# ENVIRONMENTAL IMPACT STUDY OF CORE AREA WASTEWATER TREATMENT FACILITIES: TERRESTRIAL ENVIRONMENT

# Part 2: McLoughlin Point-Hartland Facilities

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June 2010

WESTLAND RESOURCE GROUP

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# Summary

This report is Part 2 of the Environmental Impact Study (EIS) of the Capital Regional District's (CRD's) Core Area Wastewater Treatment Program: Terrestrial Environment. The Part 1 EIS describes potential effects and mitigation measures of wastewater facilities in Saanich East.

In compliance with provincial directives to institute secondary treatment of wastewater, the CRD is developing plans for treatment facilities to serve the CRD's core area. The facilities will treat wastewater flows from Victoria, Esquimalt, View Royal, Oak Bay, Saanich, Colwood, and Langford.

Following extensive engineering and planning study, in the spring of 2010 the Core Area Liquid Waste Management Committee (CALWMC) selected the McLoughlin Point site and the Hartland North site as the preferred locations for wastewater treatment facilities and determined that the existing facilities at Macaulay and Clover points will be upgraded. The sites of the McLoughlin Point-Hartland facilities and the required ancillary infrastructure are shown in Figure 3-1.

The flows from the current Macaulay Point and Clover Point catchment areas will be diverted to McLoughlin Point for treatment. Sludge will be processed at a biosolids facility built at the Hartland North site. The McLoughlin Point-Hartland facilities will also create opportunities for resource recovery including biogas, phosphorous, dried biosolids to be used as a fuel substitute, and effluent heat recovery.

The McLoughlin Point-Hartland facilities (Figure 3-1) will include:

- the Macaulay and Clover Point facilities, which will screen, remove grit, and pump the wastewater to the McLoughlin Point treatment facility,
- the McLoughlin Point facility, which will treat and discharge the liquid effluent and provide opportunities for effluent heat recovery,
- the Hartland North facility, which will anaerobically digest, dewater, and dry the solids and recover resources including biogas, dried biosolids, and effluent heat,
- underground tanks in the Saanich East-North Oak Bay area to attenuate high wastewater flows, and
- ancillary facilities, primarily pipes to convey wastewater between the facilities and to an outfall to be constructed at McLoughlin Point.

The system configuration forms the basis of amendments to the CRD's *Core Area Liquid Waste Management Plan*, submitted to the provincial government in December 2009 and June 2010. The Ministry has mandated that an Environmental Impact Study (EIS) of the selected sewage

treatment facility sites be submitted. This EIS has been prepared to comply with that requirement.

An EIS of the marine outfall and effluent discharge will be prepared and submitted when studies are completed in mid-2011.

This report describes the environmental effects of the construction and operation of the facilities on the following topics, as specified in terms of reference for the EIS developed jointly by the CRD and the Ministry of Environment:

- Geotechnical conditions,
- Hydrology and water quality,
- Vegetation,
- Wildlife and wildlife habitat,
- Fish,
- Air quality,
- Archaeology and heritage,
- Land use,
- Traffic,
- Noise, vibration, and lighting,
- Human health,
- Visual aesthetics, and
- Site contamination.

The EIS identifies potential impacts of the treatment facilities and ancillary facilities, and recommends mitigation measures as appropriate.

The methods applied in conducting the study are described in detail in Section 4. In general terms, the EIS is based on:

- a review of available literature on wastewater facility construction and operation,
- field inspections of the sites, ancillary facility routes, and surrounding areas,
- analysis of plans and reports prepared by municipalities and major institutions covering land use, environmental, and other specified topics,
- discussions with staff of local governments and major land-owning institutions, and
- direction provided by the CALWMC.

The McLoughlin Point facility and the Saanich East attenuation tanks will provide opportunities to recover heat from wastewater. Sludge will be pumped to the Hartland biosolids facility,

where it will undergo thermophilic anaerobic digestion, dewatering, and drying. This process produces methane, which can be used on-site or cleaned and injected into the natural gas distribution system, and a Class A biosolid that can be used as a soil amendment or a fuel. Using either trucks or barges, the CRD will transport the dried biosolids to Vancouver, where they will be burned in cement kilns as a coal substitute.

Construction impacts are examined separately from impacts of facility operation. Construction activities includes site clearing, grading, excavation, foundation work, building construction, equipment installation and testing, commissioning of the facility, and landscaping or site restoration. Operations include day-to-day functioning of the treatment facilities and ancillary facilities, including routine maintenance.

Project-related impacts identified in the EIS are described according to their:

- spatial extent (area affected),
- temporal extent (duration),
- reversibility,
- magnitude, and
- significance.

Tables 1-1 to 1-4 summarize the impact significance ratings for the various topics assessed for each facility site. Tables 1-5 to 1-6 summarize the ratings for the ancillary facility routes[1]. Most of the project-induced effects can be reduced to less than significant levels using mitigation measures that are standard practice. In seven cases, enhanced mitigation measures will be required to reduce project effects to a less than significant level.

[1] The conveyance pipes between the McLoughlin Point facility and the Hartland North facility will be assessed once the route is finalized.

**Table 1-1. Macaulay Point – Significance of Impacts**

| Impact on: | Impact significance | | | |
|---|---|---|---|---|
| | Macaulay Point | | | |
| | Construction | | Operation | |
| | Standard practice | Enhanced mitigation | Standard practice | Enhanced mitigation |
| Geotechnical hazards | L | L | L | L |
| Hydrology and water quality | L | L | L | L |
| Vegetation | L | L | L | L |
| Wildlife | L | L | L | L |
| Fish | N/A | N/A | N/A | N/A |
| Air quality | L | L | L | L |
| Archaeology and heritage | L | L | L | L |
| Land use | L | L | L | L |
| Noise, vibration, and lighting | L | L | L | L |
| Traffic | L | L | L | L |
| Human health | L | L | L | L |
| Visual aesthetics | L | L | B | B |

**Table 1-2. Clover Point – Significance of Impacts**

| Impact on: | Impact significance | | | |
|---|---|---|---|---|
| | Clover Point | | | |
| | Construction | | Operation | |
| | Standard practice | Enhanced mitigation | Standard practice | Enhanced mitigation |
| Geotechnical hazards | L | L | L | L |
| Hydrology and water quality | L | L | L | L |
| Vegetation | L | L | L | L |
| Wildlife | L | L | L | L |
| Fish | N/A | N/A | N/A | N/A |
| Air quality | L | L | L | L |
| Archaeology and heritage | L | L | L | L |
| Land use | L | L | L | L |
| Noise, vibration, and lighting | L | L | L | L |
| Traffic | L | L | L | L |
| Human health | L | L | L | L |
| Visual aesthetics | L | L | L | L |

| | | |
|---|---|---|
| S = | Significant | The identified effect would have characteristics that render it unacceptable to the public, regulators, other interests, or that exceeds standards or contravenes legal requirements. |
| L = | Less than significant | Effects that are not considered significant. |
| B = | Beneficial | The resource or topic under study would be improved as a result of project effects. |
| N/A = | Not applicable | |

**Table 1-3. McLoughlin Point – Significance of Impacts**

| Impact on: | Impact significance | | | |
|---|---|---|---|---|
| | McLoughlin Point | | | |
| | Construction | | Operation | |
| | Standard practice | Enhanced mitigation | Standard practice | Enhanced mitigation |
| Geotechnical hazards | L | L | L | L |
| Hydrology and water quality | B | B | L | L |
| Vegetation | L | L | L | L |
| Wildlife | L | L | L | L |
| Fish | N/A | N/A | N/A | N/A |
| Air quality | L | L | S | L |
| Archaeology and heritage | L | L | L | L |
| Land use | L | L | L | L |
| Noise, vibration, and lighting | L | L | L | L |
| Traffic | S | L | L | L |
| Human health | L | L | L | L |
| Visual aesthetics | L | L | L | L |

**Table 1-4. Hartland North – Significance of Impacts**

| Impact on: | Impact significance | | | |
|---|---|---|---|---|
| | Hartland North | | | |
| | Construction | | Operation | |
| | Standard practice | Enhanced mitigation | Standard practice | Enhanced mitigation |
| Geotechnical hazards | S | L | L | L |
| Hydrology and water quality | L | L | L | L |
| Vegetation | S | L | L | L |
| Wildlife | L | L | L | L |
| Fish | N/A | N/A | N/A | N/A |
| Air quality | L | L | S | L |
| Archaeology and heritage | L | L | L | L |
| Land use | L | L | L | L |
| Noise, vibration, and lighting | L | L | L | L |
| Traffic | S | L | L | L |
| Human health | L | L | L | L |
| Visual aesthetics | L | L | L | L |

| | | |
|---|---|---|
| S = | Significant | The identified effect would have characteristics that render it unacceptable to the public, regulators, other interests, or that exceeds standards or contravenes legal requirements. |
| L = | Less than significant | Effects that are not considered significant. |
| B = | Beneficial | The resource or topic under study would be improved as a result of project effects. |
| N/A = | Not applicable | |

**Table 1-5. Macaulay Point to McLoughlin Point ancillary facilities – Significance of Impacts**

| Impact on: | Impact significance | | | |
|---|---|---|---|---|
| | Macaulay Point to McLoughlin Point ancillary facilities | | | |
| | Construction | | Operation | |
| | Standard practice | Enhanced mitigation | Standard practice | Enhanced mitigation |
| Geotechnical hazards | L | L | L | L |
| Hydrology and water quality | L | L | L | L |
| Vegetation | L | L | L | L |
| Wildlife | L | L | L | L |
| Fish | N/A | N/A | N/A | N/A |
| Air quality | L | L | L | L |
| Archaeology and heritage | L | L | L | L |
| Land use | L | L | L | L |
| Noise, vibration, and lighting | L | L | L | L |
| Traffic | L | L | L | L |
| Human health | L | L | L | L |
| Visual aesthetics | L | L | L | L |

**Table 1-6. Clover Point to McLoughlin Point ancillary facilities – Significance of Impacts**

| Impact on: | Impact significance | | | |
|---|---|---|---|---|
| | Clover Point to McLoughlin Point ancillary facilities | | | |
| | Construction | | Operation | |
| | Standard practice | Enhanced mitigation | Standard practice | Enhanced mitigation |
| Geotechnical hazards | L | L | L | L |
| Hydrology and water quality | L | L | L | L |
| Vegetation | L | L | L | L |
| Wildlife | L | L | L | L |
| Fish | N/A | N/A | N/A | N/A |
| Air quality | L | L | L | L |
| Archaeology and heritage | L | L | L | L |
| Land use | L | L | L | L |
| Noise, vibration, and lighting | L | L | L | L |
| Traffic | S | L | L | L |
| Human health | L | L | L | L |
| Visual aesthetics | L | L | L | L |

| | | |
|---|---|---|
| S = | Significant | The identified effect would have characteristics that render it unacceptable to the public, regulators, other interests, or that exceeds standards or contravenes legal requirements. |
| L = | Less than significant | Effects that are not considered significant. |
| B = | Beneficial | The resource or topic under study would be improved as a result of project effects. |
| N/A = | Not applicable | |

The following points summarize the findings of this EIS.

- Construction of the facility at McLoughlin Point provides opportunities to advance remediation of this potentially contaminated site by the current owner.
- For all of the treatment facility sites except Clover Point, facility construction will not adversely affect public use of adjacent lands. At Clover Point, construction effects on the adjacent park can be mitigated to less than significant levels.
- Odour effects at the facilities can be mitigated to less than significant levels through implementation of advanced odour treatment technology and use of redundant systems and backup power supplies.
- Construction of the McLoughlin Point facility will result in significant traffic effects on local roads, primarily caused by removal of excavated rock and delivery of concrete. Use of barges for these activities, combined with implementation of transportation management plans, can mitigate the traffic impacts to less than significant levels.
- High quality design and finish of the facilities can mitigate visual aesthetic impacts to less than significant levels.
- Effects on archaeological features are expected to be less than significant at the Macaulay Point and McLoughlin Point sites. Further investigations are needed at Clover Point, Hartland North, and along confirmed ancillary facility routes as part of the design process.
- An OCP amendment and rezoning is likely to be required for a wastewater treatment facility at the McLoughlin Point site. The Hartland North site will require rezoning before construction of the biosolids management facility. The Clover Point facility will need to comply with a covenant that restricts use of the site. The facilities at the other sites comply with plans and bylaws. The land use effects of the facilities are less than significant.
- Few vegetation or wildlife impacts will result from facility construction or operation at the McLoughlin Point, Clover Point, and Macaulay Point sites. Construction of the biosolids facility will result in significant impacts to vegetation at the Hartland North site. If the biosolids facility design can be reconfigured to avoid disturbance to the native plant communities, then the vegetation impacts can be mitigated.
- Soils, hydrology, and other geotechnical effects are less than significant in most cases, except where water quality could be improved with site redevelopment at the McLoughlin Point site, constituting beneficial effects. Poor foundation conditions at Hartland North require mitigation to avoid significant geotechnical impacts.
- No fisheries effects will occur at any of the facility sites.
- Installing ancillary pipes along Dallas Road are likely to result in significant traffic and land use disruptions. The Dallas Road route could encounter archaeological

features. Re-routing of the pipes would reduce impacts to less than significant levels, as would scheduling construction to avoid peak tourist traffic periods.

- Operation of the facilities will generate very low volumes of traffic, resulting in less than significant impacts. Construction traffic will require careful management to avoid significant traffic impacts at each of the sites.
- Potential project nuisance effects (noise, vibration, and lighting) and human health effects can be mitigated to less than significant levels at the facilities.
- The proposed McLoughlin Point-Hartland facilities are mostly on land that has been previously developed for other urban uses, and less than 1 ha of "greenfield" land will be affected. The contribution of the wastewater project facilities to the cumulative effects of developments in the region on the environment and on land use and communities is considered less than significant. Careful planning will be needed to avoid significant cumulative effects of the projects on local traffic and roads.

The EIS commits the CRD to take a variety of actions specified in the report. These actions will mitigate the impacts identified in the EIS.

Environmental and community impacts resulting from construction and operation of treatment and ancillary facilities can be effectively mitigated. The nature of the impacts and recommended mitigation measures are described in the EIS. The impacts of building and operating wastewater treatment facilities need to be considered in the context of the substantial improvements in the quality of effluent released into the marine environment by the CRD's wastewater facilities.

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# Tables

## Figures

# 1.0 INTRODUCTION

This study is Part 2 of the Environmental Impact Study (EIS) for the Core Area Wastewater Treatment Program. This part of the study describes the environmental impacts and mitigation measures on the terrestrial environment of the McLoughlin Point-Hartland facilities portion of the project. Part 1 of the study describes the Saanich East facilities.

The purposes of the EIS are to:

- describe the locations and types of wastewater treatment facilities,
- assess the potential environmental effects of facility construction and operation,
- recommend mitigation measures to avoid or reduce project effects, and
- comply with *Municipal Sewage Regulation* and Ministry of Environment requirements.

An EIS is required by the Ministry of Environment as part of the Liquid Waste Management Plan amendment process. An EIS is required for the entire Core Area Wastewater Treatment Program, and is to examine both the marine and terrestrial environments. This report presents the EIS for the terrestrial environment for the McLoughlin Point-Hartland facilities. The CRD will prepare an EIS for the marine environment that will be presented separately.

The McLoughlin Point-Hartland facilities will include:

- the Macaulay and Clover Point facilities, which will screen, remove grit, and pump the wastewater,
- the McLoughlin Point facility, which will treat and discharge the liquid effluent and provide opportunities for effluent heat recovery,
- the Hartland North facility, which will anaerobically digest the solids and recover resources including biogas, dried biosolids, and effluent heat,
- ancillary facilities, primarily pipes to convey wastewater between the facilities and to the new outfall to be constructed at McLoughlin Point[2].

### *Report contents*

A summary of the report contents is presented at the beginning of this report. This section, Section 1, presents a brief introduction to the report. Section 2 describes the process used to select facility sites and conveyance routes, public involvement in site selection, and resource recovery. Section 3 presents the project description for the McLoughlin Point-Hartland facilities.

[2] Effects of the conveyance pipes connecting McLoughlin Point and Hartland North will be assessed when further route refinement is completed.

Section 4 describes the study methods used to assess project effects. Section 5 describes the site conditions, potential project effects, and proposes mitigation measures to reduce or avoid adverse effects. Section 6 presents the cumulative effects assessment. Section 7 recommends mitigation measures and confirms the CRD's commitment. Section 8 describes the expertise of the preparers of the report. Section 9 presents a list of references used in the study.

The study topics of this EIS have been reviewed and approved by the Ministry of Environment as compliant with the *Municipal Sewage Regulation*, but there may be other effects, such as economic, that are not in the scope of this study. These effects will be discussed in other studies.

# 2.0 SITE SELECTION

In 2009, CRD consultants conducted two siting studies for wastewater treatment facilities in the core area of the CRD. The first study, completed in March, investigated land in James Bay and South Esquimalt (Westland 2009a). The second study, completed in September, reviewed land near the Victoria Harbour (Westland 2009b). This work involved collecting and analyzing geotechnical, ecological, archaeology, heritage, and land use information. These topics were studied as they relate to the technical aspects of facility operation, cost, energy consumption, resource recovery, effluent discharge, and effect on adjacent neighbourhoods. Concurrently, the CRD and its engineering consultants conducted studies of wastewater flows, biosolids treatment options, construction and operating cost, procurement, and other topics. Through these studies, land parcels suitable for wastewater treatment facilities were identified.

The following criteria were applied during the identification of candidate sites for wastewater treatment facilities:

- archaeological and heritage features are avoided,
- existing and planned land uses are compatible,
- surficial material, seismic and liquefaction risk, and site drainage and stability are suitable for facility construction and operation,
- gravity rather than pumps can be used to transport effluent, thereby conserving energy,
- adverse effects on sensitive or important habitat are avoided,
- reclaimed water and recovered energy can be used nearby,
- parcel size is adequate for a facility to serve treatment needs to 2065,
- housing, institutional structures, and school playgrounds are avoided, and
- avoiding sites that would entail excessive capital or operating costs.

After review by the Technical and Community Advisory Committee (TCAC), a committee of municipal engineers, representatives of major institutions, and the public, and consideration by the CALWMC, the Liquid Waste Management Plan (LWMP) Amendment #7 and #8 were prepared.

LWMP Amendment #8 calls for new facilities in Saanich East, Hartland North, and McLoughlin Point. The existing pump stations at Macaulay Point and Clover Point will be upgraded and expanded to include removal of grit from the waste system. Solids removed at the McLoughlin site will be pumped to digesters at Hartland North to be processed into biosolids. To ensure that the sites included in the LWMP amendment receive an environmental review, this volume of the

EIS examines the facilities at Clover Point, Macaulay Point, McLoughlin Point, and Hartland North, and their associated ancillary facilities.

## Public involvement

The CRD has been conducting a public involvement program specific to the wastewater management program since 2006. In 2009, the CRD held open houses in Esquimalt and Victoria to provide information to the public on the proposed number and types of facilities and potential siting options in those municipalities. Other public engagement initiatives have occurred in the West Shore and Saanich East. Most of these initiatives disseminate information throughout the region, and provide opportunities for the interested public to comment on the Wastewater Treatment Made Clear program. Additional public engagement sessions are planned for 2010 to share information and to consult the public about specific concerns regarding the treatment facility sites and conveyance pipes.

## Resource recovery

The CRD is investigating opportunities to recover heat and water at the McLoughlin Point-Hartland facilities. The McLoughlin Point wastewater treatment facility will provide the opportunity to recover heat as required for facility buildings and other uses. The Hartland Biosolids Management Facility resource recovery will include biogas, struvite, and dried biosolids as a fuel substitute.

# 3.0 PROJECT DESCRIPTION

## 3.1 Overview

In June 2010, the Core Area Liquid Waste Management Committee chose the McLoughlin Option as the desired system configuration for wastewater treatment in the core area of the Capital Region.

For the purpose of this report, the McLoughlin Option facilities that will be studied include:

- Macaulay Point pump station upgrade and grit removal facility,
- Clover Point pump station upgrade and grit removal facility,
- McLoughlin Point liquids wastewater treatment facility,
- Hartland biosolids management facility, and
- Ancillary (conveyance piping) facilities (excluding those linking the McLoughlin Point and Hartland North facilities).

The locations of these facilities are shown in Figure 3-1. The facilities being studied in this report are key components of the regional system and necessary to meet the objectives of the Capital Regional District *Core Area Liquid Waste Management Plan*.

Existing Macaulay Point and Clover Point pump station sites will continue to provide initial screening. Grit removal of the influent will be added to these facilities. Once the wastewater is screened and the grit is removed, the wastewater is pumped to the McLoughlin Point liquids wastewater treatment facility for secondary treatment of the wastewater. At Clover Point, flows less than three times the Average Dry Weather Flow (ADWF) will be pumped to McLoughlin Point for treatment. The rare flows exceeding three times ADWF will be screened and discharged via the long outfall at Clover Point. Secondary treated effluent from McLoughlin Point will be discharged to the Strait of Juan de Fuca through a new outfall constructed from the McLoughlin Point site to a discharge location near the existing Macaulay Point outfall.

Sludge produced during the treatment process will be pumped from McLoughlin Point via a conveyance pipeline to a biosolids facility located at Hartland North (Figure 3-1). The Hartland biosolids facility will use thermophilic anaerobic digesters to produce pathogen-free biosolids, and to generate methane gas that will be captured, scrubbed, and reused as fuel. The biosolids produced by the digester process will be dewatered to achieve 25% to 30% solids concentration. The biosolids will be then dried to 95% solids content. The dried biosolids will be stored until shipment in trucks for beneficial re-use in cement kilns on the Lower Mainland, or to other waste-to-energy facilities on Vancouver Island.

Table 3-1 provides a summary of the McLoughlin Point-Hartland facilities.

**Table 3-1. Summary of the McLoughlin Point-Hartland facilities**

| Type of facility | Locations | Facility configurations |
|---|---|---|
| Liquids processing | McLoughlin Point | Primary and secondary treatment of wastewater |
| Solids processing | Hartland North | Anaerobic digestion, dewatering, drying, and energy recovery |
| Pumping, screening, and grit removal | Clover Point | Pump upgrades inside existing structures and grit removal facilities inside a new underground structure |
| | Macaulay Point | Pump upgrades and grit removal facilities inside new structures |
| Sludge pumping | McLoughlin Point | Pump sludge to Hartland North |
| Conveyance pipes installed in trenches | Clover to Ogden Point | 1,200 mm forcemain |
| | Macaulay to McLoughlin | 1,800 mm forcemain |
| | McLoughlin to Hartland North | 200 mm treated sludge forcemain |
| | Hartland North to McLoughlin | 200 mm decant from sludge processing |
| Conveyance pipes installed in tunnels | Ogden Point to McLoughlin | 1,200 mm forcemain installed in a 3 m to 4 m diameter tunnel |

A schematic diagram of the wastewater treatment process for the McLoughlin Point-Hartland system is presented in Figure 3-2.

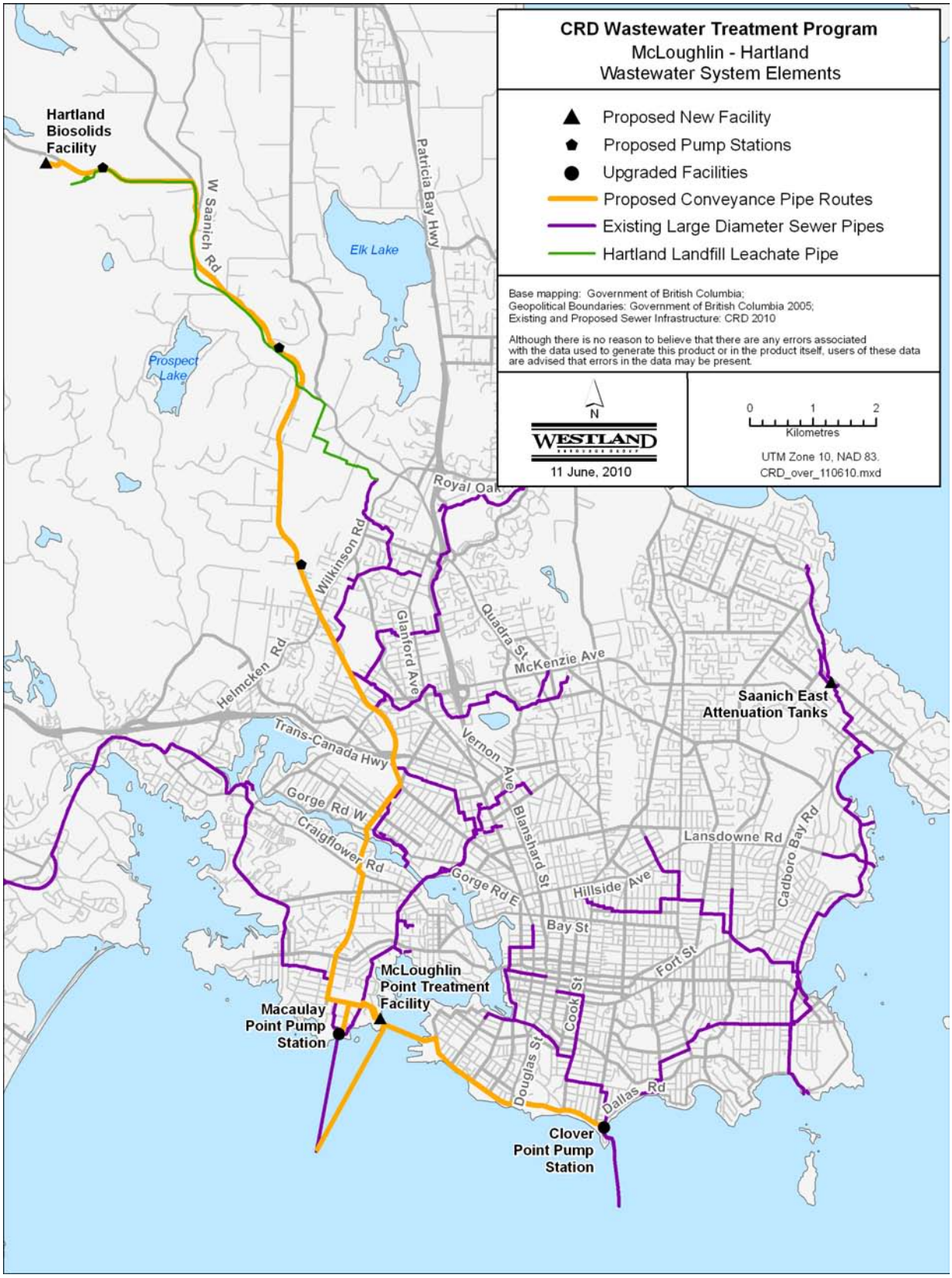


**Figure 3-1. Overview map for the McLoughlin Point-Hartland facilities**

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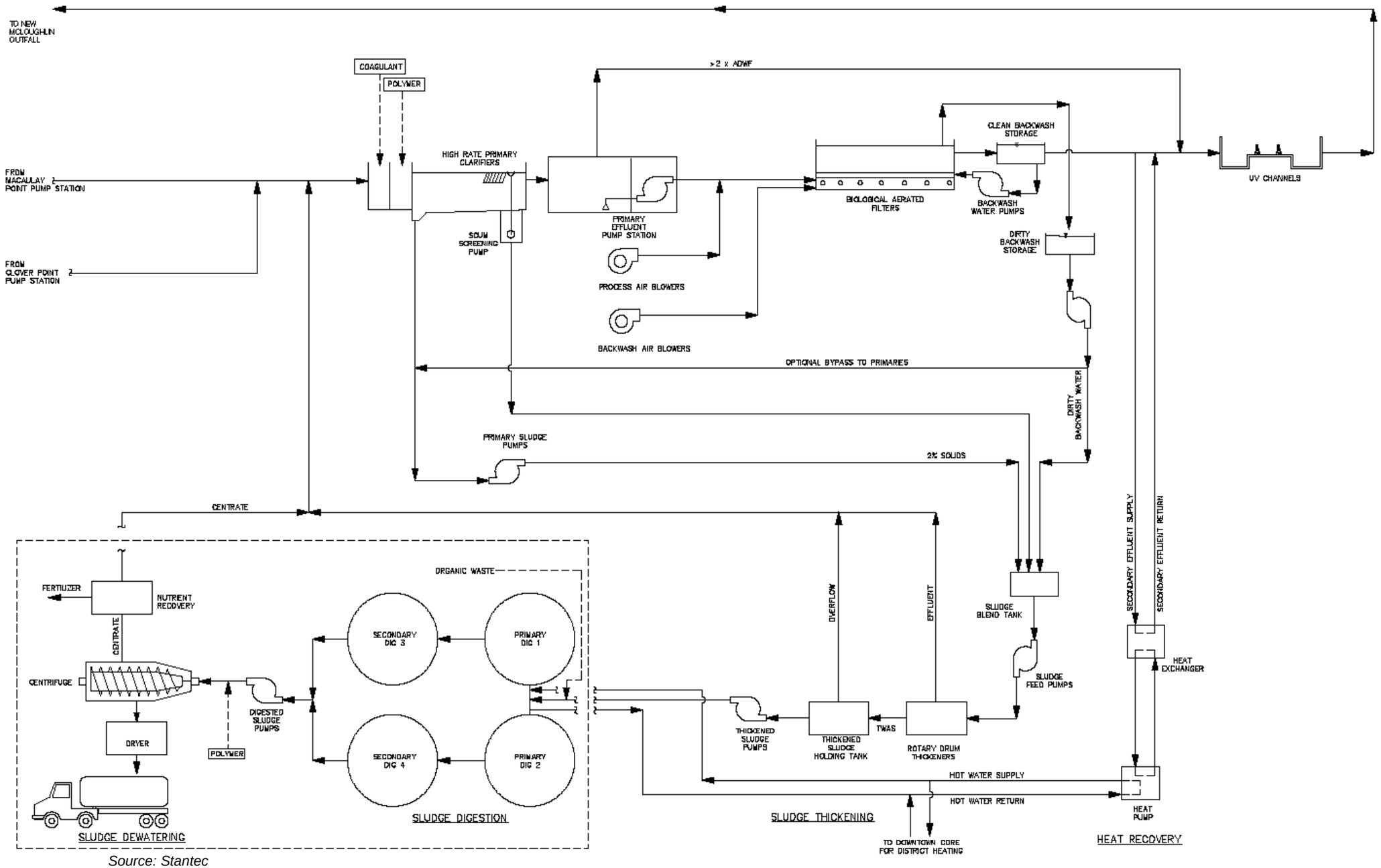


*Source: Stantec*

**Figure 3-2. McLoughlin Point-Hartland facilities – process flow diagram**

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## 3.2 McLoughlin Point-Hartland system components

### Macaulay Point and Clover Point facilities

#### *Facility site plan*

As part of the Capital Region's *Core Area Liquid Waste Management Plan*, wastewater from the existing Macaulay Point and Clover Point pump stations will be pumped to a treatment facility at McLoughlin Point. Screens at the Macaulay Point and Clover Point facilities currently remove material larger than 6 mm from the wastewater. The facilities will continue to perform this function using 6 mm screens before grit is removed by a centrifugal process. The wastewater is then pumped to the McLoughlin Point liquids wastewater treatment facility. The new grit removal facilities will be added to Clover and Macaulay locations. The screenings and grit will be transported by enclosed truck to Hartland Landfill, which is approximately 17 km northwest of the pump stations. During wet weather periods, normally October through March, flows to Clover Point exceeding three times ADWF will be screened before being discharged via the Clover Point outfall.

An expanded pump station will be constructed at Macaulay Point to convey the wastewater to the McLoughlin Point liquids wastewater treatment facility. A standby generator also will be added to the Macaulay Point facility. The Clover Point pump station will be upgraded to include new pumps to convey flows less than three times ADWF to the McLoughlin Point facility, and flows greater than three times ADWF to the outfall.

The existing screening equipment at Clover Point is adequate for the new system. However, the screens may require replacement by the time construction of the pump station upgrades is underway. The odour control system at Clover Point has recently been upgraded. Because there will be no change in volume of wastewater being pumped, the current Clover Point odour control system is considered adequate for future conditions.

### McLoughlin Point liquids wastewater treatment facility

#### *Facility site plan*

The McLoughlin Point facility site is located at the southern end of Victoria View Road in Esquimalt, British Columbia (Figure 3-3). The lands adjacent to the site are federally owned, and controlled by the Department of National Defence (DND). The McLoughlin Point site is currently a decommissioned Imperial Oil tank farm on 1.37 ha (3.46 acres) of freehold property. The facility formerly accommodated 17 fuel tanks that had a maximum storage capacity of 2.5 million litres.

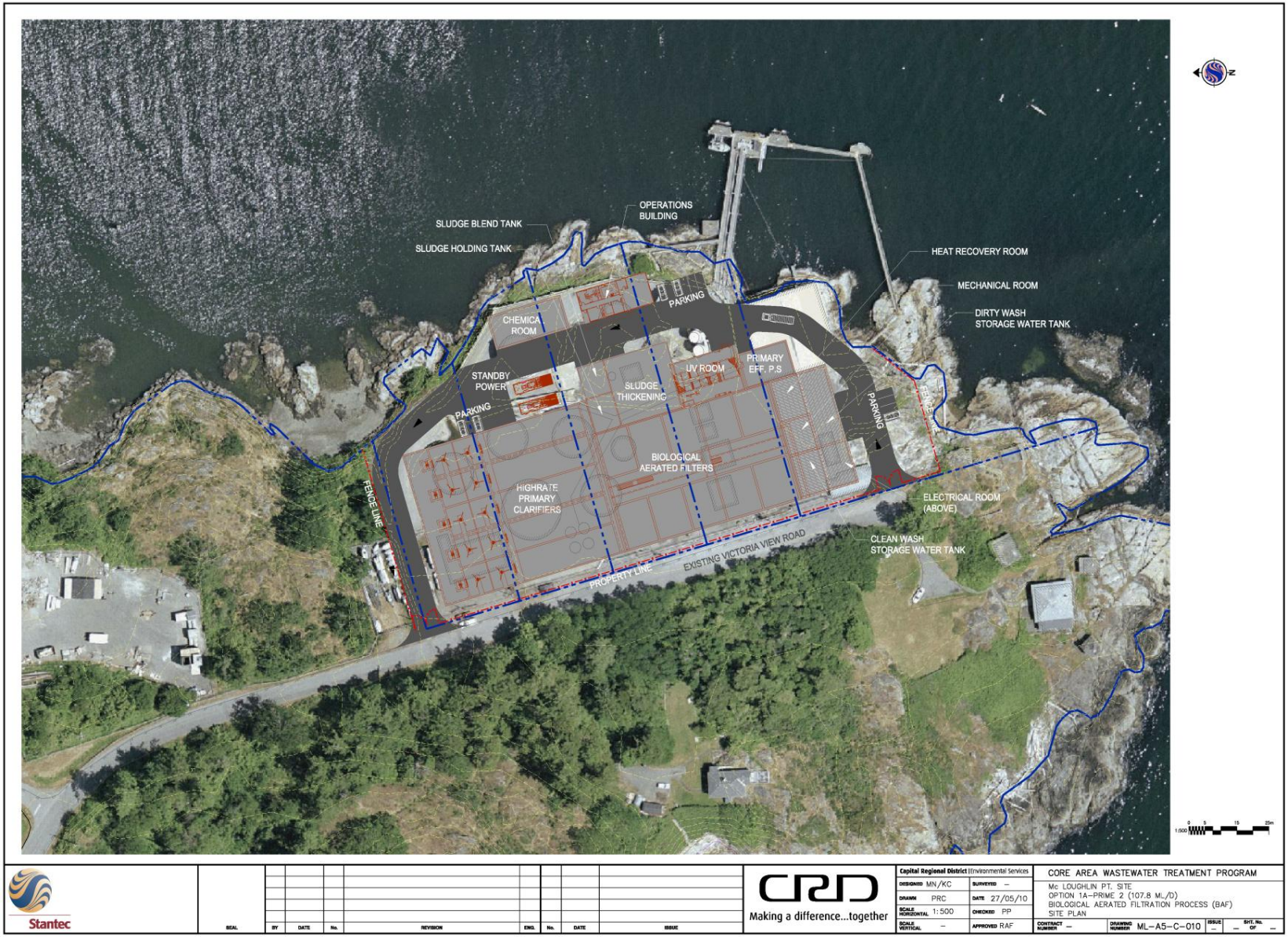
Wastewater received from the Macaulay Point and Clover Point pump stations will undergo secondary treatment at the McLoughlin Point facility. Several buildings will be constructed at

the McLoughlin Point site, and some will be located partially below ground. Some buildings will extend 5 to 10 m above grade. The facility will be designed to be attractive, and not to detract from the appearance of the area. The following treatment facilities will be constructed at McLoughlin Point:

- primary clarifiers,
- biological aerated filters (BAF),
- a blower building,
- odour control,
- heat recovery works,
- sludge thickening and pumping,
- an administration building,
- standby generators, and
- vehicle access and parking.

The equipment and treatment units that will be installed in the McLoughlin Point facility must comply with the process reliability standards set out in the British Columbia *Municipal Sewage Regulation* BC Regulation 129/99.

The sludge that is produced during the primary and secondary treatment process will be thickened and pumped to a biosolids management facility located at Hartland North. The secondary treated water will be discharged through a new outfall constructed at McLoughlin Point (Figure 3-1).




*Source: Stantec*

**Figure 3-3. McLoughlin Point facility site plan**

### *Treatment characteristics and design wastewater flows*

By convention, the McLoughlin Point facility is described by its ADWF capacity of 108 ML/d. In reality, the McLoughlin Point facility is designed to provide secondary treatment for two times ADWF of 216 ML/d and primary treatment for maximum wet weather flows of 380 ML/d. Design wastewater flows for the McLoughlin Point facility are derived from residences, industry, commercial developments, and institutional sources, as well as infiltration and inflow of surface water and ground water into the sanitary sewer systems. Details about hydraulic wastewater flows and the treatment standards for effluent from the McLoughlin Point facility are available in Table 4.5 of the Capital Regional District *Core Area Liquid Waste Management Plan - Amendment No. 8* (June 2010).

Wastewater discharge quality must meet the British Columbia *Municipal Sewage Regulation* (BC MSR), and shall not exceed the following concentrations:

- 5-day Biochemical Oxygen Demand 45 mg/L
- Total Suspended Solids 45 mg/L.

For the portion of average daily flow exceeding two times ADWF, the following standards apply:

- 5-day Biochemical Oxygen Demand 130 mg/L
- Total Suspended Solids 130 mg/L.

For all flows, pH shall be in the range of 6 to 9 pH units[3].

The McLoughlin Point facility will be designed to produce effluent that meets the proposed Federal National standards of Carbonaceous Biochemical Oxygen Demand (cBOD) of 25 mg/L and Total Suspended Solids (TSS) of 25 mg/L based on a monthly average.

## Hartland biosolids management facility

### *Facility site plan*

Sludge from the McLoughlin Point facility will be pumped through an 18 km forcemain to a biosolids management facility at the Hartland landfill (Figure 3-4). The Hartland North site is located on the south side of Willis Point Road on part of the 131.5 ha (325 acre) CRD-owned Hartland Landfill property. The site was used for storage of crushed rock and composting of

[3] Capital Regional District *Core Area Liquid Waste Management Plan- Amendment No. 8-* Draft Operational Certificate

garden waste, but is now vacant, except for some crushed rock storage on the site's western margin.

The Hartland biosolids facility will include thermophilic anaerobic digesters, where it will be stabilized to produce pathogen free biosolids. From the digesters, the biosolids will be pumped to centrifuges for dewatering to achieve 25% to 30% solids concentration, before being dried to 95% solids content. The dried biosolids will be stored in trucks or bins before shipment to cement kilns on the mainland or other waste-to-energy facilities on Vancouver Island.

The Hartland biosolids facility will consist of a series of buildings less than 8 m high (except for the digester tanks, which may be as high as 14 m above grade). The structures to be built on the site include:

- biosolids screening,
- a thermophilic anaerobic digestion complex,
- an energy and heat extraction building for biosolids management,
- a sludge dewatering building,
- thermal drying,
- receiving station for fats, oils, and grease (FOGs) and organic waste (not an enclosed building),
- an operations building,
- gas flaring units,
- phosphorus recovery facilities,
- odour control facilities, and
- a biogas treatment and scrubbing facility (not an enclosed building).

The equipment installed in the Hartland biosolids facility will comply with the process reliability standards in the British Columbia *Municipal Sewage Regulation* BC Regulation 129/99.

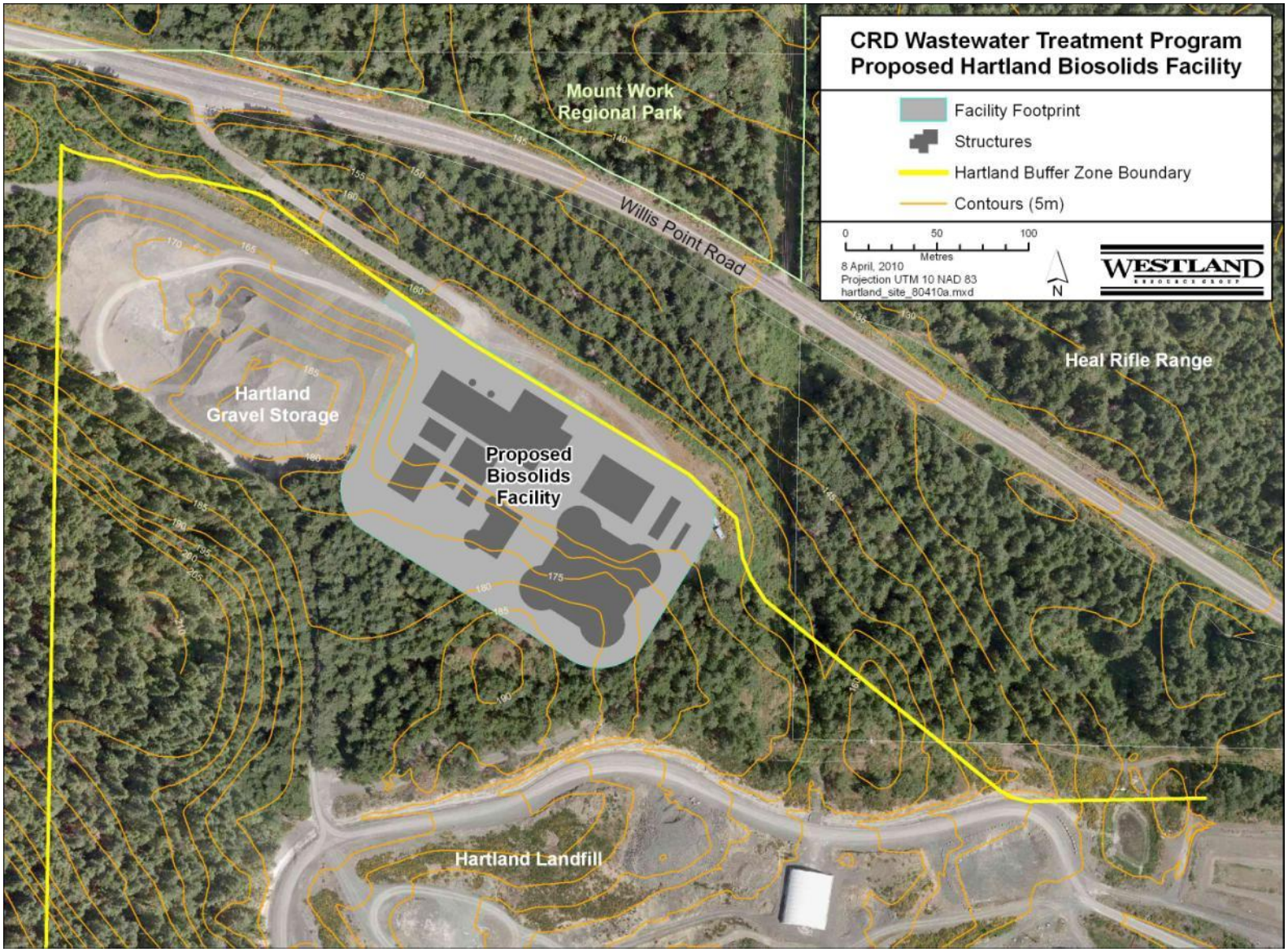



**Figure 3-4. Hartland biosolids facility site plan**

### *Resource recovery opportunities*

Processing the sludge generated by wastewater treatment will provide opportunities for beneficial use by:

- co-digesting sewage sludge combined with FOGs (fats, oils, and grease) using thermophilic anaerobic digestion to stabilize and reduce solids, kill pathogens, and generate methane gas (biogas) for use onsite or offsite in the natural gas distribution system,
- drying the digested sludge and selling the resulting biosolids as a fuel for cement kilns, paper mills, or other energy facilities, and
- extracting struvite (phosphate) from the digested biomass and using it as a fertilizer (Stantec 2009a).

## Ancillary facilities

Ancillary facilities are primarily pipes that are used to convey wastewater or related liquids for treatment, and associated pump stations and grit removal facilities. This section describes the major ancillary facilities associated with the McLoughlin Point-Hartland facilities.

#### Clover Point to McLoughlin Point

Wastewater from the Clover Point pump station will be pumped to the McLoughlin Point facility intake. The 1,200 mm diameter forcemain from Clover Point to the McLoughlin Point facility will be approximately 5 km long. The pipe will be installed in a trench along Dallas Road from Clover Point to Ogden Point, and will then be installed in a 3 m to 4 m diameter tunnel beneath the entrance to the Victoria Harbour from Ogden Point to McLoughlin Point.

#### Macaulay Point to McLoughlin Point

Wastewater from the Macaulay Point pump station will be pumped to the McLoughlin Point facility via a 1,800 mm diameter forcemain beneath Vaughan Street, Anson Street, Bewdley Avenue, Peters Street, and Victoria View Road.

#### McLoughlin Point to Hartland North

Conveyance pipeline routes connecting the McLoughlin Point and Hartland facilities are currently being finalized. It is expected that the conveyance pipelines will be built in existing road easements. No new land purchase or land clearing are anticipated for the conveyance pipelines between the McLoughlin Point and Hartland facilities. Conveyance pipelines will be below-grade for the entire route, except where they are attached to the undersides of bridges at

watercourse crossings. Pump stations will be built on land that is part of public road or other infrastructure right-of-way, though small areas of additional land may be required.

McLoughlin Point outfall

A new 1,800 mm diameter outfall to Juan de Fuca Strait will be built from the McLoughlin Point facility. The new outfall and multi-port diffuser will extend 1,700 m to a depth of 60 m below mean low water, near the end of the existing Macaulay Point outfall. Treated wastewater will be discharged uniformly through the diffuser.

Disinfection of the discharged effluent is not required at this time. Provisions will be made to include UV disinfection facilities if disinfection of the discharged secondary treated effluent is required in the future.

## 3.3 Combined sewer and sanitary sewer overflows

The CRD, in partnership with core area municipalities, will implement an inflow and infiltration (I&I) reduction program as described in Section 5 of Amendment No. 8 of the *Core Area Liquid Waste Management Plan*. The I&I reduction program will include combined system separation, a private property infiltration and inflow reduction program, and an overflow reduction plan.

## 3.4 Implementation of buffer zones

Assessment of buffer zones is required under the *Municipal Sewage Regulation*. The following section presents a discussion of available buffer zones for each facility.

