Construction Environmental Management Plan (CEMP) must include the contacts for personnel relevant to the project. This table is to be a quick reference for use during construction.

Table 1.1 Project Contacts

Personnel or Agency	Name	Organization	Number
Contract Administrator	TBD	TBD	TBD
Project Environmental Lead	Rhonda Maskiewich, RPBio Darren Filipic, RPBio	Urban Systems	250-318-6615 250-318-5228
Environmental Monitor	TBD	TBD	TBD
Site Supervisor	TBD	TBD	TBD
BC Environmental Emergency Program	-	Provincial	1-800-663-3456
Fisheries and Ocean (DFO) report a violation	-	Fisheries and Oceans	1-800-465-4336

2.0 PREVIOUS ENVIRONMENTAL STUDIES

Studies that were referenced in the preparation of this EMP include:

1. Hwy 97 Cache Creek Culvert Replacement – Fish Habitat Assessment. July 2023, Urban Systems Ltd.
2. Ministry of Transportation and Infrastructure, Hwy 97 Cache Creek Culvert Replacement, Environmental Impact Assessment. August 2023. Urban Systems Ltd.

These reports should be referred to in order to understand the environmental setting and potential impacts of the project. The EIA also outlines mitigation measures to avoid, reduce or mitigate adverse impacts.

Copies of the previous environmental studies are included in Appendix C. Note that only Appendix A (Structural and Riprap Design Drawings) is included in the Appendices for the Environmental Impact Assessment due to file size. The remaining Appendices are available upon request.

3.0 PERMITS AND APPROVALS

The following environmental permit applications will be submitted to regulatory agencies in advance of the construction period. Required permits and approvals are:

1. **BC Water Sustainability Act**
    a) Section 11 Application for Change Approval
2. **BC Wildlife Act**
    a) Scientific Fish Collection Permit
3. **BC Land Act (to be addressed by MOTI Properties Group)**
    a) Land Tenure (License of Occupation)
4. **Fisheries Act**
    a) Request for Review submission
    b) A scientific fish collection permit for fish salvage

- A Request for Review is not a permit, but an opportunity for Fisheries and Oceans Canada to review the proposed project to assess if an Authorization under the *Fisheries Act* is required. Recent discussions with Fisheries and Oceans Canada staff have indicated that the proposed works will not require a Fisheries Act Authorization.

4.0 VALUED COMPONENTS AND POTENTIAL IMPACTS

4.1 Valued Components

The Environmental Impact Assessment (EIA) prepared in July 2023 identified environmental, cultural resources/archaeological and health and safety valued components (VCs). These valued components guide the development of environmental management planning for this project. The VCs identified in the EIA are:

- Environment
    - Vegetation
    - Geology and soils
    - Surface water and fisheries resources
    - Groundwater quality
    - Wildlife and species at risk/critical habitat
- Cultural resources and archaeology
- Health and safety
- Air quality
- Noise

4.2 Potential Effects on Valued Components

Potential effects of the Hwy 97 Cache Creek culvert replacement on valued components that may result from project activities are outlined in Section 6.1 of the Environmental Impact Assessment (Urban Systems, 2023). Valued component effects identified include:

- Disturbance to Vegetation
    - Loss of vegetation.
- Disturbance to Geology and Soils
    - Existing provincial remediation Sites (Site ID 17512 and Site ID 7053)

    - Soil compaction from heavy equipment.
    - Removal of natural topsoil.
    - Soil contamination from leaking equipment, fuel spills.
- Disturbance to Surface Water Quality and Fisheries Resources
    - Removal of riparian vegetation.
    - Surface water contamination from a spill or leaking equipment.
    - Sedimentation.
    - Temporary disruption of fish access to work area.
- Disturbance to Groundwater Quality
    - Groundwater/aquifer contamination from leaking equipment, fuel/oil spill.
    - Change to subsurface water flow patterns.
- Disturbance to Wildlife and Species at Risk/Critical Habitat
    - Temporary loss of wildlife habitat during construction.
    - Disturbance to nesting/denning species during construction.
    - Surface water contamination from a spill, or leaking equipment.
- Health and Safety
    - Accidents causing harm to construction workers or local area residents.
- Air Quality
    - Dust and machinery operation during construction may decrease local air quality and may affect localized vegetation, wildlife, and people.
- Noise
    - Noise will be created during construction which may affect wildlife and people.
- Heritage/ Archaeological Resource
    - Disturbance/removal of heritage archaeological resources

In addition to the requirements listed in this EMP, the CEMP must incorporate identified mitigation measures identified in the EIA as well as additional requirements that are outlined in the regulatory approvals.

4.3 Environmentally Sensitive Areas

Cache Creek and the Bonaparte River are considered ESAs as they are both fish habitat. To ensure environmentally sensitive areas are not negatively impacted, mitigation measures described in this EMP and the EIA should be reviewed prior to development of the CEMP.

4.4 Timing Windows - Planning and Scheduling

Tender documents are to be produced by September 25th. The Tender and Award period for this project will begin on October 9th scheduled for completion by November 20th. Mobilization to site will occur from December 11th to January 1st. Construction will take place from January 1st to April 29th. The intent is to complete the C1 work prior to the 2024 freshet. Fisheries and Oceans Canada and Ministry of Forests staff are in agreement with this schedule due to the urgency of completing the work before the next freshet.

4.4.1 Instream Works

The reduced risk regional timing window for instream work in Cache Creek downstream of the Hwy 97 culvert is between July 22nd and August 15th due to the presence of salmon species, rainbow trout and steelhead (BC Government 2023). Upstream of the Hwy 97 culvert the reduced risk regional timing window for instream work is between July 22nd and October 31st.

4.4.2 Vegetation Removal

Vegetation clearing is necessary, and it will be conducted during the least risk timing window for nesting birds, which is between August 20th to March 31st. If any clearing occurs outside of this timing window (or immediately before or after the timing window), a qualified environmental professional (QEP) must assess the area for nests prior to clearing.

5.0 ENVIRONMENTAL MANAGEMENT PLAN

The intent of this Environmental Management Plan is to provide general guidance on avoiding or minimizing potential adverse effects to the valued components from the Hwy 97 Cache Creek culvert replacement project.

5.1 Environmental Monitoring

The project will be monitored by an Environmental Monitor with appropriate education and suitable experience. The Environmental Monitor will:

- Attend and participate in the start-up meeting.
- Ensure copies of regulatory permits and any conditions of approval kept on site during construction.
- Prepare and implement the CEMP[1] and any associated environmental protection plans.
- Be onsite during work in areas identified as sensitive which includes Cache Creek and the Bonaparte River which is approximately 165 m downstream.
- Provide guidance on the installation of the temporary flow bypass system.
- Monitor turbidity in Cache Creek and the Bonaparte River during construction.
- Field check equipment for leaks.
- Verify the presence and contents of the on-site spill kit.
- Liaise with the BC Ministry of Forests and Fisheries and Oceans Canada to address any environmental concerns.
- Evaluate the compliance of the Contractor with specified work practices and procedures to avoid and/or minimize environmental impacts.
- Have the authority to stop work if there is potential for harm to the environment and/or the activity is not in compliance with the permit conditions, environmental legislation, or the CEMP.
- Provide advice to the Contractor concerning incident response, remediation procedures and methods to resolve non-conformances, as needed.
- Liaise with the Contractor and appropriate agencies in the event that contamination is suspected from Provincial remediation Site ID 17512 and Site ID 7053 which are within 100 m of the project area.
- Maintain documentation and records of relevant information pertaining to applicable environmental practices and mitigation measures, including:
    - Accidents, spills, leaks, and releases and the reporting and clean-up procedures used.
    - Reviews, improvements, and adjustments to environmental mitigation measures.
    - Records of monitoring activities, including equipment inspection and maintenance.
    - Contingency measures used, if any.
- Report environmental incidents to the site supervisor and provide a summary within one day of the incident occurring.
- Prepare monthly reports during construction, and a post-construction completion summary. The summary report will outline the compliance of the project with regulatory requirements, the

[1] The Contractor's CEMP must be provided to MOTI for review a minimum of 15 days prior to mobilization to site.

effectiveness of mitigation measures employed, and corrective actions undertaken to address deficiencies.

The Contractor will

- Communicate regularly with the Environmental Monitor regarding schedule, schedule changes and discuss any changes to construction activities.
- Inform the Environmental Monitor of any incidents and near misses that occur while the Environmental Monitor is not on-site.
- Monitor for signs of contamination during construction. If suspected contamination is encountered, the MOTI representative and the Environmental Monitor will be contacted for direction.

5.1.1 Water Quality Monitoring

The Environmental Monitor will be responsible for monitoring water quality for all activities that have the potential to contribute to the sedimentation or release of deleterious substances to Cache Creek and the Bonaparte River. Turbidity monitoring will be conducted utilizing an appropriate sampling design with upstream reference sites and downstream sampling locations to determine if construction is resulting in sedimentation. The frequency and locations of the sampling will be determined by the Environmental Monitor in the field based on the site conditions and construction activities. Table 5.1 provides the maximum allowable criteria for water discharged to the environment with respect to turbidity.

Table 5.1: BC Water Quality Guidelines for the Protection of Aquatic Life (Turbidity)

Parameter	Maximum Allowable Criteria
Nephelometric Turbidity Units (NTU)	• Change from background of 8 NTU at any one time for a duration of 24h in all waters during clear flows (i.e., less than 8 NTU) or in clear waters • Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters (i.e., greater than 8 NTU) • Change from background of 10% when background is >50 NTU at any time during high flows or in turbid waters

Note: Values are from the BC Approved Water Quality Guidelines (Criteria) for Turbidity, Suspended and Benthic Sediments.[2] Background is defined as the level at an appropriate adjacent reference site, that is affected neither by works or activities associated with the project or the works site, nor by sediment-laden water, induced suspended sediments, or induced turbidity resulting from works or activities associated with the project or the work site.

5.1.2 Documentation and Records

The Environmental Monitor will document and maintain records of all relevant information pertaining to applicable environmental practices and mitigation measures, including incident response. Relevant and/or significant information to be documented includes, but is not limited to:

- Accidents, spills, leaks, releases, as well as the reporting and clean-up procedures used.
- Reviews, improvements, and adjustments to environmental mitigation measures.

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[2] Ministry of Environment & Climate Change Strategy. 2019. British Columbia Approved Water Quality Guidelines:
Aquatic Life, Wildlife & Agriculture. Water Protection & Sustainability Branch. Available from: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf. Acessed: April 28, 2021

- Records of monitoring activities, including equipment inspection and maintenance.
- Contingency measures utilized, if any.

All environmental incidents will be immediately reported to the site supervisor and the project manager with MOTI within one day of occurring. The EM will prepare a post-construction completion summary report outlining the compliance of the project, regulatory requirements, and the overall effectiveness of mitigation measures employed, and any corrective actions undertaken to address deficiencies.

5.2 Start-up and Environmental Briefing

A project start-up meeting will be held with the Contract Administrator, Contractor, Environmental Monitor, and other key project personnel. This will provide:

- An opportunity to review applicable sections of the CEMP.
- An opportunity for team members to provide feedback on planned activities in relation to the CEMP.
- An opportunity to review significant environmental features that require special consideration/ protection.
- A review of applicable permits and their requirements.
- A review of site specific and applicable environmental management (e.g., staging area, fuel storage, equipment maintenance and spill response) and how to proceed in the context of the CEMP.
- An opportunity to review the spill reporting protocol and associated responsibilities.
- The Environmental Monitor the chance to inspect machinery and equipment for leaks, and that it has been cleaned/power washed before coming to the site.

5.3 Staging Areas

The Contract Administrator will provide the Contractor with approved staging/laydown areas prior to the start of construction. All disturbed areas outside of the project area are to be restored post construction. Other areas for staging may be considered by the Contract Administrator upon the condition that the Contractor restores those areas post-construction; however, only approved staging areas may be utilized by the Contractor unless written authorization is provided by the Contract Administrator or MOTI. The environmental monitor may be contacted to review appropriate restorative efforts for any disturbed.

5.4 Clearing and Grubbing

Clearing and grubbing is required for the culvert replacement project. Specifics of clearing and grubbing will be presented in the Contractor's Clearing and Grubbing Plan.

The Contractor's Clearing and Grubbing Plan will indicate how the following will be achieved:

- Limit disturbance to the project footprint to avoid impact to surrounding native vegetation,
- Delineate the clearing boundary,
- Conduct vegetation clearing and ground disturbing activities outside of the nesting season to minimize impacts to nesting birds and to maintain compliance with the federal Migratory Birds Convention Act and BC Wildlife Act. Or, alternatively, have an appropriately qualified environmental professional conduct an active nest survey prior to clearing.

5.5 Wildlife and Species at Risk Management

Wildlife and species at risk may occur in or pass through the project area. The EIA identified two species at risk with mapped critical habitat in the project area[3]. Mitigation measures are provided to avoid or minimize effects to wildlife and species at risk, and to maintain compliance with the federal Migratory Birds Convention Act and the provincial Wildlife Act.

The Contractor's CEMP must indicate how the following will be achieved:

- Conduct instream works during the instream works window (July 22nd to August 15th), unless a variance has been granted[4]. These works include:
    - Realigning and reprofiling the creek channel
    - Construction of the new bridge
    - Removal of the existing culvert
    - Rip rap placement
- Include/ implement conditions and mitigation outlined in permits or regulatory communications (i.e., BC Water Sustainability Act Approval for works in and about a stream and response from the Fisheries Act Request for Review).
- Stop work immediately if wildlife enters the worksite. Wildlife will be allowed to vacate the area on its own and guidance will be sought from the environmental monitor.
- All food and food wastes, including food packaging waste will be kept in animal-proof containers and wastes will be removed regularly from the site.

5.6 Work Site Isolation and Fish Salvage

A work site isolation plan must be developed by the contractor and the Environmental Monitor using best practices. Once the work site is isolated, fish salvage must be completed. Fish salvage will occur prior to the commencement of the instream works. A scientific fish collection permit has been applied for from Front Counter BC to allow the salvage of fish from Cache Creek, as necessary. The following are specific recommendations for the fish salvage:

- Fish salvage must be conducted by a qualified professional using approved techniques for fish salvage (electrofishing and/or dip-net).
- All salvaged fish from the work area should be released back into Cache Creek in a similar habitat.
- All salvaged fish will be allowed to recover in a bucket for a minimum of 10 minutes prior to release.
- All salvaged fish will be identified to the species level.

The fish salvage data will be submitted to the Ministry of Forests as per the requirements of the scientific fish collection permit.

5.7 Erosion and Sediment Control

The purpose of erosion and sediment control (ESC) management is to avoid or minimize erosion and the mobilization of sediment, or other deleterious substances, into a watercourse or drainage that discharges to a watercourse.

The Contractor's Erosion and Sediment Control Plan should indicate how the following will be achieved:

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[3] Lewis's woodpecker and western rattlesnake

[4] Fisheries and Oceans Canada and Ministry of Forests have verbally indicated that works may occur outside this work window.

- Implement ESC measures to avoid sedimentation into Cache Creek and the Bonaparte River. Measures may include:
    - Clean water interceptor ditch
    - Grey water interceptor ditch
    - Seepage pump
    - Sediment fencing[5]
- Implement ESC measures to avoid erosion on steep slopes. Measures/materials may include mulches, hydroseeding, erosion mats, geotextiles, filter fabric, polyethylene covers, etc.
- Implement ESC measures and have ESC supplies available on-site during construction (e.g., sandbags and sediment fencing).
- Environmental Monitor to monitor effectiveness of ESC measures.
- Ensure ESC measures are removed upon project completion.
- Stockpile excavated material (such as salvaged organic topsoil) away from a watercourse and not on native vegetation.
- Suspend work during heavy rain to avoid erosion and sediment migration into a watercourse.

5.8 Aquatic Habitat Protection

Instream works are required for the project works. The aquatic habitats of Cache Creek and the downstream Bonaparte River are considered ESAs and works in and around them must be conducted in accordingly.

The Contractor's Plan for Working In and Around Water and Sediment and Erosion Control Plan must indicate how the following will be achieved:

- Include/ implement conditions and mitigation outlined in permits or regulatory communications (i.e., BC Water Sustainability Act Approval for works in and about a stream and response from the Fisheries Act Request for Review).
- Worksite isolation.
- Ensure equipment/vehicles are free of silt and other substance which may negatively impact fish health and aquatic habitat. Inspect vehicles and equipment upon arrival at the worksite.
- Ensure mechanical equipment is in a state of good repair and free of leaks and operated in a manner to prevent deleterious substances from entering a watercourse.
- Ensure vehicle and equipment refuelling is conducted 30 m or more from of a watercourse.
- Ensure secondary containment for all refuelling and fuel storage within 30 m of a watercourse.
- Minimize disturbance in riparian areas.
- Discharge grey water[6] from de-watering into vegetated areas that will not directly drain into a watercourse.
- Ensure a spill containment kit is on site during all works and construction personnel is trained in its use. Report any spill to water or spill of a reportable quantity of a listed substance to land to the BC Environmental Emergency Program (1-800-663-3456) and to the DFO conservation and protection violation report hotline (1-800-465-4336).

[5] Correct installation of silt fencing is to install stakes to a depth of 30 to 60 cm with stakes on the downslope side of the fence. The filter fabric is to be placed in a 150 mm wide by 150 mm deep trench and buried with compacted backfill material.

[6] Grey water is water containing clean sediments.

5.9 Air Quality, Dust Control and Noise

An Air Quality and Dust Control Plan will outline how activities, equipment, processes, and work operated or performed by the Contractor during construction will be conducted in accordance with Federal, Provincial, and local regulations governing noise levels and air emission standards. Emissions from construction equipment and machinery are expected to be the primary air quality concern during the construction period.

The Contractor's Air Quality and Dust Control Plan should indicate how the following will be achieved:

- Avoid unnecessary idling of vehicles, equipment, and machinery.
- Implement appropriate dust control measures to maintain safe working conditions and prevent impacts to adjacent lands. Such measures may include:
    - Use of water[7] trucks to spray water on disturbed areas as necessary.
    - Stabilize exposed surfaces with straw mulch, poly, geotextile, etc.
    - Limit speeds of machinery travelling over exposed areas.

Note: Withdrawals of water for construction purposes (e.g., dust control) from any surface water resource, including Cache Creek, is not permitted.

In addition, construction must take place between 07:00 and 22:00 (Cache Creek municipal Bylaw No. 334, 1984). This bylaw is meant to protect both air quality and disturbance from noise.

5.10 Construction and Waste Management Plan

The Contractor's Construction and Waste Management Plan must include but not be limited to:

- All non-toxic or non-hazardous wastes shall be either recycled or disposed of in an approved sanitary landfill or other specialized area.
- Any waste material that is inadvertently dumped in or adjacent to watercourses or other ESAs shall be removed by the Contractor and disposed of in an approved manner at the Contractor's expense.
- The Contractor shall be responsible for the regular collection, storage, and disposal of all waste material generated by employees and subcontractors.
- The Contractor shall take the necessary precautions to prevent loss of these materials during transport on public highways and roads and shall be responsible for cleanup of all of these materials and all litter deposited by employees and subcontractors along access routes during construction related activities, at no expense to the Ministry.
- Construction debris shall not be allowed to accumulate on the construction site but shall be collected promptly, placed, and stored in suitable animal-proof containers, and disposed of at an approved waste disposal site.
- Solids, sludges, and other pollutants generated as a result of construction or removed during the course of treatment or control of wastewaters shall be disposed of in a manner that prevents their direct or indirect discharge to any watercourse (drainage) or groundwaters.
- Ensure a portable toilet is on-site during construction and is pumped out regularly by a licensed hauler.
- Ensure fluid wastes from equipment and machinery are collected, sealed and removed from the site for recycling or disposal at any appropriate facility.

