2026 Human Health Risk Assessment for the Seafood Monitoring Program: Woodfibre LNG Project

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Woodfibre LNG

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Executive Summary

This human health risk assessment (HHRA) was completed by Stantec Consulting Ltd. (Stantec) on behalf of Woodfibre LNG Limited (the Proponent). The purpose of this assessment is to comply with the provincial and federal conditions set when the British Columbia (BC) Environmental Assessment Office (EAO) and Canadian Environmental Assessment Agency (now the Impact Assessment Agency of Canada or IAAC) granted an Environmental Assessment Certificate (EAC) for the Woodfibre LNG Project (the Project).

The Proponent is constructing a liquefied natural gas (LNG) production, storage, and marine carrier transfer facility for the export of LNG. The Project is located approximately 7 kilometers (km) west-southwest of Squamish, BC on the west side of Howe Sound.

In January 2015, the Proponent submitted an Application for an EAC (the Application) for the Project to the BC EAO and IAAC. On October 26, 2015, the BC EAO and IAAC issued an EAC for the Project. The EAC is subject to conditions that the Proponent must adhere to. The EAC conditions that are relevant to this assessment requires that the Proponent monitor fish and shellfish for chemicals of potential concern (COPC) before, during, and after marine construction activities. The combined work to satisfy these conditions is referred to as the Seafood Monitoring Program.

The purpose of the Seafood Monitoring Program is to confirm the predictions related to seafood quality made in the Application. The prediction was that there would be no significant adverse change in COPC concentrations in seafood during and after marine construction activities. A significant adverse change in COPC concentrations is defined as:

1. A statistically significant increase in the concentration of one or more COPCs in seafood relative to established baseline conditions; and
2. A statistically significant increase in the concentration of one or more COPCs that results in a substantial increase in health risk to seafood consumers.

In this context, the Seafood Monitoring Program functions as an early detection mechanism for changes in COPC concentrations that may have implications for human health. If monitoring results indicate a potential health risk to seafood consumers, these findings would provide timely information to local seafood harvesters and relevant authorities. Interpretation of these findings also considers whether seafood harvesting is occurring within the study area, as the presence or absence of harvesting influences the relevance of the exposure pathway and the associated health risk. This information may be used to inform risk management responses, which could include targeted advisories, refinement of monitoring frequency or spatial coverage, or implementation of additional mitigation measures, as appropriate to the nature and magnitude of the observed change.

The Seafood Monitoring Program includes monitoring Dungeness crab meat, crab hepatopancreas, and English sole meat for COPCs. The COPCs include several metals (arsenic, cadmium, copper, lead, mercury, and zinc), organometallics (methylmercury and tributyltin (TBT)), and organics

(polycyclic aromatic hydrocarbons (PAH) and polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/F)).

The collection of Dungeness crab meat, crab hepatopancreas, and English sole meat for COPC analysis is required before (pre-construction), during (mid-construction), after, and one year following marine construction activities for the Project. The pre-construction assessment took place in August 2021, and the results are compared to the October 2025 mid-construction assessment as part of this report.
The remaining post-construction sampling periods have not yet been determined.

Results

Seafood tissue samples of Dungeness crab meat, crab hepatopancreas, and English sole meat were collected from within 1,000 m of the Woodfibre and Squamish Harbour study area. Samples were analyzed for COPCs, and results were compared to the 2021 pre-construction baseline. A two-tailed t-test was conducted to evaluate whether concentrations in the 2025 mid-construction period represent a statistically significant increase ($p<0.05$) relative to 2021 for each seafood type and COPC.

For crab meat, no statistically significant increases in arsenic, cadmium, copper, lead, mercury, zinc, methylmercury, PAHs, PCDD/Fs, and TBT were identified. COPC concentrations in crab meat were consistent with pre-construction conditions, and no change in associated health risk is indicated.

For crab hepatopancreas, a statistically significant increase in copper concentrations was identified. Copper is an essential nutrient at trace levels, and the associated health risk from the increase in copper exposure was characterized as negligible (i.e., hazard quotient < 0.2). The increased exposure to copper was within the range consistent with normal dietary intake and did not reach exposure levels that constituted a health concern. No statistically significant increases were identified for the remaining COPCs (arsenic, cadmium, lead, mercury, zinc, methylmercury, PAHs, PCDD/Fs, and TBT) in crab hepatopancreas, and no change in associated health risk is identified.

For English sole meat, statistically significant increases in mercury and methylmercury concentrations were identified. Mercury in the Squamish Harbour region is influenced by historical inputs, primarily from the former Nexen chlor-alkali plant in Squamish that was decommissioned in 1991. Baseline data from 2021 pre-construction assessment indicated that mercury and methylmercury concentrations at Woodfibre were lower than those in Squamish Harbour. The 2025 results indicate that mercury and methylmercury concentrations at Woodfibre have increased to levels comparable to those observed in Squamish Harbour (i.e., hazard quotient approximately 1 to 3). Accordingly, the associated human health risk from mercury and methylmercury exposure through consumption of English sole is comparable between Woodfibre and Squamish Harbour, and harvesting seafood from either location would be expected to result in a similar degree of risk. As a result, the associated health risk from exposure to mercury and methylmercury in sole meat at Woodfibre is consistent with conditions in the broader Squamish Harbour area and is not unique to the Woodfibre site. No statistically significant increases were identified for other COPCs (arsenic, cadmium, copper, lead, zinc, PAHs, PCDD/Fs, and TBT) in English sole meat.

The results of the Seafood Monitoring Program indicate that, while statistically significant increases were identified for select COPCs, the associated human health risks remain either negligible or consistent with existing regional conditions. The observed increase in copper in crab hepatopancreas corresponds to exposure levels within the range of typical dietary intake and is associated with a negligible level of health risk. In English sole, increases in mercury and methylmercury have resulted in concentrations and hazard quotients comparable to those observed in the Squamish Harbour area, reflecting established regional conditions rather than a site-specific effect. Based on these findings, harvesting seafood from the Woodfibre site does not result in a greater Project-induced health risk relative to other locations for the COPCs evaluated. These findings are consistent with the predictions made in the environmental assessment for the Project, which had concluded that Project marine construction activities would not result in increases in COPC concentrations in seafood that would lead to a health risk for seafood harvesters and consumers.

At this time, the magnitude and nature of the identified risks do not indicate a need for mitigation measures or seafood harvesting restrictions / advisories.

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Acronyms / Abbreviations

95% UCLM	95% upper confidence limit of the mean
BC	British Columbia
CALA	Canadian Association for Laboratory Accreditation
COPC	chemical of potential concern
CPA	Certified Project Area
CSR	Contaminated Sites Regulations
DFO	Fisheries and Oceans Canada
EAC	Environmental Assessment Certificate
EAO	Environmental Assessment Office
EDI	estimated daily intake
FDS	Federal Decision Statement
HHRA	human health risk assessment
HQ	hazard quotient
IAAC	Impact Assessment Agency of Canada
Keystone	Keystone Environmental Ltd.
km	kilometers
LNG	liquefied natural gas
mg/kg (equivalent to ppm)	milligrams per kilogram
ng/kg (equivalent to ppt)	nanograms per kilogram
PAH	polycyclic aromatic hydrocarbons
PCDD/F	polychlorinated dibenzo-p-dioxins and dibenzofurans
ppm (equivalent to mg/kg)	parts per million
ppt (equivalent to ng/kg)	parts per trillion
Proponent	Woodfibre LNG Limited
Stantec	Stantec Consulting Ltd.
TBT	tributyltin
TEF	toxic equivalence factor
TEQ	toxic equivalence
The Application	The Application for an Environmental Assessment Certificate

The Project	The Woodfibre LNG Project
The Proponent	Woodfibre LNG Limited
TRV	toxicological reference value
US EPA	United States Environmental Protection Agency

1 Introduction

Woodfibre LNG Limited (the Proponent) is constructing a liquefied natural gas (LNG) facility on the former Woodfibre pulp mill site, approximately seven kilometers (km) west-southwest of Squamish, British Columbia (BC). The construction and operation of the Woodfibre LNG Project (the Project) required an Environmental Assessment Certificate (EAC) issued by the BC Environmental Assessment Office (EAO) and the Impact Assessment Agency of Canada (IAAC; formerly known as the Canadian Environmental Assessment Agency). On October 26, 2015, the BC EAO and IAAC issued an EAC for the Project (#E15-02), which was subject to conditions that the Proponent must adhere to. The EAC conditions that are relevant to this Human Health Risk Assessment (HHRA) report require that the Proponent monitor fish and shellfish for chemicals of potential concern (COPC) before, during, and after marine construction activities.

Stantec Consulting Ltd. (Stantec) developed a Seafood Monitoring Program on behalf of the Proponent. The Seafood Monitoring Program includes those works required to satisfy the EAC conditions related to seafood consumption. The purpose of the Seafood Monitoring Program is to confirm the predictions related to seafood quality presented in the Application. The Application predicted that there would be no significant adverse change in concentrations of COPCs in seafood during and after marine construction activities. It further predicted that COPC concentrations would remain within levels that do not represent an unacceptable health risk to seafood consumers.

In this context, the Seafood Monitoring Program functions as an early detection mechanism for changes in COPC concentrations that may have implications for human health. If monitoring results indicate a substantial increase in health risk to seafood consumers relative to existing conditions, these findings would provide timely information to local seafood harvesters and relevant authorities. This information may be used to inform risk management responses, which could include targeted advisories, refinement of monitoring frequency or spatial coverage, or implementation of additional mitigation measures, as appropriate to the nature and magnitude of the observed change.

1.1 Human Health Risk Assessment (2016)

In 2016, Keystone Environmental Ltd. (Keystone) conducted an updated HHRA to assess the health risk to Indigenous and recreational land users from their exposure to COPCs when consuming locally harvested seafood near the Project (Keystone 2016). This HHRA focused on human and ecological risks associated with exposure to chemicals in marine sediment within the Project’s water lot. Sediment chemistry data from past site investigations were compared to BC Contaminated Sites Regulation (CSR) soil quality standards for the protection of human health to identify constituents that may be of potential health concern. The soil quality standards only apply to scenarios where people have direct physical contact with contaminated soil or sediment (e.g., a person standing barefoot in the sediment), and they have no application as screening guidelines to identify contaminants in biota used as food (e.g., plants growing in soil, seafood living and feeding near marine sediment). However, since there are no environmental quality guidelines to screen for contaminants in seafood, the soil quality standards were used.

Using this screening method, copper, lead, and PAH were measured in the sediment at concentrations higher than the BC CSR soil quality standards and consequently these chemicals were designated as COPCs in seafood. Other methods of screening or identifying COPCs were applied as well as described below.

Provincial and federal regulators had concerns regarding potential health risks from polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/F) in seafood because these toxic compounds are known by-products of a chlorinated bleaching process used in some pulp and paper mills preceding the 1990s. The former Woodfibre pulp mill used this chlorinated paper bleaching process and was a known source of PCDD/Fs. Effluent regulations in the 1990s dramatically reduced PCDD/F concentrations in pulp mill effluent until new bleaching technology became available which eliminated the use of chlorinated products and eliminated the production of PCDD/Fs.

Although PCDD/Fs are persistent and can bioaccumulate in aquatic food webs, there is currently no site-specific empirical evidence indicating PCDD/F contamination in local marine sediments or seafood tissues. Consistent with this, there are no fisheries closures or consumption advisories in the area attributable to PCDD/Fs. For context, Fisheries and Oceans Canada (DFO) applies a dioxin contamination advisory for crab hepatopancreas based on PCDD/F concentrations exceeding 15 parts per trillion (ppt).

Accordingly, the inclusion of PCDD/Fs in the Seafood Monitoring Program is precautionary and based on historical site use, rather than on measured concentrations or confirmed contamination in the local environment or seafood.

Provincial and federal regulators also had concerns regarding methylmercury in seafood because of its bioaccumulation potential. Although total mercury concentrations were less than the BC CSR soil quality standard, the bioaccumulation potential was cited as a rationale to include it as a COPC. Since it is important to distinguish the fraction of total mercury that is methylmercury, both forms of mercury were selected as COPCs.

Tributyltin (TBT) is a non-BC CSR regulated chemical, but it was included as a COPC because the concentration of TBT in the sediment was above the Puget Sound Dredge Disposal Analysis limit. This guideline from Washington state in the United States was used for comparison because Project construction activities originally included dredging of marine sediment and no provincial or federal dredging guideline was available for TBT. At present, the Project construction activities have been revised and are expected to require limited or no dredging.

The HHRA characterized the potential health risk to people harvesting and consuming Dungeness crab meat, Dungeness crab hepatopancreas, and English sole meat from within the Project’s water lot. Based upon the concentration of COPCs measured in each type of seafood and an assumed consumption rate for each type of food, the conclusion was that there were no unacceptable human health risks from exposure to COPCs for people harvesting and consuming seafood from within the Project’s water lot.

The HHRA also included the prediction that marine activities associated with Project construction and operation would have no significant adverse change on COPC concentrations in seafood because the degree of sediment disturbance is limited, marine life is already exposed to these COPCs in the sediment, and the Project is either not a source or a limited source of these COPCs under normal construction and operation scenarios. This prediction is the underlying basis that the EAC conditions are built upon.

1.2 Provincial Environmental Assessment Conditions

After the BC EAO granted the EAC for the Project on October 26, 2015, it issued a number of conditions that the Proponent must adhere to. The full list of provincial EAC conditions established by the BC EAO are in Appendix A. It should be noted that the provincial and federal conditions included arsenic, cadmium, and zinc as additional COPCs without context or rationale for the decision. Arsenic, cadmium, and zinc were not identified as COPCs in the 2016 HHRA, and were not previously assessed for their potential risk in seafood.

