Information Request Package 13 from the Review Panel for the Roberts Bank Terminal 2 Project Environmental Assessment: Responses

List of Responses

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IR13-29 Environmental Management Plans – Clarifications

IR13-30 Compilation of Environmental Management Plans, Mitigation Measures, and Follow-Up Programs

IR13-01 Air Quality – Participation in Metro Vancouver Air Quality Management Plan

Information Source(s)

Metro Vancouver Integrated Air Quality and Greenhouse Gas Management Plan (2011)

Regional Ground Level Ozone Strategy for the Canadian Lower Fraser Valley Region (2014)

Metro Vancouver's Undertakings from the Roberts Bank Terminal 2 Panel Orientation Session, September 16, 2016 (CEAR 890)

Context

Roberts Bank Terminals are an important industrial source of air pollutants in the Lower Fraser Valley (LFV) airshed, which includes both Metro Vancouver and Fraser Valley Regional Districts. Metro Vancouver Regional District (MV) has the delegated authority and responsibility to provide the service of air pollution control in the region, which is contained in the LFV airshed. It provides regulatory services through development and administration of bylaws, emission regulations and permits for emission sources. For bodies over which it has no jurisdiction, such as Vancouver Fraser Port Authority (VFPA), MV relies on active and effective operational partnerships.

A key component of MV's air quality management efforts is a sequence of regularly updated air quality management plans, and associated air pollutant emissions inventories. The Metro Vancouver Integrated Air Quality and Greenhouse Gas Management Plan (2011) explicitly lists VFPA as a necessary partner in implementing the Integrated Air Quality and Greenhouse Gas Management Plan. The Integrated Air Quality and Greenhouse Gas Management Plan notes that VFPA is responsible for the "… mitigation of environmental impacts related to (port) development and expansion proposals."

VPFA is also an author of the multiagency Regional Ground-Level Ozone Strategy (2014) developed in order to reduce ozone concentrations in the metro Vancouver area, and is a member of the Regional Ground-Level Ozone Strategy Steering Committee, which is chaired by the Fraser Valley Regional District and supported by Metro Vancouver staff.

The Panel requires information on the Proponent's participation with Metro Vancouver in achieving the objectives of the Integrated Air Quality and Greenhouse Gas Management Plan and Regional Ground-Level Ozone Strategy generally and in relation to the proposed Project.

Information Request

Explain the Proponent's participation with Metro Vancouver in meeting the goals of the Metro Vancouver Integrated Air Quality and Greenhouse Gas Management Plan and Regional Ground-Level Ozone Strategy.

Provide mitigation measures and strategies employed by Vancouver Fraser Port Authority that would contribute to the reduction of emissions of all contaminants of concern, including emissions of precursors to ground-level ozone.

Provide an assessment of reduction in air pollutant emissions from activities under the control of the Proponent at Roberts Bank over the past decade to demonstrate the effectiveness of efforts to improve regional air quality.

Provide a discussion of Vancouver Fraser Port Authority emissions reduction efforts to date, and how those efforts would be reflected into mitigation measures and built into a follow-up program specifically directed towards air quality effects of the proposed Project.

VFPA Response

Explain the Proponent's participation with Metro Vancouver in meeting the goals of the Metro Vancouver Integrated Air Quality and Greenhouse Gas Management Plan and Regional Ground-Level Ozone Strategy.

The VFPA is committed to continued participation and collaboration with Metro Vancouver in meeting the goals of the Metro Vancouver Integrated Air Quality and Greenhouse Gas Management Plan and the Regional Ground-Level Ozone Strategy for the Canadian Lower Fraser Valley Region.

To this end, in 2010 the VFPA undertook a collaborative planning process called 'Port 2050' involving over 100 stakeholders, including Metro Vancouver. Through this process, four alternative plausible future scenarios were developed about what the future and port growth could look like in the next 20 and 40 years. Of those four futures, the 'Great Transition' was selected as the scenario the VFPA would aspire and work towards. The 'Great Transition' scenario emphasises balanced economic, environmental, and social performance in a low carbon economy[1], which is aligned with Metro Vancouver's Integrated Air Quality and Greenhouse Gas Management Plan vision: 'Healthy, clean and clear air for current and future generations' (Metro Vancouver 2011).

In 2016, the VFPA set a new vision to be the world's most sustainable port. The VFPA continues to work with collaborators and supporters, such as Metro Vancouver, to achieve this goal for all port operations (including RBT2 in the future) by reducing emissions associated with port activities, improving air quality, and decreasing the impact of port operations on the environment and human health.

The VFPA also recognises that management of ground level ozone is a key priority for Metro Vancouver, the Fraser Valley Regional District, B.C. Ministry of Environment, and Environment and Climate Change Canada. Ground-level ozone is a secondary pollutant formed by the reaction of volatile organic compounds (VOCs) and nitrogen oxides (NO_x). The VFPA, port-wide as well as specifically through construction and operation of RBT2, will support the

[1] For more information and reports on 'Port 2050', see https://www.portvancouver.com/about-us/sustainability/port-2050/

Regional Ground Level Ozone Strategy by reducing emissions of VOCs and NO_x to the extent possible, as described below.

In summary, the VFPA is committed to continued participation and collaboration with Metro Vancouver and other stakeholders on regional initiatives pertaining to improving air quality.

Provide mitigation measures and strategies employed by Vancouver Fraser Port Authority that would contribute to the reduction of emissions of all contaminants of concern, including emissions of precursors to ground-level ozone.

The VFPA focuses on supporting early compliance with pending environmental regulations, improving efficiency, and promoting clean technology. As shown in **Figure IR13-01-1**, the VFPA's air quality and energy initiatives target key port-related emission sources from all source types.

Figure IR13-01-1 VFPA Air and Energy Initiatives and Target Emission Sources

Source: VFPA 2017a

VFPA initiatives currently in place and those proposed to reduce marine source NO_x emissions are described in the response to IR6-29 (CEAR Document #1188[2]), while VFPA emission reduction initiatives targeting other combustion-related sources of NO_x (trucks, rail, cargo handling equipment) are described in the response to IR6-32 (CEAR Document #1188). As outlined in the response to IR6-32 (CEAR Document #1188), detailed information on VFPA greenhouse gas (GHG) reduction initiatives is provided in the Northwest Ports Clear Air

[2] CEAR Document #1188 From the Vancouver Fraser Port Authority to the Review Panel re: Response to IR6-04, IR6-05, IR6-10, IR6-11, IR6-12, IR6-14, IR6-21, IR6-22, IR6-23, IR6-24, IR6-25, IR6-27, IR6-28, IR6-29, IR6-31, IR6-32, IR6-34, IR6-35, and IR6-37 (See Reference Document #991).

Strategy 2016 Implementation Report (NWPCAS 2017), VFPA 2015 Port Emissions Inventory Report (VFPA 2017a), and the Port of Vancouver Sustainability Report 2016 (VFPA 2017b). A summary by sector (i.e., marine vessels, rail, on-road vehicles, non-road vehicles, and administrative operations) of the GHG emission reduction initiatives applicable to the VFPA and its tenants are summarised in Table IR6-32-1 in the response to IR6-32 (CEAR Document #1188)[3].

Contaminants of concern, including precursors to ground-level ozone, will be reduced at Roberts Bank through a variety of programs and initiatives. A key initiative is the provision of shore power capacity soon to be operational at Deltaport Terminal Third Berth and in the future at RBT2. Refer to the response to IR6-19 (CEAR Document #1113[4]) for more information on emission reduction potential from shore power. In addition, the VFPA EcoAction Program that provides resources and incentives to operations across VFPA jurisdiction will apply to RBT2 in the future. Under the VFPA EcoAction Program, vessels that implement voluntary emission reduction measures and other environmental practices (e.g., using cleaner fuels such as liquified natural gas, using shore power, participating in energy efficiency programs) that are beyond regulatory requirements receive a discount on harbour dues of up to 47%.

In terms of broader context for total GHG emissions, a review of available options has indicated that the Project is the most efficient location to provide increased container capacity on the west coast of Canada (EIS Section 34.0). Situated along an established trade corridor, the Project location is well positioned to efficiently accommodate future growth in trade activity. With shorter distances travelled during trade activity, GHG emissions are minimised.

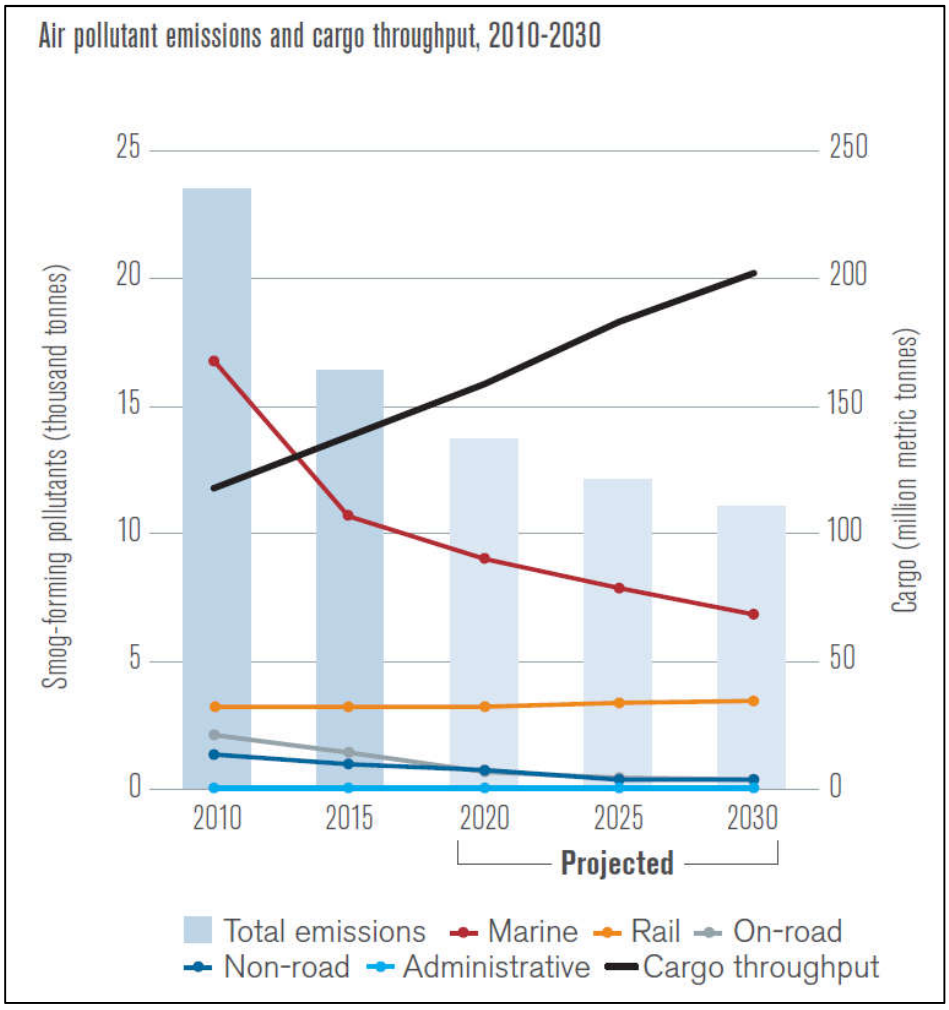
Provide an assessment of reduction in air pollutant emissions from activities under the control of the Proponent at Roberts Bank over the past decade to demonstrate the effectiveness of efforts to improve regional air quality.

Every five years, The VFPA manages a port-wide emission inventory that includes ships, on-road, non-road, rail, and administrative emission sources within VFPA jurisdiction and out into the Lower Fraser Valley airshed. Each update report represents nearly two years of engagement, data collection, analysis, and modelling. Results of the most recent inventory (2015), show total air quality related emissions are going down, despite growth in trade (VFPA 2017a). This is largely due to regulatory changes related to fuel quality and engine emission limits in the marine, non-road, on-road, and rail sectors. **Figure IR13-01-2** illustrates the emission reductions from 2010 to 2015 and future projected emission reductions from 2020 to 2030.

[3] For the rail sector, the response to IR6-33 (CEAR Document #1116) describes the SmartStart Program, which will be fully implemented for locomotives by 2017 to minimise idling, thereby decreasing GHG emissions.

[4] CEAR Document #1113 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR6-09, IR6-15, IR6-16, IR6-19, IR7-09, IR7-10, IR7-11, and IR7-32 (See Reference Documents #991 & #1000).

Figure IR13-01-2 Port of Vancouver Air Pollutant Emissions and Cargo Throughput, 2010-2030



Source: VFPA 2017a

Provide a discussion of Vancouver Fraser Port Authority emissions reduction efforts to date, and how those efforts would be reflected into mitigation measures and built into a follow-up program specifically directed towards air quality effects of the proposed Project.

Regulatory changes to fuel quality and engine emission limits in the marine, non-road, on-road, and rail sectors, and ongoing VFPA programs and initiatives outlined above will contribute to reducing emissions from port operations.

As outlined in the EIS and IR6-37 (CEAR Document #1188), the VFPA will develop, with the Infrastructure Developer and Terminal Operator, detailed Environmental Management Plans (EMPs), including an air quality and dust control plan for construction, and air quality compliance monitoring plans for construction and operation of the Project. As part of these plans, air quality monitoring will occur during construction and operation, which will include criteria and thresholds in support of a human health air quality follow-up program as described

in the EIS Section 27.12. The results from the implementation of EMPs and air quality monitoring, along with additional monitoring conducted annually by Metro Vancouver, will provide information on the effectiveness of mitigation measures implemented at RBT2.

References

Metro Vancouver. 2011. Metro Vancouver Integrated Air Quality and Greenhouse Gas Management Plan. Available at http://www.metrovancouver.org/services/air-quality/AirQualityPublications/IntegratedAirQualityGreenhouseGasManagementPlan-October2011.pdf. Accessed August 2018.

Northwest Ports Clean Air Strategy - Port of Seattle, Port of Tacoma, Port of Vancouver (NWPCAS). 2017. Northwest Ports Clean Air Strategy 2016 Implementation Report. Available at https://www.portvancouver.com/wpcontent/uploads/2015/05/NWPCAS-Implementation-Report-2016-Updated-Final-2017-11-28.pdf. Accessed July 2018.

Vancouver Fraser Port Authority (VFPA). 2017a. 2015 Port Emissions Inventory Report, Available at https://www.portvancouver.com/wp-content/uploads/2017/12/2015PortEmissionsInventory.pdf. Accessed July 2018.

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IR13-02 Air Quality – Additional receptors and effects of Project alone

Information Source(s)

EIS Volume 2: Section 9.2 Appendix 9.2-A, Table 4-4 to 4-9

B.C. Ministry of Health Submission to the Review Panel (CEAR 629)

Context

Tables 4-4 to 4-9 of Appendix 9.2-A present predicted concentrations (µg/m^3) for gaseous and particulate criteria air contaminants and formaldehyde under existing conditions (year 2010), expected conditions (year 2025) and future conditions (i.e. expected conditions with the proposed Project) for 18 discrete receptors, as well as the maximum over-water and overland concentrations. The contribution of the Project alone is shown in bracket in Table 4-6 and 4-9 for NO_2, SO_2, PM, PM_{10} and $PM_{2.5}$ (annual) only. The values did not include the influence of the background pollution concentration.

In addition, B.C. Ministry of Health noted that it was unclear whether the most sensitive receptors were adequately represented in the assessment (e.g. schools, day cares, and hospitals in the local study area). Further, no over-water receptors were assessed, while the outdoor recreation section identified a number of different types of activities that occur on the water.

Information Request

Provide tables, similar to Tables 4-4 to 4-9, presenting predicted ambient concentrations (µg/m^3) for all contaminants of concern for additional sensitive receptors such as schools, day cares, and hospitals, other than the Delta Hospital. Include receptors over water representative of outdoor recreation activities in the local assessment area. Include the influence of the background pollutant concentration in the results.

Provide tables presenting the contribution of the proposed Project alone for all contaminants of concern and averaging periods at all sensitive receptors.

VFPA Response

Clarification

As clarification, 98th percentile background concentrations for each contaminant of concern are provided at the top in each of the tables[1] in EIS Appendix 9.2-A, including Tables 4-4 and 4-7 for existing conditions, Tables 4-5 and 4-8 for expected conditions, and Tables 4-6 and

[1] 98th percentile background concentrations are provided in row 3 of these tables, below the study criteria in the first row and Metro Vancouver Ambient Air Quality Objective (MV AAQO) in the second row.

4-9 for future conditions with the Project. The concentrations presented for the 18 discrete receptors in Tables 4-4 through 4-9 are incremental and do not include the 98th percentile background concentrations, but the total concentration can be determined by adding the incremental maximum contaminant concentration presented for each receptor to the contaminant background concentration[2]. The predicted maximum receptor concentrations were reported in this manner (i.e., exclusive of the background concentration) for ease of comparing concentrations between receptors, since in some cases the background concentration was higher than the predicted increase by more than an order of magnitude.

As documented in the EIS, total concentrations inclusive of background concentrations were provided in Figures 4-8 to 4-22 in EIS Appendix 9.2-A, Figures 4-1 to 4-14 in Appendix E of EIS Appendix 9.2-A, and Figures 4 to 8 in EIS Appendix 27-A. These EIS figures are superseded by Figures IR6-24-A1 to IR6-24-A45 in Appendix IR6-24-A of the response to IR6-24 (CEAR Document #1188[3]), which were revised to include the most stringent study criteria as of December 2017 (updated study criteria outlined in Table IR6-23-1 in the response to IR6-23 (CEAR Document #1188)).