### Macaulay Point facility

The upgrade to the Macaulay Point pump station will extend the facility into the paved parking area at the north of the facility and include new structures within the existing property footprint. All components in the Macaulay Point upgrades will be enclosed in buildings and include sufficient noise and odour controls to reduce or avoid nuisance effects at the property line. A public walkway and the Strait of Juan de Fuca border the site to the south. No change in adjacent DND land uses (military training and housing) is expected and no buffer zones are considered necessary.

### McLoughlin Point facility

The McLoughlin Point facility is located on private property adjacent to DND land approximately 70 m east of the nearest residence on Victoria Road. No change in adjacent land uses (military training, housing, equipment storage) is expected. Victoria Harbour borders the

site to the east and south. The treatment facilities will be designed to be suitable in a waterfront urban setting. The treatment processing equipment will be enclosed in buildings and the facility will be fenced and landscaped. Controls will be installed to ensure acceptable odour and noise levels at the property line. With these measures in place, no additional buffer zones will be required.

### Clover Point facility

The Clover Point facility will be expanded to the south of the existing pump station on a grassy slope in Clover Point Park. Ross Bay borders the site to the east. No changes in adjacent land uses (park, road, and residential) area anticipated. The new structures will be entirely underground, and no additional buffer zone will be required.

### Hartland biosolids management facility

The Hartland biosolids management facility will be designed to fit the available site at Hartland North. Most of the treatment processing equipment will be enclosed in buildings and the facility will be surrounded by fenced. Controls will be installed to ensure acceptable odour and noise levels at the property line. Because the Hartland North site is entirely CRD-owned and in a partially cleared area surrounded on three sides by forested buffer zones, no change in adjacent land uses is expected. With these measures in place, no additional buffer zones will be required.

### Ancillary facilities

No buffer zones are required for conveyance pipelines because they will be installed beneath roadways (except for bridge crossings of watercourses).

## 3.5 Provisions for controlling adjacent development

The McLoughlin Point-Hartland facilities will be designed to minimize adverse effects on nearby properties. The development of adjacent properties is managed by zoning, subdivision, and other development controls available to the Township of Esquimalt and the Department of National Defence for the McLoughlin Point facility and Macaulay Point facility. The City of Victoria controls development activities surrounding the Clover Point facility, and the District of Saanich regulates rural lands, including Hartland North. A rigorous technical review and public involvement process accompanies applications for rezoning or Official Community Plan amendments. With these land use management processes in place, no additional provisions for controlling adjacent development are considered necessary.

## 3.6 Resource recovery conservation, and reuse opportunities

Resource recovery and conservation were two of the criteria used in the planning and design of the McLoughlin Point-Hartland facilities. The CRD is investigating opportunities to recover heat energy from the treatment facilities to achieve the following CRD goals:

- reduce greenhouse gas emissions and carbon footprint,
- minimize use of electric power,
- recover biomethane for use in the region's natural gas system to improve the CRD's carbon footprint, and
- integrate the project with other programs, such as combining solid waste and fats, oils, and grease into the anaerobic digestion process.

## 3.7 Operation of the wastewater processing system

Operations include day-to-day activities and routine maintenance of the wastewater processing system. This section describes the facilities' operational transportation and traffic, and estimated noise, odour, and electricity consumption.

### Operational traffic

#### *Screenings and grit removal*

Less than 1.5 $m^3$ per day of grit and other screenings will be removed from each of the two pump station facilities. One truck will be required every five to six days for each of the two pump stations to transport screenings and grit to the Hartland Landfill.

#### *Chemicals*

Chemicals used in the wastewater treatment process at the McLoughlin Point facility will be largely inorganic materials such as polymers, caustics, coagulant chemical agents (alum, polymer), or compounds (mild acids and caustics) for cleaning treatment media. These chemicals will be delivered once per month in small to medium sized shipments (10 to 20 $m^3$) and stored at the McLoughlin Point facility in secured tanks with containment features.

An estimated 70 to 80 mg/L of alum (aluminum sulfate) will be needed for chemically assisted primary treatment, requiring approximately 10 trucks per year (22,000 L per truck). Alum will be stored in bulk storage tanks with suitable containment sumps. Alum will only be used during wet weather flow conditions (anticipated to occur during five months of the year).

The chemicals used at the Hartland biosolids facility will consist primarily of polymers to assist in the dewatering process. The phosphorus recovery process will use magnesium chloride. These chemicals will be delivered monthly and stored at the Hartland facility in secured tanks with containment features.

### *Maintenance of facility equipment*

Maintaining and servicing the equipment at the McLoughlin Point and Hartland facilities will include daily site visits and annual cleaning. Maintenance staff will visit the Macaulay Point and Clover Point facilities to complete regular maintenance. Table 3-2 summarizes the estimated operational traffic for each facility. Table 3-3 presents the starting and destination points for operational truck traffic.

**Table 3-2. Operational traffic estimates**

| Material | Macaulay Point | McLoughlin Point | Clover Point | Hartland |
|---|---|---|---|---|
| Screenings and grits transferred to the Hartland North site | 1 per 5 to 6 days | 0 | 1 per 5 to 6 days | 0 |
| Chemicals Alum | 0 | 1 per month | 0 | 0 |
| Biosolids Polymer | 0 | 1 per month | 0 | 1 per month |
| Staff and maintenance traffic | 2 per day | 12 per day | 2 per day | 6 per day |
| Dried sludge hauling from biosolids site in Hartland North | 0 | 0 | 0 | 2 per day |

*Note: At Clover Point and Macaulay Point pump stations, grit will be removed from influent by vortex chambers in the headworks, and screenings removed by the 6 mm screens before pumping to McLoughlin Point for treatment. The frequency of chemical delivery is based on one-month storage capacity being provided on site. Smaller storage capacity will result in more truck traffic.*

**Table 3-3. Operational truck traffic starting points and destinations**

| Material Transported | Starting Points | Destinations |
|---|---|---|
| Chemicals | Swartz Bay ferry terminal | McLoughlin Point site<br>Hartland North site |
| Screenings | Macaulay Point site, Clover Point site | Hartland Landfill |
| Dried sludge | Hartland North site | Swartz Bay ferry terminal (for transport to the mainland), Hartland landfill, or other sites on Vancouver Island |

## Energy use for sewer and outfall connections and biosolids management

This section provides estimates of energy use for the specified treatment functions.

### *Inflow connection to wastewater treatment facility*

Wastewater from the Clover Point pump station will be pumped to the McLoughlin Point facility through a 1,200 mm forcemain requiring approximately 1,117,000 kWhr per year. Wastewater from the Macaulay Point facility will be pumped to the McLoughlin Point facility through a 1,800 mm diameter forcemain, using 1,249,000 kWhr per year.

### *Discharge from site*

Treated effluent will flow by gravity from the McLoughlin Point facility through the 1,800 mm outfall. No pumping will be required.

### *Sludge discharge*

Sludge produced during primary and secondary treatment at the McLoughlin Point facility will be pumped to the Hartland biosolids facility for digestion. Primary sludge will have a solids concentration ranging from 3% to 4%. Secondary waste activated sludge will have a thickened concentration of 2%. Pumping the mixture of primary and secondary sludge 18 km to the Hartland biosolids facility will consume approximately 290,000 kWhr per year.

### *Biosolids treatment*

The energy required for digesting, dewatering, and drying biosolids is estimated to be approximately 12,687,500 kWhr per year, some of which will be provided from the recovered resources (heat and biogas).

### *Energy use summary*

Table 3-4 summarizes the estimated electrical energy use for the McLoughlin Point-Hartland facilities.

**Table 3-4. Estimated electrical energy requirements for the McLoughlin Point-Hartland facilities**

| Facility | kWhrs/year |
|---|---|
| Clover Point pump station | 1,117,000 |
| Macaulay Point Pump Station | 1,249,000 |
| Power required for headworks, primary treatment, secondary treatment and disinfection | 18,920,000 |
| Sludge pumping from McLoughlin Point to Hartland North | 290,000 |
| Heat Pumps | 13,325,000 |
| Biosolids management plus energy production | 12,687,500 |
| Total power requirement (treatment plus biosolids management plus energy production plus pumping) | 47,588,500 |

Based on the total power requirement for the McLoughlin Point-Hartland facilities, the total annual electrical energy cost (using today's rate of $0.08 per kWhr) is estimated to be approximately $3,807,000.

### *Carbon offsetting*

Carbon offsets will be obtained from sale of biomethane gas to the distribution system, reclaimed heat from secondary effluent for digester heating, building heating, and district heating. These offsets are outlined in the 2009 Stantec report, *Core Area Wastewater Program – Assessment of Wastewater Treatment – Biosolids Management Plan,* and will vary depending on the extent of resource recovery implemented for the project.

## Operational health and safety, and nuisance effects

### *Health and safety*

Facility operations will comply with safety criteria established by Occupational Safety and Health Administration (OSHA), Workers Compensation Board of British Columbia (WCBBC), and the National Fire Protection Association (NFPA). Operations staff will be trained to meet relevant health and safety regulations.

### *Noise*

Operation of the McLoughlin Point-Hartland facilities will generate noise from the following equipment on site:

- pumps,
- centrifuges,
- compressors,

- standby diesel power generators,
- mixers,
- process blowers, and
- fans and blowers associated with ventilation systems.

Noise at the property line of the McLoughlin Point facility and Macaulay Point facility will not exceed the levels permitted under the Township of Esquimalt's *Noise Control Bylaw No. 2677*.

Noise at the Hartland North biosolids management facility will comply with the District of Saanich *Bylaw No. 7059 for Abatement and Control of Noise*, and Clover Point facility will comply with the levels permitted under the City of Victoria *Noise Bylaw No. 03-12*.

Sound attenuation will be installed in the buildings that house noise-generating equipment and on the exhausts of diesel engines to ensure that decibel levels remain below the required level to meet Worker's Compensation Board (WCB) and Occupational Safety and Health Administration (OSHA) criteria for worker safety. Noise-generating equipment will be installed in soundproof rooms to meet these requirements.

### *Vibration*

Equipment that has the potential to vibrate will be installed on pads and vibration isolation devices to minimize transmission of vibration to adjacent buildings or roadways. Vibration will be kept within acceptable operating limits for protection of the equipment and operational staff.

The CRD, as an employer for the treatment facility, will meet the requirements of the OSHA of the *Workers Compensation Act*.

### *Lighting*

The lighting plan for the wastewater processing facilities will include normal post-top sodium vapour lighting standards similar to those on residential streets. If night work is required, higher intensity spot lighting lamps may be needed. Lighting will be directed downward and will have shields installed to prevent lighting of the night sky.

In accordance with corporate activities for environmental sustainability, facility planning and design will incorporate energy efficiency, BC Hydro "Power Smart" initiatives, and the applicable Leadership in Energy and Environmental Design (LEED™) standards for green buildings. Low energy fixtures will be used on fixtures and motion activation sensors will turn

off or reduce lighting when rooms are unoccupied. It is anticipated the facility designs will incorporate natural lighting in buildings to reduce reliance on artificial light.

## Sources of odour and odour control

### *Odour sources*

The odour sources of the McLoughlin Point-Hartland facilities are described in Table 3-5.

**Table 3-5. Odour Sources of the McLoughlin Point-Hartland facilities**

| Source | Potential odour level before treatment |
|---|---|
| **Untreated wastewater recovery area** | |
| Headworks | Strong to Very Strong |
| Chemically Enhanced Primary Treatment (CEPT) | Light to Moderate |
| Primary Clarifier | Light to Moderate |
| Headworks Odour control | Light to Moderate (chemical) |
| **Treated effluent area** | |
| Pipe Chase Gallery | Nil to Light |
| Biological Aerated Filter (BAF) | Moderate (musty) |
| Lift Station and Sludge Pumping Station | Strong |
| UV Disinfection (Future) and Effluent Pumping | Nil to Very Light |
| Odour Control | Light to Moderate |
| Blowers Building | Nil to Very Light |
| **Biosolids management facility** | |
| Digestion Complex | Light |
| Energy Recovery Building | Nil |
| De-watering Building | Strong to Very Strong |
| Drying Building | Strong to Very Strong |
| Operations Building | Nil to Light |
| Phosphorus Recovery | Strong to Very Strong |

### *Odour control*

The design of the facilities will include best management practices for minimizing release of odour, especially from untreated wastewater and sludge. With proper, attention to design details and adherence to operating procedures, routine release of odours from the treatment facility processes can be minimized by:

- the use of submerged inlets and weirs,
- eliminating turbulence in influent piping and channels,

- the elimination of physical conditions leading to the formation of turbulence,
- proper process loadings,
- containment of odour sources,
- off-gas treatment,
- good house keeping, and
- keeping access doors and buildings closed.

The McLoughlin Point-Hartland facilities will be specifically designed for the anticipated concentrations of odorous compounds. The odour control systems will include a combination of biofilters, wet chemical scrubbing systems, and dry scrubbing systems, such as activated carbon. The heights of air exhaust stacks are 6 m above ground level for the liquids treatment facilities and 10 m for solids treatment facilities.

### *Odour discharges*

Odour discharges are expressed in terms of Odour Units (OU) per hour. An OU is a measure of odour concentration and is defined as the amount of dilution with clean air required to reduce odours to non-detectable levels. The OUs are calculated by multiplying the odour concentration in the ventilation air times the ventilation airflow rate ($m^3$ per hour). Airflow rates for exhaust stacks of the central wastewater processing system facilities are estimated as follows:

- liquid treatment exhaust: 12 $m^3/s$
- biosolids processing exhaust: 7 $m^3/s$.

Table 3-6 defines the OUs and compares various odour magnitudes.

For the McLoughlin Point-Hartland facilities, the ambient odour guideline is 5 OU, not to be exceeded under the worst-case meteorological conditions. Poor meteorological conditions are characterized by calm winds and inversions that limit mixing, dispersion, and dilution of exhaust air.

The odour emission from all sources will be reduced by odour control systems before discharge to the atmosphere through exhaust stacks. The odour units that can be detected at the facility fence lines are estimated to be 5 OU. Ventilation air scrubbing of the facilities will be applied in ways that ensure that this guideline is not exceeded during normal operation and all meteorological conditions. It is expected that there will be infrequent short periods of time when odour emissions will exceed their design values during maintenance of the scrubbers. If

objectionable odours attributable to the operation of the facilities occur beyond the boundary of the sites, measures or additional works will be required to reduce odour to acceptable levels.

**Table 3-6. Odour intensity versus ambient odour concentration**

| Category Scale | Field Qualitative Odour Intensity Scale | Estimated Odour Concentration (OU) (Detection Threshold) | Typical Description of Odour |
|---|---|---|---|
| Little or no odour | If the odour activates the sense of smell, the characteristics may not be distinguishable. Usual limit of public acceptability. | ≤ 5 | None |
| Very Light | Odour activates the sense of smell but is not objectionable to most people. | > 5 to 15 | Earthy, stale, musty, chemical |
| Light | Odour is distinctive and may be objectionable to some people. | > 15 to 50 | Earthy, garbage, soil, chemical |
| Moderate | Odour is very distinct and clearly distinguishable and may tend to be objectionable and/or irritating. | > 50 to 150 | Sewer, sour, solvent, chemical |
| Strong | Odour is objectionable, would cause a person to attempt to avoid it, and could produce physiological effects during prolonged exposure. | > 150 to 1,500 | Offensive, sewer, garbage |
| Very strong | Odour is so strong it is overpowering and intolerable for any length of time and could easily produce physiological effects. | > 1,500 | Offensive, chemical, putrid, rotten, sewer, urine, septic |

*Source: Adopted from Manual of Practise No. 25, Control of Odours and Emissions From Wastewater Treatment Plants, Wat. Env. Fed., 2004, and fit to real data from wastewater treatment facility examples.*

### *Security*

After the treatment facilities are constructed, operations staff will work daily at the sites. Access to the sites will be controlled at all times. The building doors and main gates will be remotely alarmed by the CRD's supervisory control and data acquisition (SCADA) monitoring system. A combination of sturdy, but attractive, materials for fencing, lighting, and landscaping will be incorporated into the design to discourage vandalism at the facility sites.

## Drainage management

Current principles for low impact development and stormwater management will be applied to facility site planning. Storm runoff from roofs of structures will be directed to infiltration facilities where site conditions allow. Parking areas and other on-grade surfaces will be constructed using permeable pavers, or the runoff from these areas will be directed to biofiltration swales or similar facilities. If site conditions do not allow use of infiltration techniques, oil and grease separators and sediment traps will be installed to prevent contaminants from leaving the sites. Changes in offsite hydrology caused by development of the facilities will be minimized. Landscaping will incorporate pervious soils and vegetation to minimize increases in runoff caused by the facilities. Native vegetation will be used in landscaping to reduce irrigation demand.

A credit for stormwater management towards LEED™ certification will be sought by minimizing disruption of natural water flows, limiting stormwater runoff, increasing on-site infiltration, and reducing water contaminants.

## Accidents and malfunctions

Design of the new treatment facilities will include redundant features to comply with the *Municipal Sewage Regulation*, and to reduce the chance of accidents and malfunctions. During the design phase, a Hazard and Operability (HAZOP) study will be completed to identify hazardous and malfunction conditions and appropriate design consideration will be given to these conditions. The redundancy anticipated in the design includes:

- building multiple treatment trains to enable maintenance and repairs,
- installing redundant critical equipment, including pumps, blowers, and other identified critical process equipment,
- supervision of the treatment plant processes by an automated SCADA system that will include monitoring of the critical treatment process parameters, such as dissolved oxygen and effluent turbidity (alarm conditions will be indicated so that operators may take immediate corrective actions),
- development of regular maintenance programs to minimize equipment downtime, and
- provision of standby generators to maintain the treatment processes during power outages.

The CRD will develop Standard Operating Procedures for the facilities. The procedures will have emergency contingency plans for abnormal operating circumstances caused by malfunctions.

The CRD will consider preparing a Conditional Management Plan (CMP) to minimize the risk of releases of effluent that could affect marine resources, particularly shellfish. A CMP will need to be approved by the CRD, Canadian Food Inspection Agency, Fisheries and Oceans Canada, Environment Canada, and the British Columbia Ministry of Environment.

Details regarding offshore impacts of accidents and malfunctions will be provided in the marine EIS for the wastewater program.

## 3.8 Construction of the McLoughlin Point-Hartland facilities

### Construction activities

#### *Macaulay Point pump station and grit removal facility*

The construction associated with the Macaulay Point facility involves changes in existing buildings and expansion of the pump station at the front (north side) of the facility and the addition of a standby generator at the back (south side). A new grit removal structure will also be required. The new buildings will be approximately the same height as the existing facility.

#### *Clover Point pumping and grit removal facility*

A new grit removal facility will be constructed in a structure that will be underground. Construction associated with the Clover Point pump station upgrades, including two sets of new pumps and controllers, and potential replacement of the screens, will occur in the existing underground facility, and will require excavation and concrete form work.

#### *McLoughlin Point facility*

The McLoughlin Point facility site requires remediation of contamination caused by past use as a fuel storage facility. Remediation required to satisfy Provincial and Federal regulations are currently being investigated. The remediation plan will be completed in 2010, after more detailed investigations are completed. Sale of the site by Imperial Oil to the CRD is contingent on remediation of the property to meet regulatory standards.

The McLoughlin Point site is comprised primarily of bedrock. Blasting will be necessary to construct a wastewater treatment facility. The CRD will seek permission from DND to use temporary construction laydown areas on the adjacent federal lands to the north.

The McLoughlin Point facility requires the construction of deep concrete tanks, which will be founded at various elevations on the facility site. These tanks will be constructed partially above

grade to reduce rock excavation quantities. The depth of building foundations and concrete tanks varies from 0.3 m to 6 m. Other structures on the site include covered buildings to house major process equipment, an operations building, roadways, parking facilities, and fencing. A site plan showing the current planned site development is shown in Figure 3-3.

### *Hartland North biosolids facility*

The Hartland facility will require the construction of concrete tanks and buildings. Most of the construction will consist of above-grade structures. The digester tanks will be constructed partially below-grade to obtain adequate foundation bearing.

### *Ancillary facilities*

Most of the pipes required to convey wastewater and sludge (Figure 3-1) will be installed using conventional trench excavation. Excavation is usually 2 to 3 m deep for forcemains. The maximum area of disturbance for conveyance pipelines is 5 $m^2$ per metre of pipe. Exceptions are the crossing of Victoria Harbour, which will involve a tunnel from Ogden Point to McLoughlin Point, and the use of bridges to cross water bodies between McLoughlin Point and Hartland North.

## Construction schedule

During the design stage, different options for building the facilities may be considered. These methods are intended to improve the cost, time, and reliability performance of construction. The construction schedule and project milestones based on an in-service date of the fourth quarter of 2016 are presented in Table 3-7 (note this schedule is subject to revision as the project proceeds).

**Table 3-7. Construction schedule – McLoughlin Point-Hartland project**

| Task | 2010 | | | | 2011 | | | | 2012 | | | | 2013 | | | | 2014 | | | | 2015 | | | | 2016 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| McLoughlin Point site remediation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| McLoughlin Point facility design | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hartland biosolids facility design | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conveyance and pumping design | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ogden to McLoughlin tunnel design | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| McLoughlin Point outfall design | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hartland biosolids facility construction | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pump station construction at Clover, McLoughlin, and Macaulay | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ogden to McLoughlin tunnel construction | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| McLoughlin Point facility construction | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conveyance construction | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Clover Point upgrade construction | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| McLoughlin outfall construction | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Commissioning of facilities | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

## Construction traffic

Construction traffic will include delivery of equipment and supplies and transport of rock and soil. Material and equipment deliveries include 12 $m^3$ concrete trucks, trucks delivering reinforcing steel, excavation and other equipment, haul trucks, and vehicles transporting other materials. Vehicle types will include flatbed trucks, tandems, small to large delivery vehicles, cranes, excavators, and related equipment at McLoughlin Point and Hartland North.

The estimated truck traffic for concrete, steel, excavated material, and soil and fill transport during construction of the facilities are shown in Table 3-8.

**Table 3-8. Construction truck traffic estimates**

| Facility location | | Macaulay Point | McLoughlin Point | Clover Point | Hartland North |
|---|---|---|---|---|---|
| **Estimated time to completion** | | **1 year** | **3.5 years** | **1 year** | **3 years** |
| Clearing or grubbing and aggregate | Total No. of trucks required* | 20 | 63 | 20 | 60 |
| Excavation | Total No. of trucks required* | 213 | 2884 | 233 | 1,100 |
| | Peak activity per day | 13 | 60 | 13 | 13 |
| Concrete | Total No. of trucks required* | 101 | 1106 | 80 | 635 |
| | Peak activity per day | 7 | 20 | 7 | 20 |
| Reinforcing steel | Total No. of trucks required* | 4 | 23 | 3 | 23 |
| | Peak activity per day | 1 | 1 | 1 | 1 |
| Other Deliveries | Peak activity per day | 2 | 2 | 2 | 2 |

*Source: Stantec 2010*
**Truck volumes are calculated assuming a 9 $m^3$ truck.*

Rock outcrops encountered will be removed to level the site and the rock will be crushed for reuse as fill, providing the rock is not contaminated. Peak activity will be about 60 trucks per day at the McLoughlin Point site and 13 trucks per day at the other sites.

Concrete volume estimates are based on an average building height of 4 m. A 300 mm slab is assumed for all buildings. Peak activity will be approximately 7 trucks per day during concrete-pouring activities at Clover Point and Macaulay Point and 20 trucks per day at McLoughlin Point and Hartland North. It is assumed that the concrete will not be prepared on site. Table 3-9 summarizes the starting points and destinations of the trucks for construction of the facilities.

**Table 3-9. Truck traffic starting points and destinations**

| Construction | Starting Points | Destinations |
|---|---|---|
| Concrete, structural steel, reinforcing steel, and aggregates | Upper Victoria Harbour industrial area | McLoughlin Point site<br>Hartland North site |
| Pipes and equipment | Swartz Bay ferry terminal | McLoughlin Point site<br>Hartland North site |

## Labour force during construction

Table 3-10 presents the estimated labour force during construction. Some construction activities will occur simultaneously to reduce the overall construction timeline and increase efficiency. At certain times during facility construction, several work crews may be on site concurrently. The contractors and the CRD will minimize adverse effects by informing the public of construction schedules and traffic routing.

**Table 3-10. Summary of estimated construction labour force needed to build the specified wastewater facilities**

| Facility | Estimated time to completion | Construction labour force |
|---|---|---|
| Macaulay Point pump station, grit removal, and screening | 1 year | Average 22 workers per day for 1 year with a peak of 44 workers per day. |
| Clover Point pump station, grit removal, and screening | 1 year | Average 14 workers per day for 1 year with a peak of 29 workers per day. |
| McLoughlin Point liquids wastewater treatment | 3.5 years | Approximately 38,800 worker-days per year of site labour or an average of 155 workers per day and a peak of 308 workers per day during the concrete work.. |
| Hartland North biosolids management | 3 years | Approximately 39,520 worker-days per year of site labour or an average of 158 workers per day with a peak of 314 workers.. |
| Ancillary facilities (conveyance pipes and tunnels) | 1.5 years for conveyance pipes | Each conveyance construction crew could be composed of approximately 10 workers per day and a peak 15 workers per day. An average of 84 workers per day would be dispersed at the conveyance route construction sites with a peak of 169 workers per day. |
| | 2 years for Ogden Point to McLoughlin Point tunnel | Tunnel construction crew could be composed of 25 workers per day with a peak of 50 workers per day. |

*Source: Stantec 2010*

## Construction health, safety, and nuisance effects

### *Health and safety*

The construction activities will comply with safety criteria established by OSHA, WCBBC, and NFPA, and the safety manuals and instructions will be followed. Workers will be trained in health and safety requirements. Temporary safety fencing and warning signs will be installed around the construction site.

A traffic management plan will address safety, road closures, work zone speed limits, traffic disruptions, truck traffic, and access maintenance to nearby institutions and residences during construction. Flag persons will direct vehicles and pedestrians around the construction site. Construction drivers will observe speed limits and exercise caution.

### *Noise*

Proper safety procedures will be observed to ensure the noise exposure to construction workers during construction is within permitted levels. If necessary, the contractor and the CRD will install temporary safety fencing and warning signs around the construction site to inform the public of noise levels at the construction sites.

Construction activities in the City of Victoria, District of Saanich, and Township of Esquimalt must comply with the relevant municipal noise bylaws for hours of work and noise levels. Work is allowed to occur Monday to Saturday from 7 am to 5 pm, with no work on Sundays or holidays (except in an emergency).

Construction activities such as running excavation vehicles, truck deliveries, and using chainsaws, compressors, water pumps, concrete pouring pumps, rock breakers, and blasting and blasting signals will be sources of noise for nearby residents. Generally, potential noise sources can be controlled to meet noise standards at the site property lines.

### *Vibration*

Potential sources of vibration during construction include heavy equipment movement, excavator operation, blasting, and use of compactors and paving equipment.

People nearby may be affected by vibration (from construction activity such as blasting), even when vibration is only slightly in excess of perception levels. Activities causing vibration will occur only between 7 am and 5 pm Monday to Saturday. Nearby residents and businesses will be informed and advised about work periods that may cause abnormal vibration.

The Contractor must ensure that workers are not exposed to vibration in excess of the limits specified in the *Occupational Health and Safety Regulation*.

### *Dust and mud*

Construction may generate short-term localized dust with associated air quality impacts. Air emissions generated by construction include fugitive dust and equipment exhaust. Trucks will have box covers when hauling soil or other granular materials that could create dust nuisances.

During wet weather, trucks may deposit mud from excavated areas on roads off site. Onsite wheel washing facilities will be provided and street cleaning will be done if mud tracking becomes a problem.

The CRD Code of Practice for "Construction and Development Activities" will be used to minimize dust and mud impacts. Erosion and sediment control plans will be prepared and implemented during construction.

# 4.0 METHODS

This section of the EIS report outlines the data collection and assessment methods used by the study team.

## 4.1 Effects assessment criteria

The criteria applied in this study are based on industry standards for impact assessment, adapted for use in the assessment of the CRD's wastewater program. The rating of impacts under these headings focuses on mitigated impacts. The ratings assume that standard construction and operating procedures present in the project description (Section 5) will be implemented. Significance is assessed for these mitigated project effects. If additional mitigation is recommended by the consulting team (over and above that described in the project description), those "enhanced mitigation" measures are described in the text of the EIS. These additional measures are intended to further reduce identified project impacts.

Table 4-1 presents and explains the assessment criteria applied in the EIS. The criteria cover such topics as the spatial context of project impacts, temporal context, reversibility, magnitude, and significance of potential effects of project construction and operation.

**Table 4-1. Criteria used in assessing project effects**

| Assessment Criteria | | Definition |
|---|---|---|
| **SPATIAL CONTEXT location of effect** | | |
| Treatment Facility Footprint | | Land area permanently occupied by the treatment facility including buildings, parking, and access. |
| Ancillary Facility Footprint | | Land area temporarily or permanently occupied by wastewater trunks, gravity mains, forcemains, pump stations, and other associated facilities. |
| Workspace | | Areas temporarily used during construction, including equipment and material storage or vehicle access. |
| Local Area | | Lands within 250 m of the candidate site. |
| Regional Area | | The Regional Study Area (RSA) is the area in the Core Area municipalities. |
| **TEMPORAL CONTEXT of effect** | | |
| Duration (length of time a residual effect will last) | Short-term | Event duration is less than or equal to one year. |
| | Medium-term | Event duration is longer than one year but less than or equal to five years. |
| | Long-term | Event duration extends longer than five years. |
| Frequency (how often event causing the residual effect will occur) | Occasional | Event occurs intermittently. |
| | Periodic | Event occurs intermittently but repeatedly over the construction and operations period. |
| | Continuous | Event occurs continually over the assessment period. |

| Assessment Criteria | | Definition |
|---|---|---|
| Reversibility (Will identified effects cease to be a concern?) | Yes | The potential effect can be reversed. |
| | No | The potential effect cannot be reversed, despite efforts to mitigate. |
| **MAGNITUDE of the effect** | | |
| Negligible | | Potential effect is barely detectable. |
| Low | | Potential effect is below established or derived environmental standards or thresholds. |
| Moderate | | Potential effect is detectable but meets established or derived environmental or regulatory standards or thresholds. |
| High | | Potential effect exceeds established or derived environmental standards or thresholds. |
| **BENEFICIAL or ADVERSE effect** | | |
| Beneficial | | The resource or topic under study would be improved as a result of project effects. |
| Adverse | | The resource or topic under study would be worsened as a result of project effects. |
| **SIGNIFICANCE of the effect** | | |
| Significant | | The identified effect would have a combination of characteristics that render it unacceptable to the public, regulators, other interests, or that exceed standards or contravenes legal requirements. |
| Less than significant | | All other effects that are not considered significant. |

## 4.2 Data collection and analysis

This section describes the methods used to collect and analyze data for each EIS topic.

### Geotechnical hazards

Investigation of the geotechnical conditions at the sites consisted of collection and review of available information for the study area, including the BC Ministry of Energy and Mines Quaternary Geology mapping of Greater Victoria (Monahan & Levson 2000), as well as seismic hazard maps (Monahan *et al.* 2000a, Monahan *et al.* 2000b, McQuarrie & Bean 2000). Maps detailing regional terrain and bedrock geology (Muller 1980) were also reviewed. Published information was supplemented by interpretation of current and historical Provincial and Federal Government aerial photographs based on knowledge of local conditions, their engineering properties, and construction implications provided by C.N. Ryzuk & Associates. A site reconnaissance was conducted on April 9, 2010 to visually assess existing conditions at the Hartland North site.

## Hydrology and water quality

The assessment of hydrologic and water quality conditions in the study area was based on:

- review of topographic maps and orthophotos,
- review of relevant reports, and
- on-site field inspections.

Field inspections included observation of slopes and drainage on the sites. Evidence of slope instability was sought. The locations of storm drains discharging into natural drainage courses were noted, as were the effects of these discharges on flows and erosion features.

## Vegetation

A review of existing information, literature, and other data was completed before initiating fieldwork. This office-based review included the examination of aerial photographs, existing reports about the vegetation of the study areas, and sensitive ecosystem inventory mapping of the sites. The work determined the extent of natural vegetation on the sites and the variability in vegetation composition.

Information about rare and endangered plant species and plant communities was obtained from the Conservation Data Centre (CDC) online database (BC CDC, 2008). This information and any Element Occurrence Reports (EOR) for each site were reviewed to determine whether rare plants or rare plant communities have been recorded on the sites or their ancillary facilities. Information provided through interviews with knowledgeable people from the Capital Regional District (CRD) and the Department of National Defence (DND) was incorporated into the baseline data.

Field visits were conducted to determine vegetation composition and distribution of the existing vegetation features of the sites and the associated ancillary facilities

The following information was collected at the site:

- canopy cover (dominant tree species),
- shrub cover (dominant tall and low shrubs), and
- groundcover (dominant herbaceous species).

A “Site Inventory and Conservation Evaluation” was completed for each site and associated ancillary facilities using standard "Develop With Care" checklists (MOE 2006). During site visits, all categories outlined in the protocol were assessed, but only topics relevant to the study sites are presented in this EIS.

## Wildlife and wildlife habitat

Information was compiled about wildlife use and habitats at each site and associated ancillary facilities. Information sources consulted include CDC element occurrences, Sensitive Ecosystem Inventory (SEI), Victoria Natural History Society database of important wildlife habitats, and other literature. The sites were characterized using aerial photography, topographic data, and SEI mapping before fieldwork was conducted.

Field visits were conducted at each site and associated ancillary facilities to document wildlife use, evaluate habitat conditions, and record wildlife habitat features. A "Site Inventory and Conservation Evaluation" was completed for each site and its ancillary facilities using standard "Develop with Care" checklists (MOE 2006).

## Air quality

### McLoughlin Point and Macaulay Point

For the McLoughlin Point and Macaulay Point sites, University of Victoria climatologist Dr. Stan Tuller combined hourly wind and temperature data from the Esquimalt Harbour with cloud cover and cloud ceiling height from the Victoria International Airport, for the five years 2004 and 2008, to provide an input file for the U.S. Environmental Protection Agency's (EPA's) RAMMET atmospheric dispersion model.

Atmospheric stability was estimated indirectly from the time of day and local measurements of wind speed, cloud cover and cloud ceiling height using meteorological pre-processors (special software that processes meteorological data and converts it into a form used in atmospheric dispersion models) such as the RAMMET package.

Odour modeling was conducted using the EPA ISC-PRIME atmospheric dispersion model to estimate the maximum off-site odour concentrations that may result from adverse meteorological conditions. The five years of meteorological data (discussed above) and the ISC-PRIME complex terrain option were used to estimate plume elevated-terrain interactions. The output from the ISC-PRIME model was processed in a graphical post-processor to create an overlay of odour isopleths onto a Google Earth map of the site and the surrounding communities. The odour isopleths show the maximum 10-minute odour concentrations that may occur during the 5-year period represented by the meteorological data file.

### Hartland North

For the Hartland North site, Dr. Stan Tuller extracted nocturnal drainage wind data from meteorological data recorded at the Victoria Airport, located 18 kilometres north of the site on the Saanich Peninsula. The date extraction was based on evening clear-sky, low-wind events

when there was a definite indication of a wind direction shift from a daytime sea breeze to an evening land breeze.

Atmospheric stability was estimated indirectly from the time of day and local measurements of wind speed, cloud cover and cloud ceiling height using meteorological pre-processors (special software that processes meteorological data and converts it into a form used in atmospheric dispersion models) such as the RAMMET package.

An odour assessment for the Hartland site was conducted in 2004 as part of an Environmental and Social Review (ESR) of Capital Regional District Candidate Biosolids Facility Sites. Odour dispersion modeling was carried out, assuming worst-case (full build-out at year 2045) odour emissions and worst-case meteorology. Odour was measured by sampling discrete volumes of air, testing for the presence of particular compounds in the air, and measuring the compounds against some standard, typically an odour recognition concentration. When odour pollutants are known, this is a good method for determining presence of the odour and treatment efficiencies. Since the numbers of odour compounds are numerous, olfactory measurement is a better substitute for testing for the presence of odour. This approach requires similar discrete sampling but the presence of odour and related characteristics is determined by a panel of trained odour analysts using "sniff" technologies. This information is reported in dilutions to threshold (D/T) and recognition threshold (R/T), intensity (relative to a standard compound), persistence (hang time), odour character, and pleasantness (hedonic tone) rated as pleasant to neutral to unpleasant.

The D/T is considered an odour unit concentration or odour units/$m^3$, (OU/$m^3$) and is useful in measuring the presence of odour. An odour unit is defined by the number of times the foul air that should be treated with odourless air to reach the desired odour threshold. The odour threshold is defined as the concentration of a gaseous substance that would be discerned from odourless air by at least half of an odour panel.

## Archaeology and heritage

In 2008 and 2009, AOA studies were conducted for the Victoria Harbour, South Esquimalt, and James Bay areas by Bastion Group Heritage Consultants. The results of the studies were published in *James Bay-South Esquimalt Siting Investigations for Wastewater Treatment Facilities* (Westland 2009a) and *Land Suitability for Anaerobic Digesters in Victoria Harbour* (Westland 2009b). The James Bay-South Esquimalt study reviewed archaeological and heritage reports and databases, maps and aerial photographs, and archaeological potential mapping produced by the BC Archaeology Branch. The Victoria Harbour study was conducted using the same methods as the James Bay-South Esquimalt study. Results of these studies were used to assess potential archaeological and heritage impact of construction near McLoughlin Point and Macaulay Point as well as impacts of construction of the ancillary facilities from Clover Point to McLoughlin Point, and Macaulay Point to McLoughlin Point.

Under permit from the Heritage Conservation Branch, Millennia Research Ltd. (Millennia), a Victoria based professional archaeology company, conducted an Archaeological Impact Assessment (AIA) of the McLoughlin Point facility site and an archaeological overview assessment (AOA) of the Hartland facility site. The study reviewed archaeological and heritage reports and databases, maps and aerial photographs, and archaeological potential mapping produced by the BC Archaeology Branch. Field inspections were completed as part of the AIA and AOA to verify the location of known or potential sites or features and, in the case of the AIA, to conduct an impact assessment of their condition. Members of the Songhees and Esquimalt First Nations assisted in some field reconnaissance components of the study.

A series of hand excavated subsurface tests (shovel tests) were conducted on January 4, 2010 in Clover Point Park. No tests were conducted at the northern end of the project footprint as the current City of Victoria permit limited testing 1.2 m below surface and the slope indicated that considerable fill was present suggesting it was unlikely that hand tests would reach original ground. Although it was considered unlikely that hand testing would identify an aboriginal trench feature known to exist in the area, the testing was intended to identify any other cultural materials or features, if present.

Background research for the Hartland North site included collecting information on known archaeological sites and archaeological potential within and adjacent to the study area from the Remote Access to Archaeological Data (RAAD) online application maintained by the BC Archaeology Branch, and the library held in-house at Millennia Research. The Archaeology Branch Archaeological Report Library was accessed and searched for any archived projects conducted within the study area and the internet was used to obtain heritage and historical information about the study area. A Preliminary Field Reconnaissance (PFR) at the Hartland North site was conducted by archaeologist Vashti Thiesson from Millennia Research on April 9, 2010. The Hartland North site was examined for archaeological potential. Notes were taken and a photographic record of the PFR was created.

## Land use

The land use section of this EIS builds on information collected for the siting analyses, which included a review of existing planning documents, site visits, and discussions with representatives of the Township of Esquimalt, City of Victoria, Capital Regional District, District of Saanich, and the Department of National Defence to understand existing and planned land uses and potential impacts of the wastewater treatment facilities.

The preparation of this EIS involved a review of the latest versions of relevant land use plans, including:

- City of Victoria Official Community Plan,
- Township of Esquimalt Official Community Plan,
- Macaulay Point Natural Areas Management Plan,
- Beacon Hill Park Heritage Landscape Management Plan,
- Victoria Harbour Plan,
- Rural Saanich Local Area Plan,
- District of Highlands Official Community Plan,
- Comprehensive Community Development Plan for Willis Point,
- CRD Solid Waste Management Plan, and
- Municipal zoning bylaws

News articles, media releases, letters to the editor, and information on other community initiatives were also reviewed to understand the regional and local context.

Discussions were held with municipal planners, engineers, park managers, and representatives from CFB Esquimalt, Department of National Defence to understand development plans, concerns, potential impacts, and appropriate mitigation measures.

Colour ortho-photography was reviewed and visits to the sites were conducted by the report authors to confirm the use of the sites and adjacent land by the property owner, by local residents, and by other users. These visits were undertaken numerous times and during various seasons. The most recent visits occurred during December 2009 to April 2010. The proposed routing for the ancillary facilities was reviewed in ortho-photos and site visits to accessible areas.

## Traffic

The tasks associated with the traffic impact assessment were as follows:

- Determine the existing vehicular volumes on preferred routes for the facility sites, including accident histories when available and bus service,
- Identify an order of magnitude of current pedestrian and bicycle traffic in the transportation corridors of the preferred routes,
- Forecast the type and amount of traffic that would be generated by the project for both the construction and operation time frames and identify any relevant transportation and traffic related issues,

- Determine the impact of installing the ancillary conveyance pipes under the road surface for the various options,
- Review current and future roadway cross-section data on preferred access routes,
- Assess the level of impact on affected neighbourhoods and road users, and
- Identify potential mitigation measures to reduce or avoid traffic impacts.

To conduct the aforementioned tasks, data was obtained using the following methods:

- Reviewed relevant traffic flow data, plans, and reports from the CRD, the affected municipalities, and other sources, including transportation sections of Official Community Plans (street functional classification, traffic flow maps, and truck route bylaw maps),
- Inspected the relevant routings and road system, and affected neighbourhoods during several site visits,
- Acquired additional vehicular data, as required,
- Used an assumed growth rate of 1% per annum to forecast traffic volumes to the current year (if necessary) and Horizon Year 2016 when the facilities are schedule to be fully operational, and
- Calculated PM peak hour volumes as either a percentage of the forecasted historical daily volumes or the results from surveys that were conducted in 2009. Where there were variations in traffic volumes along a road, the highest volumes were used for the analysis.

## Visual aesthetics

This report's visual assessment provides a subjective comparison of changes in the attractiveness of locations resulting from development or other changes to the landscape. The assessment considers the degree of landscape modification and the compatibility of new structures with surrounding landscape features. Modifications may include the removal of existing trees and shrubs, changes to slopes, and the addition of roads, buildings, lighting, and other utility structures. These visual elements are considered in the assessment in comparison with present conditions.

Visual assessment is a subjective exercise. People's aesthetic sensibilities and tastes are unique, though there are several common aesthetic preferences:

- natural landscapes tend to be favoured over built landscapes,
- complex natural landscapes are generally preferred over simple landscapes, for example, trees and mountains versus a prairie, and

- residential and similar urban landscapes are generally preferred over industrial landscapes.

These general aesthetic preferences have been used in this study to support the assessment of positive and adverse visual impacts of development on a site.

Sites for wastewater facilities were visited in person and were viewed using online map tools, specifically Google Streetview and Bing Maps "Birds Eye View". These tools and field visits were used to identify key viewpoints. Photographs of the sites were used as a base to refine and better identify key viewing areas. Photographs were also taken of the sites from key viewpoints for detailed visual analysis.

Three-dimensional digital perspective models were developed of the proposed facilities for McLoughlin Point to help to assess the visual impact of the treatment facilities and the potential effectiveness of mitigation. The models were superimposed on digital photographs taken from key viewpoints by the study team. The rendered images are a graphic representation of how the proposed facilities might look from different viewpoints.

# 5.0 SITE CONDITIONS AND IMPACT ASSESSMENT

This section presents the results of an assessment of the relevant environmental and social effects associated with the construction and operation of the McLoughlin Point-Hartland wastewater treatment facilities. The following topics are assessed:

- geotechnical conditions,
- hydrology and water quality,
- vegetation,
- wildlife and wildlife habitat,
- fish,
- air quality,
- land use,
- archaeology and heritage,
- land use,
- traffic,
- noise, vibration, and lighting,
- human health,
- visual aesthetics, and
- site contamination.

Each topic is assessed for potential effects associated with the construction and operation of the treatment facilities and associated ancillary facilities. Mitigation measures are recommended to reduce or avoid adverse effects, and the magnitude, temporal extent, spatial extent, reversibility, and significance are evaluated. Table 4-1 in the Methods section provides definitions of the assessment criteria.

## General site descriptions

### *Macaulay Point*

The Macaulay Point property is located on a 0.34 ha (0.83 acre) site at the southwest corner of Anson Street and Vaughan Street in Esquimalt, British Columbia (Figure 5-1). Land owned and utilized by the federal Department of National Defence (DND) surrounds the site to the west, north, and east. Macaulay Point Park, approximately 50 m to the west, is a public park situated on federal lands leased to the Township of Esquimalt. The waters of the Juan de Fuca Strait,

which abut Victoria Harbour, lie several meters to the south of the site. The property is owned by the Capital Regional District and zoned "Industrial" by the Township of Esquimalt.


**Figure 5-1. Oblique View of Macaulay Point Pump Station looking north**

*Image source: Bing Maps*

### *Clover Point*

The Clover Point property is located on a prominent point of land that extends south of Dallas Road between Moss Street and Bushby Street in the City of Victoria (Figure 5-2). The adjacent land to the west of the site is Clover Point Park. The residential neighbourhood of Fairfield is north of the site across Dallas Road. The shoreline of the Juan de Fuca Strait is to the east and south of the site. The existing wastewater facility property is owned by the City of Victoria and leased to the CRD. A protective covenant restricts use of the site.

Clover Point Park is extensively used by the public for walking, running, and dog walking. A paved multi-use waterfront walkway parallels Dallas Road. The park is a popular scenic viewpoint for the public and visitors, a staging area for kite flying, and a key access point to the rocky beach and shoreline.


**Figure 5-2. Oblique view of Clover Point Pump Station looking north**

*Image source: Bing Maps*


**Figure 5-3. Oblique view of Clover Point Pump Station access looking west**

*Image source: Bing Maps*

### *McLoughlin Point*

The McLoughlin Point site is approximately 700 m northeast of the Macaulay Point pump station in Esquimalt, British Columbia (Figure 5-4). The McLoughlin Point site is a decommissioned Imperial Oil tank farm on 1.4 ha (3.46 acres) of freehold property bounded on the north and west by federal Department of National Defence (DND) land. The facility formerly accommodated 17 oil tanks with maximum storage capacity of 2.5 million litres. The land is zoned "Industrial" by the Township of Esquimalt.

Victoria View Road runs north-south, immediately west of the McLoughlin Point site. The federal DND property extends north and west from Victoria View Road towards Macaulay Point. Victoria Harbour bounds the site to the east and south.


**Figure 5-4. McLoughlin Point site from south**

### *Hartland North*

The 2 ha Hartland North site is located on the south side of Willis Point Road on part of the 131.5 ha (325 acre) CRD-owned Hartland Landfill property. The Hartland North site is zoned *P-10 Waste Management Zone* by the District of Saanich. This zone permits "the use of land, buildings or structures for receiving, handling, sorting, landfilling, composting, recycling and processing solid waste and recyclable materials and accessory uses and, without limiting the

generality of the foregoing, includes any use of land, buildings, or structures permitted in a Solid Waste Management Plan" (District of Saanich 2003, pp. 2-10). The CRD Solid Waste Management Plan describes this parcel as an area for composting activities (Capital Regional District 1995). The Hartland North site was used for composting of garden waste, but is now vacant. Because of the industrial-type landfill activities that take place on the CRD landfill property, public access is generally restricted. A locked gate at the Willis Point Road entrance restricts public access to the Hartland North site.