The provincial conditions applicable to the monitoring of COPCs in seafood are as follows (verbatim) (BC EAO 2016):

Section 6 – Marine Water Quality – Construction

"The Holder must develop, in consultation with Ministry of Environment, Ministry of Health, Fisheries and Oceans Canada, Oil and Gas Commission, Vancouver Coastal Health and Aboriginal Groups, a marine water quality management and monitoring plan for Construction. The plan must include at a minimum:

- Results of the baseline shellfish and groundfish tissue sampling and the human health risk assessment, including arsenic, cadmium, copper, lead, zinc, methylmercury, tributyltin, polycyclic aromatic hydrocarbons, and polychlorinated dibenzo-p-dioxins and furans;
- A post-Construction follow-up program to confirm human health risk assessment, including potential additional tissue sampling to confirm the assessment predictions regarding the bioavailability and bioaccumulation of toxins in marine organisms consumed by humans, if the potential for human health risk is identified in the baseline human health risk assessment; and
- An adaptive management plan to address the effects of the Project on water quality in the event (i) those effects are not mitigated to the extent identified in the Application, or (ii) effects on water quality occur that were not predicted in the Application.

A Qualified Professional must develop the plan and supervise the implementation of the plan. The Holder must provide the plan to EAO no less than 60 days prior to the Holder's planned date to commence construction in the marine environment. The Holder must not commence Construction in the marine environment until the plan is approved by EAO. Once approved, the Holder must also provide the final plan to Ministry of Environment, Ministry of Health, Fisheries and Oceans Canada, Oil and Gas Commission, Vancouver Coastal Health and Aboriginal Groups. The Holder must implement the plan to the satisfaction of EAO."

1.3 Federal Environmental Assessment Conditions

The full list of Federal Decision Statement (FDS) conditions established by the Impact Assessment Agency of Canada are in Appendix B. The federal conditions applicable to the Seafood Monitoring Program are as follows (verbatim) (IAAC 2018):

Condition 6.5

The Proponent shall, in consultation with Aboriginal groups and relevant health authorities, develop, prior to construction, and implement a follow-up program to verify the assessment predictions regarding the bio-availability and bio-accumulation of contaminants in fish consumed by humans. The follow-up program shall include:

- 6.5.1 Prior to the commencement of marine in-water construction activities, establishing baseline conditions in the tissue of shellfish and groundfish for polycyclic aromatic hydrocarbons, polychlorinated dibenzo-p-dioxins and furans, copper, lead, zinc, tributyltin, arsenic, cadmium and methylmercury and using this information to update the human health risk assessment for the consumption of shellfish and groundfish;
- 6.5.2 During marine in-water construction activities, monitor the re-suspension and bio-availability of polycyclic aromatic hydrocarbons, polychlorinated dibenzo-p-dioxins and furans, copper, lead, zinc, tributyltin, arsenic, cadmium and methylmercury in the tissue of shellfish and groundfish; and,
- 6.5.3 If a potential for human health risk is identified in the updated human health risk assessment for the consumption of shellfish and groundfish referred in condition 6.5(a) or through monitoring referred in condition 6.5(b), conducting additional sampling of polycyclic aromatic hydrocarbons, polychlorinated dibenzo-p-dioxins and furans, copper, lead, zinc, tributyltin, arsenic, cadmium and methylmercury in the tissue of shellfish and groundfish to confirm the assessment predictions regarding the bioavailability and bioaccumulation of contaminants in fish consumed by humans. If required, additional sampling shall start immediately upon completion of marine in-water construction activities and continue for one year following completion of marine in-water construction activities. The Proponent shall communicate the results of the follow-up program, including the results of any additional sampling to Aboriginal groups."

1.4 Scope and Objective of the Seafood Monitoring Program

The objective of the Seafood Monitoring Program is to meet the Project's conditions linked to the monitoring of COPCs in seafood as described in Section 1.2 and Section 1.3. Dungeness crab is the representative shellfish and English sole is the representative groundfish used for COPC monitoring, using the meat from both. However, the hepatopancreas organ of the Dungeness crab has an equivalent function to a liver, and this organ tends to accumulate toxic metals and organic contaminants. This organ is commonly consumed as a delicacy due to its rich fat content; and is commonly referred to as "crab butter". Due to the potential risk of exposure to higher concentrations of metal and organic contaminants when consuming crab hepatopancreas, this organ was also included in the Seafood Monitoring Program. Based upon these EAC conditions, the objective of this Seafood Monitoring Program includes:

1. The collection of shellfish (Dungeness crab) and groundfish (English sole) tissue (meat and hepatopancreas) during pre-construction, mid-construction, and post-construction periods.
2. The analysis of Dungeness crab meat, Dungeness crab hepatopancreas, and English sole meat to measure concentrations of PAH, PCDD/F, TBT, arsenic, cadmium, copper, lead, mercury, methylmercury, and zinc.
3. Evaluate whether there is a statistically significant increase in COPC concentrations in seafood during the mid-construction and post-construction periods, relative to the pre-construction baseline.
4. If a statistically significant increase in COPC concentrations in seafood is found, assess the potential health risk to seafood consumers.

The existing conditions were established in 2021 during the pre-construction period. This iteration of the Seafood Monitoring Program presents the 2025 mid-construction period that will be compared to the 2021 pre-construction period.

The scope of the Seafood Monitoring Program is limited to identifying changes in concentrations of COPCs in seafood that may be attributable to Project marine construction activities. The program does not evaluate existing baseline conditions as a comprehensive regional health risk assessment, and does not characterize, quantify, or provide conclusions regarding health risks outside of the Woodfibre Project area. The program is not intended to evaluate or address existing health risks associated with COPCs originating from historical or ongoing activities of other industrial sources in the region. These external sources contribute to existing COPC concentrations in the marine environment and are outside the Proponent's control. Accordingly, the program does not provide health risk assessments, risk management recommendations, mitigation measures, or seafood harvesting advisories for locations outside of the Woodfibre site. The Seafood Monitoring Program therefore focuses on detecting Project-related changes in COPC concentrations in seafood collected from only the Project area.

2 Site Characterization

The site characterization provides a general description of the region surrounding the Project that is related to the condition of the marine environment and the quality of locally harvested seafood. This includes a description of past and present industrial activities that introduce contaminants to the marine environment, seafood harvesting bans, and seafood harvesting activities by recreational, commercial, and Indigenous marine users.

2.1 Woodfibre LNG Project Site

The Project site, illustrated in Figure 2.1, is located on the west side of Howe Sound, within the District of Squamish, approximately seven kilometres southwest of downtown Squamish. The Project site occupies an area of approximately 95 hectares (110 hectares including the waterlot). The Project site resides at the mouth of Mill Creek, which discharges into Howe Sound. This site was formerly occupied by the Woodfibre Pulp and Paper Mill that operated on the site from 1910 until its decommissioning in 2006. Two sawmills were also located on the site historically. The original sawmill was built around 1908 on upper Mill Creek but reportedly washed away in 1930. The second sawmill operated at the north end of the site in the 1960s and 1970s. There was also the townsite of Woodfibre which housed the mill staff and their families, which was present on the site from 1917 until its decommissioning in 1973. Residential buildings were located north, west, and south of the pump mill plant area. Boat traffic was present in the Woodfibre waterlot including vessels associated with sawmill and pulp mill operations and a ferry service from Squamish to the Woodfibre site.

2.1.1 Current Construction Activities for the Project (2023-2025)

Marine construction activities for the Project commenced in late 2023 and have continued through 2025 within the foreshore and nearshore areas of the Certified Project Area (CPA). These activities have involved shoreline modification, dredging, pile installation and removal, and the development of floatel mooring and berthing infrastructure. The progression of work reflects an initial phase of shoreline preparation and mooring installation, followed by expanded in-water construction and infrastructure development, and continued marine works into 2025.

In November 2023, construction activities were initiated, with marine in-water works beginning in December 2023. Early works focused on shoreline demolition, excavation, and revetment construction. Shoreline excavation was undertaken using a clamshell dredge within the foreshore and shoreline areas of the CPA. Concurrently, pile installation activities were conducted to support floatel mooring infrastructure, including installation of 36-inch piles and temporary 20-inch support piles using vibratory hammers. Temporary piles installed during this period were subsequently removed following completion of their function.

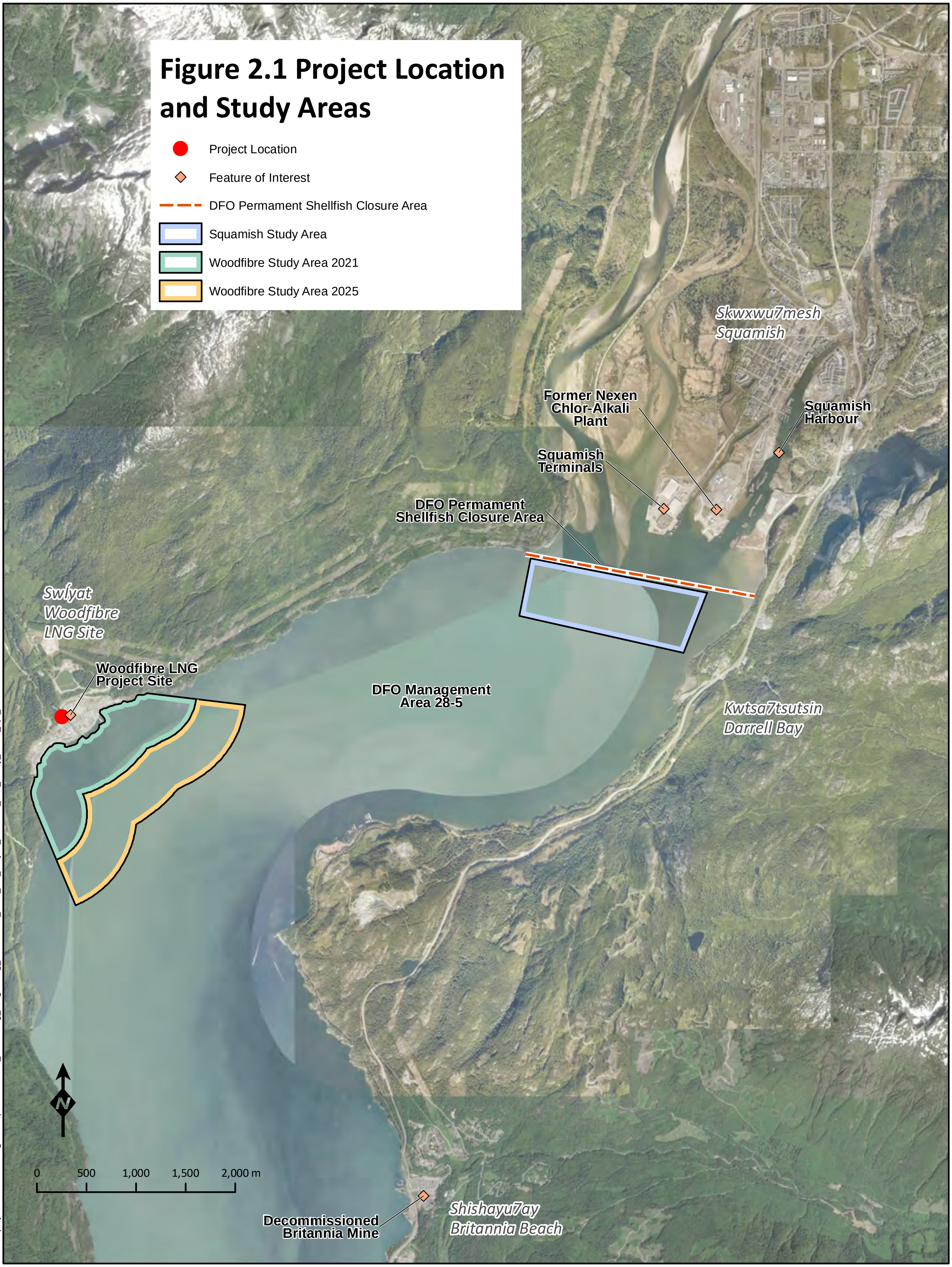

Figure 2.1 Project Location and Study Areas

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Through 2024, marine construction activities expanded in scope and frequency. In-water vibratory piling continued in early 2024 to support floatel mooring systems, including gangways, floating docks, and associated infrastructure. In June 2024, removal of two in-water piles and temporary relocation of a dock breakwater barge were undertaken to facilitate floatel mobilization and mooring. Additional removal of legacy shoreline infrastructure, including the berthing structure, occurred during this period, with associated disturbance of creosote-treated materials identified during dredging and revetment works.

Dredging activities in 2024 included shoreline excavation and sediment removal associated with shoreline demolition, temporary barge ramp construction, and revetment installation. Clamshell dredging was conducted in nearshore areas of Howe Sound, including concurrent operations with piling activities. A localized encounter with creosote-affected sediments was documented during shoreline revetment dredging in September 2024, indicating disturbance of historically impacted materials. By December 2024, construction of floatel berthing and mooring infrastructure, including docks and gangways, had been completed, and the floatel was moored and operational on site.

In 2025, marine construction activities continued within the CPA, including ongoing dredging and in-water works associated with foreshore construction and pile driving. While specific volumes and dates were not reported, dredging remained an active component of marine construction. Installation of additional mooring and berthing infrastructure was undertaken to support a second floatel, including anchor placement and realignment.

