Environmental Impact Assessment Registration Document

Oak Bay Salmon Hatchery
Oak Haven
Charlotte County
Province of New Brunswick

November 29, 2017

Prepared for:
Kelly Cove Salmon Ltd.
93 Oak Haven Road
Oak Haven, NB
E3L 3S7

Prepared by:
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November 29, 2017

SIMCorp File #SW2017-094

Ms. Lee Swanson
Project Manager
Environmental Assessment Section
PO Box 6000
Fredericton, NB E5B 5H1

Dear Ms. Swanson:

RE: EIA Submission: Oak Bay Hatchery Wastewater Treatment System Upgrade.

Sweeney International Management Corporation (Simcorp) was retained by Kelly Cove Salmon Limited (the Proponent) to submit an updated EIA Submission for the Oak Bay Hatchery Wastewater Treatment System Upgrade.

Since the EIA submission by Strum Consulting Ltd. (Strum) in April of 2015 there have been numerous consultations/discussions with government officials and shifting project needs by the proponent which require the development of a new project description and a change in scope of the EIA.

Initially the scope of the EIA was focused solely on the upgrade of the Oak Bay Hatchery's existing Waste Treatment System (WTS) which involved installing a new drum filter to improve effluent water quality. Subsequently, the scope of the EIA has been broadened to involve a Water Supply Source Assessment (WSSA) and the construction of a Family Genomics Breeding Station and Gene Bank Library (Genomics Unit) adjacent to the hatchery.

The intention of this submission (as discussed in a meeting with NBDELG and the Technical Review Committee with Simcorp and the Proponent in September 2017) is to re-package the original Strum EIA submission (2015). This current submission intends, but is not limited to: address outstanding TRC concerns/questions; fill-in information gaps; interpret collected Strum field data (benthic invertebrate and fish data); identify potential environmental attributes; make impact predictions; provide mitigation strategies; and propose a required Mixing Zone Study which will be appended to this submission (once approved and upon completion).

Some information (with permission of the Proponent) in this current submission is taken directly from the original Strum EIA submission (Appendix C). However, all information that has been submitted has been ground-truthed to the best of Simcorp's ability while other information has been updated, as new data has become available since 2015. Personal communications with government officials were re-established by Simcorp, so that any reference to them in this submission is current.

Once you have had the opportunity to review the attached EIA, please contact us to address any questions/concerns you may have.

Sincerely,

David Hyslop, BSc., P.Eng.
Project Manager
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LIST OF ACRONYMS

DFO	Department of Fisheries and Oceans
EIA	Environmental Impact Assessment
NBDAAF	New Brunswick Department of Agriculture, Aquaculture and Fisheries
NBDELG	New Brunswick Department of Environment and Local Government
PID	Parcel Identifier
TSS	Total Suspended Solids
WTS	Wastewater Treatment System
SOCI	Species of Conservation Interest
EC	Environment Canada
NB DNR	New Brunswick Department of Natural Resources
SARA	Species at Risk Act
NB SAR	New Brunswick Species at Risk
COSEWIC	Committee on the Status of Endangered Wild in Canada
ACCDC	Atlantic Canada Conservation Data Centre
S-Rank	Subnational Rank
KCS	Kelly Cove Salmon Ltd.
WSSA	Water Supply Source Assessment
WAWA	Watercourse and Wetland Alteration
OBH	Oak Bay Hatchery
VEC	Valued Environmental Component
FCR	Feed Conversion Ratio
WMP	Waste Management Plan
ICP	Integrated Contingency Plan

1.0 THE PROPONENT

Cooke Aquaculture Inc. (Cooke) is a vertically-integrated aquaculture corporation based in Blacks Harbour, New Brunswick, Canada with salmon farming operations in Atlantic Canada, the United States, Chile and Scotland. The Cooke family's group of companies began with Cooke Aquaculture, which was established in 1985 as Kelly Cove Salmon by Gifford, Michael and Glenn Cooke. The company began with a single marine cage site containing 5,000 salmon and it wasn't until 4 years later, in 1989, that the family needed a consistent and independent supply of eggs and smolt that it purchased the Oak Bay Hatchery located in Oak Haven, Charlotte County, New Brunswick. Kelly Cove Salmon Ltd. (KCS) which is a Division of Cooke Aquaculture Inc. has been running the facility ever since.

1.2 Proponent and Consultant Information

Contact Information for the Proponent and consultant are as follows:

Proponent
Kelly Cove Salmon Ltd. a Division of
Cooke Aquaculture Inc.

Proponent Contact:
Mr. Mitchell Dickie
Project Manager for Freshwater Systems

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Project Consultant
Sweeney International Management Corp. (Simcorp)

Consultant Contact:
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Engineering Consultant
Sorensen Engineering Limited

Consultant Contact:
Marc Sorensen, BSc., P.Eng.
President

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Saint Andrews NB E5B 1N9

Phone: (506) 529-0093

Email: marc@soreng.ca

2.0 THE UNDERTAKING

2.1 Name of Undertaking

Oak Bay Hatchery (OBH) Wastewater Treatment System (WTS) Upgrade, Water Supply Source Assessment (WSSA) and Family Genomics Breeding Station and Gene Bank Library (Genomics Unit) Construction.

2.2 Project Overview

Initially the EIA was focused solely on the upgrade of the Oak Bay Hatchery's existing Wastewater Treatment System (WTS) which involved the installation of 2 new drum filters (RFM60120 PR Aqua drum filters) to improve effluent water quality. Subsequently, the EIA has been updated to encompass a Water Supply Source Assessment (WSSA) and the construction of a proposed Family Genomics Breeding Station and Gene Bank Library (Genomics Unit) adjacent to the hatchery.

Following the 2015 failure of the existing drum filter, a replacement RFM60120 PR Aqua drum filter from inventory was installed within the existing wastewater treatment building. It was a requirement of the existing COA that the effluent be filtered and this necessitated effective and immediate action to replace the failed unit. Prior to the replacement of the drum filter, notice was given to and acknowledged by NBDELG.

It was a requirement of the existing COA that the effluent be filtered and this necessitated effective and immediate action to replace the failed unit. The new replacement drum filter allows for the treatment of normal facility flows and provides additional capacity needed for surge flows that occur during the normal operation of the facility. It is calculated that this new drum filter will capture at least 35% of the Total Suspended Solids (TSS) through the drum filter. The installation of a second

RFM60120 PR Aqua drum filter will provide complete redundancy/backup for the RFM60120 drum filter already installed in the event of maintenance or failure of that unit.

2.3 Purpose/Need/Rationale for the Undertaking

2.3.1 Wastewater Treatment System Upgrade

The purpose of upgrading the wastewater treatment system was to improve effluent water quality. The installation of a drum filter with greater capacity allows for much improved filtering and provides the WTS being better able to handle normal flows, as well as, any surge flows. This allows for a much more efficient and consistent treatment of the effluent. The COA for the Oak Bay Hatchery requires that total nitrogen (TN) and total phosphorus (TP) at the edge of the mixing zone must be below the levels outlined in the most recent version of the Environmental Management Program for Land Based Finfish Aquaculture in New Brunswick. The performance based standards for TN and TP are 500 µg/L and 35 µg/L respectively and it is anticipated that these limits will not be exceeded once adequate sampling locations are determined through a proposed Mixing Zone Study. It is proposed that a second RFM60120 PR Aqua Drum filter is installed for redundancy and to allow for routine maintenance of the existing RFM60120 drum filter in the WTS at Oak Bay.

2.3.2 Water Supply Source Assessment

The water source supply at Oak Bay Hatchery has been used continuously and sustainably since before KCS acquired the hatchery in 1989. No significant increases in water withdrawals have occurred over this time and no future significant increases are anticipated. KCS considers that the water quality at the OBH to be excellent for salmon rearing which is one of the main reasons for planning to construct a Genomics Unit.

A WSSA was undertaken by the request of NBDELG to confirm the sustainability of the water supply, to confirm the water quality and to confirm that there are no potential impacts to existing water users. (Appendix A).

2.3.3 Genomics Unit

The Genomics Unit is intended to enable the Proponent to compete with other multinational companies that are achieving advantages due to genetic advancements of Salmon broodstock.

The Genomics Unit will feature the latest generation of water management systems and fish rearing technology and equipment, as well as modern innovative energy saving approaches to maintain optimal fish rearing temperatures.

Since this new infrastructure will not require any additional water withdrawal, feeding requirements, or effluent production, it was suggested by NBDELG that the Genomics Unit be added to the scope of the original EIA submission and the report is attached as submitted on September 31, 2017 in Appendix B.

2.4 Project Location

The Oak Bay Hatchery (OBH) is located at 93 Oak Haven Road, Oak Haven, Charlotte County, 6.5 km northeast of the town of St. Stephen, NB (Figure 1). The OBH is bordered by Oak Haven Road to the north and west, partially forested land and a gravel pit to the south, and Oak Bay to the east. Oak Bay is the northernmost section of Passamaquoddy Bay, into which the St. Croix River empties. Oak Bay's extent fluctuates with the Bay of Fundy tidal changes. Oak Bay has a unique pool and manmade estuary caused by the creation of a causeway on Route 170 which is located north of the Project site. The OBH site is owned and operated by Kelly Cove Salmon Ltd.
Project location details are provided in Table 1.

Table 1 Property Location Information

Site Name	Oak Bay Salmon Hatchery
Civic Address	93 Oak Haven Road
PID(s)	01265925, 01270503, 15155419,15202062, 15108632
Community	Oak Haven, NB
County	Charlotte County
1:50 000 Topographic Map #	21G Edition 3 UTM Zone 19
Grid Reference	45°12'49.30"N, 67°11'51.43"W 5008269.75 m N, 641525.99 m E (Zone 19T)

2.5 Siting Considerations

The OBH facility has been owned and operated by KCS since 1989. The siting considerations for the actual installation of the new drum filter and proposed redundant drum filter was chosen with regards to the location of the existing infrastructure and space requirements (i.e. the wastewater treatment building exists already so upgrading of the building is all that is necessary).

The location of the Genomics Building was chosen because of the existing brood-stock infrastructure and expertise of the personnel at this facility. Oak Bay Hatchery has been the location of KCS's Land based Atlantic Salmon Brood-stock Program for close to 20 years. Clear rationale for locating this new genomics building at this location. The existing assets and resources also help support reduced operating and construction costs of a stand-alone unit in a new location (see Sorensen Report, 2017 – Siting Considerations, Appendix B).

Figure 1 Project Location - Oak Bay Hatchery

Project No. SW20017-094	Date: Nov 21, 2017	Scale: NTS	Drawing by: DEH

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2.6 Physical Components and Dimensions of the Project

2.6.1 Existing Facility - Oak Bay Hatchery and Water Use

The Oak Bay Hatchery consists of a hatchery, enclosed tank field, WTS, and a brood-stock operation for gamete production and an incubation room for housing salmon eggs (Figure 2). The facility uses recirculation technology and the facility requires up to 100 m^3/hr of groundwater to operate. There is an unrestricted flow of spring water that gravity flows from the infiltration gallery which is less than 109 m^3/h. The facility houses 33 tanks of varying sizes for a total tank volume of 2,985.6 m^3 (Table 2, Figure 3). From each tank, water is passed through a swirl separator and then a drum filter before being recirculated into the system.

The pre-existing treatment system incorporated recirculation technology with the wastewater treated for the removal of solids using a PR Aqua drum filter, model RFM3236. The drum filter had 53 µm filter panels and a design flow capacity of 163 m^3/h when influent water was 25 mg/L.
The settling velocity of visible solids following drum filtration is 1.04x10-4 m/s. The system, as it exists now, utilizes a RFM60120 drum filter which has54 µm filter panels and a design flow capacity of 1020 m^3/h when influent water is 25 mg/L. This is sufficient to treat the existing normal flow, and provides additional capacity for surge flows. During normal flow, the influent TSS concentration would be reduced to 10.6 mg/L on average during the day and 6.9 mg/L overnight. The second RFM60120 drum filter is intended to be installed for complete redundancy and will not be required for additional flow capacity.

The Oak Bay Hatchery utilizes re-circulation technology requiring up to 100 m^3/h groundwater to operate. There is an unrestricted flow of spring water that gravity flows from the infiltration gallery to a reservoir which is less than 109 m^3/h, unused spring water bypasses the facility and is discharged. Water is supplied from a combination of wells and freshwater springs, and provides an average flow between 75-100 m^3/hr of groundwater and less than 109 m^3/hr of spring water. Water is then distributed throughout the facility via 8 water lines that each service separate tanks: lines A, B, C, D, E, F, G (G5, G6, G7, & G8), and Egg Room. Water from the freshwater springs are distributed to all lines. Well water from Wells 1 through 6 service lines A, B, C, D, E, G, and Egg Room. Well water from Wells 7 and 8 supply water directly to lines E and F.

Table 2 Operational Requirements and Design Capacities

Line	Number of Tanks	Individual Tank Volume	Total System Volume	Recirculation Flow	Drum Filter Make	Drum Filter Capacity	Max. Feed
A & B	12	20.0 m^3	240.0 m^3	385 m^3/hr	Hydrotech 1204	475 m^3/hr	420 kg/day
C	100	0.132 m^3	13.2 m^3	26 m^3/hr	Hydrotech 801	57.6 m^3/hr	12.5 kg/day
D	2 3	100.0 m^3 30 m^3	290.0 m^3	210 m^3/hr	Hydrotech 1604	634 m^3/hr	200 kg/day
E	4	141 m^3	564.0 m^3	456 m^3/hr	PR Aqua (60120)	1,022 m^3/hr	400 kg/day
F	4	189.0 m^3	756.0 m^3	456 m^3/hr	Atlantech (4872)	515 m^3/hr	400 kg/day
G5 & G6	2	141.0 m^3	282.0 m^3	240 m^3/hr	Atlantech (4848)	343 m^3/hr	300 kg/day
G7 & G8	2	189.0 m^3	379.0 m^3	240 m^3/hr	Atlantech (4848)	343 m^3/hr	300 kg/day
Egg Room	N/A	N/A	N/A	N/A	N/A	N/A	N/A

2.6.2 Wastewater Treatment System Upgrade

Figure 2 shows an aerial photo of the OBH and WTS while Figure 3 shows the detailed site plan drawing for the existing Oak Bay Hatchery. With respect to the installation of the second drum filter a wood frame and metal clad lean-to structure will be constructed adjacent the north wall of the existing WTS. The lean-to structure finish will match that of the existing structure (see Figure 4). Other site/survey diagrams showing adjacent land owners are provided in Appendix B.

2.6.2 Water Supply Source Assessment

WSSA reporting requirements are provided in Appendix A.

2.6.3 Genomics Building

An overview of the physical components/dimensions and associated diagrams of the proposed Genomics building are provided in Appendix B.

Figure 2 Aerial View-Oak Bay Hatchery			
Project No. SW20017-094	Date: Nove 21, 2017	Source: GeoNB	
		Drawing by: DEH, GEONB	

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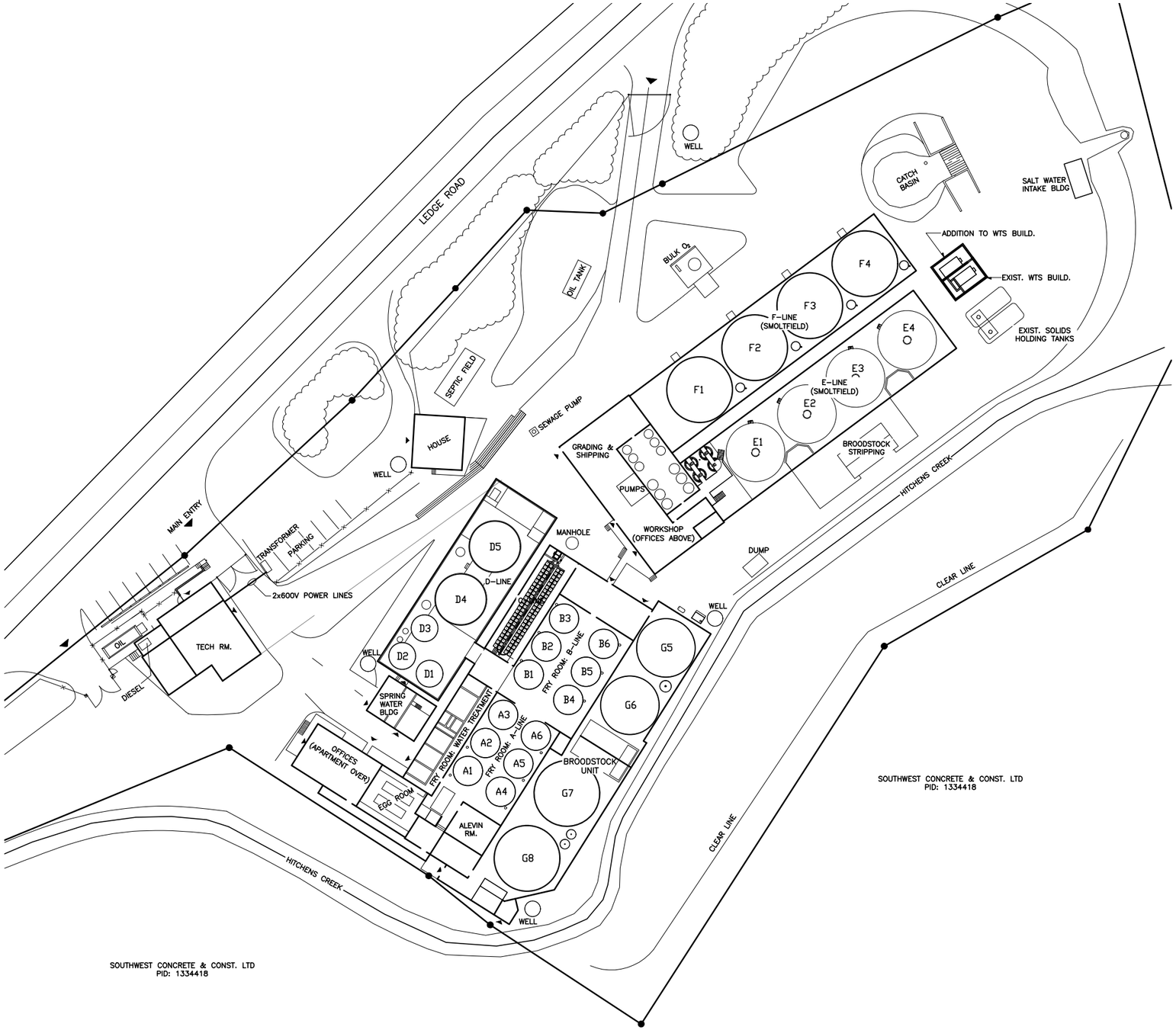


1 PLAN – OAK BAY HATCHERY

SCALE 1/64" TO 1'–0" 11"x17"
SCALE 1/32" TO 1'–0" 22"x34"

'PRELIMINARY'
'NOT FOR CONSTRUCTION'

PRINTED ON: 2017/11/22

Cooke AQUACULTURE Inc.