A portion of the Hartland North site is cleared of forest cover and was previously used to compost garden waste. The remaining portion of the site has mature second-growth forest along a steep, rocky bluff (Figure 5-5) that is identified as a "Treed Protected Area" to be retained as a visual buffer (Capital Regional District 2004).


**Figure 5-5. Aerial view of Hartland North site**

*Image source: Bing Maps*

## Ancillary facilities site description

### *Clover Point to McLoughlin Point*

Screened wastewater from the Clover Point pump station and grit removal facility will be pumped to the McLoughlin Point facility intake. The 1,200 mm forcemain from Clover Point to the McLoughlin Point facility will be approximately 5 km long. The pipe will be installed in a

trench along Dallas Road from Clover Point to Ogden Point and in a 3 m to 4 m diameter tunnel beneath the entrance to the Victoria Harbour from Ogden Point to McLoughlin Point.

### *Macaulay Point to McLoughlin Point*

Screened wastewater from the Macaulay Point pump station and grit removal facility will be pumped to the McLoughlin Point facility via a 1,800 mm forcemain below road rights-of-way under Vaughan Street, Anson Street, Bewdley Avenue, Peters Street, and Victoria View Road.

### *McLoughlin Point to Hartland North*

Two forcemains will be constructed between the McLoughlin Point and Hartland North facilities. Sludge from the McLoughlin Point facility will be conveyed via a 200 mm diameter pipeline to the Hartland facility by pumping. A 200 mm pipe from the Hartland facility will convey decant liquid from sludge processing to the McLoughlin Point facility for further treatment. Preliminary designs call for the conveyance pipes to be installed beneath the following roads:

- Victoria View Road,
- Peters Street,
- Bewdley Avenue,
- Lampson Street,
- Craigflower Road,
- Tillicum Road,
- Burnside Road West,
- Interurban Road,
- West Saanich Road,
- Wallace Drive, and
- Willis Point Road.

These 18 km forcemains will be below-grade for the entire conveyance route, except where they cross waterbodies on bridges. Three pump stations will be built. The pump stations are located adjacent to:

- Interurban Road,
- West Saanich Road, and
- Willis Point Road.

#### *McLoughlin Point outfall*

A new 1,800 mm diameter outfall will be built from the McLoughlin Point facility to Juan de Fuca Strait. The new a multi-port diffuser will extend 1,700 m to a depth of 60 m below mean low water, near the end of the existing Macaulay Point outfall. Treated wastewater will be discharged uniformly through each of 28 ports located along the 150 m long diffuser. A 336 m emergency bypass outfall at Macaulay Point is used when station capacity is exceeded during wet weather flows.

## 5.1 Geotechnical conditions

### Earthquake and tsunami risk in Greater Victoria

Vancouver Island is in the Cascadia Subduction Zone and is susceptible to major earthquakes of magnitude 9.0 or greater. In response, current building codes require that facilities be designed to withstand at least 1 in 2,000 year earthquake events.

Earthquakes in the Cascadia Subduction Zone are the main tsunami threat to Greater Victoria. This type of tsunami would most likely affect coastal areas up to 4 m above the highest tide. Because of the underwater topography of the Strait of Juan de Fuca, tsunamis created elsewhere in the Pacific Basin would be more likely to affect low-lying coastal areas in ways similar to severe winter storms (City of Victoria website).

A Greater Victoria Tsunami Planning Map produced by the CRD delineates areas of tsunami risk (CRD 2006). According to this mapping, the Macaulay Point and Clover Point sites are outside the tsunami risk area. The McLoughlin Point site could be potentially be affected by a tsunami, though the risk is low. Facility designs will need to consider tsunami risk.

### Treatment facility site conditions

#### *Macaulay Point*

The ground surface at the Macaulay Point site is uniform and near level at an elevation of 7 to 8 m above sea level, and presently is either asphalt surfaced or grassed. Available information indicates that the site previously sloped gently to the southeast and south, and has been levelled by excavation in the northwestern portion and by possible fill placement along the southern margin.

The subsurface stratigraphy is expected to consist of relatively minor amounts of surficial fill or topsoil over a veneer (possibly intermittent) of marine silts and clays, and then bedrock.

Variations to this generalized stratigraphy may include anticipated localized zones of fill (backfill material) alongside the partially buried or underground pump station facilities. The groundwater table is expected to be within 2 to 3 m of the present ground surface. Perched water table conditions may be present because of the anticipated relatively impermeable nature of the bedrock and near-surface native soils, which can result in locally high groundwater conditions and even surface water ponding, particularly during periods of heavy or prolonged precipitation.

Given the generally shallow bedrock depths anticipated at the site, soil conditions are relatively favourable concerning the seismic design parameters for structural elements.

### *Clover Point*

The ground surface at the Clover Point site slopes to the south and east. Available information indicates that the site may have been previously depressed, and current development has resulted in some excavation (to accommodate the existing facilities) and fill placement to cover the facilities and raise the grade to its current level.

The subsurface conditions are expected to be comprised of surface fill materials (associated with backfilling and cover for the existing facility) atop a morainal deposit of hard gravelly sand silt and/or very dense silty sand till and then bedrock. The groundwater table is expected to be within 4 m to 5 m of the existing grade, with possible perched water table conditions from place to place. It is anticipated that soil conditions are generally favourable concerning the seismic design parameters for structural elements.

It is anticipated that soil conditions are generally favourable concerning the seismic design parameters for structural elements. Subsurface investigation will be required to determine the extent of fill placement in the area of the proposed new development to the south of the existing facility.

### *McLoughlin Point*

The ground surface at the McLoughlin Point site is presently uniform and near level at an elevation of about 5 m. The site is asphalt or gravel surfaced, except for occasional rock outcrops. Available information indicates that the site was once irregular and rocky at a similar average grade to the adjoining sites, and was levelled to its present configuration by excavation (likely by blasting) and fill placement.

The subsurface conditions at this site are expected to comprise varying amounts of unknown fill materials atop bedrock. Possible variations might include intermittent intermediate deposits of marine silts and clays. The general groundwater table is likely within 2 to 3 m of the present

ground surface, and may be influenced by tidal fluctuations. Perched water table conditions may be experienced from place to place resulting in locally high groundwater conditions and surface water ponding, particularly during periods of heavy or prolonged precipitation.

It is anticipated that soil conditions in the proposed development area will be favourable concerning the seismic design parameters, as bedrock is anticipated to be at relatively shallow depths.

### *Hartland North*

The northeastern portion of the Hartland North site is a relatively level bench area that is bounded to the southwest by a rock slope and exposed bedrock. The gravel-surfaced bench appears to have been constructed by a cut and fill method, whereby the slope was excavated, and the excavated material placed on the downslope are to the northeast. The composition of the fill and conditions of placement are unknown. The fill along the northeast perimeter is 5 to 7 m thick, being deeper toward the northeast corner. The delineation between the cut and fill is difficult to interpret from existing land features, and such information could be obtained by shallow test pits to determine the extent of this fill. The elevation of the pad is about 165 m.

The Hartland North site is situated within the Wark Gneiss, a metamorphic rock body with intermediate to mafic composition, and just north of a mapped fault (Muller 1980). The rock slope displays near vertical fracture planes, as well as adverse fracture planes that dip out of the rock face at 45° to 60° from horizontal. The rock is highly fractured with intersecting joint sets and fracture planes. There is evidence of recent wedge-type rockfall failures, suggesting the rock slope is currently at or near its stability limit. Bedrock behind the rock face slopes moderately upwards to the south to a knoll with elevation 190 m, and is covered with a thin soil and moss veneer. The land surface is vegetated with a variety of mature trees and low lying shrubs.

Two existing water sampling standpipes indicated the groundwater was at a depth of about 1 m below existing site grade near the rock slope, and at a depth of about 5 m at the northeastern edge of the gravel pad (as measured on April 9, 2010). The measured depth to the water table appears to correlate with the expected fill thickness.

## Ancillary facility site conditions

### *Macaulay Point to McLoughlin Point*

The route of the proposed 1,800 mm diameter force main from Macaulay Point to McLoughlin Point (via Bewdley Avenue and Macaulay Street) passes through an area of shallow bedrock with an intermittent veneer or blanket of overburden marine silts and clays, with localized

surficial fill (associated with existing roadways and infrastructure). The groundwater table is expected to be variable and may be perched atop the bedrock in many areas.

### *Clover Point to McLoughlin Point*

Along the route of the proposed 1,200 mm diameter force main from Clover Point to Ogden Point (via Dallas Road) the anticipated subsurface conditions (considering minimal burial for the main) range from morainal deposits of dense gravelly silty sand and/or hard gravelly sandy silt till (from Clover Point to Cook Street) and marine deposits of very stiff to hard silts and clays over shallow bedrock (west of Cook Street). Noted exceptions include near surface weathered materials, shallow fill (associated primarily with existing roadway pavement structure and backfill for existing infrastructure), possible near surface zones of colluvial sands and gravels, and thicker fill in the Ogden Point area (likely increasing in thickness westward). The groundwater table is expected to be variable, but generally within 2 to 3 m of the present ground surface, with possible perched conditions in existing fill and areas of near surface colluvial materials.

### *McLoughlin Point to Hartland North*

This conveyance pipeline route between the McLoughlin Point wastewater treatment facility and Hartland North biosolids facility has not been finalized. A detailed description of site conditions along the conveyance pipeline route will be provided when the route has been finalized and an assessment for the route can be conducted.

## Impact assessment and mitigation measures

### *Macaulay Point*

Treatment facility construction

**Potential Impact: Geotechnical hazards may be encountered during construction.**
Some excavation will be required during construction of the new facilities at Macaulay Point, most notably for the new pump station. Unusual concerns relating to excavation instability are not expected aside from possible localized zones of fill or backfill materials. There is a possibility of moderate to substantial seepage into deeper excavations via discontinuities or possible shattered zones in the bedrock, particularly if the excavation extends below adjacent tide levels. More seepage from possible pockets of water in permeable zones of existing fill material (resulting from long-term infiltration of surface water) may be experienced. The suitability of existing fill materials, if they exist in areas of the proposed new facilities, is uncertain.

Seismically, the conditions at this site are typical of those in the Greater Victoria area that have bedrock or shallow bedrock. The seismic conditions of such sites are usually preferable from a design perspective.

The extent and characteristics of existing fill or backfill materials, relative to the new facilities can have a substantial impact on development costs, and should be investigated further.

> Mitigation measures. A geotechnical investigation and review of the treatment facility designs will be conducted. Careful consideration will be given to ground-water levels on excavations deeper than 3 to 4 m below existing grades and any excavations below sea level.
>
> Appropriate measures will be implemented to avoid or control seepage from fill or rock cuts, to ensure use of suitable fill materials, and to respond to potential buoyancy concerns where structures are below the water table.
>
> Earthquake and tsunami risks will be factored into facility designs.

Potential impacts associated with geotechnical hazards during construction at Macaulay Point are expected to be local, short-term, irreversible, low magnitude, and **less than significant**.

#### Treatment facility operation

**Potential Impact: Treatment facility operation could be affected by geotechnical conditions.** After construction is completed and operation of the treatment facility begins at Macaulay Point, no additional geotechnical impacts are anticipated, so impacts of the treatment facility operation are considered **less than significant**.

### *Clover Point*

#### Treatment facility construction

**Potential Impact: Geotechnical hazards may be encountered during construction.** Excavation and facility expansion is proposed to the south of the existing facility. The extent and composition of fill material on the site is unknown, but likely related to backfilling of the existing structure and associated infilling of the surrounding landscape areas. Further geotechnical review will be required after the specific design details are known. Specific design consideration will be required where excavations are deeper than 5 to 6 m below existing grades because of the anticipated groundwater conditions. In the existing facility, and where new loading from the upgraded components will not be substantially altered, no geotechnical concern is anticipated.

Seismically, the conditions beneath the Clover Point site are expected to be typical of those in the Greater Victoria area wherever shallow bedrock is present. Such conditions are usually preferable from a design perspective. Review of the subsurface conditions at this site, in conjunction with the foundation loading conditions of the new (reconfigured) components combined with the existing facility should be undertaken prior to final design.

Mitigation measures. A geotechnical investigation and review of the facility designs will be conducted. Careful consideration will be given to ground-water levels in excavations deeper than 3 to 4 m below existing grades and any excavations below sea level.

Appropriate measures will be implemented to avoid or control seepage from fill or rock cuts, to ensure use of suitable fill materials, and to respond to potential buoyancy concerns where structures are below the water table.

Earthquake and tsunami risks will be factored into facility designs.

If mitigation measures are implemented, potential impacts associated with geotechnical hazards during construction of the pump station upgrades at Clover Point are expected to be local, short-term, irreversible, low magnitude, and **less than significant**.

Treatment facility operation

**Potential Impact: Treatment facility operation could be affected by geotechnical conditions.** After construction of the upgrades is completed and operation of the treatment facility begins at Clover Point, no additional geotechnical impacts are anticipated, so impacts of the treatment facility operation are considered **less than significant**.

### *McLoughlin Point*

Treatment facility construction

**Potential Impact: Geotechnical hazards during construction.**
The native bedrock anticipated at a relatively shallow depth at McLoughlin Point will provide competent long-term support for the proposed new facilities. The suitability of possible existing fill materials for stable foundation support for the new facilities is uncertain. Some excavation will be required during construction, most notably for the pump station and underground storage tanks. Unusual concerns relating to excavation stability are not expected aside from stability considerations associated with localized zones of existing fill materials. There is a possibility of substantial seepage into deeper excavations via discontinuities or possible shattered zones in the bedrock, particularly for excavations that might extend below adjacent tide levels. Moderate seepage from pockets of water trapped in existing fill material (resulting from long-term accumulation of surface water) may be experienced.

Seismically, the conditions at this site are typical of those in the Greater Victoria area where shallow bedrock exists. Such conditions are usually desired from a design perspective.

Mitigation measures. A geotechnical investigation and review of the treatment facility designs will be conducted. Careful consideration will be given to ground-water levels in excavations deeper than 3 to 4 m below existing grades and any excavations below sea level.

Appropriate measures will be implemented to avoid or control seepage from fill or rock cuts, to ensure use of suitable fill materials, and to respond to potential buoyancy concerns where structures are below the water table.

Earthquake and tsunami risks will be factored into facility designs.

Potential impacts associated with geotechnical hazards during construction at McLoughlin Point are expected to be local, medium-term, irreversible, low magnitude, and **less than significant**.

Treatment facility operation

**Potential Impact: Treatment facility operation could be affected by geotechnical conditions.** After construction is completed and operation of the treatment facility begins at McLoughlin Point, no additional geotechnical impacts are anticipated, so impacts of the treatment facility operation are considered **less than significant**.

### *Hartland North*

Treatment facility construction

**Potential Impact: Existing fill materials have unknown composition and are likely not suitable for support of new structures.**

The type of fill material on the gravel pad is unknown, as is its placement and compaction, and the condition of the subgrade beneath the fill. Due to these unknown factors, it would not be prudent to rely upon this material to provide long-term stable support to structures that are vulnerable to adverse differential settlement.

Mitigation measures. Further site-specific investigations should be undertaken after design details are finalized. The existing fill can be removed and replaced with engineered fill (approved materials placed and compacted to meet specifications) beneath the building sites. Alternatively, foundation support can be achieved using piles, piers, or by lowering foundation elevations so that they can be placed directly on native subgrade. This option may be preferred for tanks and facilities that can be positioned below grade.

Impacts associated with the existing fill will affect the facility footprint area only. If no mitigation measures are implemented, the impacts will be long-term, continuous, irreversible, of moderate to high magnitude, and **significant**.

If the recommended mitigation measures are implemented, the impacts will be short term and periodic (during the fill remediation period only), reversible, of low magnitude, and **less than significant**.

**Potential Impact: The rock slope along the southwest boundary of the site has the potential for rockfall and more substantial instability.**

The rock is highly fractured with intersecting joint sets and adverse fracture planes, some of which are near vertical. The rock slope is susceptible to rockfall, as evidenced by localized wedge failures, and potential more substantial instability, particularly during a seismic event. Movement of rock material downslope has the potential to affect individuals and facilities located near the base of the slope.

> Mitigation measures. The slope should be carefully assessed to identify joint sets, fracture planes, and potential failure areas. This information should be used to model the rockslope to allow for assessment of overall stability and required slope geometry. The rock face could be resloped using either blasting or machine scaling, depending on the specific characteristics of the rock, and should be assessed as excavation progresses. Local stabilization of areas with poor rock conditions would be required, and may be achieved using rock anchors or applying shotcrete into highly fractured rock. Rockfall mesh should be installed over the slope to help contain smaller mobilized particles, or barriers constructed at the base of the slope to contain falling material and provide protection for workers and the facility.

Impacts from the rockslope will affect the facility footprint and local area. If no mitigative measures are implemented the impacts will be irreversible, long term, continuous, of high magnitude and **significant**.

If mitigative measures are employed, the impacts will be irreversible, long term, continuous, of low magnitude and **less than significant**.

**Potential Impact: Significant blasting and cuts and fills may be required to obtain design elevations.**

The current proposed development footprint would require significant blasting of bedrock in the southwestern portion of the site. Due to the poor rock conditions and the need to achieve stable

rock slopes, a substantial amount of over-blasting may be required, and the height of the rock cut could approach 25 m.

> Mitigation measures. Design grades could be modified to take advantage of existing site grades, possibly through the utilization of benching, thereby reducing the requirements for blasting and potential fill placement. The building configuration could be altered to reduce the extent of blasting required and achieve a balance between cut and fill areas. If blasting is undertaken, the newly exposed rock slope would be vulnerable to the impacts previously cited for the existing rock slope, and the same mitigation measures would apply.

Blasting and regrading will affect the facility footprint and local area. If stabilization measures are not implemented for rock cuts, the impacts will be irreversible, long term, continuous, of high magnitude and **significant**.

If rock slope mitigation measures are implemented, the impacts would be irreversible, long term, continuous, of low magnitude and **less than significant**.

Treatment facility operation

After the facility has been constructed and the rock slope stabilized, no additional geotechnical impacts are expected. Accordingly, operational impacts are assessed to be **less than significant**.

### *Ancillary facilities*

Ancillary facility construction

**Potential Impact: Geotechnical hazards could be associated with ancillary facility construction.**

Excavation for installation of the conveyance pipelines is expected to be less than 2 to 3 m, so no unusual construction conditions are anticipated. Rock blasting will likely be necessary in some areas. Due care will be necessary when blasting occurs close to existing utilities. The level of the groundwater table is not expected to pose long-term seepage concerns, although seepage from trapped pockets of water in existing granular fill and near-surface alluvial materials (from long-term infiltration of surface water) may affect work during the initial stages of excavation.

> Mitigation measures. Blasting and potential conflicts with existing underground utilities can be reduced in some instances by considering alternatives to the presently proposed alignment. In the case of the Clover Point to Ogden Point conveyance pipeline, anticipated substantial blasting and possible disturbance might be avoided by routing the pipeline down Niagara Street rather than Dallas Road between Douglas and Lawrence

Street and Montreal Street. (Predominately stiff to hard native soils are expected in excavation depth along Niagara Street, with fewer existing utilities and less traffic.)

In areas where substantial blasting will be required, care will be necessary to limit the size of charge detonated per delay, to avoid or minimize the vibration effects of the blasting on adjacent facilities and structures. Shoring will be necessary for deeper excavations in soil materials, unless there is sufficient area on each side of the installation to permit sloped excavations as per WorkSafe BC standards.

Seepage from trapped pockets of water in permeable fill and native soils can be minimized by excavating during the drier periods of the year. Such seepage can be readily mitigated by staging excavation to allow sufficient time to drain the water using a conventional sump and pump arrangement. Often a delay of only a few hours or overnight is sufficient to permit sufficient drainage and avoid associated instability.

Potential impacts associated with geotechnical hazards during construction of the ancillary facilities are expected to be local, short-term, of low magnitude, and **less than significant**.

Ancillary facilities operation

**Potential Impact: Operation of ancillary facilities could be affected by geotechnical conditions.**

After construction is completed and operation of the ancillary facilities begins, no additional geotechnical impacts on the site are anticipated, so the impacts of ancillary facility operation are considered **less than significant**.

# 5.2 Hydrology and water quality

## Treatment facility site conditions

### *Macaulay Point*

The Macaulay Point site gently slopes from north to south and southeast, ranging in elevation from 7 to 8 m above sea level. The southern shoreline on the Strait of Juan de Fuca is relatively steep. The current Macaulay Pump Station has been operating at the site since 1971 (CRD website). The site is almost entirely covered in buildings and pavement, resulting in substantial alteration of natural drainage. No drainage courses are present on the site.

The quality of groundwater on the site is unknown. No water quality sampling was conducted as part of this study.

### *Clover Point*

The CRD has operated a pump station at Clover Point since 1980 (CRD website). The Clover Point site slopes down from the northwest to the southeast. The elevation changes from 10 m to 4 m above sea level across the site. The natural slope conditions were modified during park development, likely in 1956, when the loop road was constructed (Ringuette 2005). Adjacent to the southeastern edge of the pump station site is a steep concrete-edged shoreline. The natural drainage on the site has been substantially altered by the addition of the existing structure and surrounding concrete walls, roadways, fill, and the re-sloping of the hillside. No drainage courses are present on the site.

The quality of groundwater on the site is unknown. No water quality sampling was conducted as part of this study.

### *McLoughlin Point*

The McLoughlin Point site is generally flat, at an elevation of 5 m above sea level. The seaward margins of the site (east and south) feature exposed rock outcrops. The natural drainage on the site has been substantially altered with the removal of rock outcrops, site re-grading, asphalt and concrete paving, and the addition of fill. Stormwater tends to drain to the lowest elevation point on the northern portion of the site. During a site visit in November 2009, ponding was noted in this area.

No visible drainage courses are present on the site. Just to the north of the property boundary, on DND land, a small drainage course flows from west to east through a stand of black cottonwood (*Populus balsmaifera*).

The quality of water on the site is currently being tested as part of a Detailed Site Investigation (DSI) being prepared by Imperial Oil. The site was an oil tank farm for several decades until it was decommissioned in 2008. Water draining from the site passes through an oil and grease separator before it is discharged into the ocean.

### *Hartland North*

The Hartland North site slopes to the northeast, directing runoff toward Willis Point Road. Surface water drains through an ephemeral channel, located in a wooded area between the site and Willis Point Road. This channel discharges into Tod Creek and ultimately into Tod Inlet, located approximately 3 km north of the Hartland North site.

Surface flow in the ephemeral drainage is limited to wet-weather events. During dry periods, several wetlands persist along the drainage course, but these features are not connected by surface flow.

Surface water quality is monitored near the Hartland site by the CRD as part of the environmental monitoring program for the Hartland landfill. Samples are also taken at the nearby Heal, Durrance, and Tod Creeks. Water samples are analyzed for temperature, nitrogen-ammonia, chloride, electrical conductivity, total and dissolved iron, nitrogen-nitrite, pH, potassium, sodium, and sulphate. Parameters analyzed in the water samples are not known to exceed the *British Columbia approved water quality guidelines for the protection of aquatic life* (BC Ministry of Environment, 2010; Gartner Lee Ltd. 2003).

## Ancillary facility site conditions

Most of the ancillary conveyance pipes will be located beneath roadways, except for the conveyance pipeline between Ogden Point and McLoughlin Point, which will be placed in a tunnel constructed under the entrance to the Victoria Harbour, and an aerial crossing on the Gorge Bridge, between the McLoughlin Point facility and the Hartland North facility. Drainage of these roadways is managed by the City of Victoria, Township of Esquimalt, District of Saanich, and DND (on military lands). Runoff from roadways is conveyed to the stormwater system and is discharged into the harbour or the Strait of Juan de Fuca.

The conveyance pipeline routes between the Clover Point facility and the McLoughlin Point facility, and the Macaulay Point facility and the McLoughlin Point facility, will not cross any streams. Streams in the area were enclosed in storm drains during urban development.

The ancillary facilities from the McLoughlin Point facility to the Hartland North facility, including the conveyance pipeline route and the pump station locations, are still being finalized. It is anticipated that the pipeline will be constructed on existing roadways. The most likely route between the facilities will require crossing several waterways including:

- the Gorge waterway (marine),
- Colquitz River,
- Peers Creek,
- Durrell Creek,
- Excelsior Creek,
- Tod Creek, and
- Heal Creek.

Several of the creeks are considered fish-bearing, including the Colquitz River, Tod Creek, and the Gorge Waterway, which provide habitat for Pacific salmon species and cutthroat trout, among others.

The route of the proposed sludge conveyance force mains between McLoughlin Point and Hartland North will be studied in detail when the route is finalized.

## Impact assessment and mitigation measures

### *Macaulay Point*

Treatment facility construction

**Potential Impact: Subsurface flows of groundwater or tidal water may be intercepted by excavation.**

The new structures at Macaulay Point will be constructed in areas that are currently impervious asphalt and concrete surfaces. The backup generator will be located on the south side of the site, in an area of paving and grass. Seepage from excavations may occur during construction, with the amount and quality dependent on the water table conditions and whether excavation occurs below sea level. Small subsurface flows of groundwater or tidal water may be intercepted by excavation. This water will need to be infiltrated elsewhere on the site, or conveyed to a storm drain or the ocean.

> Mitigation measures. During the construction period, excavations will need to be dewatered to maintain safe working conditions. This pumped water will be discharged to ground, a storm drain, or directly into the Strait of Juan de Fuca.

The potential effect of the interception of groundwater or tidal water during excavation is local, short-term, reversible, of low magnitude, and **less than significant**.

**Potential Impact: Sedimentation and erosion may affect water quality.**

Because the Macaulay Point site is nearly flat and has little erodible soil, excavation associated with construction of the new structures is unlikely to measurably increase erosion and sediment risk on the site. Uncovered soil stockpiles may be at risk of erosion during precipitation events. Site runoff and water pumped from excavated areas may contain sediment that could affect water quality in the Strait of Juan de Fuca. Without proper drainage management, sediment-laden water could affect the water quality in the strait directly adjacent to the site or near the stormwater outfall, if the water is conveyed to a storm drain.

> Mitigation measures. Prepare and implement a sediment and erosion control plan for site construction. The plan would include measures such as covering stockpiles of excavated soil to prevent erosion, settling, or filtering site run-off and water from excavations.

Effects of sediment and erosion on water quality are local, short-term, reversible, of low magnitude, and **less than significant**.

**Potential Impact: Rinse water from concrete pouring activities could affect water quality.** Rinse water from concrete trucks and from freshly-poured concrete has the potential to affect water quality in the Strait of Juan de Fuca. Rinse water from concrete pouring activities will not be discharged on the site, and no measurable effect on surface or ground water quality is expected.

> Mitigation measures. Concrete truck rinse water should be removed from site for treatment. Other water used in concrete pouring should be managed to prevent entry into storm drains or the ocean. The CRD will prepare an Environmental Protection Plan that will include a contingency plan that outlines procedures in case of accidental spills.

Effects of concrete rinse water on water quality are local, short-term, reversible, of low magnitude, and **less than significant**.

Treatment facility operation.

**Potential Impact: Runoff may increase during facility operation.**
The new structures will be built on impervious surfaces. During facility operation, runoff will be handled through onsite management and infiltration. With onsite infiltration, as feasible, operation of the facility will not result increased volumes of runoff leaving the site.

> Mitigation measures. A drainage management plan should be prepared. Onsite infiltration of runoff will be included in project design.

Effects of increased runoff during facility operation are local, long-term, irreversible, of low magnitude, and **less than significant**.

### *Clover Point*

Treatment facility construction

**Potential Impact: Subsurface flows of groundwater or tidal water may be intercepted by excavation.**
Seepage may occur during excavation, with the volumes and quality dependent on water table conditions and elevation relative above or below sea level. Small subsurface flows of groundwater or tidal water may be intercepted by excavation. This water would need to be infiltrated elsewhere on the site, or conveyed to a storm drain or the ocean.

> Mitigation measures. During the construction period, excavations will need to be dewatered to maintain safe working conditions. This pumped water will be discharged to ground, a storm drain, or directly into the Strait of Juan de Fuca.

The potential effect of the interception of groundwater or tidal water during excavation is local, short-term, reversible, of low magnitude, and **less than significant**.

**Potential Impact: Sedimentation and erosion may affect water quality.**
Because the construction of the new Clover Point facilities will be on a slope, excavation is likely to increase erosion and sediment risk. Site runoff and water pumped from excavated areas may contain sediment that could affect water quality in the Strait of Juan de Fuca. Without proper drainage management, sediment-laden water could affect the water quality of the strait directly adjacent to the site or near the stormwater outfall, if water is conveyed to a storm drain. Uncovered soil stockpiles may be at risk of erosion during precipitation events.

> Mitigation measures. Prepare and implement a sediment and erosion control plan for site construction. The plan would include measures such as covering stockpiles of excavated soil to prevent erosion, settling, or filtering site run-off and water from excavations.
>
> Runoff from the slope should be managed to reduce erosion. Site runoff should be monitored during precipitation events.

Effects of sediment and erosion on water quality are local, short-term, reversible, of low magnitude, and **less than significant**.

**Potential Impact: Rinse water from concrete pouring activities could affect water quality.**
Rinse water from concrete trucks and from freshly-poured concrete has the potential to affect water quality in the Strait of Juan de Fuca. Rinse water from concrete pouring activities will not be discharged on the site, and no measurable effect on surface or ground water quality is expected.

Mitigation measures. Concrete truck rinse water should be removed from site for treatment. Other water used in concrete pouring should be managed to prevent entry into storm drains or the ocean. The CRD will prepare an Environmental Protection Plan that will include a contingency plan that outlines procedures in case of accidental spills.

Effects of concrete rinse water on water quality are local, short-term, reversible, of low magnitude, and **less than significant**.

Treatment facility operation.

**Potential Impact: Pump station operation may affect site hydrology.**
Because the expanded facility will be constructed entirely underground, the site hydrology will not be materially different from the current site conditions. There are no expected adverse effects to the hydrology of the site during operation of the Clover Point facility, and impacts will be less than significant.

### *McLoughlin Point*

Treatment facility construction.

**Potential Impact: Subsurface flows of groundwater or tidal water may be intercepted by excavation.**
Seepage may occur during excavation, however, depending on the water table conditions and if excavation occurs below adjacent tide levels. Small subsurface flows of groundwater or tidal water may be intercepted by excavation. This water would need to be conveyed to the ocean.

Mitigation measures. During the construction period, excavations will need to be dewatered to maintain safe working conditions. This pumped water is likely to be discharged to the ocean because other alternatives are limited.

The potential effect of intercepting groundwater or tidal water during excavation is local, short-term, reversible, of low magnitude, and **less than significant**.

**Potential Impact: Sedimentation and erosion may affect on water quality.**
Because McLoughlin Point is nearly flat and mostly rock, excavation associated with construction of the facility is unlikely to measurably increase erosion and sediment risk on the site. Uncovered soil stockpiles may be at risk of erosion during precipitation events. Site runoff and water pumped from excavated areas may contain sediment that could affect water quality in the Strait of Juan de Fuca. Without proper drainage management, sediment-laden water could affect the water quality in the strait directly adjacent to the site.

Mitigation measures. Prepare and implement a sediment and erosion control plan for site construction. The plan would include measures such as covering stockpiles of excavated soil to prevent erosion, settling, or filtering site run-off and water from excavations.

Effects of sediment and erosion on water quality are local, short-term, reversible, of low magnitude, and **less than significant**.

**Potential Impact: Rinse water from concrete pouring activities may affect water quality.**
Rinse water from concrete trucks and from freshly-poured concrete has the potential to affect water quality. Rinse water from concrete pouring activities will not be discharged on the site, and no measurable effect on surface or ground water quality is expected.

Mitigation measures. Concrete truck rinse water should be removed from site for treatment. Other water used in concrete pouring should be managed to prevent entry into the ocean. The CRD will prepare an Environmental Protection Plan that will include a contingency plan that outlines procedures in case of accidental spills.

Effects of concrete rinse water on water quality are local, short-term, reversible, of low magnitude, and **less than significant**.

**Potential Impact: Quality of runoff water could improve after site remediation.**
For decades, Imperial Oil operated an oil tank farm at McLoughlin Point. The site is currently undergoing environmental investigations to determine contaminant types, quantities, and locations. Once the contaminants are identified, the site will be remediated before treatment facility construction proceeds. After the site is remediated, runoff water quality can be expected to improve. Presently, water that collects and runs off the site may be contaminated (before it is treated in the water treatment facility).

Mitigation measures. No mitigation is necessary.

Increased water quality of runoff is local, long-term, **less than significant**, and **beneficial**.

Treatment facility operation.

**Potential Impact: Volumes of runoff may increase during facility operation.**
The McLoughlin Point site has very low infiltration potential, as it is a paved and rocky site. A treatment facility will not increase the rate of runoff compared to existing conditions.

Mitigation measures. Opportunities exist to provide modest infiltration on the site in landscaped areas. Runoff water should pass through oil, grease, and sediment traps

before being released to the ocean or storm drains. Project design should include measures to reduce offsite runoff and to improve its quality.

Effects of runoff during facility operation are local, long-term, irreversible, of low magnitude, and **less than significant**.

### *Hartland North*

Treatment facility construction

**Potential Impact: Construction may cause changes to drainage patterns, infiltration rates, and stormwater runoff.**

Excavation, blasting, and grading associated with the construction of the Hartland facility may alter the surface drainage of the site, and cause the downstream wetlands and ephemeral watercourse to receive increased flows during wet weather events. Clearing and grubbing of vegetation for site preparation may also increase the rates of flow and patterns of stormwater runoff. New structures and impervious surfaces will be constructed in areas that currently allow stormwater infiltration.

Mitigation measures. Minimize disturbance of natural hydrology of the site to the extent practicable. Implement a drainage management plan prior to construction that identifies potential problem areas and strategies for managing them.

Effects of excavation on site hydrology are not reversible, long-term, local, of low magnitude, and **less than significant**.

**Potential Impact: Construction may cause erosion and sedimentation in surface water.**

Stripping and stockpiling of topsoil and rock would be required as part of site preparation activities. Uncovered soil stockpiles may be at risk of erosion, and sedimentation in the downslope ephemeral drainage course and wetlands during precipitation events. Site runoff and water pumped from excavated areas may contain sediment that could affect water quality.

Mitigation measures. Prepare and implement an erosion and sediment control plan. Stockpiles of excavated soil will be covered to prevent erosion. Water pumped from excavations should be settled or filtered to remove suspended sediment before release. Engage an environmental monitor during soil stripping, stockpiling, and extensive land levelling activities.

Effects of sediment and erosion on water quality are local, short-term, reversible, of moderate magnitude, and **less than significant**.

**Potential Impact: Construction may lead to changes in quantity or flow of groundwater** Ground water may be encountered during excavation, blasting, and site preparation, or during the installation of below-ground infrastructure. Installation of below-ground infrastructure may create a barrier, and cause small alterations to horizontal groundwater flow through an aquifer.

> Mitigation measures. Implement a monitoring program to ensure no changes in the quantity or movement of groundwater.

Effects of changes in quantity or flow of ground water are local, short-term, reversible, of low magnitude, and **less than significant**.

**Potential Impact: Discharges of polluting substances to surface water and groundwater.** Generally, temporary in nature, construction often involves accidental releases of polluting substances from spills of fuels and lubricants, or run off from construction operations, such as concrete placement.

> Mitigation measures. Develop and implement a construction phase environmental management plan that addresses hazardous materials handling, spill prevention and response, waste management, concrete handling and placement, and other contingency plans. Provide on-site training for implementation of the environmental management plan.

Effects of discharge of polluting substances on water quality are local, short-term, reversible, of moderate magnitude, and **less than significant**.

Treatment facility operation.

**Potential Impact: Changes in drainage patterns, infiltration rates, and stormwater runoff.** Stormwater runoff may increase as a result of vegetation removal on the site, and new structures will be built on impervious surfaces, leading to reduced infiltration rates. During facility operation, runoff will be handled through onsite management and infiltration. With onsite infiltration, operation of the facility will not result increased volumes of runoff leaving the site.

> Mitigation measures. A water management plan should be prepared. Onsite infiltration of runoff will be included in project design.

Effects of increased runoff during facility operation are local, long-term, irreversible, of low magnitude, and **less than significant**.

### *Ancillary facilities*

Ancillary facility construction.

**Potential Impact: Sedimentation and erosion may affect water quality.**
Site runoff and water pumped from excavated trenches may contain sediment that could affect water quality. Uncovered soil stockpiles may create a source of sediment during precipitation events. Without proper drainage management, sediment-laden water could affect the water quality in adjacent waterbodies or stormwater discharge areas.

> Mitigation measures. Prepare and implement a sediment and erosion control plan for site construction. The plan would include measures such as covering stockpiles of excavated soil to prevent erosion, settling, or filtering site run-off and water from excavations.

Effects of sediment and erosion on water quality are local, short-term, reversible, of low magnitude, and **less than significant**.

Ancillary facility operation.

The conveyance pipes will be installed in roadways, on bridges, and beneath Victoria Harbour. Once the routes are restored following construction, no impacts to hydrology or water quality are anticipated, so effects on the hydrology and water quality during ancillary facility operation are considered **less than significant**.

## 5.3 Vegetation

### Regional overview

The project area is located in the Coastal Douglas Fir moist maritime (CDFmm) biogeoclimatic zone. The CDFmm zone is characterized by warm, dry summers and wet, mild winters, and is located between sea level and 150 m elevation. The Vancouver Island and Coastal Mountain ranges create a 'rainshadow' effect and influence weather patterns in the CDFmm (Nuszdorfer *et al.*, 1991).

Plant communities in the CDFmm are primarily tree dominated. Common tree species include Douglas-fir (*Pseudotsuga menziesii*), western redcedar (*Thuja plicata*), Garry oak (*Quercus garryana*), arbutus (*Arbutus menziesii*), and red alder (*Alnus rubra*). Dominant tree species and natural understory vegetation vary between areas depending on soil composition and topographic features.

All natural plant ecosystems located in the CDFmm are red- or blue-listed by the British Columbia Conservation Data Centre (CDC). A total of 36 plant species in the CDFmm are listed as endangered or threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and 153 plant species are red- and blue-listed by the CDC. Many of the rare plants found in the CDFmm occur in Garry oak ecosystems, coastal plant communities, rock out-crops, or riparian wetland habitats.

In the past century, native vegetation of the CDFmm and southern Vancouver Island has been altered by urban, agricultural, and industrial development. Less than 1% of Garry oak associated plant communities and mature or old forests remain in their natural state (Pojar *et al*. 2004).

## Treatment facility site conditions

### *Macaulay Point*

The Macaulay treatment facility site is located in a currently developed area. A long history of use by the Department of National Defence (DND) and recreational use by the local population has altered the habitat of the surrounding area. There is no natural vegetation in the footprint of the project expansion at the Macaulay treatment facility.

A small area of native plants is located near the project footprint. Lands to the east and west of the facility appear to be historically Garry oak rock-outcrop and parkland plant communities. The integrity of these habitats has been affected by non-native invasive plant species, such as Scotch broom (*Cytisis scorpa*), English ivy (*Hedera helix*), Himalayan blackberry (*Rubus armeniacus*), and non-native grasses. A patch of invasive poison hemlock (*Conium maculatum*) was recorded adjacent to the Macaulay Point site.

Remnants of a native coastal bluff plant community are located approximately 20-50 m southwest and southeast of the site. Small patches of dense-flowered lupine (*Lupinus densiflorus*) and purple sanicle (*Sanicula bipinnatifida*), both provincially red-listed, have been documented 20 m from the project footprint. Dense flowered Lupine is known from only three sites in Canada, including the Macaulay Point site (COSEWIC 2005), where a single patch was recorded at the CRD property boundary. Purple sanicle is currently known from 18 sites on the east coast of Vancouver Island and can be found in areas adjacent to the Macaulay Point site. Both plant species are specialized to coastal benches and banks above the ocean splash zone.

### *Clover Point*

The CRD Clover Point pump station site is located in Clover Point Park, which experiences recreational use. The vegetation above the existing Clover Point facility is highly disturbed and dominated by non-native grasses. Clover Point is listed by the CDC as potential habitat for

Kincaid's lupine (*Lupinus oreganus var. kincaidii*), which is red-listed by the CDC and presumed extirpated by COSEWIC. No native plant communities or rare plant species have been documented in the pump station footprint (CRD 2009).

Rare plant species found in neighbouring parks and nearby bordering Dallas Road include dense-flowered lupin (*Lupinus densiflorus*), purple sanicle (*Sanicula bipinnatifida*), golden paintbrush (*Castilleja levisecta*), and yellow montane violet (*Viola praemorsa var. praemorsa*) (CRD 2009).

Vegetation features of the four facility sites are summarized in Table 5-1.

**Table 5-1. Presence of specified ecological features on the treatment facility footprints**

| | Macaulay Point | McLoughlin Point | Hartland North | Clover Point |
|---|---|---|---|---|
| **Terrestrial ecosystems in relatively unmodified state:** | | | | |
| • Old growth forest or mature forest. | No | No | No | No |
| • Second growth forests | No | No | Yes | No |
| • Native meadow/herb communities | No | No | Yes | No |
| • Garry Oak woodland community | No | No | No | No |
| • Coastal bluffs | No | Yes | No | No |
| **Presence of ecosystems at risk:** | | | | |
| • Ecological communities on Conservation Data Centre red or blue lists | No | No | Yes | No |
| • Ecosystem types identified by the sensitive ecosystems inventory | No | No | No | No |
| • Areas identified as environmentally sensitive by local governments | No | No | No | No |
| **Presence of aquatic or riparian ecosystems:** | | | | |
| • Seasonal or permanent watercourses (streams, creeks, rivers) | No | No | Yes* | No |
| • Seasonal or permanent wetlands, seepage areas, or vernal pools. | No | No | Yes* | No |
| • Riparian ecosystems beside these aquatic features and vegetated gullies | No | No | Yes* | No |
| **Presence of vegetation species at risk and their habitats:** | | | | |
| • Species at risk identified by COSEWIC | No | No | No | No |
| • Species on provincial Red and Blue lists | No | No | No | No |

***Note**: * Seasonal ephemeral drainage, seepage areas, and wetland are located approximately 60 m downslope of the project footprint.*

### *McLoughlin Point*

The McLoughlin Point site is a previous industrial site in Esquimalt. The site is located on the eastern half of McLoughlin Point, facing into Outer Victoria Harbour. The area is susceptible to strong winds and high energy waves. Topographic features include bedrock covered by a thin soil layer (*Capital Regional District*, Harbour Area Atlas 2009).

The footprint of the proposed wastewater treatment facility occurs in the former Imperial Oil tank farm, which is currently being remediated. The topography has been altered by blasting and the site has been stripped of plant cover. The few plants remaining on the site are mostly invasive and include Himalayan blackberry (*Rubus armeniacus*) and English ivy (*Hedera helix*). There are no sensitive ecosystems on the property but some native vegetation does occur west and north of the site. Plant species found in adjacent areas include Douglas-fir, Himalayan blackberry, English ivy, scotch broom (*Cytisis scorpa*), willow (*Salix spp*.), domestic apple (*Malus domestica*), black cottonwood (*Populus balsamifera*), and Garry oak (*Quercus garryana*).

Coastal bluff ecosystems line the shoreline of McLoughlin Point. Populations of red-listed purple sanicle (*Sanicula bipinnatifida*) and blue-listed Spanish clover (*Lotus unifoliolatus* var. *unifoliolatus*) have been documented on the west side of the point by the CDC. These populations are outside the treatment facility footprint, and are located approximately 25 m west of the property boundary. There is a stand of mature Douglas fir forest across the road from the McLoughlin Point site, and a small Garry oak dominated rock-outcrop ecosystem to the north of the project footprint.

### *Hartland North*

Approximately 40% of the project footprint occurs in an area with natural vegetation communities. The primary plant community is maturing second growth Douglas fir, dull Oregon grape (CDFmm-01) forest. Several rocky outcrops in the project footprint area support Douglas fir oniongrass (CDFmm-03) plant community. These plant communities are provincially red-listed by the Conservation Data Centre (CDC 2010).

The dominant forest is a moderately open stand of approximately 70% Douglas fir, and 30% arbutus canopy. The understory is composed mostly of dull Oregon grape, and some salal and ocean spray. Rocky dry outcrops host a diverse native herbaceous plant community with limited tree cover. Species include Alaska onion grass, Pacific sanicle, big-leaved sandwort, and broad-leaved shooting star. White fawn lilies, fairy slippers, and common camas were also observed on the site in April 2010.

There are no recorded occurrences of plant species at risk on the proposed Hartland North site. A rare plant survey has not been completed for this site, but based on habitat conditions, the following red- and blue-listed species may occur:

- Deltoid balsamroot (red-listed, COSEWIC – Endangered),
- Scalepod (red-listed),
- Yellow montane violet (red-listed, COSEWIC – Endangered), and
- Smith's fairybells (blue-listed).

Non-native, invasive plants are found along the edge of the natural vegetation communities and the disturbed (cleared and levelled) area. Species include Scotch broom, lemon balm, and Canada thistle. These invasive plant species have not spread far beyond the edge of the disturbed area, and the natural plant communities upslope are relatively weed-free.

## Ancillary facility conditions

The ancillary facilities associated with the wastewater treatment facilities follow existing road systems and require little or no disturbance of natural areas because they will be installed beneath existing paved roads. The setting of different terrestrial areas affected by the conveyance facilities is discussed in the following sections.

### *McLoughlin Point to Ogden Point and Ogden Point to Clover Point*

The proposed forcemain connecting McLoughlin Point and Clover Point facilities will be installed beneath Dallas Road. Dallas Road crosses the following sensitive ecosystem types:

- Coastal bluff ecosystems, which occur in the ocean spray splash zone, and consist of rocky shorelines, islets, or cliffs dominated by moss and grasses,
- Terrestrial-herbaceous ecosystems, which are natural grasslands, rock out-crops, and bryophyte dominated vegetation, and
- Old, mixed broadleaf forest, which is dominated by trees greater than 100 years old, and have a broadleaf component greater than 15%.

These ecosystems contain relatively in-tact native plant assemblages and species at risk (CRD 2009). Rare plants believed to occur in the sensitive ecosystems near Dallas road include red listed purple sanicle, Kincaid's Lupine, and golden paintbrush.

Dallas Road is lined by mature street trees near Ogden Point. The drip line of these trees is over the road, indicating that their roots may be disturbed during construction. Disturbance of roots has the potential to affect the survival of the trees.

### *Macaulay Point to McLoughlin Point*

The pipe connection between the Macaulay Point and McLoughlin Point sites will be installed beneath existing paved roads and will not affect any sensitive ecosystems. There are no records of plant species or plant communities at risk adjacent to proposed route.

### *McLoughlin Point to Hartland North*

This conveyance pipeline route between the McLoughlin Point wastewater treatment facility and Hartland North biosolids facility has not been finalized. A detailed description of site conditions along the conveyance pipeline route will be provided when the route has been finalized and an assessment for the route can be conducted.

## Impact assessment and mitigation measures

### *Macaulay Point*

Treatment facility construction

**Potential Impact: Native plants or rare plant species may be affected during construction.** Construction of new structures at Macaulay Point site will occur entirely on previously disturbed areas of the CRD property. A Conservation Data Centre (CDC) record search revealed no red-listed plant species or threatened plant communities on the site of the proposed facility expansion. No loss or damage to native plants or rare plant species due to construction of the facility expansion is expected.