Overall, marine construction activities have been concentrated within nearshore and foreshore environments and have involved repeated interaction with marine sediments through excavation, dredging, pile installation and removal, and vessel-supported operations. An annual summary of marine works is provided below:

2023 (Initiation of Marine Works):

- Commencement of construction (November 2023)
- Shoreline demolition, excavation, and revetment works (December 2023)
- Clamshell dredging within foreshore and shoreline areas
- Installation of floatel mooring piles (36-inch permanent piles and temporary 20-inch piles)
- Subsequent removal of temporary support piles

2024 (Expansion of In-Water Construction):

- Continued vibratory pile installation for floatel mooring and marine infrastructure (early 2024)
- Removal of two in-water piles and relocation of dock breakwater barge (June 2024)
- Removal of legacy berthing structure, including creosote-treated materials
- Shoreline dredging and excavation for barge ramp construction and revetment works
- Clamshell dredging in nearshore areas, including concurrent operations with piling
- Encounter with creosote-affected sediments during dredging (September 2024)

- Completion of floatel berthing and mooring infrastructure (by December 2024)

2025 (Ongoing Marine Construction and Expansion):

- Continued dredging within the CPA as part of active in-water works
- Ongoing foreshore construction and pile-related activities
- Installation of mooring and berthing infrastructure for Floatel #2

2.2 Historical Industrial Activities

2.2.1 Britannia Gold and Copper Mine (1904-1974)

The former Britannia Mine was operational from 1904 to 1974. At the time, the Britannia Mine was considered among the largest sources of metal contamination in North America. It is currently a mining museum with ongoing environmental remediation and environmental monitoring work being conducted. Environmental monitoring reports for the Britannia Mine indicates that groundwater and marine porewater contain concentrations of boron, cadmium, chromium, copper, lead, manganese, mercury, nickel, and zinc that are above the British Columbia water quality guidelines for the protection of marine and estuarine aquatic life (Ocean Watch 2020). Sediments along the shoreline of the former Britannia Mine contain copper and mercury at concentrations higher than federal sediment quality guidelines for the protection of aquatic life (Ocean Watch 2020). It is highly probable that effluent discharges to the ocean that contain cadmium, copper, lead, mercury, and zinc have migrated northward toward Squamish and the Project area due to natural wave action and tidal momentum. These metals would eventually form non-soluble salts in the ocean and deposit onto the ocean bottom as sediment particles.

2.2.2 Nexen Chlor-Alkali Plant (1965 to 1991)

The former Nexen chlor-alkali plant was located south of Squamish. It operated from late 1965 to 1991 producing caustic soda, hydrochloric acid, and chlorine to support Woodfibre Pulp and Paper Mill’s bleaching processes. The manufacture of these chemicals used a mercury-cell technology that resulted in losses of mercury to the atmospheric and marine environments through plant exhaust and effluent. Approximately six hectares of the Nexen site became heavily contaminated with mercury over the 26 years of operation. By the early 1990s, the chlor-alkali pulp and paper bleaching process used at the former Woodfibre pulp mill was being phased out because the process produced a highly toxic by-product known as PCDD/F. New effluent regulations in 1990 and the development of new paper bleaching technology that did not produce PCDD/F as a by-product led to the permanent closure of the Nexen chlor-alkali plant in 1991 (BC ENV 2009, LMRESD 2007).

Remediation efforts following the closure of the Nexen plant involved the removal 150,000 tonnes of mercury contaminated soil and sludge from the site. However, significant quantities of mercury had migrated and dispersed in the region during the 26 years of operation, and remediation efforts did not extend to the area where mercury dispersed in the marine environment (BC ENV 2009). Since metals do not degrade further into more basic elements, it is expected that mercury concentrations (and possibly methylmercury) in the sediment and biota downstream from the former Nexen plant, including the Woodfibre site, would be elevated.

2.3 Current Industrial Activities

2.3.1 Squamish Terminals

Squamish Terminals is located in Squamish Harbour and currently operates as a breakbulk terminal. Breakbulk terminals are used for the shipping and receiving of products without the use of standard cargo containers. Examples of products handled at Squamish Harbour include wood pulp, logs, electric buses, and large sections of pipeline for the oil and gas industry.

The wide variety of products handled at Squamish Terminals has the potential to introduce a range of contaminants into the environment through product spills and accidents. For example, two large fires have taken place at Squamish Terminals in April 2015 and December 2017 (personal communications between Stantec field staff and Squamish Terminals employees, March 2022). The fire in 2017 continued for more than two weeks and would have produced large quantities of smoke and soot containing PAH and other contaminants (e.g., fuels). The smoke and soot would have settled onto the surrounding land and water, while the water and other firefighting chemicals used to extinguish the fire would have washed into the marine environment and could eventually migrate downstream towards the Woodfibre study area.

These types of historical events may be reflected in seafood quality data collected during the 2021 pre-construction baseline sampling program. Since completion of the 2021 pre-construction period, there have been no identified major marine or harbour incidents in Squamish Harbour that would be expected to introduce substantial quantities of chemical contaminants to the marine environment. However, smaller-scale or operational incidents may have occurred that are not captured in publicly available records.

2.4 Seafood Harvesting Activities

Howe Sound falls within DFO Management Area 28, which encompasses Squamish, Vancouver, Bowen Island, and Indian Arm. The marine environment surrounding the Project falls within sub-Management Area 28-5, as illustrated in Figure 2.1. This area is very popular among recreational, commercial, and Indigenous seafood harvesters.

The tidal waters of the Squamish River are frequented by fishers during the salmon spawning season. These include species of chinook (Oncorhynchus tshawytscha), coho (Oncorhynchus kisutch), pink (Oncorhynchus gorbuscha), and sockeye (Oncorhynchus nerka) salmon. In open waters, common types of harvested fish include various species of herring, tuna, mackerel, cod, sole, and trout. Dungeness crab (*Metacarcinus magister*) and red rock crab (*Cancer productus*) are popular crab species among recreational harvesters, commercial fishing tours and guides, and commercially operated crabbers.

2.5 Seafood Harvesting Bans and Restrictions

Management Area 28 is closed to all forms of bivalve harvesting year-round due to the potential for contamination from marine biotoxins (e.g., red tide), bacteria, or viruses. This includes all bivalve species of clams, scallops, mussel, oysters, and geoduck (DFO 2025a).

Two other types of sanitary harvesting bans applicable to bivalves include:

- A permanent harvesting ban on all species of bivalves within a 300-metre radius of industrial, municipal, and sewage treatment plant outfall discharges (DFO 2025a).
- A permanent harvesting ban on all species of bivalves within a 125-metre radius of any marine, ferry wharf or floating living accommodation facility (DFO 2025a).

The first sanitary ban applies to the Squamish sewage treatment plant outfall discharge while the second sanitary ban applies to the proposed Floatel to accommodate Project personnel during construction.

There are also area-specific bans and consumption advisories for crabs that are issued annually by the DFO. For example, the DFO Integrated Fisheries Management Plan for the period encompassing April 1st, 2025 to March 31st, 2026 allows for the consumption of crab hepatopancreas in Management Area 28, but recommends the consumption rate be limited to a range of 55 to 130 grams per week, depending on the sub-Management Area due to potential heavy metal (e.g., mercury) and PCDD/F contamination (DFO 2025b, 2025c). It is illegal to harvest, and unsafe to consume, these types of shellfish from closure areas at any time of the year (DFO 2025a).

The DFO also applies a bivalve and crab harvesting ban for PCDD/F contamination if the concentration in crabs, oysters, prawn, or shrimp muscle tissue exceeds 15 parts per trillion (ppt) of tissue, based on a toxic equivalent of 2,3,7,8-tetrachloro-dibenzo-p-dioxin. The harvesting ban for PCDD/F contamination typically applies to areas near former pulp and paper mills using a chlorinated paper bleaching process because PCDD/F is produced as a by-product. However, the waters surrounding the Woodfibre site are not currently under a harvesting ban for PCDD/F contamination. The nearest location with a PDCC/F harvesting restriction is located 20 km southwest of the Project, in Management Area 28-1 and 28-3, along the shoreline of Gambier Island (DFO 2025c). The PCDD/F harvesting ban trigger of 15 ppt is referenced here because it is relevant when comparing to the measured concentration of PCDD/F during the course of this Seafood Monitoring Program.

Contamination and marine biotoxin harvesting bans apply to bivalves and shellfish, but not to fish. However, there are conservation regulations applicable to specific types of fish (e.g., eulachon, rock fish, lingcod, and sturgeon). However, the Seafood Monitoring Program is not affected by fishing restrictions because there are no conservation restrictions on English sole.

3 Problem Formulation

The problem formulation stage establishes an overall understanding of how people may be exposed to COPCs at a site so that the potential health risks associated with COPC exposure can be evaluated. For this HHRA, the problem formulation has already been established through the 2016 human health risk assessment conducted by Keystone and is reflected in the applicable provincial and federal EAC conditions. As such, the current assessment applies this established framework and focuses specifically on the exposure pathway associated with the consumption of seafood.

The problem formulation is comprised of three main components:

1. Identifying the relevant COPCs (screening) that could affect human health risk.
2. Identifying human receptors for the study.
3. Identifying the plausible exposure pathways through which human receptors could be exposed to COPCs.

These three components of the problem formulation stage are integrated to develop a conceptual site model, which is the foundation of a risk assessment. The conceptual site model identifies the plausible exposure pathways where human receptors could be exposed to COPCs.

3.1 Chemicals of Potential Concern

The COPCs for the Seafood Monitoring Program were established as part of the Project’s EAC conditions described in Section 1.2 and Section 1.3. These COPCs include the following organic, organometallic chemicals and metals:

- PAH (organic)
- PCDD/F (organic)
- TBT (organometallic)
- Methylmercury (organometallic)
- Cadmium (metal)
- Copper (metal)
- Lead (metal)
- Mercury (metal)
- Zinc (metal)

3.2 Study Areas

There are two study areas included in the Seafood Monitoring Program, shown in Figure 2.1. Their purpose and rationale for selection are as follows:

- **Woodfibre Study Area** - The Woodfibre study area is the primary site of interest in the Seafood Monitoring Program. The initial area of interest for Dungeness crab and English sole included the waters up to 500 metres from the Project's shoreline. This is the expected distance that disturbed sediments may travel before re-settling as a result of Project activities in the marine environment, and it is the expected area where potential changes to COPC concentrations in seafood are most likely to be detectable.
- For the mid-construction collection period, the study area was adjusted the area between 500 to 1,000 metres from the Project shoreline. This adjustment was implemented to accommodate marine safety zones established around active construction areas and floatel anchoring infrastructure, where fishing and the deployment of crab traps within 500 metres of the Project were not permitted. The expanded study area allowed for continued sampling within accessible locations while maintaining coverage of areas where Project-related influences on seafood quality may occur.
- **Squamish Study Area (Reference Site)** - The Squamish study area is an upstream reference site to the Woodfibre study area. This study area encompasses the marine waters at the mouth of the harbour just past the sanitary harvesting ban boundary for industrial, municipal, and sewage treatment plant outfall discharges. The purpose of the Squamish study area is to detect any potential contaminant effects coming from the harbour so that it can be distinguished from potential construction-related effects at the Woodfibre study area.

3.3 Target Seafood Species

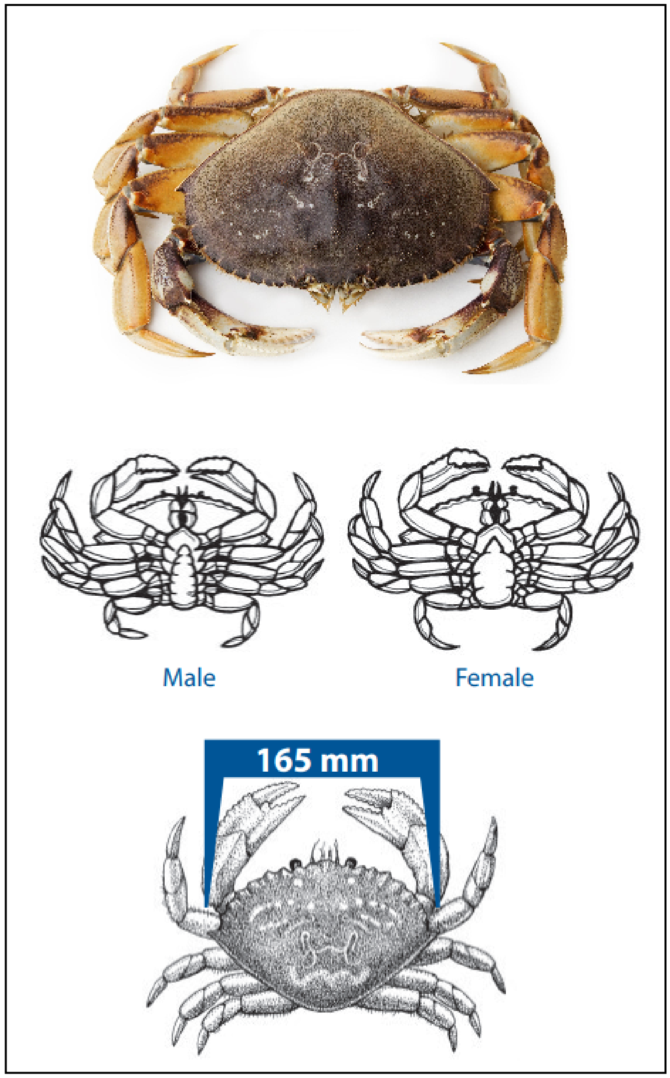
Various types of seafood were considered for the Seafood Monitoring Program including pelagic and benthic fish, bivalves, and crustaceans. Since the purpose of the study is to monitor sediment-based COPCs in seafood, the species that were selected were required to meet the following conditions:

4. The species must either be a fish or shellfish, as required by the EAC and FDS conditions.
5. The species is naturally present in both study area.
6. The species is commonly harvested by recreational, commercial, and/or Indigenous Nations for consumption.
7. The species is exposed to sediment-based COPCs by living and feeding along the bottom of the ocean.
8. The species is non-migratory and has a small home range such that an individual could reasonably spend most of their life in proximity to the study area. This would mean that COPCs in the tissues represent substances acquired from within this home range.

These conditions are required for any species of seafood to be considered suitable for the Seafood Monitoring Program. When considering the various types of species proposed by Squamish Nation, Dungeness crab and English sole were selected as the representative species of shellfish and fish. The following sub-sections provide a brief description of each seafood.

3.3.1 Dungeness Crab Meat (*Metacarcinus magister*)

Dungeness crab is the most common and commercially important crab species along the coast of British Columbia. They are commonly harvested by recreational, commercial, and Indigenous harvesters.



Dungeness crab thrive in colder water and prefer variable water depths ranging from the intertidal zone to at least 250 metres below sea level. However, they are most abundant above 50-metres in depth (DFO 2025b). Dungeness crab live and feed along the ocean bottom. They are omnivorous predatory scavengers that hunt for snails, mussels, clams, shrimp, and worms, or scavenge dead animals on the ocean floor. Younger crabs consume seaweeds such as kelp or eelgrass.

