

ALIGNMENT OPTIONS REPORT - DRAFT Rev.2

**MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
Highway 18 Lake Cowichan Alternate Route**

February 13, 2020

BINNIE CONSULTING LTD.

300 - 4940 Canada Way,
Burnaby, BC V5G 4K6
Main: 604-420-1721



Prepared by: _____
Alexandra Haag, EIT

Prepared By: _____
Dana Xu, M. Eng., P.Eng.

Reviewed by: _____
Edoardo Ballarin, P. Eng., PTOE, PMP

Reviewed by: _____
Jonathan Ho, P. Eng., PTOE

Approved by: _____
Amy Choh, P. Eng., PMP

PROJECT TEAM MEMBER LIST

Project Manager:

Amy Choh, P.Eng., PMP

Technical Staff:

Edoardo Ballarin, P.Eng., PTOE, PMP

Jonathan Ho, P.Eng., PTOE

Dana Xu, M. Eng., P. Eng.

Alexandra Haag, EIT

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Project Background.....	1
1.2	Project Scope	2
2	ROUTE ALIGNMENT OPTIONS.....	3
2.1	Design Criteria.....	3
2.2	Alignment Options.....	3
2.3	Alignment Overview.....	4
2.4	Vertical Profile.....	4
2.5	Existing Topography.....	5
2.6	Road Allowance Requirements	5
3	COST ESTIMATE	7
4	SUMMARY	8

FIGURES

Figure 1-1: Town of Lake Cowichan’s OCP Transportation Map (Source: OCP, Updated May 2019)..... 2

Figure 2-1: Highway 18 Lake Cowichan Alternate Route Concept, with Three South Connection Options 6

1 INTRODUCTION

R.F. Binnie & Associates Ltd. (Binnie) has been retained by the Ministry of Transportation and Infrastructure (MOTI) to consider options for a potential Highway 18 Lake Cowichan Alternate Route (Highway 18 Alternate Route) route.

Shown in **Figure 1-1**, the project area consists of an approximate 6-km segment between Cowichan Valley Highway (Highway 18) to the north-east, and South Shore Road to the south-west. The project corridor for this assignment travels between these two roadways east of the Town of Lake Cowichan (Town).

1.1 Project Background

Highway 18 is an east-west route connecting Lake Cowichan with Duncan. South Shore Road is the main north-south route through the Town. At the south end of the Town, South Shore Road connects to the Pacific Marine Road, which continues south to Port Renfrew. At the north end of Town, South Shore Road crosses the Cowichan River and the road changes its name to Cowichan Lake Road. North of the Cowichan River, Cowichan Lake Road connects to Highway 18 and continues east to Duncan, paralleling the south side of Highway 18.

The Town has identified a second crossing of the Cowichan River as a strategic transportation priority in its Official Community Plan (OCP) published in 2011. As shown in the OCP (**Figure 1-1**), the proposed Alternate Route would diverge from Highway 18 east of the Town, and travel south to reconnect with South Shore Road.

