Fisheries Act Authorization Application Memo

Lake Trail Road Pedestrian Pathway Project

Courtenay, BC

June 16, 2025 | Revision #0

Submitted to: City of Courtenay
Prepared by: McElhanney Ltd.

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Your Challenge.
Our Passion.

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1. Introduction

The City of Courtenay (the City) retained McElhanney Ltd. (McElhanney) to provide engineering and environmental services with respect to pathway construction, culvert works, and road widening along Arden Creek, in Courtenay, BC. The works described in this Fisheries Act Authorization (FAA) technical memorandum is being completed as part of the Lake Trail Road Pedestrian Pathway Project (the Project). McElhanney has previously submitted a request for review (RfR) under 24-HPAC-00909. DFOs response to the review indicated that an FAA for the Project was required due to potential effects on listed aquatic species at risk within Arden Creek, specifically Western brook lamprey, Morrison Creek population (*Lampetra richardsoni & Lampetra richardsoni var. marifuga*).

This report provides details to support the DFO Application Form for the Issuance of an Authorization under Paragraphs 34.4(2)b and 35(2)(b) of the *Fisheries Act* (non-emergency situations). McElhanney is assigned agency to provide environmental assessment and permitting support services on behalf of the City (***Appendix A***). The structure of the memo adheres to the checklist for prescribed information. McElhanney has previously submitted an Environmental Impact Assessment (EIA) as part of the RfR which contains additional details about the Project and the biophysical features within the study area.

Fish habitat features were assessed in the field by a Qualified Environmental Professional (QEP) where the proposed works will interact with Arden Creek and its interconnecting waterways.

1.1. CONTACT INFORMATION

1. The applicant's and, if applicable, their representative's name, address and telephone number.

Applicant	Representative
Adam Pitcher, City of Courtenay	Daniel Mackle RPBio., McElhanney
830 Cliffe Avenue, Courtenay, BC V9N 2J7	100, 402 – 11th Ave SE, Calgary, AB T2G 0Y4
apitcher@courtenay.ca	dmackle@mcelhanney.com
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2. Description of Proposed Work

2. A detailed description of the proposed work, undertaking or activity and, if applicable, a detailed description of the project of which the proposed work, undertaking or activity is a part, including:

a. The purpose of the proposed work, undertaking or activity and, if applicable, the project;

The purpose of this Project is to improve road safety considerations for all users of Lake Trail Road (residences, school, and commercial businesses). The Project design includes the construction of a pedestrian pathway and associated road widening - with culvert works, headwall installation, and ditch modifications required within Arden Creek and its interconnecting waterways.

Below is a summary of the major Project components:

- Culvert works and extensions,
- Headwall construction,
- Ditch modifications,
- Road widening,
- Tree removal,
- Waste management and disposal during construction, and
- Site clean-up, reclamation/restoration, and final landscaping.
- The use of industrial equipment for material removal, placement, and grading,
- Waste management and disposal during construction, and
- Site clean-up, reclamation/restoration, and final landscaping.

b. The associated infrastructure;

Project works will fall within within the Species at Risk Act (SARA) critical habitat for Western brook lamprey, Morrison Creek population. This includes instream works or works within the SARA buffer at 5 separate sections of the Project:

- Section 1: Culvert works in Arden Creek and Tree Removal at Webb Road
- Section 2 – Ditch Modifications and Vegetation Removal Between Church and 2877 Lake Trail Road
- Section 3 – Culvert Extensions at Powerhouse Road
- Section 4 – Culvert Extension and New Headwall at Arden Creek
- Section 5 – Road Widening

c. Any permanent or temporary structure involved; and

To facilitate the project works, both permanent and temporary impacts to riparian vegetation are expected. The areas of impact will be restored which will further stabilize the riparian areas by planting and seeding vegetation and additional riparian planting will occur within the Project Area as part of the Project's offsetting obligation. Permanent and temporary impacts to instream habitat are expected and will be offset by the construction of rock, riffle, pool, and spawning gravel installations and with the introduction of large woody debris.

d. The construction methods, building materials, explosives, machinery and other equipment that will be used.

The following activities are expected during construction (detailed explanations can also be found in Project EIA):

- Section 1: instream works associated with culvert installation and extension and tree removal.
- Section 2: instream works associated with culvert installation and vegetation removal.
- Section 3: instream works associated with culvert extensions, ditch modifications, and vegetation removal.
- Section 4: instream works associated with culvert extensions, headwall installation, and ditch modifications.

- Section 5: works within riparian buffer associated with road widening

The following methods, materials and equipment will be required for construction:

- Earthworks, material placement, and infill will be completed with the use of heavy equipment (e.g., an excavator),

The Contactor will identify the heavy equipment to be used to complete the Project works. The following equipment, which may contain petroleum products or other harmful and polluting substances in on-board tanks and/or hydraulic systems, is inferred to be required to complete the works:

- Excavator (TBD)
- Flat-bed truck or truck & trailer (TBD)
- Loader (TBD)
- Dump truck or rock truck (TBD)

Equipment will not enter the bed or shores of the adjacent watercourse during construction. The Contractor will confirm equipment usage upon project tender, within the Construction Environmental Management Plan.

3. Project Engineering Specification and Drawings

3. If physical works are proposed, the project engineering specifications, scale drawings and dimensional drawings.

The Project includes five (5) sections in which instream works, and/or riparian buffer impacts are required: referred to as Sections 1 through 5. Issued for permitting drawings and offsetting plans are included in ***Appendix B***.

4. Phases and Schedule Information

4. A description of the phases and the schedule of the proposed work, undertaking or activity and, if applicable, the project of which the proposed work, undertaking or activity is a part.

Construction of the proposed works is anticipated to take 2-3 months and will occur in the late summer and fall once project permitting is complete. The instream and riparian vegetation removal works will be performed in the least risk timing window for Morrison Creek Lamprey between July 14 to August 6; however, project works which do not involve instream or riparian impacts will continue to end of October. The scope of the Project includes all physical activities associated with the pathway construction. It includes the onsite works involving the riparian restoration of areas temporarily impacted during construction and the enhancement of riparian & instream habitat within areas that have been impacted by Project works.

5. Project Locations

5. A description of the location of the proposed work, undertaking or activity and, if applicable, of the location of the project of which the proposed work, undertaking or activity is a part, including:

a. Geographic coordinates;

Table 1. Site Locations along Arden Creek

Site ID	Coordinate System	Latitude	Longitude
Section 1	GEOGRAPHIC (WGS84)	49.672769	-125.024631
Section 2	GEOGRAPHIC (WGS84)	49.673111	-125.024175
Section 3	GEOGRAPHIC (WGS84)	49.674087	-125.02242
Section 4	GEOGRAPHIC (WGS84)	49.675051	-125.020663
Section 5	GEOGRAPHIC (WGS84)	49.672921	-125.024135

b. A small-scale plan identifying the overall location and boundaries;

The Project includes five (5) locations in which instream works, or riparian vegetation removal is required referred to as Sections 1 through 5. These sections are located between Webb Rd. and Webdon Rd., *Figure 1*.

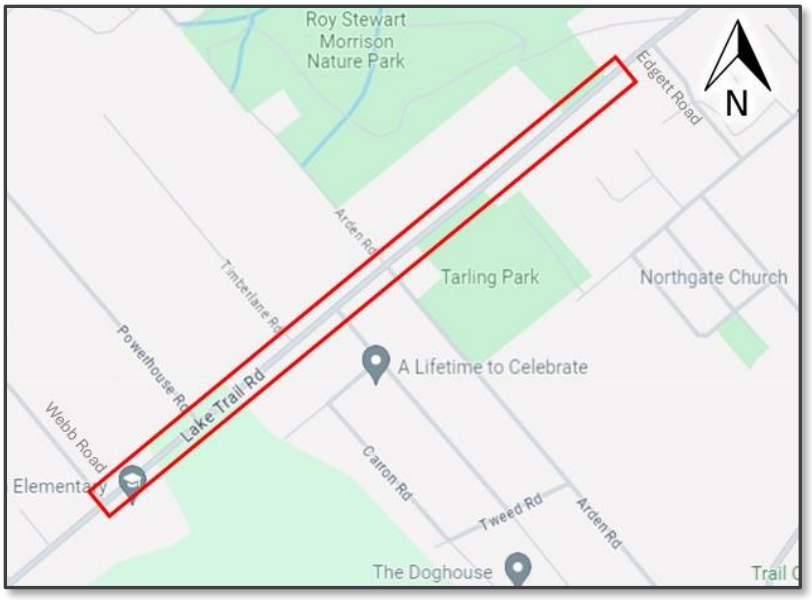

Figure 1. Project area along Lake Trail Rd, in Courtenay, BC. Proposed works affecting Arden Creek are limited to the area bounded by Webb Rd and Webdon Rd.

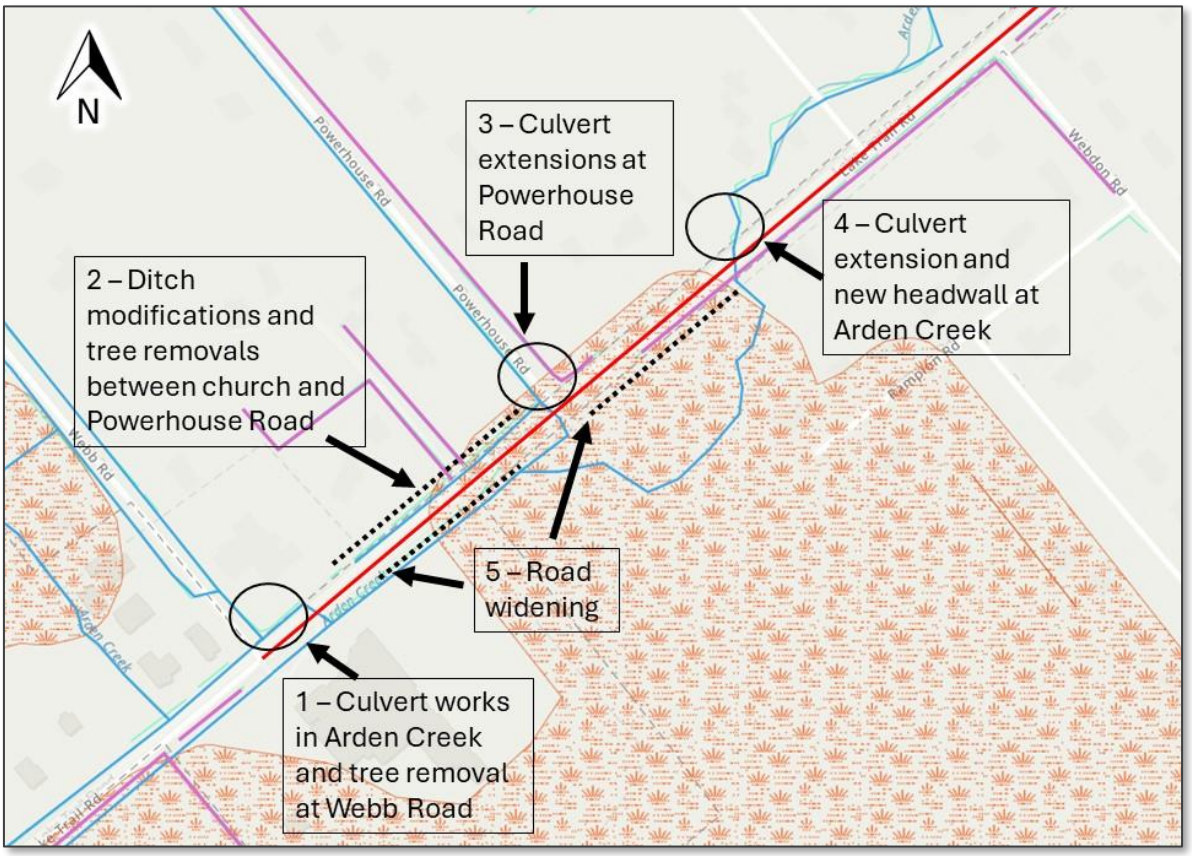

Figure 2. Project sections 1 to 5 along Lake Trail Rd, in Courtenay, BC. Proposed works affecting Arden Creek are limited to the area bounded by Webb Rd and Webdon Rd.

c. *A large-scale site plan indicating the size and spatial relationship of the planned facilities, infrastructure and other component and of any existing structures, landmarks, water sources or water bodies and other geographic features; and*

The site plan at each location indicating the size and proximity to the watercourse are shown in *Figures 2* through *12.*

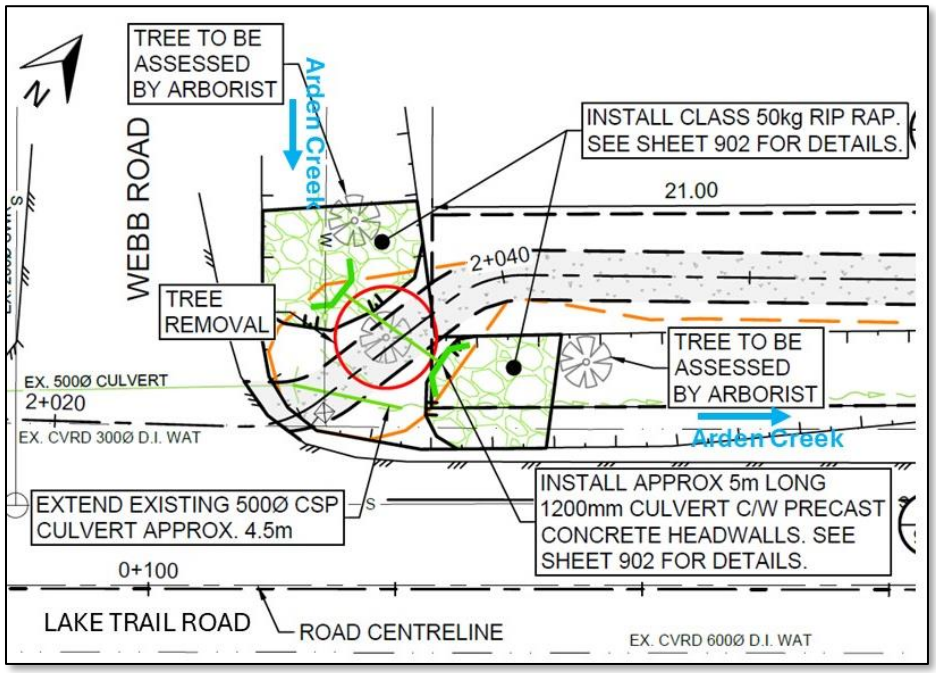

Figure 3. Project activities proposed at the corner of Webb Road and Lake Trail Road including culvert installation and extension in Arden Creek, and tree removal

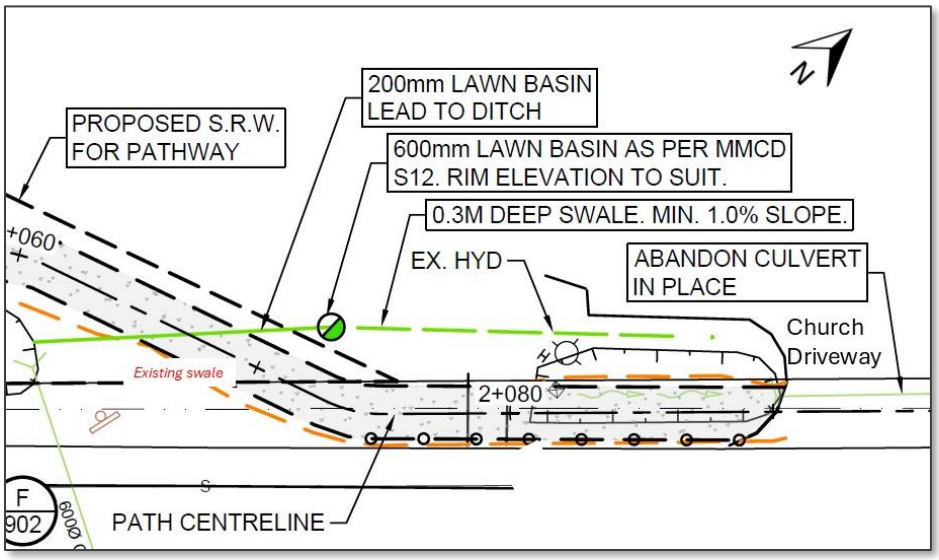

Figure 4. Site Proposed Project scope adjacent to the Courtenay Fellowship Baptist Church property including pathway construction in an existing swale

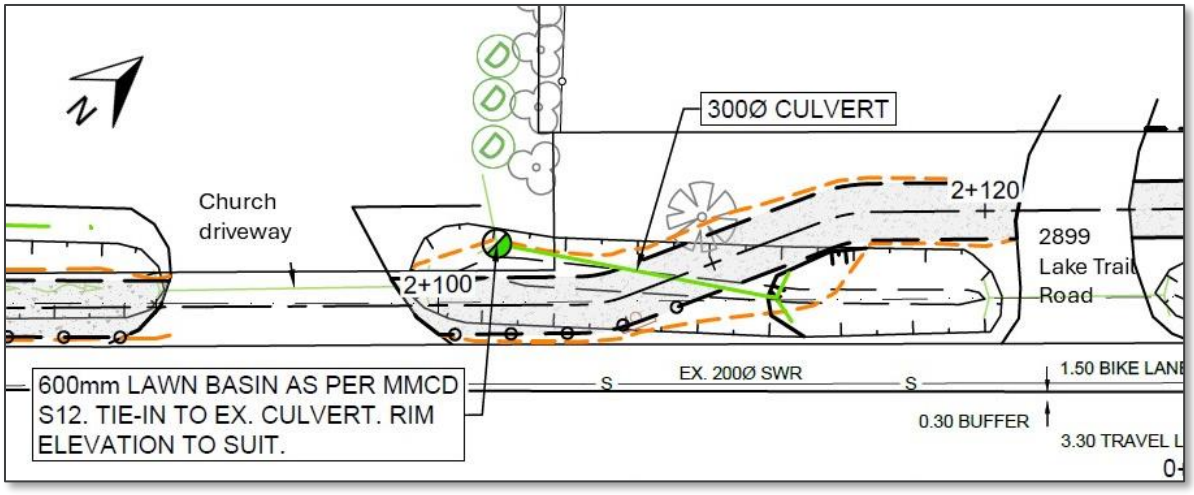

Figure 5. Proposed Project scope between the church driveway and 2899 Lake Trail Road driveway including culvert installation.

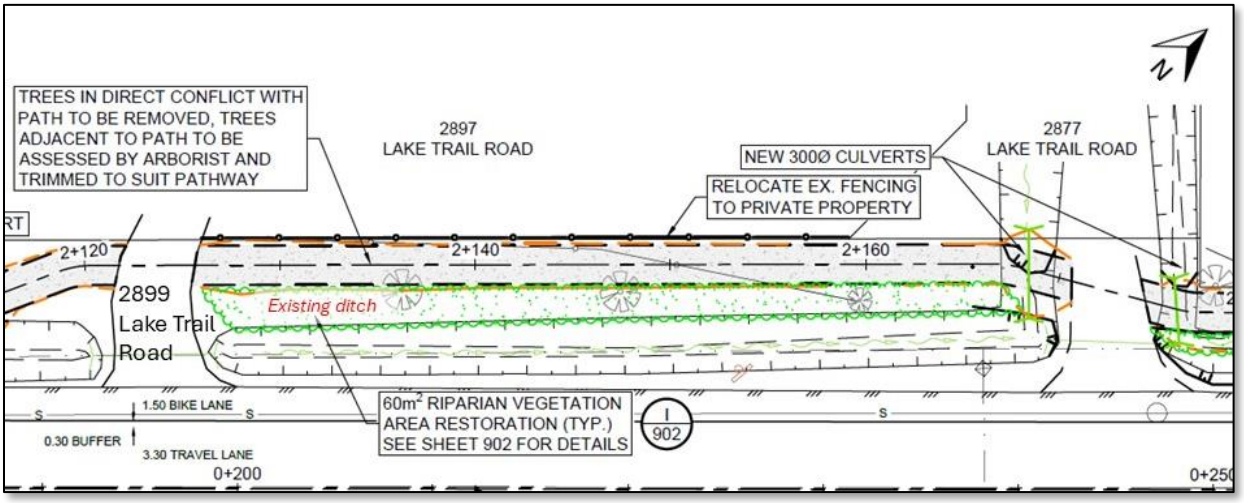

Figure 6. Proposed culvert installations on either side of the driveway at 2877 Lake Trail Road and required vegetation clearing between 2899 and 2877 Lake Trail Road.

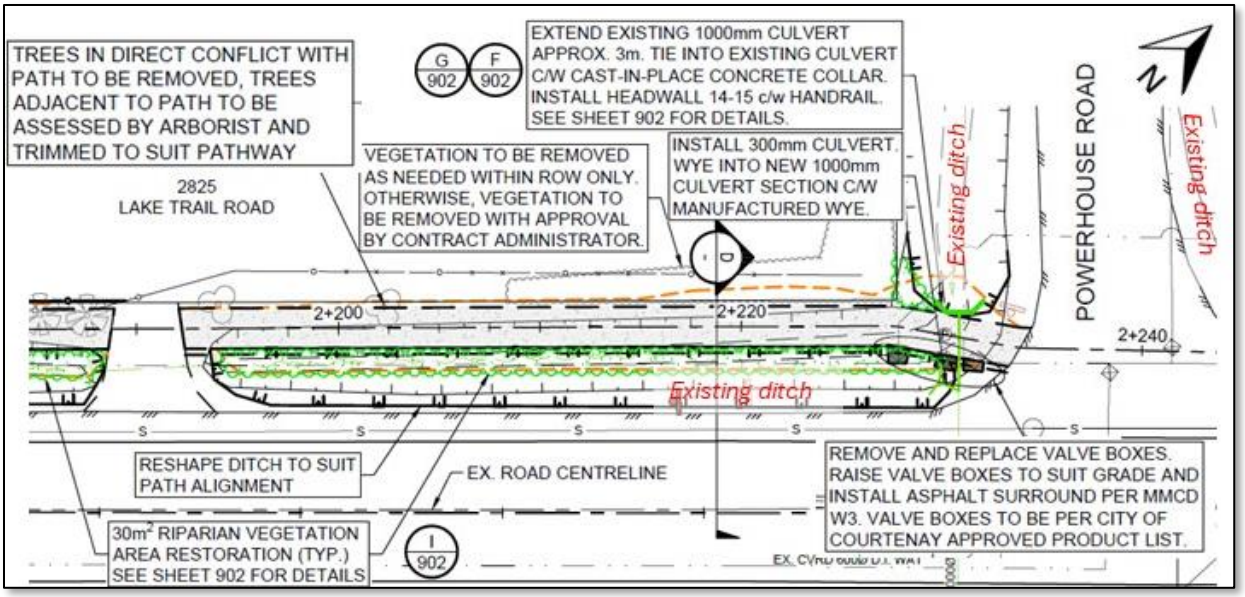

Figure 7. Proposed scope activities at Powerhouse Road including culvert installation and extension on the south side of the road, vegetation removal, and re-shaping the ditchline on the west side of Lake Trail Road.

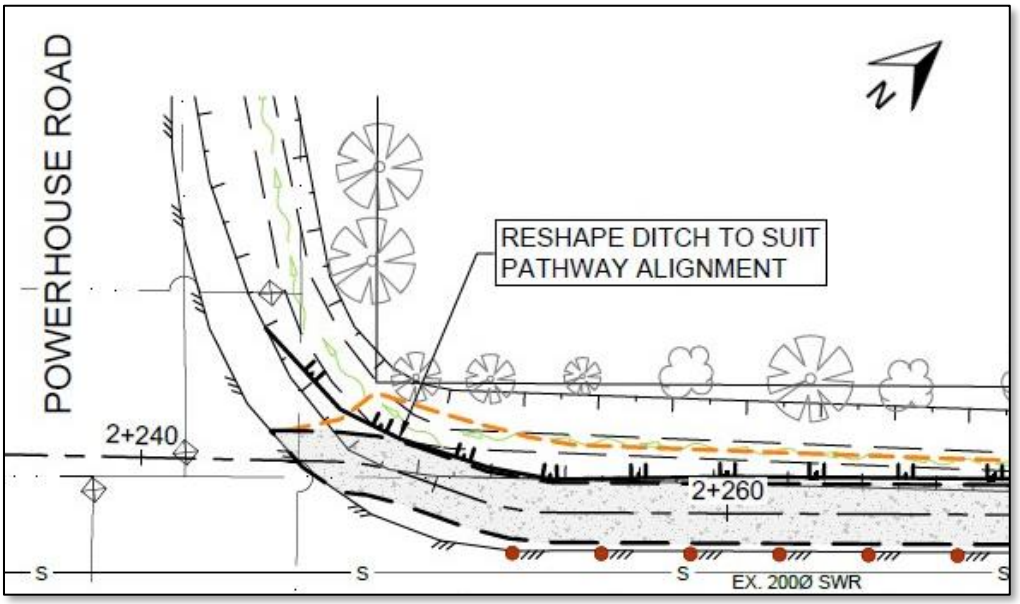

Figure 8. Proposed scope activities at Powerhouse Road including culvert installation and extension on the south side of the road, vegetation removal, and re-shaping the ditchline on the west side of Lake Trail Road.

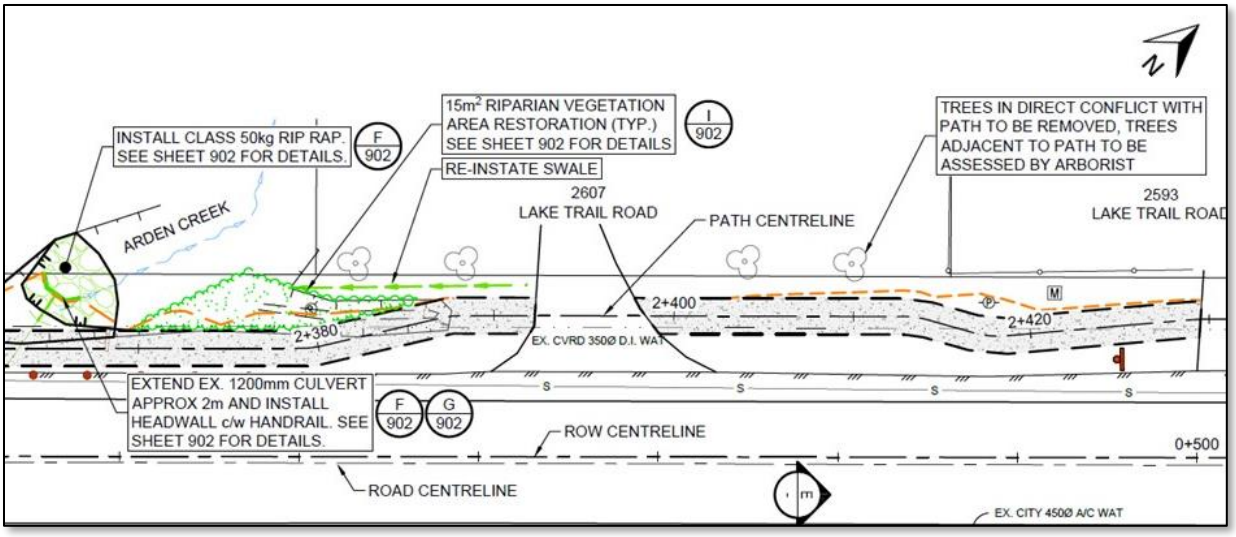

Figure 9. Proposed scope activities at approximate 2+360 where Arden Creek flows under Lake Trail Road towards the north. Modifications in this location include extending the existing culvert north into the creek, installation of a precast concrete headwall, vegetation removal, and re-instating a swale to direct surface flows into the creek.

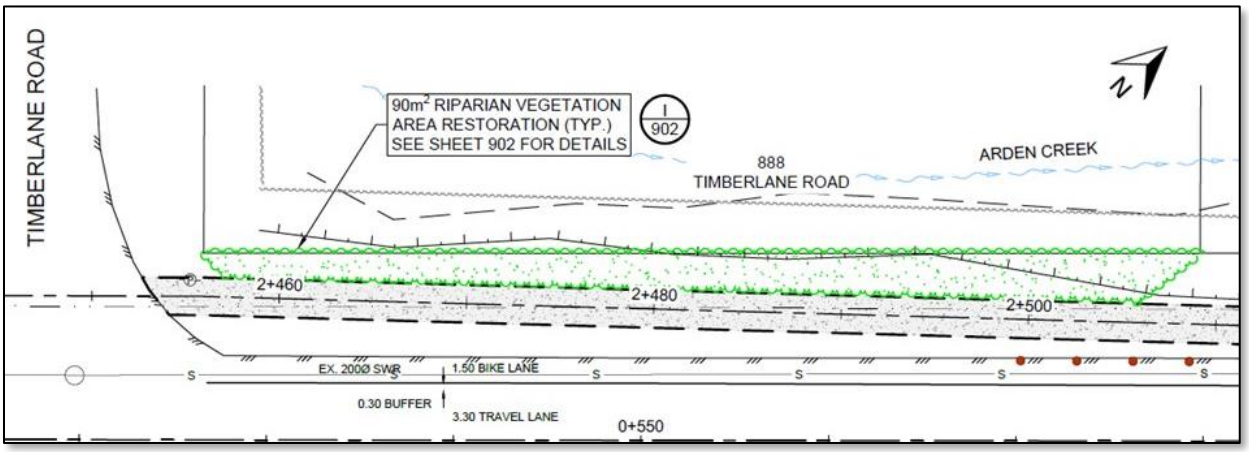

Figure 10. Vegetation restoration adjacent to Arden Creek at Timberland Road.