PROJECT
OAKBAY EIA

LOCATION
OAK BAY HATCHERY

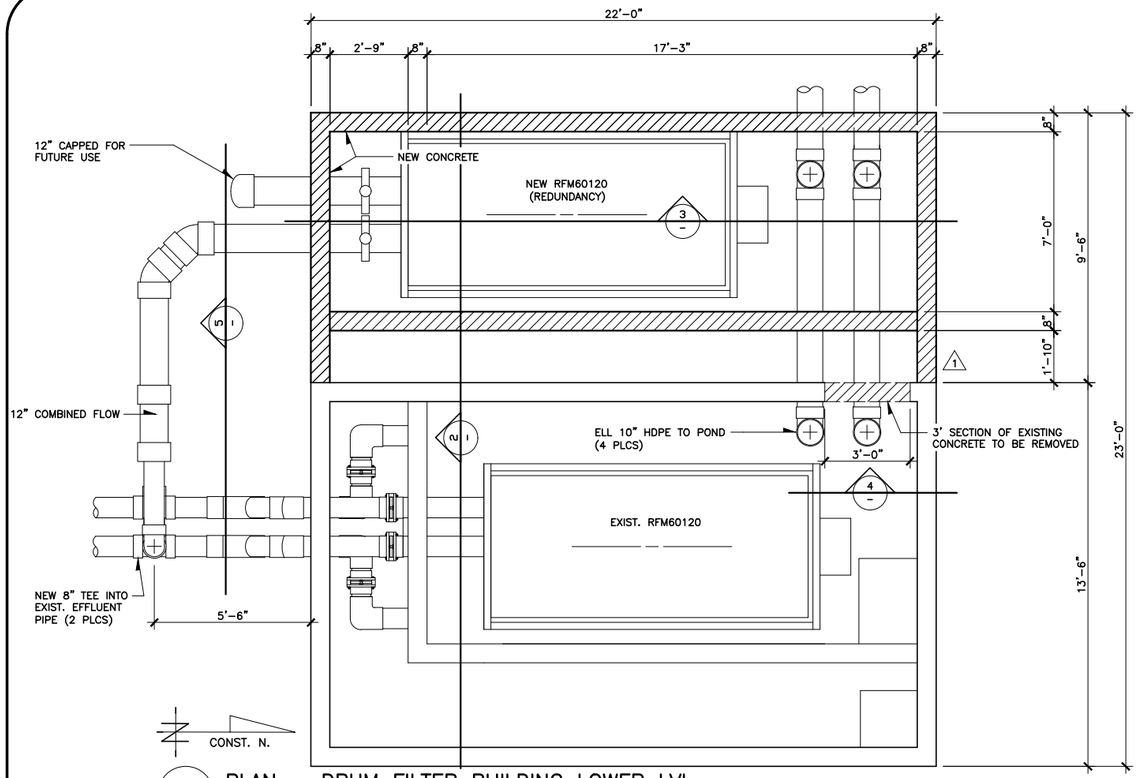
TITLE
SITE PLAN

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C16.05	16/08/02	–	L.T.H.	–

sorensen ENGINEERING LTD.
134 CARLETON, SAINT ANDREWS, NB E5B 1N9
PHONE (506) 529-0083 EMAIL INFO@SORENG.CA

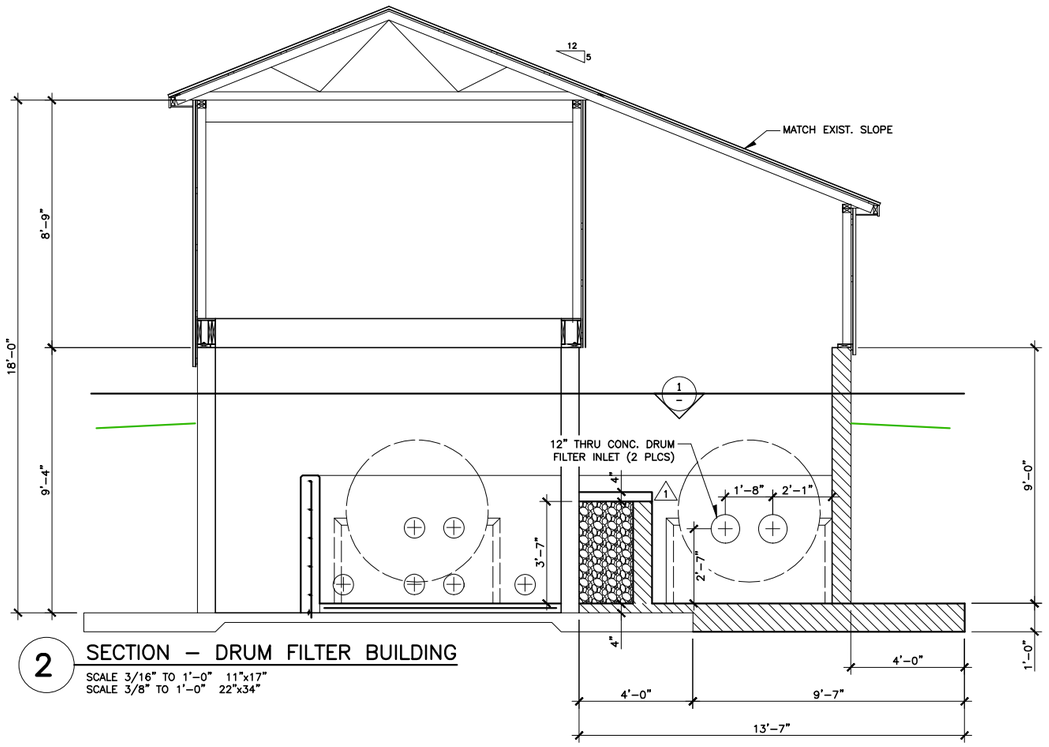
FIGURE 3
REV. 0

REV. 1



1 PLAN – DRUM FILTER BUILDING LOWER LVL

SCALE 3/16" TO 1'-0" 11"x17"
SCALE 3/8" TO 1'-0" 22"x34"



2 SECTION – DRUM FILTER BUILDING

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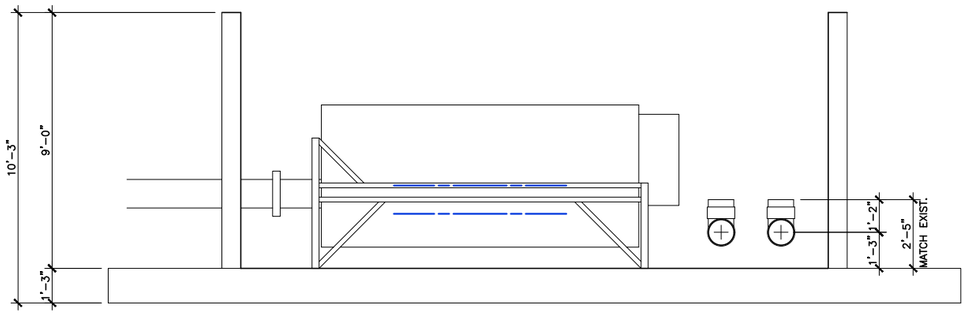
SCALE 3/8" TO 1'-0" 22"x34"



3 SECTION – DRUM FILTER BUILDING LOWER LVL

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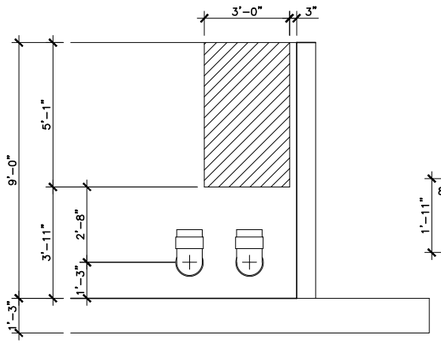
SCALE 3/8" TO 1'-0" 22"x34"



4 DETAIL – CONC. REMOVAL

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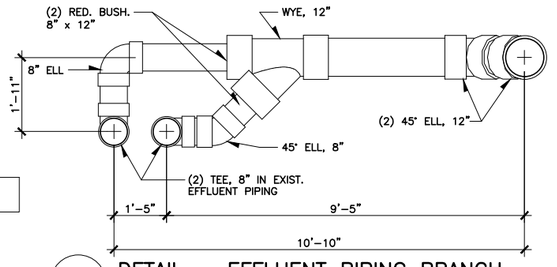

5 DETAIL – EFFLUENT PIPING BRANCH

SCALE 1/4" TO 1'-0" 11"x17"
SCALE 1/2" TO 1'-0" 22"x34"

1 ADDED WALL TO NEW DRUM FILTER TO IMPROVE HYDRODYNAMICS OF DRUM OUTLET 171006

'PRELIMINARY'
'NOT FOR CONSTRUCTION'

PRINTED ON: 2017/11/22

PROJECT: WATER TREATMENT SYSTEM UPGRADE
LOCATION: OAK BAY HATCHERY
TITLE: DRUM FILTER BUILDING MODIFICATION

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C16.05	16/08/25	17/10/06	L.T.H.	–

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134 CARLETON, SAINT ANDREWS, NB E5B 1N9
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SHEET 4
REV. 1

2.7 Construction Details

2.7.1 Wastewater Treatment System Upgrade

A wood frame and metal clad lean-to structure will be constructed adjacent the north wall of the existing WTS, facilitating the installation of a second drum filter in parallel to the existing one. The lean-to structure will match the existing building's attributes. The second drum filter is being installed to provide 100% redundancy for maintenance and mechanical failure. It is not required for flow capacity (Figure 4).

Construction activities will be limited but appropriate siltation and erosion control measures implemented if required. Construction will not take place until after the completion of the environmental assessment review and a Determination from the Minister is received.

2.7.2 Water Supply Source Assessment

The completed WSSA reporting requirements are presented in Appendix A. Since the WSSA did not require the drilling of new wells the activities were limited to those associated with the hydrogeological assessment (i.e., pumping tests).

2.7.3 Genomic Building

The new facility will be an insulated steel building with dimension of 34.2m x 24.4m. The proposed location is PID 15202062 which is adjacent to the hatchery (Appendix B). A WAWA permit was obtained from NBDELG to partially clear the land in order to assess the property's suitability for the proposed facility. A geotechnical engineer was consulted and determined that the mass of material to be removed from the site location will be less than that of the proposed building, therefore there are no geotechnical concerns.

Appendix B provides an overview of the building's siting considerations and describes the recoverability of excavated site material, temporary access to the property and the possibility of future permitting requirements.

Construction and excavating would be carried out in accordance to any conditions that may be required under the Watercourse and Wetland Alteration (WAWA) permit and procedures will be implemented to mitigate environmental impacts associated with; site preparation and civil works (i.e., clearing/grubbing, site grading, etc.); facilities construction; operations and maintenance; and accidents and malfunctions (i.e., spills, leaks or other unplanned events that could potentially occur during the project components). Construction activities will be short term and appropriate siltation and erosion control measures will be implemented as required. NBDELG will be consulted regarding any WAWA permitting requirements.

2.8 Operation and Maintenance

The Oak Bay Hatchery is operated in compliance with the *Water Quality Regulation – Clean Environment Act* as well as adheres to any municipal bylaws, other provincial acts and regulations, and federal acts and regulations. As required in the current Approval to Operate (I-9921, Appendix I) the facility also operates in accordance to the most recent version of *the Environmental Management Program for Land Based Finfish Aquaculture in New Brunswick* (2013) issued by the NBDELG.

Maintenance of the facility is routinely carried out and mechanical repairs are done as required. Drum filters screens are cleaned at least weekly and are replaced yearly. The intentions for installing a second RFM60120 drum filter will allow for maintenance of the current drum filter installed and in case a mechanical failure ensues.

2.9 Future Modifications, Extensions, or Abandonment

Future modifications, extensions or abandonment of the development are not anticipated at this time. Typically, it has been required in the terms and conditions of the Approval to Operate for the Oak Bay Hatchery: Kelly Cove Salmon Ltd. must apply in writing to the Director and receive approval for an amendment of the Approval before making any changes, including fish species, to the currently approved Facility.

2.10 Accidents and Malfunctions

Components within the scope of the EIA will be designed or implemented in accordance with applicable Acts, regulations, guidelines, codes and standards. Accidental events may occur whether they are related to activities described in the EIA or in the daily operations of the facility. Kelly Cove Salmon has an Integrated Contingency Plan (Appendix K) which includes an: Oil Spill Prevention Control and Countermeasures (SPCC) Plan; Hazardous Matter Spill Prevention Control and Cleanup Plan; and a Facility Emergency Response Plan. Accidents and malfunctions with respect to project components are assessed further in Section 5.

2.11 Project Related Reports

Project related reports are referenced throughout the EIA Report and are attached in the Appendices

Appendix A: Water Supply Source Assessment (Sorensen Engineering Ltd., 2017)
Appendix B: Project: C15.23 OBH Genomics Unit (Sorensen Eng. Ltd., 2017)
Appendix C: EIA Registration Document Oak Bay Salmon Hatchery (Strum Consulting, 2015)
Appendix D: Benthic Invertebrate and Fish Study Data (Strum Consulting, 2015)
Appendix E: Fish and Benthic Survey Summary from Strum Data (Sorensen Engineering, 2016)

Appendix F: Water Quality Environmental Baseline Study Report (Strum Consulting, 2015)
Appendix G: Mixing Zone Study Proposal (Sweeney International Management Corp, 2017)
Appendix H: Predictive Modelling (Archaeological Services New Brunswick, 2017)
Appendix I: Oak Bay Hatchery Approval to Operate I-9921 (NBDELG, 2017)
Appendix J: Waste Management Plan – Oak Bay Hatchery (Kelly Cove Salmon Ltd., 2016)
Appendix K: Integrated Contingency Plan (Kelly Cove Salmon Ltd., 2016)
Appendix L: Sorensen Engineering Response to TRC (Sorensen Eng. October 17, 2016)
Appendix M: Maxxam Labs Documentation (2017)

3.0 DESCRIPTION OF EXISTING ENVIRONMENT

3.1 Oceanographic Environment

3.1.1 Water Temperature

The Bay of Fundy has an average summer water temperature of 8°C to 12°C and winter temperatures of 0°C to 4°C (EC 1997).

3.1.2 Tides and Currents

The Bay of Fundy experiences semidiurnal tides with a tidal period of approximately 12 hours and 25 minutes. The confined nature of the St. Croix River results in exaggerated tidal extremes for the lower reaches of the watershed. The nearest tidal station to the Project site monitored by DFO is in the St. Croix River located 6.5 km west in St. Stephen, NB. Predicted hourly water data from DFO indicates high tides amounting to 7.9 m for St. Stephen in 2014 (DFO, 2014).

3.1.3 Navigation

The Bay of Fundy experiences extreme tidal ranges and the southern New Brunswick coastline can experience tides of 8 m. Harbour design and size are influenced by these tidal fluctuations. The Project site is off of the Passamaquoddy Bay which has 13 Small Craft Harbour (SCH) managed harbours along its mouth. Ten of these harbours are core fishing harbours, essential to the fishing industry, and three are non-core harbours (DFO, 2014). There are no SCH recreational harbours on the southern New Brunswick coast (DFO, 2014). The closest SCH to the Project site is Fairhaven, located approximately 31 km to the southeast.

Commercial fishing activity in Oak Bay is focused by the mouth of the Bay off Todd's Point. Due to the bathymetry of the bay and tidal influences, boat traffic closer to the Project site would be limited to recreational boaters.