[7] Water for dust suppression must be from an approved source which must be identified by the contractor in advance of construction.

5.11 Cast-in-Place Concrete

Cast-in-place concrete may be used for various aspects of bridge construction including bridge abutments. Cast-in-place concrete is highly toxic to aquatic life because it rapidly increases the pH of the water to levels unsuitable for fish and aquatic life.

The Contractor's Plan for Working In and Around Water should indicate measures to prevent potential adverse impacts associated with cast-in-place concrete:

- Use care when working with concrete to prevent concrete entering directly, or indirectly, into a watercourse.
- Dispose of all concrete waste materials off-site at an approved disposal facility.
- Ensure a CO_2 tank, regulator, and couplings (to connect the regulator to impervious water hose and water hose to soaker hose) are present on-site during works involving concrete when there is the potential for a spill to water.
- Monitor water that has contacted concrete and treat with CO_2 until the pH is less than 8.5 prior to discharge to the natural environmental.

5.12 Enhancement Plan

The MOTI design team is preparing an Enhancement Plan with the objective of improving aquatic/fish and riparian habitat in the project area. Disturbed riparian areas of Cache Creek will be revegetated following the Enhancement Plan. Salvaged organic strippings (topsoil) will be spread at a minimum depth of 150 mm and revegetated. Revegetation will involve seeding with annual ryegrass or fall rye immediately following topsoil application and planted with trees and shrubs during an appropriate planting season (i.e., spring or fall) and as identified in the Enhancement Plan. The Enhancement Plan is currently in process.

5.13 Invasive and Noxious Plant Management

To protect from invasive species establishment and spread, the Contractor must consider the following best management practices:

- Ensure equipment and machinery is power washed and free of soils, seeds, and plant parts prior to mobilizing to the project site.
- Minimize the creation of bare soils.
- Retore disturbed areas with 150 mm of topsoil and hand broadcast the appropriate seed mix as soon as possible.
- Ensure that re-seeding is conducted using only appropriate seed mix and it is guaranteed weed-free.
- Remove and dispose of noxious/invasive plant species in the project area during the construction and the establishment period of the restored area. Noxious and invasive species disposal is recommended via:
    - Bagging and labeling noxious and invasive species in clear industrial strength bags and transporting bags to an authorized facility for proper disposal.
    - Combustion of material in a controlled setting

5.14 Archaeological Chance Find Procedure

Archaeological sites are protected by the BC Heritage Conservation Act (HCA), whether on Provincial Crown or private land. They are non-renewable, very susceptible to disturbance and are finite in number. Archaeological sites are an important resource that is protected for their historical, cultural, scientific, and

educational value to the general public, local communities, and Indigenous Nations. Impacts to archaeological sites must be avoided.

The objectives of an Archaeological Chance Find Procedure are to promote the preservation of archaeological data while minimizing disruption of construction scheduling. It is recommended that all on site personnel be informed of the Archaeological Chance Find Procedure.

If it is believed that any known or suspected archaeological materials have been encountered, stop work in the area and follow the procedure below:

- All construction activity in the vicinity of the potential find is to cease immediately.
- The find location will be recorded, and all remains, materials, artifacts will be left in place.
- The Project Superintendent and Archaeology Branch will be contacted at (250) 953-3334 to determine appropriate actions and further direction.
- The potential significance of the remains will be assessed by a professional archaeologist and mitigative options will be identified.
- If the significance of the remains is judged to be sufficient to warrant further action and they cannot be avoided, then the Archaeology Branch and representatives of local Indigenous communities will determine the appropriate course of action.
- In the case of human remains, if the remains are assessed to be archaeological, then the Archaeology Branch and local Indigenous Nations will determine how to handle them. Options could include avoidance or respectful removal and reburial.
- If human remains are encountered and they are not determined to be archaeological, then the RCMP will be contacted immediately.

5.15 Spill Contingency and Response Plan

The Contractor will take all necessary precautions to prevent the discharge of contaminants that could pollute or degrade the natural environment. Measures to avoid or mitigate the effects of a potential spill are outlined below.

5.15.1 Contingency Plan

The most likely source of contaminant is from malfunction or leaks in equipment used on-site that require fuel. To minimize the potential impact of a spill, the Contractor must:

- Clean all equipment prior to bringing to site.
- Inspect all equipment for leaks prior to the commencement of the work. Equipment should be checked daily for leaks before beginning work. Leaking equipment will be immediately removed from the site and repaired.
- Re-fuel equipment and machinery at a pre-determined staging area located in an area where a spill can not migrate into Cache Creek.
- Remove equipment requiring repair or maintenance from the site. Repairs or maintenance will not occur on-site and will be conducted at an appropriate facility.
- Report all spills to the appropriate contact as outlined below.
    - Environmental Monitor – report all spills regardless of size and/or type.

  - Environmental Emergency Program (EEP)'s Report A Spill - 1-800-663-3456 -report all spills to water and spills of a reportable quantity to ground.[8]
  - Fisheries and Oceans - 1-800-465-4336 - report all spills to water.
- Ensure spill kits are on-site and, in all equipment, and machinery. Ensure all staff and operators are trained in their use.
- Clean up spills immediately by covering with an absorbent material such as an industrial standard oil absorbing material. Sawdust or straw are not recommended and will not be used. Used spill clean-up materials and contaminated soils will be removed from the work site and disposed of at an appropriate disposal facility as per the Environmental Management Act.

5.15.2 Emergency Spill Response Procedure

All construction personnel will be familiar with the following spill response procedure. An incident report sheet will be filled out for any incident that occurs. An example of a Spill Incident Report is included in Appendix D.

5.15.3 Initial Assessment

Step 1

- Identify product and extent of contamination.
- Identify any safety concerns.
- Notify Project Superintendent.

Step 2

- Eliminate the source of the spill.
- Contain the spill and mark the extent of the spill.
- Pick up spill using pads, booms, pillows, or granular absorbent.
- For spills to water, isolate the contamination, if possible.
- Dispose of contaminated spill cleaning equipment at suitable locations.
- If there is the potential for the spill to contaminate any surface water drainage, excavate the contamination and move away from the stream for further treatment.
- Contaminated soils must not be removed from the site without prior approval from the Ministry of Environment and Climate Change Strategy, and the Environmental Monitor.

All spills must be reported to the Environmental Monitor and/or the Project Superintendent. Telephone numbers in the event of a spill are noted in Table 5.1 below.

Table 5.2: Spill Reporting Contacts

Name	Role	Number
TBD	Contract Administrator	TBD
Darren Filipic	Environmental Monitor	250-318-5228
Mathieu Lizee	Environmental Monitor	780-619-7865
TBD	Project Manager	TBD
Environmental Emergency Program (EEP)		1-800-663-3456

[8] Reportable quantities of contaminants spilled to ground are listed in the Spill Reporting Regulation schedule of the *Environmental Management Act*.

6.0 REPORTING

Upon completion of the Hwy 97 Cache Creek Culvert Replacement project, the Environmental Monitor will prepare a post construction summary report. The post construction summary report will outline all monitoring activities observed and any incidents and actions taken. It will also include any reporting requirements requested by regulatory agencies. A photographic record will also be included in the report.

7.0 REFERENCES

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Environment and Climate Change Canada. 2017. Recovery Strategy for the Western Rattlesnake (Crotalus oreganus), the Great Basin Gophersnake (Pituophis catenifer deserticola) and the Desert Nightsnake (Hypsiglena chlorophaea) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. Part 1, 28 pp., Part 2, A. 37 pp., B. 36 pp., C. 28 pp.

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ILRR Map Viewer. 2023. Available from: ILRR Map Viewer (gov.bc.ca). Accessed June 2023.

Village of Cache Creek. 2023. Bylaw No. 334, 1984

APPENDIX A

LOCATION MAP

Hwy 97

Quartz Rd

Stage Rd

Cache Creek Community Hall

Cache Creek Fire Department

Trans-Canada Hwy

C3: Quartz Rd Crossing

C2: Cache Creek Inn Crossing

C1: Hwy 97 Crossing

Cache Creek

Cache Creek Elementary School

Cache Creek

Trans-Canada Hwy Frtg

Collins Rd

Stephenson Rd

Cache Creek

Approximate Project Limits

Project Location within the Village of Cache Creek

Scale: 1:40,000

URBAN SYSTEMS

0 10 20 40 60 80

Metres

Coordinate System: NAD 1983 UTM Zone 10N

Scale: 1:1,400 (When plotted at 11"x17")

Data Sources:

Urban Systems Ltd. (Existing Crossing, Project Limits);
DataBC (Roads, Streams, ParcelMap BC, Municipal Boundary);
The Ministry of Transportation and Infrastructure (2021 Imagery)

Project #:	1961.0516.12
Author:	BA
Checked:	ML/ RM
Status:	**Final**
Revision:	A
Date:	2023 / 7 / 26

- Watercourse
- Location of Existing Crossing
- Approximate Project Limits
- Municipal Boundary
- Property Boundary

Location in BC

Cache Creek

Victoria

BRITISH COLUMBIA — Ministry of Transportation and Infrastructure

Ministry of Transportation and Infrastructure

Hwy 97 Cache Creek Culvert Replacement

FIGURE 1.1

Location Map

APPENDIX B

SPAWNING DETERRENT PLAN

MEMORANDUM

URBAN SYSTEMS

DATE	August 8, 2023	FROM	Mathieu Lizee, BSc, BIT; Darren Filipic, RPBio., Urban Systems Ltd.
TO	David Rainho, Habitat Biologist, Fisheries and Oceans Canada	FILE	1961.0516.12
CC	Rhonda Maskiewich, MCIP RPP, RPBio., Chad Lishman, MSc, PAg, Joanna Cowper, Environmental Coordinator, BC MoTI	SUBJECT	Spawning Deterrent Implementation Plan

1.0 SPAWNING DETERRENT IMPLEMENTATION PLAN

The BC Ministry of Transportation and Infrastructure is currently in the design phase to replace the existing Highway 97 culvert with a clear span bridge. The proposed bridge will be constructed during the winter months. In order to minimize impacts to fish, it is recommended to install spawning deterrents in key locations (pool tail-outs) to prevent salmon from spawning within the project area.

Spawning deterrents are used to prevent fish species from spawning in a select area and thereby limit the environmental impact of project works during the spawning season. Spawning deterrent mats prevent fish from creating redds in the areas in which they are placed. The mats are composed of mesh-like fencing with spaced holes which allows for biological processes to continue such as algae and invertebrate production while preventing fish spawning. For the implementation of spawning deterrents to be effective, the mats must be secured in the waterbody prior to the arrival of spawning fish.

The confluence of Cache Creek with the Bonaparte River is approximately 250 meters downstream from the project area, with no fish barriers observed in between the two waterbodies. As such, it is possible that any fish occurring in the Bonaparte River could be present, and spawning, in Cache Creek. Species of fish known to occur within the Bonaparte River based upon review of the Province of British Columbia's Habitat Wizard web application, includes: all salmon species, bridgelip sucker, brook trout, bull trout, cutthroat trout, kokanee, lake chub, largescale sucker, leopard dace, longnose dace, longnose sucker, mountain whitefish, northern pike minnow, peamouth chub, rainbow trout, redside shiner, steelhead, and sucker (general). The placement of the spawning deterrent mats will need to occur prior to the arrival of fall-spawning salmonids.

Urban Systems will install the spawning deterrents in early August with use of J-hooks or Wooden stakes pinning the mats to the creek bed as well as boulders or sandbags on top of the mats to ensure it remains flat on the creek bed and does not obstruct the movement of fish through the water column. Once installed, the spawning deterrents will require regular monitoring by a Qualified Environmental Professional (QEP) to ensure they are not obstructing fish passage, effectively preventing fish spawning, and remain stable and laying flat on the creek bed. The spawning deterrents will be strategically placed in areas of suitable spawning habitat within Cache Creek based on the results of the Fish Habitat Assessment, as well as with guidance from Urban Systems' senior fisheries biologist.

Spawning deterrent mats are to be placed from the upstream end of the Cache Creek Inn culvert to the project boundary approximately 80-meters downstream of the Highway 97 culvert. Mats will be placed within these boundaries where the gravel, water depth and velocity fit the definition of suitable spawning requirements for the fish species listed above as per the Department of Fisheries and Oceans Canada (approximate locations shown on Figure 1). Notably, spawning deterrents will be placed within the creek at the outflow pools of both the Cache Creek Inn and Highway 97 culverts. Spawning deterrents are not to be removed until all spawning activity, if any, has ceased within Cache Creek. Installation and removal of the spawning deterrents will occur by hand. All materials used for the installation of the spawning deterrents are to be removed once spawning season has been completed.

Figure 1 – Proposed Spawning Deterrent Locations

Sincerely,

URBAN SYSTEMS LTD.

Mathieu Lizee, BSc, BIT
Environmental Consultant

COLLEGE OF APPLIED BIOLOGY
Darren Filipic
RPBio 2044
CAB

Darren Filipic, R.P.Bio
Environmental Consultant

cc: Rhonda Maskiewich, MCIP, RPP, RPBio
Chad Lishman, MSc, PAg
/ML
Enclosure
U:\Projects_KEL\1961\0516\12\E-Environmental\Spawning Detterent Plan\2023-08-08 Spawning Deterrent Implementation Plan

APPENDIX C

PREVIOUS ENVIRONMENTAL STUDIES

URBAN SYSTEMS MEMORANDUM

DATE: July 26, 2023
TO: Joanna Cowper, MoTI
CC: Tim Blackburn, Urban Systems Ltd.
Matt Gabelhei, Urban Systems Ltd.
Cody Bagg, Urban Systems Ltd.
Reid Drummond, Integris Consulting Ltd.
Jared Wilkison, Urban Systems Ltd.
Chad Lishman, P.Ag., Urban Systems Ltd.
Dan Gould, Stantec
FROM: Carmen Peterson, B.Sc., Urban Systems Ltd.
Darren Filipic, R.P. Bio, Urban Systems Ltd.
Rhonda Maskiewich, R.P.Bio., R.P.P., Urban Systems Ltd.
FILE: 1961.0516.12
SUBJECT: Hwy 97 Cache Creek Culvert Replacement – Fish Habitat Assessment

1.0 INTRODUCTION

Urban Systems conducted a fish habitat assessment of Cache Creek for the culvert replacement projects on Hwy 97 and Quartz Rd, as well as the culvert removal/stream daylighting project for the Cache Creek Inn culvert.

The Hwy 97 project (referred to as C1) is to replace the existing Hwy 97 crossing of Cache Creek, approximately 120 m north of the junction of the Trans-Canada Hwy and Hwy 97. The current crossing is a single 1,900 mm diameter CSP culvert with a concrete headwall and no endwall. It experienced heavy flooding, but no damage, in 2015, 2017, and 2018. In 2021 there was a flood that damaged C1 and a culvert extension was added to repair the culvert. However, the 2023 spring freshet impacted upstream properties and creek crossings in late April. Upstream debris plugged the culvert inlets, causing Cache Creek to overtop its banks. The Trans-Canada Hwy and Hwy 97 were flooded, causing severe damage to the culvert outlet, two of the four lanes of the Hwy 97, and a downstream bridge on the Bonaparte River. The current scope of work is to replace the existing culvert with a 14 m long clearspan bridge, including realignment of approximately 80 m of Cache Creek.

At the time of writing this report, the Urban Systems team and the Ministry of Transportation and Infrastructure team are in the process of incorporating two additional culverts upstream of C1, the Cache Creek Inn culvert (C2), and the Quartz Rd crossing (C3). There is hydrotechnical risk if C2 and C3 are not replaced in conjunction with C1. Combining the three crossings into a single project is under review.

In summary of C2, in order to improve overall fish passage and habitat quality in Cache Creek, the Cache Creek Inn culvert may be removed, and the stream may be daylighted for an approximately 50 m long section downstream of Quartz Rd. This culvert was constructed in the early 1970s and passes underneath the Cache Creek Motor Inn, as well as an asphalt parking lot.

The Quartz Rd Crossing project (C3) may replace a culvert crossing with a clearspan bridge, approximately 185 m upstream of the Hwy 97 Crossing project. The current culvert was damaged when the creek experienced heavy flooding during the 2023 spring freshet and Quartz Rd was completely destroyed. During the flooding event, emergency riprap was placed on the creek banks to protect against further erosion.

The objective of this assessment is to establish a comprehensive understanding of fish habitat available for the various life phases of the species that are known/likely to be present in the creek. Therefore, the objectives of the memorandum are as follows:

- Summarize the methodology used in the fish habitat assessment and comment on key findings.

- Evaluate and describe habitat available for various life phases of rainbow trout, all salmon species, and steelhead, as these species were indicated by a desktop review to be known/likely to be present in the creek.
- Utilize the information in an Environmental Impact Assessment and Habitat Enhancement Plan.
- Prepare a site-specific Environmental Management Plan.
- Support regulatory applications for the projects.

2.0 FISH HABITAT ASSESSMENT METHODOLOGY

The fish and fish habitat assessment followed the standards and procedures outlined in the BC Resources Inventory Standards Committee (RISC) Reconnaissance (1:20 000) Fish and Fish Habitat Inventory (RISC 2001).

Reach 1, with two sites as shown in **Figure 2.1**, was identified, one for the 40 m of creek upstream of the current Hwy 97 culvert and another for the 60 m of creek downstream. Eight cross sections were assessed at regular intervals throughout each site, with interval spacings of 5 m for Reach 1 – Site 1 and 8 m for Reach 1 – Site 2.

Reach 2 is a 165 m long reach and is located between the outlet of the Cache Creek Inn culvert to just upstream of Quartz Road. Reach 2 was divided into two sites as shown in **Figure 2.1**. Reach 2 – Site 1 starts at the outlet of the Cache Creek Inn culvert and runs for 60 m of creek upstream of the Cache Creek Inn culvert, whereas Reach 2 – Site 2 runs the remaining 105 m of creek channel in the project area. The delineation between Reach 2 – Site 1 and Reach 2 – Site 2 was determined by the presence of overhead vegetation in Site 1 and the lack of any vegetation in Site 2. Seven cross sections were assessed at regular intervals throughout Reach 2 – Site 1 and eight cross sections were assessed at regular intervals throughout Reach 2 – Site 2.

Three Urban Systems personnel, including a Senior Fisheries Biologist, assessed the fish habitat within Reach 1 on June 21st, 2023, and Reach 2 on July 14th, 2023. Site descriptions, along with a high-level summary of observed findings, are outlined in Section 2.1.1.