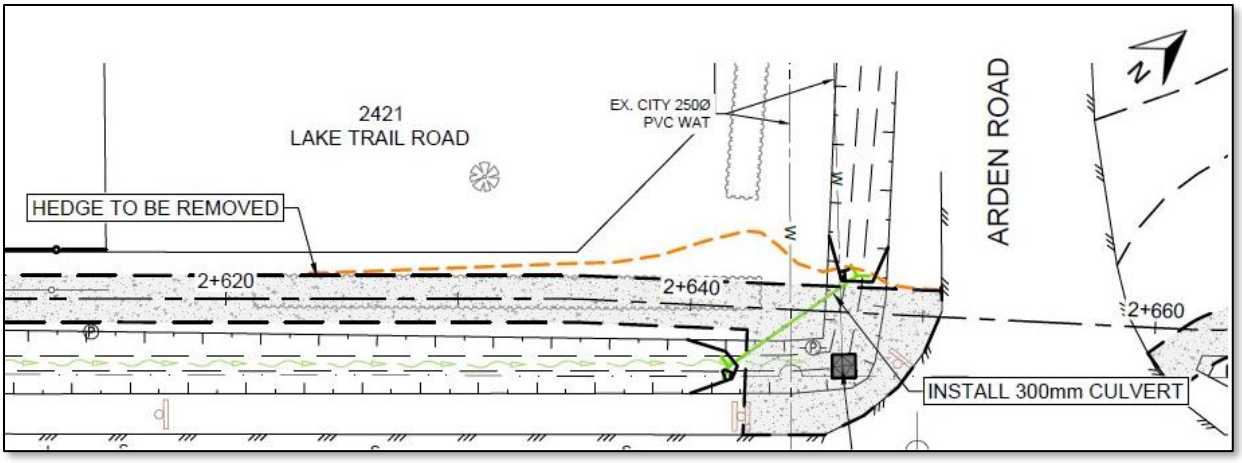

Figure 11. Culvert installation and hedge removal at Arden Road.

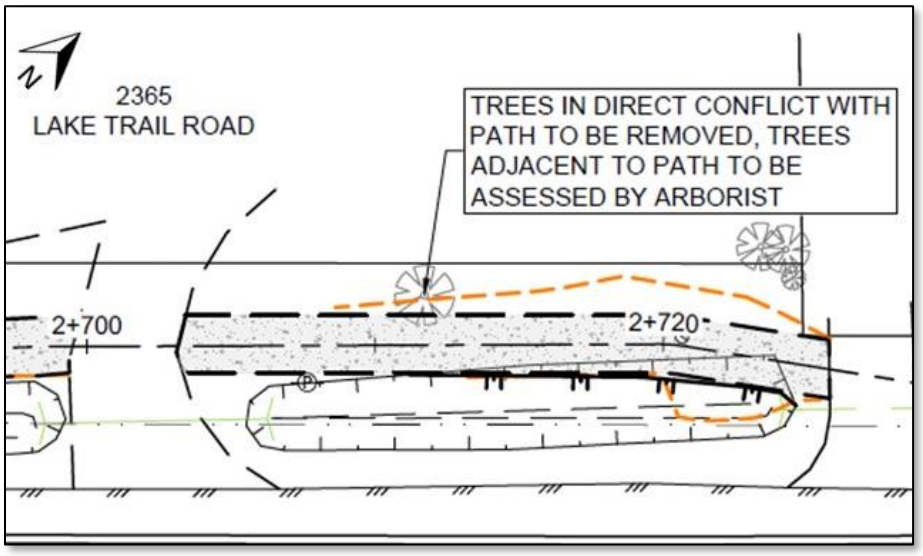

Figure 12. Tree removal on the north side of the driveway at 2365 Lake Trail Road

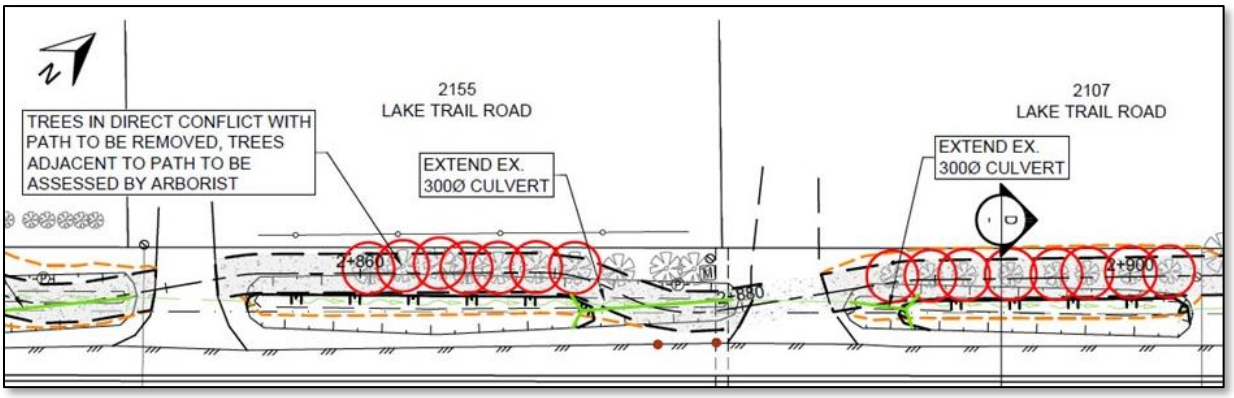

Figure 13. Vegetation removal and culvert extensions required at 2155 Lake Trail Road alongside a drainage ditch.

d. *The name of any watersheds, water sources and water bodies that are likely to be affected and the geographic coordinates of the water sources and water bodies.*

Watercourse details are summarized in *Table 2*.

Table 2. Watercourse Details

Watercourse Summary	
Watercourse Name:	Arden Creek
Waterbody ID	307756
Watercourse Type (Strahler Order Number):	First Order Stream

6. *The name of the community nearest to the location and the name of the county, district or region and the province in which the proposed work, undertaking or activity will be carried on.*

The City of Courtenay, British Columbia.

6. Description of any Consultations Undertaken Prior to Application

7. *A description and the results of any consultations undertaken in relation to the proposed work, undertaking or activity, including with Indigenous communities or groups and the public.*

The City of Courtenay has begun Indigenous consultation with K'omoks First Nation. K'omoks First Nation has requested that the City provide additional information for their review. The City will submit this report and additional documentation K'omoks First Nation concurrently with the submission to DFO to facilitate consultation.

7. Description of Fish and Fish Habitat

8. *A detailed description of the fish and fish habitat found at the location of the proposed work, undertaking or activity and within the area likely to be affected by the proposed work, undertaking or activity, including:*

a. *The type of water source or water body*

Arden Creek is a small, headwater stream, classified as a 'Strahler 1' stream order watercourse (Strahler, 1952) (Strahler, A. N., 1957). Flowing water is present year-round. The morphology of the creek within the study area has generally been altered and straightened by road and ditch development.

b. *The characteristics of the fish habitat and how those characteristics directly or indirectly support fish in carrying out their life processes;*

While each Site has slightly different habitat characteristics, overall, there are important similarities between all locations as they relate to fish habitat, specifically regarding Western brook lamprey, Morrison Creek population. The habitat requirements for this species include sand and gravel substrate, pools, riffles and hydraulic complexity for nest building, spawning, egg incubation, and rearing, in addition to foraging habitat for adults (GoC, 2022b) (Wade and Grant, 2022). Adults excavate a small depression used as a nest for spawning and egg incubation from April to June. It is inferred that none of the Sites provide spawning or

rearing habitat for Western brook lamprey given the overall lack of suitable substrates and hydraulic complexity.

Proposed works are limited in the natural areas of Arden Creek (e.g., those associated with an adjacent, undeveloped wetland) which flows away from Project Area. Both cover availability and hydraulic complexity of the watercourse appear to increase as it meanders away from Lake Trail Rd, and away from sources of modification such as landscaped lawns and urban ditch lines. Habitat for Western brook lamprey near the various Project sections is assumed to be utilized for migration - as they move between areas better suited for spawning or otherwise supporting their species' sensitive life stages. Further details can be found in the Project's Fish and Fish Habitat Assessment which was previously submitted to DFO.

7.1. SECTION 1 - CULVERT WORKS IN ARDEN CREEK AND TREE REMOVAL AT WEBB ROAD

At Section 1, Arden Creek can be characterized as a ditch with predominant run habitat (e.g., see Photo 1 & 2 - below) and moderate gradients. The channel width at the top-of-bank (TOB) ranged from 2.2 metres (m) – 5 m in width. The substrate within the assessment location was primarily composed of agronomic grasses. The wetted width ranged from 0.30 m – 1.3 m, with a maximum depth of 0.15 m at the time of the field assessment. Instream cover was observed to be negligible. Banks were rated as stable and native vegetation within the riparian area was observed to be limited, apart from some occasional shrub species adjacent to the ditch.

This Section has low-quality habitat in context of critical habitat for Western brook lamprey. The ditch substrate is vegetated, and minimal cover is provided along the margins. The Site may provide low quality habitat for other species and their sensitive life-stages.

Photograph 1. View of downstream habitat at Section 1 - Webb Rd. (January 21, 2025)

7.2. SECTION 2 - DITCH MODIFICATIONS AND VEGETATION REMOVAL BETWEEN CHURCH AND 2877 LAKE TRAIL ROAD

At Section 2, Arden Creek can be characterized as a ditch with predominant run habitat (e.g., see Photo 2 - below) and moderate gradients. The channel width at the top-of-bank (TOB) ranged from 2.2 metres (m) – 5 m in width. The substrate within the assessment location was primarily composed of agronomic grasses. The wetted width ranged from 0.30 m – 1.3 m, with a maximum depth of 0.15 m at the time of the field assessment. Instream cover was observed to be negligible. Banks were rated as stable and native vegetation within the riparian area was observed to be limited, apart from some occasional coniferous trees adjacent to the ditch. The watercourse crosses Lake Trail Rd. at this location and begins to flow downstream, along the fence line of Arden Elementary School.

This Section has low-quality habitat in context of critical habitat for Western brook lamprey. The ditch substrate is vegetated, and minimal cover is provided along the margins. The Site may provide low quality habitat for other species and their sensitive life-stages.

Photograph 2. View of upstream habitat at Section 2 - Courtenay Fellowship Baptist Church (January 21, 2025)

7.3. SECTION 3 – CULVERT EXTENSIONS AT POWERHOUSE RD.

After passing the northern property boundary of Arden Elementary School, Arden Creek transitions from an anthropogenic form to a natural morphology. Arden Creek was assessed within wetland habitat at this location where the watercourse possessed defined run and riffle sections and maximum depths of 0.33 m (e.g., see Photo 3 - below). Substrates were primarily comprised of cobble, gravel, and fine materials with a small proportion of organics. Wetted width was measured at 1.9 m and channel width at the TOB was

measured at 2.5 m. Instream cover was provided by overhanging vegetation. Banks were rated as stable, and vegetation within the riparian area consisted of grasses, shrubs, and deciduous trees. A culvert containing water was observed to cross Lake Trail Rd. at Powerhouse Rd., and therefore the ditch line on the northwest side of Lake Trail Rd. and Powerhouse Rd. in this vicinity should be viewed as potential fish habitat when water is present (e.g., see Photo 3 & 4 – below). Arden Creek continues to flow downstream through the wetland area until it again crosses Lake Trail Rd., between Powerhouse Rd. and Timberlane Rd.

From the perspective of critical habitat for Western brook lamprey, there is overhanging vegetation for concealment and some hydraulic complexity near Section 3; however, the relative lack of suitable gravel substrates means that this section is of moderate quality for the species. The Site may provide moderate habitat for other species and their sensitive life-stages.

Photograph 3. View of downstream habitat at Section 3 – Powerhouse Rd. (January 21, 2025)

Photograph 4. View of ditch line which may be hydraulically connected to Arden Creek during periods of high flow at Powerhouse Rd. – facing northwest (January 21, 2025)

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7.4. SECTION 4 – CULVERT EXTENSION AND NEW HEADWALL AT ARDEN CREEK

Section 4 is characterized by an increase in riffle habitat, increased gradient, and higher banks with maximum depths of 0.18 m (e.g., see Photo 6 - below). Arden Creek maintained its natural morphology in this area as it traversed a mix of urban yards and forested areas. Substrates were primarily a mix of gravel, cobble, and boulder material. Wetted width ranged from 0.8 m - 1.0 m and channel width at the OHW was ranged from 3.5 m – 7.0 m. Instream cover was provided by overhanging vegetation. Banks were generally stable, but some erosion was noted at Transect 5. Vegetation within the riparian area consisted primarily of grasses, shrubs, and deciduous trees. Additional downstream assessments were not completed as Arden Creek began to track away from Lake Trail Rd. beyond Transect 5 (between Timberlane Rd. and Webdon Rd.) and as further access was limited by the prevalence of private property.

From the perspective of critical habitat for Western brook lamprey, there is overhanging vegetation for concealment and increased hydraulic complexity near Section 4; however, the relative lack of suitable gravel substrates means that this section is of moderate quality for the species. The Site may provide moderate habitat for other species and their sensitive life-stages.

Photograph 5. View of downstream habitat at Section 4 - 2675 Lake Trail Rd. (January 21, 2025)

7.5. SECTION 5 – ROAD WIDENING AND ARDEN CREEK HABITAT IMPROVEMENTS

Within the western portion of Section 5, Arden Creek remains characterized as a ditch with predominant run habitat (e.g., see Photo 6 - below) and moderate gradients. The watercourse flows along the fence line of Arden Elementary School at this location. Within the eastern portion of Section 5, Arden Creek has meandered away from Lake Trail Rd – leaving only the SARA buffer to be considered as part of the road widening activities.

While assessment transects were not sited within Arden Creek at these locations, general observations made during the assessment indicated that the lack of cover and suitable substrates adjacent to Arden Elementary provide low-quality habitat in context of critical habitat for Western brook lamprey. Further south, the developed nature of the road shoulder and lack of vegetation will result in limited impacts to the riparian buffer. This section may provide low quality habitat for other species and their sensitive life-stages adjacent to the school and moderate quality habitat within the wetland portion of Arden Creek further south.

Photograph 6. View of upstream habitat adjacent to Arden Elementary (January 21, 2025)

Photograph 7. View of upstream habitat adjacent to eastern portion of Section 5 (January 21, 2025)

c. The fish species that are present and an estimate of the abundance of those species; and

The BC Habitat Wizard (BC Habitat Wizard, 2025) database was queried to identify fish species in Arden Creek. The search results are included in *Table 3.*

Table 3. Historically documented fish species within Arden Creek & their conservation status

Family	Scientific Name	Common Name	Legislated Protection		Scientific Review or Recommendation	
			SARA (Federal)	Wildlife Act (Provincial)	COSEWIC (Federal)	General Status (Provincial)
Salmonidae (trouts and salmons)	*Oncorhynchus tshawytscha (East Vancouver Island, Stream, Spring population)*	Chinook salmon	**Not listed (Under Consideration)**	**Not reviewed**	**Endangered**	**Not reviewed**
	Oncorhynchus kisutch	Coho salmon	**Not listed**	**Not reviewed**	**Not reviewed**	**Not reviewed**
Petromyzontidae (lampreys)	*Lampetra richardsoni* &	Western brook lamprey, Morrison	**Endangered**	**Critically Imperiled**	**Endangered**	**Red Listed**

Family	Scientific Name	Common Name	Legislated Protection		Scientific Review or Recommendation	
			SARA (Federal)	Wildlife Act (Provincial)	COSEWIC (Federal)	General Status (Provincial)
	Lampetra richardsoni var. marifuga	Creek population				

McElhanney reviewed the DFO mapped aquatic species at risk habitat to determine if any critical habitat polygons where within the study area. In the study area, Arden Creek is mapped by the DFO Critical Habitat database as a critical habitat polygon for Western brook lamprey, Morrison Creek population (DFO, 2023). The Morrison Creek population of Western brook lamprey is listed as 'Endangered' under Schedule 1 of the SARA and COSEWIC (GoC, 2022b), as 'Critically Imperiled' under the Wildlife Act (Province of BC , 1996) and is designated 'Red' under the provincial Red, Blue & Yellow List (Province of BC, 2023) – which indicates that it is a species at great risk of being lost. Based on DFO's Aquatic Species at Risk Map, there is also identified critical Western brook lamprey habitat located within the assessed reach of Arden Creek – including the associated wetland and ditch line areas (DFO, 2024c). The Morrison Creek population exhibits a rare life history in which both a non-parasitic (*L. richardsoni*) and a parasitic (*L. richardsoni var. marifuga*) type of lamprey are produced (GoC, 2020).

Activities occurring inside the defined critical habitat area have direct impacts, and activities located outside of an area identified as critical habitat can indirectly damage or destroy critical habitat. As such, activities including installation, maintenance, repair, or replacement of any anthropogenic structures, located within, or adjacent to, critical habitat, must be reviewed by DFO to determine whether a *SARA* permit, *Fisheries Act* and/or other authorizations or permits are required and can be issued.

A SARA permit will be required to conduct Project activities within the OHW and within a riparian buffer area that will be confirmed by DFO during the engagement process - anticipated to range between 10-30 m from each bank, depending on the associated habitat type (e.g., ditch, creek, and wetland).

d. A description of how the information provided under paragraphs (a) to (c) was obtained, including the sources, methods and sampling techniques.

Assessment methods for included the following;

1. Desktop review of existing data, aerial imagery, and regulatory guidance,

2. Field assessment data collection to supplement knowledge of habitat, and,

3. Compilation of these information sources and the proposed Project work plans to determine areas of impact, potential mitigations, and residual impacts that require on-site compensation or off-site offsetting.

Fish habitat was assessed over a series of transects throughout the portion of the project area which interacts with Arden Creek and its associated riparian habitat. Habitat composition measured in each segment included standard variables related to fish habitat quality such as average channel width and water depth, substrate classification based on particle size, assessment of in-stream and overhead cover, streambank stability and character assessment upstream and downstream of the crossing (noting the height and condition of the banks), and channel geomorphic unit flow type (also known as habitat type).

Additional data relating to parameters that characterize potential for limits to fish passage at the crossing structure were recorded. Additional photographs of the field reconnaissance and data tables which summarize the fish habitat inventories are included in the Project's Fish and Fish Habitat Assessment report, previously submitted under DFO file number 25-HPAC-00276. The below information provides a summary of the fish habitat features collected by the QEP within the relevant Project Sections. Fish inventories were conducted not due to the sensitive nature of Arden Creek's resident species (i.e., Western brook lamprey, Morrison Creek population).

8. Description of Effects on Fish and Fish Habitat

9. *(1)A detailed description of the likely effects of the proposed work, undertaking or activity on fish and fish habitat. The description must include*

a. *the fish species that are likely to be affected and the life stages of the individuals of those species;*

With the implementation of recommended mitigation measures, there is unlikely to be injury or mortality of fish within the instream footprints – this includes known species such at Western brook lamprey, Morrison Creek population, Chinook salmon, and Coho salmon. Adherence to least risk timing windows and site isolation should avoid the death of fish or Harmful Alteration, Disruption and Destruction (HADD) or fish or their habitat. It is the view of the Project team that the current condition of the instream and riparian footprint within the Project Area provides low critical habitat values for Western brook lamprey due to a relative lack of suitable substrates and hydraulic complexity, and a previously impacted riparian area. While instream impacts will alter fish-habitat at this location, it is not altering critical habitat features; however, given that the impacts will occur to instream and riparian habitat within a critical habitat polygon, a FAA was triggered for the Project. The existing landscape will be permanently modified as follows:

- Removal of some riparian vegetation to facilitate infrastructure placement, replanting will occur as required in appropriate locations to further stabilize the banks.
- Culvert installation and extension within Arden Creek.
- Headwall installation within Arden Creek.
- Ditch modifications within Arden Creek.
- Road widening within the critical habitat polygon.

b. *the extent and type of fish habitat that is likely to be affected;*

Table 4 Instream and Riparian Habitat Changes Associated with the Project

Type of Habitat Impact	Existing Conditions	Area	Total Area	Comments
Temporary Instream Alteration or Loss	In Stream	32 m^2	**32 m^2**	Habitat below the high-water mark that will be temporarily altered due to construction activities
Permanent Instream Alteration or Loss	In Stream	122.5 m^2	**122.5 m^2**	Habitat below the high-water mark that will be permanently altered or lost due to construction activities
Temporary Area within Riparian setback Alteration or Loss	Pavement	0 m^2	**0 m^2**	Riparian habitat between the ordinary high-water mark and the riparian boundary that will be temporarily altered due to construction activities .
	Gravel Shoulder	0 m^2		
	Grassed Area	0 m^2		
	Shrubs & Trees	0 m^2		
Permanent Area within Riparian setback Alteration or Loss	Pavement	0 m^2	**466.8 m^2**	Riparian habitat between the ordinary high-water mark and the riparian boundary that will be altered due to construction activities
	Gravel Shoulder	109.8 m^2		
	Grassed Area	357.0 m^2		
	Shrubs & Trees	0 m^2		
Total Riparian Loss (Temporary + Permanent) = **466.8m^2**				
Total Instream Loss (Temporary + Permanent) = **154.5 m^2**				

8.1. SECTION 1 & SECTION 2

Work in these adjacent sections will result in **75.7 m^2 of permanent riparian impacts** and **83.2 m^2 of permanent instream impacts**.

1.1.1. Section 1

Proposed Project activities in the area of Webb Road and Lake Trail Road include culvert installations and extensions in Arden Creek, as well as tree removal. Up to two trees will be removed at the corner of Webb Road and Lake Trail Road to accommodate pathway construction; these trees will not be replanted as part of the Project.

Proposed Project activities include the following:

- Extension of the existing 500 mm diameter (dia.) corrugated steel pipe (CSP) culvert approximately 4.5 m into the creek,

- Installation of a new 1200 mm dia. concrete culvert to convey Arden Creek under the pathway alignment,
- Installation of two precast concrete headwalls within the stream channel of Arden Creek, and
- Removal of one tree within the riparian zone on the north side of the creek. Additional tree removal requirements will be decided through an arborist assessment prior to the start of construction.

1.1.2. Section 2

Proposed activities within this section include culvert installations and vegetation removal on the north side of Lake Trail Road between the Courtenay Fellowship Baptist Church property and the driveway at 2877 Lake Trail Road. Stormwater runoff on the south side of the church driveway flows south towards Arden Creek, while ditches on the north side of the driveway flow north towards Powerhouse Road and Arden Creek.

The existing culvert under the church driveway will be abandoned in place (AiP) and a lawn basin and culvert will be installed in the ditch on the north side of the driveway. The proposed pedestrian pathway alignment will be above the TOB of the ditchline other than at 2+100 where culvert extension is required to accommodate the pathway.

Proposed Project activities include the following:

- Pathway construction through an existing shallow swale that is connected to Arden Creek on the south side of the church driveway,
- Installation of a 600 mm lawn basin and 300 mm dia. culvert on the south side of the church driveway to direct flows south to Arden Creek (*Error! Reference source not found.*),
- Installation of a 600 mm lawn basin and associated 300 mm dia. culvert on the north side of the church driveway at 2+100. The existing culvert under the church driveway will be AiP (*Error! Reference source not found.*),
- Installation of two new 300 mm dia. culverts within ditches at both sides of the driveway at 2877 Lake Trail Road (at 2+170) (*Error! Reference source not found.*),
- Tree removal as needed based on an arborist assessment of trees in conflict with the proposed pathway alignment (between 2899 and 2825 Lake Trail Road), and
- Vegetation restoration between the driveways of 2899 and 2877 Lake Trail Road (*Error! Reference source not found.*).

8.2. SECTION 3

Work in this section will result in **83.0 m^2 of permanent riparian impacts**.

Proposed works within this section include the extension of existing culverts within ditches on either side of Powerhouse Road at Lake Trail Road, vegetation removal, and re-shaping/widening of the ditch on the south side of Powerhouse Road. Ditches at this location flow directly into Arden Creek.

Proposed Project activities include the following:

- Install a new 300 mm dia. culvert in the ditch at the northwest corner of Lake Trail Road and Powerhouse Road at 2+230,

- Extend the existing 1000 mm dia. culvert approximately 3 m into the ditch adjacent to Powerhouse Road to tie into existing culvert,

- Install a new cast-in-place concrete collar,

- Re-shaping of the ditch on both the south and north sides of Powerhouse Road,

- Tree and shrub removal based on an arborist assessment of vegetation in conflict with the proposed pathway alignment, and

- Vegetation restoration between the driveway at 2825 Lake Trail Road and Powerhouse Road.

8.3. SECTION 4

Work in this section will result in **198.3 m^2 of permanent riparian impacts** and **39.3 m^2 of permanent instream impacts**.

Proposed Project activities in this section include the extension of the existing culvert that conveys Arden Creek flows under Lake Trail Road to the northwest, installation of a new precast concrete headwall at the outlet of the culvert, and re-instating of swale that directs surface water flows to the creek.

Proposed Project activities include the following:

- Extension of a 1200 mm dia. CSP culvert and installation of a new headwall at 2675 Lake Trail Road where Arden Creek flows under Lake Trail Road towards the northeast (at 2+360),

- Re-instatement of a swale on the east side of the existing creek channel to direct surface water flows into Arden Creek,

- Vegetation removal on the north side of the 2607 Lake Trail Road driveway based on an arborists assessment of trees in conflict with the proposed pathway alignment,

- Vegetation restoration adjacent to Arden Creek on the south side of the driveway at 2607 Lake Trail Road, and

- Vegetation restoration/planting adjacent to Arden Creek on the north side of Timberland Road (Figure 12)

8.4. SECTION 5

Work in this section will result in **109.8 m^2 of permanent riparian impacts**.

Road widening is proposed along the south side of Lake Trail Road in two locations above the TOB of Arden Creek and existing ditches:

- Adjacent to the start of the naturalized channel of Arden Creek at Arden Elementary School (2+070) to the driveway at 2877 Lake Trail Road (approximately 2+180), and

- Between Powerhouse Road (2+140) to the crosswalk at Arden Road (approximately 2+640) adjacent to an existing drainage ditch.

c. the probability, magnitude, geographic extent and duration of the likely effects on fish and fish habitat; and

Residual impacts of potential Project impacts on biophysical components were completed and provided as an impact statement. Impact statements are included in *Table 8*.

Table 5. Residual impact analysis following the implementation of BMPs and measures to reduce or avoid impacts

Biophysical Component	Potential Impact	Activities Proposed to Cause Impact	Mitigation Measure	Magnitude	Geographic Extent	Duration	Significance / Impact Statement
Landforms & Soils	Alteration or disturbance to soil profiles	• Land based clearing and construction • Site regrading/infilling • Excavations	• Where applicable, soils stripped during site preparation should be stockpiled (with cover to prevent incursion by invasive species) and put back on site during landscaping. • Ensure that topsoil is replaced on all future lawn/vegetated areas after development has been completed.	• Low or Nil given historic impacts	• local in geographic extent in a pre-disturbed environment.	• Short term	• Mitigation measures and proper pre-construction stripping of soils for re-use should retain the health of the soils to be reused. • Impact is Minimal to Minor
	Erosion and sedimentation	• Land based clearing and construction • Stripping and stockpiling of soils	• Develop an erosion and sediment control plan (ESC) • Minimize the extent of the area cleared at any one time and promptly revegetate or stabilize disturbed areas • Use of appropriate native plant species to revegetate that will quickly re-establish vegetation cover • Erosion protection measures will be applied to any material stockpiled • Control erosion and sediment generation at the source rather than attempting to treat sediment-laden water	• Moderate	• local in geographic extent in a pre-disturbed environment	• Short term	• Implementation of mitigation measures should result in a Minimal impact
	Compaction	• Heavy equipment uses on the Site	• Soil compaction can be reduced by using heavy equipment on the existing road surface wherever possible • Strip topsoil and retain it for reuse prior to the extensive use of heavy equipment during construction	• Low	• local in geographic extent in a pre-disturbed environment	• Short term	• Mitigation measures and proper pre-construction stripping of soils for re-use should retain the health of the soils to be reused. • Impact is Minimal
Hydrology & Watercourses (including fish habitat)	Construction near water (e.g., culverts, culvert extensions, ditch modifications, headwall installation)	• Removal of riparian vegetation anticipated • Modification of the bed and banks or Arden Creek • Disturbance to fish during site isolation and salvage	• Instream works will occur within an isolation. • Salvage works associated with the isolation will be conducted by a local environmental professional with experience handling the Western brook lamprey, Morrison Creek population • A Notification under the WSA is required for this aspect of the Project as well as a Request for Project Review under the *Fisheries Act*	• Moderate	• local in geographic extent in a pre-disturbed environment	• Medium term	• Impacts have been avoided, when possible, through design • Implementation of mitigation measures will be required to avoid a HADD. • Until vegetation is re-established, there will be Minor impacts locally, but long-term impacts will be Minimal.