The contour plots provided in these figures show lines of equal contaminant concentration to illustrate the maximum predicted concentrations, and illustrate the maximum predicted concentrations for all gridded receptors, not only select discrete receptors. As further explanation, the isopleths indicate the highest hourly or daily concentration in the year that results in the maximum concentration at each receptor, thereby indicating the maximum concentrations that could occur on a once-per-year basis in a given location. These plots, therefore, should not be interpreted as an aggregate plume that covers the air quality study area. In addition to the isopleth contours representing multiple points in time, they also include the 98th percentile background concentrations, noting that it is unlikely that the 98th percentile background level would occur simultaneously with the hour or day having the highest predicted concentration. For further explanation, refer to EIS Section 9.2.10.5.

For the assessment of effects on human health related to air quality (i.e., the human health risk assessment (HHRA) presented in EIS Appendix 27-A), the concentrations used to determine risk quotients for exposure to airborne concentrations of contaminants of potential concern included background concentrations. Discrete receptor parameter concentrations presented in the HHRA for all temporal cases provided in Appendix A of EIS Appendix 27-A Tables C-1.1 though C-4.1 included concentrations both with and without the inclusion of

[2] Note that maximum predicted gaseous and particulate criteria air contaminant and formaldehyde concentrations for five of these 18 receptors were presented in EIS Tables 9.2-13 and 9.2-14 for existing conditions, Tables 9.2-18 and 9.2-19 for expected conditions, and Tables 9.2-25 and 9.2-26 for future conditions with the Project operation (list reduced for presentation purposes in EIS Section 9.2). These tables were subsequently revised with the updated study criteria and associated statistical methods provided in Table IR6-23-1 (in response to IR6-23 of CEAR Document #1188) based on receptor location (i.e., relevant to the location over land in Metro Vancouver or U.S. jurisdiction, or over water), and the updates are presented in Appendix IR6-23-A (CEAR Document #1188).

[3] CEAR Document #1188 From the Vancouver Fraser Port Authority to the Review Panel re: Response to IR6-04, IR6-05, IR6-10, IR6-11, IR6-12, IR6-14, IR6-21, IR6-22, IR6-23, IR6-24, IR6-25, IR6-27, IR6-28, IR6-29, IR6-31, IR6-32, IR6-34, IR6-35, and IR6-37 (See Reference Document #991).

background concentrations (except for over-water concentrations as noted, since background concentrations are concentrations measured and representative of over land conditions).

Provide tables, similar to Tables 4-4 to 4-9, presenting predicted ambient concentrations (µg/m^3) for all contaminants of concern for additional sensitive receptors such as schools, day cares, and hospitals, other than the Delta Hospital. Include receptors over water representative of outdoor recreation activities in the local assessment area. Include the influence of the background pollutant concentration in the results.

The responses to IR6-14 and IR6-24 (CEAR Document #1188) outlined that the 18 discrete receptors were selected to assist in the discussion of the RBT2 Air Quality Study (AQ Study) results from the 8,642 gridded receptors located in the AQ Study local study area (LSA). Similar discrete receptor locations were used in the air quality assessment for the Deltaport Third Berth Project in 2005 (i.e., R1 to R11, R14, R15, and R17). New receptor points were added for the Delta Hospital (R12), BC Ferries Tsawwassen Terminal (R13), and the Air Quality Monitoring Station T39 (R18). As outlined in EIS Section 9.2.5.4, these locations were selected as reference points to represent populated locations that could potentially experience changes to air quality due to the Project and may not necessarily represent 'sensitive' receptors.

To address the request for predicted contaminant concentrations at additional receptor locations, 50 additional receptors have been considered in addition to the 18 discrete receptors originally included in the AQ Study (R1 through R18) and the two receptors included in the IR6-14 response (R19 and R20; CEAR Document #1188). The additional locations (R21 through R70) correspond to the following:

- All medical centres in the LSA;
- All schools, learning centres, and childcare facilities in the LSA; and
- Locations where land- and marine-based recreational activities occur, as identified in EIS Section 24.0.

All 70 discrete receptor locations are listed in **Appendix IR13-02-A** and shown on Figure IR13-02-B1 in **Appendix IR13-02-B**. Figure IR13-02-B1 also reflects information from the outdoor recreation assessment (EIS Section 24.0) by incorporating discrete receptor locations that correspond with the broader areas on land and water where outdoor recreation activities typically occur.

Isopleth plots of predicted air quality concentrations over water and over land for existing conditions, expected conditions, and future conditions with Project operation inclusive of 98th percentile background concentrations are provided in Appendix IR6-24-A (Figures IR6-24-A1 to A19) in the response to IR6-24 (CEAR Document #1188). In addition, isopleth plots for the Project construction phase are provided in Appendix IR6-24-A (Figures IR6-24-20 to IR6-24-45). Figures IR6-24-A21, IR6-24-A30, and IR6-24-A31 for average day Project construction emissions have been updated to show all 70 discrete receptor locations and are presented in the following figures included in **Appendix IR13-02-B**, respectively:

- Figure IR13-02-B2 – Predicted 98th percentile 1-hour NO_2 concentrations over water;

- Figure IR13-02-B3 – Predicted 98th percentile 24-hour $PM_{2.5}$ concentrations over water; and
- Figure IR13-02-B4 – Predicted Annual $PM_{2.5}$ concentrations over land and over water.

The three figures were selected for illustrative purposes with the additional receptor locations as they show the contaminants and averaging periods associated with the only potential human health effect related to air emissions (i.e., potential exposure to elevated NO_2 and $PM_{2.5}$ emissions in a localised area in the marine environment during construction). Exposure resulting in a health effect is considered unlikely for these contaminants. To reiterate, Project-related health effects are not predicted for other contaminants or other receptor locations (including those in upland areas).

As further explanation, **Appendix IR13-02-C** contains a tabulated summary of contaminant concentrations for all averaging periods for all 70 receptors, inclusive of background concentrations, for future conditions with Project operation. For five receptors (R3, R10, R12, R13, and R18), the predicted concentrations were sourced from the tables provided in Appendix IR6-23-A in the response to IR6-23 (CEAR Document #1188). For the remaining 65 receptors, concentrations were estimated from the isopleth contours shown on Figures IR6-24-A1 to IR6-24-A19 in Appendix IR6-24-A (CEAR Document #1188). As illustrated by this tabulated summary and explained in the response to IR6-14 (CEAR Document #1188), concentrations (inclusive of background concentration) at any receptor of interest could be estimated from the predicted concentration provided for a proximal discrete receptor, as differences in predicted concentrations at any given location versus a proximal discrete receptor would be small (i.e., concentrations are unlikely to peak or be elevated between receptor locations in proximity to each other). Based on a comparison of the contaminant concentration at each receptor and applicable air quality criteria, there are no predicted exceedances at any of the 70 receptor locations during the operation phase.

Provide tables presenting the contribution of the proposed Project alone for all contaminants of concern and averaging periods at all sensitive receptors.

Tables 5-10 to 5-24 of EIS Appendix 9.2-A show the incremental change from the Project (i.e., Project emissions alone) for all contaminants of concern and all averaging periods for the 18 discrete receptors originally selected for presentation purposes. These tables also provide concentrations for expected conditions inclusive of the background concentration, cumulative future conditions, and the percent cumulative change for each of the 18 discrete receptors.

As indicated above, Appendix IR6-24-A in the response to IR6-24 (CEAR Document #1188) provides updated isopleths based on the statistical methods associated with the most stringent air contaminant criteria for the applicable jurisdiction as of the end of 2017 (based on updated criteria provided in Table IR6-23-1 in the response to IR6-23 (CEAR Document #1188)). The figures illustrate maximum concentrations including the 98th percentile background concentration for all contaminants of concern and all applicable averaging periods for all locations within the LSA. For any receptor of interest, the difference between the contour concentration presented in the expected conditions isopleth plot and the future conditions with the Project isopleth plot represent Project-related incremental contributions.

As illustrated by the tabulated summary of concentrations for the future with the Project case (**Appendix IR13-02-C**), the predicted incremental change in concentrations from the Project at the 18 discrete receptors (listed Tables 5-10 to 5-24 of EIS Appendix 9.2-A) are representative of expected incremental concentrations at adjacent receptors.

Appendices

Appendix IR13-02-A List of 70 Discrete Air Quality Receptors

Appendix IR13-02-B Supporting Figures

Appendix IR13-02-C Tabulated Summary of Contaminant Concentrations (Including Background Concentrations) for Future Conditions with Project Operation for 70 Discrete Receptors

APPENDIX IR13-02-A
LIST OF DISCRETE AIR QUALITY RECEPTORS

Table IR13-02-A1 List of Discrete Air Quality Receptors

Receptor	Name	Receptor Type
Receptors Identified in the EIS		
R1	Ladner	Residential Location
R2	Farmer 1	Farm
R3	Tsawwassen First Nation Community	Residential Location
R4	Farmer 2	Farm
R5	Farmer 3	Farm
R6	Tsawwassen Beach Campsite	Recreational Location
R7	Beach Grove	Residential Location
R8	Boundary Bay	Residential Location
R9	Tsawwassen	Residential Location
R10	Point Roberts 1	Residential Location (U.S.)
R11	Point Roberts 2	Residential Location (U.S.)
R12	Delta Hospital	Hospital
R13	Ferry Terminal	Recreational Location
R14	Reifel Bird Sanctuary	Recreational Location
R15	Boundary Bay GVRD Park	Recreational Location
R16	English Bluffs Beach	Recreational Location
R17	South Arm Marsh	Recreational Location
R18	Air Quality Station T39	Residential Location
Receptors Identified in Information Request Responses		
R19	Residential location in Tsawwassen	Residential Location
R20	English Bluff Elementary	School
R21	Boat launch at Wellington Point	Other
R22	Canoe Passage	Other
R23	Tidal area where hunting takes place	Other
R24	Pebble Hill Traditional Elementary / The Rainbow Connection Children's Centre at Pebble Hill	School / Child Care Centre
R25	Ecole du Bois-Joli / Prematernelle Lutins Du Bois	School / Child Care Centre
R26	Cliff Drive Elementary / Aird's Kidzone Learning Centre / Tsawwassen Little Friends Preschool	School / Child Care Centre
R27	Sacred Heart / Neverland Childrens Centre / Lil' Saints Preschool At Sacred Heart	School / Child Care Centre
R28	Hawthorne Elementary / Ladner Animal Crackers	School / Child Care Centre
R29	Holly Elementary / Holly's Childcare Centre	School / Child Care Centre

Receptor	Name	Receptor Type
R30	Neilson Grove Elementary / Bright Eyes Academy Inc	School / Child Care Centre
R31	Delta Continuing Education	School
R32	Ladner Elementary	School
R33	Delta Secondary	School
R34	South Park Elementary	School
R35	Beach Grove Elementary	School
R36	Port Guichon Elementary	School
R37	South Delta Secondary	School
R38	Delta Christian School	School
R39	Boundary Bay Montessori House	School
R40	Southpointe Academy	School
R41	Rainbow Bridges Enrichment Centre Day Care	School / Child Care Centre
R42	Wind And Tide Preschool	School / Child Care Centre
R43	Hicks Family Playcare	School / Child Care Centre
R44	Sunny Town Learn and Play Childcare Centre	School / Child Care Centre
R45	Shooting Stars Early Learning Centre	School / Child Care Centre
R46	Wee Bairns	School / Child Care Centre
R47	Kids In Paradise	School / Child Care Centre
R48	Smuyuq'wa' Lelum Ece Centre	School / Child Care Centre
R49	Lynne's Daycare	School / Child Care Centre
R50	Happy Castle Child Care	School / Child Care Centre
R51	Reach Development Preschool South Delta	School / Child Care Centre
R52	Wind And Tide Preschool	School / Child Care Centre
R53	Evan's Day Care	School / Child Care Centre
R54	Treasure-Chest Family Daycare	School / Child Care Centre
R55	Westcoast Wee Watch	School / Child Care Centre
R56	Creation Station Day Care	School / Child Care Centre
R57	Little Bunnies	School / Child Care Centre
R58	Mother Hen's Daycare	School / Child Care Centre
R59	The Yellow Door Daycare	School / Child Care Centre
R60	Tina's Tiny Tots Daycare	School / Child Care Centre
R61	Bright Eyes Academy Inc. at Holly	School / Child Care Centre
R62	Renaissance Kids	School / Child Care Centre
R63	Delta Medical Center	Walk-in Clinic
R64	Denning Health Group	Walk-in Clinic

Receptor	Name	Receptor Type
R65	Recreational Fishing Area	Recreational Location
R66	Boating Area	Recreational Location
R67	Operations Closure	Recreational Location
R68	Recreational Boating (U.S.A.)	Recreational Location
R69	Marine Recreation Site	Recreational Location
R70	Recreational Boating Route	Recreational Location

APPENDIX IR13-02-B
SUPPORTING FIGURES

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STURGEON BANK WILDLIFE MANAGEMENT AREA

SOUTH ARM MARSHES WILDLIFE MANAGEMENT AREA

ROBERTS BANK WILDLIFE MANAGEMENT AREA

Delta

Ladner

Westham Island

Musqueam I.R. 4

Roberts Bank

Tsawwassen First Nation

Tsawwassen

Boundary Bay

BOUNDARY BAY WILDLIFE MANAGEMENT AREA

Point Roberts (U.S.A.)

CANADA

UNITED STATES

29-D

29-8

29-G

OTHER

R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R24 R25 R26 R27 R28 R29 R30 R31 R32 R33 R34 R35 R36 R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60 R61 R62 R63 R64 R65 R66 R67 R68 R69 R70

Notes:
Locations are approximate. Tsawwassen First Nation, First Nation Reserves, and other feature data obtained form the Province of British Columbia, Copyright © 2014. Province of British Columbia. All rights reserved. Navigational closures obained from the Department of Fisheries and Oceans Canada, Copyright © 2014. Government of Canada. All rights reserved. Schools (receptors) obtained from BC Ministry of Education, via DataBC. Child care locations (receptors) obtained from Ministry of Children and Family Development, via DataBC. Walk-in clinics and Hospitals (receptors) obtained from Ministry of Health, via DataBC. Wildlife management areas obtained from Ministry of Environment, via DataBC.

0 2 4
Kilometres

1:80,000

NAD 1983 UTM Zone 10N

N

Legend

- DISCRETE AIR QUALITY RECEPTOR LOCATION (R1-R18: IDENTIFIED IN THE RBT2 EIS)
- DISCRETE AIR QUALITY RECEPTOR LOCATION (R19-R70: IDENTIFIED IN IR RESPONSES)
- BOAT LAUNCH
- MARINA
- RECREATIONAL BOATING ROUTE
- WALKING TRAIL
- U.S.A. - CANADA BORDER
- BOUNDARY OF PROJECT AREA
- AIR QUALITY LOCAL STUDY AREA
- TSAWWASSEM FIRST NATION LANDS
- HUNTING AREA
- NAVIGATIONAL CLOSURE FOR COMMERCIAL CRAB HARVESTING
- NAVIGATIONAL CLOSURE FOR RECREATIONAL CRAB HARVESTING
- RECREATIONAL BOATING AND WINDSPORTING, RECREATIONAL HUNTING, AND LAND-BASED BIRDWATCHING
- GEORGE C. REIFEL MIGRATORY BIRD SANCTUARY
- ALAKSEN NATIONAL WILDLIFE AREA
- RECREATIONAL FISHING AREA - CRAB
- RECREATIONAL FISHING AREA - ANADROMOUS FISH
- BURNS BOG ECOLOGICAL CONSERVANCY AREA
- RECREATION FISHERIES MANAGEMENT AREA
- WILDLIFE MANAGEMENT AREA
- PARK AND/OR RECREATIONAL AREA

