

# **COAST SALISH DEVELOPMENT CORP.**

**OYSTER BAY IR NO. 12**

**WATER AND SEWER SERVICING STUDY**

Prepared By:



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## 1.0 BACKGROUND

IR No. 12 is located at the north end of Ladysmith Harbour and is bisected by both the Esquimalt and Nanaimo Railway (E&N) and the Trans Canada Highway (TCH). This reserve is developed with a variety of land uses that include the following:

- Chemainus Band Offices;
- Chemainus Native College;
- Mohawk Gas Station;
- A&W Restaurant;
- Coast Salish Development Services Offices; and
- Several band member homes.

Access to the reserve is provided by a 4-way signalized intersection with the TCH at a location called ‘Four Corners’.

Sewage disposal is currently provided by individual septic tank and ground disposal systems for each building. Water supply, treatment, storage and distribution is currently provided by a system that is owned, operated and maintained by the Chemainus First Nation. That system is supplied from wells located directly north of Bush Creek.

The Chemainus First Nation has concern with the long-term viability and limited capacity of those systems and the associated constraint on the potential for further development of reserve lands. In order to address that concern, the Nation has negotiated an Agreement in Principle with the Town of Ladysmith for connection to their municipal sewerage and water systems. The purpose of this letter report is to define the major system components necessary to make those connections. In addition, cost estimates are provided to deliver these works.

## 2.0 DESIGN STANDARDS

Proposed servicing to IR No. 12 will include construction of both on-site and off-site works. Relevant standards for these works are summarized as follows:

### 2.1 On-Site Works

On-site works fall under the jurisdiction of Indian and Northern Affairs Canada (INAC). INAC has adopted standards for the design and construction of infrastructure including water and sewerage works. The following INAC standards were referenced in preparing this report:

- Design Guidelines for Wastewater Systems, British Columbia Region, 3<sup>rd</sup> Edition, November, 2003
- Design Guidelines for Water Works, British Columbia Region, 5<sup>th</sup> Edition, September, 2005

### 2.2 Off-site Works

Off-site works are required within the Town of Ladysmith and within the Cowichan Valley Regional District (CVRD). Works within the CVRD will be constructed within roadways that fall under the jurisdiction of the BC Ministry of Transportation and Infrastructure. The following relevant municipal and provincial standards were referenced in preparing this report:

- Town of Ladysmith, Manual of Engineering Standards and Specifications
  - Ministry of Transportation and Infrastructure, Standard Specifications for Highway Construction, 2009
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### 3.0 DESIGN CRITERIA

The following provides a summary of the key design requirements from the referenced Design Standards that are used in this study.

#### 3.1 Planned Development

Concurrent with this report the Band has commissioned a land use planning study for IR No. 12. That work includes a market study to estimate the demand for development on reserve and a subdivision zoning plan to control development on reserve. The following 20-Year projections are provided by those studies and used in this report:

<b>Table 3.1 – 2031 Planning Projections</b>		
Single Family Dwellings	174	Units
Attached Dwellings	194	Units
Multi-Family Dwellings	196	Units
Retail Space	78,000	Square Feet
Commercial / Entertainment	10,000	Square Feet
Office	32,400	Square Feet
Estimated Residential Population	1450	Persons
Equivalent Population (Non residential uses)	<u>350</u>	Persons
<b>Total Design Population</b>	<b>1800</b>	<b>Persons</b>

#### 3.2 Sewerage System Design Criteria

Sewerage system design criteria are provided in INAC's Design Guidelines and the Town of Ladysmith's Standard Specifications. Design flows provided in the Town of Ladysmith standards have been used to size the major system components identified in this cost estimate including lift station pumps and the discharge force main. Further analysis and review will be required at the design stage to confirm these estimates.

### 3.3 Water System Design Criteria

Water system design criteria is provided in INAC’s Design Guidelines and the Town of Ladysmith Standard Specifications. Major system components identified in this cost estimate have been assessed using the Town of Ladysmith’s water consumption rates and INAC’s requirements for fire protection. Water system design criteria are summarized as follows:

<b>Table 3.2 – Water Demand</b>		
Ladysmith Average Day Demand	380	litres/person/day
Ladysmith Maximum Day Demand	670	litres/person/day
Average Day Demand for IR No. 12	684,000	litres per day
Maximum Day Demand for IR No. 12	1,206,000	litres per day
Commercial Fire Flow	150	litres per second
Reservoir Size	1,700,000	litres



## 4.0 CONCEPTUAL SEWERAGE SYSTEM DESIGN

Sewerage disposal is currently handled through ground disposal of septic tank effluent. This practice requires dedication of large areas of land for primary and auxiliary absorption fields that is not consistent with proposed land use densities. Connection to a municipal style sewerage system is key to delivery of the band's development proposals.

The point of connection to the Ladysmith municipal system is located on Rocky Creek Road, north of the intersection with Ludlow Road. Conceptual design of the system is shown on Figure 1 – Oyster Bay IR No. 12 - Community Sewer System – Conceptual Design. A lift station and forcemain will be required to convey sewerage from the reserve to the point of connection. For the purpose of this estimate we have assumed that the lift station will be located behind the Mohawk gas station, north of Oyster Sto'Lo Road. This central location will allow gravity connection to existing commercial buildings in the area and lands west of the highway.