Biophysical Component	Potential Impact	Activities Proposed to Cause Impact	Mitigation Measure	Magnitude	Geographic Extent	Duration	Significance / Impact Statement
			• Provincial and Federal fish collection permits will be required to facilitate salvage works. • Works within Arden Creek will be completed in the least risk timing window • Riparian enhancement and offsetting are planned for the Project				
	Accidental spill of deleterious substances such as fuel, oil or spills from equipment that degrade surface and groundwater quality	• Spills from heavy equipment including refueling • Asphalt resurfacing • Generation of sediment laden water during construction works	• Protection of water quality through use of ESC measures as appropriate • Utilize pre-cast concrete components • Develop a spill prevention and response plan	• Moderate	• local in geographic extent	• Short term	• Mitigation measures will result in non-substantial impact
Terrestrial Vegetation Resources (Including Riparian Areas)	Introduction of invasive species	• Disturbance to soil and vegetation clearing during site preparation	• Project design should retain vegetation where appropriate • Replace removed vegetation with new native plantings, as feasible • Use local native plants in landscaping; they are adapted to local climates and once established, will need less maintenance than non-native plants	• Low (based on current health of ecosystem)	• local in geographic extent in a pre-disturbed environment	• Long-term	• Impact is Minor with implementation of BMPs
	Damage or loss of native plant communities and species	• Vegetation clearing during site preparation • Removal of vegetation during Project construction	• Project design should retain vegetation where appropriate • Use local native plants in landscaping that are adapted to local climates • Manage weeds according to the *Weed Control Act*	• Moderate	• local in geographic extent in a pre-disturbed environment	• Medium term	• Until vegetation is re-established, there will be Minor impacts locally, but long-term impacts will be Minimal.
	Potential root zone disturbance of trees to be retained	• Damage to root zones by construction activities on the Site and on adjacent properties.	• Where applicable, erect a fence at the outer limit of the critical root zone of trees to be retained, which is defined as the distance around the tree at a radius of 10 times the diameter of the tree (at breast height) or outside the dripline of the tree, where feasible • Avoid damage to the root system, trunk, or branches of any retained tree • Do not place any material or equipment within the critical root zone of the tree	• Low (the majority of vegetation will be removed within Project footprint and replanted)	• local in geographic extent	• Medium Term	• Mitigation measures will result in non-substantial impact

Biophysical Component	Potential Impact	Activities Proposed to Cause Impact	Mitigation Measure	Magnitude	Geographic Extent	Duration	Significance / Impact Statement
			• Do not attach any signs, notices, or posters to retained trees				
	Decrease in biodiversity	• Increase in invasive species to newly disturbed areas	• Re-establishing native vegetation along new or disturbed edges of natural features by seeding or transplanting locally appropriate native species • Control of designated noxious species when encountered	• Moderate	• local in geographic extent in a pre-disturbed environment	• Medium term	• Until vegetation is re-established, there will be Minor impacts locally, but long-term impacts will be Minimal as the Site will be enhanced from current condition.

d. a description of how the information provided under paragraphs (a) to (c) was derived, including the methodologies used.

A QEP reviewed the data from desktop and field assessments in context with DFOs pathway of effects and measures to protect fish and fish habitat. Residual impacts of potential Project impacts were quantified in terms of magnitude, reversibility, geographic extent, duration, frequency, and overall significance, as outlined below, and based on guidelines provided by the BC Environmental Assessment Office (BC Environmental Assessment Office, 2013).

McElhanney has reviewed the Pathway of Effects (PoEs) available through the DFO website to describe the type of cause-effect relationships that apply to this Project (DFO, 2024). DFO's PoE framework outlines potential effects that may have an influence on fish and fish habitat which are summarized in ***Table 6***.

Table 6. Pathways of Effects (DFO 2024) relating to the Project activities.

Pressure	Pathways of Effects								
	Use of machinery on land/alteration of riparian vegetation	Use of machinery in water	Placement of materials in water	Removal of materials and aquatic vegetation from water	Water level/flow modification	Water diversion	Dewatering	Detonation in or near water	Introduction of underwater noise
Change or loss of wetted area	-	-	✓	✓	-	-	✓	-	-
Change or loss of fish passage	-	-	-	-	-	✓	✓	-	-
Change or loss of riparian habitat	✓	-	-	-	-	-	-	-	-
Change or loss of habitat structure and cover	✓	-	✓	✓	-	-	-	-	-
Sedimentation of fish habitat	✓	✓	✓	✓	-	✓	✓	-	-
Sublethal effects and/or mortality	-	✓	✓	✓	-	✓	✓	-	-
Contamination of fish habitat	-	✓	-	-	-	-	-	-	-
Potential direct or indirect impairment of the habitat's capacity to support one or more life processes of fish (spawning, breeding, rearing, nursery, feeding, migration, refuge) resulting in sublethal or lethal effects	-	✓	✓	✓	-	✓	✓	-	-
Change in water temperature	✓	-	-	-	-	-	-	-	-

1) MAGNITUDE

Magnitude is a measure of the intensity of a residual impact or the degree of change cause by a Project on an Environmentally Valuable Resource (EVR) relative to the existing conditions. Geographic extent and duration of an impact is important in classifying magnitude. For magnitude, the criteria are defined as follows:

- High: A residual environmental impact affecting a whole stock, population, habitat, or ecosystem, outside the range of natural variation that may be near or exceed the resilience limits of a population or community, such that communities do not return to pre-Project levels for multiple generations.
- Moderate: A small, measurable residual environmental impact affecting a portion of a population or habitat, or ecosystem, returns to pre- Project levels in one generation or less, rapid, and unpredictable change, temporarily outside range of natural variability.
- Low: A negligible residual environmental impact affecting a specific local group, habitat, or ecosystem, returns to pre-Project levels in one generation or less, within natural variation.
- Nil: No discernable change to an EVR.
- Unknown: A residual environmental impact affecting an unknown portion of a population or group or where the changes in a specific parameter are unknown.

2) GEOGRAPHIC EXTENT

Geographic extent refers to the spatial extent of the area affected and is related to the spatial distribution and movement of an EVR. When considering geographic extent in the determination of magnitude, it is important to understand that local scale effects are less severe than those that extend to the regional scale or beyond. Geographic extent is broken into local, regional, and beyond regional as defined as follows:

- Local scale effects are those largely associated with direct effects from the Project footprint (i.e., removal of vegetation for construction of Project components) and project specific small-scale indirect changes (i.e., within the Local Assessment Area).
- Regional scale effects are those that are associated with incremental and cumulative changes from the Project and other developments but are restricted to within the Regional Assessment Area.
- Beyond regional includes cumulative residual effects from the project and other developments that extend beyond the Regional Assessment Area

3) DURATION

Duration is defined as the amount of time from the beginning of a residual effect to when that effect on an EVR is reversed. Duration is the result of two factors: the amount of time between the start and end of a Project activity that causes stress on an EVR, and the time required for the effect to be reversible. The duration of individual Project activities and the period in which the residual effect may occur are considered. Some effects are reversible shortly after the stress has been removed (e.g., changes in the distribution of some wildlife species following the removal of noise after decommissioning and abandonment), while others may take longer to be reversed (e.g., the change in abundance of some species until revegetation has occurred). In some cases, a prediction of duration may be well beyond the temporal boundary of the Project, it is not known when those effects may be reversed, and an EVR may never return to a state that was

unaffected by the Project. In these cases, the likelihood of reversibility is so low that the effect is classified as irreversible. Duration is broken into the following categories:

- Short-term – the residual effect is reversible at the end of construction.
- Medium-term – the residual effect is reversible at the end of operation of the Project.
- Long-term – the residual effect is reversible within a defined length of time where prediction certainty can predict the effect is reversible after decommissioning and abandonment.
- Permanent – the residual effect is predicted to influence an EVR indefinitely. This is applied when an effect is determined to be irreversible.

4) SIGNIFICANCE

For adverse residual effects, the evaluation for the individual criteria was combined into an overall rating of significance as follows:

- Major: Potential impact could jeopardize the long-term sustainability of the resource, such that the impact is considered sufficient in magnitude, aerial extent, duration, and frequency, as well as being considered irreversible. Additional research, monitoring, and/or recovery initiatives should be considered.
- Medium: Potential impact could result in a decline of a resource in terms of quality/quantity, such that the impact is considered moderate in its combination of magnitude, aerial extent, duration, and frequency, but does not affect long-term sustainability (that is, it is considered reversible). Additional research, monitoring, and/or recovery initiatives may be considered.
- Minor: Potential impact may result in a localized or short-term decline in a resource during the life of the Project. Typically, no additional research, monitoring, and/or recovery initiatives are considered.
- Minimal: Potential impact may result in a small, localized decline in a resource during the construction phase of the Project and should be negligible to the overall baseline status of the resource.

An adverse effect is considered “significant” where its residual effects are classified as major; while they are considered “not significant” where residual effects are classified as medium, minor, or minimal. For effects of the Project to have a significant effect on EVRs, individuals would have to be affected to the extent that there would be a permanent adverse change to survival and reproduction at the population level.

9. (2)A detailed description of:

a. How the effects referred to in subsection (9) are likely to result in the death of fish or the harmful alteration, disruption or destruction of fish habitat; and

With the proposed habitat balance for riparian vegetation and instream habitat improvements, the Project is unlikely to result in the death of fish or a HADD in the long term. There will be short term impacts to vegetation during construction and after as it re-establishes following planting.

a. The extent of the elements referred to in paragraph (a).

Table 7. Changes to Instream and Riparian Habitat Resulting from Project Activities

Type of Habitat Impact	Existing Conditions	Area	Total Area	Comments
Temporary Instream Alteration or Loss	In Stream	32 m^2	**32 m^2**	Habitat below the high-water mark that will be permanently altered or lost due to construction activities
Permanent Instream Alteration or Loss	In Stream	122.5 m^2	**122.5 m^2**	Habitat below the high-water mark that will be permanently altered or lost due to construction activities
Temporary Area within Riparian setback Alteration or Loss	Pavement	0 m^2	**0**	Intact (not regularly maintained) riparian habitat that will be temporarily altered due to construction activities. These areas are the areas of construction for new riparian plantings.
	Gravel Shoulder	0 m^2		
	Grassed Area	0 m^2		
	Shrubs & Trees	0 m^2		
Permanent Area within Riparian setback Alteration or Loss	Pavement	0 m^2	**466.8 m^2**	Intact (not regularly maintained) riparian habitat between the ordinary high-water mark and the riparian boundary that will be altered due to construction activities
	Gravel Shoulder	109.8 m^2		
	Grassed Area	357.0 m^2		
	Shrubs & Trees	0 m^2		
Total Riparian Loss (Temporary + Permanent) = **466.8 m^2**				
Total Instream Loss (Temporary + Permanent) = **154.5 m^2**				
Proposed Instream Habitat Improvements = **500.7 m^2**				
Proposed Riparian Habitat Improvements = **356.2 m^2**				
Surplus Habitat Improvements = **235.6 m^2**				

A total of 122.5 m^2 of instream habitat is anticipated to be lost during the proposed works, mostly from the installation of culvert extensions. This is proposed to be offset by upwards of 500 m^2 of instream habitat improvements within the Project Area. A total of 466.8 m^2 of riparian area will be permanently impacted by the proposed works, mostly from construction of a gravel pathway within the existing gravel shoulder. This is proposed to be offset by 356.2 m^2 of riparian plantings within the Project Area. An overall **621.3 m^2** of habitat loss (instream and riparian) will be offset with an estimated **856.9 m^2** of habitat improvements, giving rise to a 1.4-fold increase in fish habitat. The proposed riparian planting and instream habitat restoration measures are detailed within the attached project drawings (***Appendix B***). It should be noted that much of the calculated riparian loss applies to existing gravelled or grassed road shoulders and previously disturbed areas that are located within the setback boundaries. The proposed treatments of those areas will serve to formalize a gravelled pathway for pedestrians, and in general do not require vegetation removal.

As the proposed offsets maximize the opportunities within the Project Area (i.e., available city property), additional offsetting opportunities could be explored in cooperation with the Morrison Creek Streamkeepers or other local advocacy groups that have ongoing habitat enhancement opportunities within the watershed. An example would be a control weir that backwaters the 1St Street culvert crossing on Morrison Creek in Courtenay. This rock riffle feature has deteriorated and requires some repairs to improve lamprey passage.

9. Description of Measures and Standards to Avoid or Mitigate Death of Fish or Harmful Alteration, Disruption or Destruction of Fish Habitat

9. A detailed description of the measures and standards that will be implemented, including an analysis of the expected effectiveness of those measures and standards, to:

a. Avoid the death of fish or to mitigate the extent of their death; or b. Avoid or mitigate the harmful alteration, disruption or destruction of fish habitat.

Proposed project works are anticipated to result in a measurable loss of instream and riparian habitat that will affect or alter the productive capacity of habitat for fish; however, the magnitude of residual effects is expected to be negligible. It should be noted that the proposed Project works will contribute greatly to the safety of local schoolchildren, cyclists, and pedestrians and that the design has been refined through several design concepts and iterations to minimize impacts to fish and fish habitat.

Some permanent loss of instream habitat is anticipated for the construction. The Project proposes a replanting and enhancement plan to counter these losses – both riparian and instream.

9.1. FISH AND FISH HABITAT

Mitigation measures and environmental BMPs are key steps in avoiding or reducing impacts to the existing environment. Further mitigations may also be provided by the Construction Contractor's QEP, as appropriate to the season, timing, and current conditions observed or expected at the time of construction activity. Recommended mitigation strategies are outlined below.

9.1.1. General mitigation measures

- While surface flow in the subject watercourses are expected to diminish substantially during the reduced risk timing window any residual water within the construction footprint will be carefully managed and monitored to ensure no offsite release of deleterious substances.
- The construction will be timed for the low flow conditions to reduce potential impacts to water quality.
- Maintain riparian vegetation as per the Project design. Keep an undisturbed vegetated buffer zone between areas of on-land activity and nearby water resources.
- Avoid tree removal.
- Use methods to prevent soil compaction, such as swamp mats or pads.
- Ensure proper sediment control measures are in place to avoid introducing sediment to the water.
- Develop and implement an erosion sediment control plan.
- Schedule work to avoid wet, windy, and rainy periods that may increase erosion and sedimentation.
- Prevent entry of deleterious substances into nearby surface water features.

Riparian restoration is planned to reduce or offset the impacts related to vegetation removal or grasses and low-lying shrubs in the Project footprint.

9.1.2. Timing

As an inclusive reduced risk timing window does not exist for Morrison Creek and its tributaries (i.e., Arden Creek) (Province of BC, 2011), the proposed reduced risk window for construction activities is **July 14 to August 6** for instream works - based on aquatic species expected in Arden Creek and its interconnecting waterways. This timing window has been recommended to protect sensitive life stages of aquatic species; however, timing windows will ultimately be determined through the permitting process.

9.1.3. Works in and around Water

BMPs outlined in 'Measures to protect fish and fish habitat' can be employed to protect fish habitat and water quality and should be considered to assist in adhering to the *Water Sustainability Act,* the *Wildlife Act,* and the *Fisheries Act.*

The following mitigation measures are relevant to protecting water quality:

- The removal of material must not lead to further channel instability or increase the risk of sedimentation into the waterbody.
- Any spoil materials must be placed in a location which prevents sediment or debris entering the water.
- Equipment used in proximity to watercourses must be free of deleterious material (e.g., hydrocarbons) and in good mechanical condition (no fuel or hydraulic leaks).
- Machinery (e.g., excavators, bobcats, generators) must be stored, maintained, and refueled on a flat surface, outside the drip line[1] of trees and a minimum of 30 m from waterbodies, as measured from the high-water mark; increase the 30 m buffer depending on level of risk and site-specific conditions. Refueling must take place on a tarp or portable berm, or on compacted ground.
- Gas generators must be secured to prevent movement during operation and set up on an impermeable fuel mat with a berm or within a container that can contain 110% of the volume of fuel in the generator.
- Measures must be taken to ensure that no harmful material (e.g., fuel and other hydrocarbons, soil, or sediment), which could adversely impact water quality, fish, and other aquatic life, and /or fish habitat, can enter the water as a result of the Project activities.
- Do not work in weather conditions likely to contribute to sediment production to the water.
- Erosion control measures (e.g., silt fences, matting, gravel, and check dams) shall be installed and maintained where appropriate, and
- Effective management of site water and ESC measures to protect water quality of off-Site resources. Where vegetated buffers alone do not retard water and sediment movement effectively, appropriate obstructions (e.g., logs, rocks, mounds) or sediment control structures shall be installed to dissipate the flow of water exiting the Site during construction.
- Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species, and noxious weeds.

[1] The area defined by the outermost circumference of a tree canopy where water drips from and onto the ground.

9.1.4. Heightened mitigation measures for salvage and relocation of Morrison Creek Lamprey

- Any watercourse segments within the project footprint with flowing water (or isolated standing water) will be carefully assessed for fish presence and managed prior to construction. It is understood that visual observation of lamprey is not reliable as filter feeding larvae burrow into the streambed. Accordingly, incremental dewatering methods will be used to "daylight" lamprey to the substrate surface where they will be captured with soft dip nets and transferred to dark buckets with aerated water.
- Any stream segments requiring dewatering for lamprey salvage will be isolated with coffer dams installed upstream and downstream of the channel reach, A 5 mm mesh stop net will be installed above the upstream coffer dam to prevent entrainment of fish into the flow diversion pump(s). The isolated area will be slowly dewatered using a low velocity electric pump with a screened sump. Most lamprey rearing within the substrates of the isolated construction site are expected to emerge as the site dewaters. Stream sediment suspected of containing residual lamprey will be carefully removed by hand or soft nets and washed through sieve(s).
- Salvaged lamprey will be transported in aerated buckets and relocated to suitable downstream habitat after observation and recording of data in accordance with the Fish Collection Permit.

9.1.5. Construction Materials, Practices, and Waste

The following are BMPs used to control and mitigate the effects of construction materials:

- Use natural material and environmentally friendly products whenever possible.
- When practical, consider pre-fabrication of parts of structures at an approved off-site location to minimize on-site construction impacts.
- Contain and stabilize waste material (e.g., excavated materials, construction waste and materials, vegetation) above the high-water mark to prevent them from entering any waterbody.
- All construction materials must be removed from the site on Project completion (e.g., refuse material, waste petroleum, construction material).
- Contain waste and transport to an approved waste landfill site.

Anticipated Effectiveness: High.

When outcomes will be achieved: Project completion.

Methods used to assess effectiveness: EM will identify and report on impacts to fish and fish habitat including the death of fish, fish in distress, and data obtained during salvage activities.

Reference standard used: DFO measures to protect fish and fish habitat (prevent the death of fish and prevent entry of deleterious substances in water), Least Risk Timing Window of July 14 to August 6 of any year, BC WQG for protection of aquatic life.

9.2. CONTAMINANT AND SPILL MANAGEMENT

The following are BMPs used to control and mitigate the effects of potential spills:

- Plan activities near water such that materials such as paint, primers, rust solvents, degreasers, grout, poured concrete or other chemicals do not enter the water.
- Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance and keep an emergency spill kit on site.

- Ensure that building material used in a watercourse has been handled and treated in a manner to prevent the release or leaching of substances into the water that may be deleterious to fish.
- Report any spills of sewage, oil, fuel, or other deleterious material whether near or directly into a water body.
- Ensure clean-up measures are suitably applied so as not to result in further alteration of sensitive habitat.
- Clean up and appropriately dispose of deleterious substances.
- Maintain all machinery on site in a clean condition and free of fluid leaks to prevent any deleterious substances from entering the water.

Anticipated Effectiveness: High.

When outcomes will be achieved: Project completion.

Methods used to assess effectiveness: EM will monitor for compliance of BMPs and mitigation measures.

Reference standard used: DFO measures to protect fish and fish habitat (prevent entry of deleterious substances in water).

9.3. EROSION AND SEDIMENT CONTROL PRACTICES

The Contractor will develop and implement an ESC Plan for the site that minimizes risk of sedimentation during all phases of the Project. ESC measures will be maintained until all disturbed ground has been permanently stabilized.

The ESC plan should, where applicable, include:

- When possible, minimize vegetation clearing and avoid clearing and grubbing areas with sensitive soils.
- Installation of effective ESC measures prior to onset of work, especially within 30 m of a waterbody.
- Utilize ESC products that correspond with the nature and duration of the Project. When possible, consider the use of biodegradable products. Select products that are not potential wildlife attractants and do not contain invasive species.
- Minimal soil disturbance should be planned as well as limiting the duration of soil exposure.
- Measures for managing water flowing onto the site, divert surface runoff away from exposed areas and manage water flowing onto the site as appropriate.
- If required, sediment laden water is to be pumped/diverted from the site such that sediment is filtered out prior to the water entering a waterbody. For example, pumping/diversion of water to a vegetated area, construction of a settling basin or other filtration system.
- Natural drainage patterns are to be retained wherever possible.
- Site isolation measures for containing suspended sediment where in-water work is required.
- Measures for containing and stabilizing waste material (e.g., construction waste and materials, uprooted or cut aquatic plants, accumulated debris) above the high-water mark of nearby waterbodies to prevent re-entry.
- Regular inspection and maintenance of ESC structures during all phases of the Project and modification, as necessary.
- Halt construction during periods of heavy precipitation and runoff to minimize soil disturbance.
- Removal of non-biodegradable erosion and sediment control materials once site is stabilized.

Anticipated Effectiveness: High.

When outcomes will be achieved: Continuously through construction.

Methods used to assess effectiveness: EM will monitor water quality at regular intervals for TSS.

Reference standard used: DFO measures to protect fish and fish habitat (ensure proper sediment control), CCME WQG for protection of aquatic life.

9.4. VEGETATION MANAGEMENT

The Project's CEMP will detail the specific areas where vegetation removal is required, methods for vegetation removal, methods to retain riparian and mature vegetation in and around the Project footprints where possible, and appropriate BMPs to protect the river and adjacent riparian areas. The CEMP should also include BMPs for tree felling and removal, details regarding revegetation and final landscaping for disturbed areas if they differ from the design drawings, and measures to avoid the introduction or spread of invasive weed species.

McElhanney recommends enhancement from current conditions through the planting of native trees and shrubs within and adjacent to the Project footprint. As such we have developed appropriate planting plans for on-site restoration and habitat offsetting. See **Appendix B.**

9.4.1. Revegetation Prescriptions & Habitat Enhancement

Engineering plans relating to revegetation include but are not limited to the following:

- If vegetation pruning is required on trees adjacent to the Project footprint, trim any tree branches cleanly back to the bark collar. Care must be taken to minimize damage to the bark of live trees.
- No trees outside the Project footprint are to be cut down without prior marking or approval.
- Avoid disturbance to features that have wildlife habitat value such as middens, dens, and fallen logs. Wherever possible, leave existing or potential habitat trees on the landscape.
- All imported soil, gravel, aggregate or fill must be verified by a qualified professional to be free of noxious and prohibited noxious weeds.
- Organic materials that are excavated during construction should be used during site restoration. All fill materials must comprise native mineral soils free of organics, vegetation, debris, and/or other deleterious substances or imported fill as specified in the contract documents.
- Any excess topsoil buried under disturbed root mat or organics with green side up or organics not required for rehabilitation along the trail edges should be broadcast scattered into the surrounding forest. On no account shall construction debris be disposed of by dumping onto slopes.
- Oversized rocks found during excavation and grading, to be salvaged and re-used on site.
- Seed blends will be selected that are deemed appropriate for the region.

It is recommended that native deciduous trees are planted where they have adequate depth for their rooting zone and a combination of native species (such as low-lying shrubs and herbaceous species) to be planted in areas with shallower soil profiles. It is also anticipated that many species will naturally regenerate in the years following disturbance.

9.4.2. Noxious Weeds & Invasive Plant Handling

Procedures will be followed to prevent spread of noxious weeds and invasive plant species which include the following:

- All equipment is thoroughly cleaned prior to being brought on site (e.g., remove dirt from other work sites that has accumulated on the tracks, undercarriage, tires) and before departure to the next site.
- Check clothing and footwear for seeds or plant matter and, if materials are detected, remove, and segregate to not infest the area.
- Use established roads/tracks to prevent access to potentially weed infested areas.
- Areas requiring clearing and grubbing should be screened by the EM for the presence of invasive plants. If invasive species are identified, they should be flagged, removed, segregated, and transferred under cover to a facility capable of accepting such material (i.e., transfer station).
- Know the origin of gravel or other fill used and that it is free of invasive plant species, invasive plant seeds, or rhizomatous plant parts. Avoid using fill from known sites of invasive plant infestation.
- Noxious weeds and invasive plant species that are encountered and are to be removed to facilitate construction activities will be bagged to prevent spread or dispersal and removed from site for incineration at an approved facility.
- Areas of known locations of noxious weeds will be clearly marked by the QEP to prevent unintentional disturbance. Avoid entry to areas that are marked as weed infestations to prevent spread.
- Revegetating the site as soon as possible after work is completed – cover of native or other planted species is among the best preventative measures to block weed infestations from taking hold.

A full list of noxious and undesirable weeds and exotic / introduced plants and control measures are available from the BC Ministry of Agriculture as mandated by the provincial *Weed Control Act.*

Anticipated Effectiveness: High.

When outcomes will be achieved: Project completion.

Methods used to assess effectiveness: EM will monitor for compliance with BMPs and mitigation measures.

Reference standard used: N/A.

10. A detailed description of the monitoring measures that will be implemented to assess the effectiveness of the measures and standards referred to in (9)

The Contractor will be required to develop a CEMP and have a qualified on-site EM. The EM will monitor all work below the HWM or with the potential to impact the aquatic habitat. The EM will monitor for the following:

- Fish and Fish Habitat
    - <u>Fish presence:</u>
        - Objective: Avoid and/or reduce death of fish.
        - Indicator(s): Fish presence.

        - Technique(s): Complete a sweep of the Project footprint immediately prior to construction to identify fish present. Complete a salvage of any fish identified within the Project footprint.
        - Rationale(s): Project activities will include instream works. Completing a fish salvage will reduce fish present within the footprint and therefore reduce the death of fish.
        - Timing/Frequency: Fish presence sweeps will be completed prior to construction following work zone isolation.
    - Fish disturbance:
        - Objective: Reduce disturbance to fish.
        - Indicator(s): Fish in distress.
        - Technique(s): The EM will monitor the work zone for fish presence and distress during work below the HWM.
        - Rationale(s): Project activities will some include in water works. Visually assessing the water line for fish presence will allow the EM to identify any fish in distress near the disturbance.
        - Timing/Frequency: The EM will be on-site daily to monitor for fish presence, distress, and other impacts.
- Sediment Control
    - Water quality:
        - Objective: Avoid sedimentation of marine environment.
        - Indicator(s): BC Water Quality Guidelines (MWLRS, 2025)[2].
        - Technique(s): The EM will visually monitor for sedimentation adjacent to the works and complete water quality monitoring for Total Suspended Solids (TSS) and turbidity.
        - Rationale(s): Monitoring will align with the CCME Water Quality Guidelines for the protection of aquatic life.
        - Timing/Frequency: Monitoring will occur multiple times a day during construction, and prior to construction each day to establish a baseline.
- Invasive Species
    - Equipment:
        - Objective: Avoid transfer of invasive species.
        - Indicator(s): Clean equipment and vehicles upon arrival to the Site.
        - Technique(s): EM will inspect equipment and vehicles upon arrival to the Site for mud, plant material, and miscellaneous debris.
        - Rationale(s): Inspection of equipment and vehicles upon arrival to the Site will reduce potential of invasive species being transferred to the Site.
        - Timing/Frequency: Inspections will occur upon arrival of equipment and vehicles at the Site.
- Spill Management
    - Refueling:
        - Objective: Evaluate refueling techniques and mitigation measures.