Stage Rd
Quartz Rd
Trans-Canada Hwy
Hwy 97
Collins Rd
Trans-Canada Hwy Frtg
Cache Creek
1301
1151
1248
1270
1293
1240
1260
1191
1209
1153
1109
1206
1197

Reach 2 - Site 2
C3: Quartz Rd Crossing
Reach 2 - Site 1
C2: Cache Creek Inn Crossing
C1: Hwy 97 Crossing
Reach 1 - Site 1
Reach 1 - Site 2

URBAN SYSTEMS

0 5 10 20 30 40 50
Metres

Coordinate System: NAD 1983 UTM Zone 10N

Scale: 1:1,000 (When plotted at 11"x17")

Data Sources:
Urban Systems Ltd. (Environmental Field Observations); WSP (2021 ICIS Civic Addresses); DataBC (Roads, Streams, ParcelMap BC); The Ministry of Transportation and Infrastructure (2021 Imagery)

Project #:	1961.0516.12
Author:	BA
Checked:	CP
Status:	Draft
Revision:	A
Date:	2023 / 7 / 26

- Cottonwood Tree Cluster
- Dead Cottonwood Tree

Environmental Project Sites
- Reach 1 - Site 1 (C1)
- Reach 1 - Site 2 (C1)
- Reach 2 - Site 1 (C2 & C3)
- Reach 2 - Site 2 (C2 & C3)

- Deep Pool - Overwintering Habitat
- Watercourse
- Location of Existing Crossing
- Approximate Project Limits
- Property Boundary

BRITISH COLUMBIA — Ministry of Transportation and Infrastructure

Ministry of Transportation and Infrastructure

Hwy 97 Cache Creek Culvert Replacement

FIGURE 2.1

Fish Habitat Assessment Reach

2.1 KEY OBSERVATIONS & FINDINGS

2.1.1 Reach Based Summary

A total of two habitat surveys were conducted on Cache Creek on June 21st, 2023, amounting to approximately 100 m of stream that was actively assessed. A further two habitat surveys were conducted on Cache Creek on July 14th, amounting to approximately 165 m of stream that was actively assessed. In total, approximately 265 m of stream has been surveyed.

All data collected during the assessments, including site survey length, notable field observations, and site card data, can be found in **Appendix A**. Photos of each site are provided in **Appendix B**.

Reach 1 – Site 1

Reach 1 – Site 1 is situated upstream of the current Hwy 97 culvert and downstream of a culvert that passes beneath the Cache Creek Inn and parking lot. Reach 1-Site 1 is low to moderate value fish habitat dominated by cobble substrate with pockets of gravel and boulder, with low spawning potential. Habitat complexity is poor within this site, which is largely riffle morphology with minimal availability of pool habitat, low to no available overwintering habitat, and no large woody debris. Cover for fish habitat is predominantly in the form of boulders and overhanging vegetation. Small woody debris, likely deposited from the recent flood event, is the subdominant form of cover. Riparian vegetation is limited to 5 black cottonwood trees in the middle of the channel (situated between the primary channel and high flow channel that likely only experiences flow during freshet). These trees offer 21-40% crown closure for this site. The left bank features no riparian area and is a gabion retaining wall below an asphalt parking lot. The right bank features black cottonwood saplings and ornamental cedar hedges. The channel is highly exposed due to lack of overhead cover/large woody debris, undercut banks and pool habitat. The residual pool depth for each cross section in Site 1, from upstream to downstream, are as follows: 0.14 m, 0.04 m, 0.08 m, 0.09 m, 0.09 m, 0.02 m, 0.09m, and 0.03 m. It is foreseeable that fish either drop into the Bonaparte River or move upstream to try find more suitable habitat during the winter months. The channel pattern is straight throughout the site, with no islands or meanders. The creek could be used as a migration corridor for salmon to access upstream spawning habitat; however, this has not been confirmed. The lack of cover/refuge areas provides poor rearing habitat for juveniles.

Reach 1 – Site 2

Reach 1-Site 2, downstream of the current Hwy 97 culvert, also consists of extensive riffle with minimal instream cover. However, the presence of a deep pool at the culvert outlet allows for overwintering habitat and a dominant gravel substrate in the pool provides opportunity for salmonid spawning. Juvenile salmonids, and possibly sub-adult rainbow trout, were observed in the deep pool at the time of the assessment. The residual pool depth for the deep pool is 0.43 m; followed by residual pool depths of 0.00 m, 0.01 m, 0.03 m, 0.00 m, 0.05 m, 0.014 m, and 0.09 m for the downstream cross sections. Dominant substrate type is gravel with interspersed cobble. Small sections of creek have spawning potential; specifically, the Hwy 97 culvert pool tail-out. However, habitat complexity is poor within the site, which is largely riffle morphology apart from the one deep pool. Overwintering habitat is only present in the deep pool available at the outlet of the existing culvert. Cover for fish is predominantly in the form of boulders, with small woody debris being subdominant, which was likely deposited from the recent flood event. There are trace amounts of large woody debris and overhanging vegetation present. The left bank is mostly vertical with riparian vegetation present on the banks in the form of shrubs and deciduous trees resulting in 21-40% crown closure. The right bank is sloped

with riparian vegetation consisting of grasses and deciduous trees (black cottonwood). The channel pattern is straight throughout the site, with no islands or side channels. Reach 1-Site 2 could be used as a migration corridor for salmon to access upstream spawning habitat; however, this has not been confirmed. The lack of cover/refuge areas provides poor rearing habitat for juveniles with the exception of the large Hwy 97 culvert outlet pool.

Reach 2 – Site 1

Reach 2 – Site 1 is an approximately 60 m stretch of creek situated upstream of the current Cache Creek Inn culvert, which passes beneath an existing hotel property, and downstream of Quartz Rd. Reach 2 – Site 1 is low to moderate value fish habitat dominated by cobble substrate with pockets of gravel, with low spawning potential. Habitat complexity is moderate within this site, which is largely riffle morphology. Three shallow pools were located downstream of the outlet of the damaged Quartz Rd culvert that were likely created from the 2023 flood event and are not visible on the most up-to-date aerial imagery. These pools may provide overwintering habitat for fish in the creek; however, this will depend on winter temperatures and water depth. The residual pool depth for each cross section in Site 1, from upstream to downstream, are as follows: 0.42 m, 0.30 m, 0.22 m, 0.04 m, 0.11 m, 0.11 m, and 0.05 m. It is assumed that historically fish have either moved down into the Bonaparte River or moved further upstream to try find more suitable habitat during the winter months. There is no large woody debris or instream vegetation throughout the site; cover for fish habitat is predominantly in the form of small woody debris, boulders, overhanging vegetation, and the three pools. Riparian vegetation is primarily limited to cottonwood trees on the right bank of the channel, which offer 21-40% crown closure for this site. The left bank features no riparian area and is a concrete wall below an asphalt parking lot. The channel pattern is straight throughout the site, with no islands or meanders. The section of stream could be used as a migration corridor for salmon to access upstream spawning habitat; however, this has not been confirmed. The small quantity of cover/refuge areas provides poor rearing habitat for juveniles.

Reach 2 – Site 2

Reach 2 – Site 2, approximately 40 downstream and 65 m upstream of Quartz Rd, consists of extensive riffle with very minimal instream cover. Two shallow pools were present in this site that were likely created from the 2023 flood event and are not visible on the most up-to-date aerial imagery. These pools may provide overwintering habitat for fish in the creek; however, this will depend on winter temperatures and water depth. The residual pool depth for each cross section in Site 2, from upstream to downstream are as follows: 0.07 m, 0.05 m, 0.02 m, 0.01 m, 0.05 m, 0.01 m, 0.40 m, and 0.30 m. The dominant substrate type is cobble with interspersed gravel, and no significant spawning potential was observed. Habitat complexity is poor within the site, which is largely riffle morphology, and the lack of cover provides poor rearing habitat juveniles. The minimal instream cover is present in trace amounts of boulders and deep pools. The channel right bank is vertical in shape and the left bank is sloping; neither bank has any riparian vegetation present, which results in 0% crown closure. The channel pattern is straight throughout the site, with no islands or side channels. Reach 1 – Site 2 could be used as a migration corridor for salmon to access upstream spawning habitat; however, this has not been confirmed.

2.2 DISCUSSION

This field program served to provide an assessment of existing fish habitat within the project area to identify mitigative efforts to protect or improve fish habitat within Cache Creek.

Instream habitat complexity within Reach 1 of Cache Creek was low, with each site consisting of a pool formed at the outlet of a culvert outlet followed by extensive riffle. Habitat complexity, quality, and value increased downstream of the Hwy 97 culvert as a result of trace amounts of large woody debris and overhanging vegetation. Potential spawning habitat is present within Reach 1 – Site 2, as gravel is the dominant substrate. In addition to the fish habitat observations, it was noted that the existing Hwy 97 culvert features a 75 cm drop where the new culvert extension was fastened to the old culvert as part of the 2021 repairs. This drop is a potential barrier to fish at current flow levels and may not be passable by juvenile salmonids at any flow level. The replacement of the culvert with a clearspan bridge will eliminate this issue.

Within both sites in Reach 2, instream habitat complexity within Cache Creek was low, with each site consisting of a small number of pools within extensive riffle. Habitat complexity, quality, and value was higher for Reach 2 – Site 1 than for Reach 2 – Site 2, which is the result of the presence of crown closure in Reach 2 – Site 1. No significant spawning potential was observed in Reach 2. In addition to the fish habitat observations for Reach 2, it was noted that the existing Cache Creek Inn culvert provides no fish habitat. Daylighting this section of the creek will allow for a significant opportunity to improve overall fish habitat quality in Cache Creek.

Generally, pool habitat, let alone deep pool habitat, is minimal within the sampled sections of Cache Creek. The lack of pools results in overall poor overwintering habitat for Cache Creek. In addition, the consistent lack of cover/refuge provides poor juvenile rearing habitat, especially for Reach 2 – Site 2. The aim of the Habitat Enhancement Plan will be to improve fish habitat as part of these projects.

Note: Fish habitat was sampled within a 265 m section of Cache Creek. Conclusions made in this report do not provide a comprehensive assessment of the total available habitat that exists within Cache Creek. Any tributaries which may provide significant habitat for resident and anadromous salmonids were not surveyed.

3.0 LITERATURE CITED

Resources Information Standards Committee. 2001. Reconnaissance (1:20,00) Fish and Fish Habitat Inventory: Standards and Procedures, Version 2.0. BC Fisheries Information Services Branch, Victoria BC.

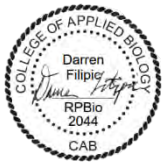
4.0 CLOSURE

This memo will support all regulatory applications for the Hwy 97 Crossing, Cache Creek Inn Culvert, and Quartz Rd Crossing projects. Furthermore, Urban Systems is currently working on an Environmental Management Plan and an Environmental Impact Assessment to support completion of the project prior to the 2024 freshet. We are available to discuss the content of this memo at your convenience.

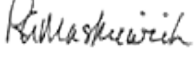
Sincerely,

URBAN SYSTEMS LTD.

Prepared by:
Carmen Peterson, B.Sc
Environmental Consultant



Prepared by:
Darren Filipic, R.P.Bio
Senior Fisheries Biologist

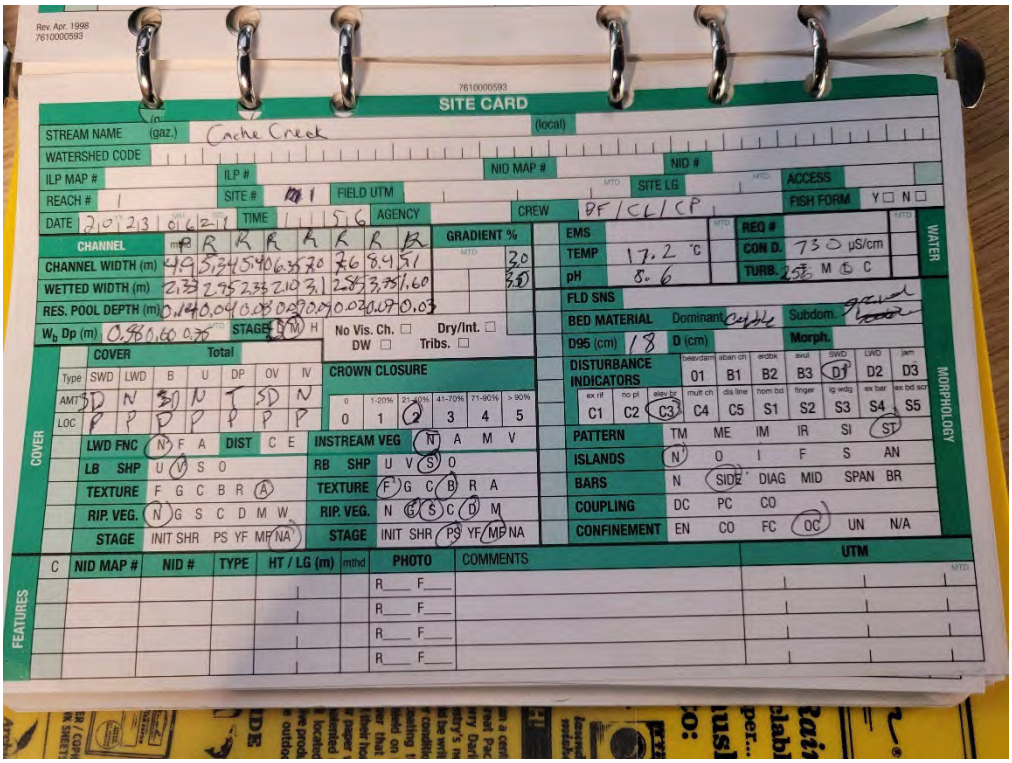


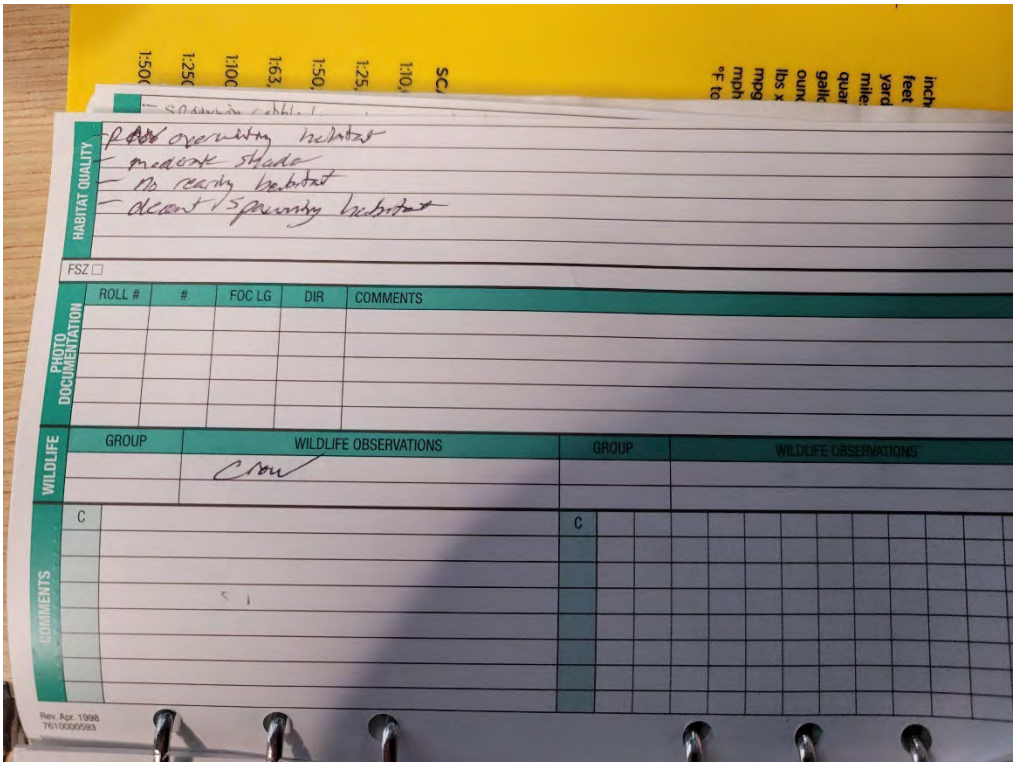
Reviewed by:
Rhonda Maskiewich, MCIP, RPP, R.P.Bio
Environmental Planner