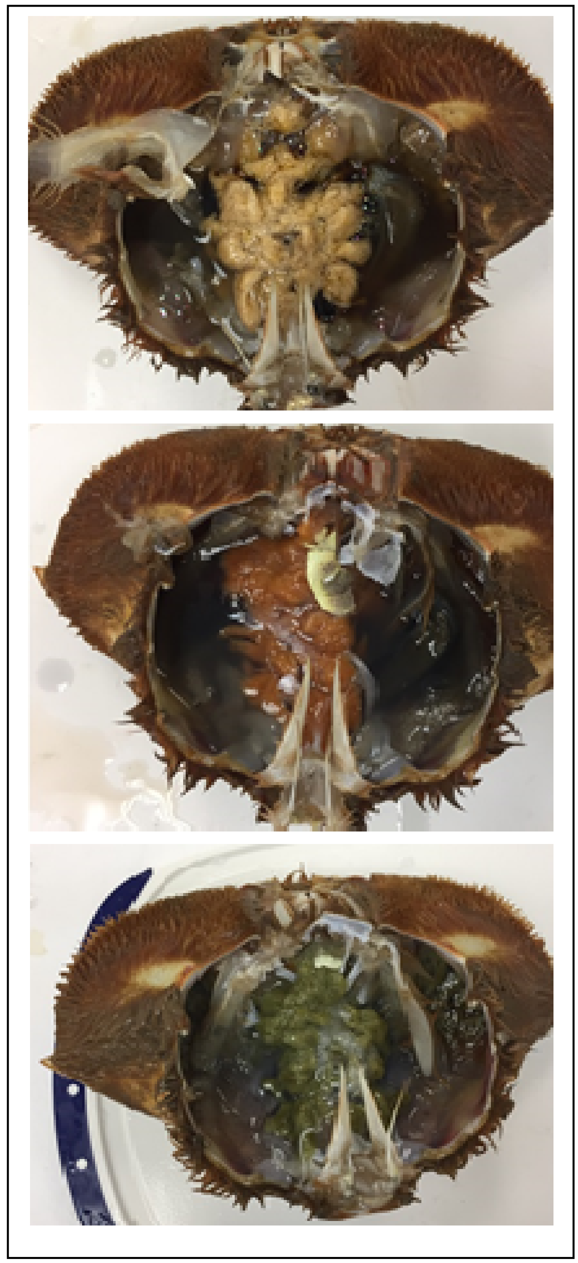
Adult crabs can reach up to 2 kilograms in weight and up to 220 millimeters in shell width. However, most crabs caught for commercial sale are less than 200 millimeters and approximately 1 kilogram in weight. Female crabs are generally smaller than males.

DFO regulations require that all harvested and retained Dungeness crabs must be adult males with a carapace width of 165 millimeters or more. Female crabs cannot be retained for consumption and must be returned to the water immediately. The sex of the crab can be identified by the shape of the abdomen flap on the crab's underside. Males have a pointed abdomen flap, while females have a rounded abdomen flap, as shown in the illustration.

For the Seafood Monitoring Program, the leg meat of the Dungeness crab is collected for analysis. Based upon the dissection information gathered during laboratory work, the leg meat harvested from a Dungeness crab is approximately 25% of the crab's total weight. For example, a 1 kg crab will yield

250 grams of leg meat on average. This quantity of tissue is sufficient to meet the 60-gram minimum tissue requirements to conduct the analysis of all COPCs, as each organic COPC (i.e., PAH, PCDD/F, methylmercury, and TBT) requires approximately 15 grams of tissue. Therefore, 10 Dungeness crab is sufficient to yield a sample number of 10 for the analysis of each COPC.

3.3.2 Dungeness Crab Hepatopancreas

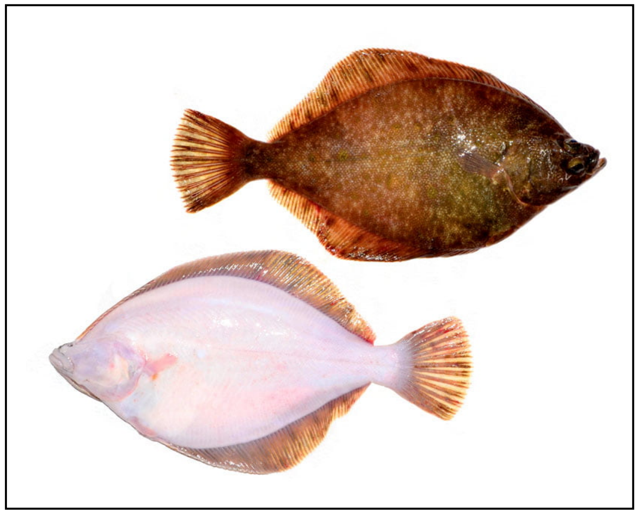


The hepatopancreas of the Dungeness crab is a fat-rich organ that is considered a culinary delicacy. It is located in the middle of the carapace shell when opened. It is typically orange or yellow in colour, but has also been observed to be grey, green, and black, as shown in the illustration. Hepatopancreas that was yellow or pale white in colour were assumed to be the healthiest because the organ was well-defined with a strong structural integrity. Orange hepatopancreas was also well-defined with moderate structural integrity. Grey and black hepatopancreas had poorly defined structure, and tended to degrade or fall apart very quickly during dissection and handling. White, yellow and orange hepatopancreas generally had the highest weights. Grey, black, and green hepatopancreas generally had the lowest weights.

The hepatopancreas performs the functions of both the liver and the pancreas. It is responsible for sequestering and metabolizing contaminants in the body. Organic contaminants are typically lipophillic (i.e., attracted to lipids and oils), and therefore tend to accumulate in the fat-rich tissues of the hepatopancreas where they are metabolized into water-soluble metabolites and excreted. The hepatopancreas also produces metallothionein proteins which are responsible for binding and sequestering toxic heavy metals. Metals that are micronutrients (e.g., copper and zinc) required for critical biological processes are typically not sequestered by metallothioneins for excretion since they are required for proper biological function. For these reasons, the hepatopancreas tends to contain higher concentrations of organic contaminants (and their metabolites) and toxic metals (e.g., arsenic, cadmium, lead, mercury, and methylmercury) compared with tissues that have lower lipid and fat content (e.g., muscle tissue). For this reason, the hepatopancreas organ is commonly used as a bioindicator in scientific studies to monitor levels of organic contaminants such as PCDD/F and PAH. The hepatopancreas is also assumed to be a useful bioindicator to monitor for arsenic, cadmium, lead, mercury, methylmercury, and TBT.

Based upon dissection information gathered as part of the Seafood Monitoring Program, the average hepatopancreas weight was 20 grams. This information is used in the exposure assessment, when defining the consumption rates of each type of seafood.

3.3.3 English Sole Meat (*Parophrys vetulus*)



The English sole is one of several flatfish or flounder species that lives on sandy and muddy bottoms near shores and estuaries on the Pacific west coast. They are right-eyed flatfish (both eyes are on the right side of the body). The dorsal side has camouflage patterns to blend in with the sediment while the ventral side is white, as illustrated.

The diet of the English sole is mainly composed of benthic marine invertebrates and zooplankton that lives in the sediment, such as marine worms, molluscs, crustaceans, echinoderms, and copepods. They typically live in deeper waters during the winter and move to shallow depths in the summer, but they do not migrate over long distances during their lifetime.

English sole can reach up to almost 60 centimetres in length and can weight up to 1.5 kg. During the study, the English sole collected ranged from 15 to 30 centimetres in length and 100 to 500 grams in weight. The average was 20 centimetres in length and 200 grams in weight.

Based upon field data gathered as part of the Seafood Monitoring Program, the filet of an English sole was on average 25% of the total body weight. The remaining 75% of the body weight included the head, skin, and bones. Using the average size of an English sole, a single fish yielded 50 grams of meat on average. This quantity is applied to the Seafood Monitoring Program when considering a person’s food consumption rate.

3.4 Human Receptor Identification

Human receptors are the people within a population that will be or could be exposed to COPCs from the consumption of seafood harvested from the Woodfibre and Squamish study areas. This includes members of the Squamish Nation, other Indigenous harvesters, residents of Squamish and nearby towns, tourists and recreational marine users who harvest seafood.

Although there are many types of human receptors for the consumption of seafood, members of the Squamish Nation are the primary human receptors of interest. This is because Dungeness crab and other local seafoods are critically important traditional foods for the Squamish Nation. Although the other human receptor groups consume locally harvested seafood, their rate of seafood consumption is presumably less than that of Squamish Nation seafood consumers. Other human receptors such as Squamish residents, recreational seafood harvesters, and tourists are assumed to have a similar or lower dependence on locally harvested seafood.

The life stages that are considered include toddlers (7 months to less than 5 years) and adults (20 to less than 80 years). Toddlers are assessed because they have a higher rate of food consumption per unit body weight relative to adults. This means that toddlers could have a higher degree of COPC exposure per unit body weight, even though toddlers consume less food in total compared to adults. Adults are assessed because this age category represents a lifetime of exposure. The adult life stage is also used to assess lifetime cancer risk from exposure to carcinogenic COPCs such as arsenic and PAH.

Infants (i.e., less than 7 months old) typically have a liquid diet consisting of mother’s milk or formula and are therefore not considered in this assessment. Squamish Nation children (5 to 12 years old) and teenagers (13 to 19 years old) are acknowledged as human receptors for seafood consumption, but they are not considered in this assessment because they have a lower rate of food consumption per unit body weight relative to toddlers and would therefore provide a less conservative estimate of health risk.

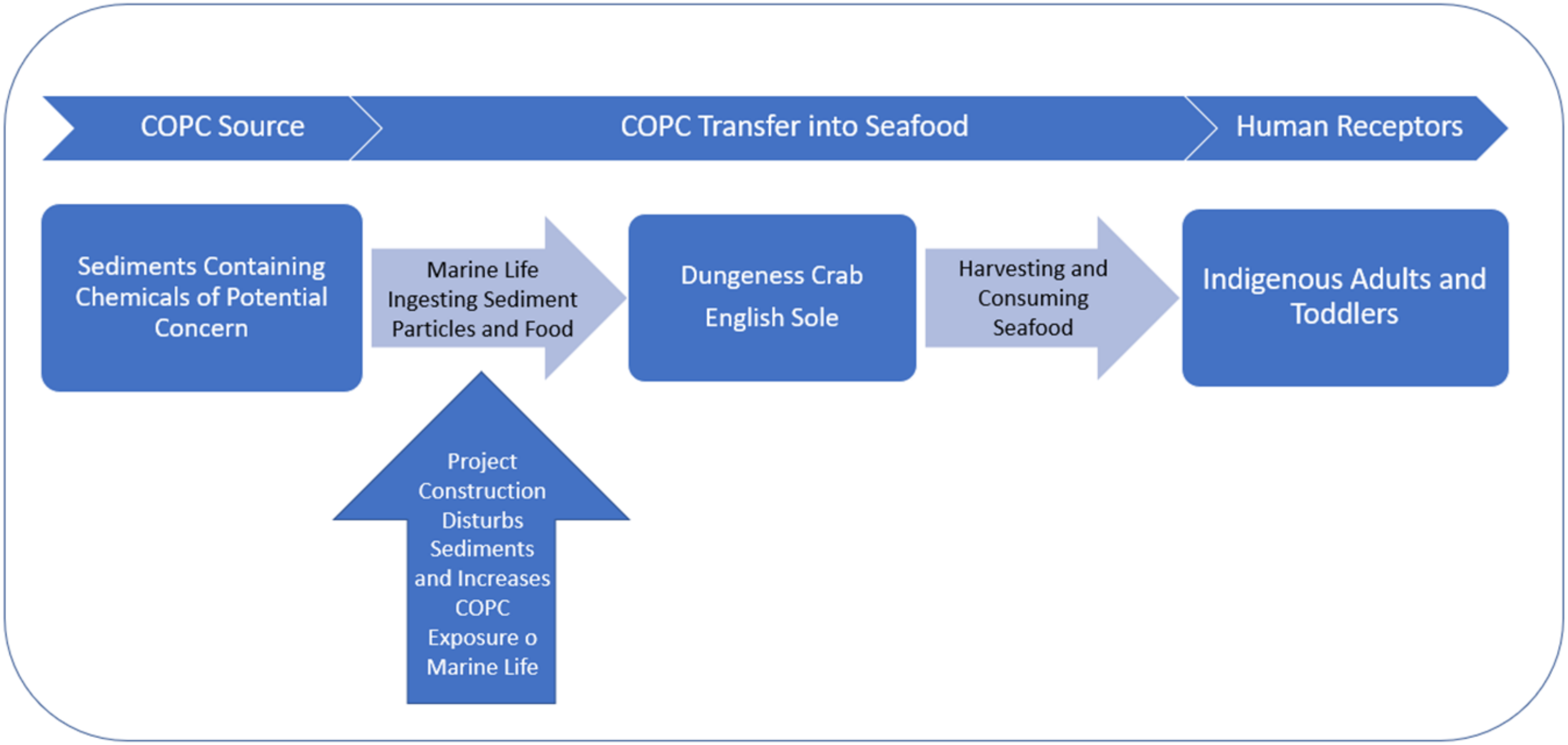
3.5 Conceptual Site Model

The conceptual site model (Figure 3.1) is the central framework for the assessment. It describes how COPCs in the marine environment could move into seafood and then be consumed by people. When a pathway is considered plausible and relevant, it is identified as “operable” and evaluated further in the assessment. Pathways that are not considered plausible or relevant are identified as “inoperable” and are not evaluated further.

This assessment focuses specifically on COPC exposure through local seafood consumption. Other potential pathways, such as inhalation or direct contact with environmental media, are not considered and not required to satisfy the provincial and federal EAC conditions. As a result, the CSM is limited to the movement of COPCs from the marine environment into seafood, and then to people by consumption.