[2] British Columbia Ministry of Water, Land, and Resource Stewardship. 2025. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture - Guideline Summary. Water Quality Guideline Series, WQG-20. Retrieved from wqg_summary_aquaticlife_wildlife_agri.pdf

- Indicator(s): Proper technique and mitigation measures in place during refueling of equipment.
- Technique(s): EM will monitor refueling activities to note technique and mitigation measures in place.
- Rationale(s): Monitoring refuelling will allow the EM to determine potential risk and areas of improvement.
- Timing/Frequency: Monitoring will occur during all refueling activities while the EM is on-site.

- Containment:

  - Objective: Evaluate preparedness of contractor to respond to a spill.
  - Indicator(s): Sufficient supplies and knowledge on how to respond.
  - Technique(s): EM will identify and assess supplies on-site and equipment and discuss preparedness with crew. EM will complete an Environmental Orientation with the crew to discuss spill response plan.
  - Rationale(s): Allows EM to identify if sufficient resources are available and knowledge gaps within the crew to respond prior to the start of work.
  - Timing/Frequency: Start of Project and each crew change.

The EM will complete a daily monitoring report for each day of works and one final report after construction is complete.

10. *A detailed description of the contingency measures that will be implemented if the measures and standards referred to in (10) do not meet their objectives.*

If measures and standards referred to in (10) do not meet their objectives the EM will issue a stop work order. All work will be ceased until the EM and the Contractor are able to implement additional mitigation measures where required to meet the objectives. Any additional mitigation measures not outlined in this document but are provided in the *Fisheries Act* Authorization will be implemented for the Project.

11. *A quantitative and detailed description of the death of fish referred to in 9(2) after the measures and standards in 10(a) are implemented.*

Not applicable

12. *A quantitative and detailed description of the harmful alteration, disruption or destruction of fish habitat referred to in 9(2) after the measures and standards referred to in 10(b) are implemented.*

The study area exhibits a variety of channel morphologies, both natural and modified, with differing levels of stability, cover, and hydraulic complexity. The area generally features a moderate-gradient, meandering riffle-run system with small channels. Arden Creek's size and morphology provide limited water depths and flow velocities, offering fish limited cover and foraging opportunities within the Project Area. As headwater streams rely primarily on terrestrial inputs for their food web (Ward, 1997), the impacted nature of much of the riparian area in relation to the proposed works will result in a lessening of negative effects.

To assess the potential for harmful alteration, disruption, or destruction (HADD) of habitat in the project area, McElhanney reviewed the Action Plan for the Western Brook Lamprey – Morrison Creek Population (*Lampetra richardsoni*) in Canada 2018 (GoC, 2020). The Western brook lamprey, Morrison Creek population is a freshwater fish endemic to the Morrison Creek watershed in Courtenay, British Columbia.

The habitat requirements for *L. richardsoni* include sand and gravel substrate, pools, riffles and hydraulic complexity for nest building, spawning, egg incubation, and rearing, in addition to foraging habitat for adults

(GoC, 2022b) (Wade and Grant, 2022). Adults excavate a small depression used as a nest for spawning and egg incubation from April to June. Channel enhancement work recently completed an estimated 1.4 km downstream of the Project under SARA Permit #21-HPAC-00937 successfully increased *L. richardsoni* production using fish habitat restoration techniques, including rock riffle installations and gravel nourishment (Wade et. al., 2025). Restored lamprey spawning habitat typically includes areas with small riffles and a mix of sand and gravel for nest building (1–100 mm diameter) (Stone, J., 2006) (Gunkel et. al., 2006) with low flow (0–0.7 m/s). Eggs generally hatch within 30 days. Subsequently, the filter feeding larvae burrow into the substrate to rear for up to seven years, before completing metamorphosis into an adult. In general, larval rearing habitat can be characterized as occurring in slow water allowing for the accumulation of fine burrowing sediments, silt and detritus covered mud areas with gravel (Farlinger and Beamish, 1984) (Stone, J., 2006). Larvae also tend to prefer the margins of streams particularly areas with root balls and undercut banks (Farlinger and Beamish, 1984). Unfragmented riparian zones support lamprey habitat by providing banks stability, mitigating fine sediment load into the watercourse, and helping maintain cool water temperatures.

The predicted HADD for Western brook lamprey, Morrison Creek population and other fish species is quantified as low risk, as the project design was carefully developed to minimize impacts. These design mitigations include:

- Narrowing the City's original plan of a 3.0m Multi-use Pathway to 2.0m
- Avoiding the use of pavement and creation of impervious surfaces and instead opting for maintaining a gravelled pathway
- Meandering the proposed pathway to avoid impact to ditches, trees, and vegetation

For existing culverts begin extended, design mitigations include placement of gravels within the culvert bottom and on the headwall apron, installation of concrete headwalls to reduce the footprint of construction within the creek, and installation of riprap aprons beyond the culvert outlet to reduce flow velocity and allow fish passage.

For the installation of the new culvert in Arden Creek at Section 1, a bridge was considered. In order to support the bridge, piers would be required which would have encroached on the existing roadway or the existing stream – the edge of pavement required for safe vehicle turning paths is within 0.5m of the top of bank at the intersection of Lake Trail Road and Webb Road. This would have in turn caused more disturbance within the riparian and instream habitat compared to placement of a culvert. The culvert proposed to be installed exceeds the size requirement for the 1 in 200 year storm, and includes all of the instream mitigations and improvements of the culvert extensions: placement of gravels within the culvert bottom and on the headwall apron, installation of concrete headwalls to reduce the footprint of construction within the creek, and installation of riprap aprons beyond the culvert outlet to reduce flow velocity and allow fish passage.

There is minimal cover, and a generally lack of suitable habitat preferred by the species within the project footprints. After revegetation, impacts are expected to be negligible or even improved compared to current conditions.

11. Habitat Credit

13. *The number of habitat credits the applicant plans to use to offset the death of fish referred to in section 13 and the harmful alteration, disruption or destruction of fish habitat referred to in section 14, as well as the number of any certificate referred to in paragraph 42.02(1)(b) of the Act.*

As the City of Courtenay does not have an existing agreement with DFO for the Morrison Creek Watershed, no habitat credits are available to be used to offset the impacts to riparian areas for this Project.

12. Offsetting Plan

The offsetting plan described in this section is based on DFOs Policy for Applying Measures to Offset Harmful Impacts to Fish and Fish Habitat (DFO, 2025)[3].

Principle 1: Offsetting is last in a hierarchy of measures

- Avoid: Unnecessary removal of riparian vegetation and the extension of existing culverts were prioritized to prevent undue impacts to fish and fish habitat.

- Mitigate: The completion of instream works and those within the riparian buffer during the Least Risk Timing Window, in addition to ESC BMPs have been specified to mitigate impacts to fish and fish habitat. The applicant has also taken steps through design to minimize impact to Arden Creek and nearby habitat in a restricted footprint. These design measures have included:

    - Narrowing the City's original plan of a 3.0m Multi-use Pathway to 2.0m
    - Avoiding the use of pavement and creation of impervious surfaces and instead opting for maintaining a gravelled pathway
    - Meandering the proposed pathway to avoid impact to ditches, trees, and vegetation

- Offset: Where the installation of new infrastructure is required to meet Project objectives (e.g., culvert installation, ditch modification, headwall installation), improvements to riparian areas and instream areas have been prescribed to counter the habitat losses.

Principle 2: There are limits to what can be offset

- Although the Western brook lamprey, Morrison Creek population is confined to a small geographical area (i.e., Morrison Creek watershed), the habitat impacted by the proposed works is generally of low value. Riparian and instream improvements proposed as part of the Project will improve upon the current state of Arden Creek.

[3] Fisheries and Oceans Canada. 2025. Policy for Applying Measures to Offset Harmful Impacts to Fish and Fish Habitat. 29p. https://www.dfo-mpo.gc.ca/pnw-ppe/documents/reviews-revues/policies-politiques/offsetting-policy-politiques-mesures-compensation-eng.pdf

Principle 3: The benefits from offsetting measures must counterbalance the harmful impacts, including time lags and uncertainties

- The project is proposing a net surplus of habitat improvements when compared against the anticipated riparian and instream impacts. The fish habitat lost through Project activities will be effectively replaced with habitat features that surpass current conditions (e.g., increased hydraulic complexity, spawning substrates, increased riparian vegetation).

Principle 4: Indigenous Peoples are engaged in the planning, design, implementation and monitoring of measures to offset

- The City of Courtenay has and will continue to engage with K'omoks First Nation as the Project evolves. In addition, the City commits to DFOs own engagement process with interested parties from First Nations communities throughout British Columbia.

Principle 5: Measures to offset are in addition to what would have otherwise occurred

- The project is proposing a net surplus of habitat improvements when compared against the anticipated riparian and instream impacts. The fish habitat lost through Project activities will be effectively replaced with habitat features that surpass current conditions (e.g., increased hydraulic complexity, spawning substrates, increased riparian vegetation).

- Habitat improvements to the areas specified in the offsetting plan are generally sited within ditch lines that front residential and commercial properties that would not otherwise have been targeted for restoration.

Principle 6: Offsetting measures are located to optimize ecological outcomes, taking into account the needs of rights holders and resource users

- Habitat improvements to the areas specified in the offsetting plan are generally sited within ditch lines that front residential and commercial properties that currently possess limited cover, unsuitable substrates for Western brook lamprey, Morrison Creek population, and low hydraulic complexity. Restoring these urban sites represents an opportunity to satisfy the habitat criteria and increase production for this species.

Principle 7: Measures to offset generate benefits that last over the long term

- The intent of the prescribed offsetting measures is to provide a long term, sustainable improvement to local fish habitat. By planting native, riparian species and introducing hydraulic complexity, cover, and suitable substrate to urban ditch lines, McElhanney contends that the habitat benefits will not be temporary – this will be verified through a 5-year post-construction monitoring effort. Furthermore, the relatively minor gradient and ditch line nature of the watercourse are unlikely to produce water velocities which could contribute to migration of the introduced materials.

Principle 8: Time lags between the impact and offsetting measures are avoided or minimized

- Offsetting measures will be installed as part of the prescribed project schedule and will occur upon completion of work within a given project section.

14. A detailed description of a plan to offset the death of fish referred to in section 13 and the harmful alteration, disruption or destruction of fish habitat referred to in section 14 that were not offset by the habitat credits referred to in section 15, including:

a. The geographic coordinates of the location where offsetting measures will be implemented;

Offsetting measures will be implemented within the project footprint at the following Sections:

Table 8 Offsetting locations within the project footprint

Site ID	Coordinate System	Latitude	Longitude
Section 1	GEOGRAPHIC (WGS84)	49.672769	-125.024631
Section 2	GEOGRAPHIC (WGS84)	49.673111	-125.024175
Section 4	GEOGRAPHIC (WGS84)	49.675051	-125.020663
Section 5	GEOGRAPHIC (WGS84)	49.672921	-125.024135

b. A small-scale site plan identifying the general location and boundaries of the location where the measures will be implemented;

Please refer to **Appendix B** for the relevant site plans.

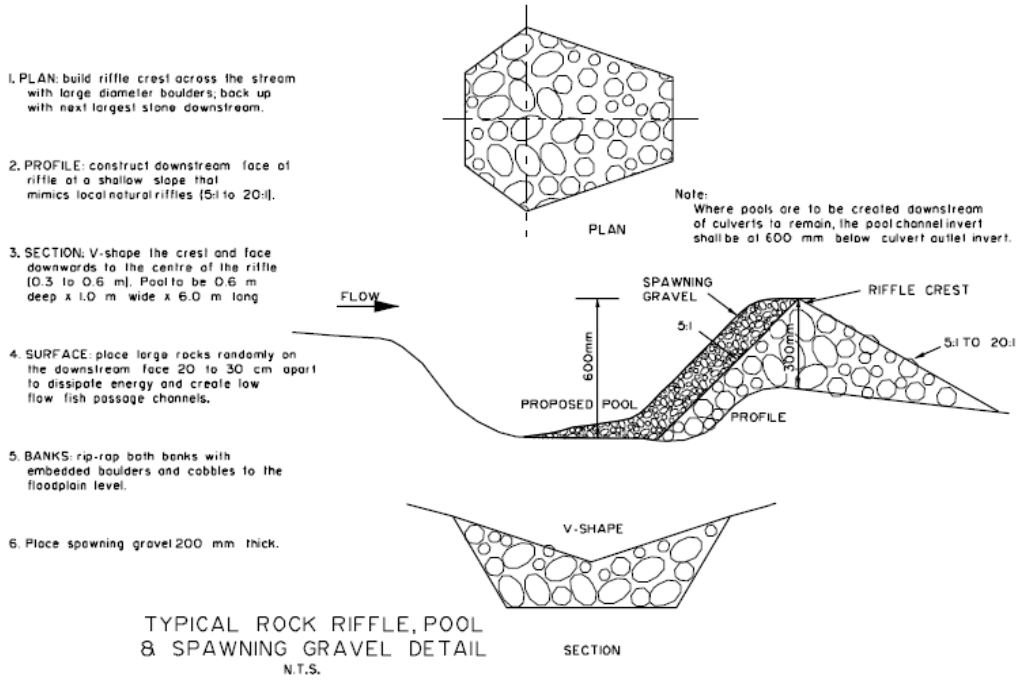
c. A detailed description of the measures and how those measures will meet their objectives;

Habitat restoration using DFOs mitigation hierarchy will be implemented, including minimizing impact, restoring on-site and offsetting impacts off-site (if needed). As very little substrate suitable for lamprey spawning and early rearing was found within the estimated 1200 m long project footprint, the installation of rock riffle sequence(s) and spawning gravel nourishment is expected to restore opportunities for *L. richardsoni* breeding and rearing. The Project will adapt similar instream enhancement strategies for *L. richardsoni* completed by Wade et. al. 2025 (Wade et. al., 2025) by way of riparian planting and instream habitat complexing. Fish habitat restoration work will be undertaken over an estimated 532 m^2 area, focused on impacted habitat near Section 2 & 5 and is expected to give rise to a long-term net benefit to lamprey and salmonid production.

Proposed restoration on-site includes installation of rock riffle sequences near Transects 2 & 3 with an emphasis on backwatering existing crossings with perched outlets to restore lamprey access. This will

improve previously impacted habitat and avoid access restrictions associated with private property. Rock riffles will provide hydraulic complexity, moderate flows, temper erosive energy and retain spawning substrates. Rock riffle sequences shown in *Figure 14* and *Photograph 8* are expected to have a moderating effect on high flows as shear stress is tempered by the decrease in water surface slope (Newbury et. al., 1997). Properly built rock riffles are also expected to address limiting factors to fish production by creating stable pool habitat, re-aerating flows, providing substrate for benthic invertebrates and sustaining spawning gravel. Gravel will be used to seed each riffle and re-nourish the channel bed wherever possible.

Figure 14 Typical rock riffle, pool & spawning gravel detail.



Photograph 8. Lamprey specific channel restoration work in Arden Creek completed in 2021 under SARA Permit 21-HPAC-00397, showing rock riffle, spawning gravel nourishment, LWD complexing and riparian planting.

The following spawning gravel mix will be used to restore an estimated 500.7 m^2 of instream habitat.

Table 9 Spawning gravel mix

Gravel type	Percentage of mix
Pit run	15
¼"– ½"	15
½ "–1"	20
1"–1 ½"	40
1 ½ "–2"	10

The following assemblage of riparian plants will be used to reinstate fish habitat along degraded or/and disturbed segments of Arden Creek and Arden Creek tributaries. Restoration work along the fragmented riparian corridor will ensure a long-term net benefit to fish habitat. Due to overhead utility conflicts, riparian restoration plantings are selected to avoid future trimming requirements.

Table 10 Proposed species for riparian restoration

Common name	Scientific Name	Spacing
Shrubs		
Pacific Willow	*Salix lucida ssp. laciandra*	1 m
Red Osier Dogwood	*Comus stolonifera*	1 m
Pacific Ninebark	*Physocarpus capitatus*	1 m
Black Gooseberry	*Ribes lacustre*	1 m
Red Flowering Currant	*Ribes sanguineum*	1 m
Nootka Rose	*Rosa nutkana*	1 m
Thimbleberry	*Rubus parviflorus*	1 m
Salmonberry	*Rubus spectabilis*	1 m
Hardback	*Spiraea douglasii*	1 m
Red Elderberry	*Sambucus racemosa*	1 m
Snowberry	*Symphoricarpos albus*	1 m

Sections 1, 2, 4, and 5 will have on-site restoration as shown in the design drawings and planting plans. Restoration and enhancement efforts have been focused on the project footprint due to the relatively small size of the Arden Creek (and greater Morrison Creek) watershed. Without obtaining permission to apply offsets on private property or finding an alternative location offsite, a 3:1 replacement ratio for riparian vegetation plantings and instream enhancements is not possible.

12.1. AREA

The area to be offset was determined by the permanent loss of 122.5 m^2 of instream habitat and the temporary/permanent alteration of 466.8 m^2 of riparian habitat. Combined instream habitat improvements of 500.7 m^2 and 356.2 m^2 of riparian habitat improvements have resulted in a surplus of 235.6 m^2.

12.2. UNCERTAINTY AND OFFSETTING RATIO

Uncertainty for the Project is evaluated based on uncertainties in prediction of Project impacts, effectiveness of habitat offsetting, and future states of nature. Future states of nature are nearly impossible to predict. To account for uncertainty associated with the success of the proposed offsetting Project, the habitat balance includes a surplus offsetting area of 235.6 m^2, located directly within the Project Footprint.

d. A detailed description of the monitoring measures that will be implemented to assess the effectiveness of the measures referred to in paragraph (c);

12.3. INSTREAM HABITAT IMPROVEMENTS SUCCESS

Post restoration monitoring for instream improvements, including the placement of large woody debris and rock riffle, pool, and spawning gravel sequences will include an image set, confirmation of location coordinates via GPS, and a description of site conditions – including incidental observations of fish and observed changes to habitat composition and structure.

12.4. RIPARIAN REVEGETATION SUCCESS

Post restoration monitoring for the reestablishment of native riparian vegetation (ground cover, shrubs, and trees) will look to a **>85% survivorship rate** to be determined by means of a field survey that includes vegetation plots set at intervals along pre-determined transects. Prior to field surveys, linear transects will be drawn through each of the vegetation treatment areas, and a random number generator to determine the location along the transect of the first plot on each transect. Subsequent plots along the transects will be measured at regular intervals.

To establish each plot, the radius will be laid out using a locked measuring tape. In the 2-person field crew, one person maneuvers the measuring tape around the circle from a fixed central point and calls out counts of individual plants by species to the second person, who documents the count and assesses the vigour of each plant as it is counted. Data will account for all live and dead vegetation, including planted and naturally regenerated vegetation. Vigour will be scored on a scale of 0 through 4, using the following parameters:

- 0 = dead
- 1 = poor, declining health / heavily stressed
- 2 = fair, stressed
- 3 = good, healthy with some new growth and/or minor stress
- 4 = excellent, strong health and abundant new growth

MONITORING METHODOLOGY

The following provides post-construction monitoring to be completed at the Offsetting Site within the existing Project footprints. Any conditions provided within the Authorization, once received, will be incorporated into the offsetting and monitoring plan.

The contractor is to provide maintenance for one year from substantial completion until the date of final acceptance. Following that, the City will hire a suitably qualified professional to conduct annual monitoring of the offsetting measures over a 3 to 5-year period according to the methodologies outlined within this report. The City proposes to monitor the offsetting works by completing three combined vegetation and instream habitat improvement surveys over a 3-year period, as outlined below. Surveys will be completed in September, during the growing season, and assess efficacy plantings and staking.

For the riparian improvements, the Offsetting Sites will be evaluated based on permanent transects diagonally through the planting site. These transects will be established during the post-construction monitoring and stakes will be placed at their end points. Photo locations along these transects will also be determined at this time to allow a times series of the site to be captured via photographs. Each transect will be assessed for percent survival based on aerial coverage to determine if success drops below 85%.

For the instream improvements, the Offsetting Sites will be evaluated at their installed locations.

MONITORING REPORTS

The City will provide a post-construction monitoring report describing the offsetting measures completed as part of the Project as per all relevant permits. The report will include details of plantings and staking works and will be submitted within 60 days of the completion of the offsetting measures. The post-construction report will include:

- Planting details including date, crew, weather, etc.,
- Locations of permanent transects to be used throughout monitoring program,
    - Including GPS coordinates and photographs before and after planting,
- GPS coordinates of entire area planted, and
- Confirmed planting density and number of each species planted.

The City will report on whether the offsetting measures have been completed according to all applicable permits by providing the following:

- Summary reports for years 1, 2, 3, and 5, addressing the conditions of the offsetting measures and their effectiveness. Each report will include:
    - Geo-referenced photographic assessment of the offsetting measures,
    - Assessment of success and effectiveness of the offsetting measures as outlined in any conditions, and
    - Identification of any functional concerns with the offsetting measures and description of any remedial measures taken.
- A final report for year 5 addressing the conditions of the offsetting measures and their effectiveness, including:
    - All aspects of the above summary reports,
    - Statistical analysis comparing year five vegetation dynamics to pre-construction,
    - Evaluate if the offsetting measures were successful based on a comparison to the reference sites, and
    - Identify any additional offsetting measures to be implemented to ensure success of the offsetting measures.
- The City will submit four monitoring reports according to the schedule below, by December 31 to info@dfo-mpo.gc.ca with the DFO reference file number:
- One post-construction report with the initial results of the improvement efforts within 60 days of Project completion,
- One report each for years 1, 2, 3, and 5 of the post-construction monitoring, and
- One final report for year 5 of the post-construction monitoring.

e. A detailed description of the contingency measures and associated monitoring measures that will be implemented if the measures referred to in paragraph (c) do not meet their objectives;

If the survival rate of the plantings at the offsetting site falls below 85% at any point in the monitoring program, it will be replanted to 100%. This will be determined in the first year of monitoring by percent survival of individual plants. For the remainder of the monitoring program this will be determined by survival

of the site as a whole using percent cover. For the instream improvements, any observed loss of large woody debris or spawning gravel will be replenished within the 5-year period.

Based on the results of the vegetation post-restoration survivorship results, targeted replanting efforts will be conducted for those species and areas that do not successfully re-establish within a 1-year monitoring timeframe. Any evidence of reintroduction of invasive plants species will be handled on a species-by-species bases for treatment either by herbicide application, mechanical removal, or hand pulling. Successful management of invasives might not be the total eradication but deters growth enough to allow for an average density of one native plant/m^2.

Thresholds for invasive species prevalence can vary, but typically, a reasonable threshold is between **5-10% coverage** of the area with invasive species, especially in sensitive ecosystems or where invasive species can rapidly spread. This means that if invasive species cover more than 5-10% of the area, additional management or remediation actions will be recommended. Highly aggressive invasive species might necessitate a lower threshold (<5%) and will be determined by the QEP conducting the monitoring.

f. A detailed description of any adverse effects on fish and fish habitat that could result from the implementation of the plan;

No adverse impacts are anticipated by implementing the improvement plans.

g. A detailed description of the measures and standards that will be implemented to avoid or mitigate the adverse effects and how those measures will meet their objectives;

No adverse effects to fish and fish habitat are anticipated through planting and staking, or the placement of large woody debris and rock riffle, pool, and gravel sequences during construction. Offsetting measures will be overseen by experienced professional engineer and will be done in such a way to avoid impacts to fish and fish habitat. Such measures may include selecting an access route to not disturb existing riparian vegetation and removing all refuse from the site after completion. These avoidance measures will also be implemented throughout the monitoring program.

The contractor must ensure that the minimum planting medium depths are achieved and that plant materials meet the minimum size requirements as indicated on the plant list. Plants shall be nursery grown under climatic conditions like those in the location of the Project and root balls are to be free of pernicious weeds.

h. The timeline for the implementation of the plan;

The timing of which will be dictated by the contractor's schedule under the requirements of permits and best practices for riparian planting. Planting will be scheduled to align with highest potential survival, which is late fall after substantial completion of construction.

i. An estimate of the cost of implementing each element of the plan; and

The estimated cost for implementation of the offsetting measures and monitoring are included in *Table 11* below. McElhanney developed an estimated cost for the 5-year monitoring plan and applicable reporting based on the details provided in *10(d)*. The material and labour cost estimate provided in *Table 12* is based on recent construction costs for similar projects in the region.

Table 11. Material and Labour Cost Estimate

Project Component	Unit Rate	Estimated Cost
Stream Improvements at Arden Elementary School (500m^2)	\$90 / m^2	\$45,000
Riparian Plantings (356m^2)	\$50 / m^2	\$17,800
Contractor Environmental Protection	Lump Sum	\$11,775
	Total	**\$74,575**

A summary of offsetting costs for the proposed plan is provided in *Table 12.* Inflation is based on the Canadian inflation target rate, for the below estimate an inflation rate of 3% was utilized against the total of 5-year monitoring and maintenance cost.

Table 12. Offsetting Cost Estimate Summary

Project Component	Estimated Cost
Initial Material and Labour	\$74,575
Project Coordination, Supervision, Implementation (5% of material and labour)	\$3,925
5-Year Monitoring and Reporting	\$16,500
Maintenance (Years 2-5)	\$37,500
Subtotal	**\$132,500**
Inflation (5 years at 3%)	\$7,976
Total	**\$140,476**

j. If the implementation of the plan requires access to lands, water sources or water bodies that are not owned by the applicant, a description of the steps that are proposed to be taken to obtain the authorization required for the applicant, the Department of Fisheries and Oceans and anyone authorized to act on the Department's behalf to access the lands, water sources or water bodies in question. This information is not required if the applicant is His Majesty in right of Canada, His Majesty in right of a province or the government of a territory.

The Offsetting Sites fall within the land owned by the City. The Offsetting Site will be accessed via public road.

13. Financial Guarantee

An irrevocable letter of credit will be developed by The City of Courtenay upon acceptance of the offsetting plan and will be submitted to DFO as soon as it's received from a financial institution (**Appendix D**).

The City will work with their financial institution to put a draft letter of credit together for DFO. The wording and format of this letter will be based upon template information provided by DFO.

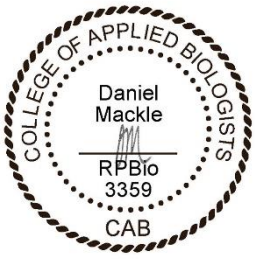
Professional Statement

This report has been prepared with information available at the time of writing. This assessment and its recommendations are based on a review of readily available web databases and field verification of desktop findings. This review identified environmentally sensitive features to be protected during the Project design and construction. Conclusions and recommendations presented here may change with additional information. We trust the information provided is sufficient to meet your needs at this time.

Respectfully submitted,

McElhanney Ltd.

Prepared by:



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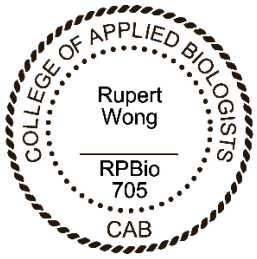
Reviewed by:



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Statement of Limitations

Use of this Report. This report was prepared by McElhanney Ltd. ("**McElhanney**") for the particular site, design objective, development and purpose (the "**Project**") described in this report and for the exclusive use of the client identified in this report (the "**Client**"). The data, interpretations and recommendations pertain to the Project and are not applicable to any other project or site location and this report may not be reproduced, used or relied upon, in whole or in part, by a party other than the Client, without the prior written consent of McElhanney. The Client may provide copies of this report to its affiliates, contractors, subcontractors and regulatory authorities for use in relation to and in connection with the Project provided that any reliance, unauthorized use, and/or decisions made based on the information contained within this report are at the sole risk of such parties. McElhanney will not be responsible for the use of this report on projects other than the Project, where this report or the contents hereof have been modified without McElhanney's consent, to the extent that the content is in the nature of an opinion, and if the report is preliminary or draft. This is a technical report and is not a legal representation or interpretation of laws, rules, regulations, or policies of governmental agencies.

Standard of Care and Disclaimer of Warranties. This report was prepared with the degree of care, skill, and diligence as would reasonably be expected from a qualified member of the same profession, providing a similar report for similar projects, and under similar circumstances, and in accordance with generally accepted engineering/planning/etc., and scientific judgments, principles and practices. McElhanney expressly disclaims any and all warranties in connection with this report.