Mitigation measures. Construction activities will remain inside the project footprint.

Effects of facility construction are short-term, reversible, negligible, and **less than significant**.

Treatment facility operation

**Potential Impact: Native plants or rare plant species may be affected by facility operation.** No additional plant removal or disturbance of vegetated ground is expected during facility operation.

Effects of facility operation are short-term, reversible, negligible, and **less than significant**.

### *Clover Point*

Treatment facility construction

**Potential Impact: Native or rare plants may be affected during construction.**
No native plant communities or rare plant species are present in the project footprint. Historical presence of rare plants and plant communities at the Clover Point site suggests some potential for ecological restoration following facility construction.

> Mitigation measures. Implement a native plant restoration project at the site following construction, if practical.

Effects of facility construction are short-term, irreversible, of low magnitude, and **less than significant**. If mitigation measures are implemented, effects of facility construction will be **beneficial**.

Treatment facility operation

**Potential Impact: Native plants or rare plant species may be affected by facility operation.**
No additional plant removal or disturbance of vegetated ground is expected during facility operation.

Effects of facility operation are short-term, reversible, negligible, and **less than significant**.

### *McLoughlin Point*

Treatment facility construction

**Potential Impact: Native plants or rare plant species may be affected by facility construction.**
Construction at the McLoughlin Point site will occur mostly on the footprint of the former Imperial Oil tank farm including the edge of a coastal bluff ecosystem on the south end of McLoughlin Point. The proposed road at the north end of the project footprint will abut native vegetation including Garry oak (*Quercus garryana*), and black cottonwood (*Populus balsamifera*) on the adjacent DND property. However, no removal of native plant communities is anticipated.

> Mitigation measures. Native vegetation and plant communities located outside of the currently disturbed areas on McLoughlin Point should be avoided. The proposed road in the current design should be relocated to fit in the previously disturbed area. Temporary workspace and lay-down areas will be located in areas that will not affect native or rare plant communities.

Effects of McLoughlin Point facility construction on native and rare plant species are local, medium-term, reversible, low magnitude, and **less than significant**.

Treatment facility operation

**Potential Impact: Native plants or rare plant species may be affected by facility operation.** No additional plant removal or disturbance of vegetated ground is expected during facility operation.

Effects of facility operation are short-term, reversible, negligible, and **less than significant**.

### *Hartland North*

Treatment facility construction

**Potential Impact: Native plants or rare plant species may be affected by facility construction.** Construction of the proposed facility at the Hartland North site will involve removal of approximately 1 ha of maturing second growth forest. The forest communities in the project area are red-listed, and the habitat conditions are suitable to support numerous plant species at risk.

> Mitigation measures. Reconfigure the site to avoid disturbance to the native plant communities. Implement an invasive plant species management plan for the site. Use native plants for site landscaping, and if practical, utilize plant material salvaged from the site.

Construction of the biosolids facility at the Hartland North site, based on the current design, will result in short-term, irreversible, and moderate to high magnitude effects on maturing forest ecosystems, native plants, and rare plant species on the project footprint. These impacts are assessed to be **significant**.

If the recommended mitigation measures are implemented, the adverse effects of constructing the Hartland facility on maturing forest ecosystems, native plants, and rare plant species are considered to be local, short-term, irreversible, of low magnitude, and assessed to be **less than significant**.

Treatment facility operation

**Potential Impact: Native plants or rare plant species may be affected by facility operation.** No adverse effects to native plants or rare plant species at the Hartland North site are expected during operation of the biosolids facility, so the impacts are **less than significant**.

### *Ancillary facilities*

### *Macaulay Point to McLoughlin Point*

Ancillary facility construction

**Potential Impact: Native plants or rare plant species adjacent to roads may be affected by ancillary facilities construction.**
Construction activity along Victoria View Road may have a negative effect on the integrity of nearby sensitive ecosystems if used for temporary workspace and lay-down sites.

> Mitigation measures. An area of mature trees on the west side of Victoria View Road should be avoided during construction of ancillary facilities. Temporary workspace and lay-down areas should be located in areas that will not affect native or rare plant communities.

Effects of ancillary facility construction are local, long-term, irreversible, moderate magnitude, and **significant**.

If mitigation measures are implemented, the effects of McLoughlin Point facility construction are local, short-term, reversible, of low magnitude, and **less than significant**.

Ancillary facility operation

**Potential Impact: Native plants or rare plant species may be affected by facility operation.**
No adverse effects on native plants or rare plant species are expected because the pipes will be installed beneath paved roads. Impacts will be **less than significant**.

### *Clover Point to McLoughlin Point*

Ancillary facility construction

**Potential Impact: Native plants, rare plant species, or street trees may be affected by facility construction.**
Conveyance pipelines connecting Clover Point to McLoughlin Point along Dallas Road are adjacent to known sensitive ecosystems and mature street trees.

The installation of the conveyance pipeline from Clover Point to McLoughlin Point requires excavating a trench along Dallas Road. There is a risk of damaging tree roots during pipe installation, resulting in potential tree health effects.

Mitigation measures. A registered arborist should be retained during the conveyance pipeline route refinement and design stages to determine further measures to avoid or mitigate potential damage to the street trees.

Sensitive ecosystems near Dallas Road should be avoided during construction of ancillary facilities. Temporary workspace and lay-down areas will be located in areas that will not affect native or rare plant communities.

With mitigation measures implemented, it is expected that loss or damage to native plants, rare plant species, or street trees during construction of the ancillary facilities between Clover Point and McLoughlin Point will be short-term, reversible, of low magnitude, and **less than significant**.

Ancillary facility operation

**Potential Impact: Native plants or rare plant species may be affected by ancillary facility operation.**
No adverse effects on native plants or rare plant species are expected along the pipeline route during operation of the wastewater treatment facilities.

Effects are limited to the ancillary facility footprint, short-term, negligible, and **less than significant**.

### *McLoughlin Point to Hartland North*

This conveyance pipeline route between the McLoughlin Point wastewater treatment facility and Hartland North biosolids facility has not been finalized. An assessment of project effects along the conveyance pipeline route will be provided when the route has been finalized.

## 5.4 Wildlife and wildlife habitat

### Regional overview

The wastewater treatment facility project area is located in the Coastal Douglas Fir biogeoclimatic (CDF) zone on the southern tip of Vancouver Island. Wildlife communities are representative of an isolated island setting and a mild climate (MacArthur and Wilson, 1967).

Black-tailed deer are the most abundant large mammal on southern Vancouver Island and are widely distributed throughout the area. Other common mammal species include racoon, river otter, and northern harbour seal.

Southern Vancouver Island possesses breeding and stop-over habitat for migratory and resident bird populations. Shorelines and small off-shore islands are vital breeding grounds for a variety of seabirds such as Double-crested Cormorant, Black Oystercatcher, Pelagic Cormorant, Pigeon Guillemot, Rock Sandpiper, Glaucous-winged Gull, and Surfbird (Meidinger and Pojar 1991).

Garry oak ecosystems host a variety of bird species including Western Meadowlark, Coastal Vesper Sparrow, Bushtit, warblers, Spotted Towhee, nuthatches, swallows, and hummingbirds. The open canopy and spars understory of these woodlands attracts raptorial predators such as soaring hawks, falcons, and owls and creates foraging habitat for mammals such as deer, mice, moles, and shrews (Flynn 1999).

Douglas-fir forests and their abundance of seeds, insects, and fruiting plants are an excellent source of nutrients for wildlife. Species reliant on mature Douglas-fir stands include owls, Bald Eagle, Downy Woodpecker, Red-breasted Sapsucker, Chestnut-backed Chickadee, Brown Creeper, Winter Wren, and Varied Thrush (Meidinger and Pojar 1991).

The urbanization of southern Vancouver Island led to the establishment of non-native wildlife species, including European cottontail, house mouse, eastern grey squirrel, Norway rat, Rock Pigeon, European Starling, and House Sparrow. Many of these introduced species compete with or prey upon native wildlife.

## Treatment facility site conditions

### *Macaulay Point*

The pump station at Macaulay Point is bordered by municipal development to the north and ocean to the south. No wildlife habitat features were noted on during site visits, and there are no records of use by provincially-listed or regionally significant wildlife species. No suitable habitat exists in the footprint of the proposed facility. However, areas adjacent to the Macaulay Point site have habitat potentially suitable for provincially blue listed ermine and red listed Vesper Sparrow.

The adjacent public area, Macaulay Point Park, is an off-leash dog walking area. Recreational activity in the area limits use by wildlife. Coastal shores adjacent to the Macaulay Point site are likely used by seabirds, seals, and river otters. Shrubs surrounding the Macaulay Point site may provide foraging and nesting habitat for local songbirds such as Song Sparrow and Dark-eyed Junco (Meidinger and Pojar 1991).

### *Clover Point*

The Clover Point site is located in Clover Point Park, a highly disturbed urban park. The shoreline at the south end of Clover Point remains in a near natural state. River otter latrines have been documented at the tip of the point approximately 200 m from the existing pump station (CRD 2009).

Clover Point Park and adjacent foreshore and marine habitats are a common stop-over for migratory birds. Species such as Bald Eagle, Black Oystercatcher, Black Turnstone, Killdeer, Surfbird, Dunlin, Sanderling, plovers, ducks, and geese can be seen regularly at Clover Point. Migrating sandpipers, Whimbrel, Marbled Godwit, Red Knot, Ruddy Turnstone, and Red-listed Horned Lark, and Western Meadowlark have been documented in and near the park.

No wildlife habitat features occur on the project footprint.

### *McLoughlin Point*

The McLoughlin Point site is located on what was previously an oil tank farm owned by Imperial Oil. No wildlife use or wildlife habitat features were recorded for the site.

Adjacent areas include Garry oak rock-outcrop, coastal bluff habitat, and mature Douglas-fir forest. These areas contain wildlife habitat features such as decomposing logs and wildlife trees. Garry oak habitat to the north of the property contains known river otter latrine sites as described by the Natural Areas Atlas (CRD website).

Provincially listed species such as blue-listed Purple Martin and red-listed Western Meadowlark (Georgia Depression population) have been sighted in the area but are unlikely to use the treatment facility site because of a lack of suitable habitat. River otters are the only wildlife known to use the rocky coastline surrounding the property.

Eastern grey squirrel and eastern cotton tail, both non-native wildlife species, occupy the adjacent vegetated areas and are occasional visitors to the property.

### *Hartland North*

Approximately 40% of the proposed Hartland North site footprint is located in a previously disturbed area that was cleared of vegetation and has been levelled. This disturbed area provides no wildlife habitat features or wildlife habitat values.

The remaining 60% of the site occurs in a maturing second growth forest with moderate wildlife habitat value. The forested area provides suitable nesting and foraging habitat for forest-

dwelling birds, and acts as a wildlife movement corridor for large mammals, such as black-tailed deer and cougar. During an April 2010 field visit, numerous deer trails were noted in the forested portion of the project footprint.

Western Screech Owls, a blue-listed species in British Columbia (BC CDC 2010), have been recorded as nesting near Durrance Lake. The project area is located in the feeding territory for these owls.

A wildlife tree, which provides cavity nesting potential, was noted on the project footprint. Bird species expected to nest in the project footprint and nearby local study area include:

- Coopers Hawk,
- Red-tailed Hawk,
- Northwestern Crow,
- Common Raven,
- Northern Flicker,
- Spotted Towhee, and
- Chestnut-backed Chickadee.

## Ancillary facility conditions

The ancillary facilities will be installed beneath existing paved roads. Though adjacent areas contain sensitive ecosystems, there are few wildlife habitats or habitat features directly adjacent to the proposed ancillary pipe routes. Douglas fir forest, and Garry Oak rock outcrops adjacent to Victoria View Road contain foraging, security, and reproductive habitat for several bird and wildlife species. The large street trees lining Dallas Road near Ogden Point provide potential nesting and security habitat to urban wildlife species.

## Impact assessment and mitigation measures

### *Macaulay Point*

Treatment facility construction

**Potential Impact: Construction activities may affect wildlife or wildlife habitat.**
Construction of new structures at the Macaulay Point site will occur entirely on previously disturbed areas of the CRD property. No wildlife or habitat is identified on the site. No sensory disturbance effects are expected to affect wildlife in the area at any time of year.

It is expected that the impacts of construction activities on wildlife or wildlife habitat will be short-term, local, reversible, negligible, and **less than significant**.

Treatment facility operation

**Potential Impact: Operational activities may interfere with wildlife or wildlife habitat.**
The new structures at Macaulay Point site will be situated entirely on previously disturbed areas of the CRD property, where very little wildlife use occurs, and no critical wildlife habitats exists. The operations of the proposed facility expansion at Macaulay Point will not be materially different from those that already occur at the site. Therefore, no adverse effects to wildlife or wildlife habitat are expected during operations of the proposed Macaulay Point facility, and the impacts will be **less than significant**.

### *Clover Point*

Treatment facility construction

**Potential Impact: Construction activities may affect wildlife and wildlife habitat.**
Construction of the Clover Point facility will require the removal of a small area of turf grass that may be occasionally used by birds. The area is considered marginal wildlife habitat. The expanded facility will be entirely underground and the area will be restored following construction.

Construction activity may cause sensory disturbances and could alter migratory bird stop-over patterns if the construction activities take place during the spring and fall bird migratory period. Disturbance seems unlikely because the facility is in an urban setting and is subject to regular vehicular traffic and active water and land recreation in and near Clover Point Park. Sensory disturbance effect to wildlife in the area due to construction activities are expected to be rare.

Mitigation measures. Reintroduction of native plant species to the Clover Point site following construction would enhance wildlife habitat and may benefit some wildlife species.

Effects of Clover Point facility construction on wildlife are local, short-term, irreversible, of moderate magnitude, and **less than significant**. If mitigation measures are implemented, the effects of the facility construction would be **beneficial**.

Treatment facility operation

**Potential Impact: Operational activities may interfere with wildlife or wildlife habitat.**
Because the operations of the proposed facility expansion at Clover Point will not be materially different from those that already occur at the site, there are no expected adverse effects to

wildlife or wildlife habitat in the area during operation of the Clover Point facility, and impacts will be **less than significant**.

### *McLoughlin Point*

Treatment facility construction

**Potential Impact: Construction activities may affect wildlife or wildlife habitat.**
Based on current facility designs, the proposed road at the north end of the project footprint will abut native trees and shrubs on the adjacent DND property but no removal of wildlife habitat or habitat features is anticipated. Native songbirds use this vegetation for feeding, security habitat and potentially for nesting.

Existing sources of regular wildlife sensory disturbances at McLoughlin Point include sea and air traffic, construction during site remediation, and urban use. River otter using the adjacent shorelines could be disturbed by the increase in construction activities.

> Mitigation measures. Wildlife habitat and native vegetation located outside of the currently fenced areas of the Imperial Oil property should be avoided in the design of the facility footprint. The proposed road in the current design should be relocated to fit within the fenced area.
>
> Temporary construction lay-down areas should also avoid areas of wildlife habitat and native vegetation.

Applying standard construction practices during the construction of the McLoughlin Point facility will result in impacts to wildlife and wildlife habitat that are local, medium-term, low magnitude, and **less than significant**.

Treatment facility operation

**Potential Impact: Operational activities may interfere with wildlife or wildlife habitat.**
There are no expected adverse effects to wildlife or wildlife habitat in the area as a result of operating the proposed McLoughlin Point facility, and the impacts will be **less than significant.**

### *Hartland North*

Treatment facility construction

**Potential Impact: Construction will require removal of wildlife habitat.**
Construction of the Hartland biosolids facility will require the permanent removal of approximately 1 ha of maturing second growth forest habitat. This removal will cause a loss of

wildlife habitat features, such as nesting sites, and will affect wildlife movement patterns through the area.

> Mitigation measures. Reconfigure the facility footprint to avoid disturbance to potential wildlife habitat features and movement corridors in the vegetated portions of Hartland North.

Construction of the Hartland biosolids facility, based on the current design, will result in long-term, irreversible, moderate magnitude effects on wildlife habitat availability and movements on the project footprint. These impacts are assessed to be **less than significant**.

If the recommended mitigation measures are implemented, the adverse effects of facility construction on wildlife will be of negligible magnitude, limited to the footprint, short-term, and reversible. These impacts are assessed to be **less than significant**.

**Potential Impact: Construction activities may disturb wildlife.**
Construction activity may cause sensory disturbances to nesting birds, and could affect nesting success if the construction activities take place during the spring bird breeding period, particularly if Western Screech Owls are nesting nearby.

> Mitigation measures. Disturbance of nesting birds can be avoided by timing vegetation removal work to avoid the nesting bird season (March 15 – July 31). A survey for Western Screech Owls should be completed in advance of starting construction activities.

If the mitigation measures are implemented, the effects of construction of the facility at the Hartland North site will be reversible, medium-term, of low magnitude, and **less than significant.**

Treatment facility operation

**Potential Impact: Operational activities may interfere with wildlife or wildlife habitat.**
The facility operation will incrementally increase human presence and human-caused disturbances of wildlife in the area. This impact is assessed to be local, long-term, irreversible, of low magnitude, and **less than significant**.

### *Ancillary facilities*

Ancillary facility construction

**Potential Impact: Construction activities may affect wildlife or wildlife habitat.**
The installation of conveyance pipelines will be installed in trenches along existing roads and in a tunnel across Victoria Harbour. Construction of the ancillary facilities will not require the removal of wildlife habitat or habitat features. Sensory disturbances to wildlife during construction of the ancillary facilities are expected to be minor.

The impact of the construction of the ancillary facilities on wildlife or wildlife habitat will be limited to the project footprint, short-term, reversible, low to moderate magnitude, and **less than significant.**

Ancillary facility operation

**Potential Impact: Operational activities may interfere with wildlife or wildlife habitat.**
There are no expected adverse effects to wildlife or wildlife habitat along the pipeline route during operation of the wastewater treatment facilities, and impacts will be **less than significant**.

## 5.5 Fish

There are no streams or other freshwater aquatic systems in or adjacent to the treatment facility sites. A tunnel or drilled forcemain will cross the Outer Victoria Harbour and a new outfall will be constructed. Because no fish habitat will be affected by the facilities under study, impacts are considered **less than significant.**

The marine Environmental Impact Study will assess potential impacts to fish habitat in the marine environment.

## 5.6 Air quality

### Treatment facility site conditions

High wind speeds create direct dilution and mechanical air turbulence, resulting in good odour dispersion. These beneficial conditions do not occur if wind speeds are low. Periods of calm conditions, if combined with an odour release from a treatment facility, would increase the risk of adverse odour impacts.

### *Macaulay Point*

Meteorological conditions were not assessed for Macaulay Point. The project only requires upgrades to the existing Macaulay Point pump station, so no change to existing air quality is anticipated.

### *Clover Point*

Meteorological conditions were not assessed for Clover Point. The project only requires upgrades to the existing Clover Point pump station, so no change to existing air quality is anticipated.

### *McLoughlin Point*

Figures 5-6, 5-7, 5-8 show 2004 - 2008 annual wind speed, wind direction, and atmospheric stability in the harbour. Air temperature, air pressure, and wind data from 2004 to 2008 were used from the Esquimalt Harbour weather station. Cloud opacity and ceiling height were obtained from Victoria International Airport. The Esquimalt Harbour station is located at the end of a short jetty extending out into the water between Duntze Head and Fisgard Island. The station is well exposed to winds coming off Juan de Fuca Strait from the south through southwest and from over Esquimalt Harbour and Constance Cove from the north-northwest through northeast. The only major high-friction surface is the land and buildings adjacent to the station to the east.

The Esquimalt Harbour weather station was used to model the meteorological conditions at the McLoughlin Point site. Data from this station were because data from the Victoria Harbour station are not available for the important evening hours. The Esquimalt Harbour weather station data should be representative as it is nearby and is subjected to similar wind patterns. This station is located 3.4 km west-northwest of the McLoughlin Point site. McLoughlin Point has more water exposure to the southeast than does Esquimalt Harbour.

The most frequent annual wind directions at the weather station are toward the southwest and south-southwest (Figure 5-6). These directions have a relatively high frequency of low wind speeds in the 0.5 to 2.1 m/s range. Winds blowing in the opposite direction are also common but are accompanied by generally higher wind speed, resulting in more atmospheric dispersion.

The pattern of the annual wind rose is a combination of warm and cold season prevailing winds. Winter winds primarily blow toward the southwest sector. From November through February, 54% of winds are headed between 200 and 250 degrees. This pattern would also hold at the McLoughlin Point site. However, the frequency of winter northwest trending winds that precede

the passage of mid-latitude cyclonic storms would be greater and their wind speeds much higher at McLoughlin Point with is open exposure and long open-water fetch to the southeast.

Summer winds primarily blow toward the north-northeast. June through September 44% of winds are headed between 10 and 50 degrees. These winds come off Juan de Fuca Strait during the daytime and bring maritime fresh air. Summer wind speeds reach a peak during the afternoon and early evening. Lighter winds blowing toward the southwest sector account for 14% of summer observations, mainly occurring during night and early morning. This wind pattern would hold at McLoughlin Point.

Overall wind speeds in the area are moderate. The annual mean is 3.1 m/s and only 2.6% of the hourly observations are calm (Figure 5-6 and 5-7). However, the median is only 2.0 m/s. Less than 11% of the measured wind speeds are 5.7 m/s or greater.

Wind speeds along the shoreline are great enough to produce mechanical turbulence (Figure 5-7). This characteristic combined with the water surfaces that limit surface heating during the day and surface cooling at night create a neutral stability class D (neither stable nor unstable) 46% of the time. Unstable air (classes A, B, and C) occurs with daytime, summer solar heating of the ground. Prevailing winds during summer days blow toward the northeast and north-northeast. Most unstable conditions are found with these wind directions.

Stable air that inhibits vertical mixing and odour dilution (classes E and F) occurs most commonly with winds blowing toward the southwest and south-southwest. Light winds from this direction are most frequently associated with high pressure systems in winter and night time conditions in summer. Of most concern is class F, very stable, which occurs 18% of the time at Esquimalt Harbour. The frequency and direction of effect would be similar at McLoughlin Point.

Although infrequent in occurrence, McLoughlin Point winds blowing toward the west through north-northwest carry odour directly over land without any fetch[4] and dilution over water. Maximum odour effects would occur in the McLoughlin Point area in these directions during the infrequent times of light winds and stable air (Figures 5-6 and 5-8).

[4] Fetch is the distance that wind can travel over water, toward land.

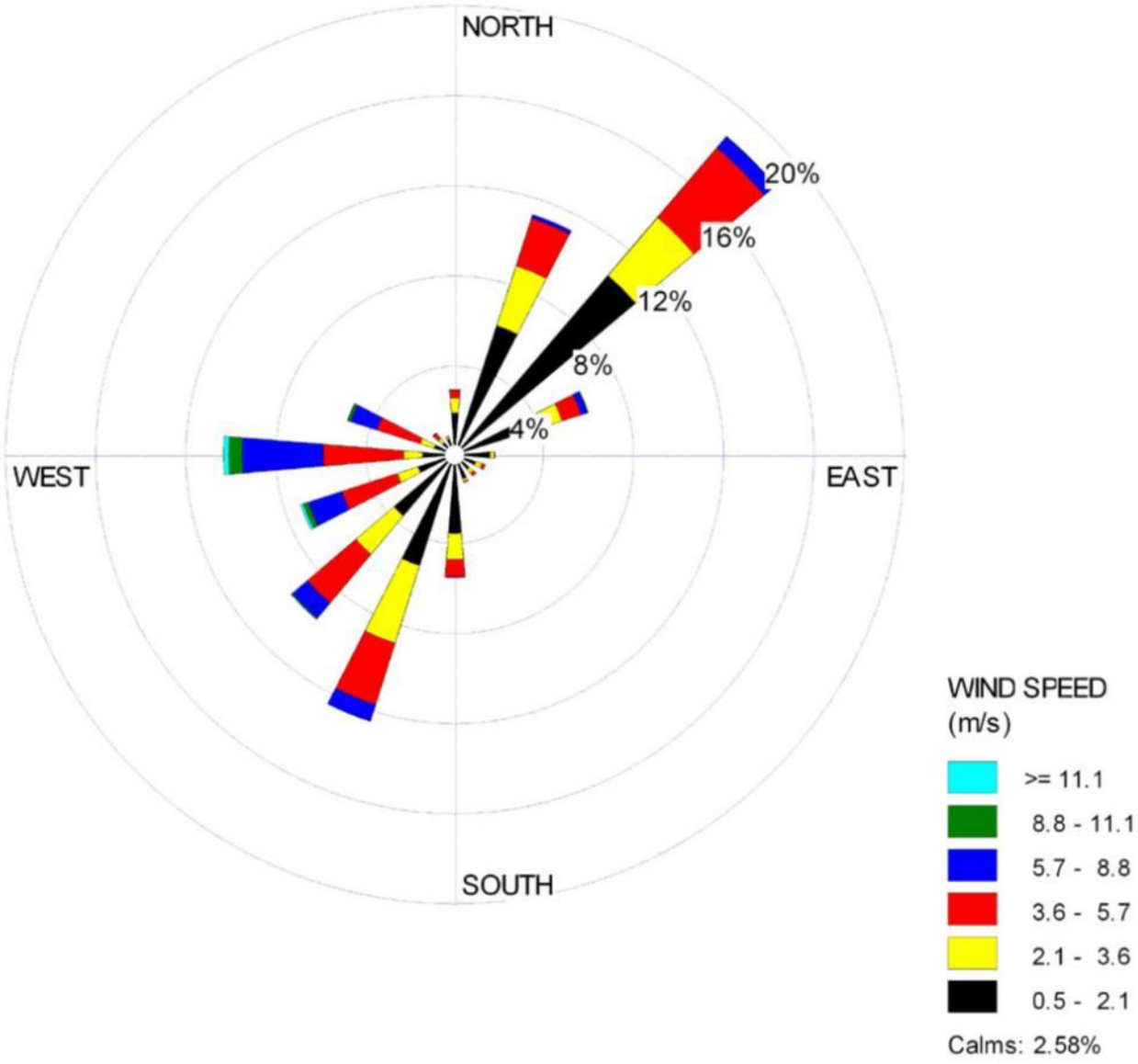



**Figure 5-6. Wind rose for Esquimalt (2004 to 2008)**

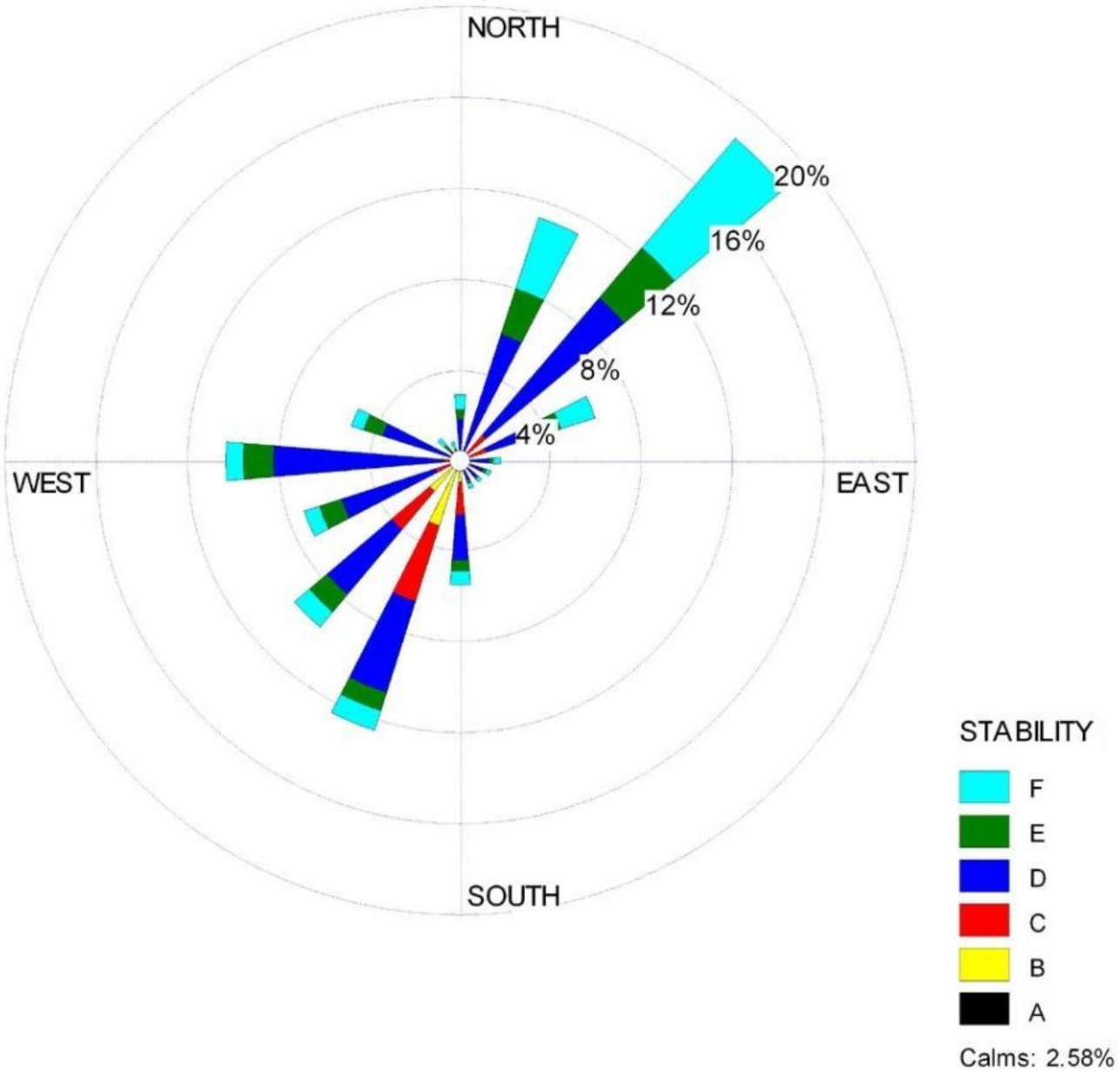



**Figure 5-7. Atmospheric stability rose for Esquimalt (2004 to 2008)**

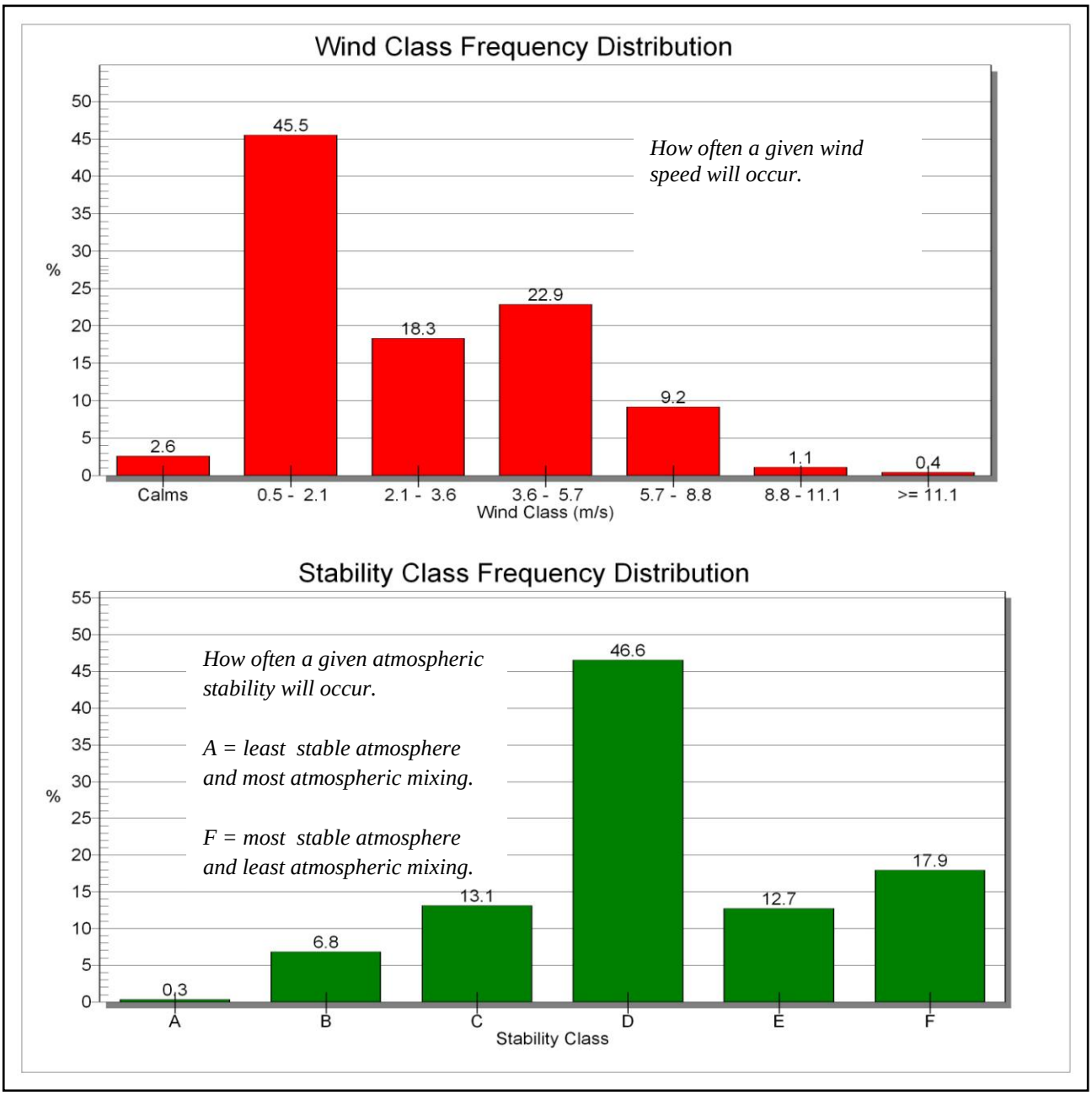



**Figure 5-8. Frequency and distribution of wind and atmospheric stability Esquimalt (2004 – 2008)**

### *Hartland North*

The Hartland landfill located to the south of the site is an occasional source of local odour that affects the Hartland North site. Most odour-causing gases at the landfill are captured and burned in the CRD's recently installed landfill gas-to-electricity facility. Malodorous landfill gas may

still occasionally escape from the landfill perimeter and over the Hartland North site, when a low-pressure weather system moves in and the higher-pressure landfill gases are released.

A major topographic ridge feature (Mount Work) to the southwest of the site tends to force light drainage winds to move in a southeasterly direction. The percentage of evenings with poor atmospheric dispersion (F-stability) was estimated to be 64% during July and August, 52% during September and October, and approximately one-half of these frequencies during the remaining months.

## Impact assessment and mitigation measures

### *Macaulay Point*

Treatment facility construction

**Potential Impact: Air quality will be reduced by dust and exhaust emissions during construction.**

People may observe reduced air quality from construction dust and exhaust emissions when working or exercising outdoors. Dust can be a nuisance when it adheres to windows and vehicles, and seeps into houses. No adverse health effects are anticipated. The dust and exhaust emissions would be most noticeable to those close to the facility. At the Macaulay Point facility, dust and exhaust emissions may affect residents of the military housing (east, northeast, and southeast of the facility), users of the public walkway south of the facility, and users of the military training facilities to the west and north of the facility.

> Mitigation measures. Dust control measures, including the use of box covers on trucks, the application of the CRD codes of practice, and a dust management plan will reduce effects on residents and land users. Vehicles and equipment will be shut off when not in use to reduce exhaust emissions.

The potential effect of reduced air quality from dust and exhaust emissions during Macaulay Point facility construction is local, short-term, reversible, low in magnitude, and **less than significant**.

Treatment facility operation

**Potential Impact: Air quality will be reduced by odour emissions during facility operation.**

The existing Macaulay Point pump station has an odour control system. The upgrades to the existing facility include an expanded pump station and a backup generator. Because the project only requires upgrades to the existing Macaulay Point pump station, no change to existing air quality is anticipated. The potential impact on air quality is assessed to be local, long-term, irreversible, of low magnitude, and **less than significant**.

### *Clover Point*

Conditions contributing to odour concerns

The Clover Point site is located in Clover Point Park, a heavily-used municipal park located on the southern shore in the City of Victoria.

Clover Point is located approximately 200 m south of a residential area of detached and attached homes. The existing pump station is a source of occasional malodours. As noted previously, Clover Point is usually well ventilated by local winds and hence project-related odour emissions can be expected to be quickly diluted to non-detectable levels.

Because there will be no change in volume of wastewater being pumped, the proposed facility upgrades will not change air quality in the local area. The odour control system at Clover Point has recently been upgraded, and this system is considered adequate for the expanded pumping facility.

Treatment facility construction

**Potential Impact: Air quality will be reduced by dust and exhaust emissions during construction.**

People may observe reduced air quality from construction dust and exhaust emissions when working or exercising outdoors. Dust can be a nuisance when it adheres to windows and vehicles, and seeps into houses. No adverse health effects are anticipated. The dust and exhaust emissions would be most noticeable to those close to the facility. At the Clover Point facility, dust and exhaust emissions may affect residents to the north, northwest, and northeast, and Clover Point Park users. Air quality impacts would mainly occur during excavation and grading activities. Winds at Clover Point tend to blow offshore, which would reduce air quality impacts during construction.

> Mitigation measures. Dust control measures, including the use of box covers on trucks and a dust management plan, will be used to reduce effects on residents and park users. Vehicles and equipment will be shut off when not in use to reduce exhaust emissions.

The potential effect of reduced air quality from dust and exhaust emissions during Clover Point facility construction is local, short-term, reversible, of low magnitude, and **less than significant**.

Treatment facility operation

**Potential Impact: Air quality may be reduced by odour emissions during facility operation.**

The existing Clover Point pump station has a new and effective odour control system. Because the expanded facility will handle the same volume of wastewater, no change to existing air

quality is anticipated. The potential impact on air quality is assessed to be local, long-term, irreversible, of low magnitude, and **less than significant**.

### *McLoughlin Point*

Atmospheric dispersion modeling

Maximum off-site odour concentrations were estimated around the McLoughlin Point site using five years (2004–2008) of wind and temperature data from the nearby Esquimalt Harbour meteorological station (described in the previous section) and cloud-cover and ceiling height data from the Victoria airport. The output from the atmospheric dispersion modeling contains estimates of the maximum 10-minute-averaged odour concentration, over the 5-year modeling period, at each of the receptor locations. The model results are then post-processed to create odour isopleths (contours of equal odour concentration) over the affected area.

The McLoughlin Point site is located near the entrance to the Victoria Harbour, where terrain elevations are modest. Clear evening skies and low winds will result in a temperature inversions and stable atmospheres with low turbulence and hence poor odour dispersion characteristics. Under inversion conditions, the odour plume from a wastewater treatment facility at the McLoughlin Point site will tend to quickly flatten out and brush against nearby elevated surfaces, such as ridges or knolls, resulting in maximum predicted ground-level odour concentration at these locations.

For the McLoughlin Point site, the ambient odour guideline is 5 odour units (OU), not to be exceeded under the worst-case meteorological conditions. The effectiveness of the treatment facility ventilation air scrubbing would be chosen so that this guideline is not exceeded during normal operation and all meteorological conditions. Figure 5-9 is a representation of the maximum odour concentrations with sufficient odour control to reduce odour units to approximately 5 OU. Under the worst-case meteorological conditions, the model estimates odour of less than 1 OU for the property line. Outside the property line, the model estimates odour between 0 and 5 odour units under worst-case conditions for the five years of meteorological data collected from the years 2004–2008.

The modeling predicts that the maximum ground level concentration would occur when a gentle late night breeze of 1 m/s causes the odour plume to impinge onto a 32 m above sea level knoll approximately 425 m west-northwest of the McLoughlin Point site. The predicted maximum concentration of approximately 5 OU would be expected to occur perhaps once during a 5-year period of normal operation. Figures 5-6 and 5-7 show, however, that the wind rarely blows towards the west-northwest. A more usual evening wind would be an outflow over the open water, and not over land.

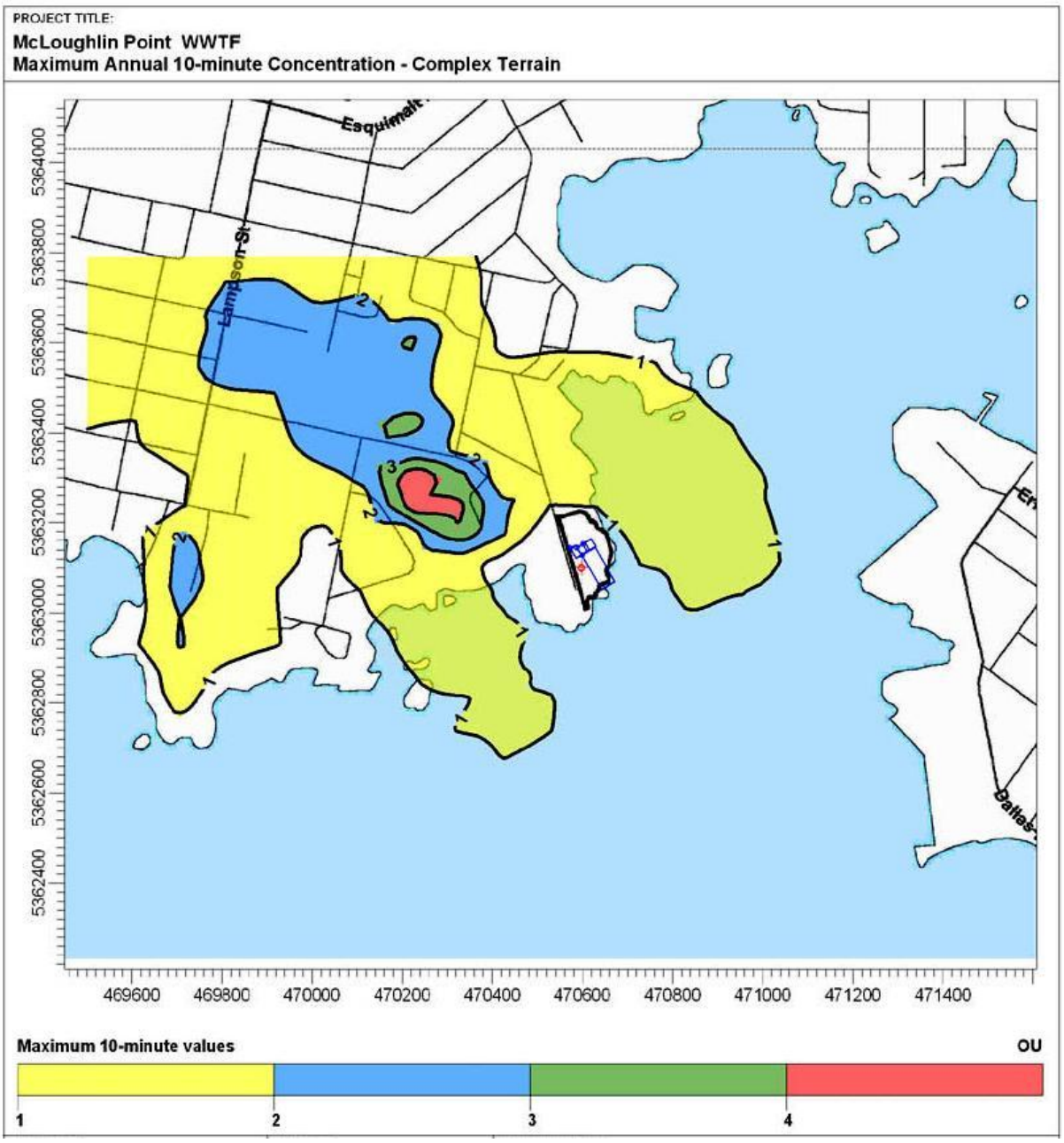



**Figure 5-9. Maximum 10-minute duration odour isopleths for McLoughlin Point site**

Treatment facility construction

**Potential Impact: Air quality may be reduced by dust and exhaust emissions during construction.**

People may observe reduced air quality from construction dust and exhaust emissions when outdoors for extended periods. Dust can be a nuisance when it adheres to windows and vehicles, and seeps into houses. No adverse health effects are anticipated. The dust and exhaust

emissions would be most noticeable to those close to the facility site. At the McLoughlin Point site, there is a substantial buffer between most of the military housing and the treatment facility site. However, two military residences are located 45 m and 70 m west of the facility site. The trees between the facility site and the residences would reduce the air quality effects of facility construction.

> Mitigation measures. Dust control measures, including the use of box covers on trucks, the application of the CRD codes of practice, and a dust management plan will be used to reduce effects on residents and land users. Vehicles and equipment will be shut off when not in use to reduce exhaust emissions.

The potential effect of reduced air quality from dust and exhaust emissions during McLoughlin Point facility construction is local, medium-term, reversible, low in magnitude, and **less than significant**.

Treatment facility operation

**Potential Impact: Air quality may be reduced by odour emissions during facility operation.** Typical operation of the facility will result in no detectable odour at the property boundary. Annual maintenance will be conducted, when possible, during breezy weather, minimizing risk of adverse odour effects. However, if a redundant odour control system is not installed and running in parallel with the main system, adverse odours could be detectable during maintenance.

In rare cases of equipment malfunction, if a redundant odour control system is not installed, adverse odour effects of unknown magnitude and duration could affect the local area. The season and prevailing wind direction at the time of the malfunction would determine the location and intensity of any adverse air quality effects.

> Mitigation measures. Redundant odour control systems and backup generators will be installed to reduce the risk of untreated air discharge from the facility. This mitigation will ensure that odour impacts during maintenance, breakdowns, or power failure are reduced to low magnitude.
>
> The CRD will respond to neighbourhood concerns about odour.

Based on the existing treatment facility design, which does not provide a redundant odour control system, the potential impact on air quality from odour emissions during routine maintenance or mechanical failure is considered local, short-term, occasional, reversible, high magnitude, and **significant**.

If a redundant odour control system is installed to operate during routine maintenance or mechanical failure, the potential impact on air quality will be reduced to low magnitude and **less than significant**.

### *Hartland North*

Atmospheric dispersion modeling

Maximum off-site odour concentrations were estimated around the Hartland North site using nocturnal drainage wind data extracted from meteorological data recorded at the Victoria Airport. The data extraction was based on evening clear-sky, low-wind events when there was a definite indication of a wind direction shift from a daytime sea breeze to an evening land breeze. The general drainage wind pattern at the Victoria Airport is from the north. The wind direction was shifted 35 degrees anti-clockwise to better reflect conditions around the facility site.

For the Hartland North site, the ambient odour guideline is 5 odour units (OU), not to be exceeded under the worst-case meteorological conditions. The effectiveness of the treatment facility ventilation air scrubbing would be chosen so that this guideline is not exceeded during normal operation and all meteorological conditions.

Figure 5-10 is a representation of the maximum odour concentrations with sufficient odour control to reduce odour units to approximately 5 OU. Under the worst-case meteorological conditions, the model estimates odour of less than 1 OU for the property line. Outside the property line, the maximum odour concentration (1.5 $OU/m^3$) occurs against the flank of Mount Work to the west and beside Willis Point Road. This odour would not be discernable under most conditions.