PORT of vancouver

ROBERTS BANK TERMINAL 2

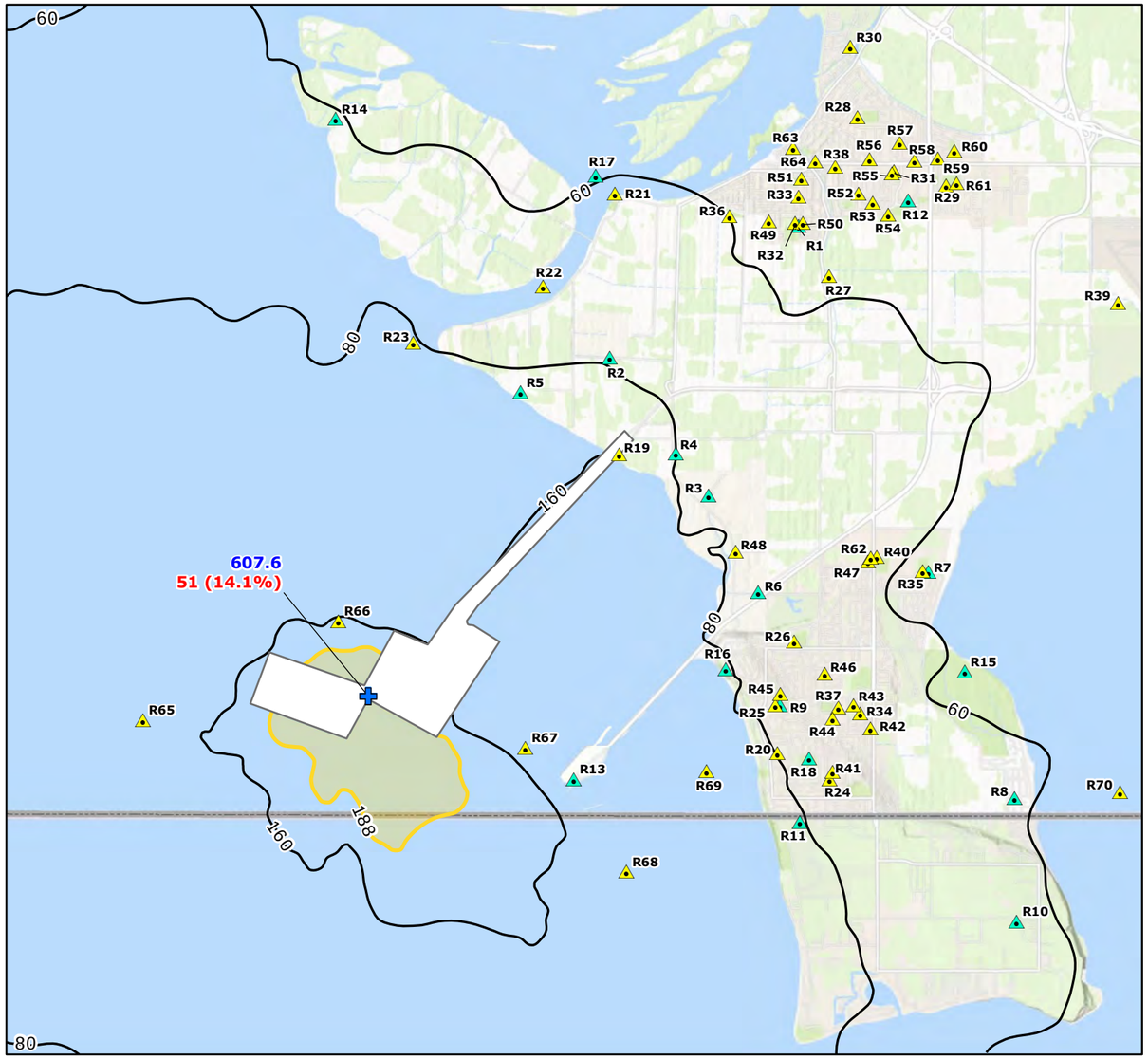
AIR QUALITY RECEPTORS - RECREATIONAL USE AREAS, EDUCATIONAL AND HEALTH CENTRES

DATE: 10/22/2018

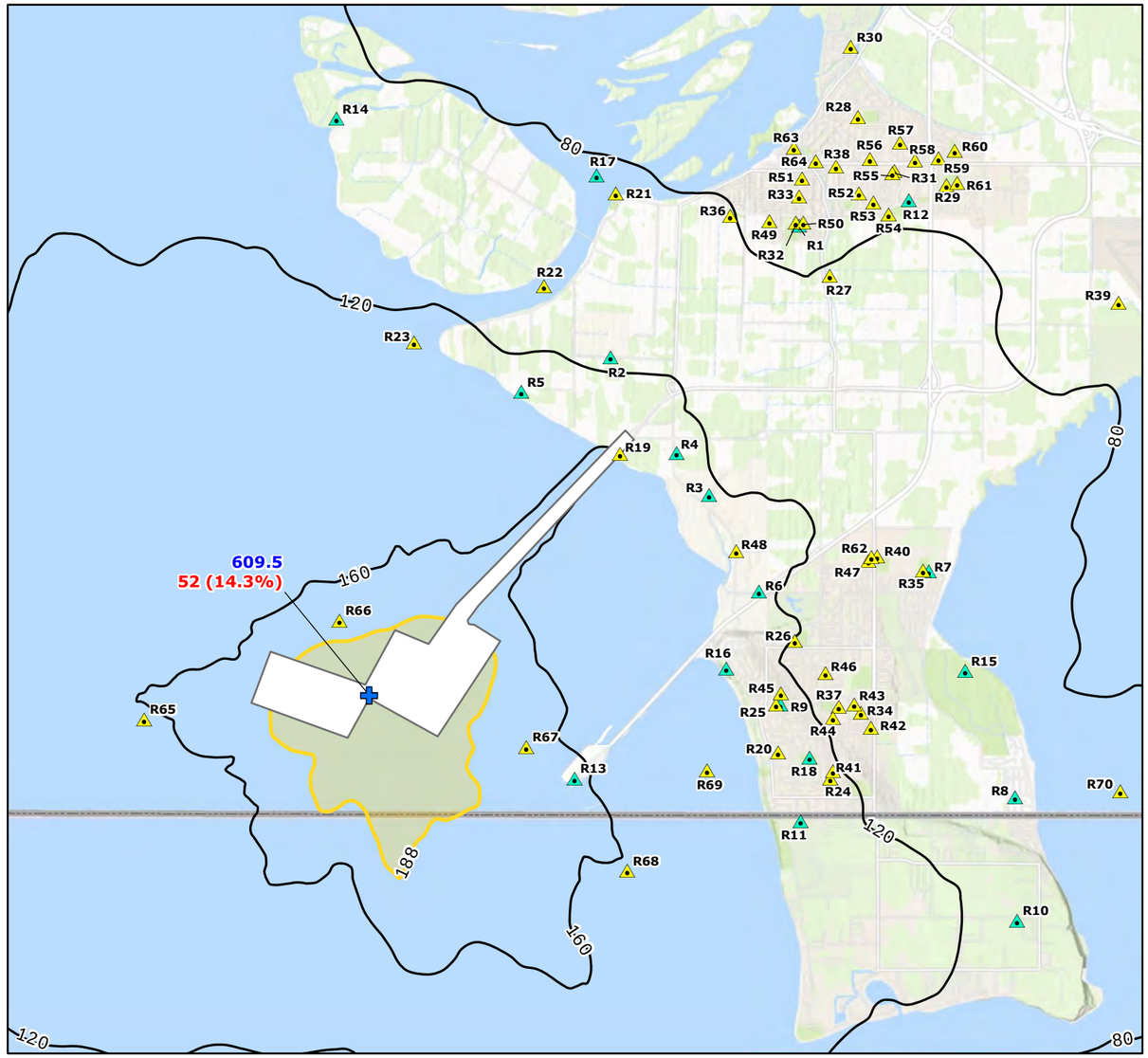
IR13-02-B1

Path: S:\Geomatics\Projects\102738IEIS IRs\IR13_02\mxd\IR13_02_B2_RBT2_AQ_AvgDay_Construction_98NO2_OverWater_180907.mxd

Predicted 98th Percentile 1-Hour NO_2 Concentrations (µg/m³) from Construction



Predicted 98th Percentile 1-Hour NO_2 Concentrations (µg/m³) from Construction and Operations at Westshore Terminals, Deltaport and B.C. Ferries Terminal (i.e. *Expected Conditions* scenario)



Legend

- DISCRETE AIR QUALITY RECEPTOR LOCATION (R1-R18: IDENTIFIED IN THE RBT2 EIS)
- DISCRETE AIR QUALITY RECEPTOR LOCATION (R19-R70: IDENTIFIED IN IR RESPONSES)
- LOCATION OF MAXIMUM CONCENTRATION OVER WATER (µg/m³)
- CONCENTRATION CONTOUR (µg/m³)
- B.C. AAQO AND UA NAAQS CRITERIA (188 µg/m³) FOR OVER WATER LOCATIONS
- PROJECT BLANKING BOUNDARY
- U.S.A. - CANADA BORDER

Notes:

Concentration contour levels include a background concentration of 44.7 µg/m³

Frequency of exceedances shown in red as days per year (percentage)

0 2 4
Kilometres
1:85,000
NAD 1983 UTM Zone 10N

N

PORT of vancouver

ROBERTS BANK TERMINAL 2

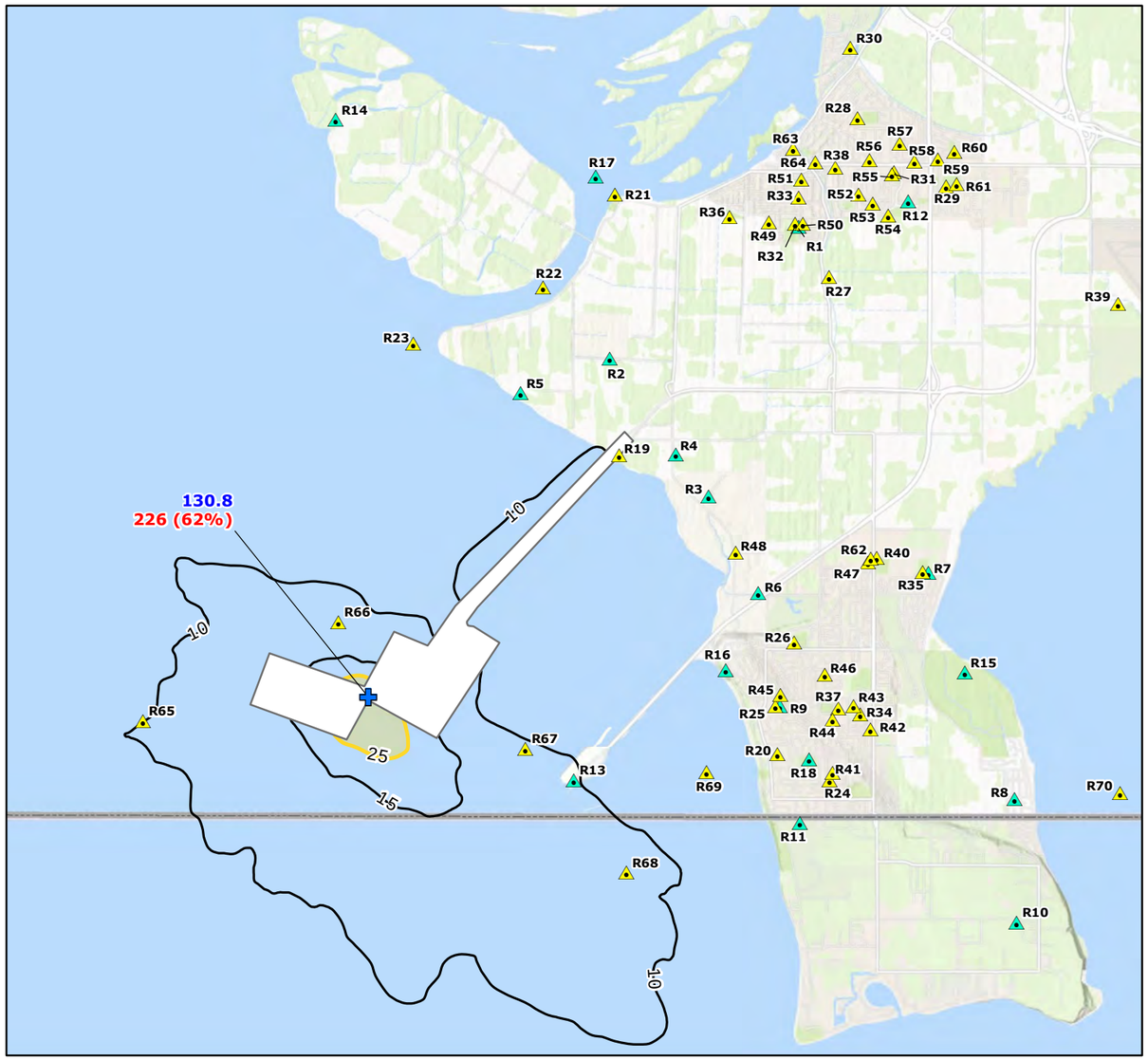
CONSTRUCTION PHASE AVERAGE DAY SCENARIO - 98TH PERCENTILE 1-HOUR NO_2 CONCENTRATIONS (µg/m³) - OVER WATER

DATE: **10/22/2018**

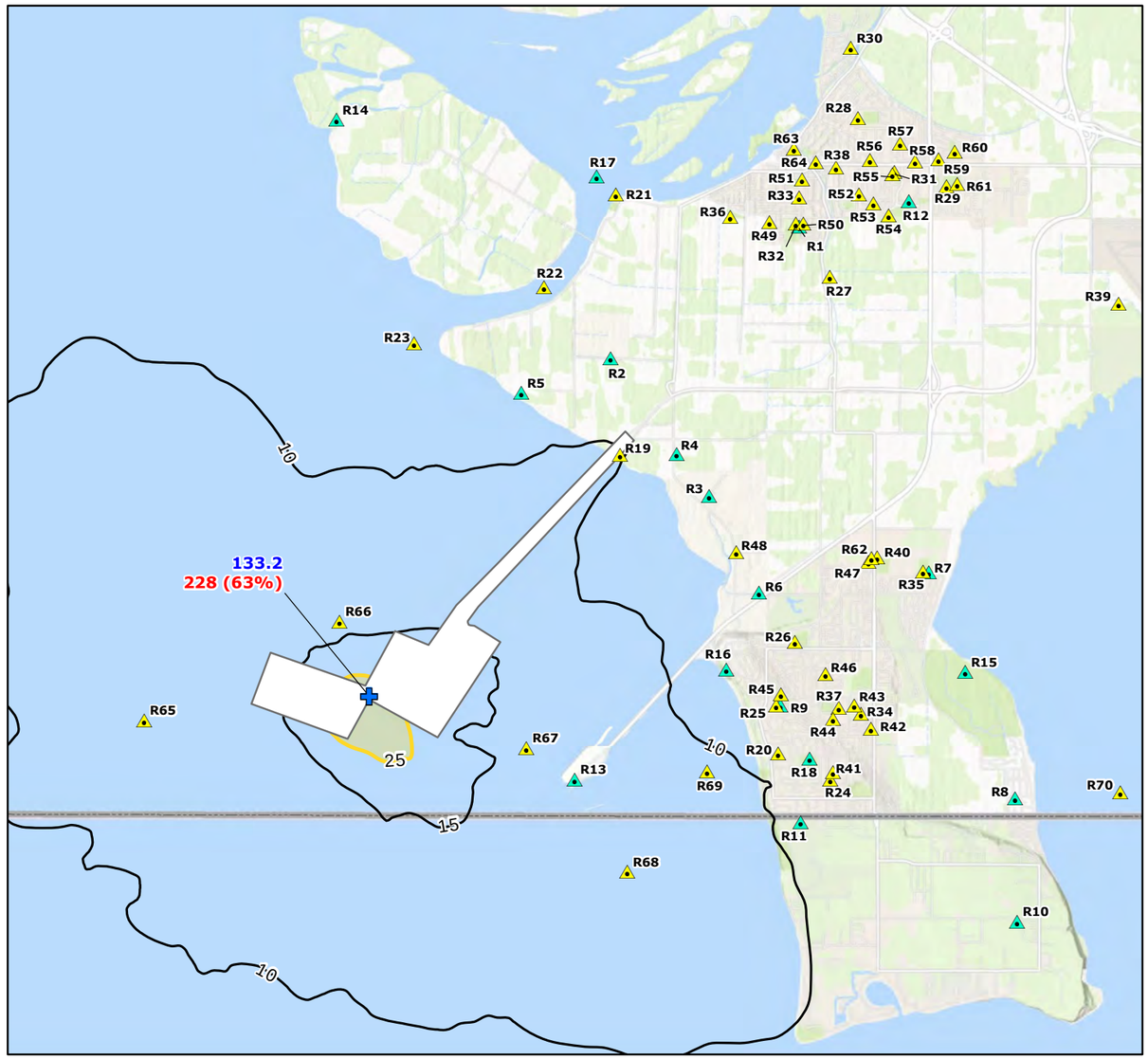
IR13-02-B2

Path: S:\Geomatics\Projects\10273\8\EIS IRs\IR13_02\mxd\IR13_02_B3_RBT2_AQ_AvgDay_Construction_98PM_OverWater_180907.mxd

Predicted 98th Percentile 24-Hour $PM_{2.5}$ Concentrations (µg/m³) from Construction



Predicted 98th Percentile 24-Hour $PM_{2.5}$ Concentrations (µg/m³) from Construction and Operations at Westshore Terminals, Deltaport and B.C. Ferries Terminal (i.e. *Expected Conditions* scenario)



- DISCRETE AIR QUALITY RECEPTOR LOCATION (R1-R18: IDENTIFIED IN THE RBT2
- DISCRETE AIR QUALITY RECEPTOR LOCATION (R19-R70: IDENTIFIED IN IR
- LOCATION OF 98TH PERCENTILE CONCENTRATION
- CONCENTRATION CONTOUR
- CRITERIA (25 µg/m³) FOR OVER WATER LOCATIONS - BASED ON ANNUAL 98TH
- PROJECT BLANKING BOUNDARY
- U.S.A. - CANADA BORDER

Notes:

Concentration contour levels include a background concentration of 8.7 µg/m³

Frequency of exceedances shown in red as days per year (percentage)