APPENDIX A

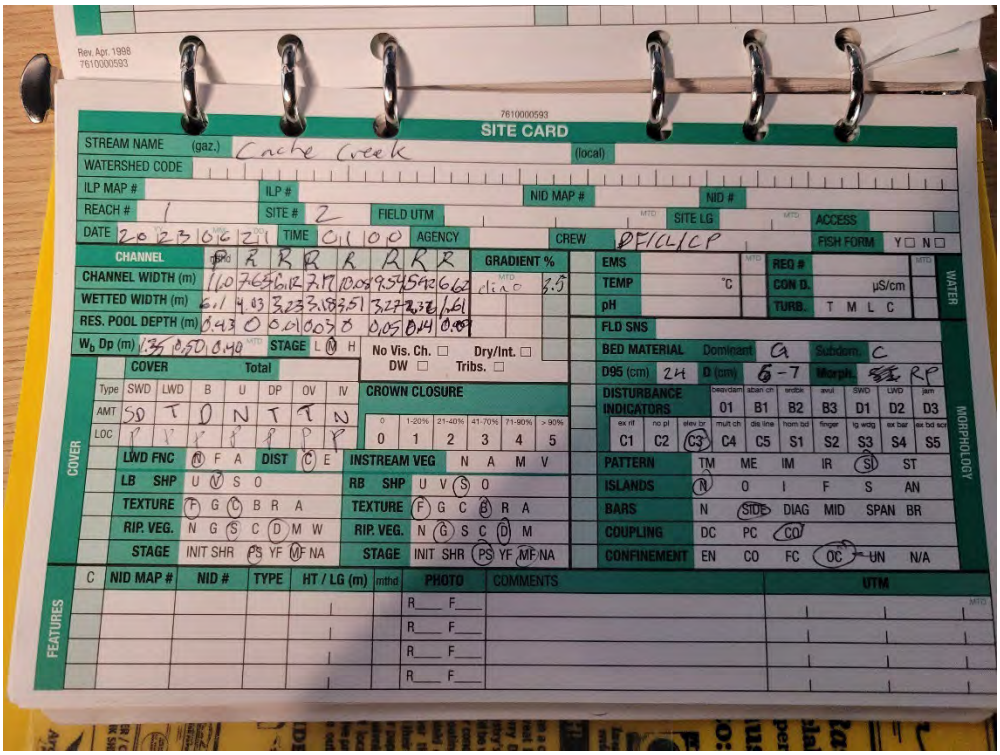
SITE CARDS

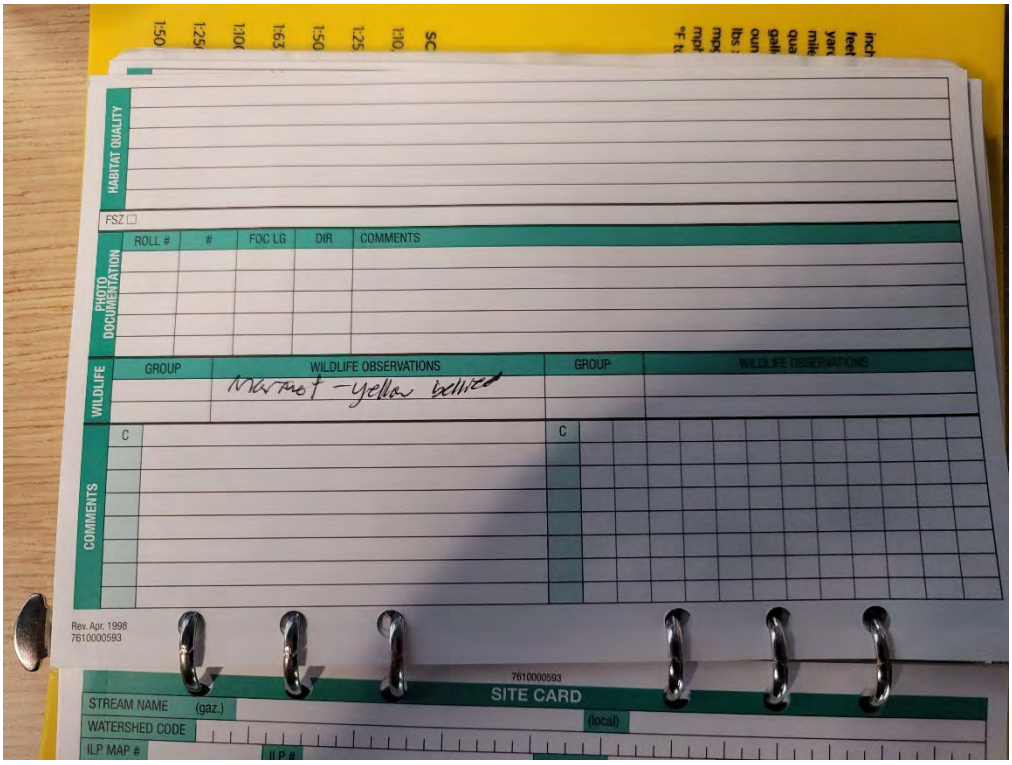
Reach 1 - Site 1



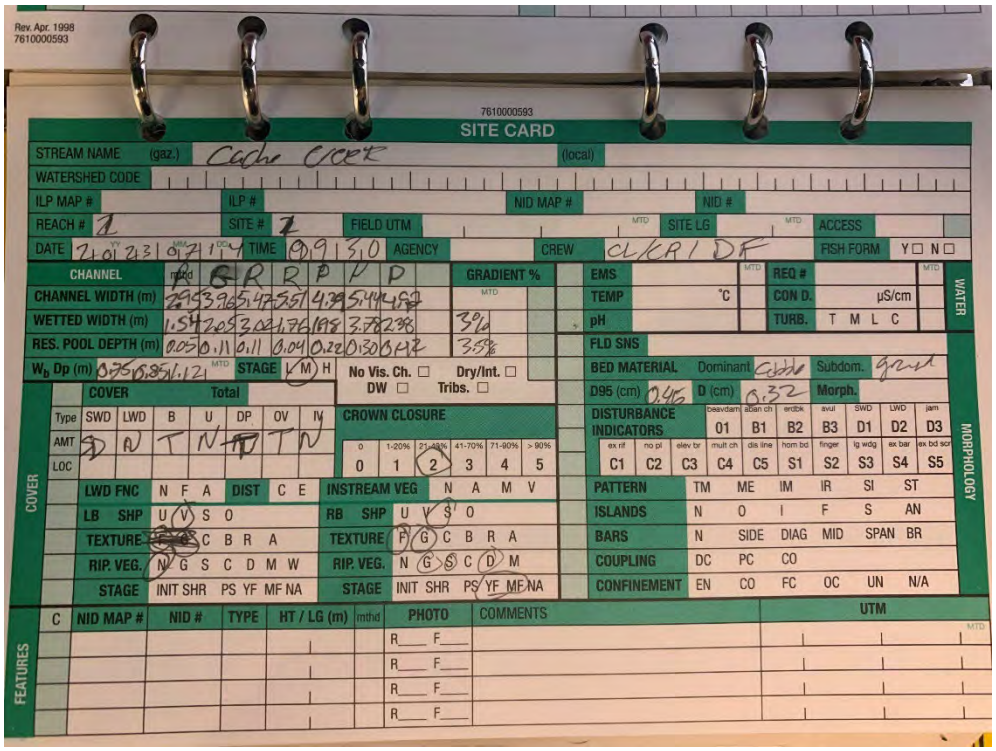


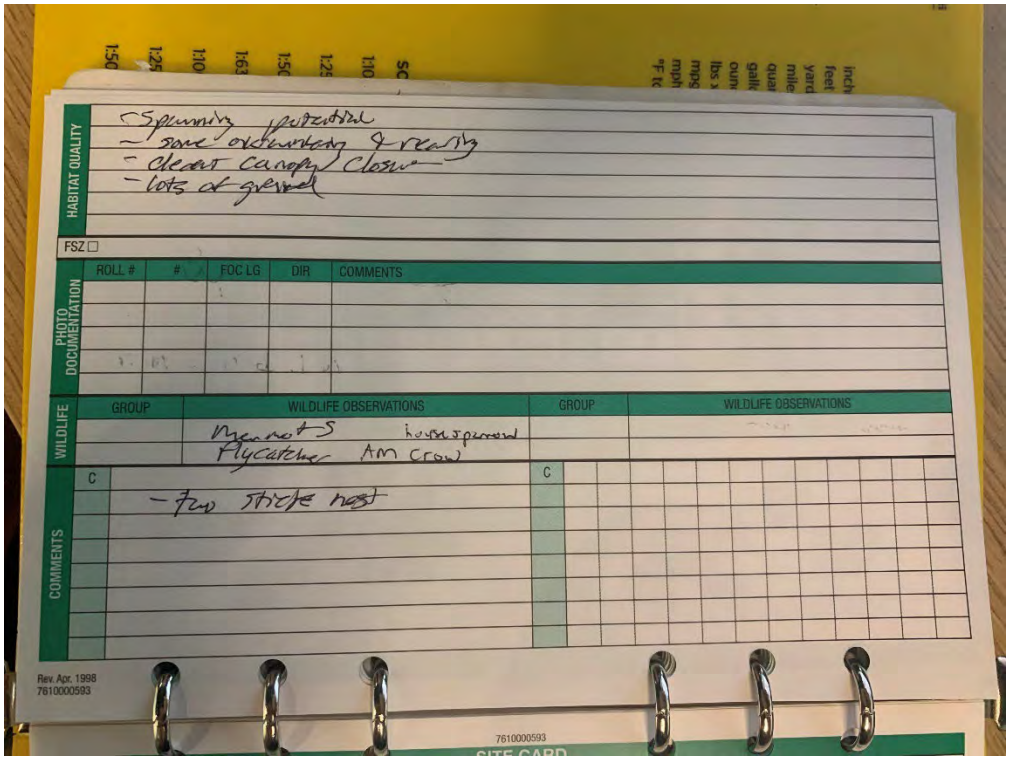
Reach 1 - Site 2





Reach 2 – Site 1





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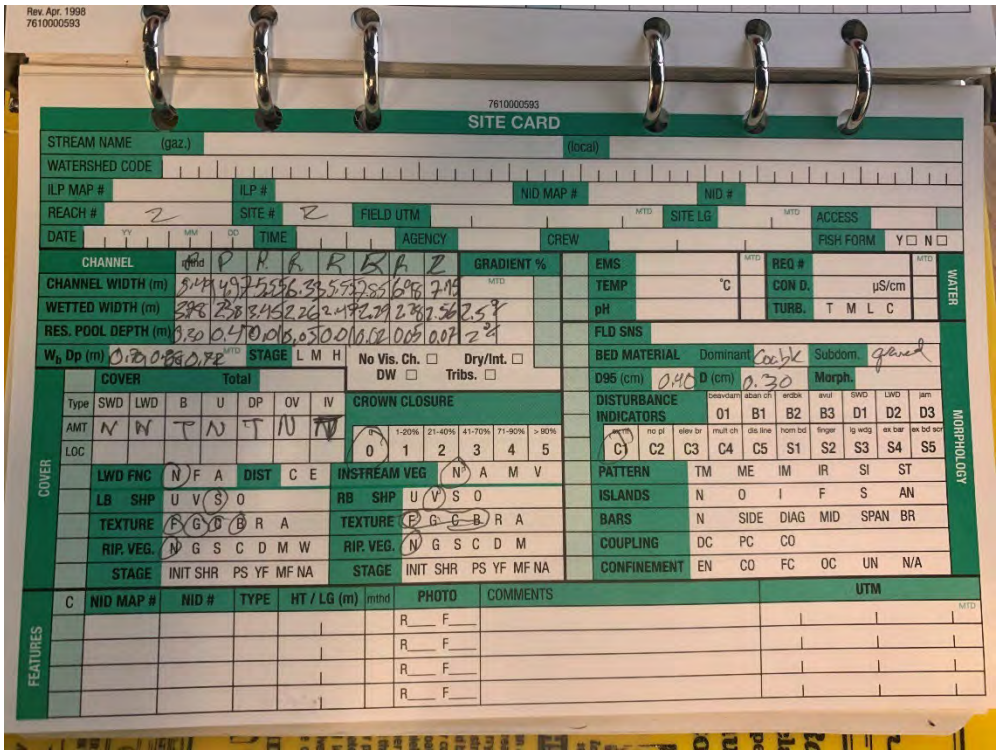

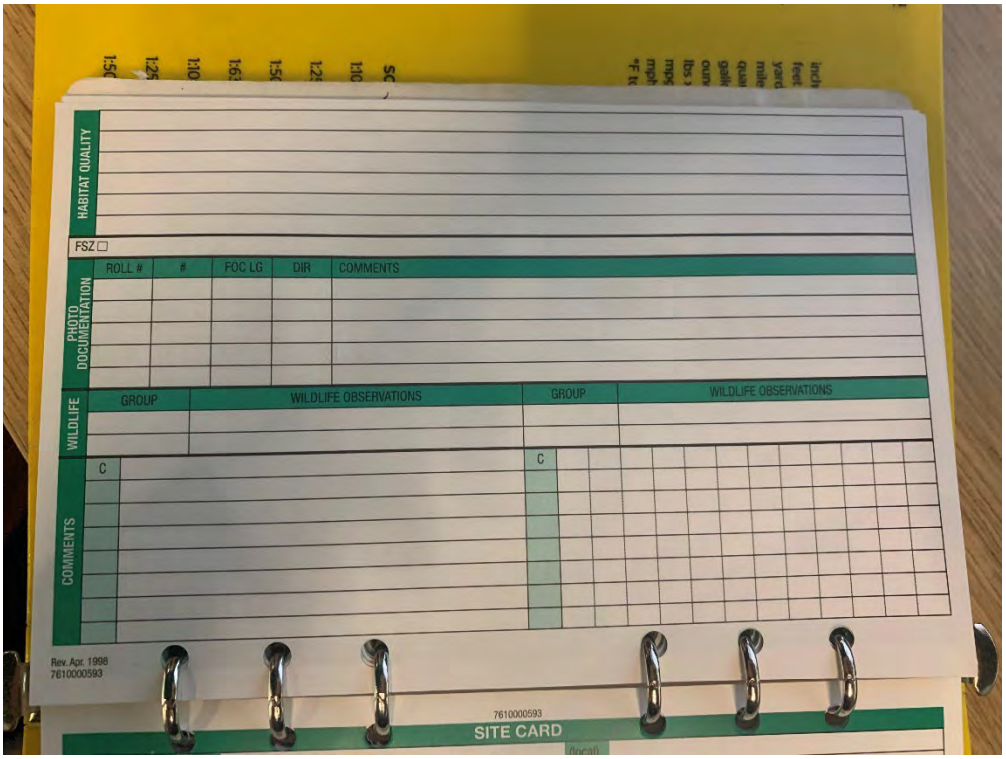

APPENDIX B

SITE PHOTOS

Highway 97 culvert and Reach 1 Site 2 deep pool-facing northeast.

Highway 97 culvert facing upstream-northeast.

Reach 1-Site 1 cottonwood bunch 1 – to be removed.

Reach 1 Site 1 cottonwood bunch 2 – to be removed.

Reach 1 Site 1 cottonwood bunch 3 - to be removed.

Reach 1 Site 1 cottonwood bunch 4 – to be removed.

Reach 1 Site 1 cottonwood bunch 5 – to be removed.

Reach 1 Site 2 deep pool – overwintering habitat – facing northeast.

Reach 1 Site 2 deep pool – overwintering habitat – facing southwest.

Reach 1 Site 2 fish habitat cover.

Reach 1 Site 2 spawning gravel.

Reach 1 Site 2 yellow-bellied marmot wildlife observation.

Reach 2 damaged former Quartz Rd culvert and emergency riprap.

Reach 2 Site 1 Cache Creek Inn culvert – facing downstream.

Reach 2 Site 1 upstream end of the site facing downstream.

Reach 2 Site 1 upstream end of the site facing upstream.

Reach 2 Site 1 washed out Quartz Rd culvert and emergency ripap.

Reach 2 Site 2 destroyed former Quartz Rd facing downstream.

Reach 2 Site 1 destroyed former Quartz Rd facing upstream.

Reach 2 Site 2 facing downstream.

Reach 2 Site 2 upstream end of site.

REPORT

URBAN SYSTEMS

Ministry of Transportation and Infrastructure

Highway 97 Cache Creek Culvert Replacement

Environmental Impact Assessment

File No.: 1961.0516.12

August 14, 2023

URBAN SYSTEMS LTD.

501 – 121 5th Avenue
Kamloops, BC V2C 0M1

Telephone: 250-374-8311

Prepared for:

Ministry of Transportation and Infrastructure
PO Box 9850 Stn Prov Govt
Victoria, BC V8W 9T5

Prepared by:
Mathieu Lizee
Environmental Consultant

Reviewed by:
Rhonda Maskiewich, MCIP, RPP, RPBIO
Environmental Planner

501 – 121 5th Avenue, Kamloops, BC V2C 0M1 | T: 250.374.8311

Date: August 14, 2023

File: 001961.0516.12

CONTENTS

APPENDICES

TABLES

FIGURES

1.0 INTRODUCTION

1.1 BACKGROUND

Flooding of Cache Creek in the southern interior of BC has occurred numerous times in recent years. In the spring of 2023, a particularly disastrous flood event occurred causing evacuation orders in the Village of Cache Creek, highway closures, culvert failures and significant erosion within the creek. A series of three culverts pass the flow of Cache Creek in its lowest reach from east to west in the Village until it confluences with the Bonaparte River. The culverts of particular concern include the following, starting at the downstream end of the reach:

- Highway 97 culvert, referred to as Crossing 1 – C1
- Cache Creek Inn culvert, referred to as Crossing 2 – C2
- Quartz Road culvert, referred to as Crossing 3 – C3

The approximate project limits and location of the existing creek crossing culverts that are the subject of this Environmental Impact Assessment are indicated on Figure 1.1 on the following page.

The BC Ministry of Transportation and Infrastructure (MOTI) is working in collaboration with the BC Ministry of Forests, Fisheries and Oceans Canada, the Village of Cache Creek, and the Bonaparte Indian Band to mitigate against future flooding events, as well as to improve fish passage and habitat quality in Cache Creek, by replacing and/or removing these culverts. While C1 is currently in the design stage, combining the three crossings into a single project is under review.

Urban Systems has been retained by MOTI to complete the design of C1 while the inclusion of C2 and C3 is currently under review. Urban Systems prepared this environmental impact assessment with the objective of identifying potential environmental constraints and opportunities for habitat enhancement for consideration in the design and construction of the proposed project.

1.2 SCOPE OF ENVIRONMENTAL IMPACT ASSESSMENT

This environmental impact assessment is based on desktop research as well as field work and includes:

- A description of the proposed project area including geographic setting and site topography.
- Regulatory considerations that include legislation and/or policies containing environmental direction or potential requirements that may be relevant to the project;
- A description of the environmental setting including valued ecosystem components such as vegetation, surface water and fisheries resources, groundwater, wildlife, species at risk and critical habitat, if any;
- Research of provincial and federal sources to determine rare element (species) occurrences, archaeological sites, and known contaminated sites that could arise from past use and pose a risk to human health or the environment;
- Recommendations to avoid and/or mitigate potential adverse impacts, including opportunities to enhance fisheries habitat in this reach of Cache Creek.

Hwy 97

Quartz Rd

Stage Rd

Cache Creek Community Hall

Cache Creek Fire Department

Trans-Canada Hwy

C3: Quartz Rd Crossing

C2: Cache Creek Inn Crossing

C1: Hwy 97 Crossing

Cache Creek

Cache Creek Elementary School

Cache Creek

Trans-Canada Hwy Frtg

Collins Rd

Stephenson Rd

Cache Creek

Approximate Project Limits

Project Location within the Village of Cache Creek

Scale: 1:40,000

URBAN SYSTEMS

0 10 20 40 60 80

Metres

Coordinate System: NAD 1983 UTM Zone 10N

Scale: 1:1,400 (When plotted at 11"x17")

Data Sources:

Urban Systems Ltd. (Existing Crossing, Project Limits);
DataBC (Roads, Streams, ParcelMap BC, Municipal Boundary);
The Ministry of Transportation and Infrastructure (2021 Imagery)

Project #:	1961.0516.12
Author:	BA
Checked:	ML/ RM
Status:	**Final**
Revision:	A
Date:	2023 / 7 / 26

- Watercourse
- Location of Existing Crossing
- Approximate Project Limits
- Municipal Boundary
- Property Boundary

Location in BC

Cache Creek

Victoria

BRITISH COLUMBIA — Ministry of Transportation and Infrastructure

Ministry of Transportation and Infrastructure

Hwy 97 Cache Creek Culvert Replacement

FIGURE 1.1

Location Map

1.3 INFORMATION SOURCES

Information gathered for this environmental impact assessment was sourced from the following:

Federal

- Canadian Climate Normals Station Data
- Environment and Climate Change Canada (ECCC) – Species Recovery Strategies
- Environment and Natural Resources Canada
- Federal Species at Risk Recovery Strategies and Management Plans
- Fisheries and Oceans Canada (Aquatic Species at Risk Map)
- Government of Canada – Nesting Calendars of Migratory Birds
- Treasury Board of Canada Contaminated Sites Inventory web site
- Discussions with Fisheries and Oceans Canada staff

Provincial

- BC Conservation Data Centre - BC Species & Ecosystems Explorer
- BC Great Blue Herons Atlas
- BC Habitat Wizard Web Application – Stream Report
- BC iMap Web Application
- BC Integrated Land and Resource Registry
- BC Invasive Alien Plant Program Web Application
- BC Ministry of Environment – Fisheries Information Data Queries (FIDQ)
- BC Online Contaminated Sites Registry
- BC Species and Ecosystems Explorer
- BC Soil Information Finder Tool
- Community Mapping Network - Wildlife Tree Stewardship Atlas Web Application
- ILRR Map Viewer
- Discussions with Ministry of Forests staff

Other

- iNaturalist
- Existing environmental reports prepared by Stantec (2021) and DWB (2018)
- Site visits conducted on June 21st and July 14th, 2023

2.0 REGULATORY CONSIDERATIONS

Legislation and policies containing environmental direction and potential requirements that may be relevant to the project are outlined below.

2.1 FEDERAL LEGISLATION AND POLICIES

2.1.1 MIGRATORY BIRDS CONVENTION ACT, 1994 (S.C. 1994, C. 22)

Most migrating birds found in Canada are protected under the Migratory Birds Convention Act (MBCA). This Act and its complementary regulations ensure the conservation of migratory bird populations by regulating potentially harmful human activities. The Migratory Bird Regulation (2022) prohibits the damage, destruction, removal, or disturbance of the nests of all migratory birds when there is a live bird or viable egg, or if the nest was built by a species that is listed in Schedule 1 of the Act. Schedule 1 lists 18 migratory bird species whose nests are known to be reused in subsequent years by migratory birds. The nests of these 18 species are protected year-round until the nest remains unoccupied by a migratory bird for the period of time designated in Schedule 1 (12, 24, or 36 months, depending on the species).

The time clock for this waiting period starts on the day that Environment and Climate Change Canada receives notification via the Abandoned Nest Registry. Nests for which a notification has been received continue to be protected against damage, destruction, disturbance, or removal during the designated waiting period.