COPCs may be present in the marine environment due to natural background conditions or historical and ongoing industrial and commercial activities in Howe Sound. Of the COPCs evaluated, PAHs are associated with Project activities, primarily from combustion sources such as flaring and fuel use in construction equipment and marine vessels. Other COPCs, including PCDD/Fs, tributyltin, methylmercury, and metals (e.g., arsenic, cadmium, copper, lead, mercury, and zinc), are not discharged by the Project. These substances are presumed to already be present in marine sediments and may be taken up by benthic-dwelling species such as Dungeness crab and English sole. Marine construction activities and vessel movement may disturb these sediments, which could recirculate COPCs into the water column and influence their uptake in marine organisms, potentially resulting in changes in COPC concentrations in seafood.

Figure 3.1 Conceptual Site Model



4 Field Collection and Laboratory Analysis

4.1 Methods

4.1.1 Field Collection

The field collection of Dungeness crab and English sole for the period representing the construction phase took place from October 3rd to 9th, 2025. In total, 30 adult male Dungeness crabs and 20 English sole were collected from each of the two study areas for a total of 60 crabs and 40 sole. Dungeness crabs were collected using 36” diameter commercial crab traps baited with chicken and canned cat food, while English sole were collected by jigging.

Overall, English sole were observed to be relatively abundant at both study areas. Catch success was influenced by fishing approach. When the vessel was anchored, English sole catch rates were low. In contrast, allowing the vessel to drift with the current resulted in a noticeable increase in catch rate of all observed fish species. This was attributed to the baited hook moving along the seabed, which increased the area covered and improved the likelihood of encountering fish. Released bycatch during these efforts included sculpins and skates, which are consistent with benthic or near-bottom habitats.

Field observations indicated that bathymetry varied considerably over short distances, with water depths changing rapidly. The use of a sonar unit was considered necessary at the Woodfibre study area to track depth and identify suitable fishing locations. This was particularly relevant for both targeting English sole and deploying crab traps.

Dungeness crab catch rates at the Woodfibre study area were low. Limited catches were observed in both relatively shallow areas (approximately 90 feet depth) and along steeper sloped terrain. Higher catch success was associated with flatter seabed areas at depths of up to approximately 300 feet, which is consistent with known habitat preferences for Dungeness crab. In some cases, deployment of approximately 10 traps with an overnight soak period yielded no adult male crabs. The low abundance of crab in the Woodfibre study area is considered to be influenced by the presence of extensive wood debris on the seafloor, associated with historical pulp mill operations. This material likely alters the benthic substrate and reduces the suitability of habitat for Dungeness crab, which typically prefer sandy or muddy environments.

Specimens were weighed and measured for body length upon capture, labelled, and placed in large zip-lock bags, then stored in a chilled, non-freezing environment within a cooler. At the end of each sampling day, an on-site dissection station was established using laboratory-provided tools and containers, and specimens were dissected in the evening. The glass containers with the tissue samples were then frozen until the end of the field program and delivered to Bureau Veritas Laboratories for analysis.

4.1.2 Laboratory Dissection

Stantec staff dissected crab leg meat, crab hepatopancreas, and English sole meat using the dissection protocol provided in Appendix C. The allocation of specimens from each study area towards each type of analysis is provided in Table 4.1.

For each of the organic COPC analyses (PAH, PCDD/F, TBT, methylmercury), a minimum tissue requirement of 15 grams was recommended by the laboratory to achieve the lowest feasible detection limit. The analysis of total metals, lipids, and moisture collectively requires less than 5 grams of tissue. Therefore, the minimum tissue requirement to analyze a single tissue sample for all COPCs is 65 grams.

A single Dungeness crab yields more than 65 grams of leg meat tissue. Therefore, the leg meat from the first 10 out of 30 crabs caught within each study area was used to analyze for all COPCs. The hepatopancreas organ of a Dungeness crab averaged 20 grams. This means that a single Dungeness crab cannot yield enough hepatopancreas tissue to meet the minimum tissue requirement of 65 grams to analyze for all COPCs. Therefore, the hepatopancreas of all 30 Dungeness crabs caught in a study area was dissected, and one or two organic COPC analysis was designated to each sample based on the organ weight. Hepatopancreas samples weighing more than 35 grams were used for two types of organic COPC analysis, while two hepatopancreas samples weighing less than 35 grams were composited into a single sample and used for two types of organic COPC analysis. For English sole, the meat from two fish were composited into a single sample for the analysis of all COPCs.

Table 4.1 Summary of Seafood Collection and Laboratory Analysis

Study Area	Specimen	Specimen Number	Tissues Collected	Lab Analysis
Woodfibre	Dungeness crab	1 – 10	Meat	PAH, PCDD/F, TBT, methylmercury, total metals, lipids, moisture
			Hepatopancreas	PAH, lipids, moisture
		11 – 20	Hepatopancreas	PCDD/F, lipids, moisture
		21 – 30	Hepatopancreas	TBT, methylmercury, total metals, lipids, moisture
	English sole	1 – 20	Meat	PAH, PCDD/F, TBT, methylmercury, total metals, lipids, moisture
Squamish	Dungeness Crab	1 – 10	Meat	PAH, PCDD/F, TBT, methylmercury, total metals, lipids, moisture
			Hepatopancreas	PAH, lipids, moisture
		11 – 20	Hepatopancreas	PCDD/F, lipids, moisture
		21 – 30	Hepatopancreas	TBT, methylmercury, total metals, lipids, moisture
	English sole	1 – 20	Meat	PAH, PCDD/F, TBT, methylmercury, total metals, lipids, moisture

4.1.3 Laboratory Analysis

Tissue samples were submitted to Bureau Veritas Laboratories for COPC analysis. For the 2025 program, methylmercury analysis was conducted in-house by Bureau Veritas. This differs from the 2021 pre-construction assessment, where methylmercury analysis was subcontracted to Flett Research Ltd. (440 DeSalaberry Avenue, Winnipeg, Manitoba). As a result, inter-laboratory differences in analytical methods, detection limits, or reported concentrations may occur when comparing results between sampling programs. TBT analysis was subcontracted by Bureau Veritas to Pacific Rim Laboratories (#103-19575 55A Avenue, Surrey, British Columbia).

The analysis of PAH, PCDD/F, and methylmercury used high-resolution mass-spectrometry or high-resolution cold vapour atomic fluorescence spectroscopy, which is required to achieve the lower detection limits that are relevant to human health. For these types of COPCs, trace amounts in the range of nanograms per kilogram (i.e., parts per trillion or ppt) may be sufficient to cause harm to humans when consumed. Low-resolution analysis is typically used for environmental media such as soil or sediment because the concentrations are typically higher in the environment and readily detectable using these lower resolution analytical methods. However, if these low-resolution methods are used to analyze seafood, the detection limit may be higher than the concentrations that pose a risk to human health. For example, the low-resolution method may only detect parts per million, but the amounts that pose a health risk are in parts per trillion.

Detection limits for PCDD/Fs have been refined and lowered in the 2025 program relative to the 2021 pre-construction assessment. In 2021, sample-specific detection limits were generally on the order of approximately 5 ppt, and results below detection were assigned a value equal to 5 ppt for evaluation purposes. In the 2025 program, detection limits are substantially lower (generally on the order of approximately 0.01 ppt, noting that detection limits vary by sample), allowing for quantification of PCDD/F concentrations that would have previously been reported as non-detect in 2021. As a result, PCDD/Fs may now be reported at measurable concentrations below 5 ppt, reflecting improved analytical sensitivity rather than an increase in environmental concentrations.

Table 4.2 shows the analytical method used for each type of COPC analysis. When available, accredited analytical methods by the Canadian Association for Laboratory Accreditation (CALA) or United States Environmental Protection Agency (US EPA) are used. For TBT, there are no accredited analytical methods, and an in-house proprietary method was used by Pacific Rim Laboratories. Metal analysis used low-resolution method because the detection limits are in the range of those relevant to human health.

Table 4.2 Analytical Methods and Method Detection Limits

Chemical of Potential Concern	Analytical Method	Method Detection Limit (mg/kg; ppm)
Polycyclic Aromatic Hydrocarbons	California EPA Method 429	0.00050*
Polychlorinated dibenzo-p-dioxins and furans	US EPA Method 1613	0.00000001*
Methylmercury	CALA Method M10221	0.000080
Tributyltin	In House Method (unpublished)	0.010
Arsenic	US EPA Method 6020B	0.0050
Cadmium	US EPA Method 6020B	0.0013
Copper	US EPA Method 6020B	0.013
Lead	US EPA Method 6020B	0.0013
Mercury	US EPA Method 6020B	0.013
Zinc	US EPA Method 6020B	0.20

* Detection limits vary by congener; the reported value reflects the highest among them.

4.2 Laboratory Analytical Results

The laboratory analytical results for COPCs in seafood are presented in tables organized by tissue type. The certified laboratory reports are provided in Appendix D.

- Table 4.3 – Crab Meat COPC Concentrations and Statistical Comparison (Woodfibre Site)
- Table 4.4 – Crab Meat COPC Concentrations and Statistical Comparison (Squamish Harbour Site)
- Table 4.5 – Crab Hepatopancreas COPC Concentrations and Statistical Comparison (Woodfibre Site)
- Table 4.6 – Crab Hepatopancreas COPC Concentrations and Statistical Comparison (Squamish Harbour Site)
- Table 4.7 – Sole Meat COPC Concentrations and Statistical Comparison (Woodfibre Site)
- Table 4.8 – Sole Meat COPC Concentrations and Statistical Comparison (Squamish Harbour Site)

Each table includes the individual laboratory results for each of the ten tissue samples analyzed for COPCs, along with the calculated 95% upper confidence limit of the mean (**95% UCLM**). The 95% UCLM represents a conservative estimate of the average COPC concentration and is used as the representative concentration for subsequent evaluation, where applicable.

Consistent with the approach applied in the 2021 pre-construction assessment, COPCs that are not detected across 90% of the dataset may be characterized as effectively non-detectable. Where concentrations are detectable in a sufficient proportion of samples, the 95% UCLM is calculated using ProUCL software (v5.2) to represent an upper-bound estimate of the mean concentration. The full set of individual sample results is provided in the tables to allow for transparency in the underlying dataset and interpretation of variability across samples.

The primary objective of this assessment is to satisfy provincial and federal environmental assessment conditions, which require evaluation of whether Project activities are associated with changes in COPC concentrations in seafood and any corresponding implications for human health risk. As such, the initial step in the evaluation is a comparison of the 2021 pre-construction baseline dataset with the 2025 mid-construction results to identify whether a statistically significant difference in COPC concentrations is present.

To support this comparison, each table includes a row labelled “Significance,” which indicates whether the comparison between the 2021 and 2025 datasets results in a statistically significant increase in concentrations. A two-tailed t-test was conducted to compare the datasets between sampling periods, with statistical significance defined at a p-value threshold of 0.05. “Not Applicable” is used where most samples are reported below the detection limit and a statistical comparison is not meaningful.

Only COPCs that exhibit a statistically significant increase in concentration between the 2021 and 2025 datasets are considered to represent a potential Project-related change. These results are identified in the tables using shaded cells and are advanced to the exposure assessment and risk characterization stages of the assessment. COPCs that do not show a statistically significant difference, or that exhibit a statistically significant decrease, are not considered indicative of a Project-related increase in exposure and are not carried forward for further risk evaluation.

Based on the analytical results and the statistical significance testing (two-tailed t-test, $p < 0.05$), select COPCs have been identified for advancement to the subsequent stages of the risk assessment. These include:

- Copper in crab hepatopancreas (Table 4.5)
- Mercury and methylmercury in English sole meat (Table 4.7)

These COPCs demonstrated statistically significant increases relative to baseline conditions and are therefore carried forward for further evaluation of potential human health implications.

Table 4.3 Crab Meat COPC Concentrations and Statistical Comparison (Woodfibre Site)

Sample Number	PAH (ppm)		PCDD/F (ppt)		Tributyltin (ppm)		Methylmercury (ppm)		Arsenic (ppm)	
	2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
1	<0.0005	<0.0005	<5.0	0.7	<0.010	<0.010	0.064	0.067	12.1	9.3
2	<0.0005	<0.0005	<5.0	0.8	<0.010	<0.010	0.023	0.082	9.8	10.3
3	<0.0005	<0.0005	<5.0	0.6	<0.010	<0.010	0.035	0.041	6.7	9.0
4	<0.0005	<0.0005	<5.0	0.2	<0.010	<0.010	0.070	0.067	10.4	7.8
5	<0.0005	<0.0005	<5.0	6.1	<0.010	<0.010	0.043	0.028	9.0	2.7
6	<0.0005	<0.0005	<5.0	0.1	<0.010	<0.010	0.039	0.098	7.7	5.4
7	<0.0005	<0.0005	<5.0	0.1	<0.010	<0.010	0.063	0.045	8.0	9.3
8	<0.0005	<0.0005	<5.0	0.2	<0.010	<0.010	0.069	0.140	7.8	12.8
9	<0.0005	<0.0005	<5.0	1.4	<0.010	<0.010	0.050	0.025	6.5	2.9
10	<0.0005	<0.0005	<5.0	0.2	<0.010	<0.010	0.039	0.069	6.2	6.1
95% UCLM	<0.0005	<0.0005	<5.0	3.0	<0.010	<0.010	0.059	0.086	9.5	9.4
Significance	Not applicable		Not applicable		Not applicable		Not significant		Not significant	

Sample Number	Cadmium (ppm)		Copper (ppm)		Lead (ppm)		Mercury (ppm)		Zinc (ppm)	
	2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
1	0.0072	0.0088	5.7	4.1	0.019	0.006	0.091	0.071	45.4	37.6
2	0.0040	0.0159	10.5	8.2	0.026	0.010	0.037	0.111	42.6	57.2
3	0.0035	0.0054	7.5	5.3	0.015	0.005	0.041	0.039	37.1	36.9
4	0.0046	0.0063	4.7	9.6	0.027	0.009	0.082	0.093	34.8	51.6
5	0.0070	0.0026	7.3	3.7	0.020	0.005	0.048	0.024	36.8	23.9
6	0.0038	0.0029	5.0	4.0	0.011	0.003	0.066	0.070	41.3	23.4
7	0.0057	0.0078	4.3	6.6	0.013	0.006	0.070	0.056	37.8	43.8
8	0.0029	0.0073	4.3	7.5	0.014	0.013	0.082	0.135	39.7	46.0
9	0.0042	0.0020	5.1	2.7	0.018	0.003	0.068	0.018	35.0	23.2
10	0.0044	0.0088	3.0	5.2	0.021	0.004	0.042	0.077	38.2	37.8
95% UCLM	0.0056	0.0092	7.0	7.0	0.022	0.008	0.074	0.091	40.8	45.1
Significance	Not significant		Not significant		Significant Decrease		Not significant		Not significant	

Shaded cells indicate the COPC is advanced to risk characterization.