3.2 Atmospheric Environment

3.2.1 Weather and Climate

Climate in the region is marked by warm, rainy summers and mild, snowy winters. The mean annual temperature is approximately 5°C. The mean summer temperature is 15°C and the mean winter temperature is -5°C. The mean annual precipitation ranges 1100-1400 mm (NBDNR, 2007).

Local temperature and precipitation data were obtained from the Pennfield meteorological station (45°06'00.00N, 66°44'00.00W) located approximately 38.7 km southeast of the Project site. For the period from 1981-2010, the mean annual temperature was 5.2°C, with a mean daily high of 10.4°C and a mean daily low of -0.1°C (EC 2015a). January and February were the coldest months (-7.1°C and -5.5°C, respectively), while the warmest months were July and August (15.6 °C and 15.6°C, respectively) (EC, 2015a).

From 1981-2010, mean annual snowfall was 192.0 cm and rainfall was 1,237.7 mm (EC, 2015a). Most snowfall is received in January and March (53.5 cm and 45.2 cm, respectively), while the rainiest months are May and November (130.2 mm and 132.2 mm, respectively) (EC, 2015a).

3.2.2 Air Quality

NBDELG monitors air quality at seven stations throughout the province. Measured parameters include ground-level ozone (O_3), particulate matter (PM2.5), and nitrogen dioxide (NO_2), and these values are used to calculate a score on the Air Quality Health Index (AQHI) (EC, 2015b). The AQHI is a scale from 1-10+, in which scores represent the following health risk categories: Low (1-3), Moderate (4-6), High (7-10), and Very High (10+). The closest AQHI monitoring stations are located in Saint John and Fredericton, approximately 89 km east and 93 km northeast of the site respectively. The AQHI at this site is usually low (1-3) at all times of the year (EC, 2015b). No industrial air emissions are found in proximity to the Project. Wood-burning fireplaces and campfires contributing particulate matter and PAHs, and vehicle emissions contributing VOCs, are the primary sources of air emissions in the immediate vicinity of the Project.

3.2.3 Ambient Sound Quality

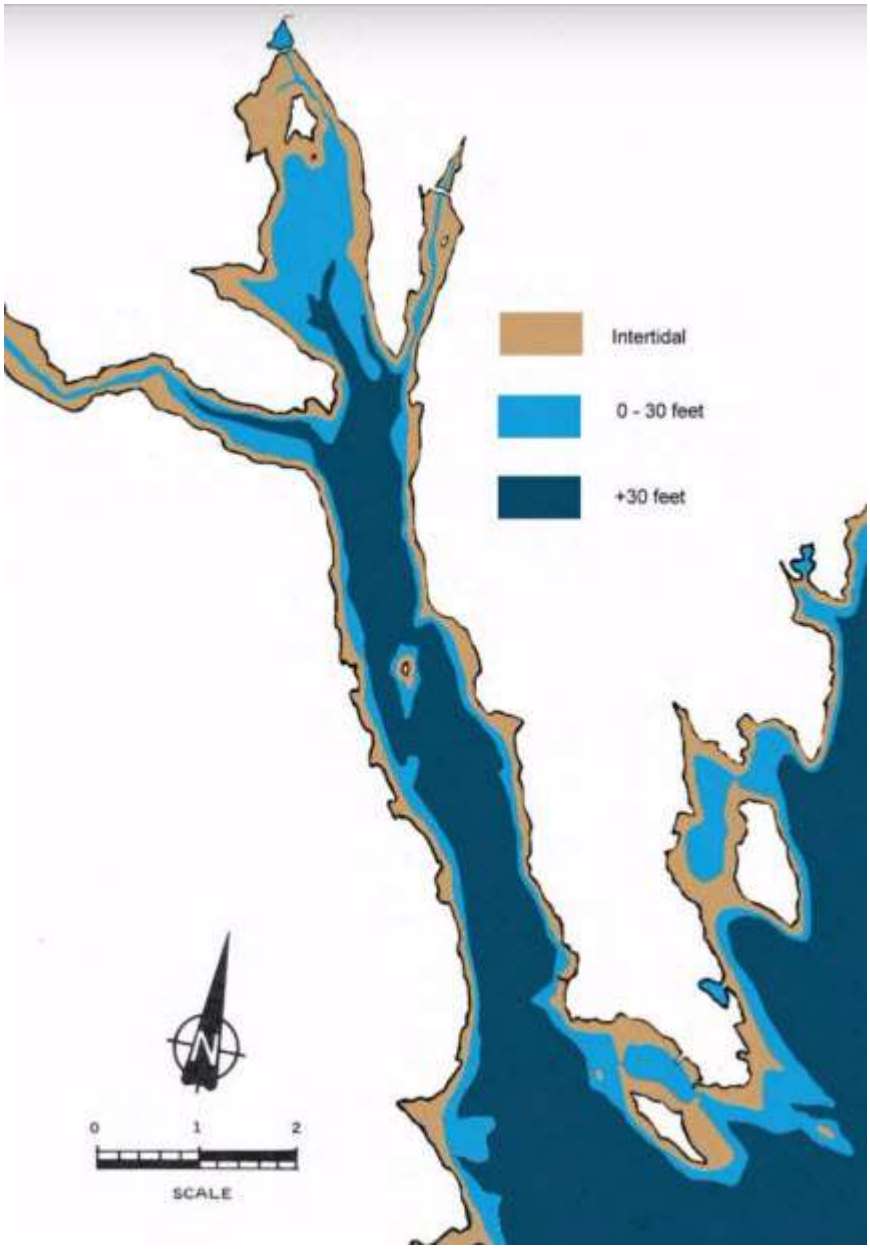
Any changes to ambient sound quality will be limited to construction activities which are anticipated to be short-term. The Project site is adjacent to operating gravel pits which experience a high amount of traffic when they are in peak use. Existing sound quality conditions in study area were not measured for this assessment.

3.3 Aquatic Environment

The existing aquatic environment, adjacent to the Oak Bay Salmon Hatchery in the Lower Oak Bay estuary, is characterized as a tidal flat (Figure 5), primarily composed of mud with some localized rocky areas, and strongly influenced by semidiurnal tides. The Lower Oak Bay estuary demonstrates

both estuarine and mud flat characteristics. Estuaries are typically associated with particle-rich environments due to terrestrially derived particulates from river flows (USEPA, 2001) whilst mud flats generally exhibit frequent resuspension of fine sediments due to receding and advancing tides (Butler *et al.*, 1996). The higher load of suspended matter within the Oak Bay estuary is corroborated by MacKay *et al.* (2003).

Figure 5 Lower Oak Bay Estuary (*Source – MacKay et al., 2003***)**



3.3.1 Water Quality

Coastal ecosystems offer a variety of ecosystem-based services which are economically, socially, and environmentally significant for recreational and commercial fisheries, fish nurseries, and human health to name a few. The transitional coastal zone intrinsically links terrestrial and freshwater ecosystems to marine ecosystems and as such, changes in one undoubtedly leads to changes in the other ("The Value of Coastal Ecosystems", 2017). However, coastal environments (e.g., estuaries) are extremely complex ecosystems due to their physical, chemical, and biological interactions, and as a result, nutrient enrichment impacts are difficult to differentiate between natural and anthropogenic influences (USEPA, 2001).

The causes of anthropogenic nutrient enrichment can also originate from a variety of point and nonpoint sources which include, but are not limited to, wastewater effluent, overflows of combined storm and sanitary sewers, runoff from agricultural and urban lands, and atmospheric deposition over a water surface (Smith *et al.*, 1999). The two (2) most widely used causal enrichment variables include Total Nitrogen (TN) and Total Phosphorus (TP) in which abundant inputs into an aquatic system may lead to a variety of insignificant to severe water quality issues (Thomas, 1983; Smith *et al.*, 1999; USEPA, 2001).

Over the past decade, a series of reports were published to address the state of the St. Croix River watershed and provides some insight into the historical land and water use within the watershed. According to the St. Croix Estuary Project Inc. (2013), the lower section of the St. Croix River watershed, including some near-shore marine areas, have been heavily impacted by industrial and municipal discharges over the last three (3) centuries. Even though point-source effluent discharges have been preliminarily addressed in the 1970s, significant changes and upgrades under regulatory requirements have only begun taking place in the early 2000's (Oblak, 2011). As a result, water quality levels remain "Of Concern" or "Elevated" throughout the lower St. Croix River Valley (Figure 6) according to MacKay *et al.* (2003).

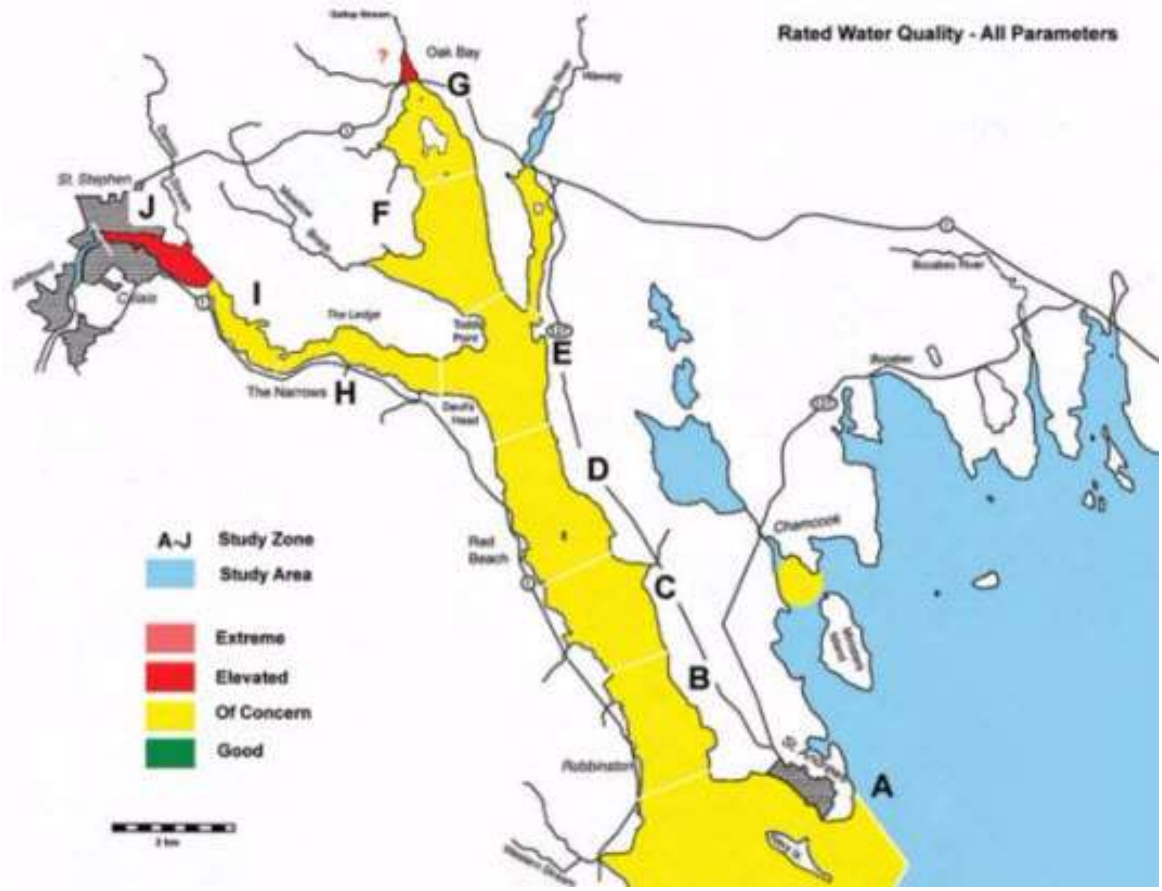
Since acquiring the Oak Bay Hatchery in 1989, KCS has continually conducted regulated water quality monitoring in the Oak Bay estuary, which has varied in some form or format over the years. The introduction of the 2013 *Environmental Management Program for Land Based Finfish Aquaculture in New Brunswick* included the current monitoring program, which regulates compliance based on TN and TP concentrations at the edge of a "mixing zone".

Sorensen Engineering Ltd., in their response to TRC questions (October 17, 2017 – Appendix L), identified several challenges associated with accurately measuring concentrations that were close to regulatory thresholds due to the variability associated with point sampling. Given this to be the case, a more thorough and scientifically defensible protocol was developed and followed (Appendix L).

Regulatory sampling of TN concentrations in 2016-2017 repeatedly measured below the regulatory limit of 500 µg/L at sampling location WQ1, which was identified as the interim "edge of mixing zone". The employed method for TP analysis of the receiving waters has an uncertainty greater than

50% of the regulatory threshold (35 µg/L) (Appendix M). With this being the case, it has not been possible to differentiate between TP concentrations at WQ1 or locations further afield that are not influenced by the Oak Bay Hatchery effluent. The Mixing Zone Study will include a survey of available techniques across Canadian accredited laboratories to determine if a lower uncertainty is available.

Figure 6 Lower Oak Bay Estuary Rated Water Quality (*Source-MacKay et al., 2003***)**



The proposed Mixing Zone Study (Appendix G), which was submitted to NBDELG on November 14, 2017, intends to use numerical models for comparative analysis with empirical TN and TP data from past and current sampling events. Since a mixing zone study has never been conducted to identify the regulatory mixing zone, the sampling locations used in the past were not empirically defined. Further, given the history of pollution observed and concentrations measured within the Oak Bay estuary (MacKay *et al*, 2003), there are external factors influencing the water quality; water quality issues cannot solely be attributed to the effluent originating from the Oak Bay Hatchery. The Mixing Zone Study will predict the concentrations that should be observed and will compare these to what

has been measured. This may also serve to confirm the presence of external influences and their affect on the water quality in the Oak Bay estuary.

3.3.2 Benthic Invertebrate and Fish Studies

Benthic invertebrate and fish studies were conducted by Strum Consulting in July 2015 (Appendix D) and the data was compiled and presented by Sorensen Engineering Ltd. in 2016 (Appendix E); however, the interpretation of the data was missing according to the NBDELG Technical Review Committee. As such, the following interpretations made by Simcorp are based on the data collected by Strum Consulting and compiled/presented by Sorensen Engineering Ltd.

Benthic Invertebrate Survey:

The methodology described within the Benthic Invertebrate Survey (Sorensen Engineering Ltd., 2016) indicates that a 10cm diameter corer was used for the collection of benthic invertebrates at three (3) locations along 30m transects parallel to shore 500m, 300m, 200m and 100m from the effluent outflow pipe. The area covered by the 10-cm diameter corer equates to an approximate surface area of 78.5 cm² per sampling station. As population density estimates are generally characterized as individuals/m², the data presented in Table 1 of the Strum Consulting Ltd. benthic invertebrate data (Appendix D) was standardized to reflect individuals / m² (Table 3). The standardized data was then summarized into an average (± SE) for each transect, as shown in Figure 7.

Table 3 Benthic Invertebrate Survey Results*

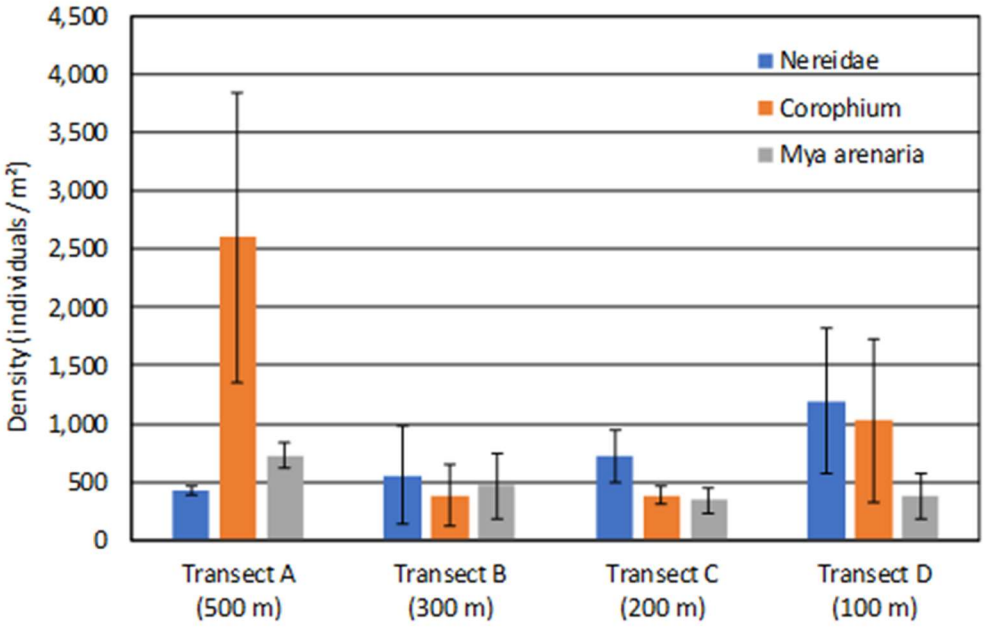
	Transect A (500 m)			**Transect B (300 m)**			**Transect C (200 m)**			**Transect D (100 m)**		
Invertebrate	**TA-1**	**TA-2**	**TA-3**	**TB-1**	**TB-2**	**TB-3**	**TC-1**	**TC-2**	**TC-3**	**TD-1**	**TD-2**	**TD-3**
Nereidae	512	384	384	128	1,408	128	384	1,152	640	512	640	2,432
Corophium sp.	3,584	128	4,096	0	256	896	512	256	384	384	2,432	256
Mya arenaria	768	896	512	128	256	1,024	512	384	128	512	640	0

*collected by Strum Consulting July 14-15, 2015, and standardized as individuals / m² by Sweeney International Marine Corp.