0 2 4
Kilometres
1:85,000
NAD 1983 UTM Zone 10N

N

PORT of vancouver

ROBERTS BANK TERMINAL 2

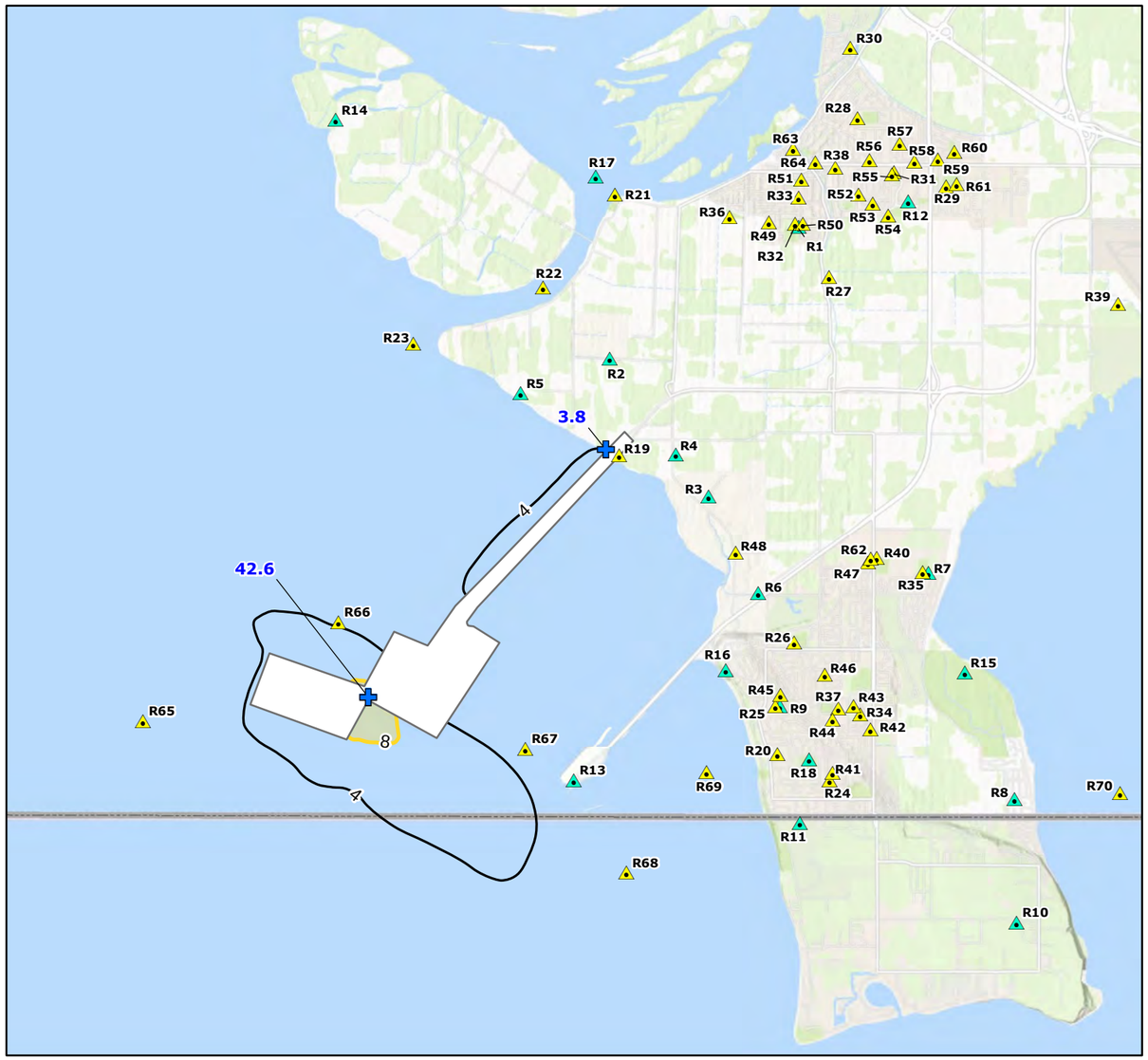
CONSTRUCTION PHASE AVERAGE DAY SCENARIO - 98TH PERCENTILE 24-HOUR $PM_{2.5}$ CONCENTRATIONS (µg/m³) - OVER WATER

DATE: 10/22/2018

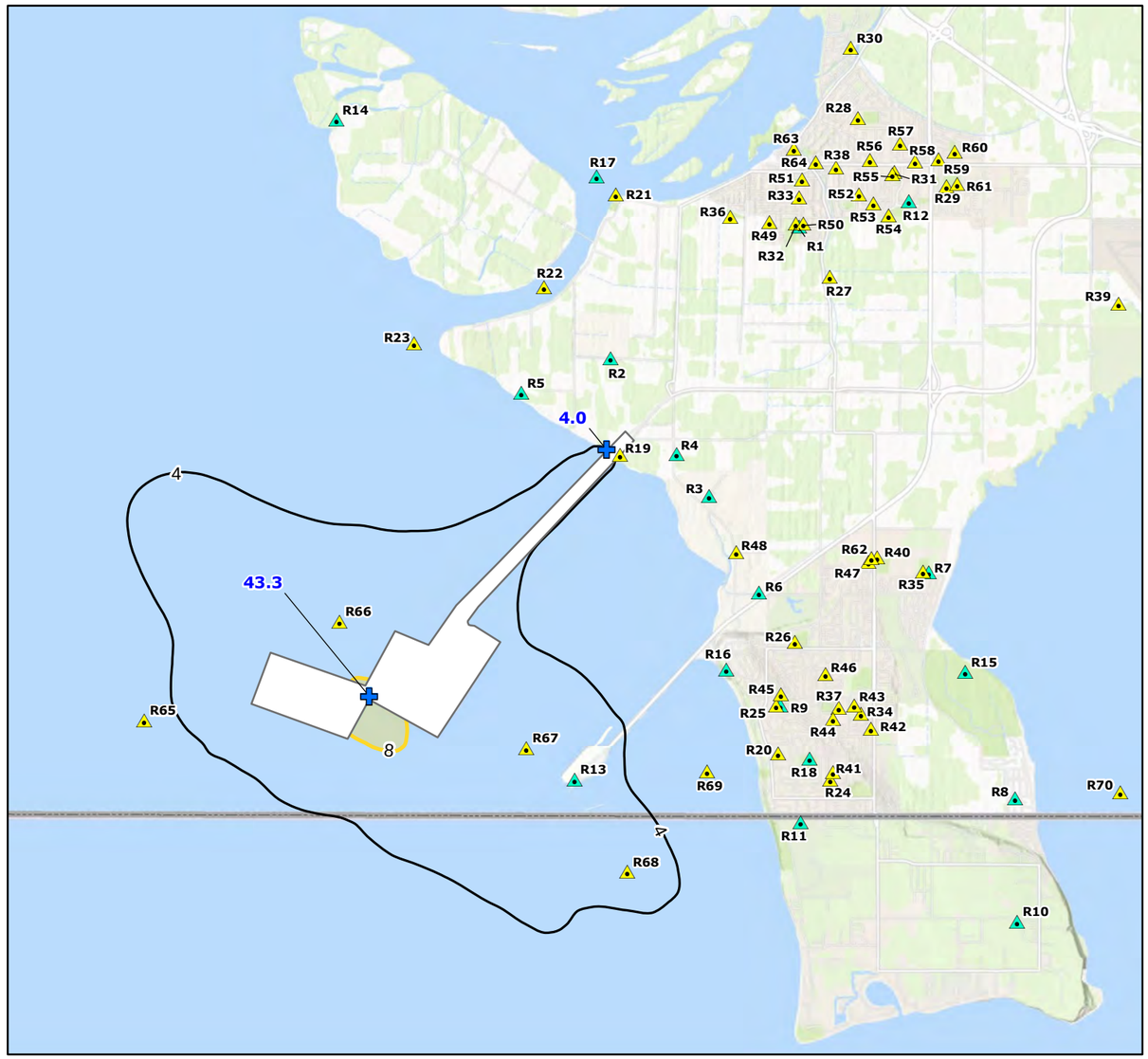
IR13-02-B3

Path: S:\Geomatics\Projects\102738\EIS IRs\IR13_02\mxd\IR13_02_B4_RBT2_AQ_AvgDay_Construction_AnnualPM_OverWater_180907.mxd

Predicted Annual $PM_{2.5}$ Concentrations (µg/m³) from Construction



Predicted Annual $PM_{2.5}$ Concentrations (µg/m³) from Construction and Operations at Westshore Terminals, Deltaport and B.C. Ferries Terminal (i.e. *Expected Conditions* scenario)



Legend

- DISCRETE AIR QUALITY RECEPTOR LOCATION (R1-R18: IDENTIFIED IN THE RBT2 EIS)
- DISCRETE AIR QUALITY RECEPTOR LOCATION (R19-R70: IDENTIFIED IN IR RESPONSES)
- LOCATION OF MAXIMUM CONCENTRATION OVER LAND AND OVER WATER (µg/m³)
- CONCENTRATION CONTOUR (µg/m³)
- CRITERIA (8 µg/m³)
- PROJECT BLANKING BOUNDARY
- U.S.A. - CANADA BORDER

Notes:

Concentration contour levels include a background concentration of 3.5 µg/m³

0 2 4
Kilometres

1:85,000

NAD 1983 UTM Zone 10N

N

PORT of vancouver

ROBERTS BANK TERMINAL 2

CONSTRUCTION PHASE AVERAGE DAY SCENARIO - ANNUAL $PM_{2.5}$ CONCENTRATIONS (µg/m³) - OVER LAND AND OVER WATER

DATE: 10/22/2018

IR13-02-B4

APPENDIX IR13-02-C

TABULATED SUMMARY OF CONTAMINANT CONCENTRATIONS (INCLUDING BACKGROUND CONCENTRATIONS) FOR FUTURE CONDITIONS WITH PROJECT OPERATION FOR 70 DISCRETE RECEPTORS

Table IR13-02-B1 Tabulated Summary of Contaminant Concentrations (Including Background Concentrations) for Future Conditions with Project Operation for 70 Discrete Receptors

Discrete Receptor No.	Location Description	CO		NO_2			SO_2			Formaldehyde	PM		PM_{10}		$PM_{2.5}$	
		1-h	8-h	1-h	24-h	Annual	1-h	24-h	Annual	1-h	24-h	Annual	24-h	Annual	24-h	Annual
	Canada Over Land Criteria	**14,300**	**5,500**	**200**	**200**	**40**	**196**	**125**	**10**	**60**	**120**	**60**	**50**	**20**	**25**	**8**
	Canada Over Water Criteria	**14,300**	**5,500**	**188**	**200**	**60**	**170**	**150**	**10**	**60**	**120**	**60**	**50**	**N/A**	**25**	**8**
	U.S. Over Land and Water Criteria	**40,000**	**10,300**	**188**	**N/A**	**100**	**196**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**150**	**N/A**	**35**	**12**
	Background Concentration (included in concentrations below)	*371.2*	*339.3*	*44.7*	*34.9*	*12.8*	*7.7*	*5.1*	*1.4*	*3.58*	*46.2*	*20.6*	*23.1*	*10.3*	*8.7*	*3.5*
R1	Ladner	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R2	Farmer 1	<750	<500	<160	~50	<15	<15	<10	<1.5	<10	<50	<21	<25	<11	<12.5	<4
R3	Tsawwassen First Nation	591.1	412.1	164.5	53.4	14.5	14.6	6.3	1.43	7.48	47.3	20.69	24.4	10.39	9.8	3.57
R4	Farmer 2	<750	<500	<200	<100	<15	<15	<10	<1.5	<10	<50	<21	<25	<11	<12.5	<4
R5	Farmer 3	<750	<500	<200	<100	~15	<15	<10	<1.5	<10	<50	<21	<25	<11	<12.5	<4
R6	Tsawwassen Beach Campsite	<750	<500	<160	<100	<15	<30	<10	<1.5	<10	<50	<21	~25	<11	<12.5	<4
R7	Beach Grove	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R8	Boundary Bay	<750	<500	<160	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R9	Tsawwassen	<750	<500	<160	<100	<15	<30	<10	<1.5	~10	<50	<21	<25	<11	<12.5	<4
R10	Point Roberts 1	438.3	362.9	122.5	49	13.6	11.2	5.8	1.42	4.38	46.9	20.64	23.9	10.34	9.1	3.54
R11	Point Roberts 2	<750	<500	<160	<100	~15	<30	<10	<1.5	<5	<50	<21	~25	<11	<12.5	<4
R12	Delta Hospital	422.6	366.7	130.9	40.2	13.2	11.2	5.5	1.41	4.38	46.5	20.62	23.6	10.32	9.1	3.52
R13	B.C. Ferries Terminal	1100.4	847.1	171.3	116.7	22.9	20.1	9.3	1.66	10.48	52.6	21.21	29.8	10.91	11.3	3.98
R14	Reifel Bird Sanctuary	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R15	Boundary Bay GVRD Park	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R16	English Bluffs Beach	<750	<500	<160	<100	<15	<30	<10	<1.5	<10	<50	<21	<25	<11	<12.5	<4
R17	South Arm Marsh	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R18	Air Quality Station T39	514.4	387.3	150.6	52.2	14.3	14.1	6.1	1.44	5.18	47.4	20.68	24.4	10.38	9.7	3.57
R19	Residential location in Tsawwassen	<750	<500	~200	<100	~20	~15	<10	<1.5	<20	<50	~21	<30	<11	<12.5	<4
R20	English Bluff Elementary	<750	<500	<200	<100	~15	~15	<10	<1.5	<10	<50	<21	~25	<11	<12.5	<4
R21	Boat launch at Wellington Point	<750	<500	<160	<50	<15	<15	<10	<1.5	~5	<50	<21	<25	<11	<12.5	<4
R22	Canoe Passage	<750	<500	<160	<50	<15	<15	<10	<1.5	<10	<50	<21	<25	<11	<12.5	<4
R23	Tidal area where hunting takes place	<750	<500	<160	<100	<15	<20	<10	<1.5	<10	<50	<21	<25	<11	<12.5	<4
R24	Pebble Hill Traditional Elementary /The Rainbow Connection Children's Centre at Pebble Hill	<750	<500	<160	<100	<15	<30	<10	<1.5	<10	<50	<21	<25	<11	<12.5	<4
R25	Ecole du Bois-Joli / Prematernelle Lutins Du Bois	<750	<500	<200	<100	<15	<30	<10	<1.5	<10	<50	<21	<25	<11	<12.5	<4
R26	Cliff Drive Elementary /Aird's Kidzone Learning Centre/ Tsawwassen Little Friends Preschool	<750	<500	<160	~50	<15	~15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R27	Sacred Heart / Neverland Childrens Centre / Lil' Saints Preschool At Sacred Heart	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R28	Hawthorne Elementary / Ladner Animal Crackers	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4

Discrete Receptor No.	Location Description	CO		NO_2			SO_2			Formaldehyde	PM		PM_{10}		$PM_{2.5}$	
		1-h	8-h	1-h	24-h	Annual	1-h	24-h	Annual	1-h	24-h	Annual	24-h	Annual	24-h	Annual
	Canada Over Land Criteria	**14,300**	**5,500**	**200**	**200**	**40**	**196**	**125**	**10**	**60**	**120**	**60**	**50**	**20**	**25**	**8**
	Canada Over Water Criteria	**14,300**	**5,500**	**188**	**200**	**60**	**170**	**150**	**10**	**60**	**120**	**60**	**50**	**N/A**	**25**	**8**
	U.S. Over Land and Water Criteria	**40,000**	**10,300**	**188**	**N/A**	**100**	**196**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**150**	**N/A**	**35**	**12**
	Background Concentration (included in concentrations below)	*371.2*	*339.3*	*44.7*	*34.9*	*12.8*	*7.7*	*5.1*	*1.4*	*3.58*	*46.2*	*20.6*	*23.1*	*10.3*	*8.7*	*3.5*
R29	Holly Elementary / Holly's Childcare Centre	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R30	Neilson Grove Elementary / Bright Eyes Academy Inc	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R31	Delta Continuing Education	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R32	Ladner Elementary	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R33	Delta Secondary	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R34	South Park Elementary	<750	<500	<160	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R35	Beach Grove Elementary	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R36	Port Guichon Elementary	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R37	South Delta Secondary	<750	<500	<160	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R38	Delta Christian School	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R39	Boundary Bay Montessori House	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R40	Southpointe Academy	<750	<500	<160	<50	<15	<15	<10	<1.5	~5	<50	<21	<25	<11	<12.5	<4
R41	Rainbow Bridges Enrichment Centre Day Care	<750	<500	<160	<100	<15	<30	<10	<1.5	<10	<50	<21	<25	<11	<12.5	<4
R42	Wind and Tide Preschool	<750	<500	<160	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R43	Hicks Family Playcare	<750	<500	<160	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R44	Sunny Town Learn and Play Childcare Centre	<750	<500	<160	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R45	Shooting Stars Early Learning Centre	<750	<500	<160	<100	<15	<30	<10	<1.5	~5	<50	<21	<25	<11	<12.5	<4
R46	Wee Bairns	<750	<500	<160	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R47	Kids in Paradise	<750	<500	<160	<50	<15	<15	<10	<1.5	~5	<50	<21	<25	<11	<12.5	<4
R48	Smuyuq'wa' Lelum Ece Centre	<750	<500	<160	<100	~15	<30	<10	<1.5	<10	<50	<21	~25	<11	<12.5	<4
R49	Lynne's Daycare	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R50	Happy Castle Child Care	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R51	Reach Development Preschool South Delta	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R52	Wind and Tide Preschool	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R53	Evan's Day Care	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R54	Treasure-Chest Family Daycare	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R55	Westcoast Wee Watch	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R56	Creation Station Day Care	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R57	Little Bunnies	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R58	Mother Hen's Daycare	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R59	The Yellow Door Daycare	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R60	Tina's Tiny Tots Daycare	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R61	Bright Eyes Academy Inc. at Holly	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4

Discrete Receptor No.	Location Description	CO		NO_2			SO_2			Formaldehyde	PM		PM_{10}		$PM_{2.5}$	
		1-h	8-h	1-h	24-h	Annual	1-h	24-h	Annual	1-h	24-h	Annual	24-h	Annual	24-h	Annual
	Canada Over Land Criteria	**14,300**	**5,500**	**200**	**200**	**40**	**196**	**125**	**10**	**60**	**120**	**60**	**50**	**20**	**25**	**8**
	Canada Over Water Criteria	**14,300**	**5,500**	**188**	**200**	**60**	**170**	**150**	**10**	**60**	**120**	**60**	**50**	**N/A**	**25**	**8**
	U.S. Over Land and Water Criteria	**40,000**	**10,300**	**188**	**N/A**	**100**	**196**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**150**	**N/A**	**35**	**12**
	Background Concentration (included in concentrations below)	*371.2*	*339.3*	*44.7*	*34.9*	*12.8*	*7.7*	*5.1*	*1.4*	*3.58*	*46.2*	*20.6*	*23.1*	*10.3*	*8.7*	*3.5*
R62	Renaissance Kids	<750	<500	<160	<50	<15	<15	<10	<1.5	~5	<50	<21	<25	<11	<12.5	<4
R63	Delta Medical Center	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R64	Denning Health Group	<750	<500	<140	<50	<15	<15	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4
R65	Recreational Fishing Area	<750	<500	<160	<100	<20	~20	~10	<2	<10	~50	<21	<30	<11	<12.5	<4
R66	Boating Area	<750	<500	<188	<125	<30	<40	<10	<2	~10	<100	<22	~30	~11	<12.5	~4
R67	Operations Closure	<750	<500	<188	<125	<30	40	<10	<2	<20	<100	<22	<40	<15	~12.5	<8
R68	Recreational Boating (U.S.A.)	<750	<500	<160	<100	<20	<20	<10	<2	<10	~50	<21	<30	<11	<12.5	<4
R69	Marine Recreation Site	<750	<500	<160	<100	<20	<20	<10	~1.5	<10	<50	<21	<30	<11	<12.5	<4
R70	Recreational Boating Route	<750	<500	<140	<50	<15	<20	<10	<1.5	<5	<50	<21	<25	<11	<12.5	<4

Notes: *The criteria that correspond to a receptor location (i.e., row) are indicated by color (e.g., white = Canada Over Land); All receptor concentrations include background concentration; Predicted concentrations for five receptors (R3, R10, R12, R13, and R18) were sourced from the tables provided in Appendix IR6-23-A (CEAR Document #1188). For the remaining 65 receptors, estimated concentrations were sourced from Appendix IR6-24-A (CEAR Document #1188) as indicate by column below:*

Over land and water locations combined	*IR6-24-A1*	*IR6-24-A2*		*IR6-24-A5*			*IR6-24-A10*	*IR6-24-A11*	*IR6-24-A12*	*IR6-24-A13*	*IR6-24-A14*	*IR6-24-A15*	*IR6-24-A16*		*IR6-24-A19*
Over land locations			*IR6-24-A3*		*IR6-24-A6*	*IR6-24-A8*								*IR6-24-A17*	
Over water locations			*IR6-24-A4*		*IR6-24-A7*	*IR6-24-A9*								*IR6-24-A18*	

IR13-03 Air Quality – Coal dust

Information Source(s)

EIS Volume 2: Appendix 9.2-A, Section 5; Appendix H

Health Canada: Submission to the Review Panel (CEAR 548)

B.C. Ministry of Health: Submission to the Review Panel (CEAR 629)

Context

The Proponent, in Appendix 9.2-A, excluded fugitive coal dust emissions from Westshore Terminals from RBT2 modelling because the Proponent considered that this terminal was not the focus of the study and because the health effects of particulate matter derived from combustion sources are different from the ones derived from coal dust. As such, coal dust was also not included in the expected condition, future conditions and the cumulative scenarios, but instead was discussed separately in Appendix H.