The following provides a brief description of the main system components and conceptual design assumptions.

### 4.1 Gravity Sewer Lines

A gravity sewer line is proposed to service existing commercial buildings and the lands to the west of the TCH. This line should be sized to accommodate all current and future flows based on proposed development of the reserve. We propose that the gravity system be sized to accommodate this maximum potential build-out. The pumping equipment and forcemain should be sized for a smaller, short-term population projection with allowance for future upgrade.

Conceptual design of the gravity sewer lines is described as follows:

- Conventional gravity sewer line within the Oyster Sto-Lo Road allowance from the south reserve boundary to the proposed lift station;
- Sewer alignment to run adjacent to the existing paved road to minimize pavement replacement; and,
- 250 mm pipe diameter

## 4.2 Highway Crossing

Construction of the Trans Canada Highway crossing will be carried out under permit issued by the Ministry of Transportation and Infrastructure (MOTI). Based on past experience with similar installations we anticipate that MOTI's requirements will include the following:

- An open cut crossing will not be allowed;
- The sewer line will need to be installed inside a welded steel carrier pipe; and,
- Carrier pipe to be installed by either boring, or jacking from one side of the highway to the other.

In some cases MOTI have installed an empty carrier pipe at the time of highway construction to accommodate future servicing requirements. Inquiries should be made in advance of design to determine if a casing was installed of adequate size and location to be used for this application. This cost estimate assumes direct drilling of a new carrier pipe.

## 4.3 Railway Crossing

The E&N railway right of way is owned by the Island Corridor Foundation (ICF). The rail bed, tracks and equipment are owned by Southern Railway of Vancouver Island (SRVI) and construction of the railway crossing will require a permit issued by SRVI. This crossing will likely be built adjacent to the existing road crossing. If a utility right of way is required in addition to the existing road crossing, then approval will be required from ICF.

Based on recent experience gaining approvals for a similar crossing on reserve land in the Victoria area we anticipate that SVRI's requirements will include the following:

- An open cut crossing will be allowed with night work;
- All work connected to the rails will be undertaken by SRVI forces; and,
- All other works will be undertaken by a private contractor hired by the band

## 4.4 Lift Station

The primary equipment required to transfer sewerage from the reserve to the municipal system is a lift station. Lift station structures are typically designed to handle the ultimate build out flow. In this case, the build-out population may take two or more decades to achieve. Mechanical and electrical components typically have a shorter design life than the hydraulic components. We would recommend that pumps, internal piping, power supply and controls

equipment be designed to handle a smaller, Intermediate flow in order to reduce initial capital and operating costs.

Lift stations can be provided with a variety of features and options. For the purpose of our estimate we have included an allowance for the following items:

- Duplex submersible pumping configuration;
- Separate Wet Well and Valve Chamber;
- Water Supply for wash down purposes;
- Control Kiosk;
- Emergency standby generator; and,
- Flowmeter.

These also represent features typically required by INAC. This cost estimate assumes an interim design population of 1000 persons serviced by 50 horsepower pumps.

#### **4.5 Forcemain**

A pressurized force main is proposed to follow the Trans Canada Highway (east side) from IR No. 12 to the existing Town of Ladysmith System. Depending on the ultimate alignment, approval may be required from the Cowichan Valley Regional District, MOTI and the Town of Ladysmith. Asphalt paving, tree removal and the crossing of Bush Creek will be required as part of the works.

Forcemain design is interconnected with pump selection. This estimate assumes a 250 mm diameter HDPE pipe to be confirmed at the time of design.

#### **4.6 Bush Creek Crossing**

Regardless of the final location of the forcemain alignment it will be necessary to cross Bush Creek. The following alternatives have been considered:

1. Suspend the supply line from the Bush Creek Bridge;
2. Construct a new stand-alone pipe bridge; and,
3. Construct a conventional buried creek crossing.

On previous projects we have found that MOTI will not allow utilities to be installed from existing highway bridges. The preferred alignment will require further consideration; however, we have based our cost estimate on a conventional buried creek crossing. Approvals from the

Ministry of Environment and Department of Fisheries will be required in order to cross the creek. In addition, stream enhancement works will likely be required as part of the permitting.



## **5.0 CURRENT WATER SYSTEM CAPACITY**

The existing water system on reserve was upgraded in 2002. That work included construction of water treatment works, pipelines and an above ground reservoir. Record drawings prepared in 2003 were reviewed as part of this study

### **5.1 Current Water Supply**

The band's current water supply is provided by two wells that are located on the north side of Bush Creek. Well #1 was drilled in 1991, has a static water depth of 2.61 metres and a pumping rate of 3.2 litres per second. Well #2 was drilled in 2000, has a static water depth of 3.66 metres and a pumping rate of 3.2 litres per second. The treatment works include a manganese treatment system and sodium hypochlorite disinfection. This treatment system was designed and constructed before adoption of the 2005 design guidelines. The current standards include more stringent requirements for wellhead protection and mandatory filtration and two stage disinfection for Groundwater Under the Direct Influence of surface water (GUDI). GUDI assessment is beyond the scope of this study, however given the close proximity to Bush Creek and the shallow depth of these wells it is possible that these existing treatment works do not meet current standards.