If the nest of a bird listed on Schedule 1 is not present, impacts to migratory birds, their nests, eggs, and young can be avoided by conducting land clearing activities outside of the nesting season for birds. The conservative nesting season for bird species nearby the project area is March 31st to August 20th. Some species, including raptors, owls, and great blue heron, commence nesting earlier. Should land clearing activities occur during the nesting season, a qualified environmental professional should be engaged to ensure that birds and their nests are not adversely affected.

A submission under the Migratory Birds Convention Act is not anticipated for this project.

2.1.2 SPECIES AT RISK ACT (S.C. 2002, C. 29)

The federal Species at Risk Act (SARA) provides protection to endangered or threatened organisms and their habitats. This legislation applies to all federal land, migratory birds, and all aquatic species as defined in the Fisheries Act, wherever they are found. Although SARA prohibitions are automatically imposed on federal lands, including First Nations lands, the intent of SARA also applies to provincial Crown and private lands. SARA encourages provincial and First Nations governments to cooperate to protect wildlife in Canada.

A permit under the SARA is not anticipated for this project.

2.1.3 FISHERIES ACT (R.S.C., 1985, C. F-14)

The Fisheries Act provides a framework to manage and control Canada's fisheries, as well as to conserve and protect fish and fish habitat, including pollution prevention. Under the Act, activities other than fishing that result in the death of fish and/or activities that may result in the harmful alteration, disruption, or destruction (HADD) of fish habitat are prohibited.

Projects with the potential to adversely impact fish and/or fish habitat and with a project scope that is not covered under the standards and codes of practice should be reviewed by Fisheries and Oceans Canada (DFO) through the Request for Review process. This applies to work in or near water bodies that are frequented by fish and any other areas which fish depend on directly or indirectly to carry out their life processes, including spawning grounds, nursery, rearing, food supply, and migration areas, as well as any waterbody that is connected to fish-bearing waters at any time of the year. The Request for Review will determine if the project requires an authorization under the Fisheries Act.

A Request for Review will be submitted for this project. Also, a Scientific Licence to Collect Fish is required for fish salvage during stream isolation.

2.1.4 CANADIAN NAVIGABLE WATERS ACT

The public right to travel on navigable waters is protected by law in Canada. This applies to all waters that the public may use for travel or transport, whether or not the waterway is on the list of "scheduled waters" of the Canadian Navigable Waters Act (CNWA). Navigable waters that are not listed on the schedule continue to be protected under the Act. The CNWA is administered by the Navigation Protection Program and can apply to anyone, including industry, all levels of government, and the public, who propose works on waters on which the public has the right to travel (navigable waters). The Act creates a new category for major works that are likely to substantially interfere with navigation. Bridges with one or more piers below the ordinary high water mark are considered "a major work" under the Major Works order established under the act. These works require approval from Transport Canada (TC) whether the affected navigable waters are on the schedule or not. The Act also introduces a process to notify the public and help resolve conflicts about works on navigable waters that are not listed on the schedule. An application for approval is not required if a minor work that meets the requirements of the classes of work established under the Minor Works Order is proposed. An assessment tool is available on the Navigation Protection Program webpage to help determine what, if any, application is required for works.

The assessment tool indicated that Cache Creek is deemed a non-navigable waterbody and a submission to Transport Canada's Navigation Protection Program is not required for this project.

2.2 PROVINCIAL LEGISLATION AND POLICIES

2.2.1 BC WATER SUSTAINABILITY ACT AND REGULATIONS (SBC 2014, C 15)

All water in BC, including land below the high-water mark, is managed by the Crown on behalf of the residents of the province. For any changes in and about a stream, an application under Section 11 of the Water Sustainability Act (WSA) is required. The Water Sustainability Regulation identifies the requirements for using water or making changes to a stream.

The Groundwater Protection Regulation ensures that activities related to wells and groundwater are performed in an environmentally safe manner. Under the Water Sustainability Act (WSA), the Groundwater Protection Regulation:

- Regulates minimum standards for well construction, maintenance, deactivation, and decommissioning, and
- Recognizes the types of qualified people certified to drill wells, install well pumps, and perform related services.

An approval submission under Section 11 of the Water Sustainability Act is required for this project.

2.2.2 BC WILDLIFE ACT (RSBC 1996, C. 488)

The Wildlife Act governs the protection and management of wildlife in BC. The Act defines wildlife as all native and some non-native amphibians, reptiles, birds, mammals, and fish. The Wildlife Act protects virtually all vertebrate animals from direct harm, except as allowed by regulations (e.g., hunting or trapping). The Act deals with the protection and maintenance of suitable habitat and the conservation of wild species, in particular those species that may be at risk of extinction, as well as nesting birds, their nests, and their eggs. Section 34 of the Wildlife Act prohibits possessing, taking, or destroying (i) a bird or its egg, (ii) the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron, or burrowing owl, or (iii) the nest of a bird not mentioned in (ii) when the nest is occupied by a bird or its egg unless authorized under permit. By conducting vegetation and ground disturbance activities outside of the nesting season for birds, a proponent is often able to maintain compliance with respect to Section 34 of this Act. Additionally, ensuring construction activities do not harm vertebrate animals will help maintain compliance with this Act.

A Scientific Fish Collection Permit is required for fish salvage during stream isolation.

2.2.3 BC WEED CONTROL ACT AND REGULATION (RSBC 1996, C. 487)

The Weed Control Act requires all land occupiers to control the spread of provincial and/or regional noxious weeds on their land and premises, and specifies provisions for transportation, movement, and cleaning of machinery.

A submission under this act is not required.

2.2.4 BC LAND ACT (RSBC 1996, C.245)

All utilities/structures located on Crown land require permission from the province to use the land. This is obtained by application under the Land Act. The land tenure will require a Management Plan which will consist of construction details, access plans, and joint use agreements, as well as drainage and environmental control measures.

MOTI Properties is working with the province on any Land Act requirements.

2.2.5 BC HERITAGE CONSERVATION ACT (RSBC 1996, C187)

All archaeological sites in BC are protected under the Heritage Conservation Act and must not be damaged or altered without a Provincial heritage permit issued by the BC Archaeology Branch. This protection applies even when archaeological sites are previously unidentified and applies to public

and/or private land. Archaeological sites may not be altered or changed in any manner without a permit. Projects involving excavation or land-altering activities should include the services of a registered professional archaeologist. An Archaeological Impact Assessment (AIA) may be recommended if there is moderate to high potential for archaeological sites to be present within the project area. If a permit is required, the application and issuance process may take 8 to 12 months.

It is understood that the MOTI is working directly with a professional archaeologist to conduct an AIA for this project.

3.0 THE PROJECT

3.1 SITE DESCRIPTION

The proposed project consists of three crossing locations within the Village of Cache Creek. The project limits include portions of Hwy 97 and the Trans-Canada Hwy and commercial developments, including the Village Fire Hall. There is a primary school immediately northwest of the project limits on the west end of the project.

C1 - Highway 97 Crossing – Cache Creek crosses under Hwy 97 through an existing culvert located approximately 120 m north of the junction of Hwy 97 and the Trans-Canada Hwy. This is the furthest downstream site on the creek. Upstream of the culvert crossing, riparian habitat is limited to approximately 5 black cottonwood trees in the middle of the channel and some saplings on the right bank. The left bank consists of a gabion basket wall to support the Dairy Queen property to the south. Downstream of the culvert, there are trace amounts of large woody debris and overhanging vegetation present with significant bank erosion due to the ongoing flooding events. The left bank is mostly vertical with riparian vegetation present on the banks in the form of shrubs and deciduous. The right bank is sloped with riparian vegetation consisting of grasses and black cottonwood trees/saplings.

C2 - Cache Creek Inn Culvert – the existing culvert at C2 is located under the Cache Creek Inn and its associated parking lot, approximately 40 m upstream of C1. If approved to be included within this project, the culvert will be removed, the stream will be daylighted, and channel reconfigured. There is no vegetation present at C2.

C3 - Quartz Rd Crossing – the culvert and Quartz Road were completely overtopped and washed out during the 2023 freshet. C3 is the furthest upstream site in the project area and is approximately 185 m from C1. Upstream of Quartz Rd, riparian vegetation is limited to cottonwood trees on the right bank of the channel and no riparian vegetation on the left bank as there is a concrete wall supporting an asphalt parking lot. Neither bank has any riparian vegetation downstream of Quartz Rd. Significant emergency works were undertaken in this area as part of the 2023 flooding event.

3.2 PROJECT DESCRIPTION

The project will consist of three crossing locations as described above if fully approved. However, only C1 is in the design phase, and construction is to be started early in 2024 with the intention of having 2 lanes of the 4 lane bridge completed as well as the new channel realignment complete before the 2024 freshet. Included in the C1 location are private utilities that were disrupted during the flooding in 2023. The

Village's watermain and a Fortis gas conduit will be re-buried beneath the creek bed within the Hwy 97 right-of-way on the west side of the stream. The Village's sanitary line will also be replaced but will have no impact on the creek. The private utilities work will be constructed in advance of the C1 work which is anticipated to be in the Fall of 2023. As part of works at C1, the highway stormwater system will need to be reconfigured with a new alignment, mechanical water treatment, and outlet configuration.

At the time of writing this report, the Urban Systems team and the Ministry of Transportation and Infrastructure team are in the process of incorporating two additional culverts upstream of C1, the Cache Creek Inn culvert (C2), and the Quartz Rd crossing (C3). While outside of MOTI jurisdiction, there is hydrotechnical risk if C2 and C3 are not replaced in conjunction with C1. Combining the three crossings into a single project is under review.

C1 – Hwy 97 Crossing - a 1900 mm x 2400 mm diameter culvert currently exists allowing Cache Creek to flow beneath the highway. However, this culvert is undersized for high flows, particularly during freshet, which has repeatedly resulted in overland flooding and erosion. To resolve this issue, a 14 m long clearspan bridge is being designed to replace the culvert. To accommodate the bridge structure and hydraulic capacity requirements, widening and re-profiling of approximately 80 m of the creek channel is required. To mitigate for working within the stream channel, a Habitat Enhancement Plan is included in the C1 works. If the other two projects proceed, this will be expanded to include those areas. The structural and riprap drawings are included in Appendix A.

C2 - Cache Creek Inn Crossing - The existing culvert under the Cache Creek Inn and associated parking lot is to be removed and the stream is to be daylighted. This will require acquisition of a portion of the Cache Creek Inn property, demolition of a part of the Cache Creek Inn and excavation of the culvert. Realignment of the creek is anticipated as well as riprap armoring and environmental enhancements to improve fish habitat. As of the date of this report, a final decision on C2 has not been made.

C3 - Quartz Rd - The Village of Cache Creek has begun preliminary design for the replacement of the culvert crossing under Quartz Rd. The Quartz Road Crossing project will replace the current culvert crossing with a clearspan bridge approximately 185 m upstream of the Hwy 97 crossing project. As of the date of this report, a final decision to include C3 in the MOTI project has not been made.

To complete these works with the least impact to fish species and aquatic habitat in the creek, the construction plan will retain as many mature trees and other vegetation within the riparian area of the existing creek channel as possible. However, retention of any trees will be dependent on the hydrotechnical analysis report which is currently in process. A qualified environmental professional will be present on-site during construction works to advise on the removal of trees. Furthermore, temporary spawning deterrents will be installed downstream of the Hwy 97 crossing to reduce the risk of fish egg deposition in the work area. These deterrents will be installed in early August of 2023 by staking snow fencing into select locations on the creek substrate to decrease fish access to spawning gravel and deter spawning activities in Cache Creek. Using spawning deterrents will decrease the chances of construction activities impacting fish eggs or fry in the creek. A Spawning Deterrent Plan is included in Appendix B.

3.3 LAND USE

The proposed project encompasses approximately 345 m of stream and consists of three crossing locations within the Village of Cache Creek. The project area crosses two roadways: Hwy 97,

approximately 120 m north of the intersection with the Trans-Canada Hwy and Quartz Rd, approximately 240 m from this same intersection. The businesses neighbouring the Hwy 97 Crossing project are: Dairy Queen (1109 Trans-Canada Hwy 1) on the southeast, Annies Pizza & Bakery (1206 Highway 97) to the southwest, numerous private homes located off Stephenson Rd to the southwest, Cache Creek Elementary School (1260 Highway 97) to the northwest, and Subway and Cache Creek Motor Inn (1209 Highway 97) to the northeast. The Cache Creek Inn Culvert project is located directly underneath the Cache Creek Motor Inn and is directly beside Junctions Coffee House (1153 Trans-Canada Hwy 1). The Quartz Rd Crossing project neighbours the Cache Creek Fire Department (1240 Quartz Rd) to the northwest and Tumbleweed Motel (1221 Quartz Rd) to the northeast, as well as it borders the Trans-Canada Hwy 1 to the south.

4.0 DESCRIPTION OF THE ENVIRONMENT

4.1 TOPOGRAPHY

Land in the project area slopes westward causing Cache Creek to flow to the Bonaparte River. The elevation ranges from approximately 472 meters to 461 meters above sea level (Google Earth, 2020).

4.2 CLIMATE

The climate of the general area can be generalized using the Biogeoclimatic Ecosystem Classification system. This system is used by natural resource practitioners within the province of British Columbia to describe general terrestrial ecosystem characteristics throughout the province, including regional vegetation, as well as biological, geographical, and climatic characteristics. The project area is located in the Bunchgrass Thompson Very Dry Hot biogeoclimatic sub-zone (BGxh). Bunchgrass occurs at lower elevations mainly in southern interior valleys of British Columbia (Meidinger and Pojar, 1991).

Climate in Bunchgrass biogeoclimatic zones is warm to hot, with dry summers and moderately cold winters accompanied by minimal snowfall (Meidinger and Pojar, 1991). The driest months are typically March and April, while the wettest months are generally December and January with additional increased precipitation noted in June (Meidinger and Pojar, 1991).

Climate Normals data from the Spences Bridge Nicola station (the closest station to Cache Creek with similar elevation) shows August to be the warmest month with a daily maximum of 29.7°C and a daily average of 22.1°C and December as the coldest month with a daily minimum of -5.7°C and a daily average of -2.8°C. Contrary to the biogeoclimatic zone precipitation information, July is the wettest month, receiving an average of 30 mm of precipitation. Annual average precipitation reported at this station is 263.7 mm. Approximately 11.5% of the total precipitation falls as snow (Environment and Climate Change Canada, 2023).

4.3 VEGETATION

The hot, dry climate in BGxh subzone results in fragile ecosystems with limited plant productivity and soil development. Floristically, the BGxh is characterized by widely spaced clumps of big sagebrush and bluebunch wheatgrass, pasture sage, rabbit brush, Sandberg's bluegrass, and needle-and-thread grass

with many lichen species encrusting the soil surface (Meidinger and Pojar, 1991). Black cottonwood, trembling aspen and willows are found in riparian areas in the BG zone.

The project area has been severely impacted by adjacent development, recent flooding, and is vegetated primarily by sparse black cottonwood trees and cedar hedges, as well as a small amount of red-osier dogwood.

4.3.1 INVASIVE PLANT SPECIES

Invasive plants (also referred to as "weeds") can lead to environmental degradation and result in the loss of native plant and animal habitat (Invasive Species Council of BC, 2021). Upon review of the Invasive Alien Plant Program web application, one invasive plant appears to be present within the project boundary (Invasive Alien Plant Program, 2019). Just northeast of Quartz Road, there is a documented occurrence of western goat's-beard from November of 2019. The estimated area of this invasive plant is 10 square meters. Western goat's-beard is not listed within the "Provincial Priority Invasive Species BC Inter-Ministry Invasive Species Working Group – March 2021" (Provincial Priority Invasive Species 2021). Nor is it listed as a noxious weed on Schedule A of the BC Weed Control Regulation.

4.4 GEOLOGY AND SOILS

The surficial geology of the project area is defined as Godey soils which are described as sandy loam to loamy sand overlying gravelly sandy loam to gravelly coarse sand. Moderately alkaline, fluvioglacial deposits are present derived from a variety of bedrock, mainly volcanic. Generally, soils are slightly stony near the surface and very stony and gravelly at depth. A variable thickness of eolian veneer is common as a surface capping (Young 1947).

A geotechnical study was conducted September 28th, 2022, by WSP E&I Canada Limited (WSP) that included a subsurface drilling investigation where two boreholes were drilled on either side of the culvert that passes beneath Hwy 97. The results of this drilling investigation showed fills consisting primarily of sand, gravel, and a small amount of silt and cobbles. WSP noted that beneath the fill, granular deposits were found described as "sand and gravel to gravelly sand". Some cobbles, gravel, silty sand, and clay were also found beneath the fill layer. Additional geotechnical drilling is scheduled during the design phase.

4.5 SURFACE WATER AND FISHERIES RESOURCES

The project works are located within Cache Creek, which is a 4th order stream and is approximately 22 kilometers in length (DataBC Habitat Wizard, 2023). Cache Creek is a fish bearing stream that provides habitat to numerous species including rainbow trout, all salmon species, and steelhead (DataBC Habitat Wizard, 2023).

The confluence of Cache Creek with the Bonaparte River is approximately 250 meters downstream from the project area, with no fish barriers observed in between the two waterbodies. As such, it is possible that any fish occurring in the Bonaparte River could be present in Cache Creek. Based upon review of a stream report provided by Habitat Wizard, fish known to occur in the Bonaparte River include all salmon species, bridgelip sucker, brook trout, bull trout, cutthroat trout, kokanee, lake chub, largescale sucker, leopard dace, longnose dace, longnose sucker, mountain whitefish, northern pike minnow, peamouth chub, rainbow trout, redside shiner, steelhead, and sucker (general) (DataBC Habitat Wizard, 2023).

A search was performed on July 10th, 2023, using the Fisheries of Oceans Canada Aquatic Species at Risk Map to identify potential critical habitat or species at risk within the project area. Using a 1 km radius search from the center of the proposed Hwy 97 culvert location, no critical habitat or species at risk were shown to be present (Fisheries and Oceans Canada, 2023).

Based on discussions with Ministry of Forests staff, the reduced risk regional timing window for instream work in Cache Creek downstream of the Hwy 97 culvert is between July 22nd and August 15th due to the presence of salmonid species, rainbow trout and steelhead. The reduced risk timing window for instream work in Cache Creek upstream of the Hwy 97 culvert is between July 22 and October 31.

During the site visits on June 21st and July 14th, 2023, juvenile rainbow trout were observed as well as other unidentified juvenile species that may have been salmonids.

4.5.1 FISH HABITAT ASSESSMENT

A Fish Habitat Assessment was completed for the project area. Site visits were conducted on June 21st and July 14th, 2023. The fish and fish habitat assessment followed the standards and procedures outlined in the BC Resources Inventory Standards Committee (RISC) Reconnaissance (1:20 000) Fish and Fish Habitat Inventory (RISC 2001). Areas surveyed for the Fish Habitat Assessment were broken into two reaches each of which were divided into two sites. Reach 1 - Site 1 is the 40 meters of Cache Creek upstream of the Hwy 97 culvert while Reach 1 - Site 2 is the 60 meters of Cache Creek downstream of the Hwy 97 culvert. Reach 2 – Site 1 starts at the outlet of the Cache Creek Inn culvert and runs for 60 m of creek upstream of the Cache Creek Inn culvert, whereas Reach 2 – Site 2 runs the remaining 105 m of creek channel in the project area (Figure 2.1).

The Fish Habitat Assessment served to provide details of existing fish habitat within the project area to identify mitigative efforts to protect and/or mitigate impacts and to provide a baseline for improvements to fish habitat within the creek.