The B.C. Ministry of Health, as well as Health Canada, indicated that all sources of particulate matter should be considered and that there is no evidence supporting the exclusion of coal dust from the assessment. As presented, the air quality study, and subsequent air quality human health risk assessment, may be underestimating health effects from particulate matter. Further, both health authorities commented that the fine particle fraction ($PM_{2.5}$) of coal dust can be quite toxic and should be assessed and added to the human health risk assessment, similar to what was done for combustion-based emissions.

Information Request

Provide tables for the expected conditions, future conditions and cumulative scenarios presenting predicted ambient concentrations ($\mu g/m^3$) of particulate criteria air contaminants including all potential sources of particulate matter (e.g. coal dust)

Present the results for all 18 discrete receptors and additional receptors used in IR13-02.

Provide the location on a map of the points of maximum over-water and overland concentration.

Include the influence of the background pollutant concentration on the results.

VFPA Response

Particulate matter (PM) emissions from coal dust from Westshore Terminals are included in the particulate matter concentrations presented for existing conditions, expected conditions (future without the Project), and future with the Project construction and operation scenarios, as part of the 98^{th} percentile background concentrations. Background concentrations were determined from observations at air quality monitoring Station T39 and were combined with

model results for each temporal case, in accordance with the 2008 Guidelines for Air Quality Dispersion Modelling in B.C. (MOE 2008) and the 2015 B.C. Air Quality Dispersion Modelling Guideline (MOE 2015). Particulate matter background concentrations are presented along with model predictions for $PM_{2.5}$[1], PM_{10}[2], and PM for each of the discrete receptors in tables provided EIS Section 9.2 and EIS Appendix 9.2-A (and relevant supporting appendices) and EIS Appendix 27-A. For further context, Station T39 was established in 2010 with the intent to monitor air quality in Tsawwassen, including emissions from existing terminals and marine activities (Metro Vancouver 2012).

The assumed volume of coal throughput for Westshore Terminals was approximately 25 megatonnes (Mt) in existing conditions (2010) and 36 Mt for expected conditions and future conditions with the Project in 2025 (Appendix H in EIS Appendix 9.2-A). While the increase in the amount of coal shipped will increase fugitive dust emissions from coal handling operations, the total amount of stockpiled coal exposed to wind erosion is assumed to remain relatively unchanged, as explained in Appendix H. In the future conditions with the Project scenario, the predicted particulate matter concentrations at the discrete receptors, and the maximum off-terminal concentrations over water and over land are on average approximately 3% higher in comparison with concentrations predicted for existing conditions. A recent monitoring study in the area, *Tsawwassen First Nation Air Quality Monitoring Study 2014-2015 Summary Report*[3], indicated that coal dust was only a marginal contributor to ambient $PM_{2.5}$ concentrations at Station T39 and at two locations on Tsawwassen First Nation Lands (i.e., between 0-1% of the $PM_{2.5}$ particles in dustfall samples was comprised of coal dust). Based on these results, the contribution of coal dust to $PM_{2.5}$ exposure is expected to be relatively low.

As recommended in both the 2008 Guidelines for Air Quality Dispersion Modelling in B.C. (MOE 2008) and the 2015 B.C. Air Quality Dispersion Modelling Guideline (MOE 2015), fugitive coal dust was modelled separately (EIS Appendix 9.2-A, Appendix H) from particulate matter emissions from combustion sources. The modelling guidelines state that assessments of fugitive dust sources should consider the following points due to the large uncertainties associated with establishing fugitive emissions and inherent challenges in modelling these emissions:

- Placing more emphasis on ambient monitoring data to establish the fugitive emission contribution to air quality;
- Using dispersion modelling to provide the concentration magnitude in order to demonstrate whether proactive fugitive emissions control/management needs to be adopted and to assess the effectiveness of mitigation plans (i.e., relative changes in predicted concentrations) with less emphasis on the absolute modelling results; and

[1] Particulate matter particles with a diameter of 2.5 micrometres or less.
[2] Particulate matter particles with a diameter of 10 micrometres or less.
[3] This report is provided in Appendix IR6-09-A in the response to IR6-09 (CEAR Document #1113).

- If possible, reporting the modelling results of fugitive sources separately from the modelling results associated with sources where there is greater certainty in the emissions (point sources for example).

The RBT2 Air Quality Study has adhered to these recommendations by presenting the air dispersion modelling results for coal dust from the Westshore Terminal separately in Appendix H of EIS Appendix 9.2-A, while including the contribution of those emissions to the modelling results of combustion sources as part of the observed background $PM_{2.5}$ concentrations measured at Station T39 in Tsawwassen.

Fugitive coal dust has been included in the RBT2 human health risk assessment (HHRA) provided in EIS Appendix 27-A. As described in Section 3.5 of EIS Appendix 27-A, the assessment of human exposure was based on ambient air concentrations measured at Station T39 (including fugitive coal dust and other sources in the vicinity such as vehicles, home heating, road dust, etc.) plus air concentrations predicted by dispersion modelling of RBT2 emissions. Therefore, PM_{10} and $PM_{2.5}$ exposure was appropriately captured from all potential emission sources in the HHRA, as indicated in **Table IR13-03-1**.

Table IR13-03-1 Summary of Requested Information Sources

Requested Information	Source of Information
Tables for the expected conditions, future conditions, and cumulative[4] scenarios presenting predicted ambient concentrations (µg/m^3) of particulate criteria air contaminants including all potential sources of particulate matter.	Refer to EIS Appendix 27-A, Appendix A: • Table C-2.1 for expected conditions for acute 24-h PM_{10} and $PM_{2.5}$; • Table C-2.2 for expected conditions for chronic annual PM_{10} and $PM_{2.5}$; • Table C-3.1 for future conditions with the Project (operations) for acute 24-h PM_{10} and $PM_{2.5}$; • Table C-3.2 for future conditions with the Project (operations) for chronic annual PM_{10} and $PM_{2.5}$; • Table A-5.1 for future conditions with the Project during peak day construction for acute 24-h PM_{10} and $PM_{2.5}$; • Table A-5.2 for future conditions with the Project during average day construction for acute 24-h PM_{10} and $PM_{2.5}$; and • Table A-5.3 for future conditions with the Project during average day construction for chronic annual PM_{10} and $PM_{2.5.}$
Present the results for all 18 discrete receptors and additional receptors used in IR13-02. Provide the location on a map of the points of maximum over-water and overland concentration. Include the influence of the background pollutant concentration on the results.	Refer to Appendix IR6-24-A in response to IR6-24 (CEAR Document #1188[5]) for particulate matter concentrations for all receptor locations inclusive of background concentrations (as described in response to IR13-02) and maximum over water and over land concentrations: • Figure IR6-24-A13 for maximum 24-h PM concentrations under existing, expected, and future conditions over land and over water; • Figure IR6-24-A14 for annual PM concentrations under existing, expected, and future conditions over land and over water; • Figure IR6-24-A15 for maximum 24-h PM_{10} concentrations under existing, expected, and future conditions over land and over water; • Figure IR6-24-A16 for annual PM_{10} concentrations under existing, expected, and future conditions over land and over water; • Figure IR6-24-A17 for maximum 24-h $PM_{2.5}$ concentrations under existing, expected, and future conditions over land;

[4] The concentrations for cumulative conditions are provided in Tables 5-7 and 5-9 of EIS Appendix 9.2-A for the Air Quality Study. Cumulative concentrations were not carried forward to the HHRA because a residual effect for human health from exposure to air emissions was not predicted, and a cumulative effects assessment for exposure to emissions from certain and reasonably foreseeable projects and activities was not required. Additional information is provided in response to IR13-13.

[5] CEAR Document #1188 From the Vancouver Fraser Port Authority to the Review Panel re: Response to IR6-04, IR6-05, IR6-10, IR6-11, IR6-12, IR6-14, IR6-21, IR6-22, IR6-23, IR6-24, IR6-25, IR6-27, IR6-28, IR6-29, IR6-31, IR6-32, IR6-34, IR6-35, and IR6-37 (See Reference Document #991).

Requested Information	Source of Information
	• Figure IR6-24-A18 for 98th percentile 24-h $PM_{2.5}$ concentrations under existing, expected, and future conditions over water; • Figure IR6-24-A19 for annual $PM_{2.5}$ concentrations under existing, expected, and future conditions over land and over water; and • Construction Phase PM, PM_{10}, and $PM_{2.5}$ emissions – Figures IR6-24-A25 to -A31 (average day) and Figures IR6-24-A35 to -A38 (peak day) and IR6-24-A43 to -A45 (peak and average day).

References

British Columbia Ministry of Environment (MOE). 2008. Guidelines for Air Quality Dispersion Modelling in British Columbia. Environmental Protection Division, Environmental Quality Branch, Air Protection Section, Victoria, BC.

British Columbia Ministry of Environment (MOE). 2015. British Columbia Air Quality Dispersion Modelling Guideline. Environmental Protection Division, Environmental Protection Branch, Clean Air Section, Victoria, BC. Available at https://www.bcogc.ca/node/13339/download. Accessed August 2018.

Metro Vancouver 2012. Station Information: Lower Fraser Valley Air Quality Monitoring Network. Air Quality Policy and Management Division of Metro Vancouver. Available at http://www.metrovancouver.org/services/air-quality/emissions-monitoring/monitoring/network/Pages/default.aspx. Accessed August 2018.

IR13-04 Human Health Risk Assessment – Air Quality – exposure limits

Information Source(s)

EIS Volume 4: Appendix 27-A: Air Quality Human Health Risk Assessment Technical Report

Health Canada: Submission to the Review Panel (CEAR 548)

Responses to Information Request from the Review Panel IR6-23 (CEAR 1188)

B.C. Ministry of Health: Submission to the Review Panel (CEAR 629)

Context

The Proponent, in subsection 3.6 of Appendix 27-A, stated that "the most stringent exposure limit from the list of values recommended by authoritative health agencies was used in the Human Health Risk Assessment (HHRA), provided that the derivation of the value was adequately documented, not outdated, and scientifically defensible. The adopted exposure limits all include uncertainty factors which further reduced the presumed acceptable exposure limit for the protection of individuals who may be more sensitive to chemical exposure."

B.C. Ministry of Health and Health Canada commented that, for a number of substances, the exposure limits selected were not the most stringent or up to date.

- For acrolein, the Proponent used the Texas Commission on Environmental Quality chronic inhalation exposure limit of 2.7 µg/m^3 instead of the existing Health Canada exposure limit of 0.4 µg/m^3.
- For benzene, the acute exposure limits of 580 µg/m^3 from the Texas Commission on Environmental Quality was selected instead of the more stringent one of the California Environmental Protection Agency Office of Environmental Health Hazard Assessment (27 µg/m^3).
- For acetaldehyde, the chronic exposure limits of 140 µg/m^3 from the Environmental Health Hazard Assessment, which was developed in 2014, is more stringent than the Health Canada's value of 390 µg/m^3, developed in 2000.
- For 1,3 butadiene, the chronic exposure limit of the 0.3 µg/m^3 of the Dutch National Institute for Public Health and the Environment from 2009 was selected, but the Environmental Health Hazard Assessment exposure limit of 0.06 µg/m^3 from 2013 is more stringent.
- For benzo(a)pyrene, the Proponent chose the chronic oral exposure limit of the RIVM value of 0.005 µg/kg/day from 2001, whereas the Health Canada exposure limit of 0.0043 µg/kg/day from 2010 or the Environmental Health Hazard Assessment exposure limit of 0.00083 µg/kg/day from 2011 are more stringent.

Table IR6-23-1 provided in responses to information request IR6-23 (CEAR 1188) presented up to date or upcoming applicable ambient air quality standards/objectives (µg/m^3) for Canadian and U.S. Over Land and Over Water Locations for CO, NO_2, SO_2, formaldehyde and

particulate matter. Some of these air quality standards/objectives are more stringent than the ones used in the air emissions HHRA.

Information Request

Use the most stringent exposure limits when responding to information requests related to the human health risk assessment for air quality.

VFPA Response

A review of the exposure limits used in EIS Appendix 27-A has been conducted, and updated risk quotients (RQs) have been provided in cases where a more stringent exposure limit applies. The exposure limits used for all contaminants of potential concern that were included in the air quality human health risk assessment (HHRA; EIS Appendix 27-A) are listed in **Table IR13-04-1**, alongside updated or more stringent exposure limits where applicable. In addition, the ambient air quality objectives (AAQOs) related to each contaminant included in the HHRA are provided, based on Metro Vancouver (MV) AAQOs, B.C. AAQOs, national AAQOs (NAAQOs), and Canadian Ambient Air Quality Standards (CAAQS).[1]

In some cases, a more stringent exposure limit was identified and considered applicable to the HHRA as noted in the **Table IR13-04-1**. For these cases a sensitivity analysis was conducted consisting of a recalculation of the RQ. The results of the sensitivity analyses are provided in **Tables IR13-04-2** to **IR13-04-6**. For cases where a more stringent exposure limit or AAQO criterion was identified but was not considered applicable to the air quality HHRA, a rationale is provided in the narrative section following **Table IR13-04-1**.

[1] As background, EIS Table 9.2-4 and Table 3-4 in EIS Appendix 9.2-A presented ambient air quality criteria (standards or objectives) used in comparisons to predicted concentrations of gaseous and particulate criteria air contaminants and formaldehyde. The air quality study criteria were selected based on the most stringent of federal and provincial ambient air quality criteria in place at the time the assessment was undertaken (2013 to November 2014). MV AAQOs were presented alongside the study criteria for comparison purposes. In the response to IR6-23 of CEAR Document #1188, Table IR6-23-1 provided background concentrations for criteria air contaminants and updated study criteria, as of December 2017. Updated study criteria were selected from the most stringent standards/objectives from amongst the MV AAQOs, B.C. AAQOs, Canada-wide Standards (CWSaq), NAAQOs, and CAAQS. In some cases, an AAQO was identified as an exposure limit for the air quality HHRA, where the AAQO was supported by health-based studies.

Table IR13-04-1 Evaluation of Air Quality HHRA Exposure Limits

Contaminant	Averaging Period	Exposure Limit for HHRA (µg/m³) (EIS Appendix 27-A)	Updated /More Stringent Exposure Limit for HHRA (µg/m³)	Related Air Quality Standards / Objectives (µg/m³)	Included in Sensitivity Analysis (Yes/No) and Supporting Rationale
CO	1 hour	15,000 (Health Canada)	N/A[a]	14,300 (B.C. AAQO)	No – see Rationale section for details
	8 hour	6,000 (Health Canada)	N/A	5,500 (B.C. AAQO)	No – see Rationale section for details
NO_2	1 hour	188 (U.S. EPA[b])	N/A	200 (MV AAQO) 188 (B.C. AAQO)	No – no change from exposure limit used in HHRA
SO_2	10 minute	500 (WHO[c])	175 (Health Canada)	N/A	Yes – more stringent exposure limit recommended by Health Canada (2016)
	1 hour	200 (U.S. EPA)	N/A	183 (MV AAQO; B.C. AAQO; CAAQS)	Yes – more stringent criterion identified by MV AAQO and B.C. AAQO based on 2017 CAAQS; supported by Health Canada (2016)
$PM_{2.5}$	24 hour	25 (WHO)	N/A	25 (MV AAQO; B.C. AAQO)	No – no change from exposure limit used in HHRA
PM_{10}	24 hour	50 (WHO)	N/A	50 (MV AAQO)	No – no change from exposure limit used in HHRA
Acetaldehyde	1 hour	470 (OEHHA[d])	N/A	N/A	No – no updated exposure limit or air quality criterion identified
Acrolein	1 hour	2.5 (OEHHA)	N/A	N/A	No – no updated exposure limit or air quality criterion identified
Benzene	1 hour	580 (TCEQ[e])	27 (OEHHA)	N/A	Yes – more stringent exposure limit recommended by OEHHA; see Rationale section for details.