Based on the general descriptive statistics of Figure 7, it appears that population estimates of the three (3) species identified during the Benthic Invertebrate Survey were generally comparable between transects, regardless of distance from the effluent pipe except for *Corophium* sp. densities 500 m from the pipe. According to Butler *et al.* (1996), *Corophium volutator* is the most important inhabitant of mud flats as it is an important food source for a variety of resident and non-resident animals. *C. volutator* can also be sensitive to changes in sediments and therefore their presence may be an indicator of a stable mud flat ecosystem. *Nereidae* sp. can also be used as a potential indicator species as they are typically the last species to vacate a severely polluted area (MacKay *et al.*, 2003) which is not the trend observed in this study. Although population dynamics information

(e.g., spat, juvenile, harvest size) was not available from the Benthic Invertebrate Survey report for the soft-shell clam (*Mya arenaria*), species density estimates were relatively high. Additionally, conditional re-openings of the clam fishery in the Oak Bay area have also occurred in recent years, indicative of a significant reduction in bacterial pollution (FB Environmental, 2008).

Figure 7 Density (individuals / m²) of Benthic Invertebrate Survey*



*collected by Strum Consulting July 14-15, 2015, and standardized as individuals / m² by Sweeney International Marine Corp.)

Fish Survey:

The methodology described in the Fish Survey performed by Strum Consulting Ltd. in 2015 and presented by Sorensen Engineering Ltd. in 2016 (Appendix E) indicates that the survey was completed during the high tide on July 16, 2015 with a few different techniques (e.g., seine net, fyke net, and minnow trap). However, the information that can be interpreted from the presented data is minimal due to incomprehensive methodology and lack of repeatability to account for natural variability.

Nonetheless, the data collected by Strum Consulting Ltd. (Appendix D) during the Fish Survey identified the presence of three (3) species. The Green crab (*Carcinus maenas*) is a known invasive species and is resilient to changing environments and thus not a significant contributor to environmental health for this study. Teo and Able (2003) classified the mummichog (*Fundulus heteroclitus*) as a key ecological component as it is known to utilize marshes and surrounding habitats (e.g., estuaries) for foraging, spawning, and possibly refuge. The mummichog also primarily

feeds on annelids and crustaceans during the daytime high tides (Kneib, 1986) and may explain the high density of specimens caught in the minnow traps and beach seines. On the other hand, the Atlantic silverside (*Menidia menidia*) also feeds on annelids and crustaceans yet is known to feed mostly during the ebb tide (Gilmurray and Daborn, 1981) and may explain the low densities captured in the nets by Strum Consulting.

Conclusions:
Although MacKay *et al.* (2003) infers that overall fauna and flora population densities have significantly declined in the Lower Estuary, this is likely due to heavy industrial pollution being released into the estuary beginning in the 1960s and its effects still lingering to this day. Although far from extensive, the Benthic Invertebrate and Fish surveys conducted by Strum Consulting Ltd. does demonstrate that the tidal mud flats of the Lower Oak Bay estuary appear to be relatively stable.

3.4 Significance of Proposed Area with Species at Risk Act (SARA)

There are a number of species found in New Brunswick and the Atlantic Ocean that are listed by COSEWIC, the Government of Canada *Species at Risk Act* and the New Brunswick *Endangered Species Act* as either endangered, threatened, or of special concern. The species listed, and the information provided in Tables 4 to 7 are from the Species at Risk Public Registry (Government of Canada, 2017) and the associated COSEWIC reports, unless otherwise stated. The following tables list species that may occur within 5 km of the study area and their status. Specific mitigation measures will be discussed in Section 5.

Table 4 Endangered species in New Brunswick, the Bay of Fundy, and the Atlantic Ocean

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Endangered Species		
blue whale	*Balaenoptera musculus*	-Last COSEWIC designation (May 2012): endangered -Blue whales range widely, inhabiting both coastal waters and the open ocean. Individuals belonging to the Atlantic population are frequently observed in estuaries and shallow coastal zones (e.g. St. Lawrence estuary) where the mixing of waters ensures high productivity of krill -Protected under the federal *Species at Risk Act* (Schedule 1) -Protected under the Marine Mammals Regulations, which fall under the *Fisheries Act* -Not likely to occur in the project area
boreal felt lichen	*Erioderma pedicellatum*	-Last COSEWIC designation (Nov 14): Endangered -SARA Schedule 1 -The species has not been found in New Brunswick since 1902

Eskimo curlew	*Numenius borealis*	-Last COSEWIC designation (Nov 2009): endangered -Occasionally staged in the Maritimes -Diet included coastal, shrimp-like invertebrates -May be extinct
leatherback sea turtle, Atlantic population	*Dermochelys coriacea*	-Last COSEWIC designation (May 2012): endangered -Sited in Atlantic Canada between June and October, generally offshore, where they forage on seasonally abundant gelatinous zooplankton -Protected under the federal *Species at Risk Act* (Schedule 1) -Not likely to occur in the project area
little brown myotis	*Myotis lucifugus*	-Last COSEWIC designation (Nov 2013): endangered -Populations of this bat have been decimated by White-nose Syndrome (WNS), a fungal disease -WNS has caused a 94% overall decline in known numbers of hibernating, myotis bats in Nova Scotia, New Brunswick, Ontario, and Quebec
north Atlantic right whale	*Eubalaena glacialis*	-Last COSEWIC designation (Nov 2013): endangered -The right whale is a migratory species that frequents coastal waters. Summers are spent feeding in the cool, temperate waters in the northern portions of its range, which includes the Bay of Fundy -Critical habitats have been identified (section 5.1.1) in Roseway Basin and Grand Manan Basin -Protected under the federal *Species at Risk Act* (Schedule 1) -Not likely to occur in the project area
northern myotis	*Myotis septentrionalis*	-Last COSEWIC designation (Nov 2013): endangered -Populations of this bat have been decimated by WNS -WNS has caused a 94% overall decline in known numbers of hibernating, myotis bats in Nova Scotia, New Brunswick, Ontario, and Quebec

piping plover	*Charadrius melodus*	-Last COSEWIC designation (Nov 2013): endangered -Nests above high-water mark on exposed gravel or sandy beaches -Protected under the federal *Species at Risk Act* (Schedule 1) -Protected by the federal *Migratory Birds Convention Act*. Under this Act, it is prohibited to kill, harm, or collect adults, young, or eggs -Not known to occur in the project area
red knot *rufa* subspecies	*Calidris canutus rufa*	-Last COSEWIC designation (2007): endangered -Migratory stopovers and wintering grounds are vast coastal zones swept by tides twice a day, usually sandflats but sometimes mudflats. In these areas, the birds feed on molluscs, crustaceans, and other invertebrates -Protected by the federal *Species at Risk Act* (Schedule 1) -Not known to use Oak Bay as a stopover point (closest known area for stopovers is Grand Manan)
roseate tern	*Sterna dougallii*	-Last COSEWIC designation (Apr 2009): endangered -SARA schedule 1 -The closest historic nesting colony to the project site is Machias Seal Island, approximately 79 km from the hatchery location at Oak Bay
tri-colour bat	*Perimyotis subflavus*	-Last COSEWIC designation (Nov 2013): endangered -This bat is found in a variety of habitats, but is rarer than the two myotis bats. -Like the myotis bats, populations of this bat species have been decimated by WNS -Declines of more than 75% have occurred in the known hibernating populations in Quebec and New Brunswick due to WNS

white shark – Atlantic population	*Carcharodon carcharias*	-Last COSEWIC designation (Apr 2006): endangered -Occurs in both inshore and offshore waters; ranges in depth from just below the surface to just above the bottom, down to a depth of at least 1,280 m -An observation of an attack on a seal was made at Dochet Island (St. Croix Island) in 1952, but unlikely to occur within 5 km of the project area

Table 5 Threatened species in New Brunswick, the Bay of Fundy, and the Atlantic Ocean

Threatened Species		
Bicknell's thrush	*Catharus bicknelli*	-Last COSEWIC designation (Nov 2009): threatened -Maritimes Breeding Bird Atlas has records a possible occurrence of breeding in the Passamaquoddy Bay area in their first atlas (Maritimes Breeding Birds Atlas)
Canada warbler	*Wilsonia canadensis*	-Last COSEWIC designation (Apr 2008): threatened -Protected under the *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act, 1994*. This act prohibits the harming of birds and the disturbance or destruction of their nests or eggs -The Maritimes Breeding Bird Atlas has a confirmed observation in the Oak Bay area for this species in the 2nd atlas (Maritimes Breeding Bird Atlas)
chimney swift	*Chaetura pelagica*	-Last COSEWIC designation (Apr 2007): threatened -Breeds in New Brunswick -Roosts in chimneys, crevices, caves, and hollow trees -Protected under the federal *Migratory Birds Convention Act, 1994*. This law makes it an offence to disturb, kill, or collect adults, juveniles, or eggs. -Protected by the federal *Species at Risk Act* (Schedule 1) -The Maritimes Breeding Bird Atlas has a confirmed observation in the Oak Bay area for this species in their 1st atlas (Maritimes Breeding Bird Atlas)

common nighthawk	*Chordeiles minor*	-Last COSEWIC designation (Apr 2007): threatened -Nests in a wide range of open, vegetation-free habitats, including dunes, beaches, and marshes; also inhabits mixed and coniferous forests -The species, including its nests and eggs, is protected under the federal *Migratory Birds Convention Act, 1994* -Protected under the federal *Species at Risk Act* (Schedule 1) -The Maritimes Breeding Bird Atlas has a confirmed observation in the Oak Bay area for this species in both atlases (Maritimes Breeding Bird Atlas)
eastern whip-poor-will	*Caprimulgus vociferus*	-Last COSEWIC designation (Apr 2009): threatened -Prefers to nest in semi-open forests or patchy forests with clearings, such as barrens or forests that are regenerating following major disturbances -Protected under the federal *Species at Risk Act* (Schedule 1) -Protected under the federal *Migratory Birds Convention Act, 1994* -The Maritimes Breeding Bird Atlas in their 1st atlas has a probable observation of this species in the lower end of the St. Croix River but not in the Oak Bay area (Maritimes Breeding Bird Atlas)
harbour porpoise	*Phocoena phocoena*	-Last COSEWIC designation (Apr 2006): special concern -Found primarily over continental shelves and occasionally in deeper waters -Frequents bays and harbours, particularly during the summer -Protected from certain activities under the Marine Mammal Regulations of the *Fisheries Act*

least bittern	*Ixobrychus exilis*	-Last COSEWIC designation (Apr 2009): threatened -Breeds strictly in marshes dominated by emergent vegetation surrounded by areas of open water -Protected under the federal *Species at Risk Act* (Schedule 1) -Protected under the *Migratory Birds Convention Act, 1994*, which prohibits harming birds, their nests, or eggs -Although COSEWIC identifies coastal Southwest New Brunswick as breeding range for the species, the Maritimes Breeding Bird Atlas has no observation for the Oak Bay area (Maritimes Breeding Bird Atlas)
olive-sided flycatcher	*Contopus cooperi*	-Last COSEWIC designation (Nov 2007): threatened -Most often associated with open areas containing tall, live trees or snags for perching -Protected under the federal *Species at Risk Act* (Schedule 1) -Protected under the *Migratory Birds Convention Act, 1994*, which prohibits harming birds, their nests, or eggs -The Maritimes Breeding Bird Atlas has confirmed and possible records for this species in the Oak Bay area in the 1st and 2nd atlases, respectively (Maritimes Breeding Bird Atlas)

Table 6 Species of special concern in New Brunswick, the Bay of Fundy, and the Atlantic Ocean

Species of Special Concern		
Barrow's goldeneye	*Bucephala islandica*	-Last COSEWIC designation (May 2011): special concern -Protected under the federal Species at Risk Act (Schedule 1) -Protected by the federal *Migratory Birds Convention Act*. Under this Act, it is prohibited to kill, harm, or collect adults, young, or eggs -The Canadian Wildlife Service has no record of sightings in Oak Bay during the winter surveys of 1991 to 2010 (see Table 8).
blue felt lichen	*Degelia plumbea*	-Last COSEWIC designation (Nov 2010): Special concern -SARA Schedule 1 -No known occurrences in the project area
brook floater	*Alasmidonta varicosa*	-Last COSEWIC designation (Apr 2009): special concern -SARA Schedule 1 Populations of brook floaters have been recorded on the St. Croix River, approximately 40 km upriver from Oak Bay
fin whale	*Balaenoptera physalus*	-Last COSEWIC designation (May 2005): special concern -Protected under the federal *Species at Risk Act* (Schedule 1) -Not likely to occur in the project area
harlequin duck	*Histrionicus histrionicus*	-Last COSEWIC designation (Nov 2013): special concern -Protected under the federal *Species at Risk Act* (Schedule 1) -Protected by the federal *Migratory Birds Convention Act*. Under this Act, it is prohibited to kill, harm, or collect adults, young, or eggs -Protected under the New Brunswick *Species at Risk Act* -The entire Bay of Fundy coast is listed as overwintering habitat, but the Canadian Wildlife Service has no record of sightings in Oak Bay during the winter surveys of 1991 to 2010 (see Table 8).

humpback whale – western North Atlantic population	*Megaptera novaeangliae*	-Last COSEWIC designation (May 2003): not at risk -Protected under the New Brunswick *Species at Risk Act*, which considers it endangered -Not likely to occur in the project area
monarch butterfly	*Danaus plexippus*	-Last COSEWIC designation (Nov 2016): endangered -Protected under the federal *Species at Risk Act* (Schedule 1) -Known, summer, breeding range includes portions of coastal Charlotte County
redbreast sunfish	*Lepomis auritus*	-Last COSEWIC designation (Apr 2008): data deficient -There are reports of the species from Modsley Lake in the St. Croix River system, but the collections have not been verified and thus are considered questionable. However, it has been confirmed in the American portion of the St. Croix drainage -Unlikely to occur in the project area
red-shouldered hawk	*Buteo lineatus*	-Last COSEWIC designation (Apr 2006): not at risk -Prefers deciduous or mixed-wood forests containing shade-tolerant hardwood trees close to wetland areas. Woodlots of 10 to 100 ha can sustain viable populations -The Maritimes Breeding Bird Atlas has a record for a probable occurrence for this species near the Oak Bay area in the 1st atlas (Maritimes Breeding Bird Atlas)
rusty blackbird	*Euphagus carolinus*	-Last COSEWIC designation (Apr 2017): special concern -A very small number of rusty blackbirds winter, albeit sporadically, in the southern part of most Canadian provinces -Protected under the federal *Species at Risk Act* (Schedule 1) -The Maritimes Breeding Bird Atlas has a probable observation for this species in in the Oak Bay area in the 1st atlas (Maritimes Breeding Bird Atlas)

short-eared owl	*Asio flammeus*	-Last COSEWIC designation (Apr 2008): special concern -Protected under the federal *Species at Risk Act* (Schedule 1) -All of New Brunswick is considered breeding range for this owl -The Maritimes Breeding Bird Atlas has a possible observation for this species near the Oak Bay area in their 1st atlas (Maritimes Breeding Bird Atlas)
snapping turtle	*Chelydra serpentina*	-Last COSEWIC designation (Nov 2008): special concern -Preferred habitat of the species is characterized by slow-moving water with a soft mud bottom and dense aquatic vegetation -Females generally nest on sand or gravel banks along waterways -Known to occur in the Oak Bay area
Yellow rail		-Last COSEWIC designation (2009): special concern -Protected under the federal *Species at Risk Act* (Schedule 1) -The Canadian breeding range includes all of New Brunswick -The Maritimes Breeding Bird Atlas has no observation for this species near the Oak Bay area (Maritimes Breeding Bird Atlas)

Table 7 Species with other designations but no SARA status in New Brunswick, the Bay of Fundy, and the Atlantic Ocean

Species with no SARA status		
American eel	*Anguilla rostrata*	-Last COSEWIC designation (May 2012): threatened -Canadian range includes all fresh water, estuaries and coastal marine waters that are accessible to the Atlantic Ocean -Blockage of migratory streams is a major threat to the species
Atlantic salmon – outer Bay of Fundy population	*Salmo salar*	-Last COSEWIC designation (Nov 2010): endangered -Found in Magaguadavic, Digdeguash, New, and Pocologan Rivers and Dennis Stream (Gowan 2012). Dennis Stream is 5.3 km from the Oak Bay hatchery by land and approximately 16 km away by water. -Protected by the New Brunswick *Species at Risk Act*
Atlantic sturgeon – Maritime population	*Acipenser oxyrichus*	-Last COSEWIC designation (May 2011): threatened -An anadromous species that resides and matures in saltwater but spawns and feeds as juvenile fish in freshwater -In Canada, the species is known to spawn in only two areas (Saint John River and middle St. Lawrence River)
bald Eagle	*Haliaeetus leucocephalus*	-Last COSEWIC designation (1984): not at risk -Common in the southwestern region of New Brunswick near open water -Protected under the New Brunswick *Species at Risk Act* -The Maritimes Breeding Bird Atlas shows confirmed evidence of breeding in the Oak Bay area in their first atlas but not the second atlas (Maritimes Breeding Bird Atlas) -Between 1991 and 2010, there have been 8 sightings of bald eagles during the CWS winter bird surveys (see Table 8).