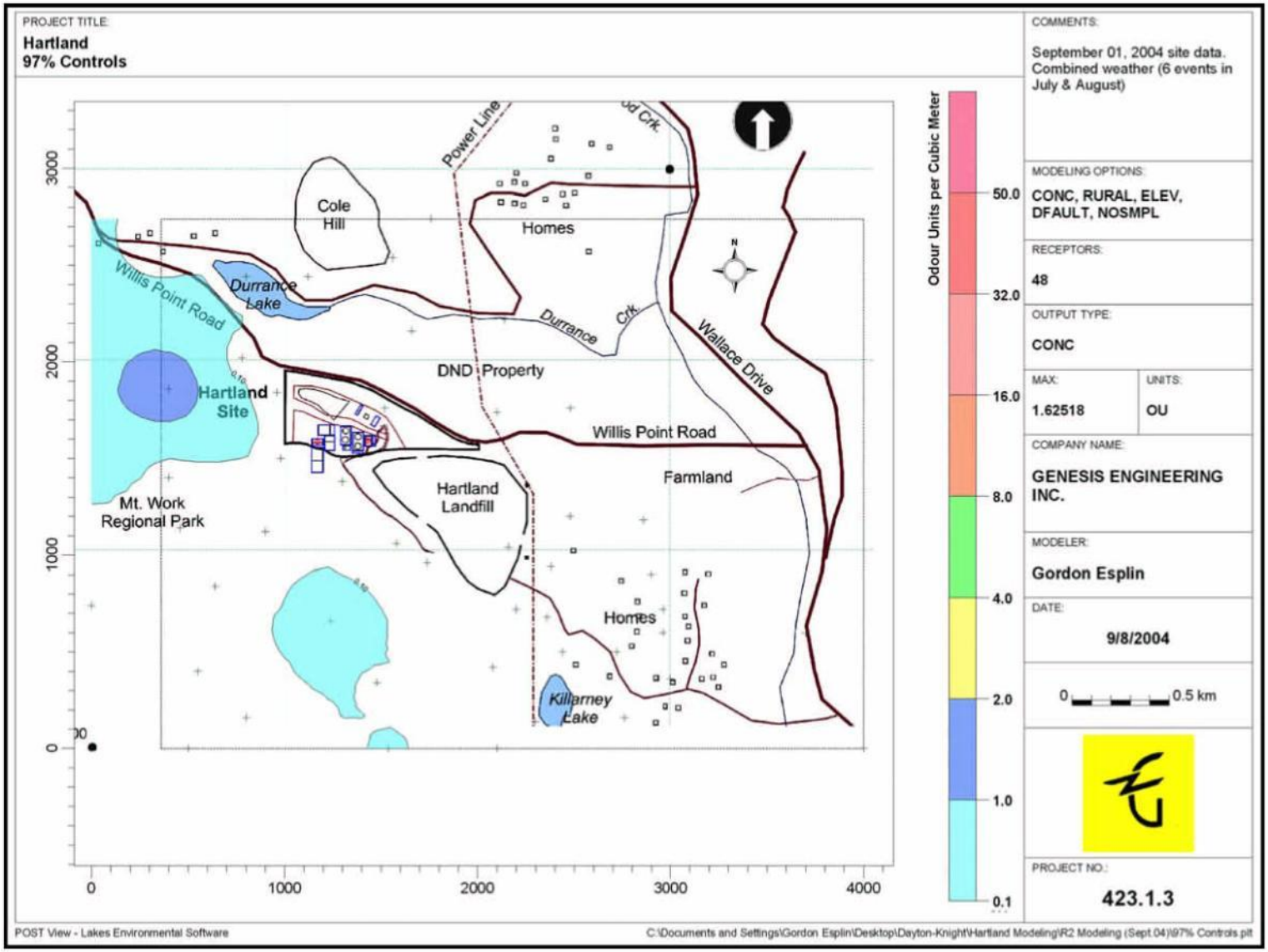



**Figure 5-10. Hartland site odour modeling results**

Treatment facility construction

**Potential Impact: Reduced air quality from dust and exhaust emissions during construction.** People may observe reduced air quality from construction dust and exhaust emissions when working or exercising outdoors. Dust can be a nuisance when it adheres to windows and vehicles, and seeps into houses. No adverse health effects are anticipated. The dust and exhaust emissions would be most noticeable to those close to the facility site. No air quality or odour effects are anticipated from the Hartland North site during construction because the nearest residences are located 1,100 m away from the site.

> Mitigation measures. Dust control measures, including the use of box covers on trucks, the application of the CRD codes of practice, and a dust management plan will be used to reduce effects on residents and land users. Vehicles and equipment will be shut off when not in use to reduce exhaust emissions.

The potential effect of reduced air quality from dust and exhaust emissions during the Hartland biosolids facility construction is local, medium-term, reversible, low in magnitude, and **less than significant**.

Treatment facility operation

**Potential Impact: Reduced air quality from odour emissions during facility operation.** Typical operation of the facility will result in no detectable odour at the property boundary. Annual maintenance will be conducted, when possible, during breezy weather, minimizing risk of adverse odour effects. However, if a backup odour control system is not installed and running in parallel with the main system, adverse odours could be detectable during maintenance.

In rare cases of equipment malfunction, if a backup odour control system is not installed and running in parallel with the main system, adverse odour effects of unknown magnitude and duration could affect the local area. The season and prevailing wind direction at the time would determine the location and intensity of any adverse air quality effects.

Based on the existing treatment facility design, which does not provide a back-up odour control system, the potential impact on air quality from odour emissions during routine maintenance or mechanical failure is considered local, short-term, occasional, reversible, high magnitude, and **significant**.

> Mitigation measures. Redundant odour control systems and backup generators will be installed to reduce the risk of untreated air discharge from the facility. This mitigation will ensure that odour impacts during maintenance, breakdowns, or power failure are reduced to low magnitude.

The CRD will respond to neighbourhood concerns about odour.

If a backup odour control system is installed to operate during routine maintenance or mechanical failure, the potential impact on air quality will be reduced to low magnitude and **less than significant**.

### *Ancillary facilities*

Ancillary facility construction

**Potential Impact: Air quality from dust and exhaust emissions could be affected during ancillary facility construction.**

People may observe reduced air quality from construction dust and exhaust emissions when working or exercising outdoors. Dust can be a nuisance when it adheres to windows and vehicles, and seeps into houses. No adverse health effects are anticipated. The dust and exhaust emissions would be most noticeable to those close to the construction site. The construction of the conveyance pipelines will introduce dust impacts for residents, institutional users, industrial users, and commercial users near the construction area. Most of the conveyances pipes will be installed under roads or in tunnels, so the construction effects will be similar to other public road projects.

Construction of the Macaulay Point to McLoughlin Point pipes may affect military residences, users of Department of National Defence (DND) military training grounds, and DND administration buildings.

The construction of the McLoughlin Point to Ogden Point tunnel will result in potential dust and air emissions at either end of the tunnel during construction activities. Few residence or others would be affected by these activities.

Construction of the conveyance pipeline between Ogden Point and Clover Point will produce dust emissions and exhaust emissions that may affect residents, commercial users, and park users along Dallas Road.

Mitigation measures. The CRD will work with the Township of Esquimalt, the City of Victoria, and the Department of National Defence representatives to minimize impacts of constructing the ancillary facilities. Dust control measures, including the use of box covers on trucks, the application of the CRD codes of practice, and a dust management plan will be used to reduce effects on residents and land users. Vehicles and equipment will be shut off when not in use to reduce exhaust emissions.

The potential effect of reduced air quality from dust and exhaust emissions during ancillary facility construction is local, short-term, reversible, low in magnitude, and **less than significant**.

Ancillary facility operation

No air quality effects are anticipated during ancillary facility operation, so impacts to air quality are considered **less than significant**.

## 5.7 Archaeology and Heritage

Figure 5-11 and 5-12 show archaeological and heritage features near the study areas.

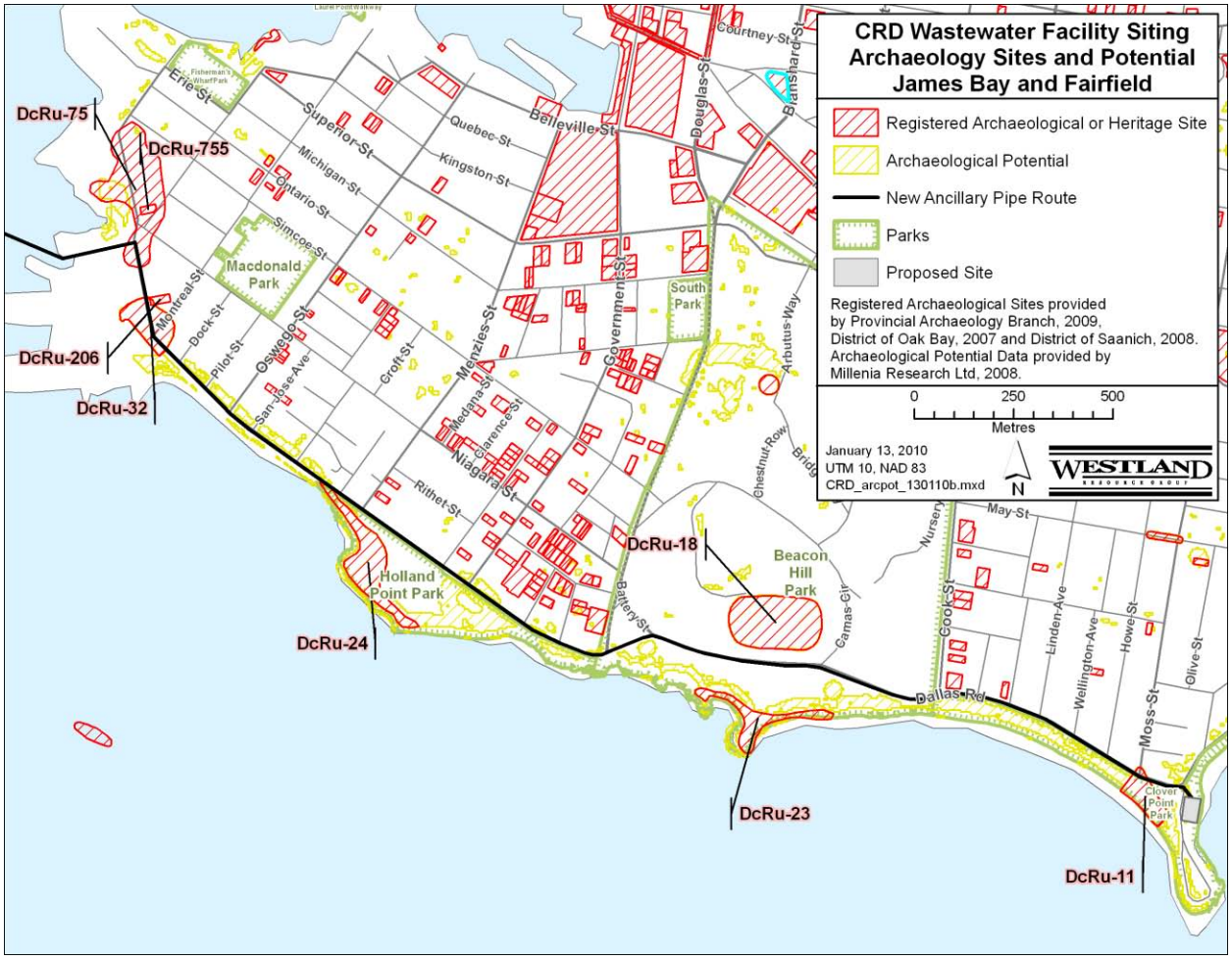



**Figure 5-11. Archaeological and heritage features in James Bay and Fairfield**

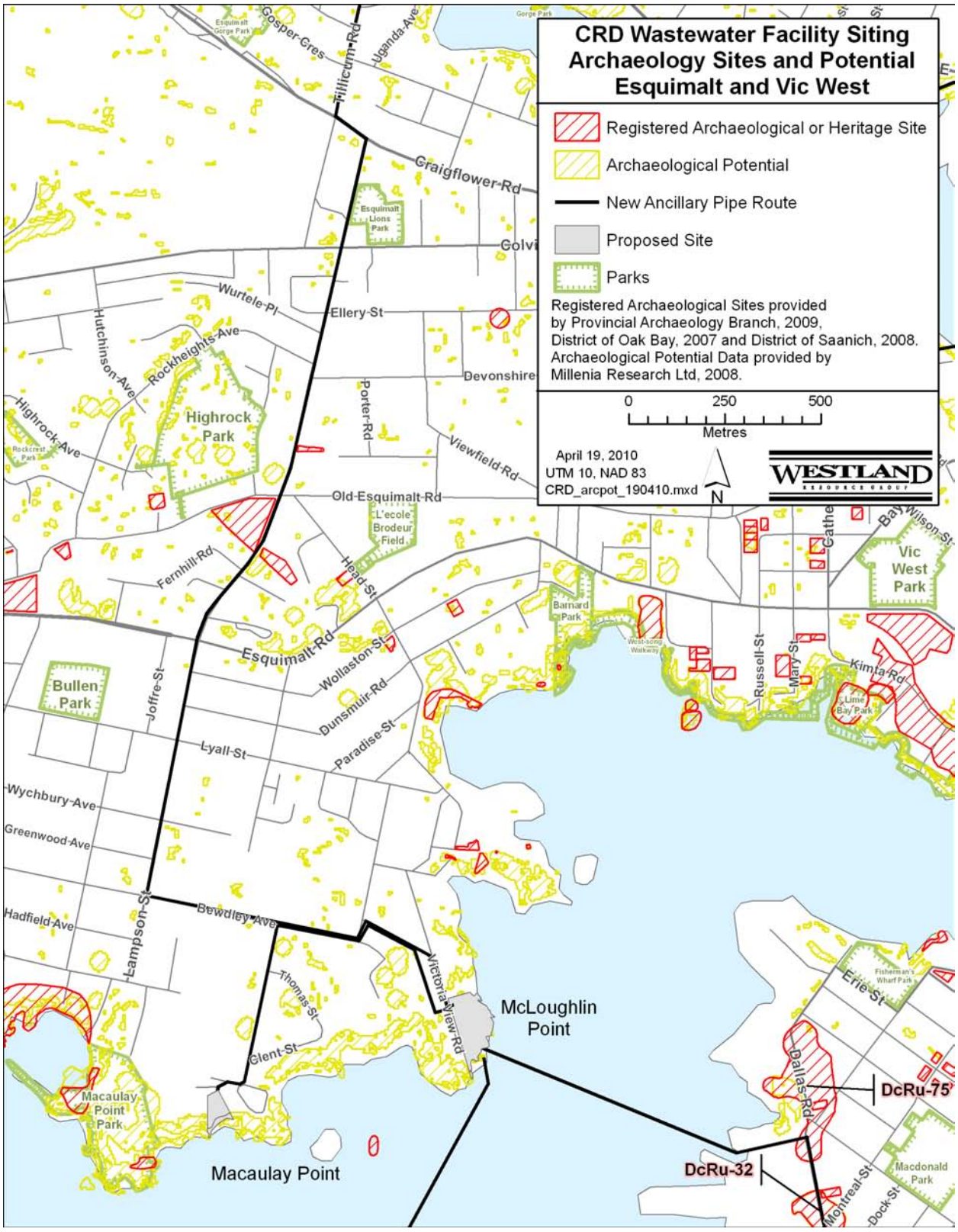



**Figure 5-12. Archaeological and heritage features in Esquimalt and Vic West**

## Treatment facility site conditions

### *Macaulay Point*

No previously recorded sites are located in the immediate vicinity of the CRD's Macaulay Point pump station. The closest recorded site is DcRu-22, a reported aboriginal defensive site located on Macaulay Point proper, more than 250 m west of the project footprint.

The archaeological potential model maintained by the BC Archaeology Branch indicates archaeological potential along the shoreline to the south of the pump station, including the area outside the facility fence with a rock outcropping to the south-west of the existing facility (Figure 5-13). Developments on the southern side of the existing facility are spatially restricted to an area between the existing building and walkway. The development areas were examined on December 9 and 30, 2009. Much of this area has likely been disturbed by the construction of the existing facility (Figure 5-1). The facility footprint on the northern side of the existing pump station is in an excavated area, indicating that further excavation in this area would be unlikely to encounter archaeological deposits, if originally present. West of the existing facility, the land is characterized by a bedrock outcrop with thinly developed soil (Figure 5-15). No cultural sediments or features, such as burial cairns, were identified.

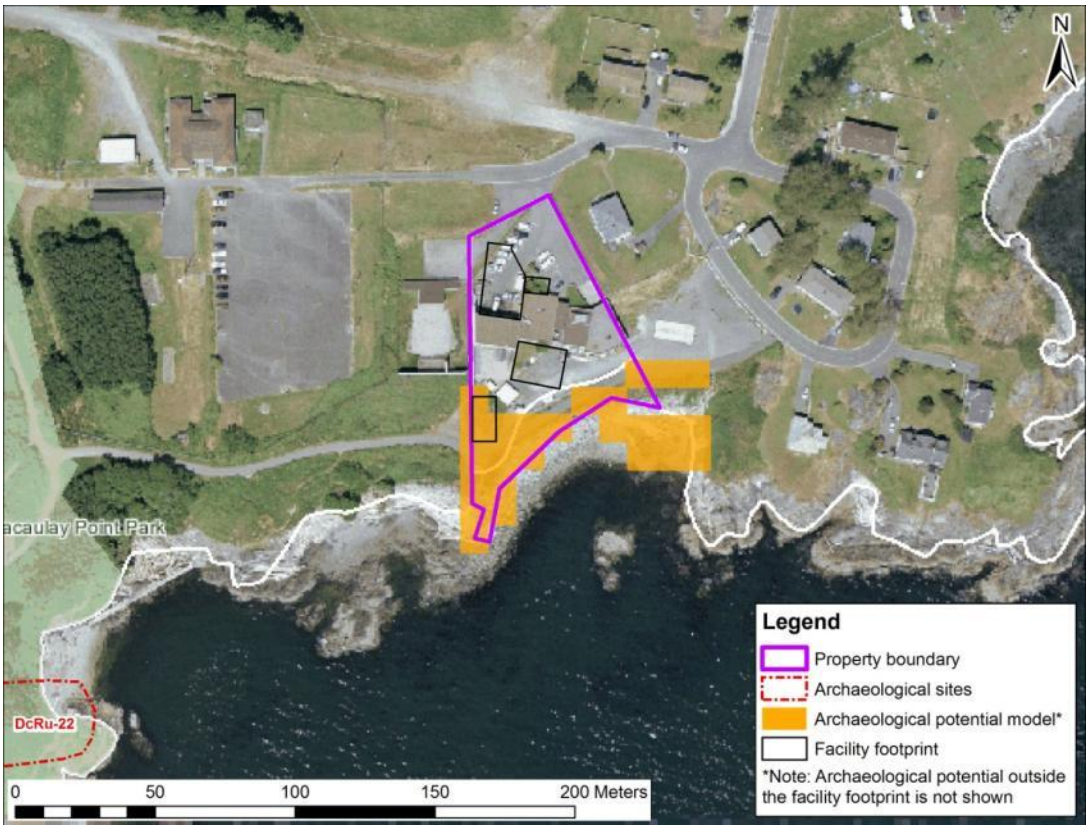



**Figure 5-13. Macaulay Point study area; areas of archaeological potential**

**Figure 5-14. Area of proposed development south of existing Macaulay Point facility**

**Figure 5-15. Southwestern edge of the Macaulay Point pump station between existing facility and walkway; note bedrock outcrop in foreground**

### *Clover Point*

One previously recorded archaeological site, DcRu-11, is located on Clover Point (Figure 5-16), approximately 50 m to the west of the existing pump station. Although there has been considerable landscape modification to area, the archaeological site consists of intact and

disturbed shell midden deposits with artifacts, faunal remains, and possible house floor features (Owens 2001). A pre-contact aboriginal trench-embankment feature is also reported for the area. Keddie (1997) has reviewed local historical references to these features. Two references provide an indication of their size and nature:

> The agger is somewhat worn down, but the fossa is clearly discernible some 12 feet in depth and 15 in breadth, extending in an oval from, round three sides....the fourth side is occupied by a steep clay cliff abutting on the sea beach (Walter Grant 1857 in Keddie 1997).
>
> I noticed a trench, cutting off a small point or rock near the shore,... about six feet deep and eight wide. Governor Douglas informed me that these were not infrequent on the island; that they generally surrounded some defensible place; and that often an escarpment was constructed facing the sea (George Gibbs 1877 in Keddie 1997).

DcRu-11 is not known to extend to the proposed project footprint and no trench-embankment feature has been identified, although the site's boundary has not been defined. Clover Point was a strategic military location during the historic period as well, serving as a training area during World War I and the site of a large military searchlight during World War II. Trenches dating to the World War I were reportedly filled in the 1930s and barracks housing the men who manned the searchlight were removed in the 1950s (Ringuette 2005).

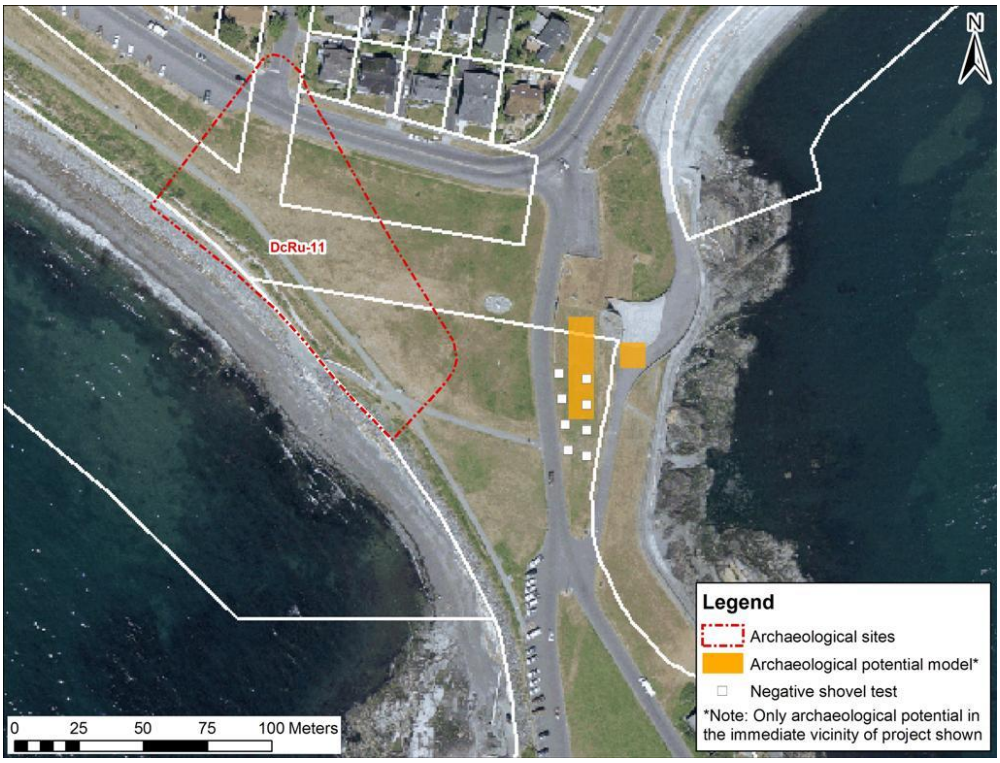



**Figure 5-16. Clover Point site; area of archaeological potential. DcRu-11 site boundary and shovel test locations**

A series of hand excavated subsurface tests (shovel tests) were conducted adjacent to the existing pump station under *Heritage Conservation Act* Permit 2009-0404 and a City of Victoria Parks Research and Collection Permit (Figure 5-17). Although it was considered unlikely that hand testing would identify the aboriginal trench feature, the testing was intended to identify any other cultural materials or features, if present. Ten shovel and auger tests were excavated to apparent natural sediments. These tests generally revealed 15 to 40 cm of brown loam with occasional historic inclusions such as nails, asphalt, plastic, and ceramic shards. This stratum was underlain by heterogeneous culturally-sterile sediments: sand with gravel over yellow-grey clay or reddish silt over yellow-grey clay. These basal layers are likely of late Pleistocene or early Holocene age. No precontact cultural deposits were identified in this stratum.

Given previous landscape modifications and filling of the area, any aboriginal trench feature is likely deeply buried and accessible only by machine testing. The aforementioned developments and modifications, in particular the WWI era trenches, and the road, parking areas, and existing outfall facilities, will have undoubtedly complicated the stratigraphic nature of the project footprint, making the identification of the aboriginal trench feature, if present, difficult through small scale hand tests. Machine excavation of a narrow trench running the length of the development footprint would clarify the matter.

**Figure 5-17. Looking north, immediately west of the existing Clover Point pump station**

### *McLoughlin Point*

The McLoughlin Point property contains no previously recorded archaeological sites, although the archaeological potential model maintained by the BC Archaeology Branch indicates a small area of archaeological potential along a rocky outcrop at the southern end of McLoughlin Point (Figure 5-18). The closest recorded archaeological sites, shell midden recorded as DcRu-662 and a shipwreck on Harrison Island recorded as DcRu-1152, are more than 350 m from the property. A site visit on December 9, 2009 confirmed the limited potential of the area. Most of the property is undergoing environmental remediation and buildings and facilities associated with previous use of the property have been removed. The central portion of the property remains capped by an asphalt pad and a concrete slab (Figure 5-19). The area beneath these structures was not examined for archaeological potential, although sediment exposures and two cleared bedrock outcrops in the remediation area were examined. A fringe of what appears to be original shoreline outside the remediation area was not examined because access was restricted to this area at the time of the site visit.

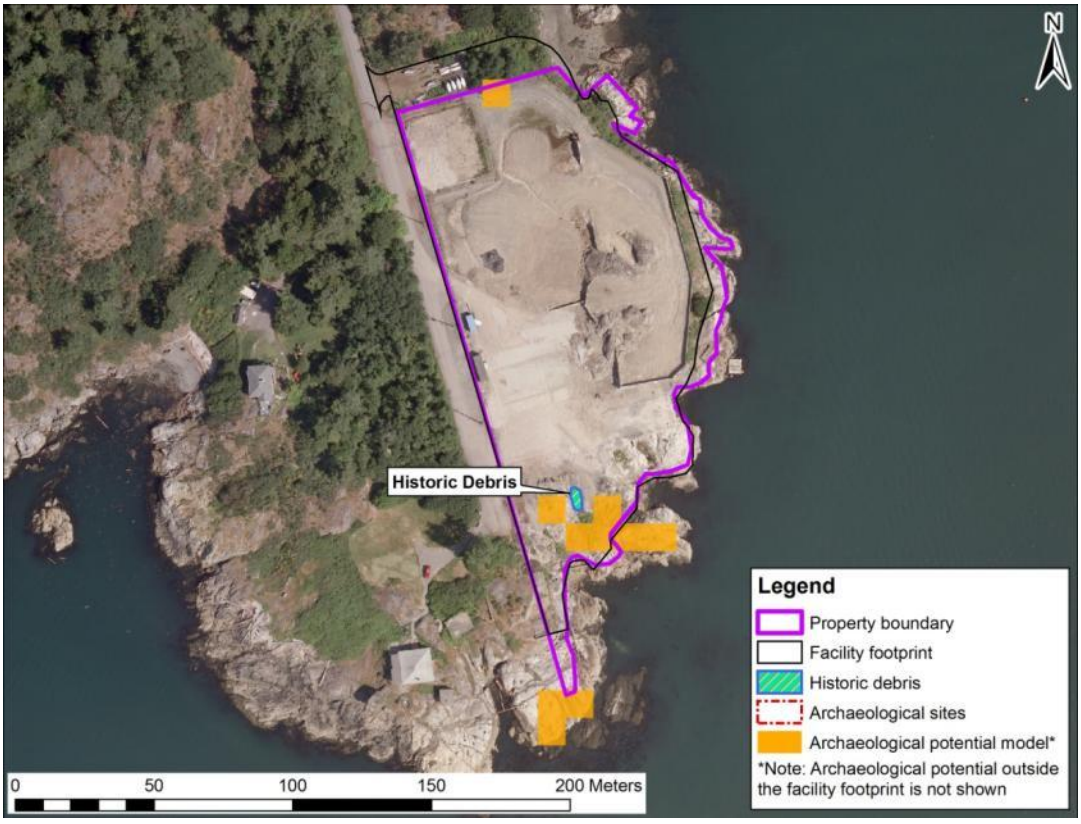



**Figure 5-18. McLoughlin Point study area, areas of archaeological potential and noted historic debris**

No precontact archaeological deposits were identified. A small concentration of historic debris – leaded glass, bottle fragments, ceramic dishware shards, and machine cut bone – were identified

in sediment in a bedrock crevice at the southern end of the remediation area (Figure 5-20). The material is of limited cultural significance and is not protected by the *Heritage Conservation Act* (HCA). Examination of the surrounding surficial exposures, including recently disturbed areas, and of excavation profiles on the western side of the property near the fence line suggests there is very limited archaeological potential in the unexamined portions of the remediation area.

The bedrock exposure south of the remediation area at the south end of McLoughlin Point was examined for cultural deposits and burial cairns. This is the area of potential as indicated by the BC Archaeology Branch's archaeological potential model. The area is a highly exposed, largely barren and it has been modified to some degree as evident from a rock wall constructed of apparent local materials, and a bunker located on adjacent Department of National Defence property (Figure 5-21). No cultural features or sediments were located.

**Figure 5-19. McLoughlin Point property, looking north. Asphalt pad and concrete slab capping in foreground.**

**Figure 5-20. McLoughlin Point study area from central bedrock outcrop looking south. Historic debris was located on bedrock outcrops in background.**

**Figure 5-21. Bedrock outcrop at southern end of McLoughlin Point study area**

### *Hartland North*

The Remote Access to Archaeological Data (RAAD) application indicates there are no previously recorded archaeological sites near the proposed Hartland facility. The nearest archaeological sites are located approximately 1 km away from the proposed Hartland North site. Approximately one-half of this site was previously used as a compost and yard waste storage area. The RAAD archaeological overview assessment model for the CRD indicates no potential for archaeological sites on the proposed biosolids facility site.

Examination of the Hartland North site (Figure 5-22) during the PFR indicates that the northern portion of the proposed facility location has undergone extensive modification in the past, but that the southern portion remains relatively undisturbed. The northern portion of the site has been graded and levelled for compost and yard waste storage, which lowers the potential for intact archaeological materials to be present. The southern portion of the proposed location retains some potential for the presence of archaeological resources, including cairns and Culturally Modified Trees (CMTs). Should this location be selected, the rock bluffs and mature arbutus trees observed during the PFR (Figure 5-23) should be examined in more detail for burial cairns and any mature trees present should be examined for evidence of cultural scars.

Based on the 2004 site assessment (Westland Resource Group 2004), there are no known Provincial heritage sites identified on the Hartland North site. No Provincial heritage sites will be affected by the construction or operations of the proposed Hartland biosolids facility.

**Figure 5-22. Hartland North site showing the cleared and levelled area of the northern portion and the less-disturbed southern portion of the study area.**

**Figure 5-23. Rock bluffs and mature arbutus in the southern portion of the project area.**

### *Ancillary facility site conditions*

Macaulay Point to McLoughlin Point

Conveyance pipeline connecting Macaulay Point to McLoughlin Point would be routed along existing road rights-of-way.

The shoreline between McLoughlin Point and Macaulay Point, identified as Shore Unit No. 1615.00 in the Harbours Ecological Inventory and Rating (HEIR) mapping project (VEHEAP 2000), contains no registered archaeological sites (Figure 5-24). However, field reconnaissance identified physiographic features associated with the potential for burial cairns, both onshore on rocky bluffs and on offshore islets. Several off-shore islets and rocky headlands (Harrison Island and McLoughlin Point, for example) may have been used by First Nations as burial sites before contact with Europeans, as was done on Coffin Island and Laurel Point in the Inner Harbour. Small bays have extensive build-up of shell deposits. Inshore level areas could contain intact shell midden that has been buried by fill in the course of building detached military housing and yards thus covering evidence of archaeological sites. No known intensive archaeological surveys have been conducted on subsurface materials in this shoreline area, which remains relatively undisturbed by residential and industrial development. The ancillary route from Macaulay Point to McLoughlin Point pipe route will follow existing road rights-of-way and is not expected to affect cultural resources along the shoreline, but there are small areas of archaeological potential along the route.

**Figure 5-24. Rocky bluffs west of McLoughlin Point**

As mentioned previously, the closest archaeological site to the Macaulay Point pump station is 250 m west at Macaulay Point: archaeological site DcRu-22, a trench embankment on the eastern side of the point. On the northwestern site of the point, site DcRu-21, is a trench embankment and an extensive shell midden inland from Fleming Cove (Figure 5-12). Both sites have suffered disturbance from construction of military and municipal park infrastructure. Traditional use records show that reef net fishing occurred off the south shoreline of Macaulay Point, a site that is under water and associated with shallow offshore reefs (Easton 1985, Duff 1969). Songhees First Nation traditional use information describes the harvesting of salmon, sea urchins, and "rockstickers" (limpets) at Macaulay Point. No information is available about harvesting of plant resources on land (English 1996, Te'mexw Treaty Association 2003).

Macaulay Point, west of the pump station, also contains a wide variety of abandoned World War II military infrastructure, including gun emplacements, artillery bunkers, tunnel networks, and observation posts (Figure 5-25). Macaulay Point, therefore, has high archaeological and historic potential.

**Figure 5-25. World War II military infrastructure on Macaulay Point**

Clover Point to McLoughlin Point

The proposed 1,200 mm forcemain from Clover Point to Ogden Point will be constructed in the right-of-way of Dallas Road west of the pump station. As noted previously, Clover Point contains a registered archaeological site, DcRu-11, found on the western side of the peninsula, opposite the pump station (Figure 5-11). This site consists of shell midden that has been badly disturbed by previous land altering activities, such as walkway construction. There may also be intact soils containing cultural deposits. The boundaries of site DcRu-11 extend north of Clover Point and across Dallas Road (BC Archaeology Branch 2009). The proposed ancillary facility route would be constructed through a portion of this archaeological site.

Dallas Road passes between two registered archaeological sites west of Clover Point, DcRu-23, and DcRu-18 (Figure 5-11). The southern portion of Finlayson Point contains archaeological site DcRu-23, a trench embankment and shell midden site (Figure 5-26). Remains of the shell midden are evident on trails and high bluffs on Finlayson Point. North of Finlayson Point, site DcRu-18 contains the remains of what were once numerous burial cairns, many of which contained ancient funereal remains (Figure 5-27). Most of these cairns were excavated in the 1920s by local archaeologists, and later disturbed by City of Victoria staff in the 1980s in the course of maintaining the grass. The hillside containing the cairns is a known camas meadow, and the Songhees First Nation has records of traditional gathering of camas and other medicinal plants on the site (Te'mexw Treaty Association 2003). Other First Nations groups also probably made traditional use of this area.

To the west of Beacon Hill Park, Holland Point Park contains an extensive archaeological site, DcRu-24. The site boundaries extend from the shoreline bluff north to Dallas Road (Figure 5-11). The site originally contained a long trench embankment (Figure 5-28), and shell midden material has been recovered here during AIA investigations conducted prior to walkway development in the park. Rock clusters, which may have been the remnants of burial cairns, remain on the open grassy lawn. A midden is still present at this site.

**Figure 5-26. Finlayson Point and site DcRu-23, Beacon Hill Park**

**Figure 5-27. Burial cairns at site DcRu-18, Beacon Hill Park**

**Figure 5-28. Trench embankment at site DcRu-24, Holland Point**

West of Holland Point Park is registered archaeological site DcRu-32, at the intersection of Dallas Road with Montreal Street (Figure 5-11). The site consists of shell midden currently capped by Dallas Road. A burial was uncovered in this vicinity during street construction on Dallas Road in 1995. According to BC Archaeology Branch records, the location of shell midden near the burial, and the location of the original shoreline of Ogden Point Bay suggest that midden deposits may still be intact under the Dallas Road pavement. The remains of two aboriginal burials unearthed during construction have been reburied along the west side of Dallas Road here.

A more extensive shell midden deposit, archaeological site DcRu-75, extends from the intersection of Dallas Road and Niagara Street north to the intersection of Dallas Road and Simcoe Street near Camel Point (Figure 5-11). This site contained a Lekwungen winter village and defensive embankment (Keddie, *pers. comm.*). Most of this site has been covered with fill in the course of construction at Camel Point and on Dallas Road. According to BC Archaeology Branch file records, some buried shell midden may exist under fill along the west side of Dallas Road from Camel Point to St. Lawrence Street. Two historic sites, DcRu-206, and DcRu-755, are also found within the boundaries of sites DcRu-32 and DcRu-75, respectively (BC Archaeology Branch 2009).

### McLoughlin Point to Hartland North

This conveyance pipeline route between the McLoughlin Point wastewater treatment facility and Hartland North biosolids facility has not been finalized. A detailed description of site conditions

along the conveyance pipeline route will be provided when the route has been finalized and an assessment for the route can be conducted.

### *First Nations lands*

The CRD has entered into an information sharing process with Songhees, Esquimalt, Tsawout, and Beecher Bay Nations on project design and siting work in the core area. The Nations' interests are being recorded and submitted to MOE officials. None of the treatment facility sites or ancillary facility routes are located on Indian Reserves. The CRD will continue to engage the First Nations communities during the project design phase.

## Impact assessment and mitigation measures

### *Macaulay Point*

Treatment facility construction

**Potential Impact: Construction activities may affect archaeological features on the Macaulay Point site.**

The field reconnaissance at the Macaulay Point site indicates that ground disturbance associated with construction activities is unlikely to affect archaeological features in the project footprint; areas of archaeological potential outside this footprint were not assessed.

> Mitigation measures. The CRD will take measures to identify and avoid archaeological sites and features, and to comply with requirements of the Archaeology Branch.
>
> In order to minimize risk with respect to the proposed development, tail-gate archaeological awareness training sessions will be held before the start of construction activities.
>
> In the event that unanticipated archaeological features are identified, construction related activities in the area will be halted and the Archaeology Branch will be contacted for further direction.

If archaeological or heritage features are disturbed during facility construction, such impacts would be long-term and irreversible. However, mitigation to avoid or reduce effects, or compensation for the removal, loss, disruption, modification, or alteration of archaeological or heritage resources, would reduce project construction effects on archaeological features at the Macaulay Point site to low magnitude and **less than significant** levels.

Treatment facility operation

**Potential Impact: Operational activities of the proposed Macaulay Point facility may affect archaeological features.**

No archaeological features or deposits are anticipated in the development footprint. In the unlikely event that unanticipated archaeological features are present, the activities that may affect the features are limited to the construction phase of the project. Facility operation is not expected to affect archaeological features and, therefore, impacts are considered **less than significant**.

### *Clover Point*

Treatment facility construction.

**Potential Impact: Construction activities may affect archaeological features on the Clover Point site.**

Archaeological testing conducted to date at the Clover Point site indicates that ground disturbance associated with construction activities is unlikely to affect shell midden or house features associated with previously recorded archaeological site DcRu-11. There is residual potential for a buried aboriginal trench feature at the site, which cannot be readily identified through hand testing.

> Mitigation measures. The CRD will take measures to identify and avoid archaeological sites and features, and to comply with requirements of the Archaeology Branch.
>
> In order to minimise risk with respect to the proposed development, an excavator with a narrow clean-up bucket should be used to excavate a north-south trending trench through the project footprint. The excavation can be conducted under *HCA* Permit 2009-0404 at the direction of an archaeologist. Archaeological monitoring will be conducted of any future environmental or geotechnical testing. Depending on the results of this monitoring, intermittent construction monitoring may be conducted by an archaeologist.
>
> Tail-gate archaeological awareness training sessions will be held prior to initiation of construction related activities.
>
> In the event that unanticipated archaeological remains are identified, construction related activities in the area will be halted and the Archaeology Branch will be contacted for further direction.

If archaeological or heritage features, such as the aboriginal trench, are disturbed during facility construction, such impacts would be long-term and irreversible. However, mitigation to avoid or reduce effects, or compensation for the removal, loss, disruption, modification, or alteration of

archaeological or heritage resources, would reduce project construction effects on archaeological features at the Clover Point site to low magnitude and **less than significant** levels.

Treatment facility operation.

**Potential Impact: Operational activities of the proposed Clover Point facility may affect archaeological features.**

No archaeological deposits have been identified in the project footprint, but there is residual potential for an unrecorded aboriginal trench feature. In the event that this feature is present, the activities that may affect it are likely limited to the construction phase of the project. Operation of the proposed Clover Point facility is not expected to affect archaeological features and, therefore, impacts are considered **less than significant**.

### *McLoughlin Point*

Treatment facility construction.

**Potential Impact: Construction activities may affect archaeological features on the McLoughlin Point site.**

The field reconnaissance at the McLoughlin Point site indicates that ground disturbance associated with construction activities is unlikely to affect archaeological features in the project footprint at McLoughlin Point. Areas of archaeological potential outside this footprint were not assessed.

> Mitigation measures. The CRD will take measures to identify and avoid archaeological sites and features, and to comply with requirements of the Archaeology Branch.
>
> In order to minimize risk with respect to the proposed development, tail-gate archaeological awareness training sessions will be held before the start of construction related activities.
>
> In the event that unanticipated archaeological features are identified, construction related activities in the area will be halted and the Archaeology Branch will be contacted for further direction.

Based on currently available information, it is unlikely that the construction of a treatment facility at McLoughlin Point would affect archaeological or heritage features. If archaeological or heritage features are disturbed during facility construction, such impacts would be long-term and irreversible. However, mitigation to avoid or reduce effects or compensation for the removal, loss, disruption, modification, or alteration of archaeological or heritage resources at

McLoughlin Point would reduce project effects to low magnitude and **less than significant** levels.

Treatment facility operation.

**Potential Impact: Operational activities of the proposed McLoughlin Point facility may affect archaeological features.**

No archaeological features or deposits are anticipated in the project footprint. In the unlikely event that unanticipated archaeological features are present, the activities that may affect the features are limited to the construction phase of the project. Operation of the proposed McLoughlin Point facility is not expected to affect archaeological features and, therefore, operation impacts are assessed to be **less than significant**.

### *Hartland North*

Treatment facility construction.

**Potential Impact: Construction activities may affect archaeological features on the undisturbed portion of the Hartland North site.**

The archaeological information available for the proposed Hartland North site combined with the observation of extensive modifications to the landscape in the northern portion of the study area indicates low potential for encountering archaeological remains within this area of the development footprint. Should this site be selected for the development of a biosolids management facility, an Archaeological Impact Assessment (AIA) should be conducted for the southern portion of the proposed Hartland Facility. This recommendation is based on observations of archaeological potential made during investigation of the site. In the event that archaeological features are present, the activities that may affect the features are likely limited to the construction phase of the project.

All archaeological sites pre-dating 1846 are automatically protected by the Heritage Conservation Act (HCA), including both previously recorded and unrecorded archaeological sites, regardless of their integrity.

Mitigation measures. In order to minimize risk with respect to the proposed project, an AIA is recommended for the southern portion of the site to determine whether the site contains archaeological features. The AIA will determine the significance and extent of the construction effects on identified archaeological features, if any, and provide recommendations to avoid, minimize, or mitigate any effects.

Tail-gate archaeological awareness training sessions with construction personnel should be held before initiation of construction related activities.

In the event that unanticipated archaeological remains are identified, construction related activities in the area should be halted and the Archaeology Branch will be contacted for further direction.

Impacts to archaeological and heritage resources, if any, will be limited to the construction phase of the Hartland biosolids facility. Any impacts that may occur will be limited to the development footprint and irreversible. Provided mitigation measures are implemented prior to construction, the impacts to archaeological and heritage resources are considered to be of low magnitude and **less than significant**.

Treatment facility operation.

**Potential Impact: Operational activities of the Hartland North facility may affect archaeological features.**
Facility operation is not expected to affect archaeological remains, so impacts are considered **less than significant**.

### *Ancillary facilities*

### *Macaulay Point to McLoughlin Point*

Ancillary facility construction

**Potential Impact: Construction activities may affect archaeological features near the Macaulay Point to McLoughlin Point ancillary facilities.**
The pipeline connection to the Macaulay Point pump station is approximately 75 to 100 m east of several registered archaeological sites. The archaeological potential model maintained by the Archaeology Branch indicates that unrecorded buried shell midden or cultural features may be uncovered in the course of construction of the forcemain.

Mitigation measures. An archaeological field reconnaissance should be conducted to determine the need for additional work. The reconnaissance report may recommend no further work or an Archaeological Impact Assessment (AIA) to determine whether the route would actually affect cultural resources, and to specify the significance and extent of these effects and recommendations to avoid or mitigate any effects.

A review of available data suggests that with the application of the proposed impact avoidance and mitigation measures, impacts will be limited to the facility footprint, long-term, and of low magnitude. These impacts are expected to be **less than significant**.

Ancillary facility operation.

**Potential Impact: Operational activities of the Macaulay Point to McLoughlin Point ancillary facilities may affect archaeological features.**

The activities that affect archaeological and heritage resources are likely to be limited to the construction phase of the project. No impacts on archaeological or heritage resources are expected from pipeline operation, except in the unlikely event of pipeline rupture.

Mitigation measures. No mitigation measures are proposed for routine operation of the pipeline. In the event of repair of the pipeline, the provisions of the *Heritage Conservation Act* and protection of archaeological sites and materials will govern the work.

No impacts on archaeological or heritage resources are expected, and impacts from pipeline operation are considered **less than significant**.

### *Clover Point to McLoughlin Point*

Ancillary facility construction.

**Potential Impact: Construction activities may affect archaeological features near the Clover Point to McLoughlin Point ancillary facilities.**

Pipeline construction activities could disturb recorded and unrecorded shell midden and cultural deposits, including deposits extending beyond the recorded site boundaries. Recorded archaeological sites on this route include:

- northern section of site DcRu-11 at Clover Point, under Dallas Road;
- northern section of site Dc-Ru-24, at Holland Point, under Dallas Road;
- southern section of site DcRu-32, at the intersection of Dallas Road and Montreal Street; and
- southern section of site DcRu-75, near the intersection of Dallas Road and Niagara Street.

Mitigation measures. To determine whether the route would actually affect cultural resources and to assess the spatial and scientific significance of these impacts, if any, an AIA should be conducted (including archaeological sampling along the finalized pipeline routes) before construction. Registered archaeological sites are protected under the provisions of the *Heritage Conservation Act (HCA)*. Areas in and adjacent to these sites near Dallas Road have high archaeological potential. The *HCA* also protects cultural resources that have not yet been identified; more than 2 km of the route crossed land that has archaeological potential has been identified along the proposed route.

The potential for affecting known archaeological features along Dallas Road could be avoided by the rerouting of the forcemain to Niagara Street, for the portion of the route west of Douglas Street. A route along Niagara Street would avoid further disturbance to archaeological sites DcRu-24 in Holland Point Park, and DcRu-32 at the intersection of Montreal Street and Dallas Road. Some disturbance may still occur if the pipes were routed along Niagara Street, although the archaeological potential model indicates the risk is considerably reduced relative to the proposed Dallas Road alignment.

East of Douglas Street, the route would remain on Dallas Road. Between Douglas and Cook Street, the archaeological potential model indicates isolated areas of potential along the roadway; areas of archaeological potential exist east of Cook Street. Disturbance of buried shell midden and cultural deposits in sites DcRu-11 and DcRu-75 may occur.