Contaminant	Averaging Period	Exposure Limit for HHRA (µg/m³) (EIS Appendix 27-A)	Updated /More Stringent Exposure Limit for HHRA (µg/m³)	Related Air Quality Standards / Objectives (µg/m³)	Included in Sensitivity Analysis (Yes/No) and Supporting Rationale
1,3-Butadiene	1 hour	660 (OEHHA)	N/A	N/A	No – no updated exposure limit or air quality criterion identified
	24 hour	15 (U.S. EPA)	N/A	N/A	No – no updated exposure limit or air quality criterion identified
Formaldehyde	1 hour	50 (U.S. ATSDR[f])	N/A	60 (B.C. AAQO)	No – exposure limit in HHRA is more stringent
Naphthalene	1 hour	2,000 (ACGIH[g])	N/A	N/A	No – no updated exposure limit or air quality criterion identified
NO_2	Annual	40 (WHO)	N/A	40 over land (MV AAQO) 60 over water (B.C. AAQO)	No – exposure limit in HHRA is equal to or more stringent than the air quality criterion identified
SO_2	Annual	25 (B.C. MOE[h])	N/A	13 during construction (CAAQS – 2020 to 2025) 10 during operation (CAAQS – 2025 onwards)	Yes – more stringent criterion identified based on 2017 CAAQS, supported by Health Canada (2016)
$PM_{2.5}$	Annual	6 (B.C. MOE; Metro Vancouver)	N/A	8 (B.C. AAQO; MV AAQO)	No – exposure limit in HHRA is more stringent
PM_{10}	Annual	20 (WHO)	N/A	20 (MV AAQO)	No – no change from criterion used in HHRA
DPM	Annual	5 – noncarcinogenic (U.S. EPA) 0.03 – carcinogenic (OEHHA)	N/A	N/A	No – no updated exposure limit or air quality criterion identified

Contaminant	Averaging Period	Exposure Limit for HHRA (µg/m³) (EIS Appendix 27-A)	Updated /More Stringent Exposure Limit for HHRA (µg/m³)	Related Air Quality Standards / Objectives (µg/m³)	Included in Sensitivity Analysis (Yes/No) and Supporting Rationale
Acetaldehyde	Annual	390 – noncarcinogenic (Health Canada) 3.7 **–** carcinogenic (OEHHA)	140 – noncarcinogenic (OEHHA)	N/A	No – see Rationale section for details
Acrolein	Annual	2.7 (TCEQ)	0.40 (Health Canada); 0.35 (OEHHA)	N/A	No – see Rationale section for details
Benzene	Annual	9.8 **–** noncarcinogenic (U.S. ATSDR) 1.3 – carcinogenic (U.S. EPA)	N/A	N/A	No – no updated exposure limit or air quality criterion identified
Benzo(a)pyrene	Annual	Inhalation – 0.00012 (WHO) Oral – 0.005 µg/kg/day (RIVM[i])	Oral – 0.0043 µg/kg/day (Health Canada) or 0.00083 µg/kg/day (OEHHA)	N/A	No – see Rationale section for details
1,3-Butadiene	Annual	2 – noncarcinogenic (U.S. EPA) 0.3 – carcinogenic (U.S. EPA)	0.06 – carcinogenic (OEHHA)	N/A	No – see Rationale section for details
Formaldehyde	Annual	9 – noncarcinogenic (OEHHA) 2 – carcinogenic (Health Canada)	N/A	N/A	No – no updated exposure limit or air quality criterion identified
Naphthalene	Annual	3 – noncarcinogenic (U.S. EPA) 0.3 – carcinogenic (OEHHA)	N/A	N/A	No – no updated exposure limit or air quality criterion identified

Notes: Unless otherwise noted, lowest of the AAQOs recommended (as of December 2017) by Metro Vancouver (over land), B.C. (land and water), and the Canadian Council of Ministers of the Environment (CCME) (land and water).

a. N/A = Not Applicable, no update identified
b. U.S. EPA = United States Environmental Protection Agency
c. WHO = World Health Organization

d. OEHHA = California Office of Environmental Health Hazard Assessment
e. TCEQ = Texas Commission on Environmental Quality
f. U.S ATSDR = United States Agency for Toxic Substances and Disease Registry (Department of Health and Human Services)
g. ACGIH = American Conference of Governmental Industrial Hygienists
h. B.C. MOE = British Columbia Ministry of Environment and Climate Change Strategy
i. RIVM = Netherlands National Institute for Public Health and the Environment

Air Quality HHRA Sensitivity Analyses Based on Most Stringent Exposure Limits

A sensitivity analysis involving the recalculation of RQ values was conducted for each chemical for which a more stringent and appropriate exposure limit or air quality objective was identified in **Table IR13-04-1**. This included the following chemicals and exposure durations:

- Acute exposure to sulphur dioxide (10-minute and 1-hour concentrations), **Table IR13-04-2** and **Table IR13-04-3**;
- The respiratory irritant group (combined exposure to 1-hour concentrations of acetaldehyde, naphthalene, NO_2, and SO_2), **Table IR13-04-4**;
- Benzene (1-hour concentrations), **Table IR13-04-5**; and
- Chronic exposure to sulphur dioxide (annual concentrations), **Table IR13-04-6**.

The maximum predicted RQ value was determined for each receptor type exposed to these chemicals individually and to the respiratory irritant group. In all cases, the use of more stringent air quality objectives and exposure limits did not change the conclusions of the air quality HHRA in terms of the impact of Project emissions on human health as a result of changes in air quality.

The revised RQ values provided below include 10-minute, 1-hour, and annual exposure concentrations predicted for construction emissions, as reported in the air quality HHRA (EIS Appendix 27-A, Appendix A). It is noted that the VFPA has made updates to Project construction based on optimisation of the design of the Project and feedback from Indigenous groups, local stakeholders, and regulatory agencies (see Project Construction Update (PCU) of CEAR Document #1210[2]). As per the PCU, the predicted air emissions during construction have decreased and, although not specifically modelled, exposure concentrations during construction activities will be lower than reported in EIS Appendix 27-A (Appendix A). The construction updates described in the PCU will effectively result in lower acute RQ values than those predicted below but are not expected to affect the overall conclusions of the air quality HHRA.

Tables IR13-04-2 to **IR13-04-5** are provided as a revision to the chemical results presented in Tables 14-15 and 17-23 in EIS Appendix 27-A.

Sulphur Dioxide – Acute Exposure

The revised acute inhalation RQ for sulphur dioxide (10-minute and 1-hour exposure periods) are provided below in **Tables IR13-04-2** and **IR13-04-3**.

[2] CEAR Document #1210 From the Vancouver Fraser Port Authority to the Review Panel re: Project Construction Update (See Reference Document #995) (NOTE: Updated June 13, 2018).

Table IR13-04-2 Revised Acute Inhalation Risk Quotient Values – Sulphur Dioxide (10-minute)

Receptor	Estimated Risk Quotients				
	Existing Conditions	Future without Project	Future with Project	Average Day Construction	Peak Day Construction
Tsawwassen First Nation (TFN)	0.35	0.06	0.06	0.06	0.08
Farmers	0.29	0.05	0.06	0.05	0.1
Canadian Residents	0.32	0.06	0.06	0.05	0.1
U.S. Residents	0.34	0.06	0.06	0.06	0.11
Recreationists	0.69	0.06	0.07	0.06	0.13
Maximum Point of Impingement (MPOI) Over Land	0.41	0.06	0.07	0.06	0.14
MPOI Over Water	0.83	0.05	0.07	0.11	0.52

Table IR13-04-3 Revised Acute Inhalation Risk Quotient Values – Sulphur Dioxide (1-hour)

Receptor	Estimated Risk Quotients				
	Existing Conditions	Future without Project	Future with Project	Average Day Construction	Peak Day Construction
TFN	0.2	0.05	0.05	0.05	0.07
Farmers	0.2	0.05	0.05	0.05	0.07
Canadian Residents	0.2	0.05	0.05	0.05	0.08
U.S. Residents	0.2	0.05	0.05	0.05	0.08
Recreationists	0.3	0.05	0.06	0.05	0.09
MPOI Over Land	0.3	0.05	0.06	0.05	0.10
MPOI Over Water	0.5	0.03	0.04	0.07	0.30

Respiratory Irritant Group

The RQ values for the respiratory irritant group, assuming additive effects from combined exposure to acetaldehyde, naphthalene, NO_2, and SO_2, were recalculated based on the revised RQ values for SO_2, and are provided below in **Table IR13-04-4**.

Table IR13-04-4 Revised Acute Inhalation Risk Quotient Values – Respiratory Irritants (1-hour)

Receptor	Estimated Risk Quotients				
	Existing Conditions	Future without Project	Future with Project	Average Day Construction	Peak Day Construction
TFN	0.8	0.5	0.6	0.5	0.9
Farmers	0.7	0.5	0.6	0.5	0.9
Canadian Residents	0.8	0.5	0.5	0.5	0.9
U.S. Residents	0.9	0.5	0.6	0.6	0.9
Recreationists	0.9	0.5	0.6	0.5	0.9
MPOI over land	0.9	0.5	0.9	0.6	1.5
MPOI over water	1.9	0.6	0.8	1.6	7.1

Notes: Respiratory irritants = acetaldehyde, naphthalene, NO_2, SO_2.

Benzene

A sensitivity analysis was also conducted for acute exposure to benzene based on the more stringent OEHHA exposure limit (**Table IR13-04-5**).

Table IR13-04-5 Revised Acute Inhalation Risk Quotient Values – Benzene (1-hour)

Receptor	Estimated Risk Quotients				
	Existing Conditions	Future without Project	Future with Project	Average Day Construction	Peak Day Construction
TFN	0.1	0.1	0.1	0.1	0.1
Farmers	0.1	0.1	0.1	0.1	0.1
Canadian Residents	0.1	0.1	0.1	0.1	0.1
U.S. Residents	0.1	0.1	0.1	0.1	0.1
Recreationists	0.1	0.1	0.1	0.1	0.1
MPOI over land	0.2	0.1	0.2	0.2	0.2
MPOI over water	0.2	0.08	0.09	0.3	0.3

Sulphur Dioxide – Chronic Exposure

A sensitivity analysis was also conducted for chronic exposure to sulphur dioxide based on the CAAQS. The maximum predicted RQ values for each receptor type chronically exposed to sulphur dioxide is provided in **Table IR13-04-6**. This table is provided as a revision to the chemical results presented in Tables 16 and 24-27 in EIS Appendix 27-A.

Table IR13-04-6 Revised Chronic Inhalation Risk Quotient Values – Sulphur Dioxide (annual)

Receptor	Estimated Risk Quotients			
	Existing Conditions	Future without Project	Future with Project	Construction
TFN	0.2	0.1	0.1	0.01
Farmers	0.2	0.1	0.1	0.01
Canadian Residents	0.2	0.1	0.2	0.02
U.S. Residents	0.2	0.1	0.2	0.02

Rationale for Selected Exposure Limits in EIS Air Quality HHRA

As indicated in **Table IR13-04-7**, for several contaminants, a more stringent exposure limit or air contaminant criterion has been identified. Through evaluation of the original exposure limit used in the EIS in these cases, it has been determined that the original exposure limit remains the appropriate limit. A rationale and references are provided below to support each of these cases.

Acetaldehyde

As described in Section 2.1.2 of Appendix C (Toxicity Profiles) to the HHRA provided in EIS Appendix 27-A, the Health Canada (2000) value of 390 µg/m^3 and the OEHHA (2014) value of 140 µg/m^3 are based on the same studies reporting nasal lesions in rats intermittently exposed (6 hours/day, 5 days/week) to acetaldehyde over a 4-week period (Appelman et al. 1982, 1986). The major difference is that Health Canada (2000) cited evidence that there was *no indication that severity of the critical effects increases with duration of exposure* and therefore, unlike OEHHA (2014), did not include an uncertainty factor to account for use of a short-term study. The OEHHA applied an additional uncertainty factor for use of a subchronic study but did not provide evidence that the severity of nasal lesions increased with increasing exposure. Therefore, the tolerable concentration recommended by Health Canada was selected for the assessment of chronic exposure to acetaldehyde.

Acrolein

The rationale for the selection of the TCEQ value over the Health Canada or OEHHA values is described in Section 3.1.2 in Appendix C of EIS Appendix 27-A. The TCEQ value is based on a more recent and relevant study (Dorman et al. 2008) compared to the study identified by Health Canada (Cassee et al. 1996). The OEHHA and TECQ values were based on the same 'No observable adverse effect level (NOAEL)' identified by Dorman et al. (2008). OEHHA applied a dosimetric adjustment factor (DAF) based on formaldehyde and adjusted the NOAEL by an additional uncertainty factor to account for use of a short-term study. OEHHA did not provide evidence that the severity of nasal lesions increased with increasing exposure. TCEQ did not consider a DAF based on formaldehyde to be appropriate for acrolein based on *differences* in the nasal dosimetry pattern for acrolein and formaldehyde. TCEQ also concluded

that exposure concentration played a greater role in the irritant effects of acrolein than duration of exposure and did not include an additional uncertainty factor for use of a short-term study. Therefore, the reference value recommended by TCEQ was considered more relevant for the assessment of chronic inhalation exposure to acrolein.

Benzo(a)pyrene

The rationale for the selection of the RIVM value over the Health Canada or OEHHA values is described in Section 5.1.3 in Appendix C of EIS Appendix 27-A. When compared to the study identified by Health Canada or OEHHA (Neal and Rigdon 1967), the RIVM value provided a guideline based on a more recent study (Kroese et al. 1999, 2001) and longer exposure period (i.e., 2 years versus 110 days). RIVM (2001) recommend an exposure limit of 0.05 µg/kg bodyweight/day for benzo[a]pyrene based on a lifetime cancer risk of 1 in 100,000. They further recommend that the exposure limit be reduced by a factor of 10 where benzo[a]pyrene is being used as an indicator compound for a polycyclic aromatic hydrocarbon (PAH) mixture. Therefore, an exposure limit of 0.005 µg/kg bodyweight/day was used to assess benzo[a]pyrene concentrations representing a PAH mixture of chemicals in air. As described in Appendix C of EIS Appendix 27-A, the oral toxicity of benzo[a]pyrene was under review by the U.S. EPA and at the external review draft stage when this appendix was compiled. The oral risk specific dose now recommended by the U.S. EPA (2017) is 0.01 µg/kg/day, based on oral slope factors for mice (Beland and Culp 1998) and rats (Kroese et al. 2001).

1,3-Butadiene

The rationale for the selection of the U.S. EPA value over the OEHHA values is described in Section 6.1.2 in Appendix C of EIS Appendix 27-A. In their development of chronic inhalation exposure limits for 1,3-butadiene, four agencies, including Health Canada (2000), RIVM (2009), TCEQ (2008), and U.S. EPA (2002), considered the results of an occupational study reporting an increased incidence of leukemia in workers exposed to 1,3-butadiene in styrene butadiene rubber plants (Delzell et al. 1995). U.S. EPA (2002) considered a wider range of studies, including the National Toxicology Program study conducted in mice (NTP 1993), and determined a risk specific concentration for 1,3-butadiene based on leukemia incidence in humans (Delzell et. al. 1995), rather than lung neoplasms in mice. Although OEHHA recommended the lowest guideline for the carcinogenicity of 1,3-butadiene based on the response in mice, the consensus of four other agencies (i.e., Health Canada, RIVM, TCEQ, U.S. EPA) on the appropriateness of the Delzell et al. (1995) study, did not support the selection of the OEHHA guideline.

Carbon Monoxide

The rationale for the selection of the NAAQO values over B.C. MOE AAQOs is described in Section 7.1.1 in Appendix C of EIS Appendix 27-A. Acute exposure limits for carbon monoxide are based on carboxyhemoglobin (COHb) levels in the blood. The NAAQO 1-hour and 8-hour values of 15,000 and 6,000 µg/m^3, respectively, were selected for the assessment of the acute inhalation effects of carbon monoxide as they represent objectives that would result in COHb blood levels within the endogenous range. As reported by Health Canada (1994), these

objectives would maintain the upper end of the range of COHb resulting from endogenous production in humans (<1% COHb in the blood).

B.C. MOE (2013) adopted slightly lower 1-hour (14,300 µg/m^3) and 8-hour (5,500 µg/m^3) AAQOs as Provincial Level A Pollution Control Objectives for carbon monoxide. However, no supporting health-based documentation were available for these objectives. Furthermore, recent and extensive evaluations completed by the U.S. EPA (2010, 2012) and WHO (2000) suggest that levels of COHb in the blood above the <1% target identified by Health Canada (1994) are required before adverse effects are observed (i.e., 2% COHb or higher).

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IR13-05 Human Health Risk Assessment – Air Quality – Chemical mixture

Information Source(s)

EIS Volume 4: Appendix 27-A: Air Quality Human Health Risk Assessment Technical Report Table 13

Health Canada: Submission to the Review Panel (CEAR 548)

Context

Table 13 of Appendix 27-A shows the contaminants of potential concern (COPCs) considered in chemical mixtures for different health endpoints and exposure duration. The COPCs considered for acute inhalation respiratory irritation included acetaldehyde, naphthalene, nitrogen dioxide, and sulphur dioxide.