Table 4.4 Crab Meat COPC Concentrations and Statistical Comparison (Squamish Harbour Site)

Sample Number	PAH (ppm)		PCDD/F (ppt)		Tributyltin (ppm)		Methylmercury (ppm)		Arsenic (ppm)	
	2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
1	<0.0005	<0.0005	<5.0	0.2	<0.010	<0.010	0.048	0.150	4.0	11.9
2	<0.0005	<0.0005	<5.0	0.1	<0.010	<0.010	0.046	0.075	7.4	3.1
3	<0.0005	<0.0005	<5.0	0.1	<0.010	<0.010	0.093	0.074	9.4	4.1
4	<0.0005	<0.0005	<5.0	0.2	<0.010	<0.010	0.121	0.130	4.7	6.4
5	<0.0005	<0.0005	<5.0	0.1	<0.010	<0.010	0.160	0.087	7.6	5.5
6	<0.0005	<0.0005	<5.0	0.2	<0.010	<0.010	0.087	0.066	6.1	5.4
7	<0.0005	<0.0005	<5.0	0.3	<0.010	<0.010	0.120	0.130	5.0	5.3
8	<0.0005	<0.0005	<5.0	0.2	<0.010	<0.010	0.050	0.160	4.0	3.7
9	<0.0005	<0.0005	<5.0	0.1	<0.010	<0.010	0.093	0.064	4.0	8.3
10	<0.0005	<0.0005	<5.0	0.0	<0.010	<0.010	0.049	0.070	4.0	5.5
95% UCLM	<0.0005	<0.0005	<5.0	0.2	<0.010	<0.010	0.109	0.122	6.7	7.4
Significance	Not applicable		Not applicable		Not applicable		Not significant		Not significant	

Sample Number	Cadmium (ppm)		Copper (ppm)		Lead (ppm)		Mercury (ppm)		Zinc (ppm)	
	2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
1	0.0027	0.0033	5.33	2.47	0.0095	0.0057	0.049	0.193	25.5	37.4
2	0.0038	0.0022	2.96	6.05	0.0085	0.0548	0.083	0.069	27.8	23.4
3	0.0060	0.0026	6.27	6.65	0.0104	0.0022	0.109	0.096	39.4	39.6
4	0.0077	0.0076	7.74	6.43	0.0119	0.0028	0.109	0.181	43.0	32.3
5	0.0031	0.0024	7.08	2.35	0.0152	0.0024	0.089	0.110	40.0	38.4
6	0.0019	0.0019	5.64	4.94	0.0133	0.0027	0.074	0.069	32.0	37.1
7	0.0034	0.0034	5.02	4.54	0.0143	0.0025	0.101	0.145	33.9	38.0
8	0.0024	0.0033	4.11	3.89	0.0102	0.0020	0.045	0.212	31.2	37.6
9	0.0056	0.0053	5.07	2.11	0.0085	0.0028	0.081	0.122	24.4	50.6
10	0.0018	0.0027	4.93	4.34	0.0103	0.0016	0.073	0.105	32.6	40.3
95% UCLM	0.0050	0.0048	6.22	5.36	0.013	0.0307	0.094	0.160	36.6	41.4
Significance	Not significant		Not significant		Not significant		Significant Increase		Not significant	

Shaded cells indicate the COPC is advanced to risk characterization.

Table 4.5 Crab Hepatopancreas COPC Concentrations and Statistical Comparison (Woodfibre Site)

Sample Number	PAH (ppm)		PCDD/F (ppt)		Tributyltin (ppm)		Methylmercury (ppm)		Arsenic (ppm)	
	2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
1	<0.0005	0.0446	<5.0	5.1	<0.010	0.034	0.019	0.009	9.2	8.1
2	<0.0005	<0.0005	<5.0	35.7	<0.010	<0.010	0.053	0.005	6.6	6.6
3	0.002	<0.0005	<5.0	11.8	0.013	<0.010	0.051	0.004	9.9	10.1
4	<0.0005	<0.0005	<5.0	3.3	<0.010	<0.010	0.034	0.009	4.8	8.2
5	<0.0005	<0.0005	<5.0	6.4	<0.010	<0.010	0.020	0.004	6.6	7.8
6	<0.0005	<0.0005	<5.0	6.6	<0.010	<0.010	0.060	0.003	8.0	11.4
7	<0.0005	<0.0005	<5.0	9.8	<0.010	<0.010	0.049	0.002	13.2	6.1
8	<0.0005	<0.0005	<5.0	41.9	<0.010	<0.010	0.045	0.006	7.2	5.7
9	<0.0005	<0.0005	<5.0	4.3	<0.010	<0.010	0.044	0.003	7.4	13.4
10	<0.0005	<0.0005	<5.0	1.5	<0.010	<0.010	0.091	0.046	3.5	2.2
95% UCLM	0.00254	0.0241	<5.0	27.6	0.010	0.016	0.058	0.020	9.2	9.8
Significance	Not applicable		Not significant		Not applicable		Significant Decrease		Not significant	
Sample Number	**Cadmium (ppm)**		**Copper (ppm)**		**Lead (ppm)**		**Mercury (ppm)**		**Zinc (ppm)**	
	2021	**2025**	**2021**	**2025**	**2021**	**2025**	**2021**	**2025**	**2021**	**2025**
1	0.575	0.691	58	35	0.0316	0.0276	0.067	0.054	21.0	16.9
2	0.332	1.22	16	126	0.0192	0.0644	0.053	0.046	21.1	15.6
3	1.22	5.89	54	255	0.0205	0.0596	0.037	0.047	17.3	17.8
4	0.707	1.22	13	124	0.0181	0.0456	0.03	0.073	12.9	24.6
5	0.465	0.522	12	30	0.0366	0.0263	0.062	0.036	22.1	17.8
6	0.356	1.33	24	162	0.0116	0.0445	0.057	0.079	16.0	25.2
7	1.97	0.718	75	94	0.0452	0.0233	0.064	0.037	27.3	15.0
8	0.662	2.68	86	19	0.0312	0.0264	0.05	0.043	18.3	30.4
9	0.495	0.607	11	79	0.0227	0.0387	0.117	0.091	16.7	18.8
10	0.0021	0.289	4	15	0.0058	0.0152	0.034	0.05	20.9	9.5
95% UCLM	0.998	3.023	53	138	0.031	0.0466	0.071	0.0665	21.7	22.6
Significance	Not significant		Significant Increase		Not significant		Not significant		Not significant	

Shaded cells indicate the COPC is advanced to risk characterization.

Table 4.6 Crab Hepatopancreas COPC Concentrations and Statistical Comparison (Squamish Harbour Site)

Sample Number	PAH (ppm)		PCDD/F (ppt)		Tributyltin (ppm)		Methylmercury (ppm)		Arsenic (ppm)	
	2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
1	<0.0005	<0.0005	<5.0	1.7	<0.010	<0.010	0.0356	0.090	5.1	6.9
2	<0.0005	<0.0005	<5.0	1.6	<0.010	<0.010	0.0776	0.150	10.9	5.7
3	<0.0005	<0.0005	<5.0	2.8	<0.010	<0.010	0.0203	0.039	6.8	6.9
4	<0.0005	<0.0005	<5.0	1.0	<0.010	<0.010	0.0763	0.071	7.7	10.1
5	<0.0005	<0.0005	<5.0	2.5	<0.010	<0.010	0.145	0.044	7.1	6.2
6	<0.0005	<0.0005	<5.0	1.3	<0.010	<0.010	0.125	0.042	10.5	2.7
7	<0.0005	<0.0005	<5.0	0.5	<0.010	<0.010	0.0692	0.039	6.8	2.4
8	<0.0005	<0.0005	<5.0	2.4	<0.010	<0.010	0.0428	0.054	2.2	2.7
9	<0.0005	<0.0005	<5.0	2.5	<0.010	<0.010	0.103	0.055	3.8	6.8
10	<0.0005	<0.0005	<5.0	1.3	<0.010	<0.010	0.131	0.030	5.6	2.6
95% UCLM	<0.0005	<0.0005	<5.0	2.2	<0.010	<0.010	0.107	0.089	8.2	6.8
Significance	Not applicable		Not applicable		Not applicable		Not significant		Not significant	

Sample Number	Cadmium (ppm)		Copper (ppm)		Lead (ppm)		Mercury (ppm)		Zinc (ppm)	
	2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
1	1.07	2.15	14.2	47.3	0.0097	0.0135	0.025	0.066	19.8	31.3
2	1.57	0.737	87.2	96.2	0.016	0.0085	0.101	0.096	17.1	27.4
3	2.32	0.758	6.11	47.5	0.0101	0.004	0.035	0.083	23.0	16.7
4	0.621	1.24	96.1	78.3	0.0094	0.0065	0.085	0.092	15.6	24.3
5	2.03	0.464	36.3	41.8	0.0232	0.011	0.176	0.053	32.0	12.7
6	2.14	0.227	23.8	6.93	0.0265	0.031	0.180	0.064	32.7	32.6
7	1.27	0.217	23	15.5	0.011	1.170	0.113	0.051	28.9	32.0
8	0.312	0.0938	3.72	7.89	0.0138	0.384	0.06	0.105	15.5	13.5
9	1.74	0.534	14	68.2	0.0243	0.0335	0.107	0.091	37.8	17.8
10	2.11	0.373	23.9	12	0.0264	0.423	0.145	0.041	55.5	34.3
95% UCLM	1.915	1.036	68.85	60.49	0.021	1.387	0.134	0.087	35.1	29.1
Significance	Significant Decrease		Not significant		Not significant		Not significant		Not significant	

Shaded cells indicate the COPC is advanced to risk characterization.

Table 4.7 Sole Meat COPC Concentrations and Statistical Comparison (Woodfibre Site)

Sample Number	PAH (ppm)		PCDD/F (ppt)		Tributyltin (ppm)		Methylmercury (ppm)		Arsenic (ppm)	
	2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
1	<0.0005	<0.0005	<5.0	0.043	<0.010	0.030	0.0573	0.070	2.6	3.2
2	<0.0005	<0.0005	<5.0	0.201	<0.010	<0.010	0.0666	0.069	3.8	3.1
3	<0.0005	<0.0005	<5.0	0.134	<0.010	<0.010	0.0471	0.049	3.1	4.7
4	<0.0005	<0.0005	<5.0	0.228	<0.010	<0.010	0.0381	0.084	4.5	12.1
5	<0.0005	<0.0005	<5.0	0.150	<0.010	<0.010	0.0797	0.120	4.0	7.1
6	<0.0005	<0.0005	<5.0	0.275	<0.010	<0.010	0.0406	0.048	6.0	1.9
7	<0.0005	<0.0005	<5.0	0.149	<0.010	<0.010	0.0346	0.058	4.1	5.1
8	<0.0005	<0.0005	<5.0	0.154	<0.010	<0.010	0.0413	0.086	5.2	8.5
9	<0.0005	<0.0005	<5.0	0.136	<0.010	<0.010	0.0338	0.061	5.5	2.7
10	<0.0005	<0.0005	<5.0	0.173	<0.010	<0.010	0.0381	0.072	4.5	4.7
95% UCLM	<0.0005	<0.0005	<5.0	0.200	<0.010	0.016	0.0593	0.084	4.9	7.1
Significance	Not applicable		Not applicable		Not significant		Significant Increase		Not significant	

Sample Number	Cadmium (ppm)		Copper (ppm)		Lead (ppm)		Mercury (ppm)		Zinc (ppm)	
	2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
1	<0.0013	0.0014	0.167	0.112	0.008	<0.0013	0.082	0.106	2.8	2.4
2	<0.0013	<0.0013	0.195	0.171	0.0103	<0.0013	0.053	0.132	3.8	3.3
3	<0.0013	0.0017	0.171	2.14	0.0107	0.082	0.068	0.069	4.4	3.8
4	<0.0013	0.0014	0.149	0.126	0.0413	0.0022	0.05	0.158	3.6	2.7
5	<0.0013	0.0016	0.189	0.106	0.0128	<0.0013	0.102	0.159	4.0	2.6
6	<0.0013	0.0013	0.126	0.167	0.0094	0.0021	0.048	0.073	3.8	3.1
7	<0.0013	0.0023	0.174	0.149	0.007	0.0017	0.039	0.108	2.9	3.2
8	0.0014	<0.0013	0.169	0.12	0.0094	<0.0013	0.052	0.141	4.0	2.8
9	<0.0013	0.0017	0.164	0.14	0.007	<0.0013	0.049	0.092	3.4	2.6
10	<0.0013	<0.0013	0.161	0.145	0.0091	0.0015	0.038	0.149	3.5	3.9
95% UCLM	<0.0013	0.0017	0.18	1.211	0.027	0.0447	0.070	0.138	3.9	3.3
Significance	Not significant		Not significant		Not significant		Significant Increase		Significant Decrease	

Shaded cells indicate the COPC is advanced to risk characterization.