Information from Client and Third Parties. McElhanney has relied in good faith on information provided by the Client and third parties noted in this report and has assumed such information to be accurate, complete, reliable, non-fringing, and fit for the intended purpose without independent verification. McElhanney accepts no responsibility for any deficiency, misstatements or inaccuracy contained in this report as a result of omissions or errors in information provided by third parties or for omissions, misstatements or fraudulent acts of persons interviewed.

Effect of Changes. All evaluations and conclusions stated in this report are based on facts, observations, site-specific details, legislation and regulations as they existed at the time of the site assessment/report preparation. Some conditions are subject to change over time and the Client recognizes that the passage of time, natural occurrences, and direct or indirect human intervention at or near the site may substantially alter such evaluations and conclusions. Construction activities can significantly alter soil, rock and other geologic conditions on the site. McElhanney should be requested to re-evaluate the conclusions of this report and to provide amendments as required prior to any reliance upon the information presented herein upon any of the following events: a) any changes (or possible changes) as to the site, purpose, or development plans upon which this report was based, b) any changes to applicable laws subsequent to the issuance of the report, c) new information is discovered in the future during site excavations, construction, building demolition or other activities, or d) additional subsurface assessments or testing conducted by others.

Independent Judgments. McElhanney will not be responsible for the independent conclusions, interpretations, interpolations and/or decisions of the Client, or others, who may come into possession of this report, or any part thereof. This restriction of liability includes decisions made to purchase, finance or sell land or with respect to public offerings for the sale of securities

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Appendix A – Letter of Agency

Infrastructure and Environmental Engineering
830 Cliffe Avenue Courtenay, B.C. V9N 2J7
Phone: 250-703-4838 | Email:
engineering@courtenay.ca
courtenay.ca

August 21, 2024 File No. 5335-20-22009

Triage and Planning Unit
Fish and Fish Habitat Protection Program
Ecosystem Management Branch
Fisheries and Oceans Canada
200 – 401 Burrard Street
Vancouver, BC V6C 3S4

Re: City of Courtenay Lake Trail Road Project, Courtenay, BC

This letter is to advise Fisheries and Oceans Canada that the City of Courtenay (the Client) has retained McElhanney Ltd. (McElhanney) to provide environmental consulting services for the City of Courtenay Lake Trail Road Project (the Project). By way of this letter, McElhanney is hereby authorized to submit relevant environmental applications and other necessary supporting documentation on behalf of the Client for the duration of the Project.

Please contact the undersigned if you have any questions.

DocuSigned by:
Adam Pitcher
8EACF04952184F5...

Adam Pitcher, AScT, PMP
Manager of Capital Projects
apitcher@courtenay.ca
250-703-4838

Appendix B – Engineering Drawings and Offsetting Site Plans

CLIENT

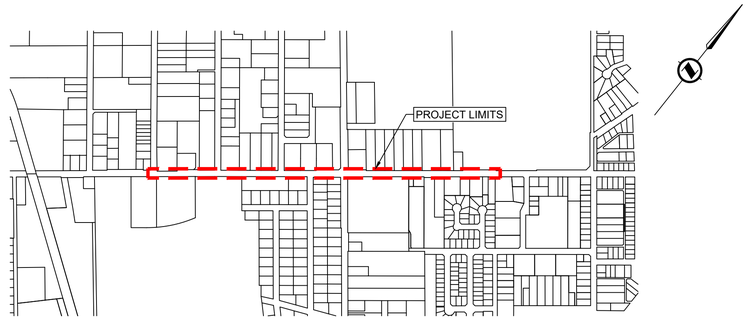
CITY OF COURTENAY

PROJECT NAME

LAKE TRAIL ROAD PEDESTRIAN PATHWAY

DESCRIPTION

WEBB ROAD TO LAKE TRAIL SCHOOL



KEY MAP

McELHANNEY PROJECT

2211-47614-05

STATUS

ISSUED FOR PERMITTING

DRAWING LIST

SHEET #	SHEET TITLE	REVISIONS			
		PE	1	2	3
001	GENERAL SITE PLAN				
101	PLAN & PROFILE - STA 2+000 TO 2+360				
102	PLAN & PROFILE - STA 2+360 TO 2+720				
103	PLAN & PROFILE - STA 2+720 TO 3+080				
104	PLAN & PROFILE - STA 3+080 TO 3+160 & 4+000 TO 4+110				
701	SIGNAGE AND ROAD MARKING PLAN - STA 2+000 TO 2+360				
702	SIGNAGE AND ROAD MARKING PLAN - STA 2+360 TO 2+720				
703	SIGNAGE AND ROAD MARKING PLAN - STA 2+720 TO 3+080				
801	ENVIRONMENTAL OFFSETTING PLAN - STA 2+000 TO 2+350				
802	ENVIRONMENTAL OFFSETTING PLAN - STA 2+350 TO 2+720				
803	ENVIRONMENTAL PLAN & PROFILE				
804	ENVIRONMENTAL DETAILS				
901	DETAILS (1 OF 2)				
902	DETAILS (2 OF 2)				

McElhanney

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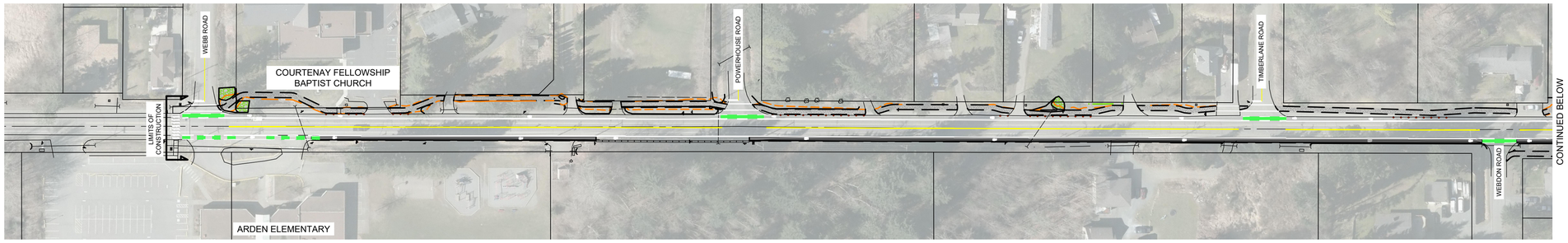

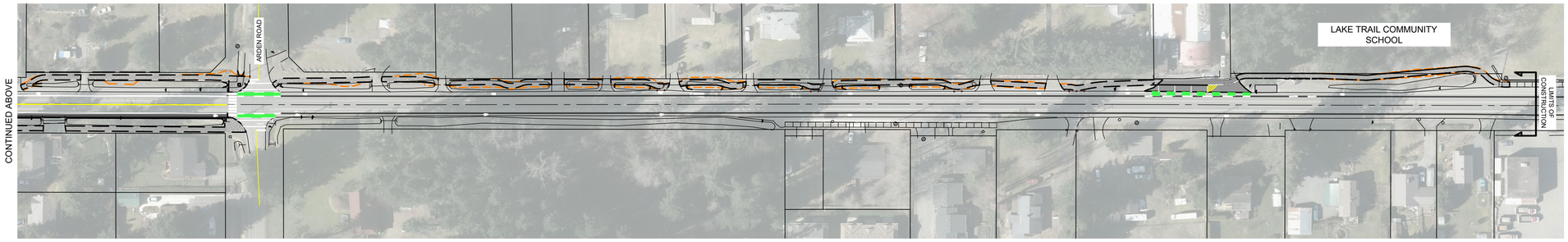

GENERAL

1. ALL WORKS, MATERIALS, AND TESTING SHALL BE IN ACCORDANCE WITH THE CITY OF COURTENAY SUBDIVISION AND DEVELOPMENT SERVICING BYLAW 2919 AND THE CURRENT ISSUE OF THE MASTER MUNICIPAL CONSTRUCTION DOCUMENT, UNLESS OTHERWISE APPROVED BY THE CONTRACT ADMINISTRATOR.
2. ALL PRODUCTS TO BE PER THE CURRENT VERSION OF THE CITY OF COURTENAY APPROVED PRODUCTS LIST.
3. ALL REQUESTS FOR CHANGES TO THE DESIGN FOR FIELD CHANGES MUST BE SUBMITTED TO THE CONTRACT ADMINISTRATOR AND THE CITY FOR REVIEW AND APPROVAL PRIOR TO IMPLEMENTING THE CHANGE AND INSTALLATION.
4. A PRE-CONSTRUCTION MEETING WITH CITY STAFF IS TO BE HELD PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. THE ENVIRONMENTAL MONITOR SHALL ATTEND THE PRE-CONSTRUCTION MEETING. THE CONTRACTOR IS REQUIRED TO SUBMIT ALL NECESSARY PERMITS (ROAD PERMIT AND E48 PROJECT INFORMATION) TO THE CITY DEVELOPMENT SERVICES DIVISION PRIOR TO SCHEDULING A PRE-CONSTRUCTION MEETING.
5. THE CONTRACTOR SHALL OBTAIN A PERMISSION TO CONSTRUCT WORKS WITHIN CITY LIMITS (ROADS) PERMIT FROM THE CITY OF COURTENAY OPERATIONS DEPARTMENT PRIOR TO CONSTRUCTING WORKS WITHIN A MUNICIPAL ROAD ALLOWANCE, STATUTORY RIGHT-OF-WAY, AND/OR UPON MUNICIPAL PROPERTY.
6. A PERMIT IS REQUIRED FROM FORTIS BC GAS WHEN THE SITE WORK OR ACTIVITY INVOLVES:
   - 6.1. WORKING WITHIN TWO (2) METRES OR CROSSING UNDER/OVER AN INTERMEDIATE PRESSURE (IP) GAS PIPELINE (701-2070 KPA / 101.6 - 300 PSI)
   - 6.2. CROSSING A TRANSMISSION PRESSURE (TP) GAS PIPELINE (ABOVE 2070 KPA / 300 PSI) OR WORKING WITHIN A RIGHT-OF-WAY.
7. TREE PROTECTION FENCING TO BE INSTALLED AS SOON AS ADJACENT TREES ARE REMOVED. FENCING TO BE MAINTAINED IN GOOD CONDITION UNTIL CONSTRUCTION/SUBDIVISION COMPLETION. ARBORIST TO PROVIDE CONFIRMATION OF CONDITION PRIOR TO REQUESTING SUBSTANTIAL COMPLETION.
8. CONTRACTOR SHALL CONTACT BC 1-CALL TO LOCATE EXISTING UTILITIES PRIOR TO CONSTRUCTION.
9. INFORMATION ON EXISTING UTILITIES MAY NOT BE COMPLETE OR ACCURATE. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL EXPOSE LOCATIONS OF ALL EXISTING UTILITIES AND ADVISE THE CONTRACT ADMINISTRATOR OF ANY POTENTIAL CONFLICTS.
10. THE CITY OF COURTENAY ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY AND VALIDITY OF THE INFORMATION SHOWN OR PROVIDED THROUGH RECORD COPIES SUPPLIED BY THE CITY OF COURTENAY. ALL INFORMATION SHOULD BE SITE VERIFIED.
11. THE CONTRACTOR SHALL DELIVER WRITTEN NOTICE OF CONSTRUCTION TO ALL RESIDENTS AND BUSINESSES WITHIN 1 BLOCK OF THE PROJECT.
12. ANY DAMAGES TO THE CITY'S INFRASTRUCTURE MUST BE REPORTED BY THE CONTRACTOR TO THE CONTRACT ADMINISTRATOR AND THE CITY IMMEDIATELY.
13. ALL DISTURBED AREAS, STRUCTURES (IE. RETAINING WALL, FENCES), VEGETATION, HABITAT, BOULEVARDS, ETC. ON PUBLIC / PRIVATE PROPERTY TO BE RESTORED TO EQUAL OR BETTER CONDITION THAN EXISTING AND TO THE SATISFACTION OF THE CITY OF COURTENAY / PROPERTY OWNER.
14. ANY EXISTING CITY INFRASTRUCTURE NOT REQUIRED AS A RESULT OF THIS PROJECT IS TO BE RETURNED TO THE OPERATIONS YARD. OPERATIONS TO BE CONTACTED A MINIMUM OF TWO WEEKS IN ADVANCE OF DELIVERY TO CONFIRM DESIRE FOR RETURN.
15. THE CONTRACTOR SHALL ASSUME "PRIME CONTRACTOR" STATUS AND WILL BE RESPONSIBLE FOR ALL MULTIPLE WORK PLACE SAFETY RESPONSIBILITIES FOR WORKERS IN ACCORDANCE WITH WORKSAFE BC AND OHS REGULATIONS.
16. THE CONTRACTOR IS TO ARRANGE FOR OBSERVATION OF ALL KEY UNDERGROUND ASPECTS OF THE WORK BY THE CONTRACT ADMINISTRATOR PRIOR TO BACKFILL.
17. THE CONTRACTOR IS TO ARRANGE FOR ALL APPLICABLE TESTING REQUIRED AND TO PROVIDE TESTING RESULTS TO CONTRACT ADMINISTRATOR FOR REVIEW AND ACCEPTANCE.

EXCAVATING, TRENCHING AND BACKFILLING

1. INFORMATION ON EXISTING UTILITIES MAY NOT BE COMPLETE NOR ACCURATE. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL EXPOSE LOCATIONS OF ALL EXISTING UTILITIES AND ADVISE THE ENGINEER OF ANY POTENTIAL CONFLICTS.
2. THE CONTRACTOR IS TO CALL "BC ONE CALL" TO LOCATE EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.
3. ALL BACKFILL IS TO BE IMPORT PIT-RUN OR AS APPROVED BY A GEOTECHNICAL ENGINEER.
4. ALL WATER, SANITARY SEWER AND STORM DRAINAGE TRENCHING IS TO BE AS PER MMCD DWG. G4 UNLESS OTHERWISE NOTED.
5. ALL GRANULAR AGGREGATE MATERIALS ARE TO BE COMPACTED TO 95% MODIFIED PROCTOR DENSITY (ASTM D1557) IN ANY AREAS THAT WHERE STRUCTURAL SUPPORT IS REQUIRED.

TRAFFIC CONTROL / SITE SAFETY

1. THE CONTRACTOR SHALL PROVIDE A TRAFFIC CONTROL PLAN FOR REVIEW BY THE CITY OF COURTENAY & THE CONTRACT ADMINISTRATOR PRIOR TO COMMENCEMENT OF CONSTRUCTION.
2. THE CONTRACTOR SHALL DELIVER WRITTEN NOTICE OF CONSTRUCTION TO ALL RESIDENTS & BUSINESSES WITHIN 1 BLOCK OF THE PROJECT.
3. THE CONTRACTOR SHALL NOTIFY ALL EMERGENCY SERVICE AGENCIES, MoTI, COMOX VALLEY REGIONAL DISTRICT, SCHOOL BUS, GARBAGE CONTRACTORS & BC TRANSIT OF THE SUBSEQUENT WORK ZONE AREA, SPEED REDUCTIONS, OR DETOURS WHICH MAY AFFECT TRAFFIC FLOW.
4. THE CONTRACTOR SHALL MAINTAIN VEHICLE & PEDESTRIAN ACCESS TO ALL RESIDENCES & BUSINESSES AT ALL TIMES.
5. THE CONTRACTOR SHALL VERIFY THAT SITE SAFETY FOR VEHICLE OPERATORS & PEDESTRIANS IS MAINTAINED FROM THE END OF EACH WORK DAY, THROUGH THE NIGHT, & UNTIL THE START OF THE NEXT WORK DAY BY USING FLASHING BEACONS, BARRICADES, SIGNS, DELINEATORS ETC., IN ACCORDANCE WITH CURRENT MoTI CONSTRUCTION ZONE SIGNAGE STANDARDS.
6. THE CONTRACTOR IS TO ERECT ALL APPROPRIATE CONSTRUCTION ZONE SIGNS AND USE CERTIFIED FLAG PERSONNEL TO MAINTAIN SAFE AND EFFICIENT TRAFFIC FLOW THROUGH & AROUND THE WORK SITE
7. ALL TRAFFIC SIGNS ARE TO BE AS PER THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA (CURRENT EDITION).

PERMITS

1. A PERMIT IS REQUIRED FROM FORTIS BC GAS WHEN THE SITE WORK OR ACTIVITY INVOLVES:
   - 1.1. WORKING WITHIN TWO (2) METRES OR CROSSING OVER/UNDER AN INTERMEDIATE PRESSURE (IP) GAS PIPELINE (701-2070 kPa / 101.6 - 300 psi)
   - 1.2. CROSSING A TRANSMISSION PRESSURE (TP) GAS PIPELINE (ABOVE 2070 kPa / 300 psi) OR WORKING WITHIN A RIGHT-OF-WAY.
2. CONTRACTOR TO OBTAIN A ROAD PERMIT TO CONSTRUCT WITHIN THE PUBLIC ROW.

ENVIRONMENTAL PROTECTION

1. THE CONTRACTOR SHALL ENSURE THAT ALL ENVIRONMENTAL PROTECTIONS TO ELIMINATE DOWNSTREAM SILT ARE IN PLACE PRIOR TO THE START OF CONSTRUCTION & REMAIN FOR THE DURATION OF THE CONTRACT. THE CONTRACTOR SHALL OBTAIN A COPY OF, AND FOLLOW THE PROCEDURES CONTAINED IN THE "LAND DEVELOPMENT GUIDELINES FOR THE PROTECTION OF AQUATIC HABITAT". THE CONTRACTOR IS TO PROVIDE AN "EROSION & SEDIMENT CONTROL PLAN", FOR REVIEW BY THE ENGINEER.
2. ALL WORKS ARE TO BE INSTALLED UNDER THE DIRECTION OF AN ENVIRONMENTAL MONITOR & ARE TO MITIGATE MIGRATION OF SILTS/SANDS BY AIR, WATER, OR VEHICLES /EQUIPMENT.
3. REQUIRED PERMITS TO WORK IN WATERWAYS WILL BE OBTAINED BY OWNER PRIOR TO CONSTRUCTION THE CONTRACTOR WILL BE REQUIRED TO FOLLOW ALL CONDITIONS REQUIRED FOR PERMIT APPROVAL.

RESTORATION

1. RESTORE DISTURBED SOFTSCAPE AREAS WITH 150mm OF TOPSOIL & HYDROSEED WITH NATIVE GRASS MIX UNLESS OTHERWISE INDICATED BY DRAWINGS
2. ALL PAINT LINES AND SIGNS ARE TO BE IN ACCORDANCE WITH BC MoTI MANUAL OF STANDARD TRAFFIC SIGNS & PAVEMENT MARKINGS.

PAVEMENT AREAS:

3. EXISTING ASPHALT EDGE IS TO BE SAW CUT IN LONG STRAIGHT LINES PRIOR TO PAVING. UTILIZE STEP JOINT WHERE EXISTING ASPHALT THICKNESS EXCEEDS 50mm.
4. LONGITUDINAL ROAD RESTORATION PAVEMENT JOINTS SHALL NOT BE LOCATED WITHIN THE LANE WHEEL PATH. RESTORATION SHALL BE TO EITHER THE WHITE FOG LINE, CENTRE OF LANE OR 1.5m EITHER SIDE FROM CENTRE OF TRENCH PER LIMITS AS DEFINED IN THESE DRAWINGS.
5. PRIO TO PAVING, REMOVE ANY BROKEN OR CRACKED PAVMENT AND ANY AREAS SHOWING SETTLEMENTADJACENT TO PAVING WORKS AND DISPOSE OF OFF-SITE,
6. GRIND EDGE OF TRENCH MIN. 500mm BACK OF TRENCH WALL AND 300mm FROM ANY BROKEN OR DAMAGED EDGES.
7. CONTRACTOR SHALL TEMPORARILY RESTORE EXCAVATIONS AND MAINTAIN A SMOOTH AND RUT-FREE SURFACE (COLD MIX) UNTIL PLACING PERMANENT PAVEMENT.
8. RESTORE ROAD AS PER TYPICAL ROAD SECTION DETAILS ON THESE PLANS.

RIPARIAN RESTORATION ARES:

1. ALL WORK AND MATERIALS TO CONFORM TO THE LATEST EDITION OF THE CANADIAN LANDSCAPE STANDARD UNLESS SPECIFICALLY OTHERWISE NOTED.
2. SOIL DISTURBANCE SHALL BE MINIMIZED WHERE POSSIBLE IN ALL RIPARIAN AREAS. CONDUCT CLOSE-CUT CLEARING OF SHRUBS INSTEAD OF GRUBBING, WHERE POSSIBLE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING ADDITIONAL PLANTS PER THE PRESCRIBED PLANTING MIX, IF NECESSARY TO RESTORE ANY ADDITIONAL DISTURBED AREAS.
3. IF INVASIVE PLANT SPECIES ARE OBSERVED IN THE WORK AREA, MACHINERY MUST AVOID CONTACT WITH THE PLANT TO PREVENT SPREAD. SPECIES IDENTIFICATION TO BE DEFERRED TO THE QEP IF/AS NEEDED.
4. DISTURBED OR NEW TOPSOIL SURFACES IN PLANTING AREAS ARE TO BE FINISHED "ROUGH AND LOOSE" PRIOR TO PLANTING, IE AVOID BOTH COMPACTION AND SMOOTH GRADING.
5. APPLY A 300 MM LAYER OF IMPORTED ORGANIC TOPSOIL THROUGHOUT TREE AND SHRUB PLANTING AREAS PRIOR TO PLANT INSTALLATIONS.
6. PROVIDE FERTILITY AND PARTICLE SIZE ANALYSIS TEST FOR IMPORTED ORGANIC TOPSOIL PRIOR TO STARTING WORK.
7. AFTER TOPSOIL AND SHRUB INSTALLATIONS, PLANTING AREA SHALL BE FINISHED WITH 25MM LAYER OF COMPOSTED BARK OR WOOD MULCH.
8. IRRIGATION WILL BE NEEDED DURING THE GROWING SEASON (MAY 1ST THROUGH SEPTEMBER 30TH) TO MAINTAIN SURVIVAL OF PLANTED STOCK, FOR THE DURATION OF THE MAINTENANCE PERIOD (TO BE SPECIFIED IN THE WORKS CONTRACT). WATER AS FREQUENTLY AS NECESSARY TO MAINTAIN HEALTHY PLANTS.

LEGEND

	EXISTING	DESCRIPTION	PROPOSED		EXISTING	DESCRIPTION	PROPOSED	
SITE		LIMIT OF CONSTRUCTION		STORM SEWER	D	STORM SEWER		STORM SEWER
	60	GROUND CONTOUR				CATCH BASIN		
		TOP OF SLOPE				LAWN BASIN		
		BOTTOM OF SLOPE				CATCH BASIN LEAD		
		DITCH		WATER WORKS	W	WATER MAIN		WATER WORKS
		SWALE				WATER VALVE		
		CULVERT				HYDRANT ASSEMBLY		
		FENCE (WOOD)				PERMANENT BLOW-OFF		
		FENCE (CHAIN LINK)				AIR VALVE		
		VEGETATION BOUNDARY			M	WATER METER		
		SIGN				WATER MANHOLE		
		EDGE OF PAVEMENT (WITHOUT CURB)				UTILITY POLE		
SAN. SEWER	S	SANITARY SEWER		UTILITIES		STREET LIGHT (DAVIT POLE)		UTILITIES
	FM	SANITARY FORCE MAIN			E	HYDRO DUCT		
		SANITARY MANHOLE			G	GAS DUCT		

Rev	Date	Description	Drawn	Design	App'd
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PE	2025-06-16	ISSUED FOR PERMITTING	ER	ER	BK

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1211 Ryan Road
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Canada V9N 3R6
T 250 338 5495

DRAFT

THIS DRAWING HAS NOT BEEN APPROVED AND MAY CONTAIN ERRORS AND OMISSIONS

CITY OF COURTENAY
-
LAKE TRAIL PATHWAY
GENERAL SITE PLAN

COURTENAY, BC

Drawing No. 001

Project Number	Rev.
2211-47614-05	PE

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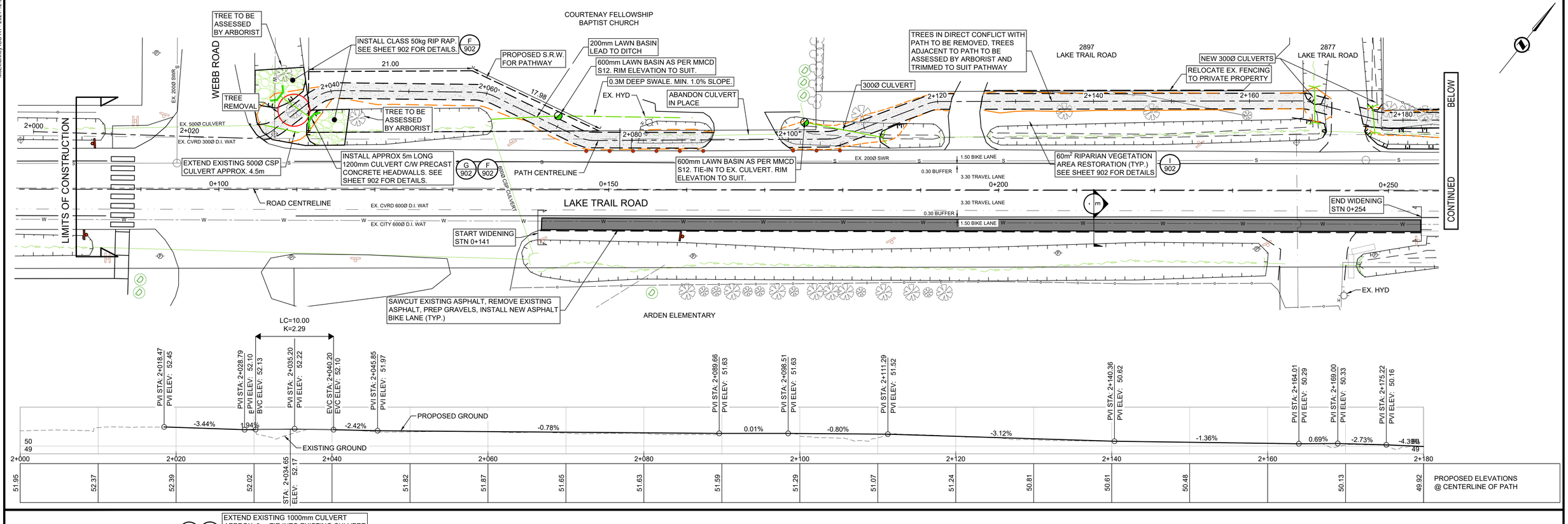