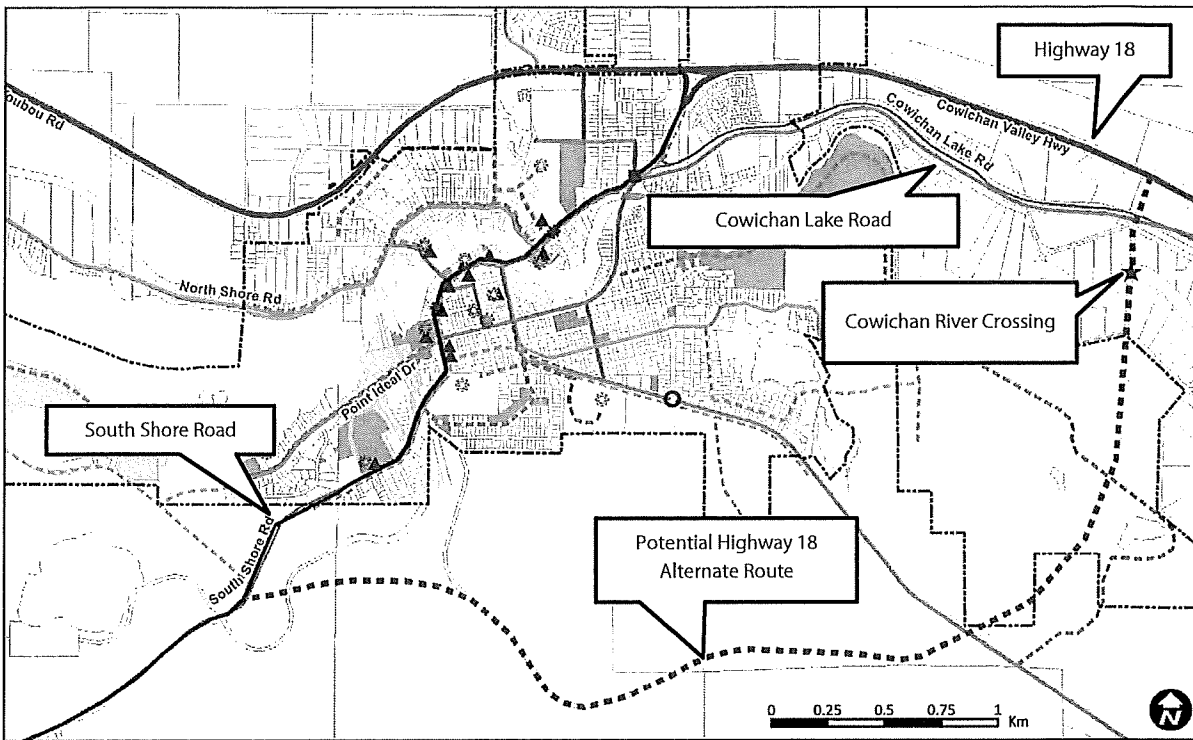


Figure 1-1: Town of Lake Cowichan’s OCP Transportation Map (Source: OCP, Updated May 2019)

1.2 Project Scope

The objective of this project is to consider high-level options for a potential Highway 18 Alternate Route, which would provide a second crossing of the Cowichan River, and to compare the options based on site constraints and other identifiable factors.

2 ROUTE ALIGNMENT OPTIONS

2.1 Design Criteria

The proposed design criteria used for the Highway 18 Alternate Route alignment options is based on a two-lane Rural Collector Undivided (RCU) road with a design speed of 50 km/h. The key design criteria elements are outlined below:

- Design Speed – 50 km/h
- Minimum Radius – 90 m
- Maximum Grade – 11% (for mountainous topography)
- Min. K Sag – 13 for non-illuminated condition; 6 for illuminated condition
- Min. K Crest – 7
- Lane Widths – 3.6 m
- Paved Shoulder Width – 1.5 m
- Clear Zone Distance/Recoverable Slope – 5.5 m / 4:1
- Multi-Use Path Width – 3.0 m

In addition to the above design criteria, 2H:1V cut and embankment slopes are assumed for the establishment of highway road allowance. It is assumed that the Alternate Route is non-illuminated.

2.2 Alignment Options

Due to the road allowance constraints at the northern end of the project between Cowichan Lake Road and Hudgrove Road, all options (shown in **Figure 2-1**) generally follow the alignment of an existing forest service road from the southern end of the project. The alignment continues east on the existing road allowance until diverging north to connect with Hudgrove Road. North of Hudgrove road, the alignment follows an existing north-south road allowance on the approach to Cowichan River and ultimately connects to Cowichan Lake Road north of the river. This crossing location was identified to have the least impact to surrounding properties and park land and was used for all alignment concepts.

At the southern end of the project, three variations on the alignment connection to South Shore Road are considered, with varying constraints and topography. An overview of the alignment, vertical profile and topography and road allowance requirements are described below, followed by a description of the three variations on the South Shore Road connection:

- South Connection Option 1;

- South Connection Option 2; and
- South Connection Option 3.