Table 4.8 Sole Meat COPC Concentrations and Statistical Comparison (Squamish Harbour Site)

Sample Number	PAH (ppm)		PCDD/F (ppt)		Tributyltin (ppm)		Methylmercury (ppm)		Arsenic (ppm)	
	2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
1	<0.0005	<0.0005	<5.0	0.029	<0.010	<0.010	0.195	0.039	3.9	1.4
2	<0.0005	<0.0005	<5.0	0.005	<0.010	<0.010	0.119	0.092	2.6	2.2
3	<0.0005	<0.0005	<5.0	0.030	<0.010	<0.010	0.0736	0.1	2.8	3.0
4	<0.0005	<0.0005	<5.0	0.008	<0.010	<0.010	0.0999	0.083	5.9	1.5
5	<0.0005	<0.0005	<5.0	0.008	<0.010	<0.010	0.0617	0.069	2.6	3.1
6	<0.0005	<0.0005	<5.0	0.007	<0.010	<0.010	0.0538	0.052	3.7	5.0
7	<0.0005	<0.0005	<5.0	0.026	<0.010	<0.010	0.0697	0.078	3.4	4.3
8	<0.0005	<0.0005	<5.0	0.012	<0.010	<0.010	0.0769	0.056	2.1	4.4
9	<0.0005	<0.0005	<5.0	0.007	<0.010	<0.010	0.0438	0.066	3.2	6.9
10	<0.0005	<0.0005	<5.0	0.007	<0.010	<0.010	0.0787	0.097	9.7	8.8
95% UCLM	<0.0005	<0.0005	<5.0	0.028	<0.010	<0.010	0.121	0.085	5.7	5.4
Significance	Not applicable		Not applicable		Not applicable		Not significant		Not significant	

Sample Number	Cadmium (ppm)		Copper (ppm)		Lead (ppm)		Mercury (ppm)		Zinc (ppm)	
	2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
1	0.0015	<0.0013	0.155	0.131	0.0145	0.0026	0.24	0.046	4.0	2.6
2	0.0013	0.0019	0.345	0.125	0.0102	0.0033	0.112	0.117	3.3	4.9
3	0.0035	0.0017	0.1	0.085	0.0088	<0.0013	0.084	0.157	3.4	2.5
4	0.0016	<0.0013	0.113	0.117	0.0103	0.0016	0.073	0.111	4.0	2.4
5	<0.0013	<0.0013	0.116	0.081	0.0052	0.0025	0.048	0.074	2.8	2.2
6	0.0027	<0.0013	0.152	0.115	0.0104	0.0014	0.056	0.105	2.9	2.7
7	<0.0013	0.0015	0.17	0.304	0.0182	<0.0013	0.079	0.036	2.7	2.8
8	<0.0013	<0.0013	0.188	0.09	0.0083	<0.0013	0.079	0.061	4.6	2.3
9	0.0014	0.0038	0.11	0.125	0.0061	<0.0013	0.051	0.108	2.6	2.5
10	<0.0013	<0.0013	0.167	0.18	0.0126	<0.0013	0.077	0.107	6.5	2.6
95% UCLM	0.00216	0.0021	0.2	0.184	0.013	0.00221	0.122	0.114	4.4	3.2
Significance	Not significant		Not significant		Significant Decrease		Not significant		Not significant	

Shaded cells indicate the COPC is advanced to risk characterization.

5 Exposure Assessment

The exposure assessment defines the characteristics of human receptors and the parameters required to quantify COPC intake from seafood consumption. These receptor characteristics typically include age class (e.g., toddler, adult), body weight, seafood ingestion rates, and exposure frequency and duration. Together, these inputs are used to represent plausible consumption scenarios, including conservative assumptions where appropriate, for individuals who may rely on locally harvested seafood as a dietary component.

Chemical concentrations of COPCs measured in seafood are combined with these receptor characteristics to estimate the magnitude of exposure. For each COPC, the representative concentration is the 95% UCLM. These concentrations are assumed to reflect the levels present in seafood within each study area.

The resulting exposure metric is the estimated daily intake (EDI), expressed in milligrams of COPC per kilogram of body weight per day (mg/kg-day). The EDI represents the average daily dose of a COPC that an individual is expected to ingest through seafood consumption over the defined exposure period. It is calculated by combining the COPC concentration in seafood with the ingestion rate and normalizing by body weight, with additional factors incorporated where relevant to reflect exposure frequency and duration. The EDI provides a standardized basis for subsequent risk characterization, allowing comparison to toxicological reference values to evaluate potential non-carcinogenic and carcinogenic health effects.

5.1 Methods

5.1.1 Estimated Daily Intake

Health Canada provides guidance on the estimation of dietary exposure to contaminants, including calculation of the estimated daily intake (EDI) using COPC concentrations in food in conjunction with human receptor characteristics such as body weight and food ingestion rates (Health Canada 2021).

The following equation was used to calculate EDI:

$$EDI_{food-COPC} = \frac{IR_{food} \times C_{food-COPC} \times F}{BW}$$

Where:

- $EDI_{food\text{-}COPC}$ = estimated daily intake of a COPC from a seafood (mg/kg body weight-day)
- IR_{food} = Ingestion rate for a seafood (kg/day)
- $C_{food\text{-}COPC}$ = COPC concentration in a seafood (mg/kg), represented as the 95% UCLM

- F = Consumption frequency; assumed to be every day for the entire year or 1 (unitless)
- BW = Body weight of the human receptor (kg)

5.1.2 Human Receptor Characteristics

Human receptor characteristics used to calculate the EDI include body weight of the human receptor (kg), ingestion rate of a seafood (kg/day), and consumption frequency (number of days consuming per year) of the seafood. Table 5.1 presents the human receptor characteristics for Indigenous toddlers (7 months to less than 5 years old), Indigenous adults (20 to less than 80 years old) and Indigenous female adults of child-bearing age (applicable to methylmercury exposure). These values are based on human receptor characteristics described in Richardson (1997) and Richardson and Stantec (2013).

Seafood consumption rates specific to members of the Squamish Nation were not available for this study. Seafood consumption rates Indigenous males and females are based on reported consumption values for fish and shellfish from Richardson (1997). These seafood consumption rates represent historical consumption rates from studies conducted in the 1970s.

The seafood consumption rates applied in this assessment are considered to overestimate current levels of seafood consumption by members of the Squamish Nation, given the accessibility and availability of alternative food sources through local retail outlets in Squamish. In addition, the assumed consumption rates are considered to overestimate present levels of seafood harvesting within the defined study areas. Individuals with access to vessels would reasonably be expected to preferentially harvest from locations that are perceived to be less influenced by nearby industrial activity, where such alternatives are available.

Observations collected during the 2021 and 2025 field programs, each of which occurred over an approximate two-week period, did not identify the presence of commercial fishing vessels or personal recreational boats actively engaged in harvesting in the vicinity of the Woodfibre site. These observations are consistent with informal communications with on-site Woodfibre LNG personnel, which indicated limited to no regular seafood harvesting activity within the Woodfibre study area during the monitoring periods.

Risk assessments generally use conservative assumptions so that potential exposures are not understated. In this case, the assessment assumes that individuals obtain all of their seafood from the Woodfibre and Squamish Harbour study areas, consistent with the applied consumption rates. This approach is used even though there was limited evidence of active harvesting during field observations. If the assessment were to assume that no harvesting occurs based on those observations, it would imply no exposure and therefore no potential risk, even if COPC concentrations in seafood were to increase.

There was no consumption rate data for crab hepatopancreas from Richard (1997). The Indigenous adult's ingestion rate of 0.02 kg/day for crab hepatopancreas assumes that one crab is consumed every day (i.e., consumption frequency = 1). The average hepatopancreas weight from the sampled crabs was 0.02 kg. The Indigenous toddler consumption rate of all seafoods is 43% of the Indigenous adult based on guidance from Richardson (1997). Table 5.1 shows the values for the human receptor characteristics that are required for the EDI calculation in Section 5.1.1.

Table 5.1 Human Receptor Characteristics

Human Receptor Characteristic	Indigenous Toddler	Indigenous Adult	Indigenous Adult Female (child-bearing age)[c]
Body Weight (BW; in kg)	15.3[a]	76.5[a]	69.8[a]
Consumption Frequency (F; unitless)	1	1	1
Crab Meat Ingestion Rate (IR_{CRAB}; kg/day)	0.094[b]	0.223[b]	0.185[b]
Crab Hepatopancreas Ingestion Rate (IR_{HEPATO}; kg/day)	0.0086	0.02	0.02
Sole Ingestion Rate (IR_{SOLE}; kg/day)	0.094[b]	0.223[b]	0.185[b]

Notes:

[a] Richardson and Stantec (2013)

[b] Richardson (1997)

[c] Indigenous adult female of child-bearing age is used only for methylmercury exposure

5.2 Exposure Assessment Results

The EDIs for copper in crab hepatopancreas and for mercury in sole meat from the Woodfibre study area presented in Table 5.2 for Indigenous toddlers, Indigenous adults, and Indigenous women of child-bearing age as applicable. It is assumed a person harvested 100% of their seafood from Woodfibre study area, and that 100% of the COPCs ingested are bioavailable and absorbed into the body.

Table 5.2 Estimated Daily Intake

Chemical of Potential Concern	Indigenous Toddler	Indigenous Adult	Indigenous Adult Female (child-bearing age)[a]
Crab Hepatopancreas			
Copper	7.76E-02	3.61E-02	Not applicable
English Sole			
Mercury	8.48E-04	4.02E-04	Not applicable
Methylmercury	5.16E-04	Not applicable	2.23E-04

All units in mg/kg-bw/day

[a] Indigenous adult female of child-bearing age only applicable for methylmercury exposure

6 Toxicological Assessment

The toxicological assessment provides a summary of the health effects associated with each COPC and identifies appropriate health-based benchmarks for use in the assessment. These benchmarks, referred to as toxicological reference values (TRVs), are derived from toxicological and epidemiological studies that characterize the relationship between exposure and adverse health outcomes. TRVs are commonly expressed on a body weight basis (e.g., mg/kg-day) to align with exposure estimates such as the EDI. The following subsections describe the TRVs selected for each COPC, including their source, basis, and applicability to the exposure scenarios evaluated in this assessment.

6.1 Copper

Copper is a naturally occurring trace metal that is widely distributed in the marine environment. It is present in seawater at low concentrations and occurs in marine sediments through natural geochemical processes, including weathering of mineralized bedrock, riverine inputs, and oceanic cycling. Marine organisms, including fish and invertebrates, can take up copper from water, sediment and their diet, resulting in its presence at low levels in edible tissues. Concentrations of copper in organisms are influenced by environmental levels and the organism's ability to regulate copper internally. When copper concentrations increase in the environment beyond this regulatory capacity, copper levels in tissues may also increase.

Copper is an essential nutrient required for normal physiological function in humans. It is a component of numerous enzymes and proteins involved in key metabolic processes, including iron metabolism and hemoglobin formation, antioxidant defense, connective tissue formation, and energy production. Dietary intake of copper is necessary to support these functions, and deficiency, although uncommon in developed regions such as Canada, has been associated with effects such as anemia, reduced immune function, and bone abnormalities (Agency for Toxic Substances and Disease Registry 2022).

At intake levels above dietary requirements, copper has been associated with adverse health effects. The primary effects observed in humans relate to the gastrointestinal system and liver, including symptoms such as nausea, vomiting, and, at higher or sustained exposures, hepatotoxicity. The TRV applied in this assessment is based on a tolerable daily intake developed by Health Canada (2021) of 0.426 mg/kg body weight per day. This value is derived from human studies evaluating gastrointestinal and hepatic responses to copper exposure.

6.2 Total Mercury and Methylmercury

Mercury is a naturally occurring element that is present in marine environments at low background concentrations. It enters ocean systems through natural processes such as weathering of mineralized rock, atmospheric deposition from natural emissions (e.g., volcanic activity and ocean-atmosphere exchange), and transport from terrestrial watersheds. In marine sediments, inorganic mercury can be transformed into methylmercury by anaerobic microorganisms under low-oxygen conditions. This transformation influences the chemical form of mercury present but does not increase the total mercury mass in the environment. Methylmercury is of particular relevance in aquatic systems due to its ability to bioaccumulate in organisms and biomagnify through the food web, resulting in higher concentrations in predatory species and in tissues of ecological and dietary importance.

In the Squamish region, mercury conditions reflect both natural processes and historical industrial activity. Elevated concentrations of total mercury and methylmercury have been identified in sediments and marine biota within Squamish Harbour and in the vicinity of the Woodfibre site. These conditions have been associated in part with the former Nexen chlor-alkali plant, which operated between 1965 and 1991 (see Section 2.2.2). Seafood sampling data from the 2021 pre-construction sampling period indicates that mercury concentrations are higher within Squamish Harbour relative to the Woodfibre area, consistent with proximity to historical sources.

Mercury has no known essential biological function in the human body. Both inorganic mercury and methylmercury are toxic, although their behaviour and toxicity differ. Inorganic mercury is less readily absorbed across biological membranes, whereas methylmercury is an organic form that is efficiently absorbed and distributed within the body. Methylmercury has a strong affinity for proteins and lipids and tends to accumulate in tissues such as muscle and internal organs of fish and invertebrates. As a result, dietary intake of seafood represents the primary exposure pathway for methylmercury in humans.

The primary health effects associated with methylmercury exposure relate to the nervous system. In adults, elevated exposure has been associated with neurological effects, including impaired coordination, sensory disturbances, and muscle weakness. Methylmercury can cross the placental barrier, and developing fetuses are more sensitive to its effects. Developmental exposure has been associated with neurodevelopmental outcomes, including reduced cognitive function.

The TRV for methylmercury applied in this assessment is based on guidance from Health Canada (2021). For sensitive populations, including women of child-bearing age, infants, and children, a TRV of 0.0002 mg/kg body weight per day is used. This value is derived from dietary exposure studies that identify intake levels not associated with measurable neurodevelopmental effects. For the general adult population, excluding women of child-bearing age, a TRV of 0.00047 mg/kg body weight per day is applied. The TRV for inorganic mercury is 0.0003 mg/kg body weight per day.

6.3 Summary of Toxicological Reference Values

The following summarizes the TRVs applied in this assessment for the COPCs in seafood. These values are used in the subsequent risk characterization to evaluate estimated daily intakes across different receptor groups, including consideration of sensitive populations where applicable.