Health Canada commented that the acute respiratory irritant mixture should include particulate matter as a component, as scientific data show that exposure to $PM_{2.5}$ can cause effects including cough and lung function decrements. For chronic effects, Health Canada added that while nasal irritation mixture was evaluated, a mixture for effects on the wider respiratory system was missing and should be added; this mixture would include nitrogen dioxide and particulate matter.

Information Request

Include particulate matter as a respiratory irritant and characterize the potential health effects for acute inhalation during construction and operation:

- Future case without the Project
- Project alone
- Future case with the Project
- Future case with the Project with other projects and activities (cumulative scenario)

Provide an evaluation for chronic effects on the wider respiratory system including combined effects of nitrogen dioxide and particulate matter.

VFPA Response

The scientific knowledge of the interactive effects of exposure to multiple chemicals is very limited, especially considering the range of possible effects resulting from multiple combinations of chemicals at various exposure concentrations and over various exposure durations.

Health Effects from Acute Inhalation of $PM_{2.5}$ and NO_2

The acute respiratory irritant mixture for the RBT2 air quality human health risk assessment (HHRA) was determined based on regulatory guidance from Health Canada (2012), which

recommends that an additive interaction only be assumed for chemicals with similar target tissues and mechanisms of action; interactions should not be assumed for chemicals with unique and dissimilar mechanisms of action. For the purpose of the RBT2 air quality HHRA (EIS Appendix 27-A), an additive interaction between chemicals was only assumed if individual chemical exposure limits were based on the same health endpoint.

The acute respiratory irritant mixture includes acetaldehyde, naphthalene, nitrogen dioxide (NO_2), and sulphur dioxide (SO_2) because the 1-hour acute exposure limit for each of these chemicals was based on the same health endpoint of respiratory irritation. For chemicals in the respiratory irritation group (i.e., acetaldehyde, NO_2, and SO_2) respiratory irritation was observed in asthmatic individuals following controlled short-term inhalation exposure to the chemical in a clinical environment, as described in the chemical toxicity profiles for these chemicals in Appendix C of EIS Appendix 27-A. The acute respiratory irritant mixture does not include $PM_{2.5}$[1] since the $PM_{2.5}$ exposure limit is based on the weight of available evidence from epidemiological studies that report associations between 24-hour $PM_{2.5}$ concentrations in ambient air and an increase in mortality and morbidity at the population level, as described in the chemical toxicity profile for $PM_{2.5}$ provided in Appendix C of EIS Appendix 27-A. These associations are based on ambient air quality data and hospital records for large urban environments. The use of such epidemiological data for assessing health effects was recently described by Health Canada (2016): "Epidemiological studies that make use of administrative databases that track information such as mortality, hospital admissions and emergency room visits have been used to characterize population risk; these studies are now a common tool in assessing the health implications of air quality changes related to environmental pollutants."

The clinical studies examining respiratory effects from controlled chemical exposures at the individual level differ substantially from the epidemiological studies examining mortality and morbidity from ambient exposures at the population level. The health endpoints for $PM_{2.5}$ were unique to $PM_{2.5}$ and therefore $PM_{2.5}$ was individually assessed and not included in a chemical mixture. Furthermore, the acute 24-hour exposure limit for $PM_{2.5}$ is already representative of a mixture of chemicals since the World Health Organization (WHO; 2006) guideline is based on epidemiological studies that make use of ambient air quality data in urban areas with a complex mixture of air contaminants, including $PM_{2.5}$ and NO_2. The design of these studies implicitly accounts for multipollutant exposure. Based on the above, no change to the health effect assessment for $PM_{2.5}$ reported in the EIS is required.

Health Effects from Chronic Inhalation of $PM_{2.5}$ and NO_2

As reported by WHO (2006), long-term exposure to $PM_{2.5}$ and mortality was the most robust association for health effects associated with chronic $PM_{2.5}$ exposure. The basis for the chronic exposure limit for NO_2 was an increase in respiratory illness in individuals with pre-existing pulmonary dysfunction. These health endpoints were considered to be unique to each chemical and therefore an additive interaction was not assumed for chronic exposure to $PM_{2.5}$ and NO_2. Similar to the acute guideline, the WHO (2006) chronic guideline is based on

[1] Particulate matter particles with a diameter of 2.5 micrometres or less.

epidemiological studies in urban areas with a complex mixture of air contaminants, including $PM_{2.5}$ and NO_2. Therefore, no change to the effects assessment for chronic inhalation of $PM_{2.5}$ and NO_2 is required.

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IR13-06 Human Health Risk Assessment – Multi-media exposure assessment

Information Source(s)

EIS Volume 4: Appendix 27-A: Air Quality Human Health Risk Assessment Technical Report.

Health Canada: Submission to the Review Panel (CEAR 548 and 1225)

B.C. Ministry of Health: Submission to the Review Panel (CEAR 629)

Review Panel Information Request IR12-02 (CEAR 1206)

Context

The Proponent, in Appendix 27-A of the EIS, indicated that the multi-media exposure assessment considered the deposition of non-volatile chemicals (formaldehyde and benzo[a]pyrene) from Project emissions to soil and plants under operating conditions. The Proponent indicated that other chemicals associated with the Project (e.g. CO, NO_2, SO_2, and PM) were not considered because they primarily occurred in air and their exposure limits were based on effects resulting from direct contact with the respiratory system following inhalation exposure. The Proponent stated that the multi-media exposure assessment did not consider construction-related emissions due to the relatively short time frame associated with the construction versus operation phases of the proposed Project. No rationale was provided to support this statement.

B.C. Ministry of Health and Health Canada recommended that the multi-media exposure assessment be conducted for the construction period as well. Health Canada indicated that a short-time frame is normally associated with a period of less than one year and that generally, project emissions and the associated exposures of humans (along with the specific chemical hazards/toxicity) should be considered in assessing potential risks from a project during all phases of the Project.

In addition, B.C. Ministry of Health noted that the multi-media exposure assessment appears to rely only on modelling and calculations and that actual baseline of contaminants of potential concern in the media evaluated do not seem to have been established through sampling. B.C. Ministry of Health stated that sampling should have been done to validate the predictions and inform any potential mitigation measures.

Health Canada further underlined (CEAR 1225) that it was not clear why the potential air-borne release of contaminants, such as arsenic and cadmium associated with coal dust, were not considered for potential deposition on water and lands and uptake in tissues of plants and animals consumed by people. Health Canada also advised that all high molecular weight PAHs should be explicitly considered on a benzo[a[pyrene equivalency basis in the multi-media assessment, as it was done in Appendix 27-C .

Information Request

Update the multi-media exposure assessment using the consumption rates from IR12-02 and consider all high molecular weight PAH on a benzo[a]pyrene equivalency basis.. Include the construction phase of the proposed Project.

Include coal dust and other particulate matter in the multi-media exposure assessment making reference to IR13-03.

Explain whether sampling or monitoring was conducted to establish the baseline of contaminants of potential concern in the media evaluated for the multi-media exposure assessment.

If the baseline was modelled, assess the confidence of using a modelled baseline as opposed to using sampling to establish the baseline for the multi-media exposure assessment.

VFPA Response

Update the multi-media exposure assessment using the consumption rates from IR12-02. Include the construction phase of the proposed Project.

To address the request for a multi-media exposure assessment for the construction phase of the Project, a comparative analysis is provided herein. Multi-media exposures are a function of chemical deposition and annual air concentrations. Factors affecting chemical deposition would remain constant in both the operation and construction phases; therefore, any difference in predicted health risks from multi-media exposure during construction would be the result of differences in emissions, resulting in different annual air quality concentrations.

The response to IR13-09 provides an update of the multi-media exposure assessment for the operation phase using the updated shellfish consumption rates as indicated in the response to IR12-02. The response to IR13-09 also addresses the request in IR13-07 to compare risk estimates from exposure to the threshold contaminant via the multi-media exposure pathways to a risk quotient (RQ) $\leq$ 0.2.

The maximum predicted annual air concentrations for the operation and construction phases are compared in **Table IR13-06-1** below.

Table IR13-06-1 Highest Predicted Annual Air Quality Concentration for Multi-media Receptors (micrograms per cubic metre (µg/m³))

Phase	Formaldehyde (including background)	Benzo[a]pyrene (not including background)
Operation	1.92[a]	0.000003[c]
Construction	1.93[b]	0.0000009[d]

Notes: a. Represents the formaldehyde air concentration associated with the future with operation emissions scenario (0.03 µg/m³) plus background air concentrations (1.89 µg/m³) (EIS Appendix 27-A, Table C-3.2, Farmer 3).
b. Represents the formaldehyde air concentration associated with the construction emissions scenario (0.04 µg/m³) plus background air concentrations (1.89 µg/m³) (EIS Appendix 27-A, Table A-5.3, Farmer 3).

c. Represents the benzo[a]pyrene air concentrations associated with operation activities alone for the purpose of estimating incremental lifetime cancer risk (EIS Appendix 27-A, Table C-4.1, Farmer 2).
d. Represents the benzo[a]pyrene air concentrations associated with construction activities alone for the purpose of estimating incremental lifetime cancer risk (Senes, personal communication).

Similar to the Project operation phase emissions, construction emissions contribute very little to the annual average air concentration for formaldehyde, which is largely driven by the measured 24-hour ambient air concentration for formaldehyde (i.e., 1.89 µg/m^3). The mean 24-hour average air concentration for formaldehyde was conservatively assumed to represent an annual background air concentration (EIS Appendix 27-A, Table A-6.1). The highest benzo[a]pyrene annual air concentration predicted for a multi-media receptor location during construction is three-fold lower than the predicted concentration during operations. Air concentrations associated with construction emissions are essentially the same or lower than in the Project operation phase, and no health risks were predicted for multi-media exposure related to the Project operation phase (EIS Appendix 27-A, Tables 32 and 33, pp. 53 and 54), which would occur over a longer exposure period (i.e., 50 years) than the construction phase (approximately 6 years). Emissions associated with the construction phase would therefore not result in health risks as a result of exposures via the multi-media pathways.

Consider all high molecular weight PAH on a benzo[a]pyrene equivalency basis. Include the construction phase of the proposed Project.

The Air Quality human health risk assessment (HHRA) considered all of the airborne chemicals associated with emissions resulting from the Project construction and operation phases that were identified in the Air Quality Study (EIS Appendix 9.2-A), as described in EIS Appendix 27-A, Section 3.1.4. The decision to select benzo[a]pyrene as an indicator chemical for polycyclic organic matter, including high molecular weight (MW) polycyclic aromatic hydrocarbons (PAHs), was made early on in the scoping process for the Air Quality Study, through the Air Quality Scoping Study (see summary in the response to IR6-04, Appendix IR6-04-A of CEAR Document #1188[1]). The Air Quality Study considered the source of Project emissions, specifically mobile-source air toxins, and deemed benzo[a]pyrene to be an appropriate indicator chemical for high MW PAHs in the Project emission sources. The list of compounds of potential concern in Project emissions, including benzo[a]pyrene as an indicator chemical, was submitted to and deemed acceptable by Environment Canada[2]. Therefore, based on this direction, benzo[a]pyrene was the representative high MW PAH included in the Air Quality HHRA multi-media assessment. The Dutch National Institute for Public Health and the Environment (RIVM 2001) recommend an oral reference dose for benzo[a]pyrene when this chemical is used as an indicator compound for a PAH mixture. This RIVM exposure limit is 10-fold lower than the limit RIVM recommends for benzo[a]pyrene alone. The conservative

[1] CEAR Document #1188 From the Vancouver Fraser Port Authority to the Review Panel re: Response to IR6-04, IR6-05, IR6-10, IR6-11, IR6-12, IR6-14, IR6-21, IR6-22, IR6-23, IR6-24, IR6-25, IR6-27, IR6-28, IR6-29, IR6-31, IR6-32, IR6-34, IR6-35, and IR6-37 (See Reference Document #991).
[2] As indicated in Appendix IR6-04-A of CEAR Document #1188, summarising the Air Quality Scoping Study process, on April 8, 2014 "[Environment Canada] provided confirmation that the contaminant selection process presented at the 25-Mar-14 meeting was acceptable based on the rationale provided."

RIVM exposure limit was selected for assessment of risk associated with multi-media exposure to benzo[a]pyrene, as described in EIS Appendix 27-A, Section 5.1.3 of Appendix C.

The predicted RQ values associated with Project operation that were determined for benzo[a]pyrene following multiple media exposure ranged from 0.00007 per 100,000 to 0.0001 per 100,000, which is equivalent to incremental lifetime cancer risk (ILCR) values of $7x10^{-10}$ to $1x10^{-9}$. These predicted cancer risks are four orders of magnitude below the 'negligible' cancer risk level of 1 in 100,000 ($1x10^{-5}$) recommended by Health Canada (2012). Therefore, it is highly unlikely that inclusion of other high MW PAHs in Project emissions in the Air Quality Study (EIS Appendix 9.2-A) would result in predicted risk via multi-media exposure pathways since exposure would have to increase by four orders of magnitude (10,000-fold) before risks would be predicted.

Benzo[a]pyrene is considered representative of all high MW PAHs, and because no risk was predicted when using the conservative exposure limit described above, the multi-media exposure assessment for the Air Quality HHRA (EIS Appendix 27-A) has not been updated to include all high MW PAHs.

Include coal dust and other particulate matter in the multi-media exposure assessment making reference to IR13-03.

Health Canada has requested that the potential air-borne release of contaminants associated with coal dust, such as arsenic and cadmium, be included in the multi-media assessment. The Air Quality HHRA considered all of the airborne chemicals associated with emissions resulting from the Project construction and operation phases that were identified in the Air Quality Study (EIS Appendix 9.2-A), as described in EIS Appendix 27-A, Section 3.1.4. Arsenic and cadmium will not be emitted by the Project and therefore were not considered in the multi-media assessment.

As stated in the response to IR13-03[3], coal is not emitted by the Project. However, the air-borne release of particulate matter from coal dust associated with Westshore Terminals was considered in the Air Quality HHRA (for assessment of risk via the inhalation pathway) by way of adding in measured ambient air concentrations of these compounds (i.e., background) to the air concentrations assumed for the existing and future (construction and operation) scenarios, as described in EIS Appendix 27-A, Section 3.1.2. Coal dust and particulate matter were not considered in the multi-media assessment because these compounds represent groups of chemicals, and the U.S. Environmental Protection Agency (2005) multi-media exposure model requires data specific to an individual chemical to predict chemical fate and transport processes in the environment. In addition, the health endpoints of concern for coal dust and particulate matter are specific to inhalation exposure only, and there are no exposure limits based on ingestion or dermal contact exposures to these compounds via other media such as soil and plants.

[3] The response to IR13-03 (CEAR Document #1333) refers to information provided in EIS Appendix 9.2-A, Appendix H, where coal dust is considered in the air quality assessment.

Explain whether sampling or monitoring was conducted to establish the baseline of contaminants of potential concern in the media evaluated for the multi-media exposure assessment.

If the baseline was modelled, assess the confidence of using a modelled baseline as opposed to using sampling to establish the baseline for the multi-media exposure assessment.

No sampling or monitoring was conducted to determine baseline concentrations of formaldehyde in soil and plants, as it was determined that, due to its physical chemical properties, formaldehyde was not likely to be detected in samples in quantities that would provide a reliable basis for the assessment; however, a literature search was conducted and a modelling approach was taken, as outlined below. Formaldehyde was the only threshold chemical in Project emissions that was sufficiently non-volatile to be considered for deposition to soil and plants in the multi-media assessment, as described in EIS Appendix 27-A, Section 3.1.4. A search of the available literature indicated an absence of data for measured background concentrations of formaldehyde in soil and plants in the study area, in B.C. or in Canada. The lack of data for formaldehyde in these media is likely due to its physical-chemical properties, in particular the soil organic carbon-water partition coefficient (K_{oc}) and bioconcentration factor, which suggest formaldehyde will not significantly adsorb to soil particles or accumulate in biota (Environment Canada and Health Canada 2001). In the absence of measured data, formaldehyde concentrations in soil and plants under the existing condition scenario (i.e., baseline) were modelled based on existing formaldehyde concentrations in air (development and emission rates as of 2010). The air concentrations for this exposure scenario included the mean 24-hour ambient (measured) formaldehyde concentration plus the formaldehyde concentrations predicted for the multi-media receptor locations as a result of existing (2010) emissions to air, as described in EIS Appendix 27-A, Section 3.5.3.

As per IR13-07, the B.C. Ministry of Health and Health Canada advised that a RQ of ≤0.2 be used for the assessment of risk associated with exposure to threshold contaminants, where the risk assessment approach did not account for exposure from all potential sources. The risk assessment accounted for all sources of formaldehyde in air, however, as described above, there was no data to describe formaldehyde concentrations in drinking water, soil, plants, or commercial foods and no baseline sampling studies were conducted in the local study area. Therefore, as requested in IR13-07, risks associated with formaldehyde exposure via the multi-media pathway have been compared to a RQ of ≤0.2. This is described in the responses to IR13-07 and IR13-09. The update to compare to a RQ of ≤0.2 is considered appropriate and increases the confidence in the predicted risks associated with multi-media exposure to formaldehyde. All of the multi-media RQ values determined for formaldehyde were at least an order of magnitude below 0.2, as reported in Table 33 of EIS Appendix 27-A.

Baseline concentrations were not considered for the assessment of risk from multi-media exposure to benzo[a]pyrene as this chemical is a non-threshold carcinogen. Estimates of the ILCR associated with multi-media exposure to air concentrations of benzo[a]pyrene resulting from Project emissions were compared to the essentially negligible ILCR of 1 in 100,000 (Health Canada 2012), as described in EIS Appendix 27-A, Section 3.7.2. Ratios of the predicted ILCR to the essentially negligible ILCR are provided in Table 34 of EIS

Appendix 27-A. All of the multi-media ratios determined for benzo[a]pyrene were orders of magnitude below 1.0.