If cultural resources are found while conducting the AIA, the CRD should consider project redesign to minimize or avoid cultural resources. The AIA will provide project specific recommendations if avoidance is not possible. These recommendations may include large-scale data recovery under a *HCA* Section 14 Site Investigation permit, monitoring of construction activities, or a combination of both. Alteration to a protected site requires a Section 12 Site Alteration Permit, which may include a provision for monitoring. A qualified archaeologist should monitor all ground-disturbing activities near the archaeological sites, unless AIA results indicate that there would be no impact

The AIA is intended to avoid or minimize the unanticipated discovery of cultural materials during construction, which may require suspension of construction activities and possible project delays while impacts are investigated and systematic recovery is conducted, if appropriate.

The unavoidable loss of significant archaeological resources resulting from project impacts should be compensated in cash or in-kind (BC Archaeology Branch 1989). Unmitigated impacts may require compensation for the removal, loss, disruption, modification, or alteration of archaeological and heritage resources because of the project.

A review of current data suggests that while such impacts would be long-term and irreversible. With the application of the proposed mitigation measures to avoid or reduce effects, or to compensate for the removal, loss, disruption, modification, or alteration of archaeological or heritage resources, potential impacts at sites DcRu-11 and DcRu-75 are likely to be limited to the ancillary facility footprint, long-term, and of moderate magnitude. These impacts are expected to be **less than significant.**

Ancillary facility operation.

**Potential Impact: Operational activities of the Clover Point to McLoughlin Point ancillary facilities may affect archaeological features.**

The activities that affect archaeological and heritage resources are likely to be limited to the construction phase of the project. No impacts on archaeological or heritage resources are expected from pipeline operation, except in the unlikely event of pipeline rupture and emergency repair work required to fix the rupture.

> Mitigation measures. No mitigation measures are proposed for routine operation of the pipeline. If the pipeline needs to be excavated for repairs, the provisions of the *Heritage Conservation Act* and protection of archaeological sites and materials will govern ground-disturbing activities.

No operational effects on archaeological or heritage resources are anticipated, so impacts from pipeline operation are considered **less than significant**.

### *McLoughlin Point to Hartland North*

This conveyance pipeline route between the McLoughlin Point wastewater treatment facility and Hartland North biosolids facility has not been finalized. An assessment of project effects along the conveyance pipeline route will be provided when the route has been finalized.

## 5.8 Land use

## Treatment facility site conditions

### *Macaulay Point*

Current Site Uses

The Macaulay Point property is located at the southwest corner of Anson Street and Vaughan Street in Esquimalt, British Columbia. The CRD-owned and -operated pump station on the site includes several structures, the pump house, screening chamber, headworks, an asphalt parking lot, and storage areas (Figure 5-1). Chain link fencing encloses the property. The Macaulay Point property is owned by the Capital Regional District (CRD) and zoned "I5 – Industrial" by the Township of Esquimalt. This zone permits sewage handling facilities and related uses (Parkes, pers. comm., Township of Esquimalt 2008).

Adjacent Land Uses

Land owned and used by the federal Department of National Defence (DND) borders the Macaulay Point CRD property to the west, north, and east. This land is part of Canadian Forces

Base Esquimalt. The DND land includes military married quarters along Anson Crescent and Vaughan Street. The nearest house is 20 m east of the CRD property line. The nearest residential dwellings outside of DND property are located on Clifton Terrace, approximately 250 m northwest of the Macaulay site.

A public paved pedestrian walkway connects Anson Crescent to walkways in Macaulay Point Park. The walkway passes to the south of the Macaulay Point site, between the pump house and the shoreline of the Juan de Fuca Strait. An indoor pistol range is located directly west of the pump station. Two baseball diamonds are located north across Vaughan Street.

Macaulay Point Park is approximately 50 m west of the Macaulay Point facility site. The public park is situated on federal lands leased to the Township of Esquimalt. This 7.6 ha park is popular with birdwatchers, hikers, and dog walkers. Park walkways provide access to the shoreline and historic military works, and offer views of the Olympic Mountains and Strait of Juan de Fuca. Former military bunkers, lookouts, and defensive berms provide historical context to the park.

#### Planned Land uses

With regard to the Macaulay Point pump station, the Township of Esquimalt's OCP states that a "minor expansion of the current pumping and screening facility may be considered to address effluent volume increases. However, the Township opposes the use of this site for a regional multi-stage sewage treatment plant" (Township of Esquimalt 2007, p. 40).

Discussions with DND staff revealed that a Master Asset Development Plan (MADP) is currently being developed to guide future land uses on the Canadian Forces Bases (CFB) Esquimalt property that abuts the CRD-owned pump station. Based on preliminary information from the MADP, the northern portion of the base will be dedicated to military administration structures, and most of the southern portion will be used for outdoor military training (Tabbernor, pers. comm.). The current draft of the MADP assumes that CRD wastewater treatment facilities will be built on the Macaulay Point and McLoughlin Point sites. The draft plan seeks to ensure compatibility between DND activities on federal property and the wastewater treatment facilities on adjacent land.

### *Clover Point*

#### Current Site Uses

Clover Point is a prominent point of land that extends south of Dallas Road between Moss Street and Bushby Street in the Fairfield neighbourhood of the City of Victoria. Clover Point Road loops around the point of land from Dallas Road. The Clover Point pump station property is

owned by the CRD and zoned R1-B (Single Family Residential). Short-term parking for approximately 85 vehicles is provided along the adjacent Clover Point Road. Parking for an additional 13 vehicles is located near the intersection of Clover Point Road and Dallas Road. A paved arm of Clover Point Road on the west side of the point extends to the water to provide boat launch access.

The public uses Clover Point Park for walking, running, and dog walking. A paved walkway crosses the property, parallel Dallas Road along the shoreline in the James Bay and Fairfield communities. The site is a popular viewpoint, offering for the public and visitors panoramic views of the Olympic Mountains and Juan de Fuca Strait (Figure 5-29). The park is used as a staging area for kite flying, kite boarding, and paragliding, watching boat races, and gaining access to the adjacent rocky beaches.

**Figure 5-29. Looking south over existing underground CRD pump station from Clover Point site at Dallas Road and Clover Point Road intersection**

*Image source: Google Streetview*

## Adjacent Land Uses

The residential neighbourhood of Fairfield is north of the Clover Point site (Figure 5-30). Some nearby dwellings (Figure 5-31) have maintained the Arts and Crafts character and architecture that was popular during the late 19th century and early 20th century in Victoria (Segger and Franklin 1996). The rocky beaches and shoreline of the Juan de Fuca Strait surround the site on the east, south, and west.


**Figure 5-30. Fairfield residential neighbourhood north of the Clover Point site**

**Figure 5-31. Detached dwellings in the Fairfield neighbourhood along Dallas Road, north of the Clover Point site**

*Image source: Google Streetview*

Planned Land uses

The proposed Clover Point facility upgrades will expand the facility footprint to the south of the existing pump station facility. Clover Point Park is subject to a covenant requiring the land to be used for public park purposes. The expanded pump station will be an underground facility, and the land surface will still be available for park use. The facility, therefore, will not prevent the land from being used as park, which is consistent with the spirit and wording of the covenant. The CRD will meet with representatives of the City of Victoria to discuss the project design, to ensure that effects on public use of Clover Point Park are minimized.

A policy described in the City of Victoria Official Community Plan (OCP) (1995) recommends that the City maintain current parks improvement programs at Clover Point Park. A neighbourhood plan does not exist for the Fairfield area. The existing CRD pump station will remain in operation.

### *McLoughlin Point*

Current Site Uses

The McLoughlin Point site in Esquimalt, British Columbia is currently a decommissioned Imperial Oil tank farm on 1.4 ha (3.46 acres) of freehold property, owned by Imperial Oil Ltd. and bounded by federal Department of National Defence (DND) land and Victoria Harbour. The oil tanks, parking, buildings, and ancillary structures have been demolished and removed from the site as part of a remediation program (Figure 5-4). The land is currently zoned "I3 – Industrial" by the Township of Esquimalt, which is intended to "accommodate bulk petroleum storage facilities and related uses" (Township of Esquimalt 2008, p. 5-72). A wastewater treatment facility is not a permitted use under current zoning.

Adjacent Land Uses

The McLoughlin Point site is approximately 700 m northeast of the existing Macaulay Point sewage pumping station. Victoria View Road runs north-south, immediately west of the McLoughlin Point site. The federal DND property extends west from Victoria View Road towards Macaulay Point.

A CFB Esquimalt marina is located just north of the site (Figure 5-32) and includes 100 mooring berths for power boats less than 30 feet in length, a boat launch ramp, a storage compound, servicing bays, and a clubhouse for the CFB Esquimalt Power Boat Club. The CFB Esquimalt Power Boat Club is open to all members of the Regular and Reserve Force, to DND civilian employees, and to other employees of federal services. All facilities are secured by fences and protected by lockboxes, allowing exclusive access to members of the Boat Club.

**Figure 5-32. CFB Esquimalt marina, north of the McLoughlin Point site**

*Image source: Bing Maps*

The mouth of Victoria Harbour bounds the McLoughlin Point site to the east and south. Marine and air traffic use the gateway of the Harbour, including ferries from Washington, cruise ships, seaplanes, helicopters, Canada Coast Guard, and private and commercial marine vessels.

DND staff refers to the DND property near the McLoughlin Point site as the Work Point area (Beach, pers. comm.). Uses of the Work Point area include military training, residences (detached and attached structures) for DND staff and military personnel, a canteen, a maintenance supplies yard, CFB Esquimalt administration buildings, and heritage fortification structures (Gingras, pers. comm.). The two nearest residences to the McLoughlin Point site are 45 m and 70 m west of the site.

### Planned Land uses

In discussing the McLoughlin Point site, the Town of Esquimalt OCP states:

> The storage facilities are anticipated to remain on the waterfront for the near future. At the time any redevelopment plan is prepared for the surrounding DND lands, consideration should be given to alternate uses for this site that complement and support the redevelopment plan (Town of Esquimalt 2007, p. 22).

Most of the DND property near the McLoughlin Point site is planned for outdoor military personnel training (Gingras, pers. comm.). The current draft of the Master Asset Development Plan (MADP) for future DND activities anticipates that a wastewater treatment facility will be

built on the McLoughlin Point site (Gingras, pers. comm.). Land uses in the MADP are intended to minimize conflict with a future wastewater treatment facility.

### *Hartland North*

Current Site Uses

The 2 ha Hartland North site is located on the south side of Willis Point Road on part of the 131.5 ha (325 acre) CRD-owned Hartland Landfill property. The Hartland North site is zoned *P-10 Waste Management Zone* by the District of Saanich. This zone permits "the use of land, buildings or structures for receiving, handling, sorting, landfilling, composting, recycling and processing solid waste and recyclable materials and accessory uses and, without limiting the generality of the foregoing, includes any use of land, buildings, or structures permitted in a Solid Waste Management Plan" (District of Saanich 2003, pp. 2-10). The current zoning does not specifically permit biosolids processing, so the Hartland North site will require rezoning to allow for a biosolids facility.

The landfill is operated in accordance with the CRD Solid Waste Management Plan (SWMP) developed under provincial legislation and approved by the Minister of Environment. The CRD Solid Waste Management Plan describes this parcel as an area for composting activities (Capital Regional District 1995). The Hartland North site was used for composting garden waste, but is now either vacant or used for storing gravel. A locked gate at the Willis Point Road entrance restricts public access to the Hartland North site (Figure 5-33).

**Figure 5-33. Gated entrance to Hartland North site from Willis Point Road.**

The northern portion of the Hartland North site is cleared of forest cover. The southern portion of the site has mature second-growth forest along a steep, rocky bluff (Figure 5-5). This area is identified as a "Treed Protected Area" to be retained as a visual buffer (Capital Regional District 2004).

## Adjacent Land Uses

The Hartland North site is bounded by Mount Work Regional Park to the west and north. Willis Point Road passes to the north of the Hartland North site. Durrance Lake (part of the Park) is located northwest of the Hartland North site on the north side of Willis Point Road. The Department of National Defence (DND) operates the Heals Rifle Range and associated training area northeast of the site on the north side of Willis Point Road. The nearest residences to Hartland North are by Durrance Lake, approximately 1,100 m northwest of the site. The landfill area of the CRD property is located immediately to the southeast of the Hartland North site (Figure 5-34) and a gravel storage area is located to the northwest (Figure 5-35).

**Figure 5-34. Hartland Landfill, looking southeast from the Hartland North site**

**Figure 5-35. Gravel storage area immediately to the northwest of the Hartland North site**

Planned land uses

The 2008 Rural Saanich Local Area Plan, the 2002 Comprehensive Community Plan for Willis Point Bylaw No. 1, and the 2007 District of Highlands Official Community Plan acknowledge that the Hartland Landfill adjacent to the Hartland North site will continue to operate for the near future to manage the region's solid waste. The 1995 CRD Solid Waste Management Plan (SWMP) identifies composting as the primary activity on the Hartland North site.

## Ancillary facilities

### *Macaulay Point to McLoughlin Point*

The conveyance pipeline that will carry screened wastewater from the Macaulay Point pump station to the McLoughlin Point facility will be installed along roads through the DND land (Figure 3-1). The DND land uses along the conveyance pipeline route include military detached housing, a community garden, a boat storage yard, CFB Esquimalt administration buildings, a maintenance supply yard, and extensive space for military training activities.

### *Clover Point to McLoughlin Point*

The conveyance pipeline that will carry screened wastewater from the Clover Point pump station to McLoughlin Point facility will be installed in a trench along Dallas Road, then in a tunnel from Ogden Point to McLoughlin Point. This route along Dallas Road passes by three City of

Victoria parks, a paved pedestrian waterfront walkway, and constitutes part of the popular 11 km Seaside Touring Route.

Facilities at Ogden Point include commercial and industrial uses that support the on-site passenger cruise ship terminal facility and regional helicopter landing port and flight service. Ogden Point is a major entry point for tourists to Victoria, mainly consisting of passengers of docked cruise ships. A ROW will need to be obtained for excavation of the tunnel across Ogden Point and Victoria Harbour.

Mature trees along the section of Dallas Road near Ogden Point are of environmental and visual importance to the community and the City of Victoria (Darrah, pers. comm.). Since the trees along this segment of Dallas Road are on City of Victoria property, they are not protected under the Tree Preservation Bylaw, which applies only to trees on private property (Daitl, pers. comm.).

### *McLoughlin Point to Hartland North*

This conveyance pipeline route between the McLoughlin Point wastewater treatment facility and Hartland North biosolids facility has not been finalized. A detailed description of site conditions along the conveyance pipeline route will be provided when the route has been finalized and an assessment for the route can be conducted.

## Impact assessment and mitigation measures

### *Macaulay Point*

Treatment facility construction

**Potential Impact: Construction could affect activities on adjacent DND land.**
Considering the nearby land uses (military housing, trails, indoor pistol, range, baseball diamonds, Macaulay Point Park), there may be short-term nuisance effects (Section 5.10) and traffic effects (Section 5.9) during construction of the Macaulay Point facility. However, such disturbances are unlikely to have long-term adverse impacts on those adjacent land uses.

Potential interference to adjacent activities related to construction of the Macaulay Point facility expansion is considered local, short-term, reversible, of moderate magnitude, and **less than significant**.

**Potential Impact: Public use of Macaulay Point Park or foreshore may be affected by construction.**
The expansion of the Macaulay Point facility will occur on the CRD property and will not restrict public use of the pedestrian path to Macaulay Point Park or the adjacent foreshore during construction. For this reason, potential disruption of public use of Macaulay Point Park or the foreshore during construction is considered negligible and **less than significant**.

Treatment facility operation

**Potential Impact: The facility must comply with adopted plans and zoning bylaws.**
The Township of Esquimalt zoned the existing Macaulay Point pump station site I5- Industrial, which permits wastewater screening and pump station facilities. The Township of Esquimalt OCP states only "minor expansion of the current pumping and screening facility" is appropriate at the Macaulay Point site. The proposed changes to the facility will occur entirely within the boundaries of the CRD property, and casual observers will be unlikely to notice the change in the facility footprint. The Macaulay Point facility expansion, therefore, is considered minor. The facility complies with Esquimalt's zoning bylaw and OCP. Because rezoning or an OCP amendment are not required, the impact of the Macaulay Point facility on adopted plans and zoning bylaws will be negligible and **less than significant**.

**Potential Impact: Operation of the Macaulay Point facility may affect surrounding land uses.**
Because the Macaulay Point facility includes only minor expansion of the pump station and the development of a standby power generator located on the existing CRD property, there will not be a noticeable difference in the operation of the wastewater treatment facility compared to the existing facility. The current draft of the MADP assumes that an expansion of wastewater facilities will be built on the Macaulay Point site. In addition, no walkway restrictions or effects on walkway users are expected during operation of the expanded Macaulay Point facility. The Macaulay Point facility will be compatible with surrounding land uses and effects of Macaulay Point facility on surrounding land uses during operation will be local, long-term, reversible, of low magnitude, and are deemed **less than significant.**

### *Clover Point*

Treatment facility construction

**Potential Impact: Construction of the facility may affect use of Clover Point Park.**
The Clover Point facility expansion will occur in Clover Point Park. Community use of the parks's vehicle parking, sections of the paved pedestrian walkway to Ross Bay, and the facility footprint and workspace of the Clover Point wastewater facility will be restricted during the construction period. The quality of the recreational experience in Clover Point Park is likely to be reduced during site grading and other specific construction activities associated with facility

expansion. The availability of alternative recreational opportunities in nearby parks will reduce the community effects during the construction phase.

> Mitigation measures. The CRD will meet with representatives of the City of Victoria to discuss the project design, to ensure that effects on public use of Clover Point Park are minimized. To reduce community impacts during facility construction, detour routes near the Clover Point site should direct users of the pedestrian waterfront walkway to the Dallas Road sidewalk on the north side of the street.
>
> Signs and newspaper advertisements will be used to inform park users of the construction schedule and portions of the walkway, vehicle parking, and park that will be temporarily closed to the public.

Provided the mitigation measures are implemented, and ensuring the availability of nearby recreational opportunities in Clover Point Park is maintained, the public access limitations during the construction phase are considered to be local, short-term, reversible, of moderate magnitude, and **less than significant**.

**Potential Impact: Publicly accessible land in Clover Point Park will be reduced during construction.**

A portion of the park will be restricted from public use during construction activities to help ensure public safety.

> Mitigation measures. Prepare a public access management plan to minimize construction effects on public use of the park.

Access to a small area of land in Clover Point Park will be restricted during construction of the facility. If mitigation measures are implemented, the impact on public access to the park will be local, short-term, reversible, of moderate magnitude, and **less than significant**.

### Treatment facility operation

**Potential Impact: Compliance of facility operation with restrictive covenant**

The proposed Clover Point facility upgrades will expand the facility footprint to the south of the existing pump station facility. Clover Point Park is subject to a covenant requiring the land to be used for public park purposes. The expanded pump station will be an underground facility, and the land surface will still be available for park use. The facility, therefore, will not prevent the land from being used as park, which is consistent with the spirit and wording of the covenant.

Mitigation measures. The CRD will meet with representatives of the City of Victoria and the Federal Government to ensure that the facility operation complies with the restrictive covenant.

The expanded Clover Point facility will comply with the restrictive covenant, so the potential impact is considered **less than significant**.

**Potential Impact: Facility operation may affect adjacent land uses.**
Because the expanded pump station will be an underground facility, the land surface will still be available for park use during facility operation, so no adverse effects to land uses in the area are expected during operation of the Clover Point facility, and impacts will be **less than significant**.

### *McLoughlin Point*

Treatment facility construction

**Potential Impact: Compliance of facility design with adopted DND plans and uses.**
DND staff has not expressed concern that the construction of the McLoughlin Point wastewater treatment facility will adversely affect the adjacent DND land uses and activities (Gingras, pers. comm.). The draft MADP anticipates construction of a CRD wastewater treatment facility on the McLoughlin Point site. A portion of the road at the north end of the proposed facility design (Figure 3-4) is to be constructed on DND property, requiring a permit from the federal government.

Mitigation measures. During facility design, efforts should be made to alter the footprint to avoid federal land to the north of the site.

If permission from DND is granted to construct the road at the north of the facility on DND property, the impact of the wastewater facility design on adopted DND plans is considered to be negligible and **less than significant**.

**Potential Impact: Public access to McLoughlin Point may be disturbed during construction.**
As private land, McLoughlin Point is not readily accessible by the public. Public access is also restricted on the surrounding DND land, and use of Victoria View Road is under DND control. Because public access to McLoughlin Point is already limited, restrictions on public access during construction of the wastewater treatment facility at this site is considered to have a local, short-term, reversible, low magnitude, and **less than significant** impact on public access to McLoughlin Point.

**Potential Impact: Construction activities could conflict with Victoria Harbour air traffic land use regulations.**

Considering the nearby aerodrome for seaplanes and helicopters, it is necessary to ensure the construction of the facilities on the McLoughlin Point site complies with federal air traffic safety policies and regulations of Transport Canada, or with Nav Canada air navigation safety guidelines. The Transport Canada document, *TP 1247 - Aviation - Land Use in the Vicinity of Airports*[5], describes the operational characteristics of airports and aerodromes that may influence land uses outside the aerodrome boundary and recommends, where applicable, guidelines for nearby land uses. However, Transport Canada does not have regulations in place associated with structural height limitations on land adjacent to the Victoria Harbour aerodrome (Youngson, pers. comm.).

> Mitigation measures. Design of the facilities and construction methods at the McLoughlin Point site should follow the Transport Canada guidelines. It is recommended a Land Use Submission Proposal[6] be submitted to Nav Canada. The agency can assess potential obstructions and impacts of a proposed physical structure on air navigation in Victoria Harbour.

Compared to other buildings near Victoria Harbour, the wastewater treatment facilities will be relatively low (three storeys or less). Cranes needed to build the treatment facility are unlikely to create a hazard to aircraft. Although this conclusion should be revisited following Nav Canada review of CRD plans, currently available information about the wastewater facilities and federal regulations indicate that construction will not affect air navigation in Victoria Harbour, and impacts will be local, medium-term, reversible, of low magnitude, and assessed to be **less than significant**.

Treatment facility operation

**Potential Impact: Compliance of facility operation with adopted plans and zoning bylaws.**

DND staff have not identified adverse effects of the operation of the McLoughlin Point wastewater treatment facility on adjacent land uses (Gingras, pers. comm.). The draft MADP anticipates operation of a CRD wastewater treatment facility on the McLoughlin Point site.

The McLoughlin Point site is zoned "I3 – Industrial" by the Township of Esquimalt, a designation is intended to "accommodate bulk petroleum storage facilities and related uses"

[5] For more information on this federal aviation safety document, refer to the website at: http://www.tc.gc.ca/civilaviation/publications/tp1247/menu.htm

[6] More information on the Land Use Submission Proposal process can be located online: http://www.navcanada.ca/NavCanada.asp?Content=ContentDefinitionFiles%5CServices%5CANSPrograms%5CLandUseProposal%5Cdefault.xml

(Township of Esquimalt 2008, p. 5-72). A wastewater treatment facility will require rezoning to permit wastewater treatment facility at McLoughlin Point site.

The Esquimalt OCP anticipated that the fuel storage facility would remain on the McLoughlin Point site (Town of Esquimalt 2007, p. 22). The Esquimalt OCP provides no specific guidance regarding other use of the site. However, the OCP does outline sewage treatment policies that suggest a wastewater treatment facility at McLoughlin Point may require an amendment, including statements, such as:

- the Township is of the view that a large facility at this site would have a negative impact on the community and significantly limit/impact the redevelopment potential of the DND lands, and
- the Township will not approve a bylaw that will have the effect of authorizing the use of lands in and around Macaulay Point for the purposes of a Regional Sewage Treatment Facility (Town of Esquimalt 2007, p. 40).

An OCP amendment is likely to be required to accommodate the development of a wastewater treatment facility on the McLoughlin Point site. However, the Town of Esquimalt has a clear process for OCP amendment and rezoning, which would bring the McLoughlin Point site into full compliance with municipal bylaws. The impacts of the wastewater facility on compliance with local plans and bylaws are considered to local, long-term, irreversible, of low magnitude, and assessed to be **less than significant**.

**Potential Impact: Facility operation may affect existing and planned adjacent land uses.**
Two houses are located 45 m and 70 m west of the site. The houses are owned by DND and leased to DND staff (Gingras, pers. comm.). Approximately 20 m north of the site is a federal maintenance yard for storing building and landscaping materials. Heritage fortifications are located southwest of the site. Aside from these uses, the DND land surrounding the McLoughlin Point site is mostly used as a training area for military personnel (Beach, pers. comm.).

Based on the draft MADP, most land near the McLoughlin Point site will be used for outdoor training for military personnel (Gingras, pers. comm.). The operation of the McLoughlin Point wastewater treatment facility will not conflict with the existing and planned uses of the surrounding DND property.

The operation of the McLoughlin Point facility is deemed compatible with adjacent uses, and the impact on current and planned DND activities is assessed to be local, long-term, irreversible, of low magnitude, and **less than significant**.

### *Hartland North*

Treatment facility construction

**Potential Impact: Construction activities will disrupt adjacent land uses.**
The potential nuisance effects of construction activities at the Hartland North site could affect visitors to Mount Work Park and local residents. Nuisance effects could include:

- construction traffic,
- site preparation noise and vibration caused by blasting and grading,
- dust from site preparation and truck traffic, and
- parking along Willis Point Road by construction workers.

Blasting and heavy equipment work associated with facility construction may be heard in the residential areas to the northwest or southwest. The separation distance between the site and the residences is great enough, however, that it is unlikely that the construction activity noise will be disruptive. The site preparation phase of construction would last approximately one year, a moderate term, after which impacts would cease.

> Mitigation measures. The impact of site preparation could be further reduced by informing the District of Saanich, CRD Parks staff, nearby residents, and park users of the schedule and duration of potentially disturbing activities.

The impacts of construction on adjacent properties are considered to be local, reversible, medium-term, of moderate magnitude, and **less than significant**.

Treatment facility operation

**Potential Impact: Effects on adjacent land uses during operation.**
The impact of the Hartland Landfill operations on the community is of interest to local residents and the District of Saanich. Although the Hartland biosolids facility is separate from the Hartland Landfill, the public is unlikely to differentiate between the operations of the landfill and the biosolids facility. Both will be seen as industrial-type waste management operations that will occur on CRD property.

Through engagement activities for the 2008 Rural Saanich Local Area Plan, the public and stakeholders identified issues that are related to possible new activities at the Hartland North site, operation and management, and public information processes (District of Saanich 2008, p. 93).

> Mitigation measures. The CRD should continue to engage the public, the District of Saanich, Willis Point residents, and the District of Highlands as planning for the Hartland

biosolids facility proceeds. Community concerns regarding development of the facility should be considered in facility planning and design, including additional mitigation measures as necessary.

If mitigation measures are implemented, the operational impacts of the Hartland biosolids facility are assessed to be local, long-term, irreversible, of low magnitude, and **less than significant**.

### *Ancillary facilities*

### *Macaulay Point to McLoughlin Point*

Ancillary facility construction

**Potential Impact: Construction of the Macaulay Point to McLoughlin Point conveyance pipeline will affect adjacent land uses during construction.**
Construction of the pipe between from Macaulay Point to McLoughlin Point will affect access by CFB Esquimalt administration staff and other to the community garden, boat storage yard, and maintenance supply yard. Traffic effects and nuisance disturbances are assessed in other sections of this report.

Mitigation measures. Users of facilities that could be affected by pipeline construction should be notified about the work schedule and potential disruptions.

By applying standard construction procedures and the recommended mitigation measures, the adverse effects of the Macaulay Point to McLoughlin Point conveyance pipeline on nearby land uses during construction are considered to be local, short-term, reversible, low magnitude, and **less than significant**.

Ancillary facility operation

**Potential Impact: Facility operation may affects adjacent land uses.**
Occasional, short-term road access disruptions to CFB Esquimalt administration staff, users of the community garden, boat storage yard, and the maintenance supply yard may occur if pipeline repairs are needed in the future. Such effects of pipeline operation on adjacent land use are considered local, short term, reversible, low magnitude, and **less than significant**.

### *Clover Point to McLoughlin Point*

Ancillary facility construction

**Potential Impact: Construction of the Clover Point to McLoughlin Point conveyance pipeline will affect adjacent land uses.**
Users of the Beacon Hill and Clover Point parks will be affected by ancillary pipeline installation. Similarly, travellers on Dallas Road may be affected by some construction activities. Dallas Road residents will experience short-term access restrictions and disturbances during pipeline construction.

The exact location of the tunnel access has not yet been determined. Nonetheless, because the tunnel construction will affect Ogden Point, short-term access restrictions and disturbances may affect the Helijet Airways operations and other commercial activities that support the passenger cruise ship terminal facility.

A right-of-way will need to be acquired across Ogden Point (Greater Victoria Harbour Authority) property and beneath Victoria Harbour (for the tunnel). Because the right-of-way will not cross any permanent structures and the tunnel entry point can similarly avoid surface structures, permanent structures at Ogden Point will not need to be relocated during construction.

> Mitigation measures. Residents of Fairfield and James Bay are likely to request input in the route selection process of the conveyance pipeline (Sturdy, pers. comm.). City of Victoria staff and community stakeholders should be engaged to review and comment on the proposed conveyance pipeline construction program to minimize access restrictions and disturbances to residents and visitors.
>
> It is recommended that to avoid access restrictions and disturbances during peak periods of use by residents, visitors, and cruise ship passengers, construction of the conveyance pipes near Victoria parks and the Seaside Touring Route be scheduled to occur between late October and May, if feasible.

Standard construction procedures, combined with implementation of the recommended mitigation measures should ensure that adverse effects of the conveyance pipeline construction on surrounding land uses are local, short-term, reversible, moderate in magnitude, and **less than significant**.

Ancillary facility operation

**Potential Impact: Adjacent land uses could be affected by conveyance facility operation.**
If repairs to the conveyance pipes are required, short-term road and access disruptions could affect tourists, residents of James Bay and Fairfield, regional helicopter service operations, and

commercial and industrial activities at Ogden Point. Such events would be quite infrequent. These adverse effects on adjacent land uses during operation are considered local, long-term, reversible, of low magnitude, and **less than significant**.

#### *McLoughlin Point to Hartland North*

This conveyance pipeline route between the McLoughlin Point wastewater treatment facility and Hartland North biosolids facility has not been finalized. An assessment of project effects along the conveyance pipeline route will be provided when the route has been finalized.

## 5.9 Traffic

### Treatment facility site conditions

The Clover Point site is located in the city of Victoria. The Macaulay Point and McLoughlin Point sites are in the Township of Esquimalt. The Hartland North site is located in the District of Saanich. The four sites and the adjacent road networks, including designated truck routes, are outlined in Figure 5-36 and 5-37.

This traffic impact assessment examines:

- the volumes and types of vehicular traffic,
- road classification,
- proximity to designated truck routes,
- alternative modes of transportation,
- accident history,
- transit service, and
- impact on existing traffic from construction and installation of pipes underneath existing road surfaces.

The time frames examined are 2009 (present conditions) and 2012 to 2016 (construction of the wastewater treatment facilities).

Traffic to and from the sites can use several routes. Where feasible, designated truck routes and the shortest distances to designated truck routes are assessed. A summary of the characteristics of the access roads for the four sites is presented in Tables 5-2 to 5-5.

The City of Victoria and Township of Esquimalt differ in their functional classification of roads. Victoria uses 'arterial' as their highest category; whereas Esquimalt uses 'major', but the purposes of the road types are consistent. Victoria has a more robust network than Esquimalt and a more detailed classification scheme that uses secondary arterials and secondary collectors to discriminate among road types.

In the Township of Esquimalt, major roads are considered to be truck routes. In 2007, Esquimalt amended their truck route bylaw to restrict truck access on roads south of Lyall Street because of concerns about a proposed expansion of sewage treatment facilities in the Macaulay Point-McLoughlin Point areas (as outlined in their letter to the Capital Regional District dated July 3, 2007). The following traffic assessment does not reflect this revision but rather examines the road network contained in the current Esquimalt Official Community Plan.

In the District of Saanich, roads are typically categorized by the characteristics of road mobility and access. The Provincial facilities, such as the Trans Canada Highway and Pat Bay Highway, offer high mobility and limited access to individual land uses. Major routes in a community are also primarily for mobility with limited direct access to land parcels. Major routes in turn connect to other roads that provide more access, such as collector roads or local roads.


**Figure 5-36. Truck routes near the facility sites in Victoria and Esquimalt**


**Figure 5-37. Designated truck routes on the Saanich Peninsula**

*Source: Capital Regional District, 2009*

**Table 5-2. Characteristics of site access roads for Macaulay Point**

| Macaulay Point Access Roads | | Designated Routes | | |
|---|---|---|---|---|
| **Roads** | **Class** | **Truck** | **Bus** | **Bicycle** |
| Anson Street | local | | | |
| Munro Street | local | | | |
| Lampson Street | collector (1) | | yes | yes |
| Lampson Street | major (2) | yes | yes | yes |
| **OPTIONS** | | | | |
| Esquimalt Road | major | yes | yes | yes |
| Bay Street | arterial | yes | yes | yes |
| Blanshard Street | arterial | yes | yes | yes |
| **OR** | | | | |
| Tillicum Road | major | yes | yes | yes |
| Trans Canada Hwy | arterial | yes | yes | yes (3) |
| **OR** | | | | |
| Esquimalt Road | major | yes | yes | yes |
| Admirals Road | major | yes | yes | yes |
| Trans Canada Hwy | arterial | yes | yes | yes (3) |

(1) South of Lyall Street
(2) North of Lyall Street
(3) Except at specified interchange locations

**Table 5-3. Characteristics of site access roads for Clover Point**

| Clover Point Access Roads | | Designated Routes | | |
|---|---|---|---|---|
| **Roads** | **Class** | **Truck** | **Bus** | **Bicycle** |
| Dallas Road | collector | | | yes |
| **OPTIONS** | | | | |
| Moss Street | secondary collector | | | yes |
| Fairfield Road | collector | yes | yes | |
| Cook Street | arterial | yes | yes | yes |
| Pandora Avenue | secondary arterial | yes | yes | yes |
| Blanshard Street | arterial | yes | yes | yes |
| **OR** | | | | |
| Cook Street | Secondary arterial | | yes (1) | yes (2) |
| Cook Street | Arterial | yes | yes | yes |
| Pandora Avenue | Secondary arterial | yes | yes | yes |
| Blanshard Street | Arterial | yes | yes | yes (4) |
| **OR** | | | | |
| Dallas Road | Secondary arterial | | | yes |
| Douglas Street | Secondary arterial | | yes (3) | |
| Blanshard Street | arterial | yes | yes | yes (5) |

(1) North of May Street
(2) South of Park Boulevard
(3) Between Niagara Street and Superior Street
(4) North of Fort Street
(5) Except at specified interchange locations

**Table 5-4. Characteristics of site access roads for McLoughlin Point**

| McLoughlin Point Access Roads | | Designated Routes | | |
|---|---|---|---|---|
| **Roads** | **Class** | **Truck** | **Bus** | **Bicycle** |
| Victoria View Road | local | | | |
| Patricia Way | local | | | |
| Peters Street | local | | | |
| **OPTIONS** | | | | |
| Lyall Street | collector | | yes | yes |
| Gore Street | collector | | yes | yes |
| Head Street | collector | | yes (1) | yes |
| Esquimalt Road | major | yes | yes | yes |
| Bay Street | arterial | yes | yes | yes |
| Blanshard Street | arterial | yes | yes | yes |
| **OR** | | | | |
| Lyall Street | collector | | yes | yes |
| Lampson Street | major | yes | yes | yes |
| Tillicum Road | major | yes | yes | yes |
| Trans Canada Hwy | arterial | yes | yes | yes (2) |
| **OR** | | | | |
| Lyall Street | collector | | yes | yes |
| Admirals Road | major | yes | yes | yes |
| Trans Canada Hwy | arterial | yes | yes | yes (2) |

(1) Route 25 from Gore Street to Dunsmuir Road
(2) Except at specified interchange locations

**Table 5-5. Characteristics of site access roads for Hartland North**

| Hartland North Access Roads | | Designated Routes | | |
|---|---|---|---|---|
| **Roads** | **Class** | **Truck** | **Bus** | **Bicycle** |
| Willis Point Road | major | yes | no | yes (1) |
| Wallace Drive (2) | major | yes | no | yes (1) |
| **OPTION** | | | | |
| West Saanich Road | major | yes | yes | yes (3) |

(1) Route is part of designated commuter route
(2) Between Willis Point Drive and West Saanich Road
(3) Existing commuter bicycle route

The existing volumes on the roads to the facilities are summarized in Tables 5-8 to 5-11. These tables show the current traffic volumes in vehicles per day (vpd) and vehicles per hour (vph) for the afternoon and evening (PM) peak hour period for each road. A more detailed description of traffic conditions relevant to each facility site is outlined in the following paragraphs.

### *Macaulay Point*

Municipal arterial or major roads typically have two-lane or four-lane cross-sections and are expected to carry traffic volumes in the range of 10,000 to 30,000 vpd[7] (Table 5-8). Municipal collector roads can have similar width to arterials, but there is more traffic impedance from

[7] For comparison, wider arterials, such as Blanshard Street, are expected to carry more than 30,000 vpd

access to adjacent lands. Collector roads are expected to carry traffic volumes of 5,000 to 20,000 vpd. Admirals Road, Blanshard Street, and Bay Street near Bridge Street experience congestion during peak hours.

Pedestrian movement at the Lyall Street and Lampson Street intersection was 95 pedestrians in the morning (AM) peak hour. These counts are 65% higher than the noon and PM peak hours, because of pedestrian movements associated with Macaulay School. Pedestrian movements at the Dunsmuir Road and Head Street intersection ranged from 25 to 54 in the noon and PM peak hours respectively. There are no crossing signals at this intersection.

A vehicle classification count on Lyall Street (east of Lampson Street) found that passenger cars, pickups, vans, and RVs accounted for 92% of all vehicles. Trucks with two axles and six tires accounted for another 6% and larger trucks were 0.4% of total traffic.

### *Clover Point*

The daily and PM peak hour traffic volumes for the Clover Point site access roads are presented in Table 5-9. Moss Street, as a secondary collector, has a traffic volume range less than a collector. For secondary arterials such as Cook Street, Dallas Road, the southern portion of Douglas Street, and Pandora Street, their classification reflects street cross section and adjacent land uses. Their traffic volumes are appropriate for their classifications, but there are areas of congestion on Cook Street and Blanshard Street during peak hours.

Data on trucking, pedestrian, and bicycle volumes were not available for all of the access roads to Clover Point, but traffic volume data were available from the City of Victoria and additional survey data were collected for vehicular movements on Dallas Road.

Dallas Road and connecting roads are not designated trucks routes and it is noted that any data recorded for alternative modes of transportation at the time of this analysis (winter of 2009) would be lower than volumes of pedestrian and bicycle traffic during the summer period.

### *McLoughlin Point*

The vehicular volumes for McLoughlin Point access routes (Table 5-10) are comparable to the Macaulay Point site. The roads with substantial congestion during peak hours of travel include Admirals Road, Tillicum Road, Blanshard Street, and Bay Street. The pedestrian movements and vehicle classification percentages cited for the Macaulay Point site also apply to analysis of McLoughlin Point.

### *Hartland North*

The daily and PM peak hour traffic volumes for the Hartland North site access roads are presented in Table 5-11. Road capacity is related to such factors as density of accesses to adjacent land uses, and the number of lanes available to carry vehicular traffic. All of the roads associated with the Hartland North site assessment are designated as 'major' because the rural road network is not as extensive as in urban areas and does not allow for defining different road types.

There is minimal BC Transit service on any of the roads connecting to the Hartland North site. Transit Route #83 along West Saanich Road is the closest bus route to the site.

Crash data covering the period from January 1, 2004 to December 31, 2008 are available for the intersections of Willis Point Road and Wallace Drive, West Saanich Road and Wallace Drive, and West Saanich Road and Hartland Avenue. A review of that data resulted in a recommendation that consideration be given to change the existing "Yield" control to "Stop" control at the West Saanich Road and Wallace Drive intersection. No crash data are reported for the Hartland North access to Willis Point Road.

## Impact assessment and mitigation measures

The forecast trips for the construction of the facility are shown in Table 5-6 as average trip rates per day (vpd) with an assumed 250 workdays per annum. For the calculation of vehicular volumes associated with excavation and concrete activities, the peak rate was used for all facilities. The more intermittent or less intense construction activities, which do not generate significant daily volumes, have their rates expressed in terms of trucks per week.

To determine the impact of construction trips on daily volumes, the trips must be doubled to account for vehicles arriving and departing from the sites. In order to determine the impact on peak hour traffic, a combination of the worker-related trips and 20% of truck trips is used. Although most of the workers can be assumed to arrive or depart during peak AM or PM hours, the truck trips would be distributed throughout the day. A worst case scenario is assumed to be all worker trips and 20% of the truck trips all occurring during the peak hour. Daily one-way, two-way, and peak hour trips are shown in Table 5-6 for all the sites.

The construction of the facilities between 2012 and 2016 is forecast to generate two-way daily trips ranging from 70 to 582 vpd. The increase in afternoon peak hour trips is forecast to range from 24 to 243 vph because of construction of the facilities. The McLoughlin Point and Hartland North sites have the largest trip volumes because they are new, larger facilities, while the Macaulay Point and Clover Point sites are smaller upgrades to existing facilities.

**Table 5-6. Daily and peak hour construction traffic volumes for the treatment facility sites**

| Activities | | Trucking Impact | | | |
|---|---|---|---|---|---|
| | | Macaulay Point (1 year) | McLoughlin Point (3.5 Years) | Clover Point (1 year) | Hartland North (3 Years) |
| Clearing, grubbing, or aggregate | Total trucks required | 20 | 63 | 20 | 60 |
| Excavations | Total trucks required | 213 | 2884 | 233 | 1,100 |
| | Peak trucks per day | 13 | 60 | 13 | 13 |
| Concrete | Total trucks required | 101 | 1106 | 80 | 635 |
| | Peak trucks per day | 7 | 20 | 7 | 20 |
| Reinforcing steel | Total trucks required | 4 | 23 | 3 | 23 |
| | Peak trucks per day | 1 | 1 | 1 | 1 |
| Other deliveries | Peak trucks per day | 2 | 2 | 2 | 2 |
| Workers | Average workers per day | 22 | 155 | 14 | 158 |
| | Peak workers per day | 44 | 308 | 29 | 314 |
| Total daily one-way trips | Peak trucks per day | 13 | 60 | 13 | 20 |
| | Worker vehicles per day | 33 | 231 | 22 | 236 |
| Total peak hour one-way trips | All vehicles per peak hour | 36 | 243 | 24 | 240 |
| Total daily two-way trips | All vehicles per day | 92 | 582 | 70 | 511 |

Source: Stantec 2010

The construction traffic for the sites, as detailed in Table 5-6, is added to the forecast traffic for 2016 on the access roads to the sites. The total peak hour trips–both peak hour and daily–are the totals coming from all directions. Construction worker trips would have dispersed origins and destinations, whereas most of the construction materials and equipment would come from the Upper Harbour industrial area and the Swartz Bay ferry terminal. The total increased trips have been added to each access road option, which results in overestimates of the impact or percentage increase where there are multiple routings.

The likely origins and destinations of the materials and equipment required for construction are shown in Table 5-7.

**Table 5-7. Origins and destinations of construction truck traffic for all facilities**

| Construction | Starting Points | Destinations |
|---|---|---|
| Concrete, structural steel, reinforcing steel and aggregates | Upper Victoria Harbour and Keating Cross Road industrial areas | McLoughlin Point, Clover Point, Macaulay Point, and Hartland North sites |
| Pipes and equipment | Swartz Bay ferry terminal | McLoughlin Point, Clover Point, Macaulay Point, and Hartland North sites |

Data on current traffic volume and vehicle classification were obtained from the City of Victoria, Township of Esquimalt, the Capital Regional District, traffic surveys, and previous traffic and environmental studies conducted for the Hartland North site (Westland 1996 and 2004).

The existing volumes and predicted traffic impacts on the roads to the facilities are presented in Tables 5-8 to 5-11. These tables show the current traffic volumes in vehicles per day (vpd) and vehicles per hour (vph) for the afternoon and evening (PM) peak hour period for each road. The predicted volume change because of construction traffic is calculated.

### *Macaulay Point*

Treatment facility construction.

**Potential Impact: Construction at the Macaulay Point site may result in increases in local traffic congestion, parking concerns, and safety risks.**

Construction traffic increases associated with the Macaulay Point site are described in Table 5-8. Most of the traffic increases are less than 3% which would be considered moderate . An exception is the lower portion of Lampson Street, where present volumes are so low that the construction traffic would increase peak hour volumes by 30% and daily volumes by nearly 8%. As a designated collector, Lampson Street could accommodate the forecast volumes, because it has substantial surplus capacity. These traffic increases would be occasional during the medium term construction period. In this context, the forecast traffic impacts on Lampson Street are considered moderate in magnitude.

Although the existing traffic volumes on Anson Street and Munro Street were not available, such local roads typically can carry up to 1,000 vpd. This capacity is slightly less that than current volumes on Lampson Street, so that the percentage volume increases on Anson and Munro streets would be larger. However, the increased traffic levels would not exceed the roads' vehicular capacity or result in congestion.

Increased volumes of traffic are generally considered to be accompanied by commensurate increases in the potential for traffic accidents. However, with standard traffic control measures for projects of this nature, safety risk can be effectively managed during facility construction.

> Mitigation measures. Standard traffic control measures for projects of this nature will be implemented. Nearby residents are typically notified in advance of disruptive construction activities. With the use of flag persons and signage, the risk to the public from vehicle movement is greatly reduced. The construction site will be fenced to prevent access by the public. In areas near travel routes to schools, flag persons will be present during school hours. If pedestrian risks are identified on other roads or intersections, flag persons will be assigned to those locations during high traffic periods.

If insufficient space is available to accommodate parking needs on-site, van-pooling, ride-sharing, and park-and-ride programs are recommended to reduce the number of trips. Additional parking should be developed if construction worker vehicles cannot be accommodated on-site, and if van-pooling, ride sharing and park-and-ride programs will not be effective in mitigating on-street parking effects.

There may be opportunities to combine the mitigation measures proposed for the Macaulay Point and McLoughlin Point sites for not only parking facilities, but also removal of excavated material and delivery of construction supplies and equipment.

Traffic increases will be occasional over the 10-month construction period. Parking effects, if any, can be reduced by creating parking areas elsewhere. Construction traffic impacts on Lampson Street, Munro Street, and Anson Street are moderate to high in terms of percentage increase, but volumes do not exceed capacity of these streets. Construction traffic impacts are considered to be local, short-term, reversible, of moderate magnitude, and **less than significant.**

**Table 5-8. Impact of daily and peak hour construction traffic on access roads for Macaulay Point**

| | | | Traffic volumes | | Construction traffic 2016 | |
|---|---|---|---|---|---|---|
| **Road Name** | **Classification** | **Units** | **2009** | **2016** | **vehicle trips** | **% volume change** |
| Anson Street | local | | N/A | | | |
| Munro Street | local | | N/A | | | |
| Lampson Street | collector | vpd | 1,100 | 1,180 | 92 | 8% |
| | | vph – PM peak hour | 115 | 120 | 36 | 30% |
| Lampson Street | collector | vpd | 11,300 | 12,100 | 92 | < 1% |
| | | vph – PM peak hour | 1,190 | 1,270 | 36 | 3% |
| **OPTIONS** | | | | | | |
| Esquimalt Road | major | vpd | 16,350 | 17,500 | 92 | < 1% |
| | | vph – PM peak hour | 1,720 | 1,840 | 36 | 2% |
| Bay Street | arterial | vpd | 23,000 | 24,700 | 92 | < 1% |
| | | vph – PM peak hour | 2,070 | 2,220 | 36 | 2% |
| Blanshard Street | arterial | vpd | 45,000 | 48,250 | 92 | < 1% |
| | | vph – PM peak hour | 4,725 | 5,050 | 36 | < 1% |
| **OR** | | | | | | |
| Tillicum Road | major | vpd | 24,200 | 25,900 | 92 | < 1% |
| | | vph – PM peak hour | 2,540 | 2,720 | 36 | 1% |
| **OR** | | | | | | |
| Esquimalt Road | major | vpd | 11,600 | 12,500 | 92 | < 1% |
| | | vph – PM peak hour | 1,220 | 1,310 | 36 | 3% |
| Admirals Road | major | vpd | 14,300 | 15,300 | 92 | < 1% |
| | | vph – PM peak hour | 1,500 | 1,610 | 36 | 2% |

### *Clover Point*

Treatment facility construction.