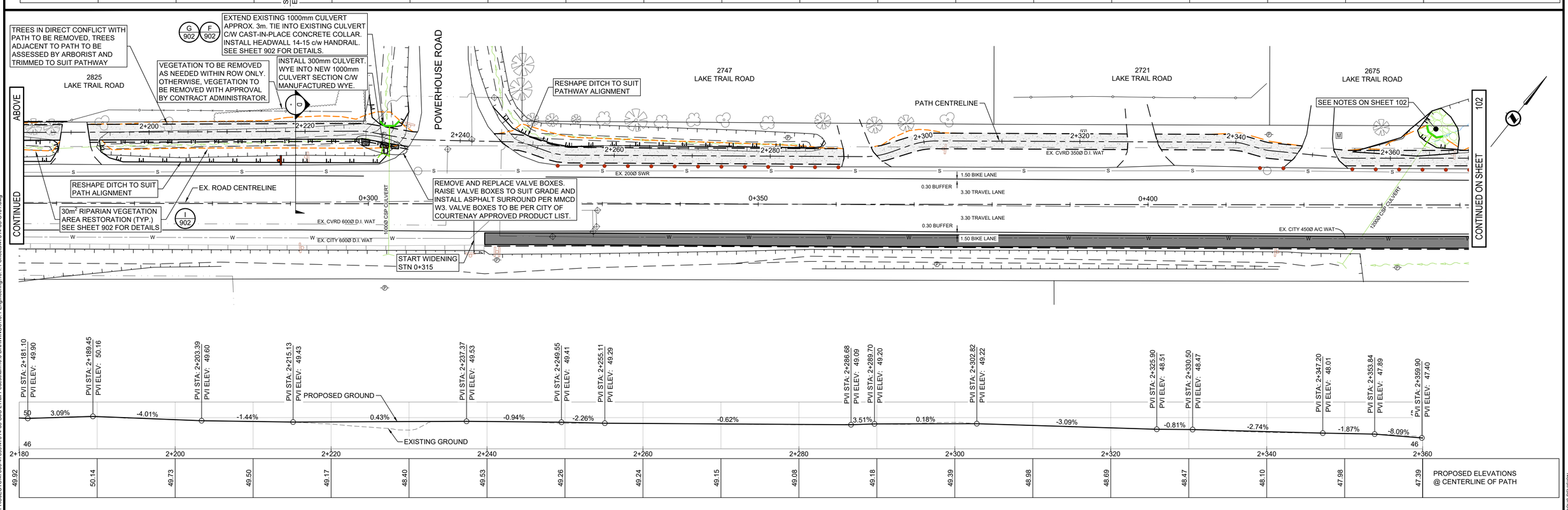

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McElhanney
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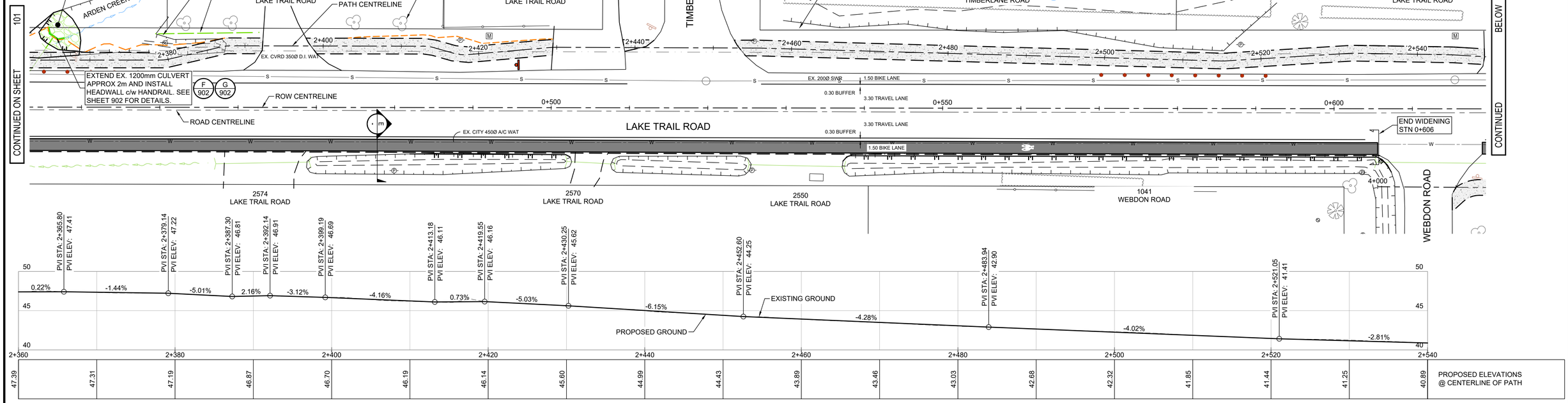
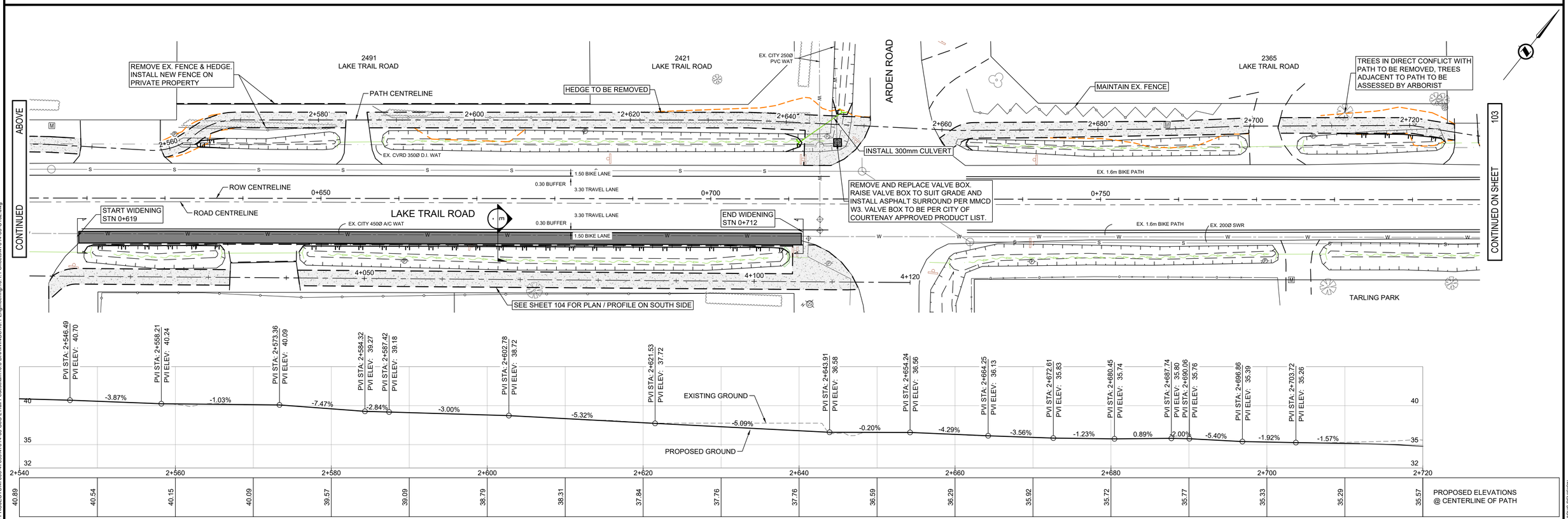
CITY OF COURTENAY
-
LAKE TRAIL PATHWAY
PLAN & PROFILE
STA 2+000 TO 2+360

COURTENAY, BC

Drawing No. 101

Project Number	Rev.
2211-47614-05	PE





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CITY OF COURTENAY
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LAKE TRAIL PATHWAY
PLAN & PROFILE
STA 2+360 TO 2+720

COURTENAY, BC

Drawing No. 102

Project Number	Rev.
2211-47614-05	PE

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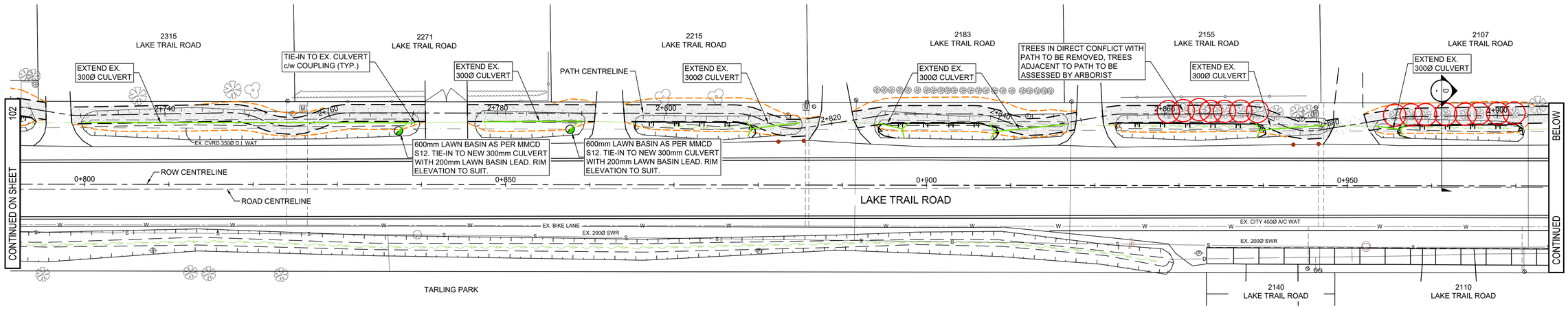

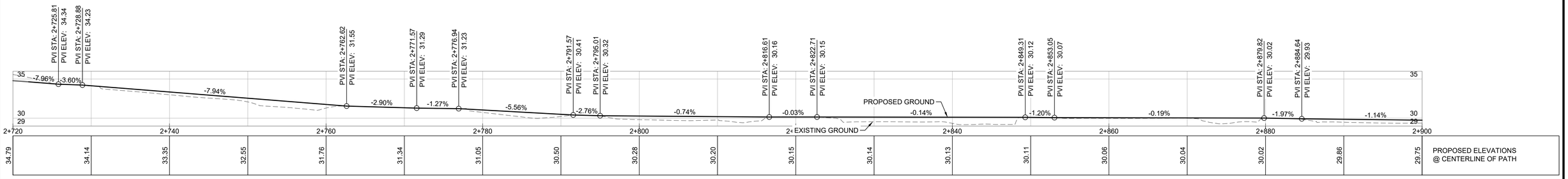

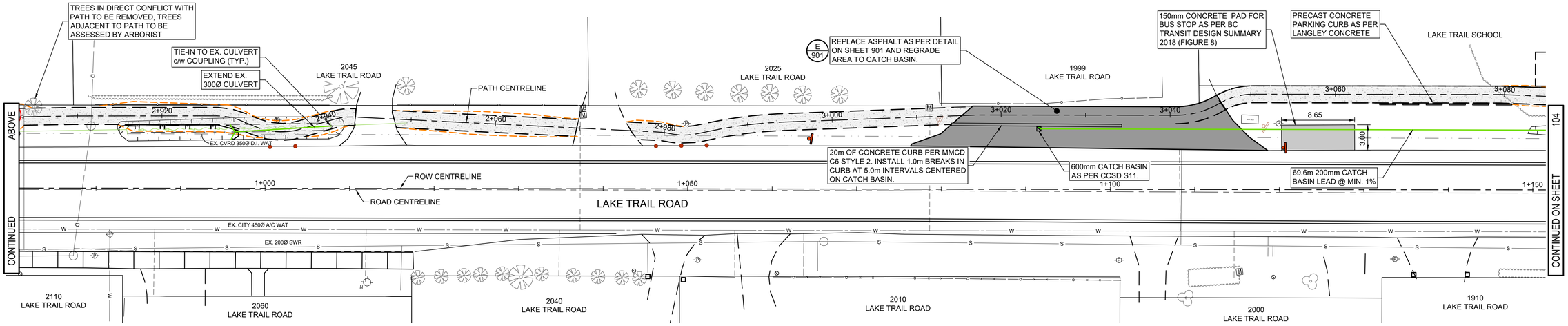

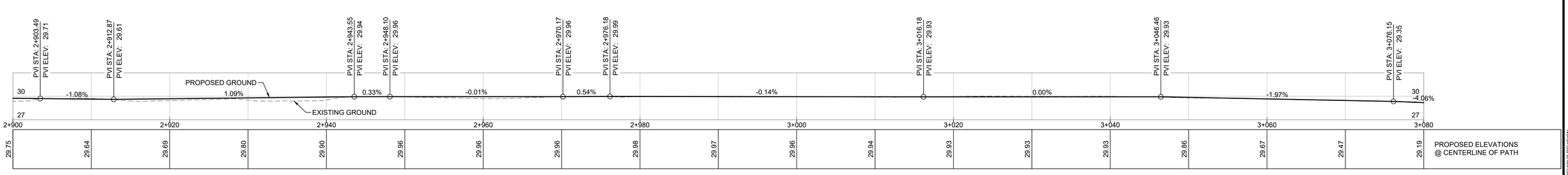

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CITY OF COURTENAY
-
LAKE TRAIL PATHWAY
PLAN & PROFILE
STA 2+720 TO 3+080

COURTENAY, BC

Drawing No. 103

Project Number	Rev.
2211-47614-05	PE

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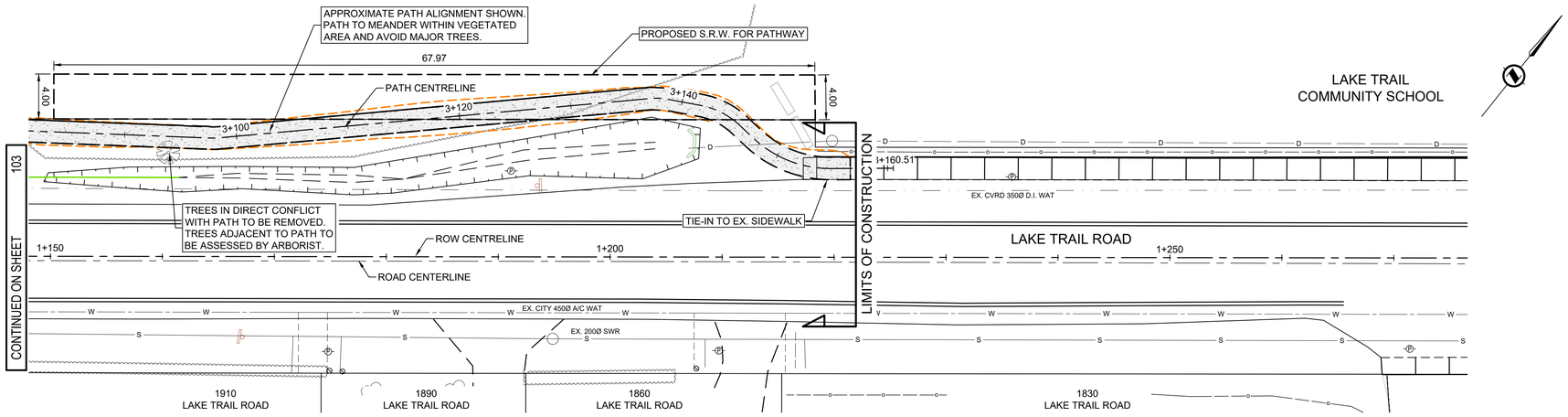

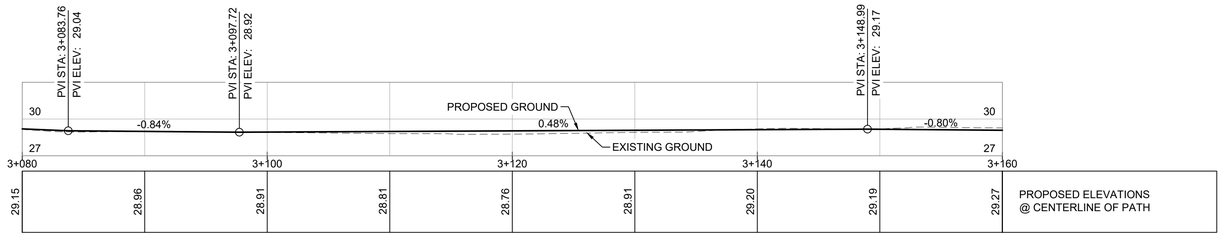

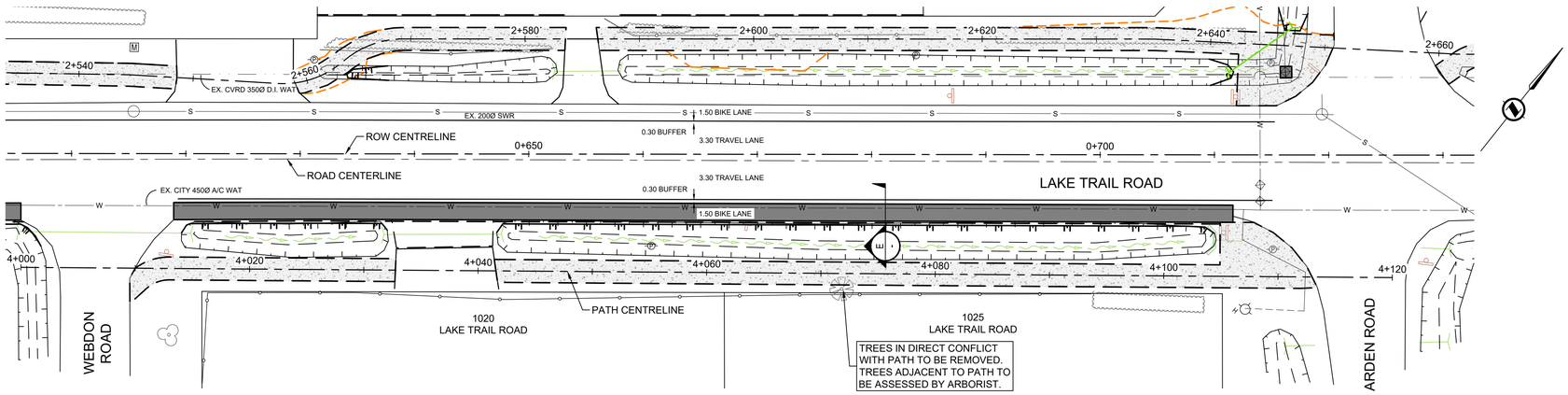

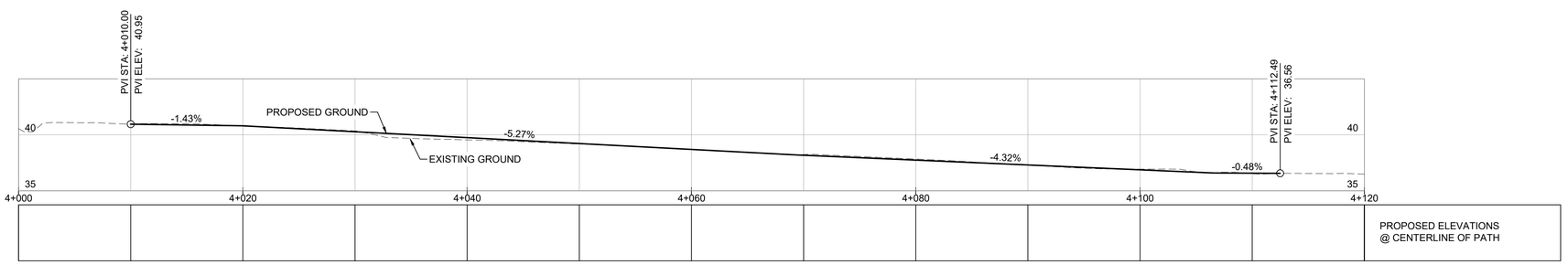

SOUTH SIDE PATHWAY
WEBDON ROAD TO ARDEN ROAD

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CITY OF COURTENAY
-
LAKE TRAIL PATHWAY
PLAN & PROFILE
STA 3+080 TO 3+160 & 4+000 TO 4+110

COURTENAY, BC

Drawing No. 104

Project Number	Rev.
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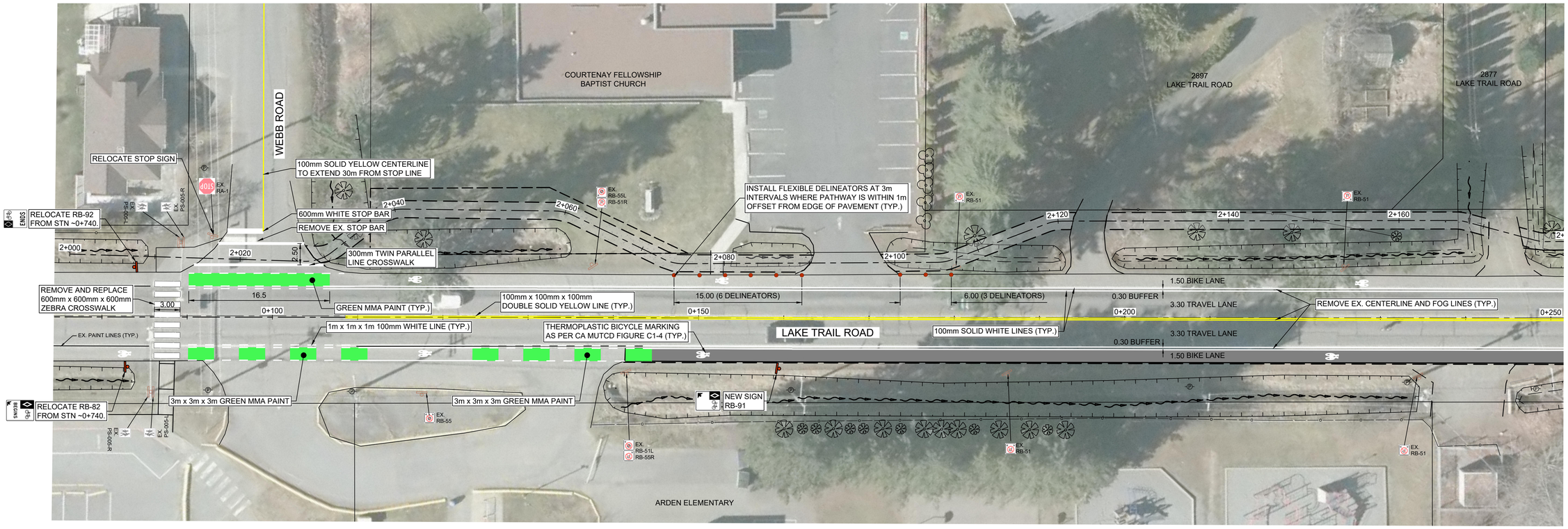

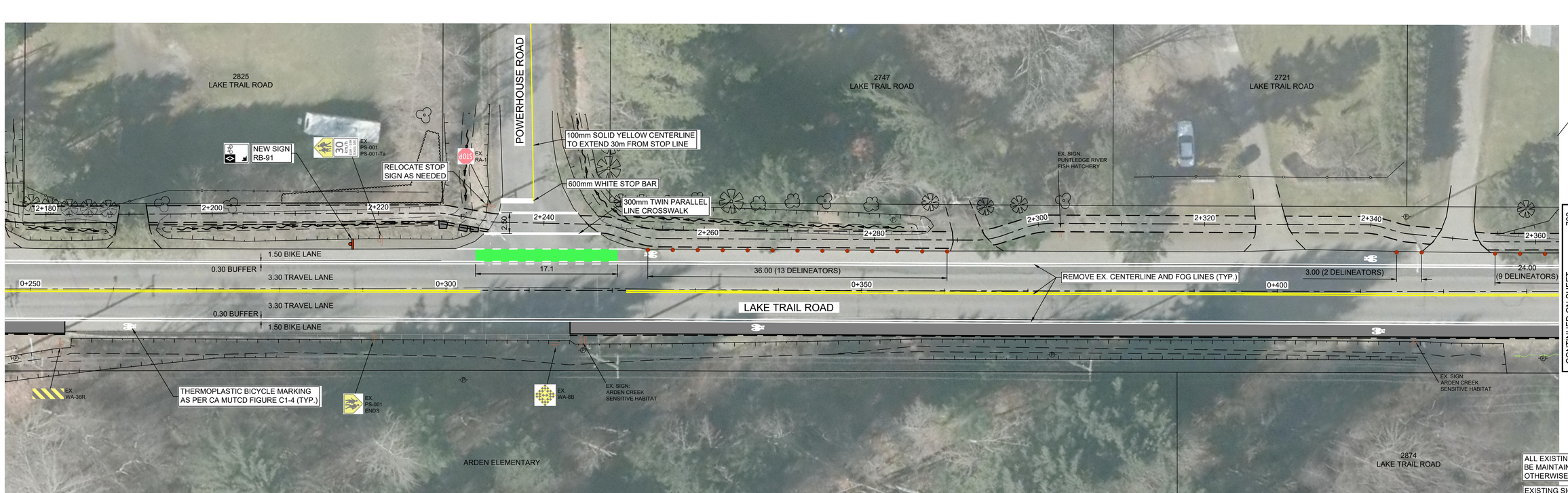

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EXISTING SIGNS IN CONFLICT WITH PATH TO BE REINSTATED IN SIMILAR LOCATION.

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CITY OF COURTENAY

-

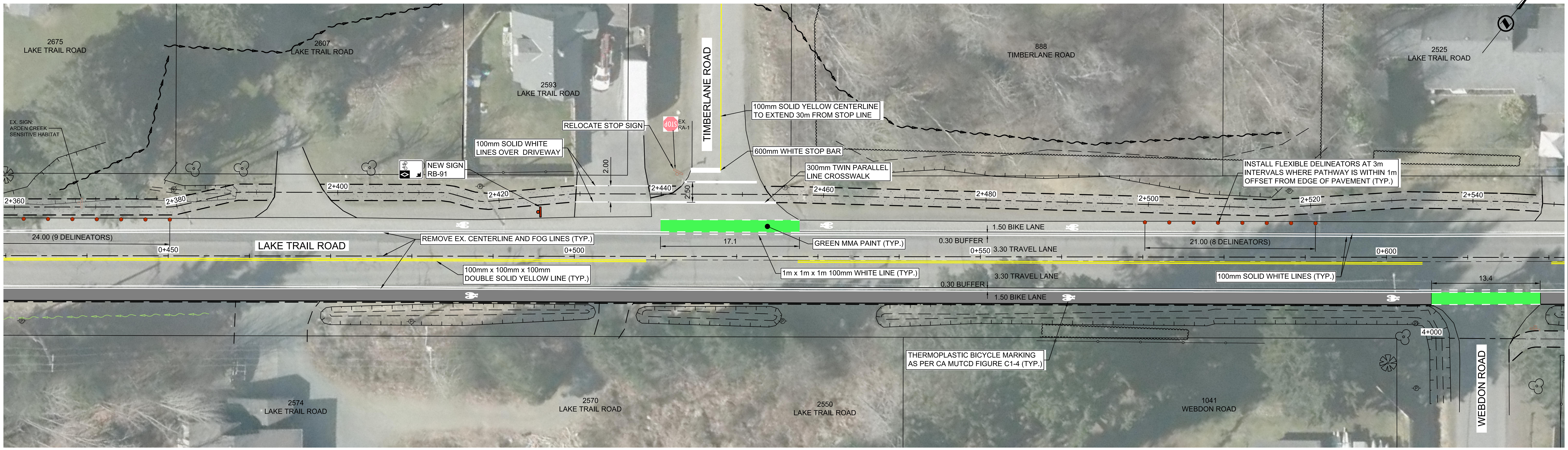
LAKE TRAIL PATHWAY SIGNAGE AND ROAD MARKING PLAN STA 2+000 TO 2+360

COURTENAY, BC

Drawing No. 701

Project Number 2211-47614-05

Rev. PE



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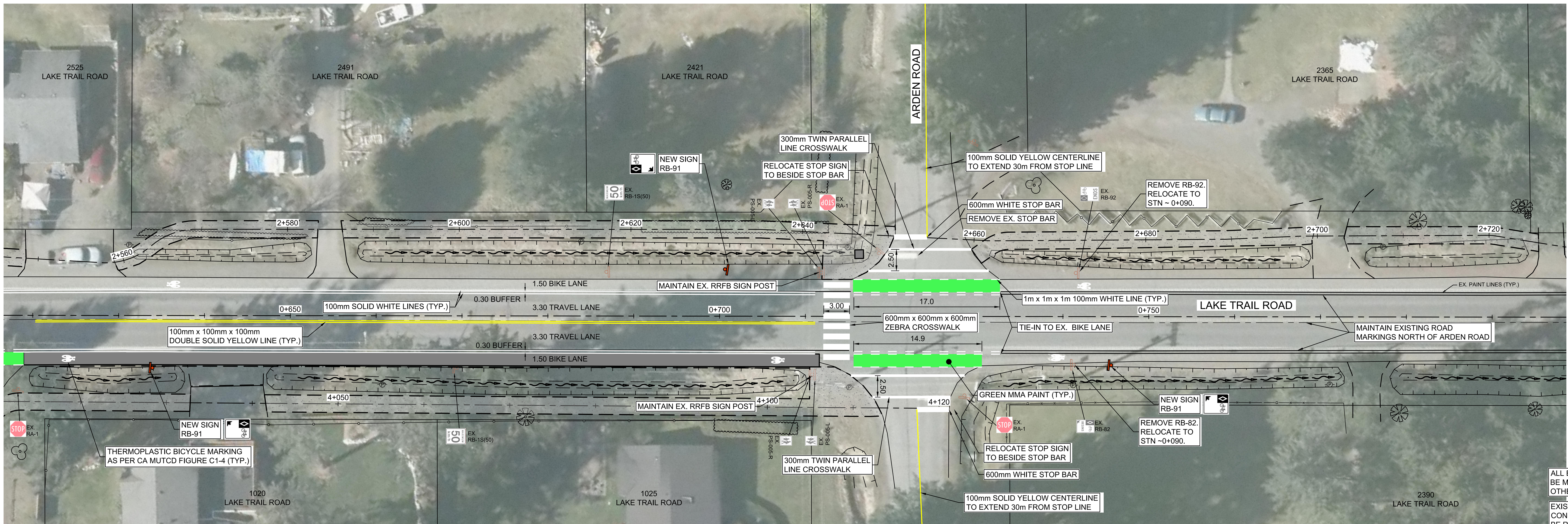