2.3 Alignment Overview

All three options connect to South Shore Road at various locations, described below, before continuing east to connect with an existing road allowance. The alignment continues east along this road allowance before diverging north to connect with Hudgrove Road. The alignment then crosses Cowichan River through an existing road allowance on both approaches to the river. After crossing the river, the alignment continues north to tie into Cowichan Lake Road approximately 2.3 km east of the existing Cowichan Lake Road at Highway 18 intersection.

South Connection Option 1: Option 1 connects to South Shore Road at the Lakeview Park Road intersection, and then continues east along the existing forest service road alignment for 1.2 km before connecting to an existing road allowance.

South Connection Option 2: Option 2 connects to South Shore Road approximately 100 m north of the Lakeview Park Road intersection, and then continues east for approximately 900 m before connecting to the road allowance.

South Connection Option 3: Option 3 alignment connects to South Shore Road approximately 200 m south of the Lakeview Park Road intersection, and then travels north along an existing road allowance for 1.1 km before continuing east to connect with a second road allowance. This option is approximately 600 m longer than Option 1 and Option 2, but it avoids some of the topographical features of Option 1 and 2.

2.4 Vertical Profile

All three options vary in the vertical profile at the southern end of the project limit, but ultimately they ascend to the crest of a hill east of South Shore Road at approximately 205 m elevation. The alignment then gradually descends to 175 m, followed by a gradual ascent to 180 m to match the elevation of Hudgrove Road before crossing the Cowichan River to match the elevation of Cowichan Lake Road at 183 m.

South Connection Option 1: East of South Shore Road, the Option 1 alignment crosses a gully approximately 250 m in length and 17 m in depth, before quickly ascending at a grade of +4.9% to an elevation of 215 m.

South Connection Option 2: East of South Shore Road, the Option 2 profile crosses a gully approximately 350 m in length and 17 m in depth, and then crosses a second gully approximately 180 m in length and 12 m in depth. After crossing both gullies, the profile gradually ascends to 205 m at a grade of +1.1%.

South Connection Option 3: East of South Shore Road, the Option 3 alignment would cut through a hill approximately 90 m in length and 8 m in height, while gradually descending at a -0.5% grade to an

elevation of 175 m. From this elevation, the alignment quickly ascends at +6.0% to an elevation of 205 m.

2.5 Existing Topography

All alignment options would require a bridge structure to cross the Cowichan River at the north project limit but vary in topographical elements near the south end of the project.

South Connection Option 1: Option 1 crosses an existing gully east of south shore road that would require fill material, a culvert structure and/or a bridge structure to cross.

South Connection Option 2: Option 2 crosses two gullies at the southern end of the project which would require fill material, a culvert structure and/or a bridge structure to cross.

South Connection Option 3: Option 3 follows a relatively flat topography and does not cross the gullies described in Option 1 and Option 2.

2.6 Road Allowance Requirements

The preliminary road allowance requirements for the alignment is estimated to be 50 m. This allowance assumes:

- Two-lane cross-section (one 3.6 m wide lane in each direction);
- A 5.5 m clear zone distance for each direction;
- A Multi-Use Pathway (MUP) on one side; and
- Allowance for cut and fill up to 6 m due to the mountainous topography.

Based on this proposed road allowance, there would be impacts to the private properties on the north and south side of the Cowichan River. Road allowance requirements are generally consistent for all three south connection options.