bank swallow	*Riparia riparia*	-Last COSEWIC designation (May 2013): threatened -The Maritimes Breeding Bird Atlas has confirmed evidence of breeding in the Oak Bay area in their first atlas only (Maritimes Breeding Birds Atlas)
barn swallow	*Hirundo rustica*	-Last COSEWIC designation (May 2011): threatened -The Maritimes Breeding Bird Atlas has confirmed evidence of breeding in the Oak Bay area in both of their atlases (Maritimes Breeding Birds Atlas)
black-foam lichen	*Anzia colpodes*	-Last COSEWIC designation (May 2015): threatened -Requires mature, deciduous-tree habitats with high humidity and high light levels -There are no known occurrences in the project area
bobolink	*Dolichonyx oryzivorus*	-Last COSEWIC designation (Apr 2010): threatened -Has nested in forage crops and also occurs in various grassland habitats including wet prairie, graminoid peatlands and abandoned fields dominated by tall grasses -The Maritimes Breeding Bird Atlas has probable evidence of breeding in the area of Oak Bay in both atlases (Maritimes Breeding Bird Atlas)
eastern wood pe-wee	*Contopus virens*	-Last COSEWIC designation (Nov 2012): special concern -The Maritimes Breeding Bird Atlas reports probable and possible evidence of breeding in the Oak Bay area in both atlases (Maritimes Breeding Bird Atlas)
evening grosbeak	*Coccothraustes vespertinus*	-Last COSEWIC designation (Nov 2016): special concern -The Maritimes Breeding Bird Atlas reports a possible occurrence of breeding in the Oak Bay area in their 1st atlas (Maritimes Breeding Bird Atlas)

killer whale – northwest Atlantic population	*Orcinus orca*	-Last COSEWIC designation (Nov 2008): special concern -Inhabits a wide range of nearshore and pelagic habitats -Considered rare in the Bay of Fundy -Not likely to occur in the project area
loggerhead sea turtle	*Caretta caretta*	-Last COSEWIC designation (Apr 2010): endangered -Loggerhead sea turtles in the region are generally associated with the warmer offshore waters of the Gulf Stream; there are few inshore records of loggerheads -Not likely to occur in the project area
peregrine falcon	*Falco peregrinus anatum*	-Last COSEWIC designation (Apr 2007): non-active -Sea coasts are used as hunting grounds (as well as marshes, meadows, etc.) -Protected under the New Brunswick *Species at Risk Act* (*anatum/tundrius* subspecies), which considers it endangered -The Maritimes Breeding Bird Atlas has no observation for this species in the Oak Bay area (Maritimes Breeding Bird Atlas)
porbeagle shark	*Lamna nasus*	-Last COSEWIC designation (May 2014): endangered -Can be found from the coast to the open sea, but does not enter fresh water -The porbeagle shark is protected by the *Oceans Act* and by the *Fisheries Act* under the terms of the *Atlantic Fishery Regulations, 1985* -Not likely to occur in the project area

red-necked phalarope	*Phalaropus lobatus*	-Last COSEWIC designation (Nov 2014): special concern -Occurs in every territory and province as either breeders or migrants; is considered a migrant through the Bay of Fundy -During migration, the species is primarily pelagic, but may also stop over on inland wetlands or other non-riverine water bodies. Observations of stopover sites include estuaries, salt marshes, bays, inlets, pools, ponds, lakes, etc. In the lower Bay of Fundy, red-necked phalaropes are concentrated along areas of tidally induced upwelling where zooplankton is concentrated
shortfin mako – Atlantic population	*Isurus oxyrinchus*	-Last COSEWIC designation (Apr 2017): special concern -In the northwest Atlantic they have been found both inshore and offshore but typically associated with the warm water of the Gulf Stream -Not likely to occur in the project area
spiny dogfish	*Squalus acanthias*	-Last COSEWIC designation (Apr 2010): special concern -This small shark is widely distributed in temperate regions of the world's oceans and appears to be a habitat generalist -Found in intertidal waters to the shelf slope and is most common in coastal waters 10 to 100 m deep -Can tolerate a wide range of salinities including estuarine waters
Transverse lady beetle	*Coccinella transversoguttata*	-Last COSEWIC designation (Nov 2016): special concern -Historic range covered California to Virginia, to Labrador to Alaska; now most common in the Rocky Mountains (Iowa State University 2017) -Numbers of this species are declining throughout its range, perhaps due to competition from introduced species (Iowa State University 2017)

wood thrush	*Hylocichla mustelina*	-Last COSEWIC designation (Nov 2012): threatened -The Maritimes Breeding Bird Atlas shows possible evidence of breeding in the Oak Bay area in the 1st atlas (Maritimes Breeding Bird Atlas)
yellow-banded bumble bee	*Bombus terricola*	-Last COSEWIC designation (May 2015): special concern -A habitat generalist -Nests underground -Has a large range in Canada, spanning numerous ecozones and habitat types

Table 8 Canada Wildlife Service Recorded Bird Sightings

Canadian Wildlife Service - Block 14

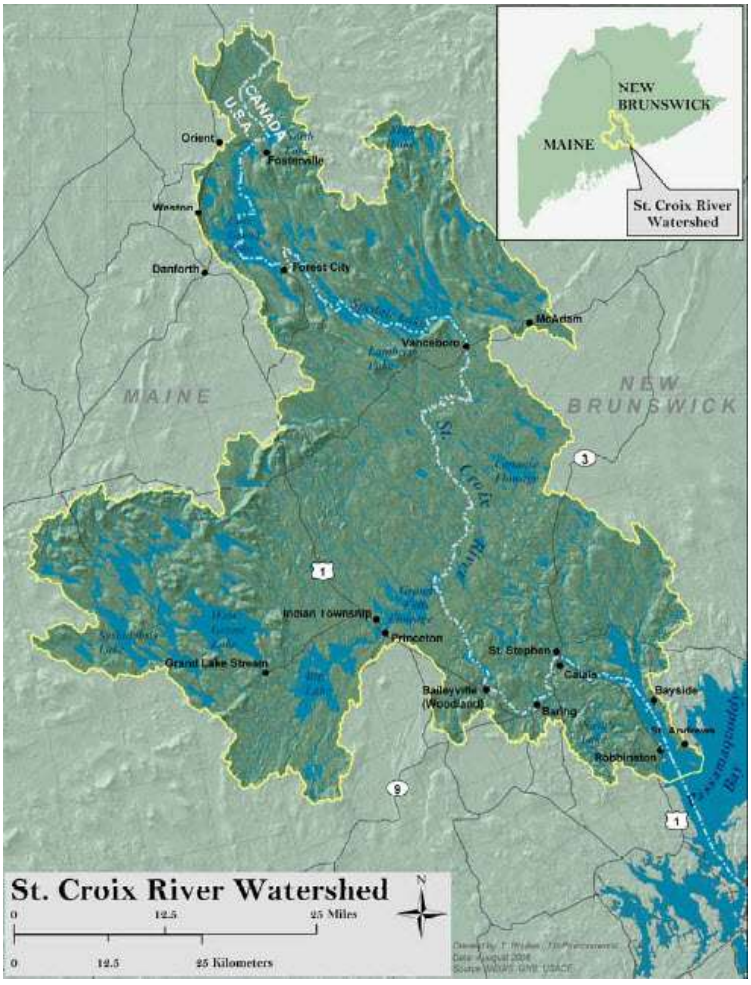
Number of Sightings per Survey Season

Species	1991	1994	1996	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008	2010	Total
Adult Eagle						2	1	1	1	1					**6**
American Black Duck			986			1383	621	120	10	96	142	142		167	**3667**
American Green-winged Teal							5								**5**
American Wigeon															**0**
Atlantic Brant															**0**
Barrow's Goldeneye															**0**
Black Guillemot										1					**1**
Black Scoter						38	16	4			120				**178**
Blue-winged Teal															**0**
Bufflehead			65			14	56	35	18		1	11		51	**251**
Canada Goose							7								**7**
Common Eider	12	20	842	42	63	1112	1993	588	883	760	830	1827	50	243	**9265**
Common Goldeneye								358	778	288	58	16		62	**1560**
Common Loon									27	53	15	12		5	**112**
Common Merganser						40	5	7		28	20	3			**103**
Gadwall															**0**
Greater Scaup															**0**
Harlequin Duck															**0**
Hooded Merganser															**0**
Immature Eagle								1		1					**2**
King Eider															**0**
Lesser Scaup															**0**
Long-tailed Duck			13			86	431	87	67	323	77	320		24	**1428**
Mallard						9									**9**
Northern Pintail															**0**
Northern Shoveler															**0**
Red-breasted Merganser							2	9							**11**
Ring-necked Duck															**0**
Seal										4				8	**12**
Snow Goose															**0**
Surf Scoter			6			5	38	8	9	6				8	**80**
Unidentified Cormorant							2	1	1	3		2			**9**
Unidentified Diving Duck															**0**
Unidentified Duck			2												**2**
Unidentified Goldeneye			187			629	1595	426							**2837**
Unidentified Grebe						4	3		4	1					**12**
Unidentified Loon			1			5	33	8							**47**
Unidentified Merganser			14			85	294	215	273	808	616	375		76	**2756**
Unidentified Scaup						119	140		527	147		2		40	**975**
Unidentified Scoter			30						52	31	3			4	**120**
Unidentified Teal															**0**
White-winged Scoter						10				25					**35**
Wood Duck															**0**

3.5 Terrestrial Environment

The Oak Bay Salmon Hatchery is in the south-eastern portion of the St. Croix River Watershed which shares its natural landscapes between the province of New Brunswick and the state of Maine (Figure 8). The St. Croix River Watershed is predominantly characterized as forest cover (77%) in which the lower section, within the vicinity of the hatchery, consists of agricultural lands (1%), roads and runways (1%), developed land (1%), and bare lands (< 1%) (FB Environmental, 2008).

Figure 8 St. Croix River Watershed (*Source-FB Environmental, 2008*)



3.5.1 Wetlands

A review of the GeoNB Database indicates that there are no Provincially Significant Wetlands (PSW) or regulated wetlands on the Project site. GeoNB identified two PSW within 1 km of the Project site (Figure 9). Both are salt marshes, with one located 0.5 km northeast and the other 0.6 km southeast of the Project site. The closest regulated wetland is a 3.84 ha bog located 2.5 km southwest of the Project site (http://geonb.snb.ca/wetlands/).

3.5.2 Environmentally Significant Areas

The Nature Trust of New Brunswick was established in 1987 and is responsible for the conservation of over 2600 ha of throughout the province. There are no nature preserves, as identified by the Nature Trust of New Brunswick, within 500 m of the Project site. (http://www.naturetrust.nb.ca/wp/)

Important Bird Areas (IBAs) are discrete sites that support specific groups of birds: threatened birds, large groups of birds, and birds restricted by range or by habitat (https://www.ibacanada.org). The nearest IBA is called the Quoddy region IBA (NB037) and is located over 33 km to the Southeast of the Project Site (Figure 10).

The ACCDC database identified five environmentally significant areas within 5 km of the Project site (ACCDC 2015) (Table 9). These sites are significant for their geological value and their provision of fish, bird and plant habitat.

Table 9 Environmentally Significant Areas within 5 km of the Project Site (ACCDC 2015)

ESA Name	Distance from Project	Reason of Significance
Oak Bay/Spoon Island ESA	1.5 km E	Geology
Waweig River ESA	4.5 km E	Fish/Bird/Plants
St. Croix Mountain ESA	3.5 km SE	Bird
St. Croix River Estuary ESA	Adjacent to site	Bird/Fish
Highway 1, Exit 14 to St. Andrew's	3.5 km SE	Geology

3.5.3 Regional Geology, Hydrogeology

Regional geology and hydrogeology as it relates to the project requirements is described in the WSSA report presented in Appendix A.

Figure 9 Wetlands

Project No. SW20017-094	Date: November 21, 2017	Scale: NTS	Drawing by: DEH, GeoNB

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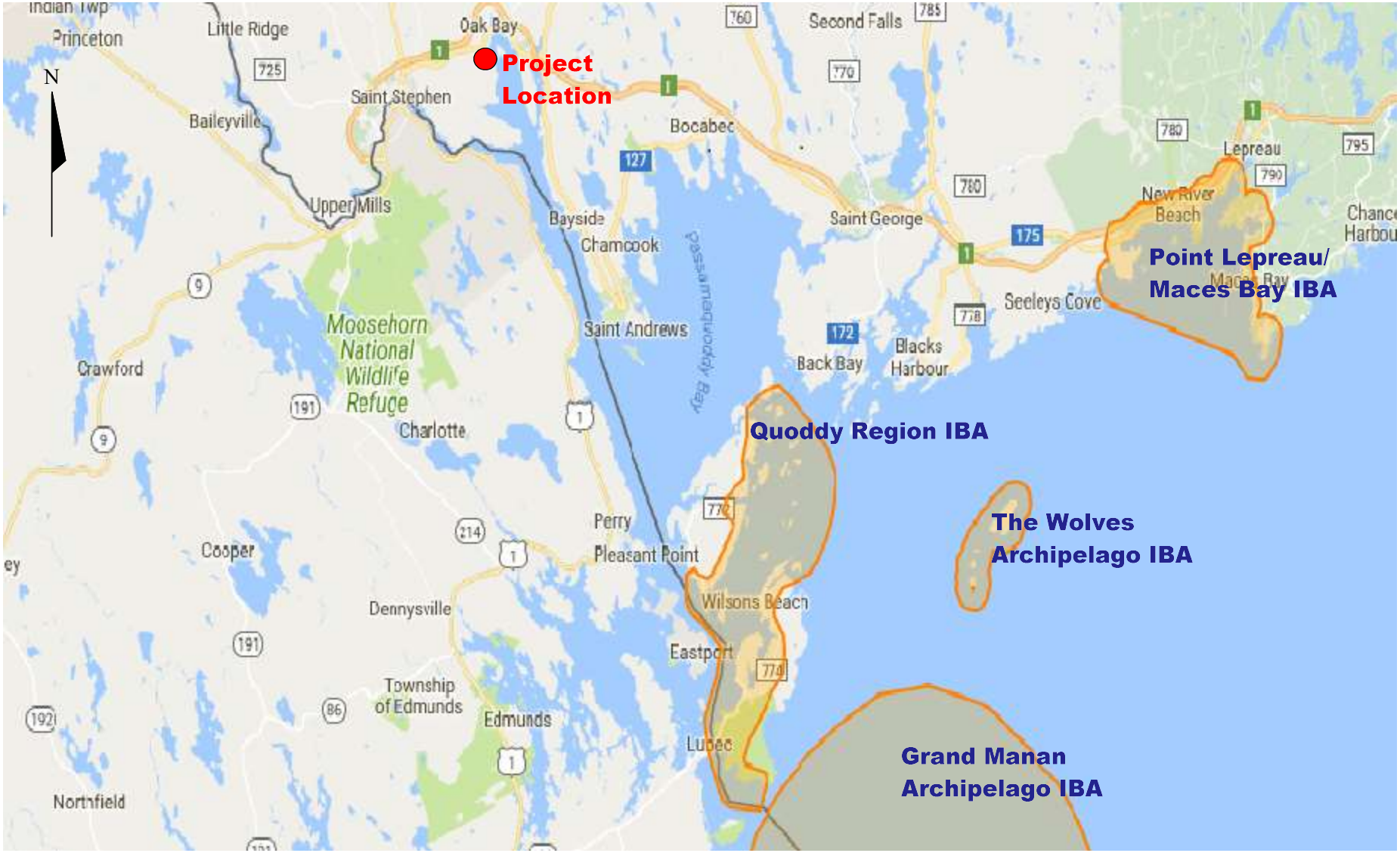

Figure 10 Important Bird Areas			
Project No. SW20017-094	Date: Nov. 17, 2017	Scale: NTS	
		Drawing by: DEH, IBA.org	

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3.6 Archaeological and Cultural Features

As a result of a request to Archaeological Services Branch of the New Brunswick Department (ASNB) of Tourism, Heritage and Culture for predictive modelling there are no known registered archaeological sites that lie within a 1 km radius of the proposed project area. This area falls within 80m of a watercourse/waterbody and may contain elevated archaeological potential. According to the predictive modelling, it does appear the location has some slope to it; however, it may be necessary for a professional archaeologist do an assessment of the location to confirm (T. Jarratt, ASNB – Pers. Comm.). Archaeological resources are further assessed in Section 5 and a copy of the GIS predictive modelling is presented in Appendix H.

3.7 Socio-Economic Environment

3.7.1 Population and Labour Force

The Project is located at 93 Oak Haven Road, Oak Haven, Charlotte County, approximately 6.5 km northeast of the town of St. Stephen, New Brunswick. Charlotte County is located in southwestern New Brunswick and borders the state of Maine, which makes it the closest entry point to markets in New England and the eastern seaboard of the United States. Charlotte County is a rural area with six municipalities: the town of St. Stephen, the town of St. Andrews, the town of St. George, the village of Grand Manan, the village of Blacks Harbour, and the community of Campobello. The largest communities in Charlotte County include the town of St. Stephen (pop. 4,415), the village of Grand Manan (pop. 2,360), and the town of St. Andrews (pop. 1,786) (Census Profile, 2016 Census). The area surrounding the Project site is sparsely populated by the small communities of Benson Corner (0.5 km), Oak Haven (1.5 km), and Oak Bay (1.9 km).