Instream habitat complexity within Reach 1 of Cache Creek was low, with each site consisting of a pool formed at the outlet of a culvert outlet followed by extensive riffle. Habitat complexity, quality, and value increased downstream of the Hwy 97 culvert as a result of trace amounts of large woody debris and overhanging vegetation. Potential spawning habitat is present within Reach 1 – Site 2, as gravel is the dominant substrate. In addition to the fish habitat observations, it was noted that the existing Hwy 97 culvert features a 75 cm drop where the new culvert extension was fastened to the old culvert. This drop is a potential barrier to fish at current flow levels and may not be passable by juvenile salmonids at any flow level. The replacement of the culvert with a clearspan bridge will eliminate this issue.

Within both sites in Reach 2, instream habitat complexity within Cache Creek was low, with each site consisting of a small number of pools within extensive riffle. Habitat complexity, quality, and value was higher for Reach 2 – Site 1 than for Reach 2 – Site 2, which is the result of the presence of crown closure in Reach 2 – Site 1. No significant spawning potential was observed in Reach 2. In addition to the fish habitat observations for Reach 2, it was noted that the existing Cache Creek Inn culvert provides no fish habitat. Daylighting this section of the creek will allow for a significant opportunity to improve overall fish habitat quality in Cache Creek.

Generally, pool habitat, let alone deep pool habitat, is minimal within the sampled sections of Cache Creek. The lack of pools results in overall poor overwintering habitat for Cache Creek. In addition, the

consistent lack of cover/refuge provides poor juvenile rearing habitat, especially for Reach 2 – Site 2. The aim of the Habitat Enhancement Plan will be to improve fish habitat as part of these projects.

The complete Fish habitat Assessment can be found in Appendix C.

Stage Rd
Quartz Rd
Trans-Canada Hwy
Hwy 97
Collins Rd
Trans-Canada Hwy Frtg
Cache Creek
1301
1151
1248
1270
1293
1240
1260
1191
1209
1153
1109
1206
1197

Reach 2 - Site 2
C3: Quartz Rd Crossing
Reach 2 - Site 1
C2: Cache Creek Inn Crossing
C1: Hwy 97 Crossing
Reach 1 - Site 1
Reach 1 - Site 2

URBAN SYSTEMS

0 5 10 20 30 40 50
Metres

Coordinate System: NAD 1983 UTM Zone 10N

Scale: 1:1,000 (When plotted at 11"x17")

Data Sources:
Urban Systems Ltd. (Environmental Field Observations); WSP (2021 ICIS Civic Addresses); DataBC (Roads, Streams, ParcelMap BC); The Ministry of Transportation and Infrastructure (2021 Imagery)

Project #:	1961.0516.12
Author:	BA
Checked:	CP
Status:	Draft
Revision:	A
Date:	2023 / 7 / 26

- Cottonwood Tree Cluster
- Dead Cottonwood Tree

Environmental Project Sites
- Reach 1 - Site 1 (C1)
- Reach 1 - Site 2 (C1)
- Reach 2 - Site 1 (C2 & C3)
- Reach 2 - Site 2 (C2 & C3)

- Deep Pool - Overwintering Habitat
- Watercourse
- Location of Existing Crossing
- Approximate Project Limits
- Property Boundary

BRITISH COLUMBIA — Ministry of Transportation and Infrastructure

Ministry of Transportation and Infrastructure

Hwy 97 Cache Creek Culvert Replacement

FIGURE 2.1

Fish Habitat Assessment Reach

4.6 GROUNDWATER

A search on iMapBC for groundwater resources revealed that Aquifer 133 and 134 is within the project area (iMapBC, 2023). Aquifer 133 is described as a sand and gravel aquifer with high productivity, low vulnerability, and high demand. Aquifer 134 is described as a sand and gravel aquifer with high productivity, high vulnerability, and high demand.

A search for groundwater wells revealed that there are 4 wells within 200 meters of the project area, with the nearest well located within project area (Well tag number 76327). This well is located 5 m north of the inlet to the Cache Creek Inn culvert. The second well is located west of the project area (Well tag 2075) and the remaining two are located southeast of the project area (Well tag number 16112 & 16086).

The Geotechnical Data Report completed by WSP states that groundwater is likely to be affected by the water levels in Cache Creek (WSP E&I Canada Limited, 2022).

Groundwater wells within 200 m of the proposed project area are listed from north to south in **Table 4.1.** Further information can be found in Appendix D.

Table 4.1. Groundwater wells within a 200 m radius of the proposed project area.

WELL TAG NUMBER	DEPTH TO WATER (M)	WELL DEPTH (M)	DIAMETER (MM)	DISTANCE FROM PROJECT AREA (M)	WELL USE	REPORTED YIELD (L/S)
76327	6.4	11.6	168.3	5 m north of the Cache Creek Inn Culvert inlet	Private Domestic	2.20815 l/s
2075	N/A	4.6	N/A	162	Private Domestic	N/A
16112	N/A	21.3	203.2	133	N/A	N/A
16086	N/A	17.7	203.2	110	N/A	N/A

4.7 CULTURAL RESOURCES AND ARCHAEOLOGY

A search of the Integrated Land and Resource Registry (ILRR) records was conducted on June 15th, 2023. The ILRR provides information on various legal interests on provincial Crown land and private land where available, including tenures, regulated uses, and sensitive occurrence records such as archaeological sites, land and resource use restrictions, and reservations. A search was conducted to determine sensitive records that may indicate cultural resources and archaeological sites within the project area. The ILRR search revealed no sensitive records, indicating that there are no known and recorded archaeological sites within the vicinity of the project area. However, a qualified archaeologist will be contracted for assistance with this project to avoid potential archaeological disturbances. The ILRR search did reveal three non-sensitive records, outlined below in **Table 4.2**.

Table 4.2. ILRR search results for the project area.

INTEREST ID	INTEREST TYPE	STATUS
113523	Pre-Tantalis crown Grant	Active
1205209	Trapline Area	Active
1205510	Trapline Area	Active

4.8 WILDLIFE

Wildlife species found within the various habitats within the Bunchgrass biogeoclimatic zone are described in Ecosystems of British Columbia (Meidinger and Pojar, 1991). Most of the habitat in the project area has been lost due to development and flooding events. A few remaining cottonwood trees/saplings and some shrubs are found in a couple of locations along the stream.

On June 21st, 2023, a bird nesting sweep was conducted and American crow, as well as an unidentified flycatcher species, were observed on site. No nests were found.

The project area is located within critical habitat for both western rattlesnake and Lewis's woodpecker. The cottonwood trees located within the project area were surveyed for nesting cavities during the nest sweep on June 21, 2023. No nest cavities were observed. Refer to Section 4.9.

A search using the Wildlife Tree Stewardship Atlas was conducted on July 10th, 2023, and no osprey or bald eagle nests were observed in the data base within a 1 km radius search of the center of the Hwy 97 culvert location (Wildlife Tree Stewardship Atlas, 2023).

4.9 SPECIES AT RISK

Species at risk are ranked and listed by both federal and provincial government agencies. The federal and provincial species at risk ranking processes are discussed in the following sections.

4.9.1 FEDERAL SPECIES AT RISK ACT

Under the Species at Risk Act (SARA), species ranking is conducted by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), established under Section 14 of the SARA. COSEWIC is a committee of experts that assesses and designate wild species of animal, plant, or other organisms that are in danger of disappearing from Canada, under Sections 15 to 21 of the SARA. COSEWIC status categories are: extinct, extirpated, endangered, threatened, special concern, data deficient, and not at risk. COSEWIC species assessments are then reviewed under the SARA and a decision is made to accept the assessment and add the species to the SARA Schedule 1 or not.

Schedule 1 of the SARA is the official list of species that are classified as extirpated, endangered, threatened and of special concern. To ensure the protection of species at risk, the SARA contains general prohibitions that apply to endangered, threatened, or extirpated species listed on Schedule 1. While the prohibitions do not apply to species of special concern, protection may be provided provincially or under regional management plans. Species on Schedules 2 and 3 of the SARA are not protected under the Act but have been assessed by COSEWIC and may eventually be listed under Schedule 1.

Under SARA's general prohibitions, it is an offence to:

- Kill, harm, harass, capture, or take an individual of a species listed in Schedule 1 of the SARA as endangered, threatened, or extirpated;
- Possess, collect, buy, sell, or trade an individual of a species listed in Schedule 1 of the SARA as endangered, threatened, or extirpated; and
- Damage or destroy the residence (e.g., nest or den) of one or more individuals of a species listed in Schedule 1 of the SARA as an endangered or threatened species, or as an extirpated species if a recovery strategy has recommended the reintroduction of the extirpated species into the wild in Canada.

4.9.1.1 Critical Habitat

Critical habitat is identified for species listed as Endangered or Threatened under the SARA and is defined under section 2 of the Act as: "the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species".

Under the SARA, it is illegal to destroy any part of the critical habitat of any listed endangered species or of any listed threatened species – or of any extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada if:

a) the critical habitat is on federal land, in the exclusive economic zone of Canada or on the continental shelf of Canada;

b) the listed species is an aquatic species; or

c) the listed species is a species of migratory birds protected by the Migratory Birds Convention Act.

4.9.2 PROVINCIAL SPECIES AT RISK

The BC Conservation Data Center (CDC) tracks and categorizes species according to their conservation status in BC. Provincially, the CDC assigns a provincial rank or listing of 'Red' or 'Blue' or 'Yellow' to a species based on its status within BC. The rankings or provincial listing categories described below highlight the wildlife and plant species as well as natural plant communities that require special attention. The CDC listing is an advisory and management tool and is not a legal designation in the province.

- **Red:** any indigenous species, subspecies or plant community that is extirpated, endangered, or threatened in BC. Extirpated elements no longer exist in the wild in BC but do occur elsewhere. Endangered elements are facing imminent extirpation or extinction. Threatened elements are likely to become endangered if limiting factors are not reversed.
- **Blue**: any indigenous species, subspecies or community considered to be vulnerable (special concern) in BC. Vulnerable elements are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed elements are at risk, but are not extirpated, endangered, or threatened.
- **Yellow**: indigenous species which are not at risk in British Columbia.

4.9.3 SPECIES AT RISK SEARCH METHODOLOGY

To determine potential species at risk and or wildlife species of management concern that may occur within the project area, the following information review was conducted:

- SARA critical habitat mapping was reviewed using CDC iMap, Fisheries and Oceans Canada Aquatic Species at Risk Map, and iMapBC to determine species with mapped critical habitat within the study area.
- Mapped element occurrences (red and blue-listed species) were reviewed using BC's Conservation Data Centre iMap web application, Fisheries and Oceans Canada Aquatic Species at Risk Map, and iMapBC. Species with occurrences within a 1 km search radius were included. Species occurrences are based on sightings that are reported to the provincial database. The BC Conservation Data Center illustrates these occurrences using polygons that reflect locational uncertainty associated with the source data and are represented with varying sized circles.

4.9.4 SPECIES AT RISK SEARCH RESULTS

Upon review of CDC iMapBC, iMapBC, and Fisheries and Oceans Canada's Aquatic Species at Risk Map, no species at risk occurrences or potential occurrences were present within a 1 km radius search of the center of the Hwy 97 culvert location. Critical habitat was not found to be present using Fisheries and Oceans Canada's Aquatic Species at Risk Map; however, three critical habitat areas of two species were noted within a 1 km radius of the proposed bridge location using CDC iMap and iMapBC.

Species with mapped critical habitat within the study area include:

- Lewis's woodpecker
- Western rattlesnake

5.0 CONTAMINATED SITES

5.1 PROVINCIAL CONTAMINATED SITES REGISTRY

A search of the BC Online contaminated sites registry was conducted on July 18th, 2023. The search was conducted for a 200-meter distance from the centre of the Hwy 97 culvert crossing. The search indicated 9 known provincially registered contaminated site within the search area (Site ID's: 5861, 17512, 7053, 10257, 1636, 21981, 26984, 1630, 6209) (Appendix E). Contaminated sites located outside of the 200-meter search radius are also available from BC Online; however, these sites are located at a distance that is not anticipated to influence the project area, with the exception of Sites 17512, 7053. However, based on the estimated groundwater flow direction, the likelihood of these sites influencing the project site is low. The details of the contamination can be purchased from the provincial database if they are determined to be relevant to the project. A request for information on these two sites has been sent to BC Online.

Table 5.1. Environmental Remediation Sites within 200 m of the project area based on iMapBC

SITE ID	ENVIRONMENTAL REMEDIATION SITE ID	SITE ADDRESS	DISTANCE FROM PROJECT AREA (M)
5861	66376213	1340 Highway 97 North (Chevron)	189 (North)
17512	66386219	1320 Highway 97 North (1320 Hwy 97)	75 (North)
7053	66376516	1293 Highway 97 North (former bus garage)	60 (North)
10257	66380137	1097 Trans-Canada Hwy 1 (Esso)	110 (South)
1636	66372004	1097-1108 Trans-Canada Hwy 1 (Shell and Esso stations)	135 (South)
21981	66389545	1086 Trans-Canada Hwy 1	145 (South)
26984	66367284	Trans-Canada Hwy 1 at Todd Rd	179 (South)
1630	66371628	1094 Collins Rd (BC Tel)	184 (Southeast)
6209	66376558	1046-1064 Trans-Canada Hwy 1 (Oasis Hotel)	192 (South)

5.2 FEDERAL CONTAMINATED SITES INVENTORY

A search of the Treasury Board of Canada's Federal Contaminated Sites Inventory web site was conducted on June 19th, 2023. The search indicated that no known federally registered contaminated sites exist within the project area. The closest federal contaminated site is over 4 kilometers from the project area. Given the distance, it is not anticipated to affect the project.

6.0 EFFECTS ASSESSMENT AND RECOMMENDED MITIGATION

6.1 VALUED COMPONENTS

Valued Components (VC) are elements of the natural and human environment that are considered to have scientific, ecological, economic, social, cultural, archaeological, historical, or other importance. VCs vary by project to reflect the nature of the project's potential positive and adverse effects. There is a clear positive ecological, economic, social and health (public safety) effects are expected to result from the completion of this project, particularly if all three crossings could be completed at the same time. For the purposes of this report, the VCs are based on the potential effects of activities associated with all construction works on Cache Creek.

The following valued components are considered in this environmental impact assessment:

- Environment
    - Vegetation
    - Geology and soils
    - Surface water and fisheries resources
    - Groundwater quality
    - Wildlife
    - Species at risk/critical habitat
- Cultural Resources and Archaeology
- Health and Safety
    - Air Quality
    - Noise

Potential environmental effects on valued components and the mitigation measures for use during construction are detailed in **Table 6.1**. The potential for project effects to influence species within mapped critical habitat areas and proposed mitigation is presented in **Table 6.2**.

Table 6.1 Potential environmental effects on valued components and mitigation measures

VALUED COMPONENT	DEVELOPMENT IMPACTS	POTENTIAL EFFECTS	MITIGATION MEASURES
Vegetation	Vegetation removal, excavation and work within the Cache Creek riparian area and stream channel. Introduction of weed species.	Loss of existing vegetation	• Avoid tree removal within the Cache Creek riparian area and stream channel, if possible. Any tree/vegetation removal to be conducted under the guidance of a qualified environmental professional. • Delineate the project limits prior to construction to avoid impacting adjacent areas. • Restrict vegetation clearing to the project footprint. • Ensure equipment and machinery is power washed and free of soils, seeds and plant parts prior to mobilizing to the project area. • Implement riparian planting as per the Enhancement Plan. • Re-seed disturbed areas with a native grass seed mix or other native vegetation suited for the region. • Ensure seed and plant stock are weed-free. • Remove and carefully dispose of any invasive species from the project area at an approved facility.
Geology and Soils	Excavation, land clearing and construction activities. Alteration to subsurface materials.	Soil compaction from heavy equipment. Removal of natural topsoil. Soil contamination from leaking equipment, fuel spills.	• Provincial remediation Site ID 17512 and Site ID 7053 are within 100 m of the project area and are considered to be low risk for impacts to construction. However, the contractor and site personnel should monitor for signs of contamination during construction. If suspected contamination is encountered, the MOTI representative and the Environmental Monitor should be contacted for direction. • Have a geotechnical professional assess terrain stability and geotechnical conditions for bridge abutments with a focus to prevent the erosion of surficial materials and sediment discharge to Cache Creek and the Bonaparte River. • Restrict the operation of heavy machinery to the project footprint and designated areas to minimize the impact on surrounding soils/subsurface conditions. • Ensure all equipment is clean and leak-free prior to project initiation. • Establish a staging area for fuelling and maintenance of equipment. • Ensure secondary containment is provided for all fuel storage. • Have a spill response plan and materials in place prior to project initiation. • Have a spill kit on-site and ensure all on-site personnel are trained in its appropriate usage. • Stockpile native topsoil (if weed free) and re-use where possible.
Surface Water and Fisheries Resources	Stream isolation. Excavation, land clearing and construction activities. Removal of existing culvert. Sediment deposit/upwelling into Cache creek. Machinery in/near Cache creek.	Removal of riparian vegetation. Surface water contamination from a spill, or leaking equipment. Sedimentation. Temporary disruption of fish access to work area.	• Install spawning deterrents in August to deter spawning of salmonids in work area or immediately downstream. • Instream works to be completed in the dry (in isolation of stream flow). • Follow Best Management Practices for instream work area isolation guided by a qualified environmental professional. • Implement erosion and sediment control measures during instream works and monitor effectiveness throughout construction. • Ensure spill kits are in all machines and are adequately stocked. • Have sediment control equipment (e.g., sediment fencing) available for installation if needed. Ensure that all sediment control measures are removed upon project completion. • Delay construction during high precipitation events, if necessary. • Instream works should occur during the least impact work window for Cache creek (July 22nd to August 15th), or as approved by regulatory agencies. • Implement riparian planting as per the Enhancement Plan.
Groundwater Quality	Excavation, land clearing and construction activities. Alteration to subsurface materials.	Groundwater/aquifer contamination from leaking equipment, fuel/oil spill. Change to subsurface water flow patterns.	• Have a geotechnical professional assess terrain stability and geotechnical conditions for bridge abutments with a focus to prevent the erosion of surficial materials and sediment discharge to Cache Creek and the Bonaparte River. • Confirm presence of groundwater well that is mapped as being 5 m north of the inlet to the Cache Creek Inn culvert and protect from construction activities or decommission as per the BC Groundwater Protection Regulation. • Restrict the operation of heavy machinery to the project footprint and designated areas to minimize the impact on surrounding soils/subsurface conditions.