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CITY OF COURTENAY

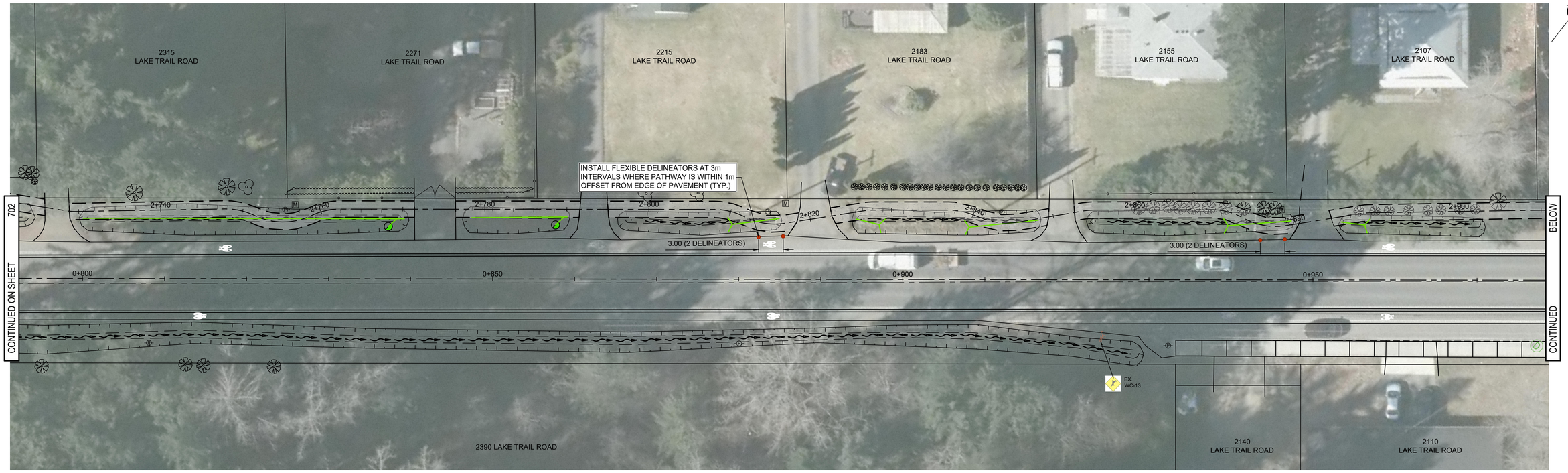
LAKE TRAIL PATHWAY SIGNAGE AND ROAD MARKING PLAN STA 2+360 TO 2+720

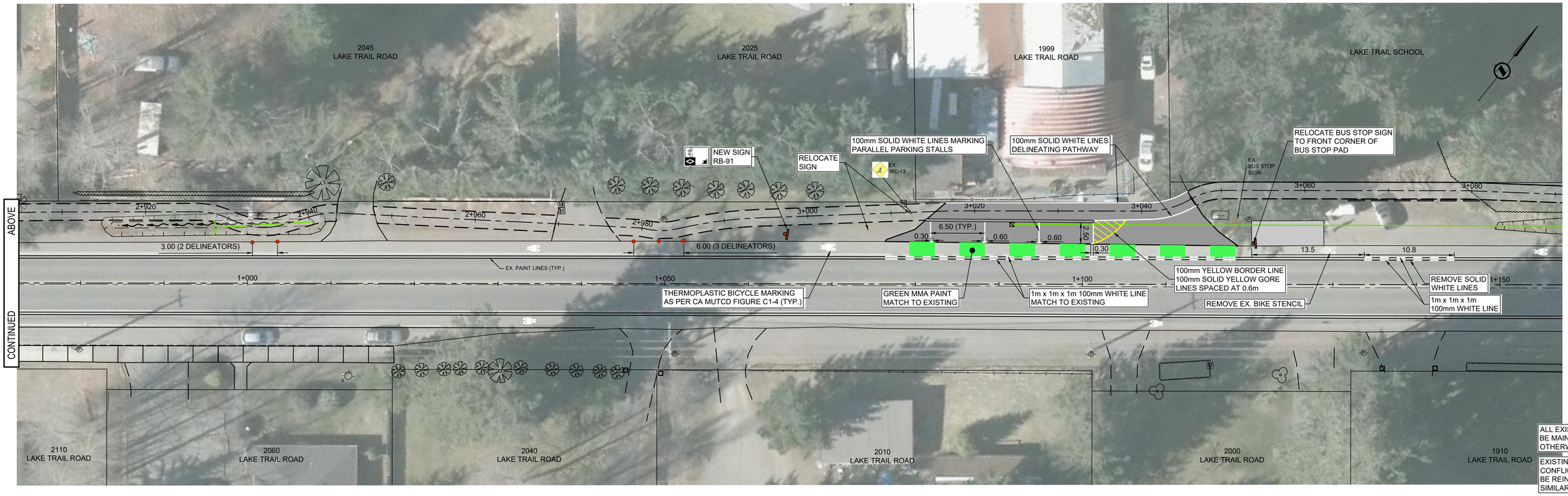
COURTENAY, BC

Drawing No. 702

Project Number 2211-47614-05

Rev. PE





ALL EXISTING SIGNS TO BE MAINTAINED UNLESS OTHERWISE NOTED.

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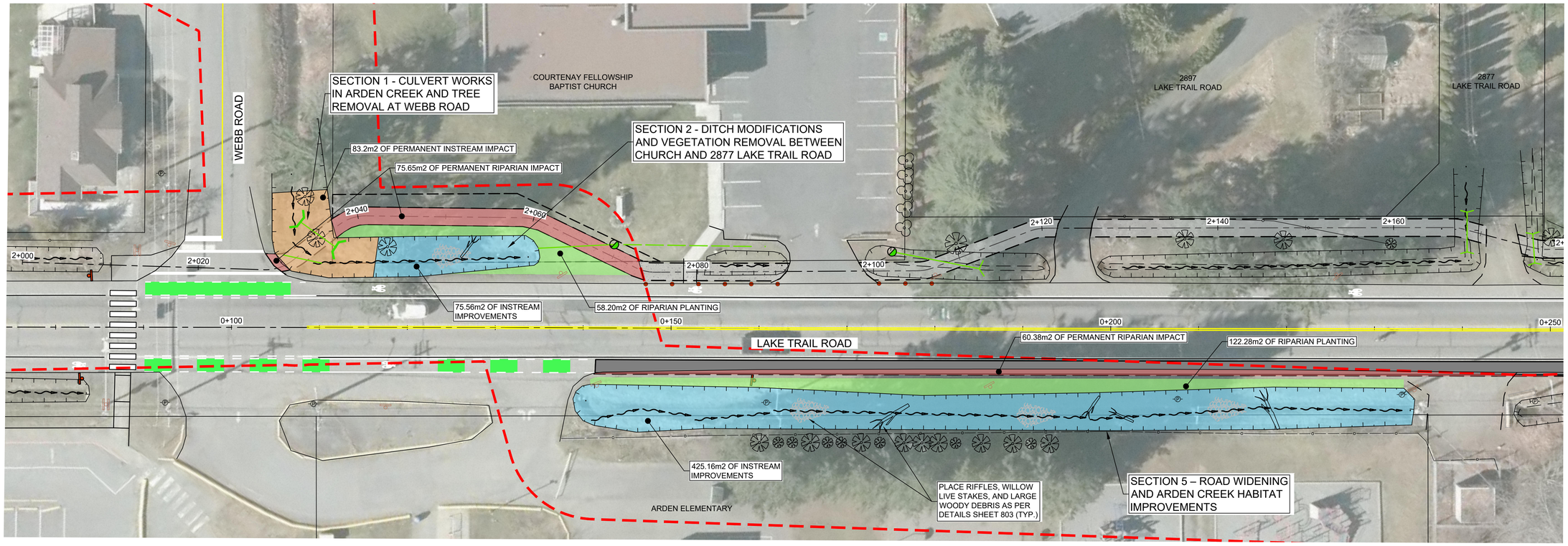
CITY OF COURTENAY
-
LAKE TRAIL PATHWAY
SIGNAGE AND ROAD MARKING PLAN
STA 2+720 TO 3+080

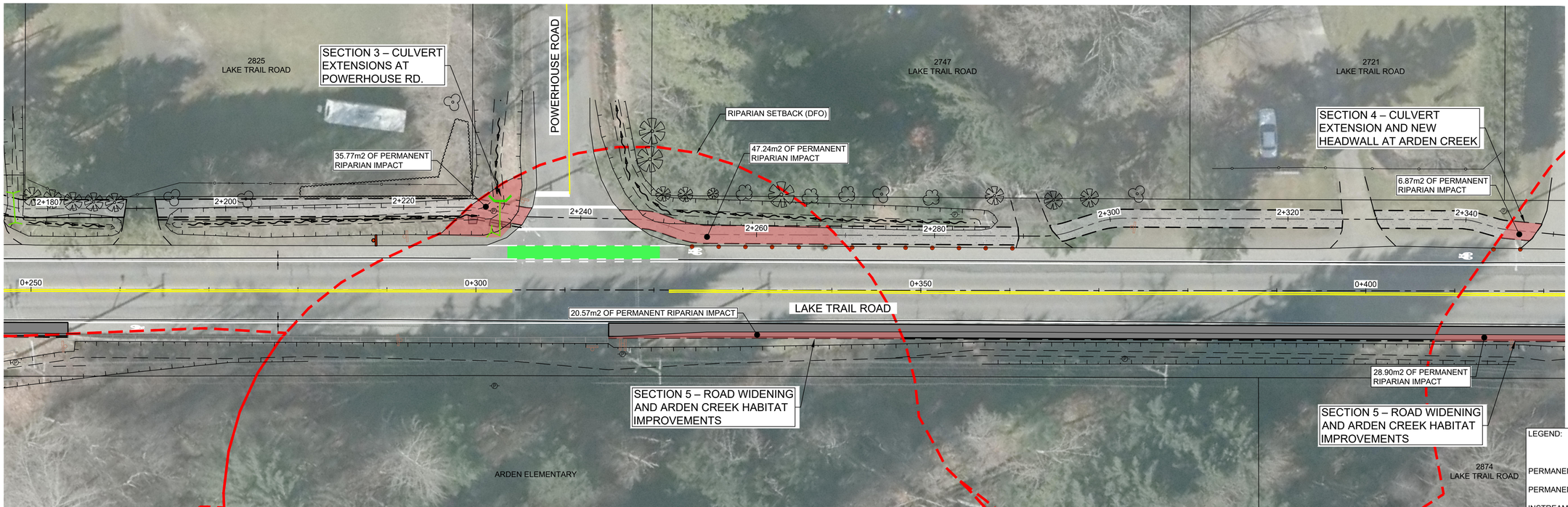
COURTENAY, BC

Drawing No. 703

Project Number 2211-47614-05

Rev. PE





LEGEND:

- PERMANENT RIPARIAN IMPACT
- PERMANENT INSTREAM IMPACT
- INSTREAM IMPROVEMENT (OFFSET)
- RIPARIAN PLANTING (OFFSET)

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CITY OF COURTENAY
-
LAKE TRAIL PATHWAY ENVIRONMENTAL OFFSETTING PLAN STA 2+000 TO 2+350

COURTENAY, BC

Drawing No. 801

Project Number	Rev.
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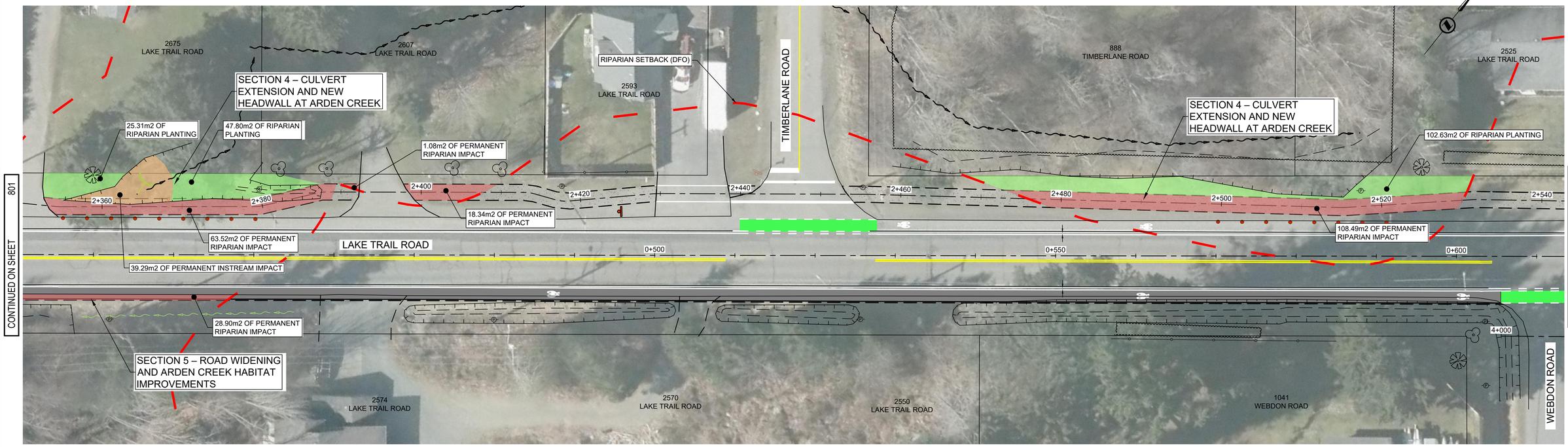

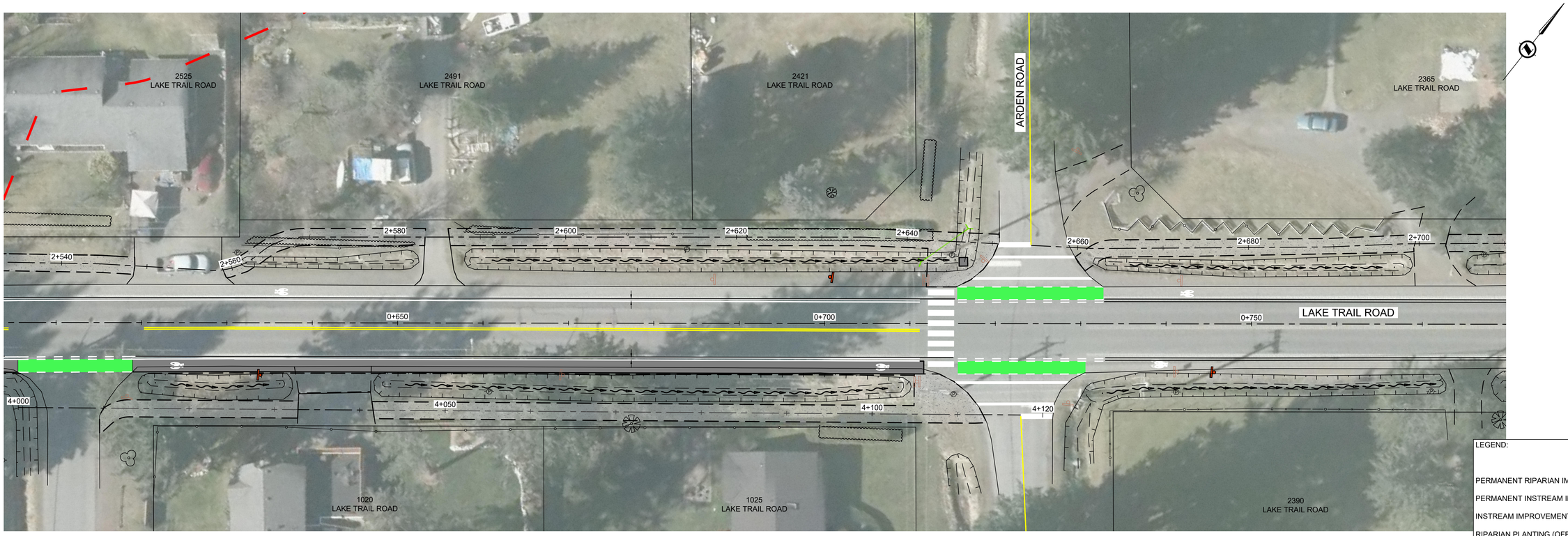

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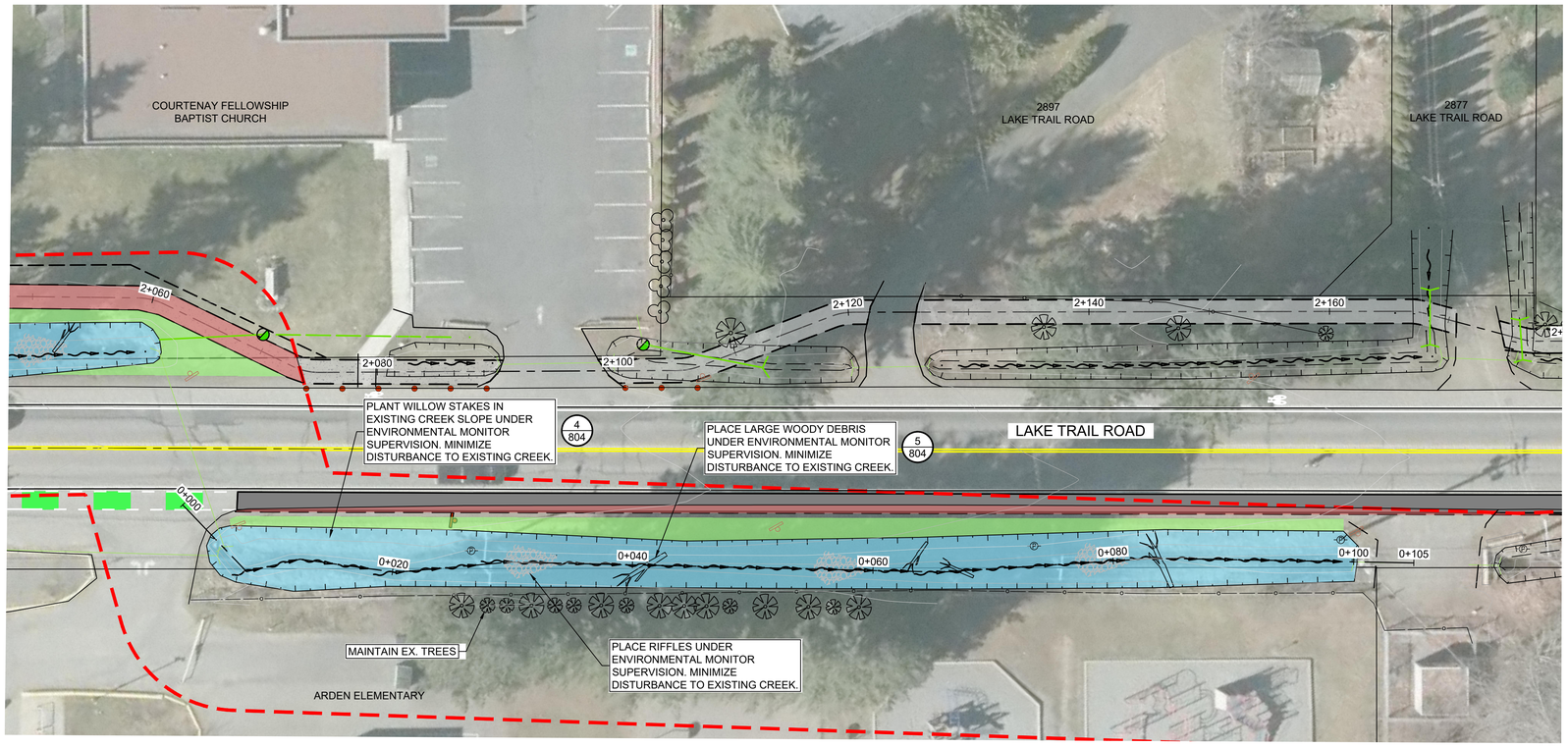
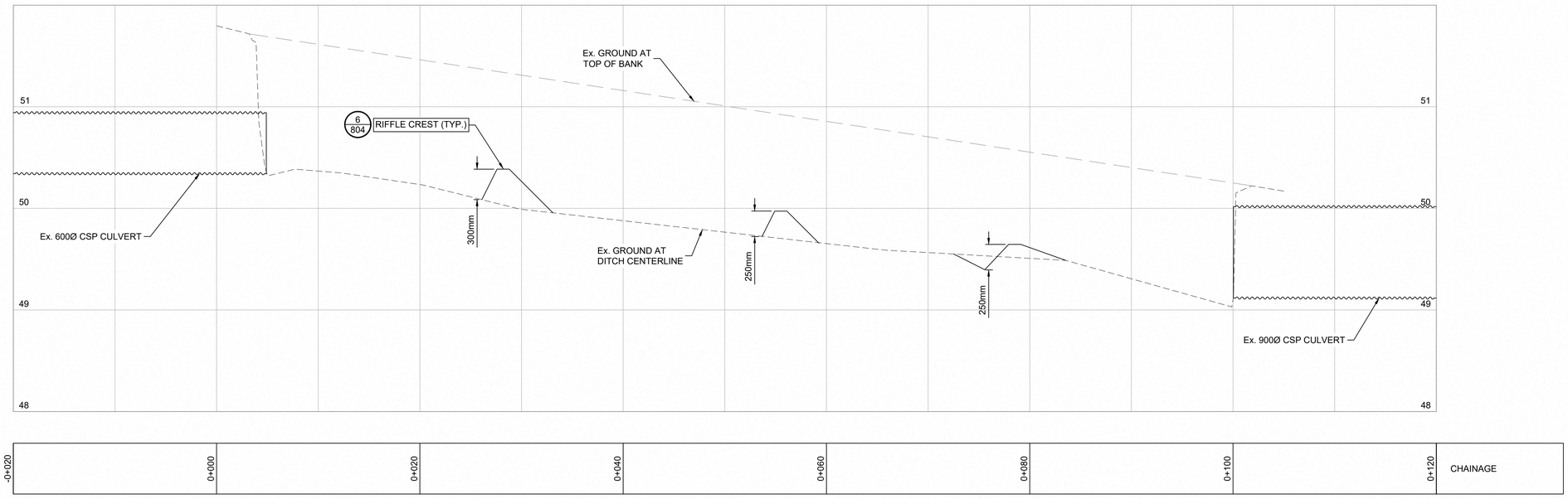
CITY OF COURTENAY
-
LAKE TRAIL PATHWAY
ENVIRONMENTAL OFFSETTING PLAN
STA 2+350 TO 2+720

COURTENAY, BC

Drawing No.
802

Project Number	Rev.
2211-47614-05	PE





LEGEND:

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- PERMANENT INSTREAM IMPACT
- INSTREAM IMPROVEMENT (OFFSET)
- RIPARIAN PLANTING (OFFSET)

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CITY OF COURTENAY
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LAKE TRAIL PATHWAY
ENVIRONMENTAL PLAN & PROFILE
STA 0+000 TO 0+105

COURTENAY, BC

Drawing No.
803

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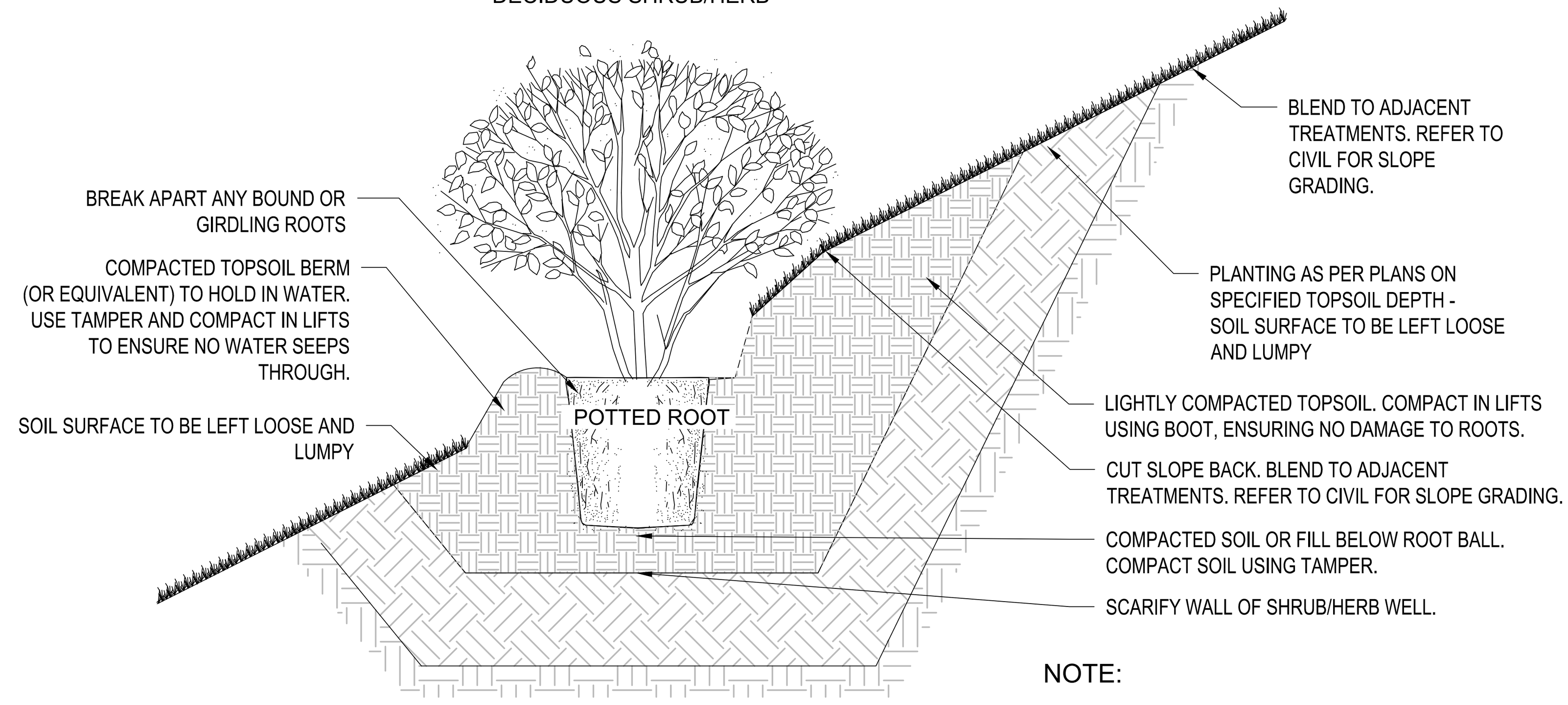
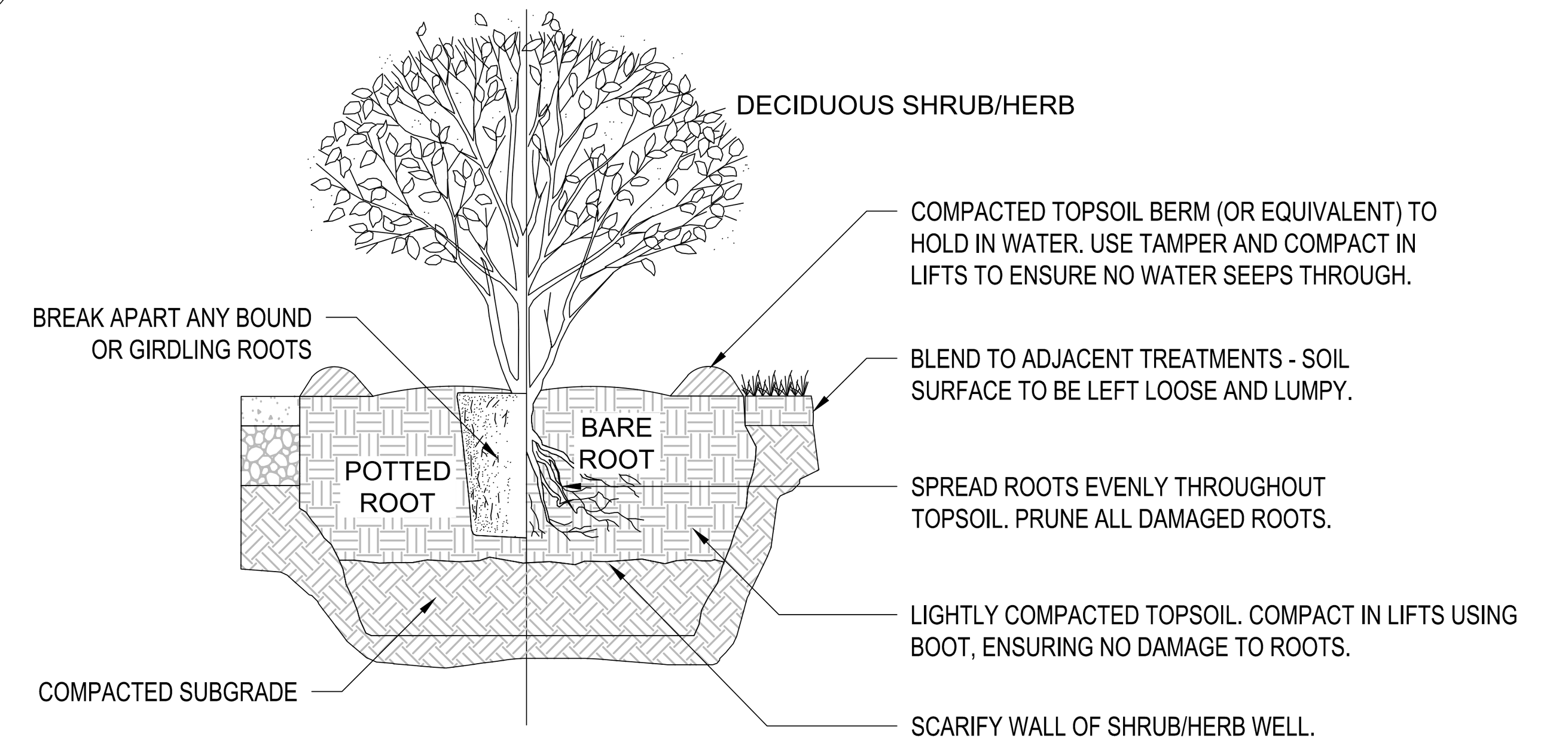