Population statistics for Saint David Parish Census Subdivision (includes Oak Haven) and Charlotte County derived from the 2016 census are summarized in Table 10.

Table 10 Population in the Saint David Parish Census Subdivision and Charlotte County

Population Statistics	Saint David Parish Census Subdivision	Charlotte County
Population in 2016	1,529	25,428
Population in 2011	1,605	26,549
Population change from 2006-2011 (%)	-4.7	-4.2
Total private dwellings in 2016	743	13,513
Land area (square km)	190.66	3,426.97
Population density per square kilometre	8.5	7.8

Source: http://www12.statcan.gc.ca (Census Profile - 2016)

The age distribution in the Saint David Parish and Charlotte County reveals a median age of 50.5 years and 47.9 years respectively, which are both higher than the provincial median age of 43.7 years and the Canadian median age of 40.6 years (2016 Census). An overview of age distribution for 2016 for the Saint David Parish and Charlotte County is outlined in Table 11 below.

Table 11 Age Distribution in the Saint David Parish Census Subdivision and Charlotte County

Age Statistics	Saint David Parish Census Subdivision	Charlotte County
0 - 14 years	200 (13.1%)	3,755 (14.8%)
15 - 64 years	1,000 (65.4%)	16,260 (63.9%)
65+ years	325 (21.2%)	5.420 (21.3%)
Total Population	**1,529 (100%)**	**26,428 (100%)**

Source: 2016 Census - http://www12.statcan.gc.ca (Census Profile - 2016 Census)

The median total income for recipients in the Saint David Parish and Charlotte County was $26,668 and $30,961 a year respectively, compared with the median income of $30,480 for New Brunswick (Census Profile, 2016 Census). The median income for the Saint David Parish was lower than the Canadian median of $33,920 (. The median value of dwellings in the Saint David Parish and is $129,881 and $129,557 respectively according to the 2016 Census (http://www12.statcan.gc.ca). In comparison, the median value of dwellings in New Brunswick and in Canada was $150,010 and $341,556, respectively (Table 12).

Table 12 Median Dwelling Value and Individual Income

Jurisdictions	Median Dwelling Value	Median Individual Income
Saint David Census Subdivision	$129,881	$26,668
Charlotte County	$150,010	$30,961
Province of New Brunswick	$150,010	$30,480
Canada	$341,556	$33,920

Source: http://www12.statcan.gc.ca (Census Profile – 2016 Census)

Employment and unemployment rates for 2011 (according to Statistics Canada) in the Saint David Parish was 9.5% and 57.4% respectively, which is lower than the Charlotte County and New Brunswick rates of 12.3% and 9.5%, respectively. The Saint David Parish employment rate of 57.4% was found to be higher than both the Charlotte County and New Brunswick rates of 52.6% and 56.4%, respectively (2011 National Household Survey).

A breakdown of the labour force within Saint David Parish and Charlotte County is provided in Table 13. The highest proportion of workers in the Saint David Parish and Charlotte County are in the manufacturing industry, while the highest proportion of workers in the province is in the “health care and social assistance” category.

Table 13 Labour Force by Industry in Saint David Parish, Charlotte County and New Brunswick

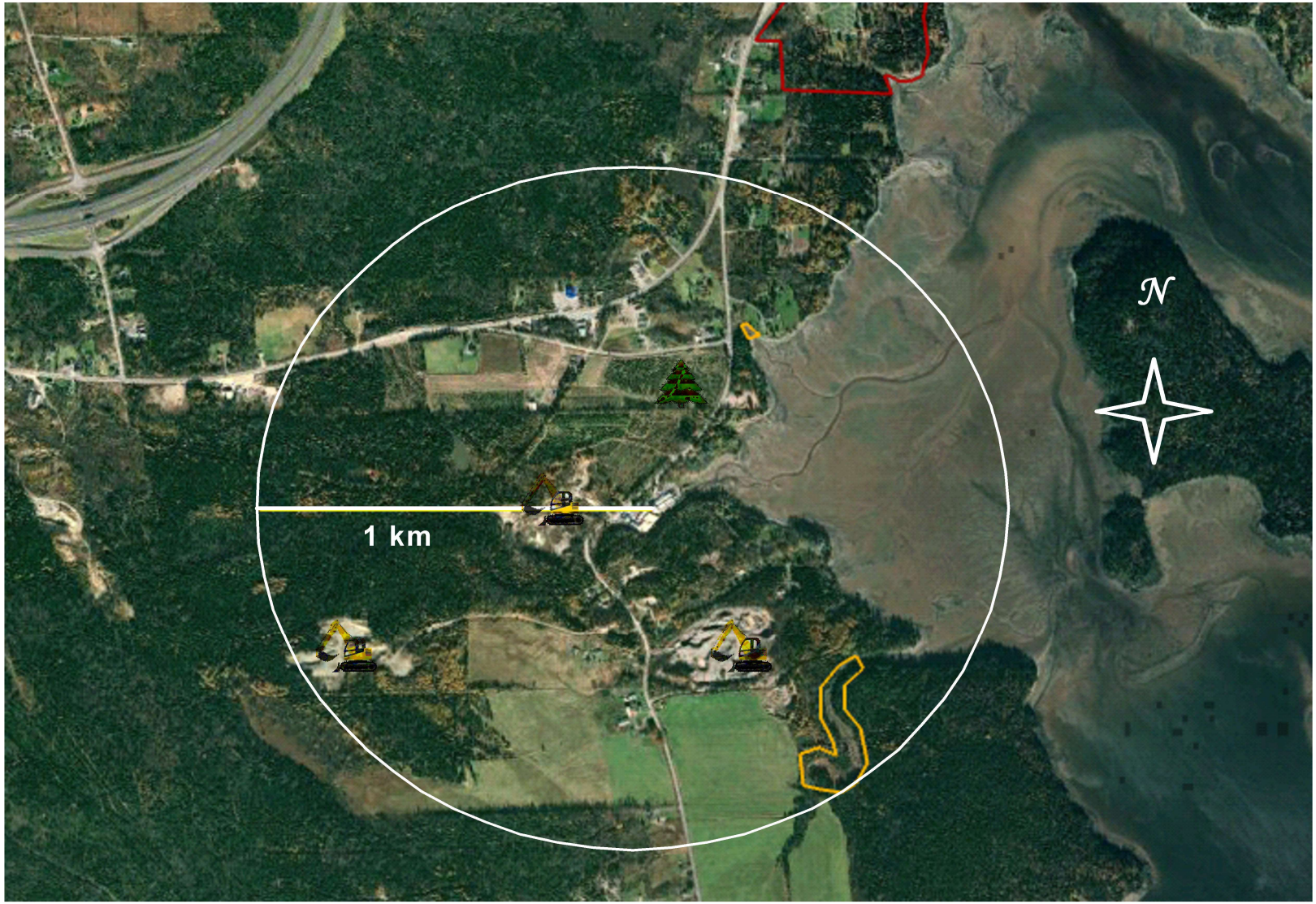
Total	Saint David Parish	Charlotte County	New Brunswick
Total experienced labour force 15 years +	835	13,220	395,420
Manufacturing	145	2,130	33,325
Retail trade	125	1,265	46,285
Health care and social assistance	90	1,485	49,660
Transportation and warehousing	70	640	19,240
Construction	65	1,230	29,340
Agriculture, forestry, fishing and hunting	65	1,785	15,480
Professional, scientific and technical services	55	300	16,205
Public administration	50	915	39,515
Educational services	35	575	27,045
Other services	35	645	17,895
Accommodation and food services	20	680	23,805
Administrative and support, waste management and remediation services	15	455	19,025

Source: 2011 National Household Survey – Statistics Canada

3.7.2 Existing and Historic Land Use

The Oak Bay Hatchery was a pre-existing hatchery prior to 1989 when it was purchased by Cooke Aquaculture (then called Kelly Cove Salmon). There are active gravel pits immediately to the south and west of the Project site as well as Christmas tree farming to the west. Other land uses in the immediate area could be best described as residential with some seasonal and others permanent. Oak Bay borders the Project site to the east. Figures 11 and 12 provide an overview of the land-use features within a 1km and 5 km radius of the Project, respectively.

The closest aboriginal community is the Oromocto First Nation located along the approximately 91 km northeast of the Project site (Figure 13).



Christmas tree farm Open pit Provincial Park Wetlands

Figure 11 Land Use and Features (1km radius)			
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		Drawing by: TD,DEH	

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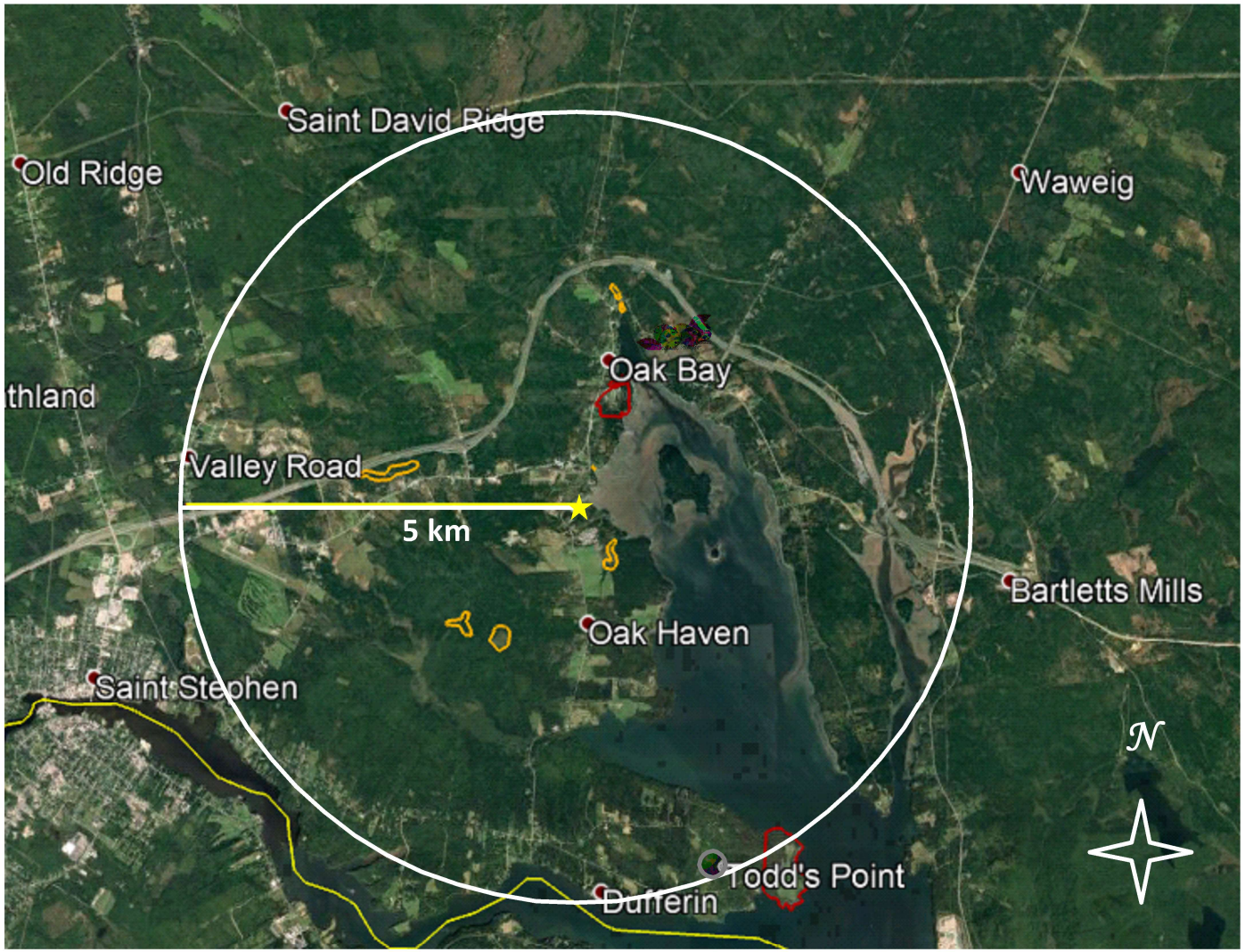

Oak Bay hatchery

Nature Trust Land

Park

Blueberry fields

Wetlands

Figure 12 Land Use and Features (5km radius)			
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		Drawing by: TD, DEH	

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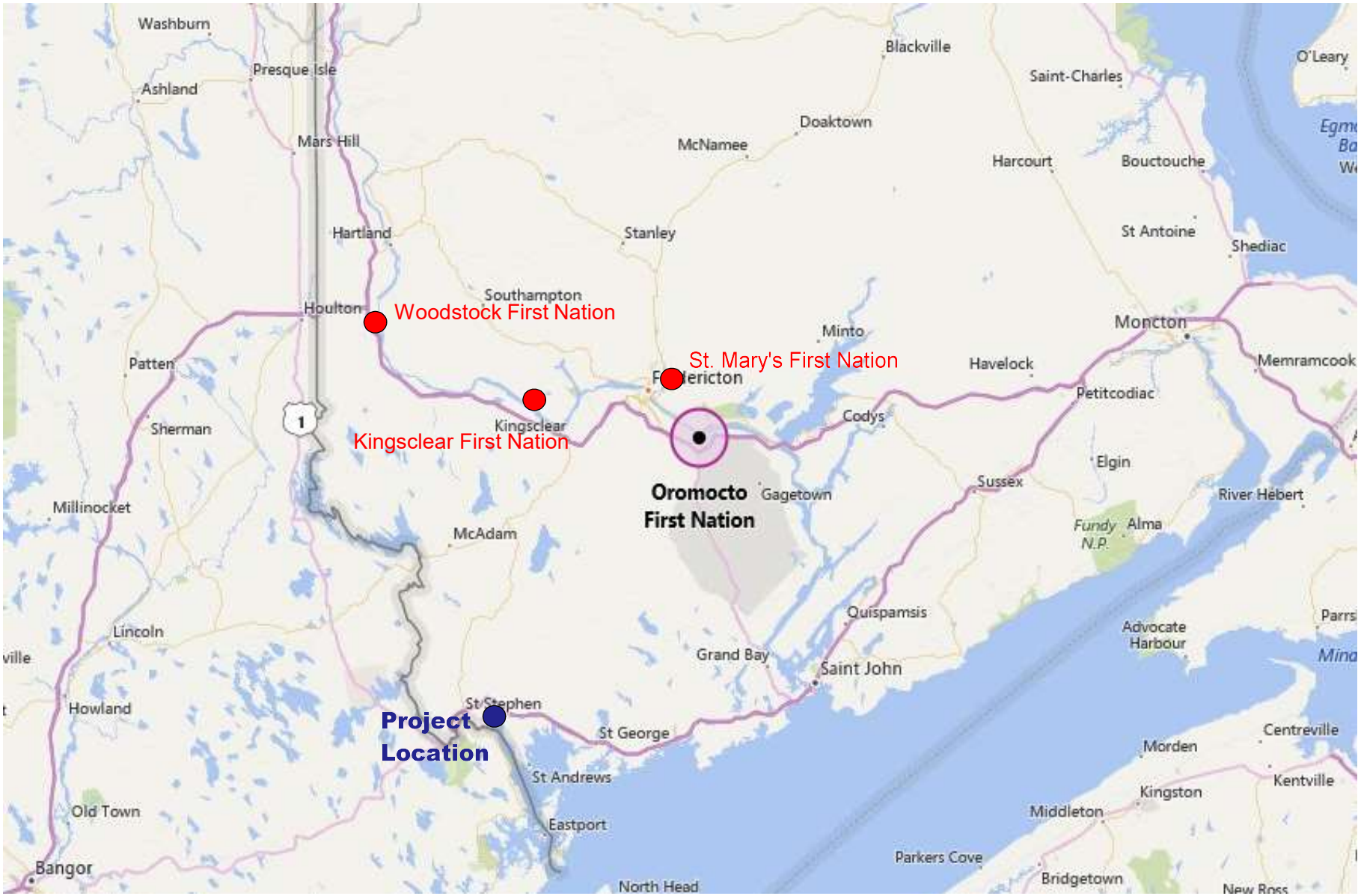

Figure 13 NB First Nations			
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		Drawing by: DEH	

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3.7.3 Recreation and Tourism

Towns in the vicinity of the Project site include that of St. Stephen and St. Andrew's. St. Stephen is located 6.5 km southwest of the Project site and is known as *Canada's Chocolate Town*, home of Ganong Bros Ltd., Canada's oldest family-owned candy company. This small-town community, which is also one of the busiest Canadian/U.S. border crossings in the province, offers a variety of recreational activities such as golfing, canoeing, kayaking, hiking/walking, swimming and ice skating. Tourism attractions include the Chocolate Museum, Charlotte County Museum, walking tours, David Alison Ganong Park summer concert series, summertime festivals, and boasts a variety of shops and restaurants.