**Potential Impact: Construction at the Clover Point site may result in increases in local traffic congestion, parking concerns, and safety risks.**

Construction traffic increases associated with the Clover Point facility expansion plans are presented in Table 5-9. In this context, most of the daily vehicular traffic volume increases are below 2%. The exceptions are Moss Street and the peak hour traffic on the secondary arterial portion of Dallas Road, where present volumes are relatively low. Moss Street is a secondary collector and Dallas Road is a secondary arterial. Both roads have substantial surplus capacity to accommodate the forecast increases in vehicular volumes.

Increased volumes of traffic are generally considered to be accompanied by commensurate increases in the potential for traffic accidents. However, with standard traffic control measures for projects of this nature, safety risk can be effectively managed during facility construction.

> Mitigation measures. Standard traffic control measures for projects of this nature will be implemented. Nearby residents are typically notified in advance of disruptive construction activities. With the use of flag persons and signage, the risk to the public from vehicle movement is greatly reduced. The construction site will be fenced to prevent access by the public. In areas near travel routes to schools, flag persons will be present during school hours. If pedestrian risks are identified on other roads or intersections, flag persons will be assigned to those locations during high traffic periods.
>
> The Clover Point site is part of Clover Point Park and is adjacent to the Fairfield residential neighbourhood to the north of Dallas Road. There will be limited options for additional parking near the site. If there is not sufficient space to accommodate all the parking on-site, it is recommended that van-pooling, ride-sharing and park-and-ride programs be developed to reduce the number of trips. Additional parking should be developed if construction worker vehicles cannot be accommodated on-site, and if van-pooling, ride sharing and park-and-ride programs will not be effective in mitigating on-street parking.

Traffic increases will be occasional over the construction period. Parking effects, if any, can be reduced by creating parking areas elsewhere. Construction traffic impacts associated with the pump station upgrades are considered to be local, short-term, reversible, of low magnitude, and **less than significant.**

**Table 5-9. Daily and PM peak hour traffic volumes for Clover Point access roads**

| | | | Traffic volumes | | Construction traffic 2016 | |
|---|---|---|---|---|---|---|
| **Road Name** | **Classification** | **Units** | **2009** | **2016** | **vehicle trips** | **% volume change** |
| Dallas Road | collector | vpd | 10,600 | 11,330 | 70 | < 1% |
| | | vph – PM peak hour | 1,110 | 1,190 | 24 | 2% |
| **OPTIONS** | | | | | | |
| Moss Street | secondary collector | vpd | 2,050 | 2,200 | 70 | 3% |
| | | vph – PM peak hour | 215 | 230 | 24 | 10% |
| Fairfield Road | collector | vpd | 10,820 | 11,600 | 70 | < 1% |
| | | vph – PM peak hour | 1,140 | 1,220 | 24 | 2% |
| Cook Street | arterial | vpd | 25,650 | 27,500 | 70 | < 1% |
| | | vph – PM peak hour | 2,700 | 2,890 | 24 | < 1% |
| Pandora Avenue | secondary arterial | vpd | 12,550 | 13,440 | 70 | < 1% |
| | | vph – PM peak hour | 1,320 | 1,410 | 24 | 2% |
| Blanshard Street | arterial | vpd | 45,000 | 48,250 | 70 | < 1% |
| | | vph – PM peak hour | 4,725 | 5,050 | 24 | < 1% |
| **OR** | | | | | | |
| Cook Street | secondary arterial | vpd | 16,600 | 17,800 | 70 | < 1% |
| | | vph – PM peak hour | 1,750 | 1,850 | 24 | 1% |
| Cook Street | arterial | vpd | 25,650 | 27,500 | 70 | < 1% |
| | | vph – PM peak hour | 2,700 | 2,890 | 24 | < 1% |
| Pandora Avenue | secondary arterial | vpd | 12,550 | 13,440 | 70 | < 1% |
| | | vph – PM peak hour | 1,320 | 1,410 | 24 | 2% |
| Blanshard Street | arterial | vpd | 45,000 | 48,250 | 70 | < 1% |
| | | vph – PM peak hour | 4,725 | 5,050 | 24 | < 1% |
| **OR** | | | | | | |
| Dallas Road | secondary arterial | vpd | 4,740 | 5,080 | 70 | 1% |
| | | vph – PM peak hour | 500 | 530 | 24 | 4% |
| Douglas Street | secondary arterial | vpd | 11,650 | 12,500 | 70 | < 1% |
| | | vph – PM peak hour | 1,220 | 1,310 | 24 | 2 % |
| Blanshard Street | arterial | vpd | 45,000 | 48,250 | 70 | < 1% |
| | | vph – PM peak hour | 4,725 | 5,050 | 24 | < 1% |

### *McLoughlin Point*

Treatment facility construction.

**Potential Impact: Construction at the McLoughlin Point site may result in increases in local traffic congestion, parking concerns, and safety risks.**

Construction traffic impacts associated with construction of the McLoughlin Point facility are illustrated in Table 5-10. This new facility will require extensive excavation and concrete truck traffic as well as a large labour force, which results in an increase of 582 vpd and 243 vph. The roads near the site are either local or collector roads and increased volumes of this magnitude cause increases of up to 18% over the day and up to 69% in the PM peak hour, resulting in capacity and congestion during peak hours of travel. The high vehicular volumes of hauling

excavation material from the site, delivery of construction supplies and equipment to the site and the large numbers of workers requiring parking will all require enhanced mitigation measures. Without enhanced mitigation, the traffic and roads effects of McLoughlin Point construction would be **significant**.

The McLoughlin Point site is relatively isolated, and is accessible only via Victoria View Road, a DND road on which access can be controlled. No walkways or other public accesses reach the site. Hence, public safety risks on or near the site are limited. Truck traffic in residential and commercial areas could increase safety risks.

Mitigation measures. With the large number of workers required on site at various times, there will not be sufficient parking either on site or adjacent to the site. Parking areas would need to be identified for the various stages of the project to ensure that sufficient parking was available and then buses used to shuttle workers to and from the work site and the parking areas. It would be possible to share this parking areas with workers employed at the Macaulay Point site.

With truck trips estimated to total more than 4,100 for McLoughlin Point facility construction, measures to reduce this traffic on the local road network include the use of barges to transport excavated materials from the site and to deliver construction materials and equipment to the site. Depending on timing of the various construction stages, the construction activities at Macaulay Point could also access the barges to reduce truck traffic.

It should be noted that the impact of the forecast increases in vehicular traffic associated with the construction activities at the various sites is evaluated in comparison to the existing and forecast average weekday PM peak hour traffic volumes on the roads accessing the sites. It may be possible to adjust work schedules for the construction activities so that much of the construction traffic to and from the site occurs outside of the peak commuting hours.

Standard traffic control measures for projects of this nature will be implemented. With the use of flag persons and signage, the risk to the public from vehicle movement is greatly reduced. In areas near travel routes to schools, flag persons will be present during school hours. Nearby residents are typically notified in advance of disruptive construction activities.

With the various mitigation measures available to reduce the impact of the construction traffic for the McLoughlin Point as well as the Macaulay Point sites, it is recommended that a comprehensive traffic management plan (TMP) be developed to provide an integrated approach to minimizing the impact of any vehicular traffic associated with this project. The issues discussed in the previous paragraphs should be included in the Traffic

Management Plan, as well as methods for ensuring that all affected parties are consulted during preparation of the Traffic Management Plan. Meeting with planners with the Township of Esquimalt to identify and refine construction routes to minimize traffic effects would be an integral component of any Traffic Management Plan.

The magnitude of construction traffic impacts on local roads is considered high in most cases. Overall, the impact of increased construction traffic will be local, medium-term, periodic, reversible, and is evaluated as **significant**. With the implementation of enhanced mitigation measures, such as extensive use of barges and provision of offsite parking and buses, the magnitude of traffic effects is reduced to moderate, and the impact becomes **less than significant**.

**Table 5-10. Impact of daily and peak hour construction traffic on access roads for the McLoughlin Point Site**

| | | | Traffic volumes | | Construction traffic 2016 | |
|---|---|---|---|---|---|---|
| **Road Name** | **Classification** | **Units** | **2009** | **2016** | **Vehicle trips** | **% volume change** |
| Victoria View Rd | local | | N/A | | | |
| Patricia Way | local | | N/A | | | |
| Peters Street | local | | N/A | | | |
| **OPTIONS** | | | | | | |
| Lyall Street | collector | vpd | 3,410 | 3,660 | 582 | 16% |
| | | vph – PM peak hour | 350 | 385 | 243 | 63% |
| Gore Street | collector | vpd | N/A | | | |
| | | vph – PM peak hour | | | | |
| Head Street | collector | vpd | 3,100 | 3,320 | 582 | 18% |
| | | vph – PM peak hour | 325 | 350 | 243 | 69% |
| Esquimalt Road | major | vpd | 16,350 | 17,500 | 582 | 3% |
| | | vph – PM peak hour | 1,720 | 1,840 | 243 | 13% |
| Bay Street | arterial | vpd | 23,000 | 24,700 | 582 | 2% |
| | | vph – PM peak hour | 2,070 | 2,220 | 243 | 11% |
| Blanshard Street | arterial | vpd | 45,000 | 48,250 | 582 | 1% |
| | | vph – PM peak hour | 4,725 | 5,050 | 243 | 4.8% |
| **OR** | | | | | | |
| Lyall Street | collector | vpd | 3,410 | 3,660 | 582 | 16% |
| | | vph – PM peak hour | 350 | 385 | 243 | 63% |
| Lampson Street | major | vpd | 11,300 | 12,100 | 582 | 5% |
| | | vph – PM peak hour | 1,190 | 1,270 | 243 | 19% |
| Tillicum Road | major | vpd | 24,200 | 25,900 | 582 | 2% |
| | | vph – PM peak hour | 2,540 | 2,720 | 243 | 9% |
| **OR** | | | | | | |
| Lyall Street | collector | vpd | 4,160 | 4,460 | 582 | 13% |
| | | vph – PM peak hour | 440 | 470 | 243 | 52% |
| Admirals Road | major | vpd | 14,300 | 15,300 | 582 | 4% |
| | | vph – PM peak hour | 1,500 | 1,610 | 243 | 15% |

### *Hartland North*

Treatment facility construction.

**Potential Impact: Construction at the Hartland North site may result in increases in local traffic congestion, parking concerns, and safety risks.**

The vehicular activity associated with the construction activities of the Hartland biosolids facility are shown in Table 5-11 as average vehicles per day (vpd) or vehicles per week (vpw) with an assumed 250 worker days per annum. The percentage increase in traffic volumes on the roads accessing the Hartland biosolids facility via Willis Point Road are also shown in Table 5-11.

**Table 5-11. Construction average weekday traffic volumes and percent for the Hartland North site**

| | | | Traffic volumes | | Construction traffic 2016 | |
|---|---|---|---|---|---|---|
| **Road Name** | **Classification** | **Units** | **2010** | **2016** | **vehicle trips** | **% volume change** |
| Willis Point Road | major | vpd | 1,330 | 1,390 | 164 | 12% |
| | | vph – PM peak hour | 140 | 150 | 64 | 39% |
| Wallace Drive | major | vpd | 4,140 | 4,310 | 164 | 3% |
| | | vph – PM peak hour | 410 | 430 | 64 | 13% |
| Wallace Drive – Keating Cross Rd | | vpd | 8,210 | 8,550 | 164 | 2% |
| | | vph – PM peak hour | 820 | 850 | 64 | 7% |
| Wallace Drive – Interurban Road | | vpd | 11,750 | 12,220 | 164 | 1% |
| | | vph – PM peak hour | 1,180 | 1,220 | 64 | 5% |
| South of Interurban Road | | vpd | 9,600 | 9,960 | 164 | 2% |
| | | vph – PM peak hour | 960 | 1,000 | 64 | 6% |
| Keating Cross Road | major | vpd | 10,930 | 11,380 | 164 | 1% |
| | | vph – PM peak hour | 980 | 1,020 | 64 | 6% |

Most of the daily vehicular traffic volumes increases are small to moderate ranging from 1% to 4%. The increases on Willis Point Road are higher at 12% and 10%, which reflects the relatively low volumes carried by this major road. The forecast increases in traffic volumes associated with construction activities will not affect the capacity of the road on a daily basis. The percentage increases during the average weekday PM hour range from 5% to 7% on the higher volume Keating Cross Road and West Saanich Road; changes that are considered moderate. The PM peak hour increases on Wallace Drive and Willis Point Road range from 13% to 44%. As is the case with the daily volumes, the percentage increases reflect the lower existing volumes on Wallace Drive and Willis Point Road, even though these roads are classified as major.

Although some congestion occurs on Keating Cross Road during the PM peak hour due to more intensive abutting land uses in this industrial area, the roads investigated have significant surplus capacity to accommodate the additional traffic of 164 vpd and 64 vph in the PM peak hour.

With limited bus service provided on West Saanich Road, it is not anticipated that there will be any impact on the existing bus schedules from construction traffic.

Increased volumes of traffic are generally considered to be accompanied by commensurate increases in the potential for traffic accidents. However, with standard traffic control measures for projects of this nature, safety risk can be effectively managed during facility construction.

> Mitigation measures. Standard traffic control measures for projects of this nature will be implemented. Nearby residents are typically notified in advance of disruptive construction activities. With the use of flag persons and signage, the risk to the public from vehicle movement is greatly reduced.

The duration of the impact of the increased construction traffic will be periodic over the three-year construction schedule, and volumes may be reduced if ride-sharing programs are introduced for the workers. Construction traffic volume increases will not exceed the vehicular capacity of the routes. Parking effects, if any, can be reduced by creating parking areas elsewhere. Traffic impacts resulting from the construction of the biosolids facility are considered to be local, medium-term in duration, reversible, of moderate magnitude, and are assessed as **less than significant**.

**Potential Impact: Construction workers parking along Willis Point Road will disrupt nearby residents and park users.**

A peak of 60 workers per day on site during construction is forecast, with a need to provide parking for these workers.

> Mitigation measures. If the Hartland North site has insufficient room to accommodate the parking demand for construction workers either on the site or on the Hartland Landfill, van-pooling, ride-sharing, and park-and-ride programs should be developed to reduce the number of trips, or additional parking should be developed elsewhere.

The effect of increases in construction worker demand for off-street parking is local, medium-term, reversible, of low magnitude, and assessed to be **less than significant**.

### *All facilities*

Treatment facility operation

**Potential Impact: Operation of the McLoughlin Point-Hartland facilities may result in increases in traffic congestion.**

Operational effects are similar for all McLoughlin Point-Hartland facilities. Daily and peak hour operational traffic volumes for the facilities are presented in Table 5-12. The site-generated trips for the operation of the facilities are quite small, and when compared to the existing and forecasted vehicular trips on the roads, most are of negligible impact. The exceptions are the peak hour traffic volumes on Lyall Street and Head Street associated with the operation of the McLoughlin Point site. With the modest volumes currently using these routes, the forecasted increase of 12 vph represents a 3% increase in traffic, but it is unlikely that all 12 vehicles will use the same route to and from the facility and it would not have any substantial impact on the capacity of these roads.

Traffic effects of facility operation would be local, continuous, long-term in duration, and irreversible. The magnitude of the effects is, however, low to negligible, so the impact is assessed to be **less than significant**.

**Table 5-12. Daily and peak hour operational traffic volumes for all sites**

| Materials / Activities | | Vehicle Impact | | | |
|---|---|---|---|---|---|
| | | Macaulay Point | McLoughlin Point | Clover Point | Hartland North |
| Screenings and grits transferred to the Hartland landfill site | | 1 every 5 to 6 days | 0 | 1 every 5 to 6 days | 0 |
| Chemicals (aluminum sulfate) | | 0 | 1 per month | 0 | 0 |
| Biosolids polymer | | 0 | 1 per month | 0 | 1 per month |
| Staff and maintenance traffic | | 2 per day | 12 per day | 2 per day | 6 per day |
| Dried biosolids hauled from Hartland | | 0 | 0 | 0 | 2 per day |
| Total daily one-way trips | Trucks | 5 per month | 2 per month | 5 per month | 3 per day |
| | Staff vehicles per day | 2 | 12 | 2 | 6 |
| Total peak hour one-way trips | All vehicles per peak hour | 2 | 12 | 2 | 7 |
| Total daily two-way trips | All vehicles per day | 5 | 25 | 5 | 18 |

### *Ancillary facility construction*

Macaulay Point to McLoughlin Point ancillary facilities

**Potential Impact: Construction of the ancillary facilities connecting Macaulay Point and McLoughlin Point may result in increases in traffic congestion.**

Ancillary facility pipes will be installed beneath road travel lanes, using cut and cover methods. Public safety effects of installing pipes in roadways are primarily associated with operation of heavy equipment and the presence of open trenches. Flag persons will be employed during the

day to manage vehicles and pedestrians near the worksites. Barriers or flagging will be installed to alert people to the presence of open trenches.

Construction of ancillary facilities will disrupt vehicular traffic on affected routes. The extent and severity of disruption will be a function of the traffic volumes and available opportunities to keep some lanes open or to reroute traffic. The roads potentially affected by the construction of ancillary facilities are two-lane, so it is assumed that one lane could remain open and alternating directions of traffic utilize the remaining lane.

The road distances and the planned route for the 1,800 mm forcemain between the Macaulay Point and McLoughlin Point facilities are presented in Table 5-13. All roads are local two-lane roads with low volumes.

**Table 5-13. Route and length of ancillary pipes between Macaulay Point and McLoughlin Point facilities**

| Roads | Length (m) |
|---|---|
| View Point Road | 30 |
| Vaughn Street | 50 |
| Anson Street | 425 |
| Bewdley Avenue | 215 |
| Peters Street | 50 |
| Patricia Way | 185 |
| Victoria View Road | 135 |
| **Total Length** | **1,090** |

Mitigation measures. Standard procedures for managing vehicular traffic in a construction zone will be implemented, keeping one lane open to alternating directions of traffic. Ancillary pipe construction will be restricted to single blocks at a time and, to the extent feasible, scheduled outside of peak periods of vehicular activity.

Increases in traffic will be local, short-term in duration, and continuous during the construction period. However, only small volumes of traffic will be affected, so the impact is considered low in magnitude. One-way alternating traffic will be permitted and there will be no residual impact, resulting in a rating of **less than significant**.

Clover Point to McLoughlin Point ancillary facilities

**Potential Impact: Construction of the ancillary facilities connecting Clover Point and McLoughlin Point may result in increases in traffic congestion.**

A 1,200 mm forcemain will be installed from the Clover Point facility to the McLoughlin Point facility. The conveyance pipeline will be installed under Dallas Road from Clover Point to Ogden Point and continue in a tunnel under Victoria Harbour to McLoughlin Point (Table 5-14).

**Table 5-14. Route and lengths of ancillary pipes between Clover Point and McLoughlin Point**

| Roads | Length (m) |
|---|---|
| Dallas Road | 3,235 |
| Ogden Point Parking Lot | 185 |
| **Total Length** | **3,420** |

Public safety effects of installing pipelines in roadways are primarily associated with operation of heavy equipment and the presence of open trenches. Construction will disrupt vehicular traffic on affected routes. The extent and severity of disruption will be determined by the traffic volumes and available opportunities to keep some lanes open or to reroute traffic. All the roads potentially affected by the construction of ancillary facilities are two-lane. Dallas Road has a wide area assigned to angle parking, so it is assumed that one lane could remain open and alternating directions of traffic utilize the remaining lane.

Dallas Road is busy during peak tourist season, is a primary link to the regional helicopter and cruise ship terminals, and provides a linear connection to parks for a range of transportation modes. With the volumes of traffic that will be affected on Dallas Road, traffic effects during construction of conveyance pipelines from Clover Point to McLoughlin Point during peak use period are considered local, short-term and continuous during the construction period, reversible, high in magnitude, and **significant**.

Mitigation measures. Standard procedures for managing vehicular traffic in a construction zone will be implemented, which will result in one lane remaining open to alternating directions of traffic. Flag persons will be employed during the day to manage vehicles and pedestrians near the worksites. Barriers or flagging will be installed to alert people to the presence of open trenches. Construction should be restricted to single blocks at a time.

Schedule the ancillary pipeline construction along Dallas Road outside the peak use period, preferably in the late fall, winter, or early spring. If this is not possible, consider an alternative route along Niagara Street.

Table 5-15 shows that the lengths of the alternative routes are almost identical.

**Table 5-15. Pipe lengths of alternative ancillary routes from Clover Point and McLoughlin Point**

| Route Options | Roads | Length (m) |
|---|---|---|
| **Dallas Road** | Dallas Road | 3,235 |
| | Ogden Point parking lot | 185 |
| | **Total Length** | **3,420** |
| | | |
| **Dallas Road / Battery Street / Niagara Street** | Dallas Road | 1,385 |
| | Battery Street | 245 |
| | Niagara Street | 1,495 |
| | Ogden Point parking lot | 230 |
| | **Total Length** | **3,355** |

The portion of the route from Clover Point to Battery Street is identical for both the Dallas Road and Niagara Street options. The evaluation of the impact is a function of the traffic volumes and the opportunities to mitigate the construction traffic disruption from Douglas Street to St. Lawrence Street. Dallas Road has three to four times the traffic volumes of Niagara Street with parallel parking along the north side and 395 m of angle parking in three areas on the south side of Dallas Road between Douglas Street and St. Lawrence Street. Niagara Street is a relatively narrow street with a paved cross-section varying between 10 m and 7 m, whereas Dallas Road is at least 10 m wide for its entire length, not including the parking areas on the south side. Although the Niagara Street option would disrupt less traffic, the Dallas Road route provides for more options to mitigate traffic issues and potentially making the installation of the pipes easier by having two travel lanes open at all times. From a traffic impact perspective, there is little advantage to the Niagara Street alternative.

If Dallas Road is chosen and construction occurs during off-peak seasons, impacts of constructing the conveyance pipe from Clover Point to McLoughlin Point will be local, short-term and continuous during the construction period, reversible, moderate in magnitude, and assessed to be **less than significant**. Similarly, construction along the Niagara Street route would also result in impacts that are **less than significant**.

### *McLoughlin Point to Hartland North*

This conveyance pipeline route between the McLoughlin Point wastewater treatment facility and Hartland North biosolids facility has not been finalized. An assessment of project effects along the conveyance pipeline route will be provided when the route has been finalized.

***Ancillary facility operation.***

All ancillary facility routes

No traffic impacts will result from the operation of the ancillary facilities, because the pipes will be underground or secured under bridges. In the unlikely event that a pipe needs to be repaired, standard traffic management practices will be followed.

There will be no measurable residual effect of the construction of the ancillary facilities and the impact is considered negligible and **less than significant**.

## 5.10 Noise, vibration, and lighting

### Treatment and ancillary facility site conditions

Refer to *Section 5.8: Land use* in this report for a description of treatment and ancillary facility site conditions as they relate to noise, vibration, and lighting effects of the project.

### Impact assessment and mitigation measures

***Macaulay Point***

Treatment facility construction.

**Potential Impact: Nuisance effects of noise and vibration may occur during facility construction.**

Construction of the treatment facilities will involve the use of heavy machinery, compressors, pumps, concrete pouring equipment, and other equipment to prepare the site and build the treatment facilities. During the construction period, noise and vibration impacts will affect neighbouring residents and DND, in particular, the detached residence on the northeast side of the facility and the cluster of military residences to the east and northeast.

Peak construction activity and potential noise, and vibration effects will occur in the first few months during the excavation and concrete pouring phase. Construction of the Macaulay Point facility is expected to take 1 year to complete. After the peak construction period, the construction activities will be similar to the construction of utility or industrial buildings.

Mitigation measures. Construction activities will comply with the applicable Township of Esquimalt bylaws for hours of work and noise levels. Work will usually occur on weekdays from 7 am to 5 pm with no work on Sundays or holidays (except in an emergency or where a critical piece of work must be completed in a specified work window). If required, construction lighting will be oriented downward to reduce effects on neighbours and institutional users. Discussions will be undertaken with DND and

neighbouring residents during project planning and before construction to confirm noise mitigation measures.

Nuisance effects of noise and vibration during facility construction at Macaulay Point are local, short-term, of moderate magnitude, reversible, and **less than significant**.

Treatment facility operation.

**Potential Impact: Nuisance effects of noise, lighting, and vibration may occur during facility operation.**

The operation of the expanded pump station at Macaulay Point will result in additional noise, vibration, and lighting effects on neighbours. The facility will generate more truck traffic, increasing the frequency of traffic noise. The new buildings will require additional lighting and during power outages, the backup power generator will be operational, generating noise and vibration.

Mitigation measures. Noise from the treatment facilities will not exceed 45 dB and 55 dB at the edge of the facility footprints at night and day, respectively. Sound attenuation will be installed in the buildings housing noise-generating equipment and on diesel engine exhaust to ensure that decibel levels remained below 45 dB at the property lines. Noise levels will meet the Township of Esquimalt noise control bylaw requirements and WCB-OSHA criteria for worker safety. Noise-generating equipment will be installed in soundproofed rooms to meet these requirements.

All installed vibrating equipment will be contained in isolated structures that meet vibration limits acceptable in residential areas. The pump station equipment does not include excessive vibrating equipment and are typical of current operating systems found elsewhere, vibration issues are not anticipated and if present can be mitigated.

The lighting plan for the facilities are expected to include normal post top sodium vapour lighting standards similar to those on residential streets. Lighting will be directed downward and will have shields installed to minimize scatter lighting of the night sky. LED lighting that uses low energy and emits low Ultra Violet lighting will be specified.

Nuisance effects of noise, vibration, and lighting during facility operation at Macaulay Point will be local, intermittent, long-term, of low magnitude, and **less than significant.**

### *Clover Point*

Treatment facility construction.

**Potential Impact: Nuisance effects of noise and vibration may occur during facility construction.**

Construction of the treatment facilities will involve the use of heavy machinery, compressors, pumps, concrete pouring equipment, and other equipment to build the pump station upgrades. During the construction period, noise and vibration impacts will affect neighbouring residents and park users, in particular, the detached residences 80 m north of the facility.

Peak construction activity and potential noise, vibration, and lighting effects will occur in the first few months during the excavation and concrete pouring phase. Construction of the Clover Point is expected to take 1 year to complete. After the peak construction period, the construction activities will be similar to the construction of utility or industrial buildings.

> Mitigation measures. Construction activities will comply with the applicable City of Victoria bylaws for hours of work and noise levels. Work will usually occur on weekdays from 7 am to 5 pm with no work on Sundays or holidays (except in an emergency or where a critical piece of work must be completed in a specified work window). If required, construction lighting will be oriented downward to reduce effects on neighbours and park users. Discussions will be undertaken with neighbouring residents, and the City of Victoria Parks department during project planning and before construction to confirm noise mitigation measures.

Nuisance effects of noise and vibration during construction of facility upgrades at Clover Point will be local, short-term, reversible, of low magnitude, and **less than significant**.

Treatment facility operation.

**Potential Impact: Nuisance effects of noise, lighting, and vibration may occur during facility operation.**

The operation of the upgraded Clover Point facility will not result in a noticeable increase in noise, vibration, or lighting effects on neighbours or park users. Presently, Clover Point Park is illuminated by nine street lights and the roadway loop and parking area are heavily used by vehicles. Additional noise and lighting effects of the new buildings would not measurably increase the current conditions.

Nuisance effects of noise, vibration, and lighting during facility operation at Clover Point will be local, long-term, irreversible, of negligible magnitude, and **less than significant.**

### *McLoughlin Point*

Treatment facility construction.

**Potential Impact: Nuisance effects of noise and vibration may occur during facility construction.**

Construction of the treatment facilities will involve the use of heavy machinery, compressors, pumps, concrete pouring equipment, and other equipment to prepare the site and build the treatment facilities. During the construction period, noise and vibration impacts will affect neighbouring residents and institutional uses, in particular, the military housing to the west of the McLoughlin Point facility, but the residences near the McLoughlin Point site are more than 180 m away, so noise and vibration effects during construction are expected to be minor.

Peak construction activity and potential noise and vibration will occur in the first 9 months during the excavation and concrete pouring phase. Construction of the McLoughlin Point facility is expected to take 3.5 years to complete. After the 9-month peak construction activity has occurred, the construction activities will be similar to the construction of utility or industrial buildings.

> Mitigation measures. Construction activities will comply with the applicable Township of Esquimalt bylaws for hours of work and noise levels. Work will usually occur on weekdays from 7 am to 5 pm with no work on Sundays or holidays (except in an emergency or where a critical piece of work must be completed in a specified work window). If required, construction lighting will be oriented downward to reduce effects on neighbours and institutional users. Discussions will be undertaken with DND and neighbouring residents during project planning and before construction to confirm noise mitigation measures.

Nuisance effects of noise and vibration during facility construction at McLoughlin Point are local, medium-term, of low magnitude, reversible, and **less than significant**.

Treatment facility operation.

**Potential Impact: Nuisance effects of noise, lighting, and vibration may occur during facility operation.**

During facility operation, noise, lighting, and vibration effects are unlikely to affect neighbouring residents and institutional uses. Residences near the McLoughlin Point site are 70 m away. DND training and administrative activities to the northwest are unlikely to be disrupted. Victoria Harbour traffic generates substantial noise, especially during the daytime. This area is accustomed to intermittent periods of noise.

Noise generating equipment will include:

- air-driven pumps,
- compressors,
- fans and blowers,
- diesel-driven pumps, and
- standby diesel power generators.

Mitigation measures. Noise from the treatment facility will not exceed 45 dB and 55 dB at the edge of the facility footprint at night and day, respectively. Sound attenuation will be installed in the buildings housing noise-generating equipment and on diesel engine exhaust to ensure that decibel levels remained below 45 dB at the property lines. Noise levels will meet the Township of Esquimalt noise bylaw requirements and WCB-OSHA criteria for worker safety. Noise-generating equipment will be installed in soundproofed rooms to meet these requirements.

All installed vibrating equipment will be contained in isolated structures that meet vibration limits acceptable in residential areas. The facility equipment does not include excessive vibrating equipment and are typical of current operating systems found elsewhere, vibration issues are not anticipated and if present can be mitigated.

The lighting plan for the facility is expected to include normal post top sodium vapour lighting standards similar to those on residential streets. Lighting will be directed downward and will have shields installed to minimize scatter lighting of the night sky. LED lighting that uses low energy and emits low Ultra Violet lighting will be specified.

Nuisance effects of noise, vibration, and lighting during facility operation at McLoughlin Point will be local, irreversible, long-term, of low magnitude, and **less than significant**.

### *Hartland North*

Treatment facility construction

**Potential Impact: Nuisance effects of noise, vibration, and lighting during facility construction.**

Construction of the Hartland biosolids facility will involve the use of heavy machinery, compressors, pumps, concrete pouring equipment, and other equipment to prepare the site and build the treatment facilities. During the construction period, noise and vibration impacts will affect neighbouring residents and recreational users of Mt. Work Regional Park to the southwest. Peak construction activity and potential noise, and vibration effects will occur in the first few months during the excavation and concrete pouring phase. Construction of the Hartland

biosolids facility is expected to take approximately three years to complete. After the peak construction period, the construction activities will be similar to the construction of utility or industrial buildings.

Mitigation measures. Construction activities will comply with the applicable District of Saanich bylaws for hours of work and noise levels. Work will usually occur on weekdays from 7 am to 5 pm with no work on Sundays or holidays (except in an emergency or where a critical piece of work must be completed in a specified work window).

The lighting plan for the facility is expected to include normal post top sodium vapour lighting standards similar to those on residential streets. Lighting will be directed downward and will have shields installed to minimize scatter lighting of the night sky. LED lighting that uses low energy and emits low Ultra Violet lighting will be specified.

The impact of site preparation could be further reduced by informing the municipality and any nearby residents of the schedule and duration of potentially disturbing activities (such as blasting).

Nuisance effects of noise and vibration during facility construction at Hartland are local, medium-term, of low magnitude, reversible, and **less than significant**.

Treatment facility operation

**Potential Impact: Nuisance effects of noise, lighting, and vibration during facility operation.** The operation of the Hartland biosolids facility will result in additional noise, vibration, and lighting effects on the local study area. The facility will generate more truck traffic, increasing the frequency of traffic noise. The new buildings will require additional lighting and during power outages, the backup power generator will be operational, generating noise and vibration.

Mitigation measures. Noise levels will meet the requirements of the District of Saanich Bylaw No. 7059 for Abatement and Control of Noise bylaw and WCB-OSHA criteria for worker safety. Noise-generating equipment will be installed in soundproofed rooms to meet these requirements.

All installed vibrating equipment will be contained in isolated structures that meet vibration limits acceptable in residential areas. The pump station equipment does not include excessive vibrating equipment and are typical of current operating systems found elsewhere, vibration issues are not anticipated and if present can be mitigated.

The lighting plan for the facilities are expected to include normal post top sodium vapour lighting standards similar to those on residential streets. Lighting will be directed

downward and will have shields installed to minimize scatter lighting of the night sky. Low energy lighting will be installed will be installed wherever practical specified.

Nuisance effects of noise, vibration, and lighting during facility operation at the Hartland North site will be local, intermittent, long-term, irreversible, of low magnitude, and **less than significant.**

### *Ancillary facilities*

Ancillary facility construction.

**Potential Impact: Nuisance effects from noise and vibration may occur during ancillary facility construction.**

Construction of the ancillary facilities will introduce noise, vibration, and lighting impacts for residents, institutional, and industrial users near the construction areas. The ancillary facilities will be constructed in urban areas that are accustomed to occasional noise and vibration from road and building construction.

From Macaulay Point to McLoughlin Point, the ancillary route is adjacent to military housing and DND administrative buildings. From Clover Point to McLoughlin Point, the ancillary route is adjacent to residents, tourist accommodation, three parks, and is a popular tourist destination. This conveyance pipeline route between the McLoughlin Point wastewater treatment facility and Hartland North biosolids facility has not been finalized.

Mitigation measures. Discussions with potentially affected residents, DND, and stakeholders prior to construction will help to ensure mitigation measures are appropriate to minimize disturbance. CRD representatives will work with the DND and community groups to minimize impacts of constructing the conveyance pipes through residential neighbourhoods. Pipe construction will be conducted in accordance with local municipal bylaws to minimize disturbance. The CRD will consider scheduling the construction of the Clover Point to McLoughlin Point route outside the peak summer season.

Nuisance effects of noise and vibration during ancillary facility construction are local, short-term, reversible, of low magnitude, and **less than significant**.

Ancillary facility operation.

Once the pipes are in service, no noise, vibration, or lighting effects are anticipated. Noise, lighting, and vibration effects are considered negligible and **less than significant**.

## 5.11 Human health

Section 6.11 in Part 1 of this EIS presents a detailed discussion of potential health risks associated with wastewater treatment facilities. Recent health research reports have found no conclusive evidence of health risks to nearby residents, but they note that some health risks may be present for treatment facility workers.

The facilities will be entirely enclosed, and air will be filtered with advanced odour control and air filtration systems before it is released. This enclosed design will reduce exposure to microbial aerosol releases outside the treatment facilities. The ventilation systems will not be connected to the odour control system in the facility. These ventilation systems will filter air vented from the interior of the facility to the outside.

The odour control system will employ proven and reliable technology. One such system that could be used, a three stage chemical scrubber, includes absorption, adsorption, filtration, entrapment, and chemical conversion systems designed to remove disease-causing organisms. Chemical scrubbers typically use an acid followed by hypochlorite and water to remove amine and reduced sulphur compounds; sometimes a caustic is also used. This system provides a barrier to most viruses and bacteria. Next, the activated carbon filter absorbs residual molecular organic compounds not completely oxidized by the scrubber. It is unlikely that disease organisms will pass through the odour treatment system and pose a risk to nearby residents (Refer to Part 1, Section 6.11 of this EIS).

Birds, rodents, and insects have been known to serve as vectors for transmitting bacteria and viruses from traditional wastewater facilities. Because the McLoughlin Point-Hartland facilities would be enclosed, the risk of disease transfer by birds, rodents, or insects is negligible.

### Impact assessment and mitigation measures

Treatment facility construction.

**Potential Impact: Human health risks could result from exposure to dust and noise.**
Dust control measures will be implemented if dust is generated during construction. Noise levels will be typical of a major construction project.

> Mitigation measures. Nearby residents, businesses, industry, and institutions will be notified in advance of potentially disruptive construction activities. Dust control measures, such as box covers on trucks, will be used as needed.

Human health risks associated with exposure to dust and noise during treatment facility construction are local, short-term at Clover Point and Macaulay Point, and medium-term at McLoughlin Point and Hartland North, reversible, of low magnitude, and **less than significant**.

Treatment facility operation.

**Potential Impact: Safety risks may be associated with the public accessing the facilities.** It is unlikely that the public would gain entry into the treatment facilities. As discussed in the project description, the facilities will be fenced to minimize public entry, and the equipment at the facilities is enclosed.

Mitigation measures. No additional mitigation measures are necessary.

Safety risks associated with the public accessing the facilities are local, long-term, reversible, of low magnitude, and **less than significant**.

**Potential Impact: Human contact with disease organisms could constitute a health risk.** Human health risks will be limited to treatment facility workers who may come into contact with untreated wastewater or microbial aerosols. The enclosed facilities will prevent direct transmission of disease organisms to residents. Advanced odour control systems reduce the risk of viruses, bacteria, or other contaminants being discharged by air from the facilities. The distance between the treatment facilities and residences or institutions further reduces human health risks.

Mitigation measures. No additional mitigation measures are necessary.

Human health effects of human contact with untreated wastewater are local, long-term, irreversible, of low magnitude, and **less than significant**.

Ancillary facility construction.

Aside from temporary noise and dust during pipe installation, no human health effects are anticipated during ancillary facility construction, so impacts are negligible and **less than significant**.

Ancillary facility operation.

Once the pipes are in service, no human health impacts are anticipated, so impacts are negligible and **less than significant**.

## 5.12 Visual aesthetics

This section contains information on the visual aesthetic character of Macaulay Point, McLoughlin Point, Clover Point, and Hartland North, and an assessment of the significance of visual impacts of the construction and operation of wastewater facilities on these sites.

## Treatment facility site conditions

### *General conditions*

All of the sites are lit by security lighting, operations related lighting, or adjacent street lighting. Additional lighting would be added to each of the sites and ancillary routes during construction or operation, but alterations to the lit visual environment were not considered to contribute a significant change to the existing visual environment, so they did not receive further review.

### *Macaulay Point*

Macaulay Point is the site of an existing CRD pump station and outfall. The facility is on a gently sloping area adjacent to a rocky shoreline to the south. There is a baseball field to the north, detached dwellings to the east (the nearest is 20 m from the property line), and an outdoor pistol shooting range to the immediate west of the CRD property. Further to the west are a parking lot and the leased Macaulay Point Park. A public walkway is routed between the pump station and the rocky coastline, providing access between Macaulay Point Park and Aston Rd (Figure 5-1).

The existing CRD pump station occupies a parcel of approximately 0.3 ha. A 2 m high chain link fence surrounds the parcel. The site has ground-level parking and flat-roofed concrete and steel industrial buildings ranging in height from 2 m to 7 m (Figure 5-38).


**Figure 5-38. Macaulay Point Pump Station oblique view looking south**

*Image source: Bing Maps*

The existing facility adds an industrial element to an area that is predominately residential and open space. However, large DND training and warehousing buildings are about 200 m from the facility.

The pump station can be viewed from the following streets:

- Anson Street, 50 m to the east,
- Vaughn Street, 5 m to the north,
- Clifton Terrace, 225 m to the northwest,
- Munro Street, 225 m to the north, and
- Bewdley Avenue, 450 m to the north.

Nearby streets are local access roads with detached residential dwellings and limited traffic. Munro Street provides access for a DND training facility, and Bewdley Avenue is a collector road with light traffic and distant views of the pump station. The walkway immediately to the south of the pump station provides local access to Macaulay Point Park and is heavily used by the public. Walkway users have close-up and uninterrupted views of the facility. Marine traffic will have limited views of the facility as nearby rocky islands and peninsulas constrain marine approaches, consequently views of the facility, from the water will typically be from at least 200 m distant (although kayaks can come close to shore).

### *Clover Point*

The Clover Point site has an existing underground CRD pump station. It is a grassy area, with an adjacent access road leading to a small peninsula. To the north of the site (60 m) is Dallas Road. On the north side of Dallas Road are detached residential dwellings. There are heavily used walkways to the east and west. Figure 5-2 presents an oblique view of the location of the existing pump station and the surrounding area. The existing pump station is underground, so its visual impact is minimal and mainly confined to the facility's doorways and retaining walls, which can only be seen from the south and east (Figure 5-3). Views of the entryway are available to pedestrians on the coastline walkways to the south and east of the site, and to marine traffic to the southeast of the site. The rock wall and steel doors generate a relatively low level of visual intrusion in an open coastal landscape of rocky coastline, concrete walkways, parking areas and grassy backshore. The new underground grit removal facilities will be constructed adjacent to the south side of the existing facilities.

**Figure 5-39. View of Clover Point site looking south from Dallas Road, January 2010**

### *McLoughlin Point*

McLoughlin Point is a rocky peninsula at the western side of the entrance to Victoria Harbour. Victoria View Road bisects the peninsula in a north south direction. The western half of the peninsula is partially treed and contains two detached dwellings and several heritage fortification structures. The eastern half is the proposed location of the CRD wastewater treatment facility. The site was formerly an Imperial Oil tank farm (Figure 5-40), was decommissioned in 2008, and fuel storage structures removed (Figure 5-4).


**Figure 5-40. McLoughlin Point site before fuel tank decommissioning in 2008**

*Image source: Bing Maps*

The McLoughlin Point site is flat or gently sloping, with rocky outcrops, gravel and concrete base material, 3 m high concrete retaining walls, and several spoil heaps. A chain link fence surrounds the north, east, and south boundaries of the property. The vacant, partially remediated site has few features that would be considered visually appealing. The site's relatively low profile reduces its visual impact when viewed from the south or east, near sea level.

Trees and rock outcrops to the west and north shield the site from view, except from Victoria View Road and a neighbouring small-boat storage yard to the north (Figure 5-41). The two dwellings on the western side of Victoria View Road have partial views of the site when the intervening deciduous trees are not in leaf.

**Figure 5-41. McLoughlin Point site looking southeast from Victoria View Road, December 2009**

From the east and south, close views of the site are available only from the water (for example, from cruise ships and ferries), or the air (the site is close to floatplane and helicopter landing and take off areas). Distant views (greater than 500 m) of the site are available from the east side of Victoria Harbour.

### *Hartland North*

The 2 ha Hartland North site is located approximately 100 m south of Willis Point Road on part of the 131.5 ha (325 acre) CRD-owned Hartland Landfill property. The CRD Solid Waste Management Plan (SWMP) designates a forested "buffer strip" of "not less than 50 m wide" (Figure 5-42) between the Hartland North site and Willis Point Road "to accommodate visual screening" (Capital Regional District 2004, pp. 2). Vegetation screening "in the form of trees, brush, and plants" have been planted at the entrance to the Hartland North site from Willis Point Road as part of the CRD Solid Waste Management Plan Amendment No. 3 (Capital Regional District 2004, pp. 2).

Because the access road to the Hartland North site from Willis Point Road is angled and screened by vegetation, the Hartland North site is not visible from the road (Figure 5-33). Approximately half of the Hartland North site has been cleared of forest cover, leaving a level area used for gravel storage, and the remaining half of the site has mature second-growth forest along a steep, rocky bluff that is identified as a "Treed Protected Area" to be retained as a visual buffer (Capital Regional District 1995).

**Figure 5-42. View looking northwest along Willis Point Road (Hartland North vegetated buffer strip on the left)**

The proposed Hartland facility site is bounded by Mount Work Regional Park to the west and to the north. The closest trail to the Hartland North site is approximately 300 m northwest of the site. The facility site is not visible from this trail. The nearest residences are near Durrance Lake, approximately 1,100 m to the northwest of the Hartland North site. The site is not visible from these dwellings. A locked gate at the Willis Point Road entrance restricts public access to the Hartland North site.

## Ancillary facility site conditions

Ancillary pipes would be installed beneath roads through the urban and suburban streetscapes of Esquimalt, Fairfield, James Bay, and Victoria. The visual environment includes streetscapes with the following elements,

- mature street trees,
- landscaped parks,
- scenic coastline,
- harbour views,
- suburban areas with detached and attached residences, and
- industrial and light industrial areas.

## Impact assessment and mitigation measures

### *Macaulay Point*

Treatment facility construction.

**Potential Impact: Construction of Macaulay Point will affect local views of the site.** Construction at Macaulay Point Pump Station will introduce construction equipment, materials, and associated traffic near to an area bordered by detached dwellings and open grassy fields used for DND training. Construction at the front of the existing buildings will be visible from nearby houses on the east and northeast. At the rear of the Macaulay Point facility, construction will be fully visible from the adjacent public walkway. Dwellings to the northwest will have partial views of construction activities through trees, hedges, and other screening material. Foot and vehicle traffic on Bewdley Avenue and Clifton Terrace will have screened views of distant construction activities. Traffic on Munro Street and Vaughan Street will have partially screened and unobstructed views of construction activities. Topography, vegetation, and buildings will block views of construction from Macaulay Point Park.

The construction period is estimated to be approximately one year.

> Mitigation measures. Because of the proximity of construction activity to a local walkway that provides access to the nearby Macaulay Point Park, visual screens could be considered as part of security fencing on the south side of the property. The proximity of the dwellings to the east should be considered when sitting any staging areas to minimize visual disturbance to local residents.

Construction at Macaulay will result in short-term and reversible visual impacts on a small number of potential viewers, and result in limited change to existing viewscapes. In consequence, the visual impacts of construction related to constructing an expanded pump station at this site are considered local, short-term, reversible, of low magnitude, and **less than significant**.

Treatment facility operation.

**Potential Impact: The pump station will affect views from nearby homes, trails, and fields.** Construction on the north side of Macaulay Point Pump Station will convert an area of parking into a light industrial building. At the south of the site, a steel enclosure will be placed on a partially grassed and paved area that is now used for materials and equipment storage. Neither the additional building nor enclosure will exceed the height of existing structures.

Five residential dwellings within 100 m of the pump station will have unobstructed views of the expansion of the existing facility. Walkway users accessing Macaulay Point Park from Anson Street will have views of a new utility structure.*

Mitigation measures. The use of vegetation screens along the north property line (where feasible), and the northeast property line is suggested as a means of obscuring the view of facility structures from nearby residences. At the south side of the property, the existing chain link fence should be replaced with a solid attractive fence to reduce the visibility of the facility from the heavily used walkway.