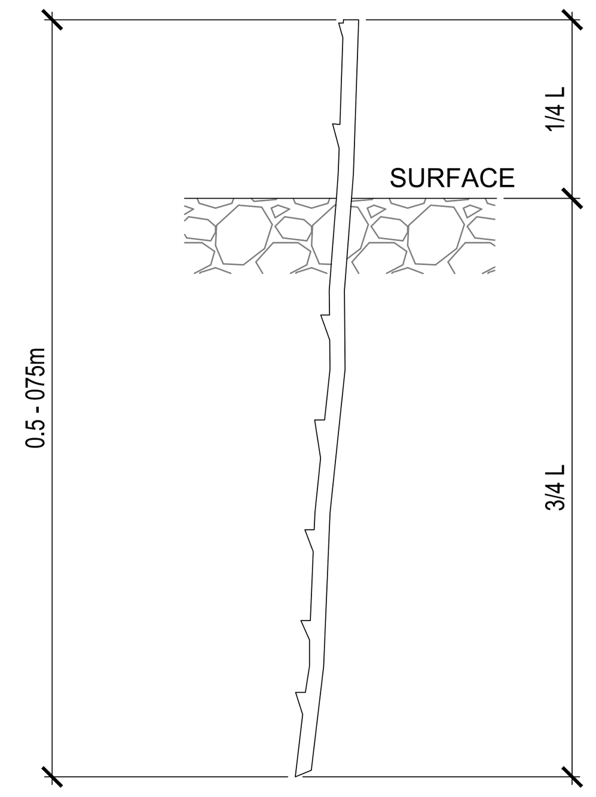
NOTE:

1. REFER TO PLANTING PRESCRIPTIONS FOR CONTAINER SIZE.

01 SHRUB/HERB PLANTING ON SLOPE
SCALE: N.T.S.



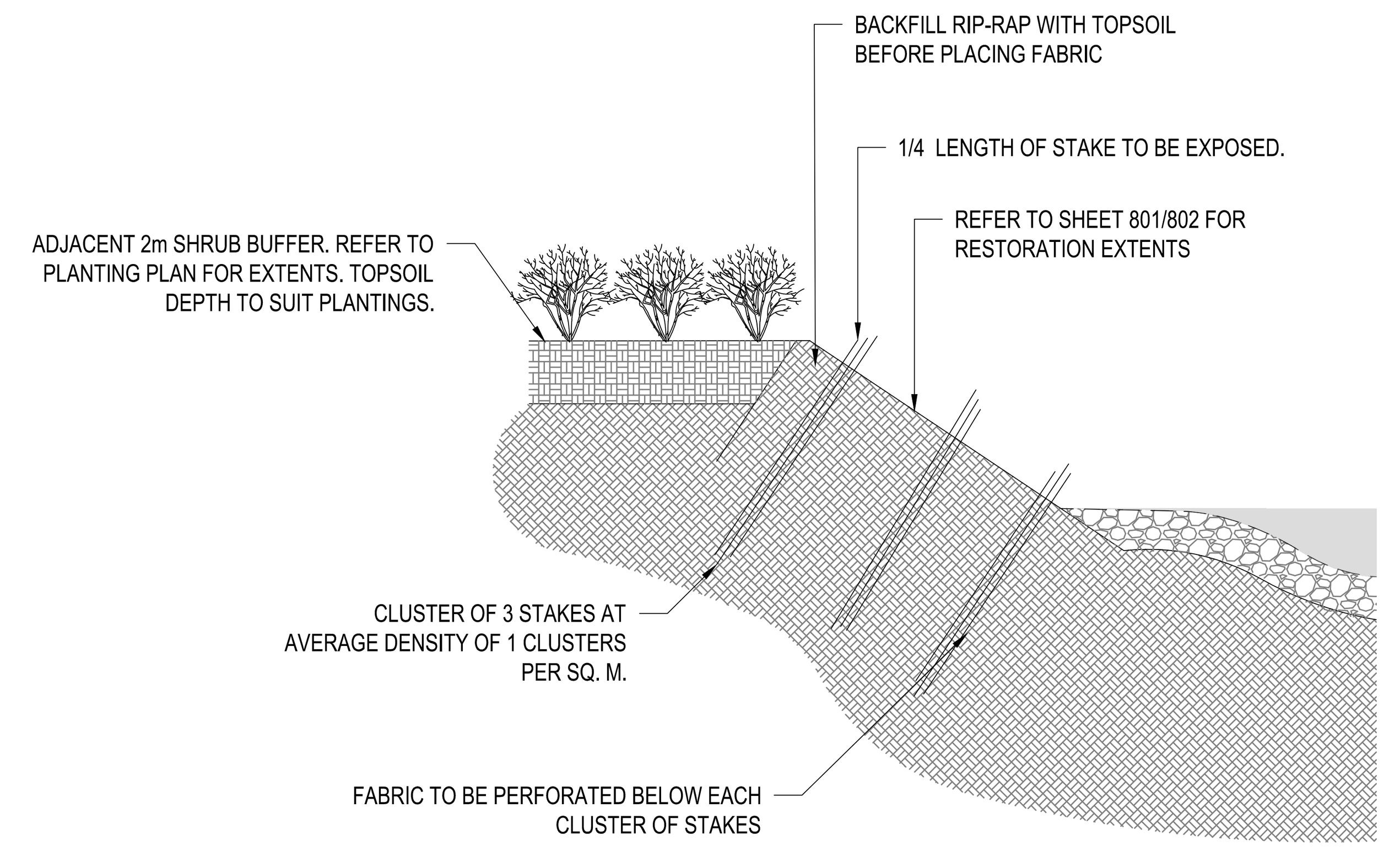
02 SHRUB/HERB PLANTING ON LEVEL SITES
SCALE: N.T.S.



NOTES:

1. HARVEST LIVE POLES DURING THE DORMANT STAGE, NOVEMBER 1-MARCH 31.
2. STORE POLES IN COOL, WET PLACE UNDER STRAW/BURLAP AND AWAY FROM DIRECT SUN. SOAK POLES DURING STORAGE FOR MAX 2 WEEKS, ENSURING THEY DO NOT DRY OUT. IF POLES ARE TO BE STORED FOR A LONGER PERIOD, DRY REFRIGERATION WILL BE REQUIRED.
3. PROTECT POLES FROM DESICCATION DURING TRANSPORT, AND KEEP MOIST ON SITE UNTIL PLANTING.
4. PILOT OPENINGS FOR STAKES SHALL BE CREATED USING REBAR.
5. USE RUBBER MALLET ON FLAT TOP TO BURY STAKE.
6. MULCH TO BE APPLIED FOLLOWING STAKING.
7. ANGLED CUT TO BE MADE AT BUTT-END AND PLANT BUTT-END DOWN.
8. BUDS MUST POINT UPWARDS.
9. MINIMUM DIAMETER OF 1.5cm CALIPER.
10. STAKES MUST BE IN CONTACT WITH TOPSOIL AT EDGES OF PILOT HOLE TO ENSURE ROOTING.
11. FOR SPECIES AND QUANTITIES, REFER TO PLANTING PRESCRIPTION TABLE.

03 LIVE STAKE PLANTING DETAIL
SCALE 1:20



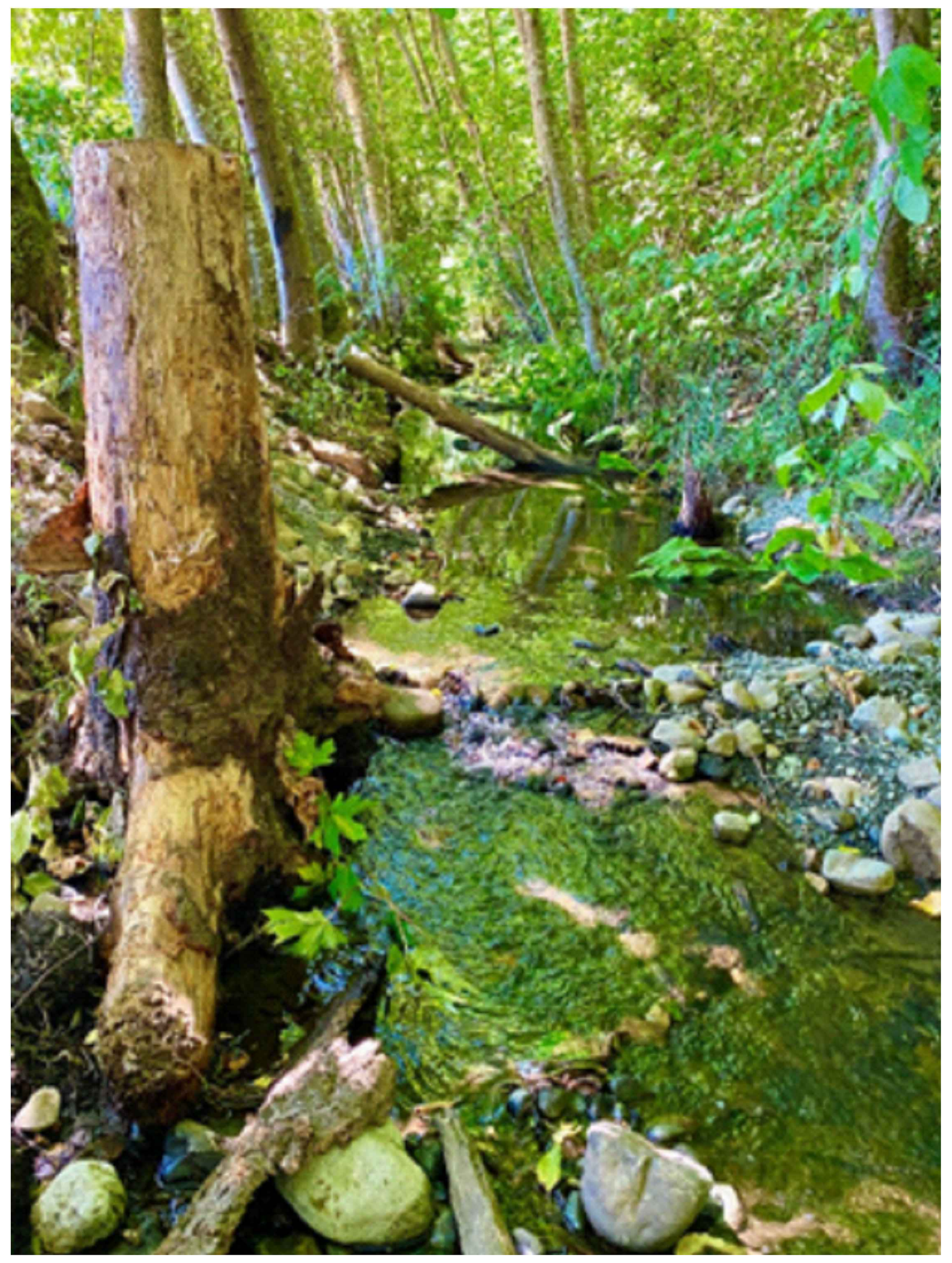
04 LIVE STAKE PLANTING IN STREAM BANK
SCALE 1:50

PLANTING PRESCRIPTION SCHEDULE:

Riparian Plantings					
Salix lucida ssp. laciandra	Pacific Willow	Live Stakes (intream only)	Plant at 1 per 1 sq.m. Maintain 1 m distance from existing retained trees/shrubs. Follow all specifications in Details and Guidelines.	40%	244
Cornus stolonifera	Red Osier Dogwood	#2 Pot or 2+0 plugs		5%	31
Physocarpus capitatus	Pacific Ninebark	#2 Pot or 2+0 plugs		3%	18
Ribes lacustre	Black Gooseberry	#2 Pot or 2+0 plugs		3%	18
Ribes sanguineum	Red Flowering Currant	#2 Pot or 2+0 plugs		5%	31
Rosa nutkana	Nootka Rose	#2 Pot or 2+0 plugs		9%	55
Rubus parviflorus	Thimbleberry	#2 Pot or 2+0 plugs		8%	49
Rubus spectabilis	Salmonberry	#2 Pot or 2+0 plugs		8%	49
Spiraea douglasii	Hardhack	#2 Pot or 2+0 plugs		5%	31
Sambucus racemosa	Red Elderberry	#2 Pot or 2+0 plugs		5%	31
Symphoricarpos albus	Snowberry	#2 Pot or 2+0 plugs		9%	55
			SHRUBS TOTAL	100%	366

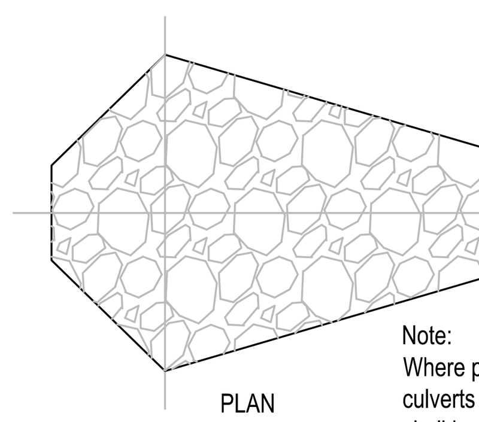
RESTORATION GUIDELINES

GENERAL	1	All work and materials to conform to the latest edition of the Canadian Landscape Standard unless specifically otherwise noted.
	2	Soil disturbance shall be minimized where possible in all riparian areas. Conduct close-cut clearing of shrubs instead of grubbing, where possible. The Contractor shall be responsible for installing additional plants per the prescribed planting mix, if necessary to restore any additional disturbed areas.
	3	If invasive plant species are observed in the work area, machinery must avoid contact with the plant to prevent spread. Species identification to be deferred to the QEP if/as needed.
TOPSOIL & MULCH	4	Disturbed or new topsoil surfaces in planting areas are to be finished "rough and loose" prior to planting, ie avoid both compaction and smooth grading.
	5	Apply a 300 mm layer of imported organic topsoil throughout tree and shrub planting areas prior to plant installations.
	6	Provide fertility and particle size analysis test for imported organic topsoil prior to starting work.
	7	After topsoil and shrub installations, planting area shall be finished with 1 5mm layer of composted bark or wood mulch.
MAINTENANCE	8	Irrigation will be needed during the growing season (May 1st through September 30th) to maintain survival of planted stock, for the duration of the maintenance period (to be specified in the works contract). Water as frequently as necessary to maintain healthy plants.

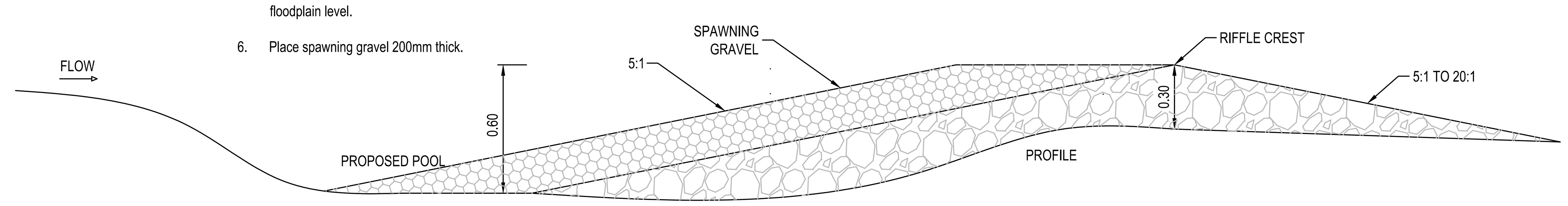


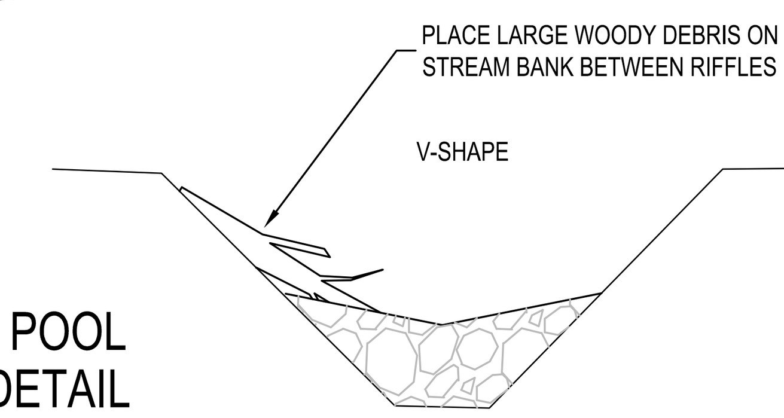
05 EXAMPLE OF INSTREAM HABITAT RESTORATION

1. PLAN: build riffle crest across the stream with large diameter boulders; back up with next largest stone downstream.
2. PROFILE: construct downstream face of riffle at a shallow slope that mimics local natural riffles (5:1 to 20:1).
3. SECTION: V-shape the crest and face downwards to the centre of the riffle (0.3 to 0.6m). Pool to be 0.6m deep x 1.0m wide x 6.0m long
4. SURFACE: place large rocks randomly on the downstream face 20 to 30 cm apart to dissipate energy and create low flow fish passage channels.
5. BANKS: rip-rap both banks with embedded boulders and cobbles to the floodplain level.
6. Place spawning gravel 200mm thick.



Note:
Where pools are to be created downstream of culverts to remain, the pool channel invert shall be at 600mm below culvert outlet invert.





TYPICAL ROCK RIFFLE, POOL & SPAWNING GRAVEL DETAIL
N.T.S.

06 TYPICAL ROCK RIFFLE, POOL & SPAWNING GRAVEL DETAIL
SCALE: N.T.S.

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PE	2025-06-16	ISSUED FOR PERMITTING	SB	BK	BK

SCALE AS NOTED

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CITY OF COURTENAY
-
LAKE TRAIL PATHWAY
ENVIRONMENTAL DETAILS

COURTENAY, BC

Drawing No. 804

Project Number 2211-47614-05 Rev. PE

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

DATE: 2025-06-16, 16:12 FILE: X:\2211\2- PROJECTS\47600-47699\47614-05 CoC LTrail Pedestrian\10.0 Engineering\10.1 Sheets\47614-05-C804.dwg

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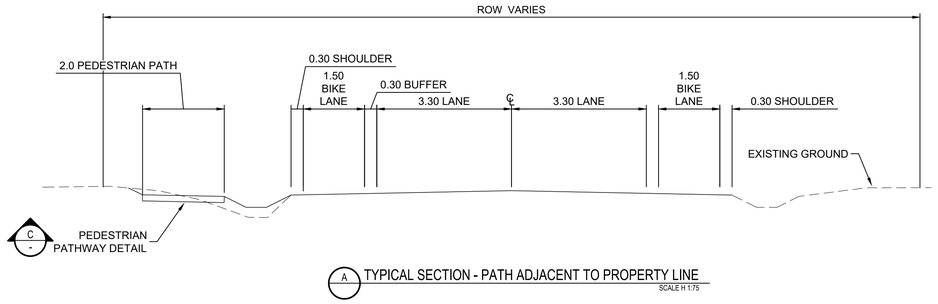
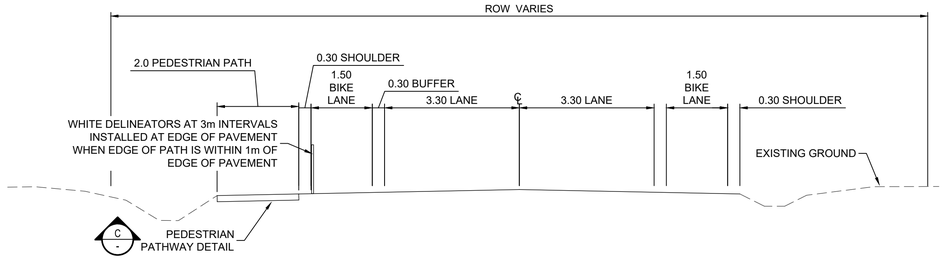
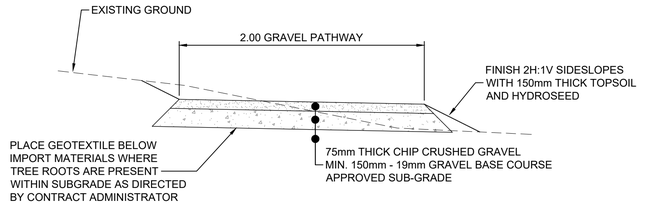


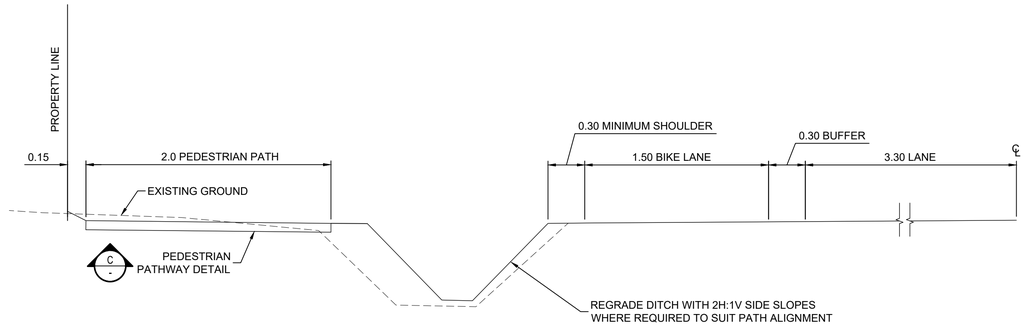
A - TYPICAL SECTION - PATH ADJACENT TO PROPERTY LINE
SCALE H 1:75



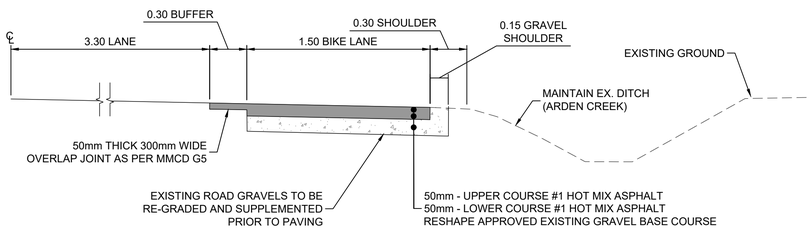
B - TYPICAL SECTION - PATH ADJACENT TO ROAD
SCALE H 1:75



C - GRAVEL PATHWAY TYPICAL SECTION
SCALE H 1:25
V 1:25



D - PATHWAY AND DITCH
SCALE H 1:25
V 1:25



E - ROAD WIDENING SECTION
SCALE H 1:25
V 1:25

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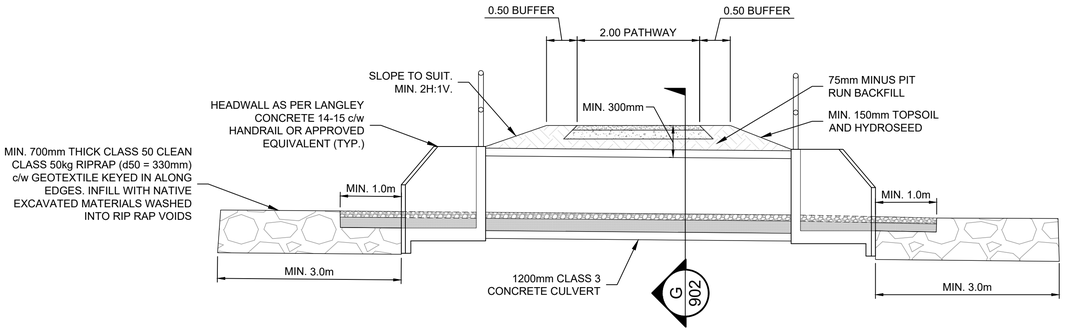
CITY OF COURTENAY
-
LAKE TRAIL PATHWAY DETAILS (1 OF 2)

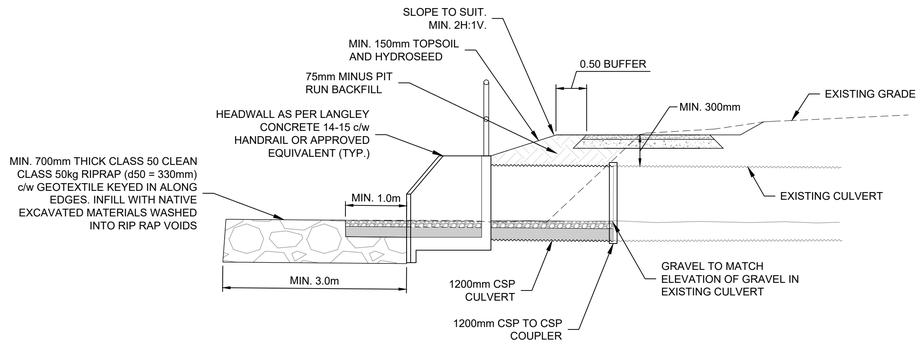
COURTENAY, BC

Drawing No.
901

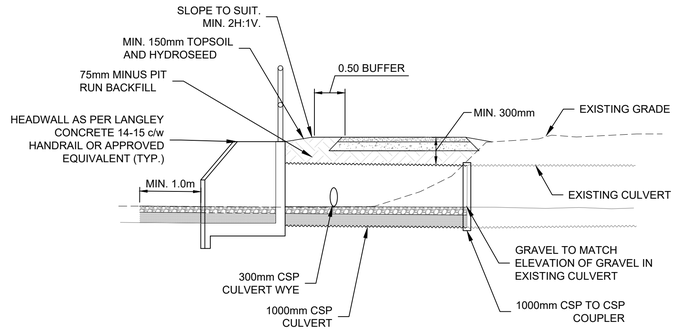
Project Number	Rev.
2211-47614-05	PE



F
-
CULVERT CROSSING PATH AT WEBB ROAD
SCALE H 1:50

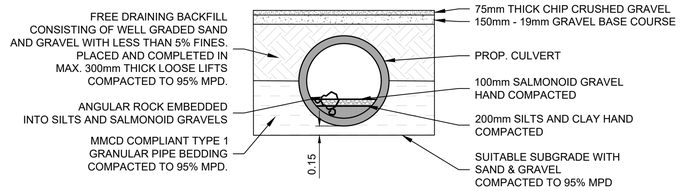


J
-
ARDEN CREEK CULVERT EXTENSION
SCALE H 1:50

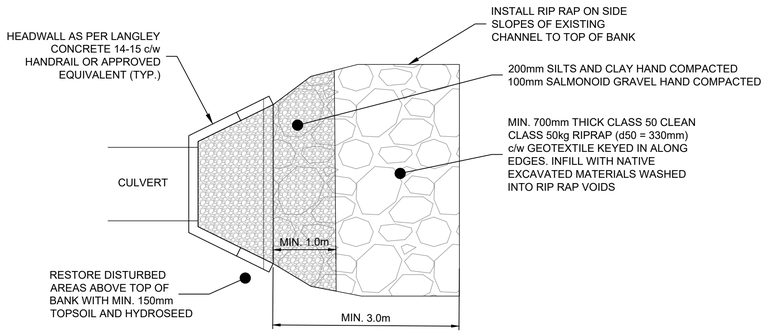


K
-
POWERHOUSE ROAD CULVERT EXTENSION
SCALE H 1:50

CHANNEL SUBSTRATE SPECIFICATION:
- CLEAN SALMONOID GRAVEL WITH THE FOLLOWING GRADATION:
  - 80% 10mm - 50mm
  - 20% UP TO 100mm
  - SMALL PORTION OF COARSE SAND (2 - 5mm)



G
-
CULVERT SECTION
SCALE H 1:50
V 1:50



H
-
TYPICAL HEADWALL DETAIL
SCALE H 1:50

Rev	Date	Description	Drawn	Design	App'd
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CITY OF COURTENAY
-
LAKE TRAIL PATHWAY
DETAILS (2 OF 2)

COURTENAY, BC

Drawing No.
902

Project Number	Rev.
2211-47614-05	PE

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

Appendix C – Letter of Credit

PLACEHOLDER FOR LETTER OF CREDIT - TO BE PROVIDED IN CONSULTATION WITH DFO

Contact
McElhanney | Daniel Mackle, RPBio.
587-582-2826
dmackle@mcelhanney.com

McElhanney

CANADA BEST MANAGED COMPANIES