### **5.2 Current Water Storage**

Water storage is provided by an above-ground bolted steel tank that is located at a high point on the northwest corner of the reserve. That reservoir has a storage volume of 680,000 litres, a base elevation of 68.6 metres and a top water level of 78.7 metres. The four corners site has an elevation of approximately 10 metres. This reservoir maintains a normal system pressure of approximately 670 kPa (97 psi).

### **5.3 Current Water Distribution**

The current water distribution system on reserve was updated in 2002 with pipe and appurtenances that meet present standards. The main discharge line from the reservoir to Four Corners is 250 mm diameter and has adequate capacity to supply the design fire flow in combination with a new supply line from the Town of Ladysmith system. The existing on-reserve system of mains will need to be expanded to distribute domestic and fire flows as development proceeds.

## 6.0 CONCEPTUAL WATER SYSTEM DESIGN

### 6.1 Town of Ladysmith System

The Town of Ladysmith water system serves Rocky Creek Road with a 250 mm diameter main that ends at Gladden Road. That line operates at a Hydraulic Gradeline of 115 metres, which is 36 metres higher than the top water level of the IR No. 12 reservoir. IR No. 12 could be served by extending the Town of Ladysmith system approximately 2 kilometres north to Four Corners. Conceptual design of the system is shown on Figure 2 – Oyster Bay IR No. 12 - Community Water System – Conceptual Design. Control valves will be required to accommodate this pressure difference and to augment fire flows available from the existing IR No. 12 reservoir.

Existing chlorine residuals at the point of connection should be reviewed to assess the need for re-chlorination.

### 6.2 Supply Line

The proposed supply line to serve IR No.12 from the Ladysmith system will follow the east side of the Trans Canada Highway from the intersection of Rocky Creek Road and Gladden Road to Four Corners. Construction of these works will require approval and authorization from the Town of Ladysmith and the Ministry of Transportation. Asphalt paving, tree removal and a crossing of Bush Creek will be required as part of the works.

The fire flow presented above can be provided by combining flow from the Town of Ladysmith system and the IR No. 12 reservoir. We estimate that a 250 mm supply line is required; however this size will need to be confirmed at the time of design.

### 6.3 Bush Creek Crossing

As with the forcemain crossing discussed above, we have based our cost estimate on a conventional buried creek crossing.

### 6.4 Valving

Water supply from the Town of Ladysmith system to IR No. 12 will be provided by a dedicated supply line that operates at a hydraulic gradeline (HGL) of 115 metres. This line will tie-in to the existing 150 mm diameter reservoir supply line near the intersection of Oyster Sto-Lo Road and Beale Road. That reservoir supply line currently operates at an HGL of 79 metres. A pressure

reducing valve will be required to separate these two pressure zones. In addition, this supply line will need to be metered to record consumption for payment.

The existing reservoir has insufficient capacity to meet INAC requirements for domestic and fire storage. This proposed system will address that shortfall by providing additional fire flow through the dedicated supply line. A pressure reducing valve will be required adjacent to the Four Corners to enable this second supply to bypass the reservoir when system pressure drops in response to high fire flow demands. In addition, an altitude valve will be required adjacent to the reservoir to control filling and a check valve will be installed on the reservoir discharge line to ensure that there is no back-feed from the supply side into the reservoir under fire flow conditions. The proposed valving arrangement is shown on Figure 2.



## 7.0 COST ESTIMATES

The estimated cost of these proposed works is summarized as follows:

<b>Water Works</b>		
Supply Line	\$500,000	
Bush Creek Crossing	\$35,000	
Inter - Connecting Valves and Flow Meter	\$100,000	
Altitude Valve	\$50,000	
	<b>Subtotal – Water Works</b>	<b>\$685,000</b>
<b>Sewerage Works</b>		
Gravity Sewer Lines	\$120,000	
Highway Crossing	\$40,000	
Railway Crossing	\$40,000	
Lift Station	\$240,000	
Forcemain	\$500,000	
Bush Creek Crossing	<u>\$35,000</u>	
	<b>Subtotal – Sewerage Works</b>	<b><u>\$975,000</u></b>
	<b>Subtotal</b>	<b>\$1,660,000</b>
	Contingency (25%)	<u>\$415,000</u>
	<b>Construction Cost Estimate</b>	<b>\$2,075,000</b>
	Feasibility (3%)	\$65,000
	Detailed Design (7%)	\$150,000

	Construction Services (8%)	<u>\$170,000</u>
	<b>Project Budget</b>	<b>\$2,460,000</b>

This is a 'Class C' estimate that is based on a full description of the works to a conceptual design level. It is based on our local design and construction experience, recent tendered projects and reflects current market conditions. It is intended to provide sufficient information to make investment decisions and obtain preliminary project approval.



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