St. Andrew's which sits on the scenic Passamaquoddy Bay is located 19 km southeast of the Project site. It is a well-known tourist hub which boasts itself as Canada's Premier Historic Seaside Resort. Recreational activities include such things as seaside signature golf, kayaking, sailing, swimming, tennis, hiking, and scuba diving. Art galleries, museums, interactive walking tours, National Historic sites, Huntsman Marine Science Centre and the Kingsbrae Garden (an 11ha horticultural masterpiece), are very popular tourist attractions.

The Ganong Nature Park is approximately 5 km's south of the projects site (Figure 12, "Nature Trust"). This beautiful 350 acre property is open year round for visitors. It overlooks the "cross" of the St. Croix River and St. Croix Island where, in 1604, Demonts and Champlain tried to establish the first settlement north of Florida. The Ganong Nature Park has woods, hiking trails, fields and 180 acres of inter-tidal area for visitors to enjoy. The park is a charitable, not-for-profit community organization.

The Oak Bay Provincial Park and Campground is located 1.4 km north, northeast of the Project site (Figures 11 and 12). The 33.5acre Park is privately managed and offers serviced and un-serviced camping sites, a canteen, picnic area, and a sandy beach.

Any recreational boating activities and fishing activities in the immediate area of the site are influenced by the Bay of Fundy tides which leaves the inter-tidal area of Oak Bay predominately of mudflats at low tide. Land-based recreational activities consist mainly of hunting, photography, and ATV use.

3.7.4 Commercial, Recreational and Aboriginal Fisheries

Commercial Fisheries:

The nearest aquaculture facility is the Elmsville Hatchery which is owned by the Proponent and is located 16 km east on the Digdequash River which drains into Passamaquoddy Bay. The Elmsville Hatchery also rears Atlantic salmon which are destined for Company owned aquaculture sites for grow-out.

Commercial fishing activities in Oak Bay, because of the muddy substrate and extreme tides, is limited to some shellfish harvesting (soft-shell clams - *Mya Arenaria*) and possibly periwinkling activity (J. Cline, DFO – Pers. Comm.). The area close in close proximity to the hatchery is a restricted area, the remainder of Oak Bay is conditionally approved (Figure 14). These conditional areas are managed seasonally normally between October to April and are closed on varying amounts of rainfall (J. Cline, DFO – Pers. Comm.).

Recreational Fisheries:
Within the upper reaches of Oak Bay, by Oak Bay Provincial Park there is a small recreational striped bass fishery (P.Turmel, NBDNR – Pers. Comm.).

Gallop Stream, which empties into the Oak Bay, does support a large Brook Trout population and is popular amongst recreational fishermen (P.Turmel, NBDNR – Pers. Comm.).

As noted above, along with a limited commercial fishery, a recreational fishery associated with the harvesting of soft-shell clams and periwinkles may exist (J. Cline, DFO – Pers. Comm.).

Aboriginal Fisheries:
The Department of Fisheries and Oceans indicates that; “We do not have any First Nation licenses that identify that specific area on any commercial communal licenses therefore that is not searchable data; however, the same bands as noted below would have access to that area for fishing.”

These include:

Saint Mary’s First Nation
Kingsclear First Nation
Oromocto First Nation
Woodstock First Nation

(Licensing Operations, Maritimes Region, DFO – Pers. Comm.)

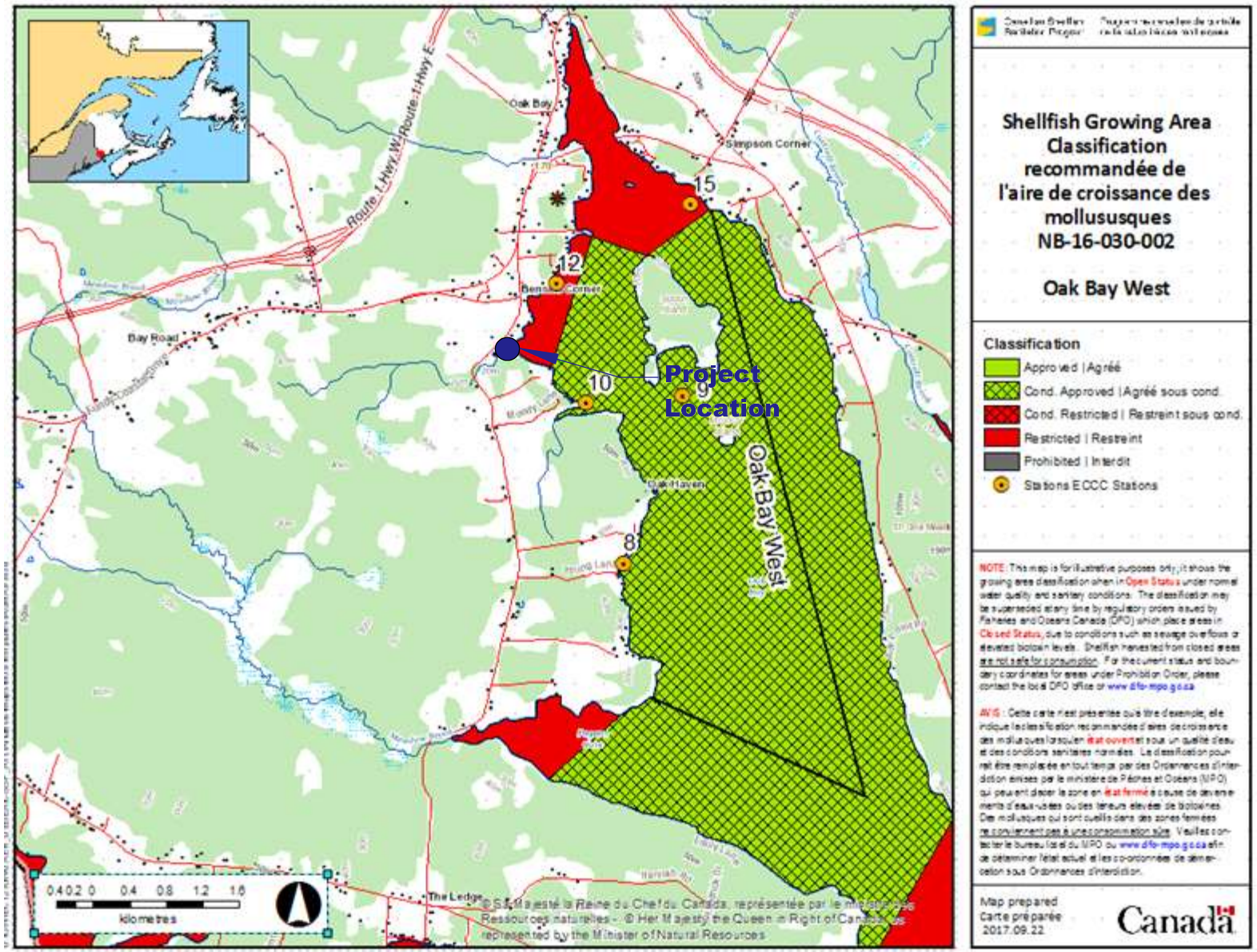

Figure 14 Shellfish Growing Area Classification			
Project No. SW20017-094	Date: November 21, 2017	Scale: as noted	
		Drawing by: DEH, Gov. Can	

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4.0 ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS

As discussed in Section 2.0 the EIA scope has three components: the upgrading of the WTS, the WSSA (which has been completed and included in Appendix A, and the development of a Genomics Unit (Appendix B). Each component has been assessed for potential environmental impacts associated with project activities unique to that component. For instance, the Genomics Unit will require site preparation (grubbing, civil works, etc.) and some construction activities and will be tied into the upgraded WTS, while the upgrading of the WTS will require little, in the way, of site preparation and construction activities but, will have potential impacts associated with its operation and maintenance. The WSSA, on the other hand, did not have any site preparation/construction activities associated with it, but may have potential environmental impacts associated with residual water during the pumping tests.

An assessment of potential impacts, with respect to upgrading the WTS, the WSSA and, the proposed Genomics Unit has been undertaken, as well as any potential accidental events/malfunctions.

4.1 Valued Environmental Components (VECs) and Valued Socio-Economic Components (VSCs)

Components deemed to have specific value to the environment are identified as Valued Environmental Components (VECs) and Valued Socio-Economic Components (VSCs). These components were assessed based on their intrinsic value to the environment, heritage and culture, legislation, and on professional judgment.

In relation to the scope of the Project, the following have been identified as VECs/VSCs:

- Intertidal Marine Habitat
- Water Quality
- Birds/Bird Habitat
- Archeological and Cultural Resources
- Socio-Economic Environment (Local Economy)

4.2 Project Activities

There are three main project activities/phases associated with the components within the EIA:

1. **Construction Phase**: includes site preparation/civil works activities (grubbing, clearing, grading etc.) and construction activities for the Genomics Unit.

2. **Operation and Maintenance**: includes the day to day operations and maintenance of the OBH (including the Genomics Unit) which would have a direct affect on the WTS.
3. **Accidents and Malfunctions**: includes any incidents that cause spills or leaks and any unplanned events that could occur during project activities.

The OBH (including the Genomics Unit) is expected to operate into the foreseeable future so the decommissioning of the facility was not considered in this EIA. If the facility were to be decommissioned it would be subject to any applicable legislation or regulations of the day.

4.3 Project Components/VECs/VSCs/Project Activity Interactions

Table 14 describes the components within the scope of the EIA, their associated VECs/VSCs and if there is an potential impact with a project activity. Mitigations associated with VECs/VSCs and project activities are further discussed in Section 5.

The Genomics Unit, once constructed, would become part of the Oak Bay Hatchery and, since the new infrastructure will not require any additional water withdrawal, feeding requirements, or effluent production, the VEC's associated with the maintenance and operation of the WTS upgrade were all that were assessed.

Table 14 Project Interactions

EIA Components	Associated VECs/VSCs	Project Activity			
		Construction Phase		Maintenance and Operation	Accidents and Malfunctions
		Site Prep.	Construction*		
WTS Upgrade	Intertidal Marine Habitat			Yes	Yes
	Water Quality			Yes	Yes
	Socio-Economic		Yes	Yes	
WSSA	Water Quality		Yes		Yes
	Socio-Economic		Yes		
Genomics Building	Water Quality	Yes	Yes		Yes
	Birds/Bird Habitat	Yes	Yes		Yes
	Archaeological Resources	Yes	Yes		Yes
	Socio-Economic	Yes	Yes		

*construction = pump testing activities with respect to the WSSA

5.0 SUMMARY OF PROPOSED MITIGATIONS

5.1 Methodology

VECs and VSCs were assigned to each component (i.e. WTS, WSSA, Genomics Unit) within the EIA and the potential negative impact with a project activity (i.e., construction, maintenance and operation, and accidents and malfunctions) was determined (Table 14). If the interaction was expected to result in a negative impact to the VEC then it was identified for mitigation measures and possible follow-up monitoring. There were no negative VSCs impacts identified but positive impacts were assessed.
Significance of potential effects prior to mitigative measures and significance of predicted residual effects, after mitigative measures are imposed, were determined based on professional judgment. The level of significance is typically assessed a numerical value based on the level of significance with 0=none, 1=insignificant, 2=significant, 3=unknown, and 4=positive.

5.2 Wastewater Treatment System (WTS)

5.2.1 Construction

5.2.1.1 Socio-economic

VSC	Description of VSC	Potential Effect	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
Local Economy	Employment/ expenditure	Positive Economic Effect	4	Hire Locally	4	Not required

5.2.2 Operation and Maintenance

5.2.2.1 Valued Environmental Component: Intertidal Marine Habitat

VEC activity: Release of faecal matter

Potential Effects:

- Decreased DO
- Nutrient Loading
- Reduction of water and sediment quality

Significance Before Mitigation: 2=significant

Mitigation Measures:

- Maintain appropriate feed conversion ratios (FCRs)
- Staff training on feeding techniques
- Maintain appropriate filter system
- Adhere to Waste Management Plan (WMP, Appendix J)

Significance of Residual Effects: 1=insignificant

Follow-up monitoring:

- Annual water quality monitoring (as stipulated in Approval to Operate)
- Mixing Zone Study to determine requirements

5.2.2.2 Valued Environmental Component: Intertidal Marine Habitat

VEC activity: Release of excess feed

Potential Effects:

- Decreased DO
- Increase in bacterial levels
- Nutrient Loading
- Reduction of water and sediment quality

Significance Before Mitigation: 2=significant

Mitigation Measures:

- Maintain appropriate feed conversion ratios (FCRs)
- Staff training on feeding techniques
- Maintain appropriate filter system
- Adhere to Waste Management Plan (WMP)

Significance of Residual Effects: 1=insignificant

Follow-up monitoring:

- Annual water quality monitoring (as stipulated in Approval to Operate)
- Mixing Zone Study to determine requirements

5.2.2.3 Valued Environmental Component: Intertidal Marine Habitat

VEC activity: Release of dissolved inorganic nutrients

Potential Effects:

- Nutrient Loading

Significance Before Mitigation: 2=significant

Mitigation Measures:

- Maintain appropriate filter system

Significance of Residual Effects: 1=insignificant

Follow-up monitoring:

- Annual water quality monitoring (as stipulated in Approval to Operate)
- Mixing Zone Study to determine requirements

5.2.2.4 Valued Environmental Component: Intertidal Marine Habitat

VEC activity: Use of therapeutants

Potential Effects:

- Acute toxicity

Significance Before Mitigation: 2=significant

Mitigation Measures:

- Use only approved products
- Dilution prior to discharge
- Follow Fish Health Management Plan (FHMP) and Best Aquaculture Practices (BAP)

Significance of Residual Effects: 1=insignificant

Follow-up monitoring:

- Audits by BAP
- Internal audits by veterinarian as needed

5.2.2.5 Valued Environmental Component: Intertidal Marine Habitat

VEC activity: Refuse Disposal

Potential Effects:

- Waste Accumulation

Significance Before Mitigation: 2=significant

Mitigation Measures:

- Follow approved WMPs

Significance of Residual Effects: 1=insignificant

Follow-up monitoring:

- Site manager follow-ups /internal auditing

5.2.2.6 Valued Environmental Component: Water Quality

VEC activity: Release of faecal matter

Potential Effects:

- Decreased DO
- Increase in microalgae levels
- Nutrient Loading
- Reduction of water quality

Significance Before Mitigation: 2=significant

Mitigation Measures:

- Maintain appropriate feed conversion ratios (FCRs)
- Staff training on feeding techniques

- Maintain appropriate filter system
- Adhere to Waste Management Plan (WMP)

Significance of Residual Effects: 1=insignificant

Follow-up monitoring:

- Annual water quality monitoring (as stipulated in Approval to Operate)
- Mixing Zone Study to determine requirements

5.2.2.7 Valued Environmental Component: Water Quality

VEC activity: Release of excess feed

Potential Effects:

- Decreased DO
- Increase in microalgae levels
- Nutrient Loading
- Reduction of water quality

Significance Before Mitigation: 2=significant

Mitigation Measures:

- Maintain appropriate feed conversion ratios (FCRs)
- Staff training on feeding techniques
- Maintain appropriate filter system
- Adhere to Waste Management Plan (WMP)

Significance of Residual Effects: 1=insignificant

Follow-up monitoring:

- Annual water quality monitoring (as stipulated in Approval to Operate)
- Mixing Zone Study to determine requirements

5.2.2.8 Valued Environmental Component: Water Quality

VEC activity: Release of dissolved inorganic compounds

Potential Effects:

- Increase in microalgae levels
- Nutrient Loading

Significance Before Mitigation: 2=significant

Mitigation Measures:

- Maintain appropriate filter system

Significance of Residual Effects: 1=insignificant

Follow-up monitoring:

- Annual water quality monitoring (as stipulated in Approval to Operate)
- Mixing Zone Study to determine requirements

5.2.3 Accidents and Malfunctions

During all phases of the Project there is a potential for accidents or malfunctions to occur, and some have the potential to impact the intertidal marine and water quality.

The intent of the installation of a second RFM60120 PR Aqua Drum filter is to allow for the routine maintenance and for redundancy in case of a malfunction of the now existing RFM60120 drum filter. Kelly Cove Salmon has a Waste Management Plan and Integrated Contingency Plan (ICP) with includes an Oil Spill Prevention Control and Countermeasures (SPCC) Plan, Hazardous Matter Spill Prevention Control and Cleanup Plan and, Facility Emergency Response Plan.

The effect of the potential impacts of accidents and other unplanned events prior to mitigation is unknown (=3) but, with adherence to the WMP and the various components of the ICP it is reduced to insignificant (=1).

5.3 Water Supply Source Assessment (WSSA)

5.3.1 Construction

5.3.1.1 Socio-economic

VSC	Description of VSC	Potential Effect	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
Local Economy	Employment/ expenditure	Positive Economic Effect	4	Hire Locally	4	Not required

5.3.1.2 Valued Environmental Component: Water Quality

VEC activity: Sedimentation/Siltation due to pumping tests

Potential Effects:

- Decrease in water quality

Significance Before Mitigation: 2=significant

Mitigation Measures would typically be:

- Scheduling activities to minimize potential impacts associated with erosion (i.e., avoid activities during intense storm events).
- Installation of effective erosion and sediment control measures before starting work to prevent sediment from entering a water body.
- Regular inspection and maintenance of erosion and sediment control measures and structures during the course of the WSSA.
- Repairs to erosion and sediment control measures and structures if damage occurs.
- Removal of non-biodegradable erosion and sediment control materials once WSSA is completed.