The small scale of the additions, and the screening that will partially obscure both new and existing structures from view, indicated that the mitigated visual impact of expanding the Macaulay Point facility is local, short-term, irreversible, of low magnitude, and **less than significant**. With the addition of screening on the south side of the facility, adjacent to a public walkway, the visual impact of the project could be considered **beneficial**.

### *Clover Point*

The following photos show the present appearance of the Clover Point pump station.

**Figure 5-43. View of Clover Point site looking west from walkway, January 2010**

**Figure 5-44. View of Clover Point facility looking north from walkway, January 2010**

**Figure 5-45. View of Clover Point site looking northwest from adjacent walkway, January 2010**

Treatment facility construction.

**Potential Impact: Construction activities may affect view of Clover Point Park.**
Construction of an expanded facility at Clover Point will introduce:

- earth moving machinery,
- security fencing,
- security and work lighting,
- truck traffic, and
- potentially, stockpiled construction material, and covered and uncovered fill.

The relatively exposed Clover Point location will provide unscreened views of construction activities in a recreation park environment from all direction. The adjacent walkways, the road accessing the peninsula parking lot, and grassy slopes are in use all year and in heavy use in the summer. Park users and drivers will have close and uninterrupted views of construction. Foot and vehicle traffic on Dallas Road, and dwellings on the north side of Dallas Road, will also have uninterrupted views of construction activities.

The construction period is estimated to be one year. Construction activities at Clover Point will adversely, though temporarily, affect the visual environment of the surrounding area.

> Mitigation measures. To reduce visual impact, consideration should be given to locating the staging and storage area off-site, minimizing the construction footprint, and potentially limiting the use of heavy equipment during the summer when viewing numbers are highest. Construction area security fencing should incorporate visual screening material. Some people find construction activities interesting to watch, and viewing areas could be provided to allow safe observation of construction progress.

Construction activities associated with Clover Point facility will adversely affect a visually sensitive area, but because the effects are local, short-term, and reversible, the overall visual impacts of construction will be of low magnitude, and **less than significant**.

Treatment facility operation.

**Potential Impact: Facility operation may affect the Clover Point Park viewshed.**
Because the operations of the expanded, underground pump station at Clover Point will not be materially different from those that already occur at the site, there are no expected adverse effects to the visual aesthetic character of the Clover Point facility, and impacts will be **less than significant**.

### *McLoughlin Point*

The following figures provide a photographic record of current site conditions at McLoughlin Point and a graphic representation of the site post-development. Viewpoints have been selected based on areas of high traffic and high site visibility.

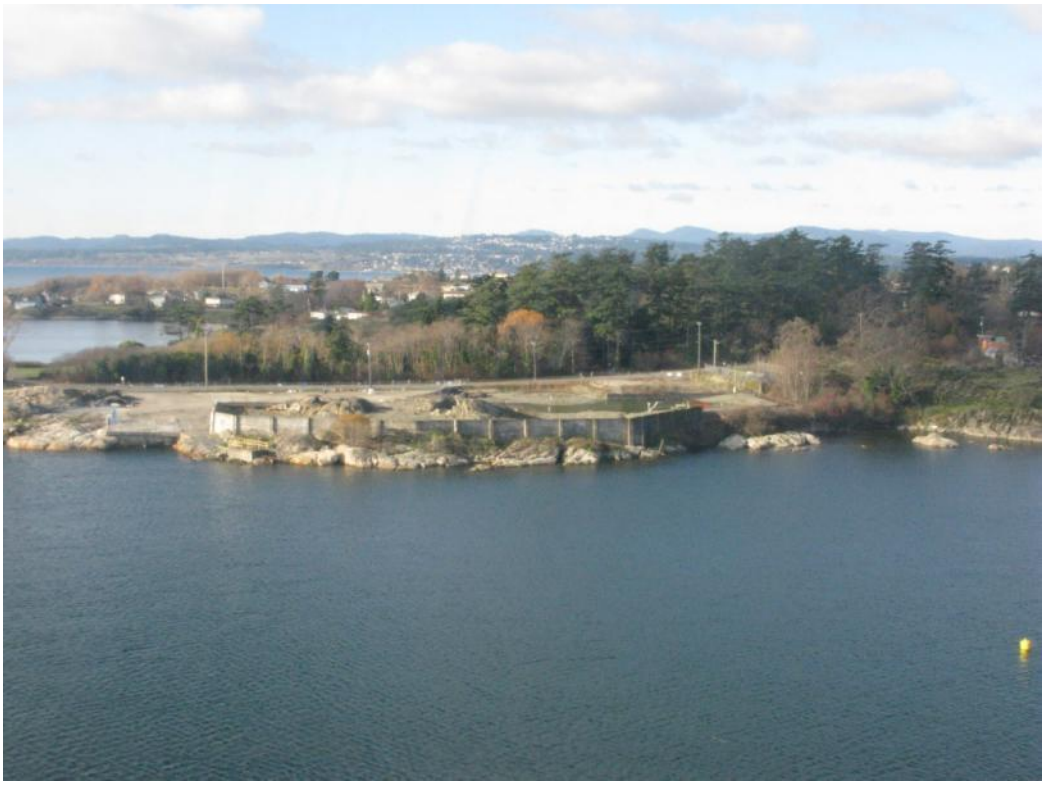


**Figure 5-46. View of McLoughlin Point site looking west from floatplane leaving Victoria Harbour, November 2009**

**Figure 5-47. Rendered view of the McLoughlin Point site with the proposed wastewater treatment facility superimposed**

**Figure 5-48. View of McLoughlin Point looking northeast from the end of Ogden Point breakwater, November 2009**

**Figure 5-49. Rendered view of the McLoughlin Point site from Ogden Point Lighthouse with the proposed wastewater treatment facility superimposed**

**Figure 5-50. View of McLoughlin Point site from Victoria Cruise Ship Terminal, Pier B, November 2009**

**Figure 5-51. Rendered view of the McLoughlin Point site from Victoria Cruise Ship Terminal Pier B with wastewater treatment facility superimposed**

Treatment facility construction.

**Potential Impact: Remediation and construction activities at McLoughlin Point will affect viewscapes that include rocky shoreline, mature trees, and vacant industrial land.**
As a former fuel storage facility ("tank farm") the McLoughlin Point site requires remediation before construction activities take place. Remediation introduces the following visual elements into the local viewscapes:

- excavators,
- soil stockpiles,
- security and work lighting,
- large trucks moving material off-site, and
- potentially on-site soil processing equipment.

Completion of site remediation operations is anticipated to take three years.

Facility construction is expected to commence near the end of the remediation period. During construction, the following visual elements will be introduced into the local landscape:

- earth moving equipment, cranes and other construction related large equipment,
- soil and aggregate stockpiles,
- stockpiled construction materials,
- security and work lighting,
- truck and other construction related traffic, and
- partially completed treatment facility structures.

Because of the site's location in an area that is a mix of natural rocky coastline with vegetated waterfront and urban waterfront, the introduction of the identified visual elements during remediation and construction may be considered an adverse visual impact.

The principle viewers of construction activities will be users of Victoria Harbour. Air and marine traffic will have unobstructed views of the site from the northeast, east, and southeast as they enter and exit the harbour. Because of established harbour traffic routes and the presence of a rocky shoreline, most ground and water-based views will be distant (greater than 200 m).

The construction period for the facility is estimated to last approximately 3.5 years. The visual impacts of site remediation and facility construction could last up to six years.

Mitigation measures. Most viewers will see the site from several hundred metres distant, and obliquely from ferry decks, cruise ship decks, or float planes. Because of the long

period of remediation and construction, consideration should be given to selecting security fence materials that also screen the site, for example green or black chain link fence slats. Selecting colours for such screens that are analogous to background colours would lessen the visual impact of construction to viewers from Victoria View Road (not a public road) and from distant viewpoints on the east side of the Harbour.

The temporary nature of the construction activities associated with the McLoughlin Point facility, and the lack of intrusion into, or development of, visually sensitive areas, for example forested areas, creates visual impacts of development of the site that are local, long-term, reversible, of low magnitude, and **less than significant**.

Treatment facility operation.

**Potential Impact: Siting a wastewater treatment facility at McLoughlin Point will affect views from the east side of Victoria Harbour.**

Viewed from the east side of Victoria Harbour, including Ogden Point, the McLoughlin Point site appears as a distant low concrete retaining wall against a treed backdrop. The wastewater treatment facility will add industrial buildings, parking, administration offices, and landscaping (Figure 5-46 to Figure 5-51). Viewers near sea level looking at the site from the east side of the harbour will see partially screened industrial and office buildings in the middle distance against a treed background. The distances between land based viewers and the facility (greater than 500 m) ensures that this will be a minimal adverse visual impact.

Mitigation measures. Vegetation screens and landscaping are recommended along the east and south shorelines of the site to partially screen the facility and to blend the site with the surrounding landscape.

An industrial facility seen from the east side of the harbour may be considered unattractive, but its appearance is largely mitigated by the distance between most viewers and the proposed facility and by vegetation screens. In consequence, the mitigated visual impact of the McLoughlin Point wastewater treatment facility, as viewed from east side of Victoria Harbour, is considered local, long-term, irreversible, of low magnitude, and **less than significant**.

**Potential Impact: Siting a wastewater treatment facility at McLoughlin Point will affect marine and harbour views obtained when entering or leaving Victoria by cruise ship, ferry, floatplane, or helicopter.**

The McLoughlin Point site is in a prominent location at the entrance to Victoria Harbour. Potentially some 400,000 viewers per year enter or exit the harbour by large vessel, helicopter, or floatplane (Dykes, 2009). High vantages provide a more oblique view of the site, so these viewers presently have unscreened views of a vacant 1.5 ha area of broken concrete and spoil heaps. After construction, these viewers will have unobstructed or partially screened views of facility buildings and associated infrastructure and landscaping (Figure 5-47).

For most viewers entering or exiting the harbour, a wastewater treatment plant at McLoughlin Point may be considered a neutral or positive visual effect, because it replaces an unattractive vacant industrial lot with modern, well-designed industrial building, infrastructure, and landscaping.

> Mitigation measures. It is recommended that buildings be designed to a high architectural standard. Where feasible, facades on east and south faces should be designed and finished to reduce the industrial appearance of the facility. Vegetated screens and landscaping are recommended along the east and south shorelines of the site to partially screen the facility and to blend the site with the surrounding landscape.

The site's development will replace an unattractive vacant lot with a well-designed industrial facility that is highly visible to harbour marine and air traffic, so the visual impacts are considered **beneficial**. In consequence, the mitigated visual impact of development of this site as a wastewater treatment facility, on most viewers entering or leaving the harbour, is considered to be **less than significant**, and **beneficial**.

**Potential Impact: Views of vacant McLoughlin Point industrial land from Victoria View Road will be replaced by views of an industrial facility**

Victoria View Road is a private DND road used to access two detached residential dwellings on the west side of the peninsula. Viewers on the road have unscreened views of a vacant, partially remediated, industrial lot in the foreground with marine and harbour views in the middle distance and background, (Figure 5-41). Viewers from the detached residences have heavily screened and occasional glimpses of the site (when deciduous foliage is absent). Development of the McLoughlin Point site will replace an unattractive vacant lot and marine views with views of a partially screened, modern, wastewater treatment plant.

> Mitigation measures. It is recommended that vegetation screens be planted adjacent to Victoria View Road to partially screen the facility from view and to complement the treed view on the west side of the road.

Siting a wastewater treatment plant at McLoughlin Point will replace an unattractive vacant lot with a modern facility, but will also obscure extensive harbour and marine views. The limited use of Victoria View Road and the glimpses of the site from the residential dwellings on the west, combined with the replacement of an unattractive vacant lot with a modern wastewater treatment facility balance the loss of marine views. In consequence, the mitigated visual impact of development of McLoughlin Point as viewed from Victoria View Road is considered local, long-term, irreversible, of low magnitude, and **less than significant**.

### *Hartland North*

Treatment facility construction

**Potential Impact: Structures built as part of the proposed Hartland biosolids facility could alter the visual landscape of the Hartland North site from adjacent properties.**
As noted in the Project Description (Section 3.0), the structures at the proposed Hartland biosolids facility will be less than 10 m above-grade. This height is below the height of the mature trees in the buffer strip and the Treed Protected Area, and is below the height of the adjacent gravel piles. Topography and vegetative screening will prevent the Hartland North site, and the activities that take place during construction of the Hartland biosolids facility from being visible from Willis Point Road, Mount Work Regional Park trails, or residential properties. No mitigation measures are required at the Hartland North site to protect the existing viewscape and visual aesthetic quality of the area during construction of the proposed Hartland biosolids facility.

The magnitude of visual impacts of the Hartland biosolids facility during construction is considered to be negligible and **less than significant.**

Treatment facility operation

**Potential Impact: Operation of the proposed Hartland biosolids facility could alter the visual landscape of the Hartland North site from adjacent properties.**
Similar to the facility construction assessment of visual aesthetics, the operating Hartland biosolids facility will not be visible from Willis Point Road, Mount Work Regional Park trails, or residential properties because of the topography and vegetative screening surrounding the Hartland North site. No mitigation measures are required at the Hartland North site to protect the existing viewscape and visual aesthetic quality of the area during operation of the proposed Hartland biosolids facility.

The magnitude of visual impacts of the Hartland biosolids facility during operation is considered to be negligible and **less than significant.**

### *Ancillary facilities*

Ancillary facility construction.

**Potential Impact: Installation of conveyance pipes will affect streetscapes of Esquimalt, Fairfield, James Bay, and Victoria.**
Construction of ancillary sewer pipes will result in trenching and construction along 7 km of the urban and suburban streetscapes of Esquimalt, Fairfield, James Bay, and Victoria. The introduction of construction equipment, materials, and related traffic into non-industrial urban and suburban areas is considered an adverse visual impact. Views of construction equipment

and construction traffic will be localized and of moderate duration (occurring over a one year period). Construction of a 750 m long tunnel between the McLoughlin Point site and James Bay (at a site, and using a method yet to be determined) is expected to have few visual impacts.

On Dallas Road, between Montreal and Simcoe streets, street trees have been identified as contributing greatly to the visual quality of the streetscape. Tree removal would cause an adverse visual impact.

> Mitigation measures. If possible, construction along Dallas Road should be scheduled for winter months when viewers in Beacon Hill Park, Clover Point Park, and on Dallas Road are at their lowest numbers. Pipe routing and construction options should be selected to ensure that trees in visually sensitive areas are not damaged.

The temporary nature of the construction activities associated with the ancillary facilities, and the lack of intrusion into or development of, visually sensitive areas ensures that the overall mitigated visual impacts of development of these facilities are local, short-term, reversible, of low magnitude, and **less than significant**.

Ancillary facility operation.

After construction, it is anticipated that the pipes will be located underground and no visual impact will occur. Impacts are, therefore, considered negligible and **less than significant.**

## 5.13 Site contaminants

### *McLoughlin Point*

The McLoughlin Point site is a decommissioned Imperial Oil tank farm. Preliminary Site Investigations (PSIs) are currently underway at the McLoughlin Point site to identify potential or existing environmental contamination liabilities. No information is presently available on the contaminant status of the McLoughlin Point property. Results of the studies will be available to the CRD in 2010.

### *Hartland North*

The Hartland North site was used for yard and garden waste composting from 1996 to 1999. Today, the facility site is adjacent to a large (200,000 $m^3$) gravel stockpile. The Hartland Landfill is less than 100 m south of Hartland North site. As part of CRD's leachate monitoring program, test wells have been drilled in several locations around the site perimeter. Analysis of water samples from the test wells show elevated tannin levels, likely due to the previous composting facility operation, and elevated sulphites, due to water run-off from the gravel

stockpile. The size of the gravel stockpile is being reduced and it is anticipated that the stockpile will be covered to reduce run-off (Watkins *pers. comm.*).

CRD Hartland Road Landfill is a provincially registered contaminated site (Site ID 4682). Registration was obtained for receiving contaminated soils and refers to the landfill area (Watkins *pers. comm.*). Although a preliminary site assessment has not been conducted on the Hartland North site, known uses of the site are not anticipated to result in contamination.

Release of contaminants, during development of the site for the biosolids facility, will have an environmental impact that is local, short-term, reversible, of low magnitude, and **less than significant**.

## Brownfield development on private land

The Province of British Columbia defines brownfields as "abandoned, vacant, derelict or underutilized commercial or industrial properties where past actions have resulted in actual or perceived contamination and where there is an active potential for redevelopment" (National Round Table on the Environment and the Economy 2003, pp. 1). Under this definition, the McLoughlin Point site can be considered a brownfield site. The BC Brownfield Renewal Strategy may assist in identifying constraints and opportunities associated with development of wastewater treatment facilities on these sites.

The Environmental Management Act (EMA) and Contaminated Sites Regulation outlines the framework for identification and remediation of contaminated and brownfield sites and include remediation standards for site assessment and cleanup, the principles of liability for remediation, and requirements for approving remediation activities at sites in British Columbia.

Under EMA, a proponent may request an Approval in Principle (AiP) of a remediation plan, which confirms that the planned actions area high likely to successfully remediate the site. Following implementation of a remediation plan, proponents may apply for a Certificate of Compliance (CoC), which confirms site remediation that meets environmental quality standards. AiPs and CoCs provide increased certainty to lending institutions and other parties that liability associated with contamination will be reduced or eliminated.

### Financial Incentives

The BC Brownfield Renewal Funding Program contributes funding to land owners or developers (including local governments) for environmental investigations or remediation of brownfield sites where it is possible to achieve triple-bottom-line benefits. Eligible activities and costs include:

- preliminary site investigations, up to 85% of eligible project costs or $40,000, whichever is less,
- detailed site investigations, up to 70% of eligible project costs or $125,000, whichever is less, and,
- other environmental investigations or related environmental activities, up to 50%, or $125,000, whichever is less[8].

The *Community Charter* provides local governments with the ability to offer revitalization tax exemptions to owners of brownfield sites. The Ministry of Community Development has published a primer document for local governments on the *Community Charter*, which enables the Revitalization Tax Exemption tool for local governments. Using this tool, local governments can offer developers tax exemptions for up to 10 years on brownfield redevelopment sites.

The Federation of Canadian Municipalities' Green Municipal Fund (GMF) grants and below-market loans support municipal initiatives, such as brownfield redevelopment initiatives.

The federal SD Tech Fund from Sustainable Development Technology Canada is available to private organizations involved in remediation and green building technology development.

As the CRD's wastewater program proceeds, it may be feasible to apply some or all of the foregoing programs to development on the McLoughlin Point site.

[8] More information on the Funding Program is located online: http://www.agf.gov.bc.ca/clad/ccs/brownfields/Documents/BC%20Brownfield%20Funding%20Program%20Guide.pdf

# 6.0 CUMULATIVE EFFECTS ASSESSMENT

For the purposes of this EIS, cumulative effects refer to the regional or local effects of constructing and operating wastewater treatment facilities in combination with the effects of other existing or planned developments in the core area of the CRD.

The area considered in this cumulative effects assessment includes Victoria Harbour, James Bay, southwest Fairfield, Vic West, southern Esquimalt, and the Willis Point Road area of Saanich. With exception of the lands near the Hartland North site, this area is the urban core of the region, and includes residential neighbourhoods, offices, industry, and Department of National Defence training and housing. The Hartland North site occurs on the Hartland Landfill property. Several parks are located near the proposed wastewater facilities and conveyance pipeline routes, including Beacon Hill Park, Clover Point Park, Holland Point Park, Banfield Park, MacDonald Park, Macaulay Point Park, Victoria West Park, the Galloping Goose Regional Trail, and Mt. Work Park.

In the urban core, virtually all native forests have been removed in the study area; old growth is limited to scattered trees and small residual stands, mainly in Beacon Hill Park, and Mt. Work Park. Naturally occurring water courses in this urban area have been enclosed in storm drains and the natural landscape has been largely replaced by roads, buildings, and landscaping. The few remnant natural foreshore areas retain some ecological value. The Hartland North site occurs on a CRD owned property zoned for use as a landfill, and is surrounded by natural forest ecosystems and rural land uses.

## Environmental effects of a wastewater facility

The geotechnical setting, hydrology, water quality, vegetation, and wildlife collectively represent the "environment" of the study area. It is evident from aerial photographs or a cursory field inspection that past urban development in the study area constitutes a high magnitude, long-term, irreversible impact on the environment that must be considered **significant.**

The treatment facilities and their supporting ancillary infrastructure will affect a total of 5.5 ha of land (excluding conveyance pipes between facilities at McLoughlin Point and Hartland North). Nearly all areas where the treatment facilities will be constructed have been affected by previous human activity. The facility footprints at McLoughlin Point, Macaulay Point, and the Hartland North have already been altered by clearing of vegetation, paving, and similar actions. Only 25% of the Hartland facility would affect "greenfield" land that has not already been used for industrial or utility purposes. The wastewater conveyance pipelines will be installed in roadways, on bridges, and beneath Victoria Harbour. Because existing developed areas will be

"re-used" for the wastewater facilities, the project will make a negligible contribution to the cumulative effects of development on the environment.

In assessing the cumulative effects of the Project, it should be noted that the rationale for providing wastewater treatment is to improve environmental quality. These improvements include:

- The ability to recover energy for reuse, particularly in the McLoughlin Point and Hartland North areas,
- Benefits to the marine environment by discharging much cleaner effluent than is the case today, with associated long term reductions in impacts on the sea, and
- Remediation of the McLoughlin Point site that is now believed to be contaminated.

The negligible contribution of the wastewater facilities to existing cumulative environmental effects of development in the Core Area is considered **less than significant.**

The improved marine conditions resulting from wastewater treatment improve the net environmental effect of this project.

## Social effects

Cumulative effects of development on socio-community conditions in the study area are associated with archaeology, heritage, traffic, health, visual aesthetics, air quality, noise, vibration, lighting, and land use change. Based on the results of this EIS, the following statements can be made about the potential contribution of the proposed wastewater treatment facilities to cumulative effects on socio-community conditions.

The cumulative effects of existing development on archaeological and heritage resources in the study area can be considered adverse and **significant**. It is unlikely that the wastewater facility will contribute to further damage or loss of archaeological or heritage resources. Compliance with the *Heritage Conservation Act* and the conduct of an Archaeological Impact Assessment (AIA) study of conveyance pipes after routes have been finalized will mitigate effects of the wastewater project.

With regard to socio-community effects, travel and mobility are commonly disrupted by construction activity in the urban area. New buildings and infrastructure installation and replacement often result in road closures that affect travel patterns and generate dust and vibration. Most people accept the occasional travel disruption and associated nuisance effects, because they recognize the importance of development and redevelopment in maintaining the vitality of an urban area.

The cumulative effects of motor vehicle-dependent developments in the core area already have **significant** cumulative effects on roadways and neighbourhoods. The small volumes of traffic generated by operation of the wastewater facilities will not contribute materially to congestion on roadways.

Construction of the wastewater facilities could combine with other construction projects to cause cumulative travel and nuisance effects on nearby neighbourhoods. For example, truck traffic, noise, and dust associated with constructing buildings or repairing roads could compound the similar effects of wastewater facility construction if the activities occur at the same time. Because the construction periods associated with the wastewater facilities are long (up to three and a half years), it is likely that other construction or utility maintenance work will occur at the same time and location as the wastewater facilities, resulting in cumulative effects on neighbourhoods and travellers. Traffic generated by construction at McLoughlin Point, compounded by the concurrent construction at Macaulay Point, has the potential to cause **significant** cumulative effects on traffic and roads, particularly if municipal work occurs on nearby major roads or bridges during construction of the wastewater facilities.

The spatial and temporal extent, magnitude, and significance of cumulative traffic and community effects of facility construction are **unknown** at this time. Even considering this uncertainty, certain project impacts can be mitigated by:

- Identifying other private sector or public sector construction or maintenance projects that are planned to occur near to, and at the same time as, the wastewater facilities,
- Avoiding or minimizing community disruption through scheduling or other measures, and
- Seeking ways of coordinating activities to shorten construction intervals or road work (*e.g.*, delaying road resurfacing to follow, rather than precede, installing wastewater pipes).

Municipal and CRD coordination of major construction activities would reduce the cumulative effects of multiple projects on communities to **less than significant** levels.

Compared with the combined impacts on human health of urban form, design of existing developments, and personal behaviour choices, the contribution of the wastewater project's noise, vibration, lighting, and air quality effects will be negligible and **less than significant**.

The visual aesthetics effects of the proposed wastewater facility will be small in comparison with the aesthetic effects of other structures throughout the study area. Some of the proposed

wastewater facilities may constitute a **beneficial** visual effect when compared with present conditions, and others will be neutral or less-than significantly adverse.

Wastewater treatment has the potential to release unpleasant odours that could affect areas near the treatment facilities, but the CRD is committed to a goal of eliminating noticeable odours emitted by the facilities. Compared to other sources of airborne odour effects, such as domestic fireplaces and diesel exhaust from vehicles, the wastewater facilities are not expected to contribute to cumulative odour effects. Air quality in the CRD is generally very good, and the proposed wastewater treatment facilities are not expected to materially affect air quality. Cumulative effects of wastewater treatment combined with other emissions in the core area are considered **less than significant**.

The cumulative effects of development in the study area on socio-community conditions are rarely considered in the development review process. The analysis conducted in this EIS, however, indicates that the contribution of the wastewater facilities to the cumulative social and community effects of development in the study area will be of low magnitude and **less than significant.**

# 7.0 RECOMMENDATIONS

This section summarizes the mitigation measures identified in this EIS and confirms the CRD's commitment to implement these recommendations.

## 7.1 Mitigation measures

The CRD commits to the following mitigation measures for the construction and operation of the McLoughlin Point-Hartland facilities, including associated ancillary facilities:

- A geotechnical investigation and review of the treatment facility design will be conducted.
- Careful consideration will be given to groundwater levels of excavations deeper than 3 to 4 metres below existing grades and any excavations below sea level.
- Appropriate measures will be implemented to avoid or control seepage from fill or rock cuts, to ensure use of suitable fill materials, and to respond to potential buoyancy concerns where structures are below the water table.
- Earthquake and tsunami risks, and projected 100-year sea level rise, will be factored into facility designs.
- The CRD will consider alternate pipe routes to avoid identified project effects on Dallas Road.
- When blasting, the CRD will limit the size of charge detonated per delay to avoid or minimize vibration effects on adjacent facilities and structures.
- The CRD will follow WorkSafe BC standards.
- The road at the north end of the McLoughlin Point project footprint will be relocated in order to avoid removal of native trees.
- Areas of native vegetation and plant communities located on or near facility footprints will be avoided, where possible.
- Temporary workspace and lay-down areas will be located in areas that will not substantially affect native plant communities or public access to parkland, especially during construction of the McLoughlin Point facility, the Clover Point upgrades, and ancillary facilities along Dallas Road.
- Vegetation clearing work will be avoided during the nesting bird season (March 15 to July 31).
- Redundant odour control systems and backup generators will be installed where required to reduce the risk of untreated air discharge from the treatment facilities.

- The CRD will respond to neighbourhood concerns about odour.
- The CRD will take measures to identify and avoid archaeological sites and features, and to comply with requirements of the Archaeology Branch.
- An archaeological impact assessment (AIA) will be conducted at Clover Point, Hartland North, and along specified pipe routes before construction takes place.
- Signs, newspaper advertisements, or other measures will be used to inform residents and businesses about the construction schedule and temporary walkway, park, and vehicle parking closures or other potentially disruptive construction activities.
- Users of facilities that could be affected by pipeline construction will be notified about the work schedule and potential disruptions.
- The CRD will seek to comply fully with City of Victoria, District of Saanich, and Township of Esquimalt plans and bylaws in siting, design, construction, and operation of the facilities.
- Construction of the conveyance pipes near CRD Regional Parks, Victoria parks and the Seaside Touring Route will be scheduled to occur between late October and May, as feasible, to avoid the peak tourist season.
- The CRD will meet with City of Victoria and Federal government representatives to ensure that the Clover Point facility expansion complies with the Clover Point Park covenant.
- Design of the facilities on the McLoughlin Point site will follow the Transport Canada guidelines and a Land Use Submission Proposal will be submitted to Transport Canada.
- A registered arborist will be retained during the conveyance pipeline route planning and design stages to determine further measures to avoid or mitigate potential damage to street trees.
- The construction site will be fenced to prevent access by the public. In areas near travel routes to schools, flag persons will be present during school hours.
- The CRD will instruct contractors to investigate alternative parking locations with van pooling for construction crews.
- The CRD will discuss and refine construction traffic routes with engineers and planners at the Township of Esquimalt, City of Victoria, and District of Saanich.
- The CRD will actively pursue the use of barges to transport excavated rock and soil from the McLoughlin Point site, and to deliver concrete and other bulk materials to the site. The shared use of barge facilities to handle material excavated from construction at the Macaulay Point pump station will be investigated.

- To reduce employee traffic during construction at McLoughlin Point and Macaulay Point, contractors will be required to provide offsite parking and to bus employees to and from the worksites.
- The CRD will prepare detailed traffic management plans for construction at Clover Point, Hartland North, ancillary facilities, McLoughlin Point, and Macaulay Point. The plans will identify measures to reduce traffic effects on surrounding neighbourhoods, maintain safety, reduce damage to road surfaces, and reduce fuel use and emissions. The plan for McLoughlin and Macaulay Point facilities will be an integrated document.
- Ancillary pipe construction will be restricted to single blocks at a time and will be scheduled outside of peak periods of vehicular activity, whenever practical.
- CRD representatives will work with the DND and community groups to minimize impacts of constructing the conveyance pipes through residential neighbourhoods.
- The CRD will engage in discussions with nearby institutions and neighbouring residents during project planning and before construction to confirm noise mitigation measures.
- All buildings will be designed to a high architectural standard and, where feasible, designed and finished to reduce the industrial appearance of the facility.
- Where feasible, vegetated screens, security fencing materials, and landscaping will be used to partially screen the facilities and to blend the facilities with the surrounding landscape.
- Location of staging areas will be chosen to minimize visual disturbance.
- If practical, the area atop and near the new Clover Point facilities will be seeded with native grasses and restored with native plants.
- The CRD will consider providing viewing areas near Clover Point from which the public may safely observe construction progress.
- A water management plan will be prepared to minimize on-site and off-site effects of groundwater changes associated with the project. If feasible, onsite infiltration of runoff will be included in project design.
- Water used in concrete pouring should be managed to prevent entry into storm drains or the ocean.
- Stockpiles of excavated soil will be covered to prevent erosion.
- During construction, settlement ponds or filtration basins will be provided to reduce suspended sediments in construction drainage. Silt fencing may be appropriate to control movement of sediments.

- During operation, runoff water should pass through oil, grease, and sediment traps before being released to the ocean or storm drains.
- As part of the Environmental Protection Plan for the McLoughlin Point-Hartland facilities, a spill response plan will be prepared that specifies procedures to follow in case of an accidental spill of wastewater, sludge, or biosolids.

## 7.2 Environmental protection plan

The EPP for the McLoughlin Point-Hartland facilities will contain a set of instructions that are developed to avoid or minimize adverse clearing and construction effects of the project on the environment.

The mitigation measures described in Section 5 of this EIS and the forthcoming marine EIS will be incorporated in the EPP. The EPP will apply to each phase of the project, including clearing, grading, construction, operation, and restoration.

An Environmental Protection Plan (EPP) will be developed by the CRD specifically for the McLoughlin Point-Hartland facilities. The EPP will incorporate the appropriate requirements of the CRD's existing procedures and manuals that are applicable to the construction and operation phases of the McLoughlin Point-Hartland facilities. The EPP will examine the following topics:

- outline environmental standards,
- adherence to applicable permits,
- use and handling of approved materials,
- construction practices,
- proper disposal of waste, and
- compliance with the Workplace Hazardous Materials Information System (WHMIS) and other pertinent regulations.

The standards will be incorporated into the building contracts, and compliance will be a legal obligation for contractors.

The EPP will be written in construction specification format so that it is clear and can be easily interpreted and followed in the field by contractors, trade and environmental inspectors, regulatory inspectors, and other government representatives. The use of the construction specification format also allows the instructions contained in the EPP to be directly included in the construction contract bid documents and specifications.

Before construction of the McLoughlin Point-Hartland facilities, workers will receive environmental orientation and training describing requirements related to safety and environment.

The Environmental Protection Plan will include a series of contingency plans covering:

- wet soils,
- soil erosion or siltation,
- flooding or excessive flow,
- accidental spills,
- fire,
- accidental release of drilling mud during horizontal direction drilling,
- wildlife incidents,
- discovery of plant species or wildlife species of concern during construction, and
- discovery of archaeological or heritage resources during construction.

## 7.3 CRD commitment

By accepting this EIS, the CRD commits that it will make best efforts to implement the recommended actions identified in Section 7.1. Acceptance of the EIS also obligates the CRD to develop an Environmental Protection Plan as described in 7.2, and to implement the actions described in the EPP.

The timing and sequence of the implementation actions will be linked to the schedules for planning, design, construction, and restoration stages of the wastewater project. The actions will be subject to approval by the CALWMC or Board of the CRD, and will be contingent on availability of adequate funds to conduct the tasks.

# 8.0 PREPARERS OF THE REPORT

The EIS was prepared by Westland Resource Group and affiliated consultants, with the involvement of CRD personnel. The study team was headed by senior planners and environmental scientists at Westland, a Victoria-based environmental consulting firm. Support for the engineering and facility construction elements of the report was provided by staff from the CRD and Stantec. Expertise was provided in the following areas:

- land use planning and analysis,
- biology (vegetation and wildlife),
- hydrology and water quality,
- community effects (noise, odour, light and glare),
- archaeology and heritage,
- Geographic Information Systems-based mapping and spatial analysis,
- traffic and roads,
- facility design, construction, and operation,
- odour dispersion modelling,
- geotechnical analysis,
- archaeology, and
- meteorology.

All of the consultants in the Westland team have professional registrations in their respective fields and are experienced in conducting studies of this type. Westland was selected to conduct the EIS after a competitive proposal process conducted by the CRD.

## Westland Resource Group Team

**David Harper, Ph.D., P.Ag., CPESC, MCIP**, is the Project Manager for the siting and environmental assessments. He led several elements of the project, including municipal planning issues, neighbourhood and socioeconomic impacts, First Nations issues, facilitation of meetings with the Core Area Liquid Waste Management Committee (CALWMC), oversight of the GIS analysis, report preparation, quality assurance, and administration. Dr. Harper, with Westland Resource Group, has more than 30 years of experience in community and environmental planning, resource and watershed management, site location studies, impact assessment, and public involvement for the private sector and for local and senior governments. He led the development of the ESR concept with the District of Saanich, managed preparations of ESRs in

several municipalities, and has participated in siting and impact assessment studies for industrial clients throughout British Columbia. Dr. Harper is a Registered Planner, a Professional Agrologist, and a Certified Professional in Erosion and Sediment Control.

**Wayne Biggs, M.Sc., P.Ag., R.P.Bio.**, is the Project Biologist and Assistant Project Manager for the siting and environmental assessments. He is responsible for identifying sensitive ecosystems, vegetation communities, wildlife habitats, and other ecosystem elements for the siting study and ESRs. Mr. Biggs is a Registered Professional Biologist and a Director of Westland Resource Group. He has more than 30 years' experience as an environmental consultant in British Columbia. He has conducted numerous environmental planning, biological inventory, habitat resource mapping and restoration projects in the province, and participated in the CRD biosolids facility site selection and ESRs. He was involved in the development of the ESR concept for the District of Saanich, and has participated in preparation of ESRs in the region. He has worked with the CRD on several engineering projects, including the septage disposal siting study and the Hartland Road composting study.

**Carmen Holschuh, M.Sc., R.P.Bio.,** is the Vegetation and Species at Risk Specialist for the project. Ms. Holschuh has conducted environmental impact assessments on Vancouver Island and throughout British Columbia, including inventory and site characterization, potential impact identification, mitigation planning, and evaluation of the significance of impacts. She has experience in environmental research design, data collection and analysis, field-based wildlife and vegetation inventories, and species at risk assessment and management. Ms. Holschuh has conducted many biological studies on Vancouver Island, including identifying and mapping sensitive habitats for CRD Parks, habitat and species inventories on proposed development sites in the CRD that assessed potential project impacts and guided the form and location of development.

**Rahul Ray, B.Sc., DEIA, M.R.M, MCIP,** is an Environmental Planner and is Community Planning Specialist for the project. Mr. Ray has co-ordinated socioeconomic studies for major industrial projects in federal and provincial environmental regulatory processes, leading to the assessment of potential effects and identification of mitigation measures. He is familiar with collecting and analyzing information on land and resource use, public health, demography, community infrastructure, and services. Mr. Ray has participated in a broad range of resource management projects across British Columbia, often involving multi-stakeholder groups created to address complex resource issues. He has experience working collaboratively with representatives from government, industry, communities, environmental groups, and First Nations. Mr. Ray has an educational background and experience in land use planning and environmental and social impact assessment.

**Steve Young, B.Sc., Dip.E.M.A, M.En.S.,** is a Geographic Information System and Mapping Specialist, and has more than 17 years' experience working as a professional ecologist and GIS specialist in the environmental sector. He is the Spatial Analyst for the CRD project. Mr. Young has been analyzing spatial phenomena and making maps in the land and resource management field in British Columbia for the past eight years. His accomplishments include creating maps and spatial analyses for numerous Land and Resource Management Plans and environmental assessment applications. In the CRD, Mr. Young has mapped old growth forest remnants, marbled murrelet habitat, Sensitive Ecosystem Inventory areas, and the proposed Victoria Harbour Pathway. His specialties include cartography, analytical programming, web mapping, and forestry and protected areas analyses.

**Tara Lindsay, B.Sc.,** is an Environmental Planner and is a Data Analyst for the project. Ms. Lindsay has a bachelor of science in geography from the University of Victoria. She has nine years' experience managing and conducting environmental projects in the CRD. She has training and experience collecting environmental data, producing and analyzing Geographic Information Systems data and maps, collecting field and published data, facilitating meetings, and engaging and educating the public. She is highly skilled with graphic and analytic computer programs. She has worked extensively on environmental projects and has prepared environmental assessments for major industrial projects. Her work has included collaboration with federal, provincial, and local governments, non-governmental organizations, businesses, and the public.

**Sean Moore, M.R.M, MCIP**, is an Environmental Planner and is the Land Use Specialist for the project. Mr. Moore has extensive experience in community and regional planning, and resource and environmental management in British Columbia and Alberta. He has successfully facilitated collaborative plans, policies, and programs by working with diverse stakeholder groups, industries, First Nations, and governments. His professional expertise involves conducting stakeholder workshops and public engagement events, research and critical analysis, project management, report writing, and presenting project results to a range of audiences. Mr. Moore has managed or been involved in projects for all levels of government and First Nations to address complex land use issues, climate change planning and implementation, growth strategies, environmental and socioeconomic impact assessments, community tourism development, infrastructure siting, and state of sustainability reporting.

**Richard H. Dixon, P. Eng**., is the project's Transportation Engineer with Bunt Engineering. A Professional Engineer, he has had extensive experience in transportation projects over the past 30 years in a variety of public and private positions. He was involved in the traffic impact component of the ESR for the CRD's Biosolids Facility Site Comparison, which examined the impacts of candidate sites on local transportation infrastructure, changes to traffic volumes, and potential mitigation measures. Mr. Dixon's experience includes the Transportation Master Plan

for the Town of View Royal and the analysis of the impacts of the redevelopment of the Town & Country Shopping Centre from 230,000 to almost 700,000 square feet. Other significant projects have involved the proposed redevelopment of the Bamberton Lands as a community of approximately 3,200 residences and transportation demand management plans for the Pacific Sport Institute.

**Gordon J. Esplin, M.Sc., P.Eng**., is the Principal and Senior Engineer of Genesis Engineering Inc., a company devoted to advanced environmental technology and to solving air pollution problems. He is the Air Emissions Specialist for the project. Mr. Esplin has more than 30 years' experience, and is an expert in odour control measurements and odour control modelling. His experience includes air pollution dispersion modelling for Vancouver International Airport, pulp mills, shipyards, landfills, and large wastewater treatment facilities. Previously, Mr. Esplin was Head of the Air Quality Division of B.C. Research Inc. He prepared the odour emissions and air dispersion modelling, impact assessment, and mitigation components of the ESR for the CRD's biosolids study.

**Stanton Tuller, Ph.D.**, is an accredited consulting meteorologist in topics including applied climatology, climate impact assessment and wind engineering and a professor at the University of Victoria. His major research interests are in the area of applied climatology including effects of ground surface alterations on the overlying climate, human thermal bioclimate, microclimatic and applied effects of onshore winds and time and space variations in wind. Current research focuses on changes in coastal wind speed and wind power over the period of observational record. Dr. Tuller supplied data and support for the odour modelling performed by Genesis Engineering.

**C. N. Ryzuk, M.Eng., P.Eng**., is the Geotechnical Engineer for the project. The Principal of C. N. Ryzuk and Associates, he applied his substantial local knowledge and experience to identifying geotechnical conditions and issues associated with the treatment facilities. Mr. Ryzuk has worked extensively in the CRD on large and small geotechnical site investigations. He is one of the most experienced geotechnical engineers in the Capital Region, and has been responsible for geotechnical assessments and recommendations affecting some of the largest and most complex structures on southern Vancouver Island.

**Lane Campbell, M.Eng.,** is a senior geotechnical engineer and principal of C.N. Ryzuk & Associates Ltd. with over 19 years of experience in civil and geotechnical engineering. He received his B.Sc. in Civil/Forest Engineering from the University of New Brunswick, and his M.Eng. in Geotechnical Engineering from the University of Alberta, and has been involved with numerous commercial developments throughout the Victoria area. Lane has extensive experience with in-ground shoring systems, shallow and deep foundation design, and earth retaining structures, as well as project engineer for the wastewater treatment plant and associated infrastructure for Dockside Green.

**Dannica Switzer, EIT, GIT,** is a Project Engineer with C.N. Ryzuk & Associates. She assisted in the Geotechnical assessments for the project. She has degrees in Civil Engineering and Earth Sciences from Dalhousie University. She has been involved with a variety of commercial and residential projects throughout the Victoria area, including site investigations, geotechnical assessments and analyses, and associated reporting.

**D'Ann Owens, B.A.,** is a Senior Archaeologist for Millennia Research. D'Ann has intensive archaeological experience participating in and directing large scale archaeological projects since 1994. She has directed traditional use studies in the southern interior for the Cook's Ferry and Lytton First nations, Lillooet (Lookout Point) and the Pavilion First Nation, on the midcoast for the Kitasoo Indian Band, and with the Kitkatia on the north coast.

**Vashti Thiesson, B.A.**, is an Archaeologist with Millennia Research. She has experience in a variety of archaeological field methods and reporting formats. Her primary activities at Millennia include fieldwork, including survey and excavation, lab work, including analysis and processing of samples and report production, including writing, and editing to Archaeology Branch of British Columbia standards.

**Bjorn Simonsen, B.A., M.A.,** is a Heritage and Archaeology Specialist for the project. Mr Simonsen is the Principal of The Bastion Group Heritage Consultants, and has more than 35 years of experience in the cultural resources management field in Canada, including 10 years as British Columbia's Provincial Archaeologist. He is a well known and respected professional in the fields of cultural resources management and archaeological research and site management.

Mr. Simonsen has also managed the day-to-day operation of five historic sites in Greater Victoria, including Helmcken House, Craigflower Farm, and the Emily Carr House. He has conducted archaeological impact assessment studies, heritage resources feasibility and management studies, First Nations economic development initiatives, and treaty and land claims related work. He worked with Westland on the ESRs for the CRD's candidate biosolids treatment facilities. In the course of his work, Mr. Simonsen has authored more than 300 reports on various aspects of British Columbia's First Nations culture and archaeological heritage and has an excellent working relationship with numerous First Nations communities throughout the province.

**Thomas Munson, M.Sc., Dipl. E.R**., supported the archaeological and heritage component of the siting and environmental assessments. Mr. Munson has worked with First Nations in the Yukon Territory, British Columbia, and Colombia, South America for much of the past 20 years. His has assessed development impacts on archaeological and cultural sites, conducted ethno-botanical field studies, traditional use research, multi-party treaty negotiations, and

environmental impact assessments. Mr. Munson has worked as an Archaeological Field Technician in Greater Victoria, conducting fieldwork and preparing Archaeological Impact Assessment (AIA) reports on the Bear Mountain Resort development area, a sewer trunk project in North Saanich, Portage Cove Regional Park, and proposed private property developments. He has worked alongside members of the Esquimalt Nation, Songhees First Nation, Tsartlip First Nation and Tseycum First Nation, and other First Nations in the Lower Mainland and British Columbia interior.

**Roxanne Tripp, B.Sc.,** is a junior biologist and field technician. She assisted in preparing the vegetation and wildlife impact assessments. Ms. Tripp has more than five years experience working as a technician and wildlife biologist in the forestry and wildlife sector of British Columbia. She has successfully participated in, lead, and trained data collection crews and is familiar with vegetation and wildlife standards set by British Columbia's Resources Information Standards Committee (RISC). Past projects have included habitat analysis, vegetation plot assessments, riparian area assessments, breeding bird surveys, and water quality sampling.

## Stantec Team

**Reno Fiorante, P.Eng.,** is a professional engineer and Vice President of Environmental Infrastructure for Stantec. He is a consulting engineer for this project. Reno has 25 years experience in the design and management of wastewater treatment projects in Canada and the USA. Reno recently served as project manager for the 2007 Lions Gate WWTP Site Assessment Feasibility Study and was involved in the 2005 Facility Plan for the Iona WWTP. He was the project manager for plant expansions for the Whistler BNR plant, the Kelowna BNR plant, and the Squamish WWTP. The Whistler and Kelowna plants are designed using a sustainable design philosophy and resource recovery for biosolids and liquid treatment streams. Reno was the design manager for the award winning Kamloops Membrane WTP (first LEED Gold in Canada for a treatment facility), Missoula BNR Plant, and an enhanced nutrient removal facility in Howard County, Maryland.

**C. M. Paul Pai, M.Sc., P.Eng.,** is a Senior Project Engineer with Stantec and is a consulting engineer for this project. His 37 years of experience have included the design of wastewater treatment plant upgrades for the cities of Kelowna, Okotoks, and Vernon, Whistler, Howard County in Maryland, Helena, and Missoula in Montana, as well as water treatment plants for Metro Vancouver, Kamloops, Penticton, and St. Lucia. Mr. Pai has provided senior level input in process selection and complete site layouts for several large projects for both the preliminary and detailed design of the selected alternatives, and provided input into the preparation of related opinions of probable costs.

**Gilbert Cote, BA Sc., P.Eng.,** is a Senior Project Manager with Stantec and is a consulting engineer for this project.

## CRD Team

**Tony Brcic, P.Eng.,** is a professional engineer and the Project Manager for the Core Area Wastewater Treatment Program. He has considerable experience working on small and large infrastructure projects, such as planning Sooke's secondary wastewater treatment plant in 2005 and Vancouver Island's natural gas pipeline in the 1990s.

**Seamus McDonnell, P.Eng.,** is a Project Engineer for the Core Area Wastewater Treatment Program. He is a professional engineer with 35 years of experience in a variety of wastewater projects. He was the Project Manager for the Saanich Peninsula Wastewater Treatment Plant.

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