- Copper – 0.426 mg/kg body weight per day
- Mercury (inorganic) – 0.0003 mg/kg body weight per day
- Methylmercury (for pregnant women and children under 12) – 0.0002 mg/kg body weight per day

7 Risk Characterization

The risk characterization stage provides a quantitative measure of potential health risk to human receptors from the consumption of seafood containing COPCs. Health risk is evaluated using the hazard quotient (HQ), which represents the ratio between the EDI of a COPC and the corresponding TRV. The HQ is calculated using the following formula:

$$HQ_{COPC}\ (unitless) = \frac{EDI_{COPC}}{TRV_{COPC}}$$

Where:

- HQ_{COPC} = Hazard quotient for a COPC
- EDI_{COPC} = Estimated daily intake of a COPC (mg/kg bw-day); from Table 5.2
- TRV_{COPC} = Toxicological reference value of a COPC (mg/kg bw-day); from Section 6.3

The HQ provides a relative measure of how the estimated exposure compares to a health-based benchmark. Regulatory practice across Canada applies different HQ thresholds when interpreting potential risk, commonly 0.2 or 1.0. In this assessment, an HQ threshold of 0.2 is applied to account for the presence of other potential exposure pathways to the same COPCs that are not explicitly evaluated. Under this approach, the seafood consumption pathway is considered to represent a portion of total potential exposure. HQs for the 2021 pre-construction period are presented alongside those for the 2025 mid-construction period to illustrate any incremental change in potential risk over time.

An HQ less than 0.2 is interpreted as negligible risk for the pathway considered. An HQ between 0.2 and 1.0 is interpreted as low risk, indicating that exposure remains below the selected health-based benchmark. An HQ equal to or greater than 1.0 indicates that the estimated exposure exceeds the TRV and may represent a potential health concern; however, it does not indicate that adverse health effects would be expected to occur at the estimated consumption and exposure rates.

The HQ does not represent a direct prediction of health effects. TRVs are derived using toxicological or epidemiological data and incorporate safety or uncertainty factors to establish a margin between exposure levels associated with observed effects and the selected benchmark. For example, if adverse effects are identified at an exposure level of 10 mg/kg body weight per day, the application of an uncertainty factor of 100 would result in a TRV of 0.1 mg/kg body weight per day. In this context, an HQ exceeding 1.0 indicates that the exposure is above the TRV, but it may remain below levels associated with observed adverse effects.

Accordingly, when an HQ exceeds 1.0, further evaluation of the underlying TRV is conducted, including consideration of the critical effect, the study basis, and the magnitude of the uncertainty factors applied. This additional context supports interpretation of whether the estimated exposure is likely to be associated with a meaningful potential for adverse health effects.

7.1 Copper in Crab Hepatopancreas

Table 7.1 presents the HQs associated with copper exposure when consuming crab hepatopancreas. The health risk from copper exposure in crab hepatopancreas from the Woodfibre study area is characterized as negligible for Indigenous toddlers and Indigenous adults, with HQs below 0.2. This indicates that copper intake remains within a range consistent with typical dietary levels. The statistically significant increase in copper concentrations in crab hepatopancreas does not correspond to a meaningful change in health risk.

Comparison with the Squamish Harbour reference site indicates that copper concentrations and associated HQs are similar between locations, with values below 0.2. This indicates that copper levels in crab hepatopancreas from both the Woodfibre and Squamish Harbour study areas are within a range considered safe for human consumption and are not associated with an appreciable health risk.

Table 7.1 Hazard Quotients for Copper in Crab Hepatopancreas

Human Receptor	**Woodfibre**		**Squamish Harbour**	
	2021	**2025**	**2021**	**2025**
Indigenous Toddler	0.07	0.18	0.09	0.08
Indigenous Adult	0.03	0.08	0.04	0.04
HQ greater than 0.2 are in bold underline				

7.2 Total Mercury in Sole Meat

Table 7.2 presents the HQs associated with exposure to mercury from the consumption of English sole tissue. At the Woodfibre study area, HQs for both the pre-construction and mid-construction periods exceed 0.2, indicating pre-existing mercury risk that persists into the construction phase. During the mid-construction period, HQs exceed 1.0 under the assumed consumption rates, indicating that estimated exposure is above the TRV.

These exposure conditions reflect mercury that is already present in the local marine environment, with known historical inputs from the former Nexen chlor-alkali plant in Squamish. While a statistically significant increase in mercury concentrations in English sole was observed at the Woodfibre site during the mid-construction period, the resulting concentrations are comparable to those measured in English sole collected from Squamish Harbour.

Pre-construction mercury levels and associated HQs at Woodfibre were lower than those at Squamish Harbour, consistent with the greater distance from the historical source area. The observed increase at Woodfibre results in risk levels that are now similar to those across the broader Squamish Harbour area, indicating that current conditions at Woodfibre are consistent with the existing regional mercury profile rather than representing a distinct or isolated increase in risk.

Interpretation of HQ values considers the derivation of the TRV. The TRV for inorganic mercury incorporates an uncertainty factor of approximately 1,000, relative to exposure levels at which adverse effects were observed in toxicological studies (Health Canada 2021). As a result, even the highest estimated HQ (up to 2.83 for Indigenous toddlers) remains well below exposure levels associated with observed effects and is characterized as low risk under the assumed consumption scenario, particularly given that mercury concentrations are similar across the Woodfibre and Squamish Harbour areas.

In addition, the assumed exposure scenario that 100% of an individual's seafood consumption is sourced from the Woodfibre study area is a conservative assumption used to represent a high exposure case. Access restrictions associated with marine construction activities, including safety perimeters, limit harvesting in the immediate vicinity of the Woodfibre site. Harvesting practices are more likely to occur either closer to Squamish Harbour (e.g., from shore or pier access) or at locations further south from the Woodfibre site because they are perceived to be cleaner areas that are far away from commercial and industrial activities. These factors indicate that the assumed exposure scenario likely overstates typical harvesting behaviour and associated mercury intake.

Overall, the potential health risk from mercury exposure is characterized as low and is similar across both the Woodfibre and Squamish Harbour study areas, reflecting regional conditions rather than a site-specific effect from Project construction activities.

Table 7.2 Hazard Quotients for Mercury in Sole Meat

Human Receptor	Woodfibre		Squamish Harbour	
	2021	2025	2021	2025
Indigenous Toddler	**1.43**	**2.83**	**2.50**	**2.33**
Indigenous Adult	**0.68**	**1.34**	**1.19**	**1.11**
HQ greater than 0.2 are in **bold underline**				

7.3 Methylmercury in Sole Meat

Table 7.3 presents the HQs associated with methylmercury exposure from the consumption of English sole meat. At the Woodfibre study area, HQs for the pre-construction period exceed 0.2 for sensitive receptors and have increased during the mid-construction period for Indigenous toddlers and Indigenous adult females of child-bearing age. Mid-construction HQs are greater than 1.0 for these receptor groups, indicating that estimated exposures are above the applicable TRV under the assumed consumption rates.

As observed for total mercury, these conditions reflect methylmercury that is present within the regional marine environment. The increase in methylmercury concentrations in English sole at the Woodfibre site results in HQs that are comparable to those at the Squamish Harbour reference area. This indicates that the observed risk is not specific to the Woodfibre site, but is representative of conditions within the Howe Sound region in the vicinity of Squamish.

Interpretation of these HQs considers the derivation of the TRV for methylmercury, which incorporates a relatively smaller uncertainty factor of 5 (Health Canada 2021). As a result, HQ values of 2.58 for Indigenous toddlers at Woodfibre and 2.61 at Squamish Harbour approach exposure levels at which adverse effects have been observed in toxicological studies. Based on this context, the potential health risk for Indigenous toddlers and Indigenous adult females of child-bearing age from the consumption of English sole is characterized as moderate. This level of risk is considered applicable to the broader Howe Sound region near Squamish, rather than being attributable to site-specific effects from Project construction activities.

Table 7.3 Hazard Quotients for Methylmercury in Sole Meat

Human Receptor	Woodfibre		Squamish Harbour	
	2021	**2025**	**2021**	**2025**
Indigenous Toddler	1.82	2.58	3.72	2.61
Indigenous Adult Female (Child-bearing Age)	0.79	1.11	1.60	1.13
HQ greater than 0.2 are in bold underline				

7.4 Summary of Risk Characterization

Copper exposure from the consumption of crab hepatopancreas is characterized as negligible for all receptor groups evaluated. HQs remain below 0.2 under both pre-construction and mid-construction conditions, indicating that estimated intake represents a small fraction of the applicable TRVs and is consistent with normal dietary levels. Although a statistically significant increase in copper concentrations was observed during the mid-construction period, this change does not correspond to a meaningful increase in health risk. Copper concentrations and associated HQs are similar between the Woodfibre and Squamish Harbour study areas, and are considered within a range appropriate for human consumption.

For mercury and methylmercury in English sole tissue, HQs exceed 0.2 under pre-construction conditions and exceed 1.0 during the mid-construction period for key receptor groups, including Indigenous toddlers and Indigenous adult females of child-bearing age. At the Woodfibre site, a statistically significant increase in concentrations has resulted in levels comparable to those observed at Squamish Harbour, reflecting regional conditions influenced by historical inputs, including the former Nexen chlor-alkali plant. Interpretation of risk considers the derivation of the TRVs, with inorganic mercury incorporating a large uncertainty factor (approximately 1,000) and methylmercury a smaller factor (approximately 5). As a result, inorganic mercury is characterized as low risk, while methylmercury is characterized as low risk for sensitive receptors, given that HQs approach levels associated with observed effects. Overall, the potential health risk from mercury and methylmercury exposure is considered representative of the broader Howe Sound region near Squamish and is not specific to the Woodfibre site.

For the remaining COPCs, including PAHs, PCDD/Fs, TBT, arsenic, cadmium, lead, and zinc, no statistically significant differences in concentrations were identified between the pre-construction and mid-construction sampling periods in crab meat, crab hepatopancreas, or English sole tissue. Based on these results, there is no indication of a change in exposure conditions for these substances. Accordingly, the health risk associated with consumption of these seafoods from the Woodfibre study area is considered unchanged relative to pre-construction conditions.

8 Conclusions and Recommendations

The results of the Seafood Monitoring Program indicate that, while statistically significant increases were identified for copper, mercury, and methylmercury, the associated human health risks remain either negligible or consistent with existing regional conditions. The observed increase in copper in crab hepatopancreas corresponds to exposure levels within the range of typical dietary intake and is associated with a negligible level of health risk. In English sole, increases in mercury and methylmercury have resulted in concentrations and hazard quotients comparable to those observed in the Squamish Harbour area, reflecting established regional conditions rather than a site-specific effect. The mercury source is assumed to be the site of the former Nexen chlor-alkali plant in Squamish Harbour based on historical records that describe mercury contamination in the marine sediment at this site.

There were no statistically significant increases in PAH, PCDD/F, TBT, arsenic, cadmium, lead, and zinc in seafood. This suggests that marine construction activities had no measurable effect on the concentration of these substances in their tissues.

Overall, harvesting seafood from the Woodfibre study area does not result in a greater health risk relative to other locations for the COPCs evaluated, and the magnitude and nature of the identified risks do not indicate a need for mitigation measures or seafood harvesting advisories.

These findings are consistent with the predictions of the 2016 human health risk assessment conducted by Keystone, which indicated that Project marine construction activities would not result in increases in COPC concentrations in seafood that would lead to a health risk for seafood harvesters and consumers.

9 References

ATSDR (Agency for Toxic Substances and Disease Registry). April 2022. Toxicological Profile for Copper. Available online at: https://www.atsdr.cdc.gov/ToxProfiles/tp132.pdf (Accessed April 2026).

BC ENV (British Columbia Ministry of Environment). 2009. Profiles on Remediation Projects. Nexen: Former Chlor-Alkali Plant, Squamish, BC.

DFO (Fisheries and Oceans Canada). 2025a. Area 28 – Sanitary Contamination Closures. Available online at: https://www.pac.dfo-mpo.gc.ca/fm-gp/rec/tidal-maree/a-s28-eng.html (Accessed April 2026).

DFO. 2025b. Pacific Region Integrated Fisheries Management Plan. Crab by Trap. April 1, 2025 to March 31, 2026. Available online at: https://publications.gc.ca/collections/collection_2025/mpo-dfo/Fs143-3-23-2445-eng.pdf (Accessed April 2026).

DFO. 2025c. BC Tidal Area 28 – Vancouver, Bowen Island, Indian Arm, Squamish: Recreational Fishing Limits, Openings and Closures. Available online at: https://www.pac.dfo-mpo.gc.ca/fm-gp/rec/tidal-maree/a-s28-eng.html (Accessed April 2026).

Health Canada. 2021. Federal Contaminated Site Risk Assessment in Canada – Toxicological Reference Values (TRVs) and Chemical-Specific Factors, Version 3.0. Available online at: https://publications.gc.ca/collections/collection_2021/sc-hc/H129-108-2021-eng.pdf (Accessed April 2026).

Keystone Environmental Ltd. 2016. Updated Human Health Risk Assessment – Aboriginal and Recreational Receptors. Prepared for Woodfibre LNG Limited. January 2016.

LMRESD (Lower Mainland Region Environmental Stewardship Division). 2007. Management Plan: Skwelwil'em Squamish Estuary Wildlife Management Area. Available online at: https://squamish.ca/assets/LDA/6471022cdf/Skwelwilem-WMA-Management-Plan-Final.pdf (Accessed April 2026).

Ocean Watch. 2020. Howe Sound Edition 2020. Executive Summary: Overview and Future Directions. Available online at: https://oceanorg.blob.core.windows.net/oceanorg/2023/08/Ocean-Watch-Howe-Sound-Edition-2020.pdf (Accessed April 2026).

Richardson, G.M. 1997. Compendium of Canadian Human Exposure Factors for Risk Assessment. Ottawa, ON.

Richardson, G.M. and Stantec Consulting Ltd. 2013. Canadian Exposure Factors Handbook. Toxicology Centre, University of Saskatchewan, Saskatoon, SK, Canada.

Appendices

Appendix A Provincial Conditions

Appendix B Federal Conditions

Appendix C Dissection Protocol

Appendix D Certified Laboratory Reports