In the case of the pumping tests at the Oak Bay Hatchery residual water from the pump tests was used in the hatchery and then discharged through the wastewater treatment facility.

Significance of Residual Effects: 0=none

Follow-up monitoring: None

5.3.2 Accidents and Malfunctions

During all phases of the WSSA there is a potential for accidents or malfunctions to occur, and some have the potential to impact on the water quality of the adjacent waterbody.

Kelly Cove Salmon has an on-site Integrated Contingency Plan (ICP) with includes an Oil Spill Prevention Control and Countermeasures (SPCC) Plan, Hazardous Matter Spill Prevention Control and Cleanup Plan and, Facility Emergency Response Plan. Other mitigations include but are not limited to:

- That equipment used near any watercourse be mechanically sound and not leaking fuel, hydraulic fluid, or lubricants.
- Any debris generated during the project be disposed of in an environmentally friendly manner.
- Any spills or leaks that occur will be reported to the appropriate regulatory authorities as soon as possible.
- Refueling, oiling, and maintenance of equipment will be completed in specifically designated areas.
- Servicing of equipment will be completed offsite by a licensed mechanic.

The effect of the potential impacts of accidents and other unplanned events prior to mitigation is unknown (=3) but, with adherence to the ICP and appropriate mitigative measures it is reduced to insignificant (=1).

5.4 Genomics Building

5.4.1 Construction

5.4.1.1 Socio-economic

VSC	Description of VSC	Potential Effect	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
Local Economy	Employment/ expenditure	Positive Economic Effect	4	Hire Locally	4	Not required

5.4.1.2 Valued Environmental Component: Water Quality

VEC activity: Sedimentation/Siltation

Potential Effects:

- Decrease in water quality

Significance Before Mitigation: 2=significant

Mitigation Measures:

- Scheduling activities to minimize potential impacts associated with erosion (i.e., avoid activities during intense storm events).
- Installation of effective erosion and sediment control measures before starting work to prevent sediment from entering a water body.
- Regular inspection and maintenance of erosion and sediment control measures and structures during the course of the construction.
- Repairs to erosion and sediment control measures and structures if damage occurs.
- Removal of non-biodegradable erosion and sediment control materials once construction is completed.
- Minimize ground disturbance to reduce the potential for erosion and sedimentation.

- Preserve natural vegetation on site as much as possible. Re-vegetate disturbed areas with species of plants native to the area or, if not available, insure plants used are not known to be invasive.

Significance of Residual Effects: 1=insignificant

Follow-up monitoring: Not required after construction is completed.

5.4.1.3 Valued Environmental Component: Birds/Bird Habitat

VEC activity: Tree removal

Potential Effects:

- Disturbance of nesting sites

Significance Before Mitigation: 3=unknown

Mitigation Measures:

- Clearing of trees to take place outside of nesting fledgling season

The *Species at Risk Act* (SARA) makes it illegal to destroy any critical habitat of a species at risk. Critical habitat is an area vital to the survival or recovery of a wildlife species. Recovery strategies have been developed for many of the species listed in Tables 4 to 7. One of the common primary goals of these strategies is defining current habitats for these species at risk. However, with limited population numbers, it is often difficult to determine current habitats and even more difficult to define critical habitats.

The following birds, that may occur within 5 km of the study, area are listed in Tables 4 to 7 and, are protected under the Species at Risk Act. These species and the specific mitigation measures that Kelly Cove Salmon Ltd (KCS) will employ are:

Little Brown Myotis, Northern Myotis and Tri-coloured Bat
Hibernacula are used by the little brown myotis (*Myotis lucifugus*), northern myotis (*M. septentrionalis*), and tri-colored bat (*Perimyotis subflavus*) to overwinter when ambient temperatures decline, and insects are unavailable. Suitable hibernacula may be limiting for these species. As such, any site where any of these species have been observed hibernating is considered critical habitat. Even sites where white-nose syndrome is established are considered critical habitat and must be preserved to aid population recovery should the bat population begin to recover.

Typically, hibernacula for these species are subterranean features, such as caves, abandoned mines, hand-dug wells, cellars, or tunnels where light and noise levels are low. Hibernacula typically contain sections that have relatively stable temperatures (2 - 10˚C) and stable, high humidity levels (> 80%) (Environment Canada 2015). Currently identified critical habitat in New Brunswick is located in the Shepody Bay area, the Sussex area, and the Saint John/Kennebecasis Bay area.

Maternity roosts are used for giving birth and rearing young and contribute to the survival of these three species of bats. It is currently not possible to determine which maternity roosts are necessary for the survival or recovery of these species; therefore, maternity roosts were not identified as critical habitat in the Environment Canada recovery strategy (2015).

Mitigation Plan for KCS: The little brown myotis, northern myotis, and tri-coloured bats are protected under the federal *Species at Risk Act*. KCS will comply with these regulations. While no known hibernacula have been identified in the Oak Bay area, KCS personnel will not attempt to disturb, kill, or harass any bats that are seen on the Oak Bay hatchery property. If bats are found in the Oak Bay hatchery facility, a licensed person that is equipped to properly and humanely deal with them will be contacted. If active bats are noticed during the winter months or dead bats are found around the Oak Bay hatchery facility, KCS will contact the Species At Risk Section, of the Forest Health and Stewardship Branch, Department of Energy and Resource Development (Hubert Askanas 506.453.5873).

Canada Warbler

The recovery strategy for the Canada warbler (*Cardellina Canadensis*) (Environment Canada 2016a) states that the habitat specificity, population size, and threats to the Canada warbler indicate that critical habitat should be identified at a landscape scale. However, while habitat suitability is generally understood and some habitat suitability modeling has been done, currently, it is unknown whether habitat is limiting in Canada. Thus far, identifying critical habitat at a landscape scale has not been possible.

The Canada warbler breeds in a variety of habitats that differ across its range but is almost always associated with moist forests with a dense, deciduous shrub layer, complex understory, and available perch trees. Habitats often used in the Maritime Provinces include mature cedar swamps and other wet habitats; mixed forest in a complex, mature or regenerating state; partial cuts; and shrublands.

Based on data gathered in Alberta, the Canada warbler returns to its breeding grounds between May 12 and June 14 and fall migration ends around September 20.

Mitigation Plan for KCS: The Canada warbler is protected under the *Species at Risk Act*, which makes it an offense to kill, harm, harass, capture, or take any individuals of a listed species, and the *Migratory Birds Convention Act, 1994*, which prohibits the harming of birds and the disturbance or destruction of their nests or eggs. KCS will comply by these rules.

Since the peak period for encountering the Canada warbler is between May 12 and September 20, KCS will not clear land for the genomics building during these months. The land will be cleared outside of this time period to avoid disturbance of possible nest sites.

Chimney Swift

Before the arrival of European settlers, the chimney swift nested in large hollow trees. However, much of the old growth forest has since been logged, resulting in a change in the chimney swift's nesting sites. For nesting and roosting, the chimney swift looks for a sheltered spot with vertical surfaces it can grip onto and attach its nest and rapidly adopted artificial shelters (e.g. chimneys, barns, hand-dug wells) as the old-growth forest was cut (COSEWIC 2007). Today, the species is found over a large variety of habitats such as cities and towns, villages, and rural or wooded areas, but it is most often associated with urban and suburban zones. Because of the abundance of insects, Chimney swifts are often seen near bodies of water, such as wetlands.

Chimney Swifts winter in the upper Amazon basin of Peru, Ecuador, Chile, and Brazil but little is known of the biology of these birds while there (Steeves et al 2014). They return to North America in March or April in flocks and soon thereafter break off into pairs for mating. Eggs hatch ~20 days after laying and the young fledge at ~ 30 days post-hatch (Steeves et al 2014).

Mitigation Plan for KCS: The chimney swift is protected under the *Species at Risk Act*, which makes it an offense to kill, harm, harass, capture, or take any individuals of a listed species, and the *Migratory Birds Convention Act, 1994*, which prohibits the harming of birds and the disturbance or destruction of their nests or eggs. KCS will comply by these rules.

Since the peak period for encountering the chimney swift is between April and June, KCS will not clear land for the genomics building during these months. The land will be cleared outside of this time period to avoid disturbance of possible nest sites.

Common Nighthawk

The recovery strategy for the common nighthawk (*Chordeiles minor*) (Environment Canada 2016b) states the current knowledge of the species, its wide breadth of nesting habitats, and the dynamic nature of landscapes used for nesting, roosting, and foraging result in a high degree of uncertainty in the identification of habitat necessary for the survival or recovery of the common nighthawk in Canada. Information that is currently available is insufficient to enable the identification of critical habitat. Common Nighthawks defend a large area and their foraging habitats can be separated from nest sites by many kilometers, so it is not possible to determine how an individual is using the habitat where it is detected. Identifying nest sites, and even general nesting locations, is problematic. However, the Maritimes Breeding Bird Atlas has a confirmed evidence of breeding in the Oak Bay area.

Females arrive at their breeding grounds in late May and early June; the males arrive a few days later (NYS Dept. Environmental Conservation). The incubation period is 16 to 20 days, the nesting period is 17 to 18 days, and 1 to 2 broods are raised per year (The Cornell Lab of Ornithology 2015). The young begin to fly at 21 days (National Audubon Society a) and can feed independently at 25 days. Within one month, they are on their own (Seattle Audubon Society a). The common nighthawk begins its southward migration in early fall.

Mitigation Plan for KCS: The common nighthawk is protected under the *Species at Risk Act*, which makes it an offense to kill, harm, harass, capture, or take any individuals of a listed species, and the *Migratory Birds Convention Act, 1994*, which prohibits the harming of birds and the disturbance or destruction of their nests or eggs. KCS will comply by these rules.

Since the peak period for encountering the common nighthawk is between late May and early fall, KCS will not clear land for the genomics building during these months. The land will be cleared outside of this time period to avoid disturbance of possible nest sites.

Eastern Whip-poor-will

Critical habitat for the eastern whip-poor-will is defined by two criteria: habitat occupancy and habitat suitability. Habitat occupancy describes the areas of nesting and foraging habitats used by the species. Habitat suitability refers to the biophysical attributes of habitats in which the species may breed and forage. Nesting and foraging habitats may overlap to a degree. Using the 10 x 10 km atlas squares of the Maritime Breeding Bird Atlas, COSEWIC has identified five areas in New Brunswick that contain critical habitat for the eastern whip-poor-will. None of the areas are within 5 km the Oak Bay hatchery, the closest being in Sunbury County.

The breeding season for the eastern whip-poor-will is estimated to be between May 21 and August 15 (COSEWIC 2015).

Mitigation Plan for KCS: The eastern whip-poor-will is protected under the *Species at Risk Act*, which makes it an offense to kill, harm, harass, capture, or take any individuals of a listed species, and the *Migratory Birds Convention Act, 1994*, which prohibits the harming of birds and the disturbance or destruction of their nests or eggs. KCS will comply by these rules.

Since the peak period for encountering the eastern whip-poor-will is between late May and mid-August, KCS will not clear land for the genomics building during these months. The land will be cleared outside of this time period to avoid disturbance of possible nest sites.

Olive-sided Flycatcher

The recovery strategy for the olive-sided flycatcher (*Contopus cooperi*) (Environment Canada 2016c) states that the geographic range, habitat specificity, population size, and threats to the Canada warbler indicate that critical habitat should be identified at a landscape scale. However, while habitat suitability is generally understood, and some habitat suitability modeling has been done, currently, it

is unknown whether habitat is limiting in Canada. Thus far, identifying critical habitat at a landscape scale has not been possible.

Incubation typically lasts 16 to 17 days but is sometimes reported as 14 days. The age of young at first flight is about 21 to 23 days (National Audubon Society b). One clutch per pair is raised per year (Altman and Sallabanks 2012). Olive-sided flycatchers fledge at 19 to 21 days but continue to depend on the adults for about a week after leaving the nest; family groups may stay together until fall migration (Seattle Audubon Society b). The olive-sided flycatcher is a late spring and early fall migrant and can be expected to return to nesting territory in late May and depart in early August (eBird 2013).

Mitigation Plan for KCS: The olive-sided flycatcher is protected under the *Species at Risk Act*, which makes it an offense to kill, harm, harass, capture, or take any individuals of a listed species, and the *Migratory Birds Convention Act, 1994*, which prohibits the harming of birds and the disturbance or destruction of their nests or eggs. KCS will comply by these rules.

Since the peak period for encountering the olive-sided flycatcher is between late May and early August, KCS will not clear land for the genomics building during these months. The land will be cleared outside of this time period to avoid disturbance of possible nest sites.

Significance of Residual Effects: 1=insignificant

Follow-up monitoring: Not required.

5.4.1.4 Valued Environmental Component: Archaeological Resources

Potential Effects:

- Discovery of archaeological artifacts and/or human remains.

Significance Before Mitigation: 2=significant

Mitigation Measures:

- Make onsite construction workers aware of the potential for archaeological resources on the construction site and proper mitigative activities if an archaeological resource or human remains is unearthed.

- As per Section 9 of the Heritage Conservation Act, any person who discovers an archaeological object, burial object, or human remains is required to report the discovery to the Minister as soon as practicable at (506) 453-2738.

- No one shall disturb, move or re-bury any uncovered artifact until the site is assessed by an qualified archaeologist. Construction will only resume after authorization is given by Archaeological Services NB.

- If human remains are unearthed, work in the area will cease and the RCMP will be notified immediately.

Significance of Residual Effects: 1=insignificant

Follow-up monitoring: Not required after facility is constructed.

5.4.2 Accidents and Malfunctions

During construction of the Genomics Unit there is a potential for accidents or malfunctions to occur, and some have the potential to impact on the water quality, bird habitat, and/or archeological resources.

Kelly Cove Salmon has an on-site Integrated Contingency Plan (ICP) with includes an Oil Spill Prevention Control and Countermeasures (SPCC) Plan, Hazardous Matter Spill Prevention Control and Cleanup Plan and, Facility Emergency Response Plan. Other mitigations include but are not limited to:

- That equipment used near any watercourse be mechanically sound and not leaking fuel, hydraulic fluid, or lubricants.

- Any debris generated during the project be disposed of in an environmentally friendly manner.

- Any spills or leaks that occur will be reported to the appropriate regulatory authorities as soon as possible.

- Refueling, oiling, and maintenance of equipment will be completed in specifically designated areas.

- Servicing of equipment will be completed offsite by a licensed mechanic.

The effect of the potential impacts of accidents and other unplanned events prior to mitigation is unknown (=3) but, with adherence to the ICP and appropriate mitigative measures it is reduced to insignificant (=1).

6.0 PUBLIC CONSULTATION

Upon submission of this EIA Document a comprehensive public consultation strategy will be developed in consultation with NBDELG. At a minimum it will involve:

- Direct communications with elected officials (i.e. the MLA and mayor), local service districts, community groups, environmental groups, and other key stakeholder groups (companies, agencies, interest groups etc.) and First Nations as appropriate, enabling them to become familiar with the proposed project and ask questions and/or raise concerns.

- The provision of direct, written notification (letter, information flyer, etc.) about the project and its location to potentially affected area residents and landowners and individuals (to be determined in consultation with Sustainable Development, Planning and Impact Evaluation Branch).

- The Sustainable Development, Planning and Impact Evaluation Branch, Department of Environment and Local Government (DELG) shall place notice of the Registration on its web site at http://www.gnb.ca/0009/0377/0002/0016-e.pdf and shall make the Registration Document (and any subsequent submissions in response to issues raised by the Technical Review Committee) available for public review at 20 McGloin Street, 2nd Floor, Fredericton, N.B.

- The provision of copies of the project registration document, (and any subsequent submissions in response to issues raised by the Technical Review Committee) available to any interested member of the public, stakeholder or First Nation and shall deposit a copy of this document along with any subsequent revision with the appropriate DELG regional office (St. Stephen), where it will be available for public review.

And for all registered projects:

Within 60 days of project registration, a report documenting the above public involvement activities will be prepared and submitted to the Department of Environment and Local and this report will be made available for public review. The report will:

• describe the public involvement activities (dates and times of any meetings, copies of newspaper notices, flyers, letters etc.);

• identify key public and private stakeholders (local naturalist groups, industry representatives, politicians, etc.) and First Nations directly contacted;

• include copies of all correspondence received from and sent to stakeholders and the general public;

• describe (summarize) any issues or concerns received as a result of the public involvement program (names and affiliations of persons providing the comments will be included in the report, but personal information such as addresses, and telephone numbers will be omitted);

• indicate how these issues and concerns were (or will be) considered or addressed;

• describe any proposed future public consultation with respect to the undertaking (e.g. ongoing public liaison committees, etc.).

7.0 CONCLUSION

This EIA registration has been prepared on behalf of Kelly Cove Salmon Ltd. The environmental components and potential project effects were assessed and presented with appropriate mitigation measures to minimize and/or eliminate the potential effects. Based on these interactions, it can be concluded that, with the proper mitigations and appropriate follow up monitoring that will be determined by an appropriate Mixing Zone Study, that the residual effects of the project would be considered not significant for all project components.

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