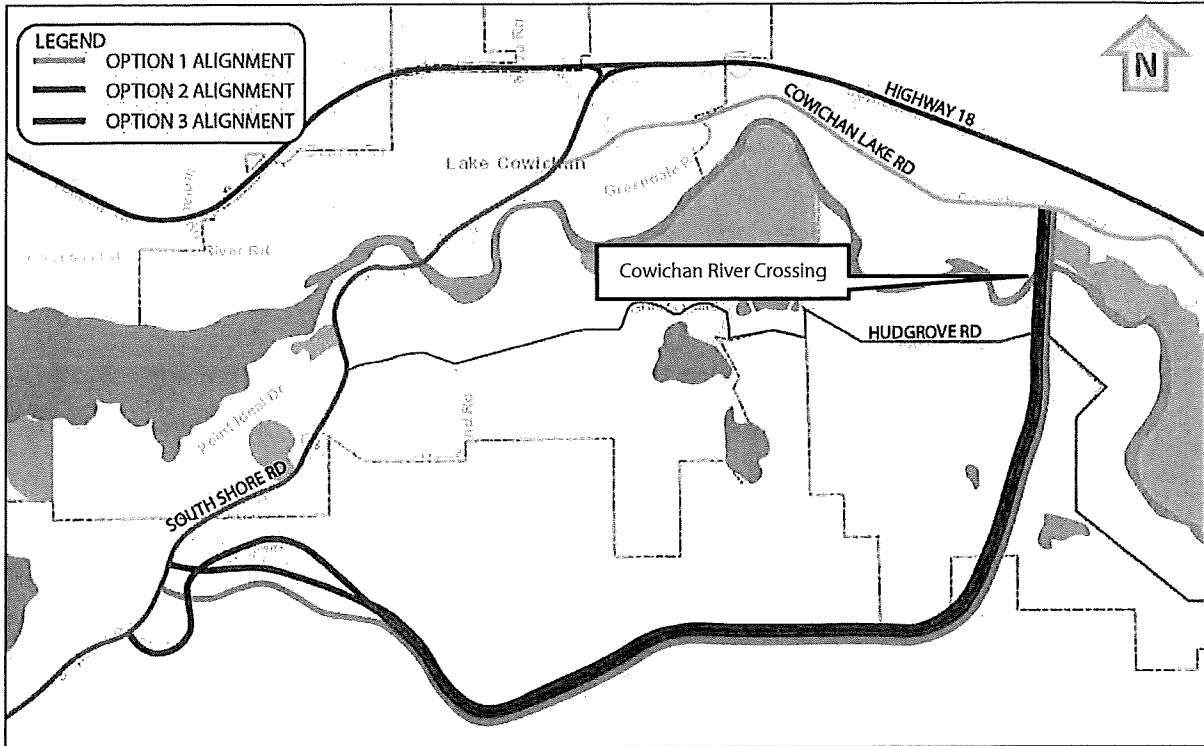


Figure 2-1: Highway 18 Lake Cowichan Alternate Route Concept, with Three South Connection Options

3 COST ESTIMATE

High-level cost estimates considered the following assumptions for the three variations of the Highway 18 Alternate Route:

- Utilities are not required;
- Ground treatment is not required;
- No rock excavation is required;
- Roadway is non-illuminated;
- Right-of-Way (ROW) is acquired at no cost between South Shore Road and Hudgrove Road;
- Two properties between Hudgrove Road and Cowichan Lake Road are to be acquired at \$400 per sq. m; and
- Cowichan River Park land is not being impacted.

Based on these assumptions, the cost estimates for the three variations on the alignment for the Lake Cowichan Alternate Route are as follows:

- **South Connection Option 1:** \$98,520,000
- **South Connection Option 2:** \$108,170,000
- **South Connection Option 3:** \$104,870,000

The cost variation of the three south connection options is generally based on the topographical features associated with each option. Option 2 would cross two gullies near the southern end of the project limit, while Option 1 would cross one and Option 3 does not cross any. Although Option 3 does not cross the gullies present in Option 1 and Option 2, the alignment is nearly 600 m longer than the other two options. Option 1 crosses one gully and it is the most direct alignment.

4 SUMMARY

The three options presented in this Report are compared in the following table:

Table 4-1: Comparison Results

Criteria	Option 1	Option 2	Option 3
Road Geometry	●	●	◐
ROW Impact	◐	◐	◐
Bridge Length	◐	◐	◐
Community Access	◐	◐	◐

● = Excellent or No Negative Effect

◐ = Good or Little Negative Effect

◑ = Neutral or Moderate Negative Effect

◒ = Poor or Strong Negative Effect

○ = Very Poor or Severe Negative Effect