VALUED COMPONENT	DEVELOPMENT IMPACTS	POTENTIAL EFFECTS	MITIGATION MEASURES
			• Ensure all equipment is clean and leak-free prior to project initiation. • Establish a staging area for fuelling and maintenance of equipment. • Ensure secondary containment is provided for all fuel storage. • Have a spill response plan and materials in place prior to project initiation. • Have a spill kit on-site and ensure all on-site personnel are trained in its appropriate usage. • Stockpile native topsoil (if weed free) and re-use where possible.
Wildlife	Excavation, land clearing and construction activities. Removal of vegetation/trees. Potential deposits of contaminants into Cache Creek.	Temporary loss of wildlife habitat during construction. Disturbance to nesting/denning species during construction. Surface water contamination from a spill, or leaking equipment.	• Focus the development to avoid vegetation removal whenever possible. • Restrict vegetation clearing and land disturbance to the project footprint. • If wildlife is observed within the project area temporarily halt works to allow the individual to vacate the area. • Conduct all vegetation clearing and ground disturbing activities after August 20th and before March 31st (i.e., outside of the conservative nesting season) to minimize impacts to nesting birds and to maintain compliance with the federal Migratory Birds Convention Act. If vegetation clearing and ground disturbance will occur during the nesting bird season, an active nesting survey should be completed by a qualified environmental professional to ensure active nests are not disturbed. Vegetation clearing and ground disturbance should occur within 3 days of the survey in areas where active nests were not identified. Should the works not occur during the 3 days post survey, a second survey should be conducted. • If any species at risk, amphibian species, migratory bird or nesting bird is observed on site during project works, works must be temporarily halted, and a qualified environmental professional must be contacted and the appropriate measures taken.
Species at Risk/Critical Habitat	Excavation, land clearing and construction activities. Removal of vegetation/trees which could be used as nesting habitat.	Potential deposits of contaminates into Cache creek. Disturbance to nesting/ denning species.	Surface water contamination from a spill, or leaking equipment. • Same mitigation as above. • Refer to Table 6.2 below.
Cultural Resources and Archaeology	Excavation	Disturbance/removal of heritage archaeological resources.	• Follow recommendations from the Professional Archaeologist.
Health and Safety	All construction activities	Accidents causing harm to construction workers or local area residents. Noise will be created during construction.	• Follow WorkSafe BC Standards. • Design project based on geotechnical building recommendations. • Ensure appropriate safety information and warning signs are displayed in visually prominent areas during construction. • Use hearing protection when working around heavy machinery and/or loud construction activities.
Air Quality	Excavation and land clearing activities, vehicle/machinery idling.	Dust and machinery operation during construction may decrease local air quality and may affect localized vegetation, wildlife, and people.	• Spray with dust palliatives, if required. • Avoid unnecessary idling of machinery.
Noise	All construction activities	Noise will be created during construction which may affect wildlife and people.	• Follow the Noise Regulation Bylaw No. 334, 1984 (Village of Cache Creek Bylaw) • Use hearing protection when working around heavy machinery and/or loud construction activities.

6.2 POTENTIAL EFFECTS TO SPECIES AT RISK AND PROPOSED MITIGATION

The project passes through or adjacent to identified critical habitat for two species at risk. The potential for species to experience project related effects are classified into four categories defined below as per definitions developed by J Hobbs Ecological Consulting (2019).

- **High**: Anticipated activities will permanently damage or destroy habitat (i.e., remove habitat) required by species to meet life requisites OR anticipated activities will result in permanent alienation of habitat as a result of prolonged disturbance (i.e., due to changes in levels of human activity, light or noise).
- **Medium**: Anticipated activities will degrade habitat (i.e., negatively alter habitat) required by species to meet life requisites OR anticipated activities will result in temporary alienation of habitat as a result of short-term disturbance (i.e., due to temporary changes in levels of human activity, light or noise).
- **Low**: Anticipated activities will alter habitat required by species to meet life requisites. In this case the effects from habitat alteration may be challenging to quantify but suspected to be slightly negative or benign. Also rated as Low if anticipated activities may result in temporary alienation of habitat as a result of short-term disturbance (i.e., due to temporary changes in levels of human activity, light or noise).
- **Nil**: Anticipated activities will *not* negatively alter habitat required by species to fulfill key life requisites. In this case the effects from habitat alteration or alienation may be challenging to quantify but are suspected to be neutral or positive.

Table 6.2. Potential for project related effects on critical habitat

SPECIES CRITICAL HABITAT	POTENTIAL FOR PROJECT-RELATED EFFECTS	ASSUMPTIONS & PROPOSED MITIGATION
Western Rattlesnake	Low	• Project is within mapped critical habitat. • Limited potential for denning within project area; however, western rattlesnakes could pass through the site or be found basking within the site. • If a Western rattlesnake is encountered during any works associated with the project, a qualified environmental professional will be contacted, and appropriate mitigation will take place.
Lewis's woodpecker	Low	• Project is within mapped critical habitat. • Work limits have been surveyed for nest cavities suitable for Lewis's woodpecker and none were found. • If a Lewis's woodpecker is encountered during any works associated with the project a qualified environmental professional will be contacted and appropriate mitigation implemented.

7.0 SUMMARY AND CONCLUSION

Urban Systems Ltd. has prepared this environmental impact assessment using available desktop information sources and site visits to identify potential environmental constraints for consideration in the design and construction of the project.

The project area is located in the Bunchgrass biogeoclimatic zone within the municipal boundary of the Village of Cache Creek. The general project area has been impacted by previous development and flooding events. There is limited vegetation in the construction area which includes relatively young black cottonwood trees and cultivated cedar hedges, with a small amount of red osier dogwood. The project area is located within critical habitat for two species: Western rattlesnake and Lewis's woodpecker. However, critical habitat attributes for these species are not present on site. No species at risk occurrences were identified within a 1 km radius of the project area based on review of CDC iMap, iMapBC, and Fisheries and Oceans Canada's Aquatic Species at Risk Map. Cache Creek is known to be fish-bearing and fish were observed in the project area downstream of C1. Mitigative measures and best management practices to minimize potential adverse impacts to valued components are presented in **Table 6.1** and **6.2**.

An Enhancement Plan is currently in process that will be implemented during construction. The aim of Enhance Plan is to improve aquatic and riparian habitat in the project area and remove the barrier to fish passage that is currently located at the outlet of C1. Positive ecological, economic, social and health (public safety) effects are expected to result from the completion of this project, particularly if all three crossings could be completed at the same time.

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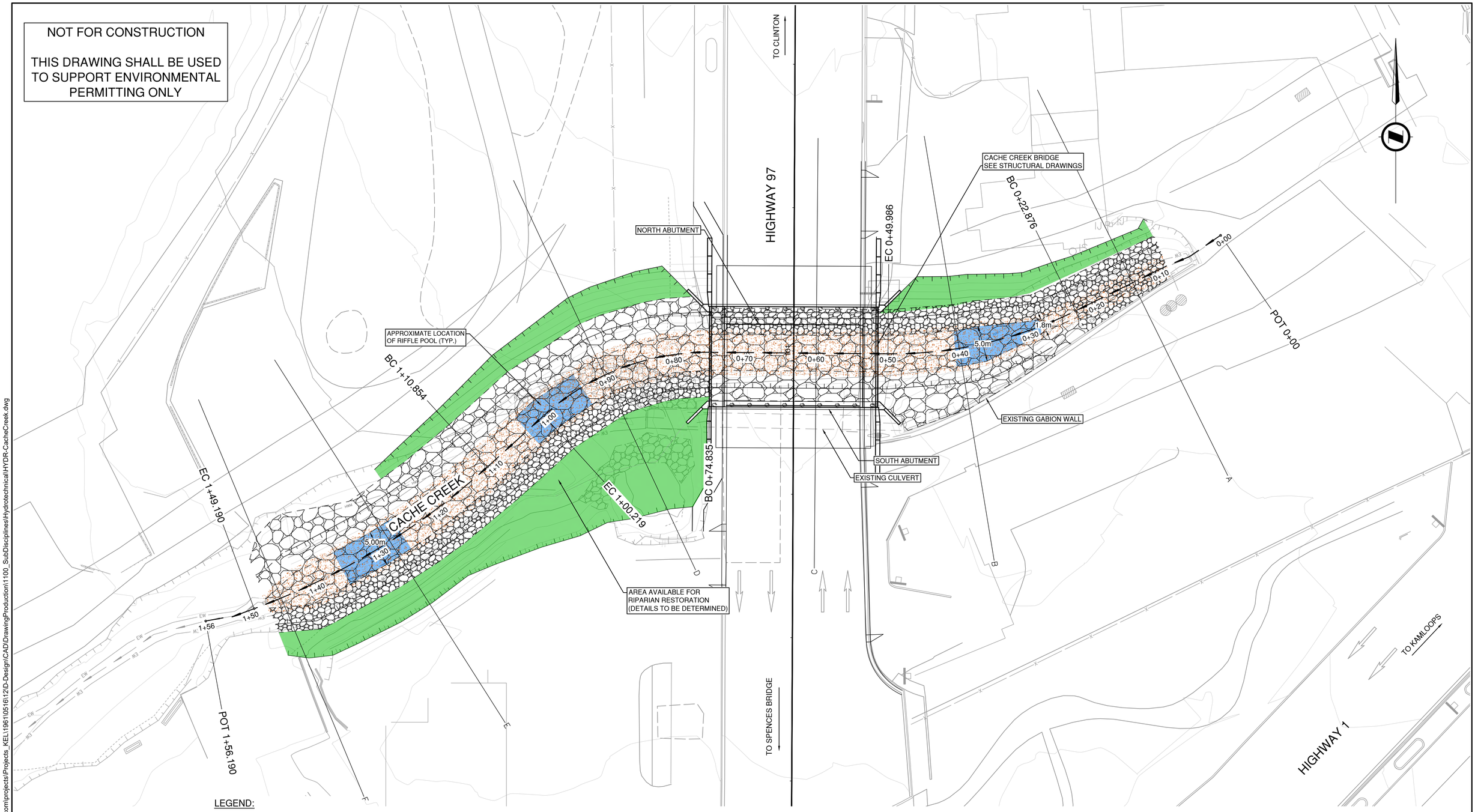
APPENDIX A

STRUCTURAL AND RIPRAP DESIGN DRAWINGS

NOT FOR CONSTRUCTION

THIS DRAWING SHALL BE USED TO SUPPORT ENVIRONMENTAL PERMITTING ONLY



LEGEND:

EDGE OF RIPRAP
TOP OF SLOPE
TOE OF SLOPE/ TOP OF TOE TRENCH
RIPRAP, VOIDS INFILLED WITH GRAVEL
APPROXIMATE LOCATION OF RIFFLE POOL
100kg RIPRAP
250kg RIPRAP
EXISTING RIPRAP
APPROXIMATE RIPARIAN PLANTING AREA

REV	DATE	REVISIONS	NAME

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — C. T. COLES # 28149 — 2023-08-16

BRITISH COLUMBIA

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTHERN INTERIOR REGION
HIGHWAY ENGINEERING AND GEOMATICS

CAD FILENAME HYDR-CACHECREEK
FILE NUMBER 1961.0516.12
PLOT DATE 2023-08-16

DESIGNED C. COLES DATE 2023-08-16
QUALITY CONTROL T. BLACKBURN DATE 2023-08-16
QUALITY ASSURANCE C. BAGG DATE 2023-08-16
DRAWN J. BRUINEMAN DATE 2023-08-16

CHANNEL PLAN

CACHE CREEK BRIDGE

STA 0+08.717 TO STA 1+47.266

SCALE	PROJECT NUMBER	REG	DRAWING NUMBER	REV
0 2 1:250 12m	25357	2	R2-1239-1111	1

PLOT DATE: 2023/08/16 \\us\.urban-systems.com\projects\Projects_KEL\1196\0516\12\D-Design\CAD\DrawingProduction\1100_SubDisciplines\Hydrotechnical\HYDR-CacheC

NOT FOR CONSTRUCTION

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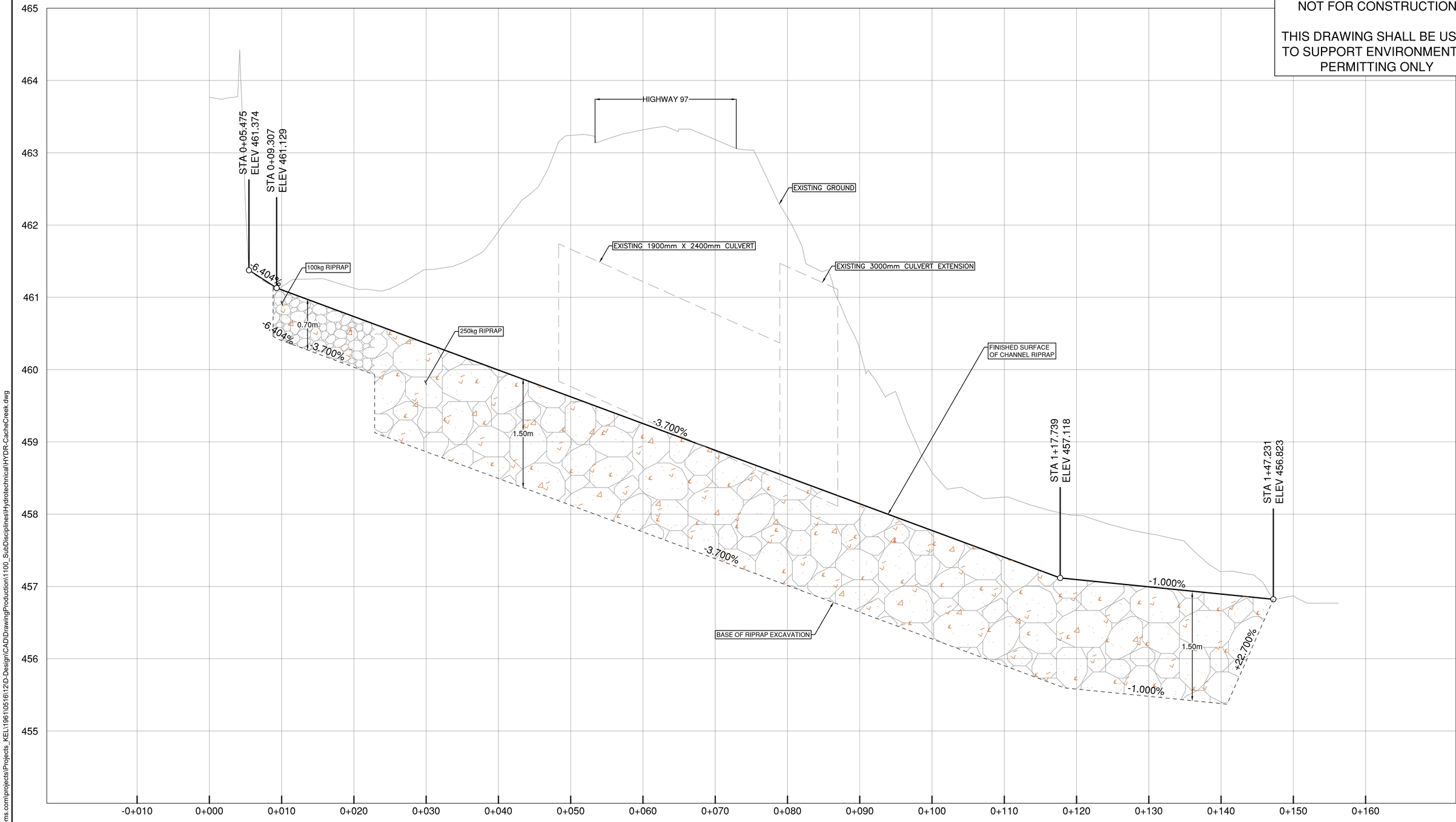

REV	DATE	REVISIONS	NAME

Engineers & Geoscientists BC Permit #1000200

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — C. T. COLES #28149 — 2023-08-16

BRITISH COLUMBIA

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

SOUTHERN INTERIOR REGION

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DRAWN J. BRUINEMAN DATE 2023-08-16

CHANNEL PROFILE

CACHE CREEK BRIDGE

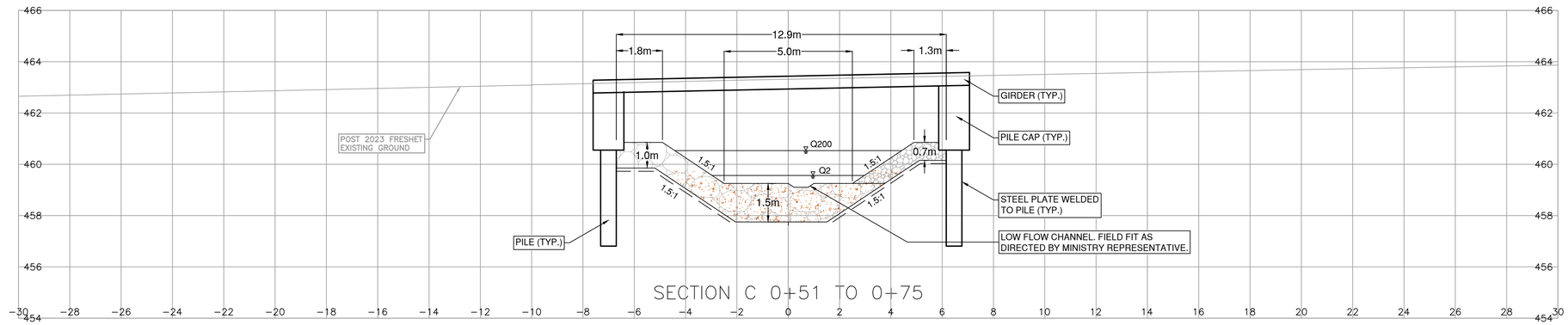
SCALE 0 2 1:250 12m

PROJECT NUMBER	REG	DRAWING NUMBER	REV
25357	2	R2-1239-1112	1

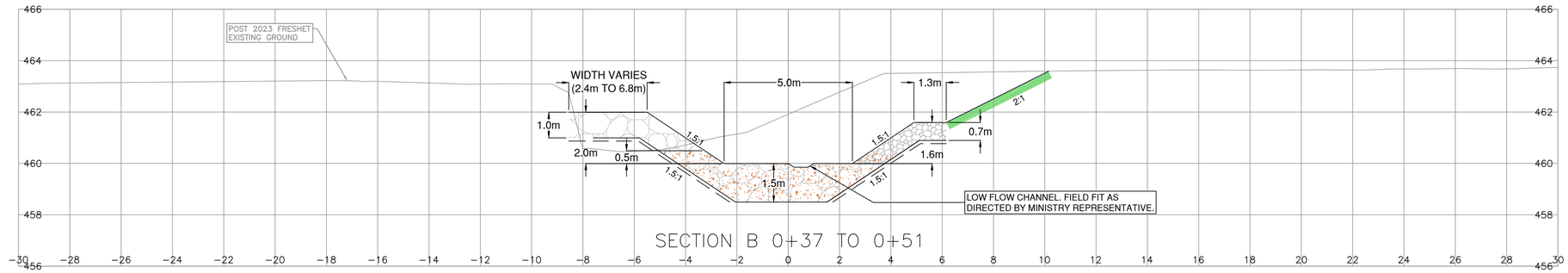
PLOT DATE: 2023/08/16 \\usl.urban-systems.com\projects\Projects_KEL\1961\0516\12\D-Design\CAD\DrawingProduction\1100_SubDisciplines\Hydrotechnical\HYDR-CacheCreek.dwg

NOT FOR CONSTRUCTION

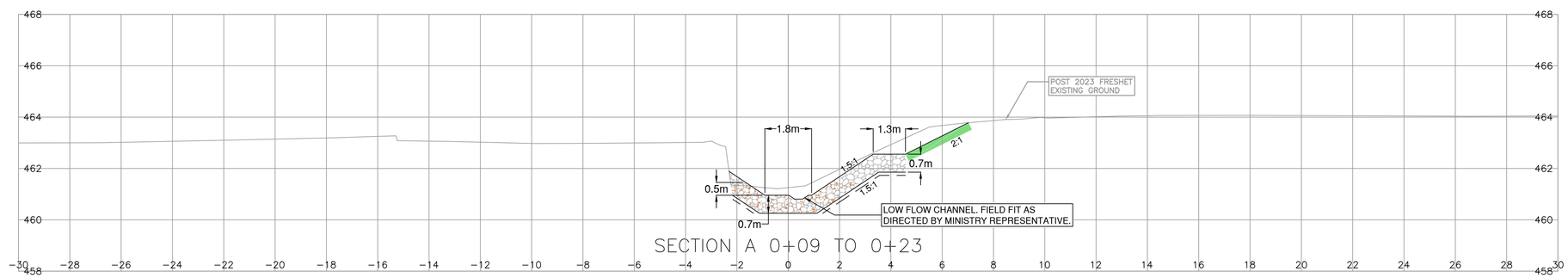
THIS DRAWING SHALL BE USED TO SUPPORT ENVIRONMENTAL PERMITTING ONLY



SECTION C 0+51 TO 0+75



SECTION B 0+37 TO 0+51



SECTION A 0+09 TO 0+23

LEGEND:

100kg RIPRAP

250kg RIPRAP

NON-WOVEN GEOTEXTILE

RIPRAP, VOIDS INFILLED WITH GRAVEL

RIPARIAN AREA

NOTES:

1. ALL UNITS IN METERS UNLESS OTHERWISE NOTED

REV	DATE	REVISIONS	NAME

Engineers & Geoscientists BC Permit #1000200

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
C. T. COLES
28149
2023-08-16

BRITISH COLUMBIA

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTHERN INTERIOR REGION
HIGHWAY ENGINEERING AND GEOMATICS

CAD FILENAME HYDR-CACHECREEK
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QUALITY ASSURANCE C. BAGG DATE 2023-08-16
DRAWN J. BRUINEMAN DATE 2023-08-16

CHANNEL SECTIONS

CACHE CREEK BRIDGE

SCALE 0 1 1:100 5m

PROJECT NUMBER	REG	DRAWING NUMBER	REV
25357	2	R2-1239-1113	1

PLOT DATE: 2023/08/16 \\ust.urban-systems.com\projects\Projects_KEL\196\105\16\12\D-Design\CAD\DrawingProduction\1100_SubDisciplines\Hydrotechnical\HYDR-CacheCreek.dwg

NOT FOR CONSTRUCTION

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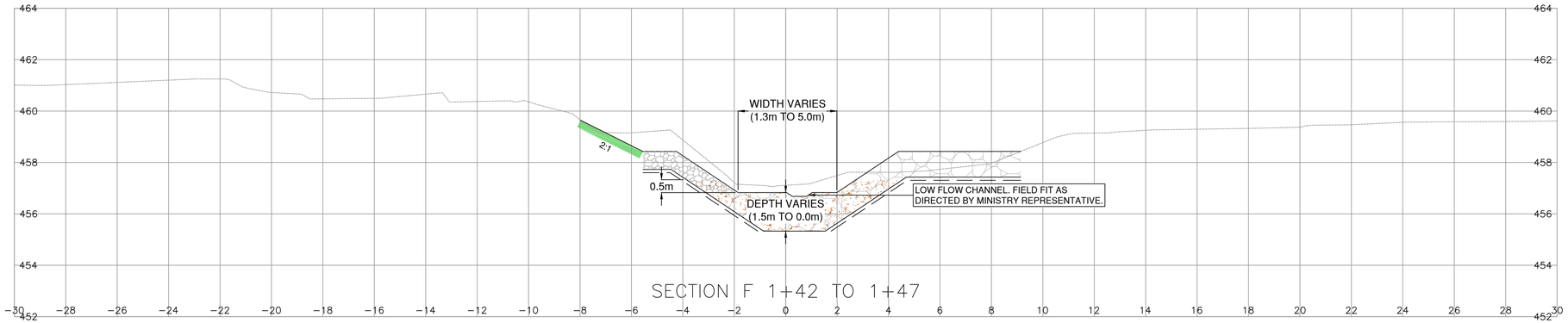
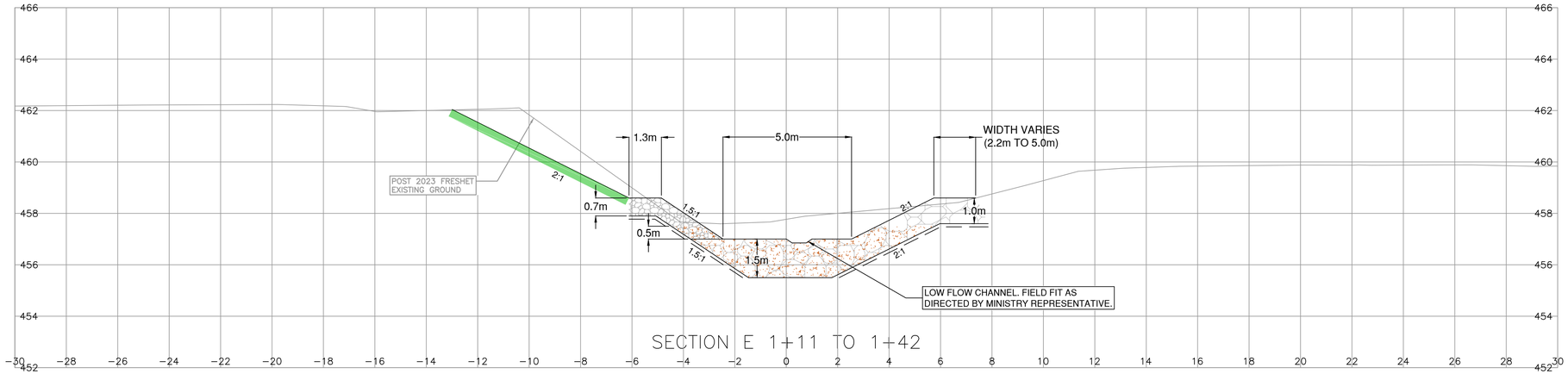
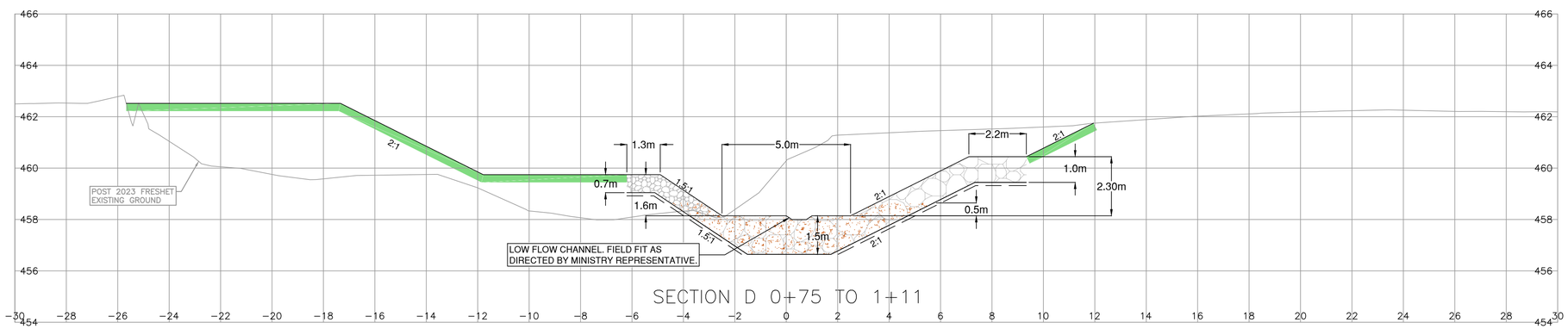


SECTION F 1+42 TO 1+47



SECTION E 1+11 TO 1+42



SECTION D 0+75 TO 1+11

LEGEND:

100kg RIPRAP

250kg RIPRAP

NON-WOVEN GEOTEXTILE

RIPRAP, VOIDS INFILLED WITH GRAVEL

NOTES:

1. ALL UNITS IN METERS UNLESS OTHERWISE NOTED

REV	DATE	REVISIONS	NAME

Engineers & Geoscientists BC Permit #1000200

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA C. T. COLES # 28149

2023-08-16

BRITISH COLUMBIA

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTHERN INTERIOR REGION
HIGHWAY ENGINEERING AND GEOMATICS

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QUALITY ASSURANCE C. BAGG DATE 2023-08-16
DRAWN J. BRUINEMAN DATE 2023-08-16

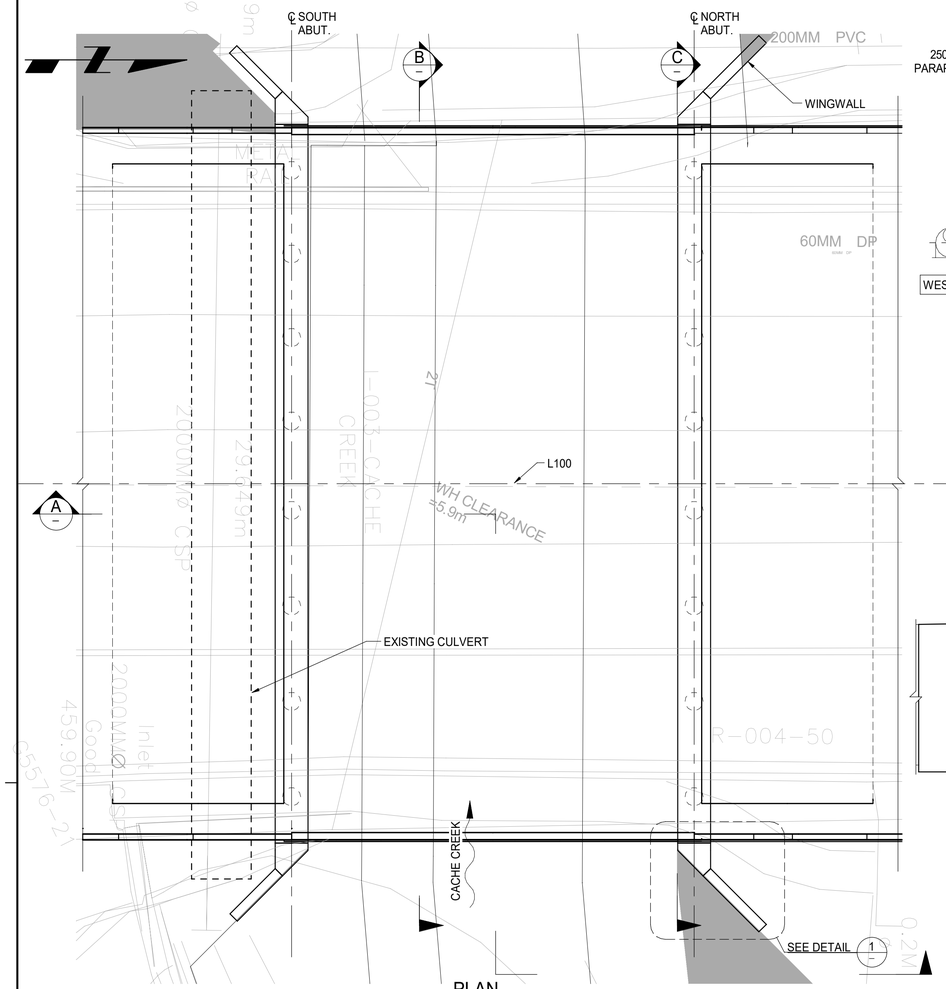
CHANNEL SECTIONS

CACHE CREEK BRIDGE

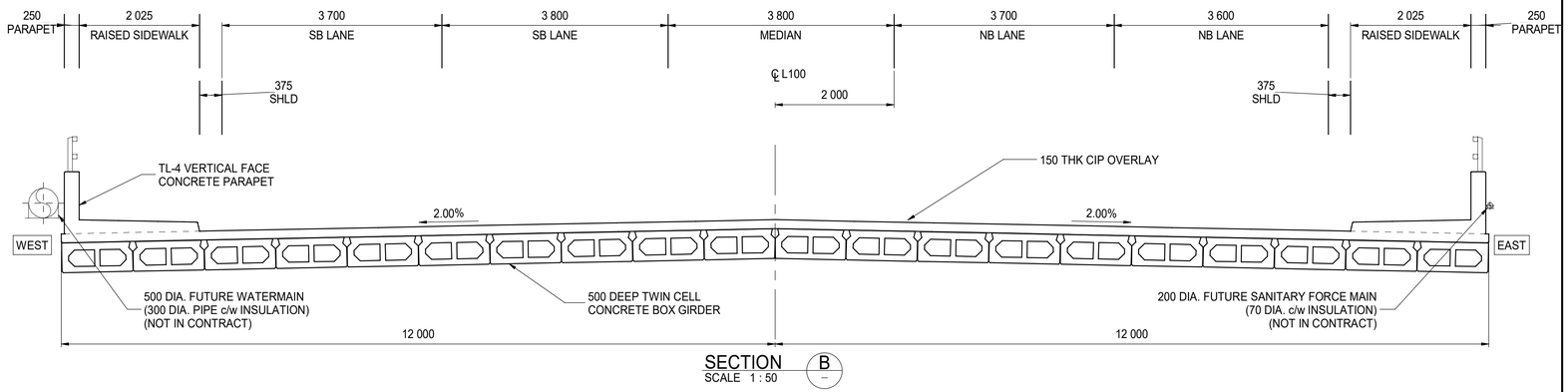
SCALE 0 1 1:100 5m

PROJECT NUMBER	REG	DRAWING NUMBER	REV
25357	2	R2-1239-1114	1

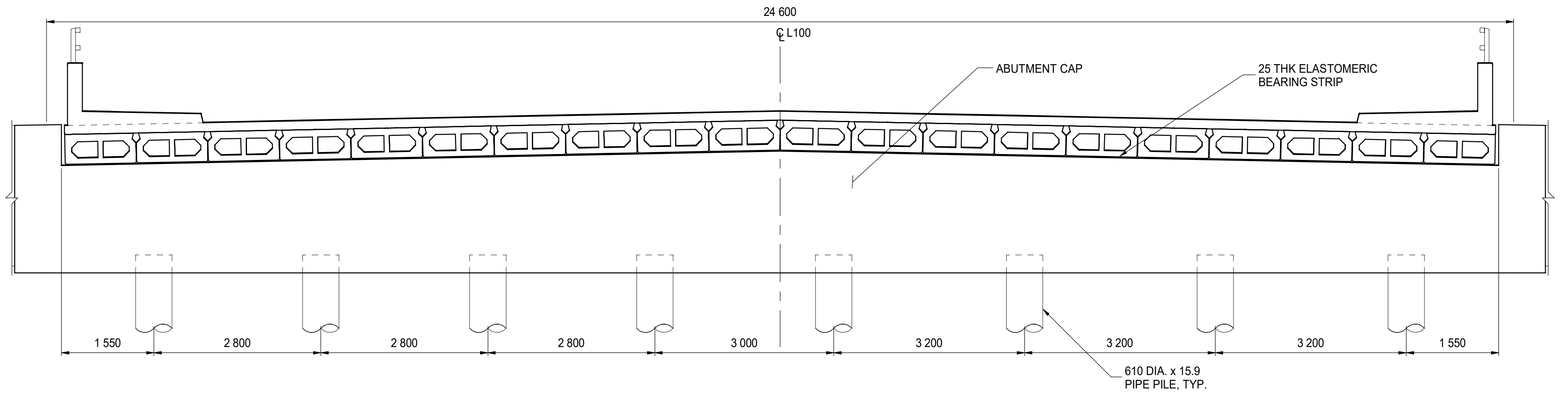
PLOT DATE: 2023/08/16 \\usl.urban-systems.com\projects\Projects_KEL\1961\0516\12\D-Design\CAD\DrawingProduction\1100_SubDisciplines\Hydrotechnical\HYDR-CacheCreek.dwg



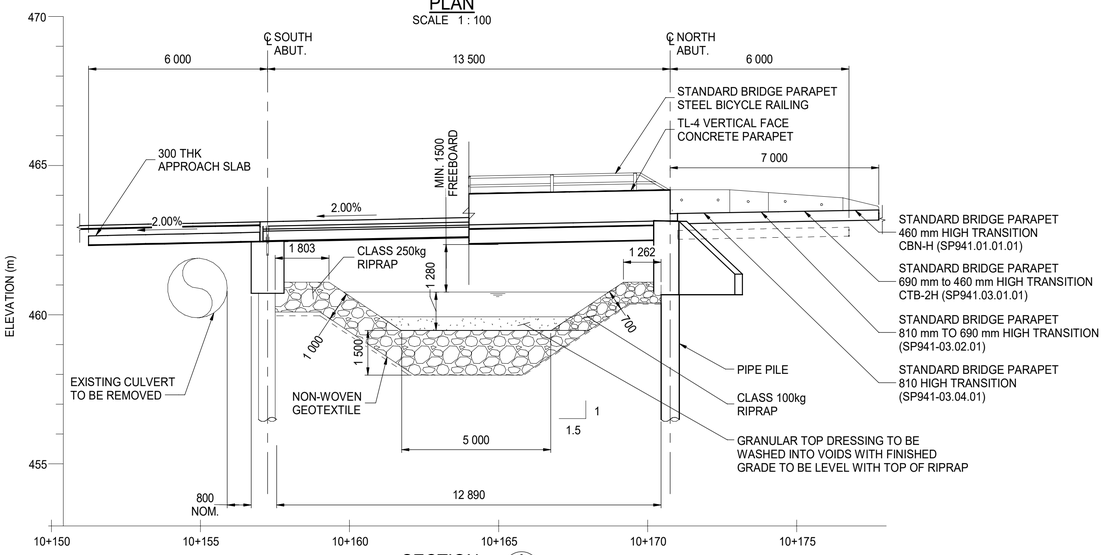
PLAN
SCALE 1 : 100



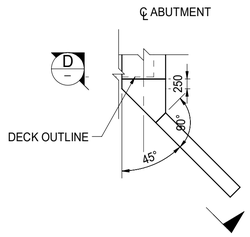
SECTION B
SCALE 1 : 50



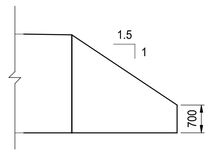
SECTION C
SCALE 1 : 50



SECTION A
SCALE 1 : 100



DETAIL 1
SCALE 1 : 75



SECTION D
SCALE 1 : 75

NOT FOR CONSTRUCTION

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Rev	Date	Description	Init
A	2023/08/11	ISSUED FOR ENVIRONMENTAL PERMIT	TN

REVISIONS

BRITISH COLUMBIA | Ministry of Transportation & Infrastructure
Southern Interior Region

SOUTHERN INTERIOR REGION
Highway 97

CRRP CACHE CREEK GENERAL ARRANGEMENT

EGBC P2P ##1000200

PREPARED UNDER THE DIRECTION OF
TOM NOTT
ENGINEER OF RECORD
DATE 2023/08/11

DESIGNED CC DATE 2023/08/11
CHECKED TN DATE 2023/08/11
DRAWN KC DATE 2023/08/11
SCALE AS SHOWN
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.
	221-11730-00.3680	2	ENV -101 | A

CANCEL PRINTS BEARING PREVIOUS LETTER

DATE: 8/11/2023 2:33:31 PM (KC)
PATH: Autodesk Docs://221-11730-00 - Cariboo Road Recovery - R22/Cache Creek bridge model.rvt

H:\30b\r1-c07-04b\

APPENDIX D

SPILL INCIDENT REPORT

Spill Incident Report

Date of Report:	
Date and Time of Incident:	
Date and Time Reported to Site Supervisor:	
Date and Time Reported to the Contractor:	
Personnel at Spill Site:	
Spilled contents and amount:	
Cause and effect of spill:	
Spill stopped or continuing:	
Spill contained:	
Extent of contamination:	
Containment method:	
Further action required:	
Hazards to persons, property, or environment:	
Comments:	

Form filled out by:	
Position:	
Contact:	

Copies of this form must be provided to the Ministry of Transportation and Infrastructure, the Contractor, and the Project Supervisor