References

Environment Canada and Health Canada. 2001. Formaldehyde, Priority Substances List Assessment Report. Canadian Environmental Protection Act, 1999. Available at http://publications.gc.ca/site/eng/9.571381/publication.html. Accessed November 2018.

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Dutch National Institute of Public Health and the Environment (RIVM). 2001. Re-evaluation of Human Toxicological Maximum Permissible Risk Levels. RIVM Report 711701 025.

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IR13-07 Human Health Risk Assessment – Multiple sources of exposure

Information Source(s)

EIS Volume 4: Section 27: Human Health Effects Assessment (Revised June 2016)

Appendix 27-C: Roberts Bank 2 Technical Report - Shellfish Harvesting Potential and Contaminant-Related Consumption Risks at Roberts Bank

Appendix 27-A – Air Quality Human Health Risk Assessment Technical Report Subsection 3.7

Proponent Response to Follow-up Additional Information Requirements of December 4, 2015 Human Health Total Cumulative Effects Assessment (CEAR 412)

Health Canada: Submission to the Review Panel (CEAR 548, 629, and 1225)

Context

The Proponent, in Section 27 of the EIS, indicated that for determining significance of health effects, estimated exposures via inhalation or ingestion of food were compared to threshold levels accepted by authoritative health agencies (i.e., a risk quotient (RQ) ≤1.0).

B.C. Ministry of Health and Health Canada advised that a RQ of ≤1.0 is appropriate, as long as all sources of exposure to contaminants of potential concern (COPCs) are considered. For example, many COPCs, can be found in multiple mediums (e.g., fish tissue, commercial foods, drinking water and soil), meaning that people can be exposed to the same contaminants from multiple sources. Both health authorities stated that unless the risk assessment accounts for exposure from all potential sources, a RQ of ≤0.2 should be used. The same approach should be taken for air pollutants and food contaminants, where some of the pollutants assessed may also be found in other media.

The Proponent considered the deposition of non-volatile chemicals (formaldehyde and benzo[a]pyrene) from Project emissions to soil and plants under operating conditions as part of the multi-media exposure pathways assessment, but it is unclear whether all potential sources for all contaminants were considered in the human health risk assessment for air emissions and food contaminants.

Information Request

Discuss what sources of exposure pathways (e.g., air, soil, water and commercial foods) have been considered in the human health risk assessment for marine country foods and air emissions.

Incorporate all sources of exposure in the human health risk assessment from marine resources and air emissions or provide a risk assessment using a RQ of ≤0.2.

VFPA Response

Discuss what sources of exposure pathways (e.g., air, soil, water and commercial foods) have been considered in the human health risk assessment for marine country foods and air emissions.

The human health risk assessment (HHRA) for air emissions (EIS Appendix 27-A) considers a direct inhalation pathway for all receptors via acute and chronic inhalation of all volatile and non-volatile contaminants in Project emissions. The air quality HHRA also includes a multi-media exposure assessment that evaluates risks as a result of the deposition of non-volatile contaminants from Project emissions. In addition to the direct inhalation of vapours and particles, the following exposure pathways were considered for receptors in the multi-media assessment of contaminants deposited to land and water as listed in Section 3.5.3 of EIS Appendix 27-A:

- Incidental ingestion of soil;
- Inhalation of dust generated from soil;
- Dermal contact with soil;
- Dermal contact with sediments;
- Incidental ingestion of sediments;
- Ingestion of plants (root vegetables and above ground plants);
- Ingestion of cattle meat, milk from dairy cows, pigs, chicken, and eggs from chickens feeding on soil and plants;
- Ingestion of deer feeding on soil and plants; and
- Ingestion of shellfish exposed to sediments in the Roberts Bank intertidal zone.

The HHRA for marine country foods (EIS Appendix 27-C) considers a direct ingestion pathway, via exposure to contaminants present in the marine environment (water and sediment).

Incorporate all sources of exposure in the human health risk assessment from marine resources and air emissions or provide a risk assessment using a RQ of ≤0.2.

Risk Quotient for Marine Resources Assessments

The revised HHRA analysis for existing health risk from consumption of shellfish at Roberts Bank, provided in the response to IR12-02, calculates health risk using a non-cancer risk quotient (RQ) threshold of ≤0.2. This revised RQ was applied because the shellfish HHRA appropriately considers one potential source of non-volatile contaminants in the diet (shellfish harvested at Roberts Bank) and not others such as drinking water, commercial foods, and inhalation of contaminants present in air. Based on the revised assessment, the potential risks associated with the consumption of non-volatile contaminants in shellfish under existing conditions at Roberts Bank marginally exceed applicable non-cancer health thresholds for cadmium, inorganic arsenic, and polychlorinated biphenyls (PCBs).

In the response to IR12-04, the assessment of potential Project construction-related effects used a RQ of ≤0.2. As described in the response to IR12-04, Project construction is not anticipated to result in increased contaminant concentrations in marine country foods and will have a negligible effect on human health.

Risk Quotient for Air Quality Assessments

Inhalation Pathway

As outlined in the response to IR13-10, a revised air quality HHRA has not been completed for the inhalation pathway for volatile contaminants (i.e., chemicals for which 100% of human exposure occurs via the inhalation pathway) because, as per the rationale discussed in responses to IR13-02 and IR13-03 (CEAR Document #1333[1]), no new air quality results were generated in the responses, and therefore a revised air quality HHRA is not warranted. Furthermore, a RQ of ≤0.2 is not considered appropriate for assessment of risks associated with exposure to volatile contaminants, as explained below.

In terms of the air quality HHRA for the inhalation pathway in the EIS, a target RQ of 1.0 was appropriate when considering inhalation exposure to volatile contaminants of potential concern. This was the case for the assessment of non-carcinogenic effects from acute and chronic inhalation exposure to criteria air contaminants[2] and volatile organic compounds[3], since the inhalation pathway is the only human exposure pathway for these chemicals in air and the assessment accounted for Project-related plus background (ambient) concentrations of these chemicals in air. Furthermore, the non-carcinogenic health endpoints associated with acute or chronic exposure to the majority of these chemicals (exceptions being particulate matter (PM), benzene, and 1,3-butadiene) are the result of direct contact with ocular or pulmonary tissues, which only occur via the inhalation pathway (EIS Appendix 27-A, Tables 10 and 11).

A target RQ of 1.0 was considered appropriate for acute and chronic inhalation exposure to formaldehyde, the only non-volatile, non-carcinogenic chemical in project emissions. Again, the assessment accounted for background (ambient) concentrations of formaldehyde in air and the non-carcinogenic health effects associated with inhalation exposure to formaldehyde, including irritation of the eyes and nose (acute inhalation exposure) and respiratory tract irritation (chronic inhalation exposure), which could only occur via the inhalation pathway (EIS Appendix 27-A, Tables 10 and 11). It was not appropriate to combine inhalation and oral exposures to evaluate the non-carcinogenic effects of formaldehyde since the health endpoints for inhalation exposure to formaldehyde in air are unique to the inhalation exposure pathway (i.e., irritation of the eyes, nose, and respiratory tract) and the health endpoints for oral exposures to formaldehyde are unique to the oral exposure pathway (i.e., histopathological changes in the gastrointestinal tract).

[1] CEAR Document #1333 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR7-31, IR11-02, IR11-11, IR11-20, IR12-05, IR13-02, IR13-03, IR13-15, and IR13-18 (See Reference Documents #1000, #1179, #1206 and #1228).
[2] Carbon monoxide, nitrogen dioxide, sulphur dioxide, inhalable particulate matter (PM_{10}) and respirable particulate matter ($PM_{2.5}$), respirable diesel particulate matter, and volatile organic compounds (i.e., acetaldehyde, acrolein, benzene, 1,3-butadiene, and naphthalene).
[3] Acetaldehyde, acrolein, benzene, 1,3-butadiene, and naphthalene.

Multi-media Assessment

A RQ of $\leq$ 0.2 was applied to the multi-media assessment provided in response to IR13-06. As described in Section 3.1.4 of EIS Appendix 27-A, formaldehyde was the only non-carcinogen considered for the multi-media assessment based on physical-chemical properties that indicate a potential for this chemical to be deposited to soil and water (EIS Appendix 27-A, Table 6). There were no data available to describe ambient formaldehyde concentrations in drinking water, soil, plants, or commercial foods. No baseline studies were conducted in the local study area that provided measured formaldehyde concentrations in soil and vegetation. Therefore, it is appropriate to use a RQ of ≤0.2 since not all pathways of oral exposure were considered for formaldehyde in the multi-media assessment, as explained further in the response to IR13-06. All of the multi-media RQ values determined for formaldehyde were at least an order of magnitude below 0.2, as reported in Table 33 of EIS Appendix 27-A.

Background exposures are not considered in the determination of incremental lifetime cancer risks (ILCR) and therefore this approach does not apply to benzo[a]pyrene. All of the multi-media RQ values determined for benzo[a]pyrene were orders of magnitude below 1.0 (Table 34 of EIS Appendix 27-A). As described in Section 3.7.2 of EIS Appendix 27-A, a RQ value of 1.0 would indicate an ILCR equal to 1 in 100,000.

IR13-08 Human Health Risk Assessment – Incremental lifetime cancer risk

Information Source(s)

EIS Volume 4: Appendix 27-A: Air Quality Human Health Risk Assessment Technical Report

Health Canada: Submission to the Review Panel (CEAR 548 and 1225)

B.C. Ministry of Health: Submission to the Review Panel (CEAR 629)

Project Construction Update (CEAR 1210)

Context

The Proponent, in Section 3.7.2 of Appendix 27-A, indicated that for carcinogenic chemicals, inhalation exposure was defined by project-only air concentrations (i.e., future with the Project minus future conditions without the Project) to allow for an estimate of the incremental lifetime cancer risks specific to Project emissions. No rationale for excluding other scenarios was provided.

B.C. Ministry of Health and Health Canada commented that incremental lifetime cancer risks for chronic inhalation and multi-media exposures should be calculated for all scenarios, including baseline, Project only, Project plus baseline conditions, and cumulative effects to better characterize and contextualize the results. B.C. Ministry of Health also noted that 5.5 years is a considerable period of exposure therefore, incremental lifetime cancer risks should be calculated for entire the construction period. In the Proponent's construction update, the construction period was extended, which was acknowledged by Health Canada (CEAR 1225).

Further, B.C. Ministry of Health and Health Canada recommended that incremental lifetime cancer risk estimates should be characterized as a value per 100,000, not as a percentage of 1 in 100,000 or as a risk quotient.

Information Request

Calculate the incremental lifetime cancer risks for chronic inhalation and multi-media exposures for the following scenarios including construction and operation:

- Future case without the Project
- Future case with the Project
- Future case with the Project with other projects and activities (cumulative scenario)

Present the incremental lifetime cancer risk as a value per 100,000, not as a percentage of 1 in 100,000 or a risk quotient.

VFPA Response

Clarification

As described in Section 3.7.2 of EIS Appendix 27-A:

> *"The air concentrations for the Project alone were represented by the difference between the future case with the Project and the future case without the Project. The incremental change in air quality as a result of the Project is required for the assessment of incremental cancer risk associated with Project emissions (AHW 2011)."*

In the absence of guidance for human health risk assessment (HHRA) specific to B.C. for environmental assessment, the RBT2 air quality HHRA followed recommendations for the assessment of incremental lifetime cancer risk (ILCR) provided in the Alberta Health and Wellness (AHW) *Guidance on Human Health Risk Assessment for Environmental Impact Assessment in Alberta* (AHW 2011). In terms of determining ILCR, this guidance states the following:

> *"The acceptable or tolerable cancer risk of 1 in 100,000 was specifically developed to address cancer risks that are above background. There are no regulatory benchmarks of acceptable or tolerable cancer risk for background cancers. Consequently, background environmental media concentrations should not be included in the calculation of ILCR."* (AHW 2011, p. 9).

> *"…health risks should be evaluated under "project only" conditions, in order that the contribution of the project can be assessed on its own, and the results can be used in the communication and consultation process. The project alone case considers potential environmental effects and associated health risks under project conditions only. A further benefit of assessing health risks on a "project only" basis is in the evaluation of ILCR for carcinogens. Unlike threshold compounds, in which exposure from all sources including background is compared with applicable exposure limits, carcinogenic risk is expressed in incremental terms for the purposes of assessing the significance of a particular source of exposure. For the reasons stated above, the ILCR risk related to the project is not readily obtained from the application (baseline plus project) case."* (AHW 2011, pp. 13-14).

Guidance from Health Canada also defines ILCR as "*The increase in lifetime cancer risk above the normal risks associated with background exposures"* (Health Canada 2010, p. 1; 116).

In accordance with the Health Canada guidance, the ILCR values provided in EIS Appendix 27-A (Appendix A, Table C-4.1) were representative of the increase in cancer risk associated with the Project and did not include background (baseline) exposures. The air contaminant concentrations predicted for future scenarios, including Project construction and operation, include contributions from baseline sources.

To respond to this information request, ILCR values were determined for the total predicted annual air concentrations of carcinogenic chemicals under the future case without the Project (expected conditions), the future case with the Project, and the construction case. The VFPA wishes to note that the ILCR values provided below have been prepared to address the Panel information request to include baseline (existing conditions) air concentrations, which is not consistent with HHRA guidance provided by AHW (2011) or Health Canada (2010). ILCRs calculated in this context provide the 'incremental' lifetime cancer risk, associated with Project emissions combined with existing emissions. ILCR values were not determined for a cumulative scenario as a cumulative effects assessment was not required for the HHRA for air quality, as described in EIS Section 27.10, Table 27-21 (p. 27-74), and in the response to IR13-10 and IR13-13.

Summary of Approach to Calculating ILCRs for Future Conditions Including Baseline

Cancer risks from the inhalation of outdoor air were determined using recent guidance from Health Canada (2017) for HHRA of air quality. The time-adjusted lifetime daily air concentrations (TLCA) were determined using Equation 2.3 (Health Canada 2017, p. 10) and ILCRs were determined using Equation 2.7 (Health Canada 2017, p. 16). The following was assumed for exposure duration and relative chemical absorption:

- The daily time spent outdoors (i.e., D1 in Equation 2.3) was assumed to be 1.5 hours/day as per Health Canada (2012) guidance;
- For the future case without the Project and the future case with the Project, no adjustments were made for the fraction of days exposed per week, weeks exposed per year, or years exposed per lifetime (i.e., a value of 1 was assumed for D2, D3, and D4 in Equation 2.3);
- For the construction case, a value of 1 was assumed for D2 and D3 (i.e., fraction of days exposed per week, weeks exposed per year) and a construction exposure period of 10[1] years over a lifespan (80 years) was assumed for D4 (i.e., years exposed per lifetime);
- A relative absorption factor of chemical for inhalation (i.e., RAFInh in Equation 2.3) of 1 or 100% was assumed for all carcinogens; and
- Carcinogenic chemicals determined to have similar target tissues (e.g., lung) were grouped together and an additive interaction was assumed, as described in EIS Appendix 27-A, Section 3.6.4, p. 28.

The ILCR values for individual chemicals and chemical groups at all receptor locations under the future case without the Project, future case with the Project, and construction case, are provided as requested in **Appendix IR13-08-A** (Tables IR13-08-A1 to IR13-08-A3, respectively). The maximum ILCR values for each receptor type are summarised below for

[1] A construction period of 10 years was assumed in this analysis for the purposes of a conservative assessment. The predicted risk using this assumption is below the applicable threshold for negligible cancer risk, and adjusting the duration of the construction period to be more accurate would further reduce the predicted risk.

individual carcinogens (**Table IR13-08-1** to **Table IR13-08-7**) and chemical groups (**Table IR13-08-8** to **Table IR13-08-10**).

All of the ILCR values determined for the future case without the Project, future case with the Project, and construction case are below $1x10^{-5}$, indicating "essentially negligible" cancer risk as per Health Canada (2012) guidance.

Table IR13-08-1 Incremental Lifetime Cancer Risk Values – Acetaldehyde

Receptor	Averaging Time	ILCR – Acetaldehyde		
		Future without Project	Future with Project	Construction
Tsawwassen First Nation (TFN)	Annual	8.5E-10	1.4E-09	1.9E-10
Farmers	Annual	1.1E-09	1.7E-09	2.5E-10
Canadian Residents	Annual	8.5E-10	1.4E-09	1.9E-10
U.S. Residents	Annual	9.9E-10	1.4E-09	2.5E-10

Table IR13-08-2 Incremental Lifetime Cancer Risk Values – Benzene

Receptor	Averaging Time	ILCR – Benzene		
		Future without Project	Future with Project	Construction
TFN	Annual	5.4E-10	9.2E-10	1.2E-10
Farmers	Annual	6.3E-10	1.1E-09	1.8E-10
Canadian Residents	Annual	5.4E-10	9.2E-10	1.2E-10
U.S. Residents	Annual	6.6E-10	1.0E-09	1.8E-10

Table IR13-08-3 Incremental Lifetime Cancer Risk Values – Benzo[a]pyrene

Receptor	Averaging Time	ILCR – Benzo[a]pyrene		
		Future without Project	Future with Project	Construction
TFN	Annual	1.8E-08	2.5E-08	4.9E-09
Farmers	Annual	1.9E-08	2.6E-08	1.0E-08
Canadian Residents	Annual	1.8E-08	2.6E-08	4.9E-09
U.S. Residents	Annual	2.6E-08	3.6E-08	3.6E-09

Table IR13-08-4 Incremental Lifetime Cancer Risk Values – 1,3 Butadiene

Receptor	Averaging Time	ILCR – 1,3 Butadiene		
		Future without Project	Future with Project	Construction
TFN	Annual	4.7E-10	7.7E-10	9.6E-11
Farmers	Annual	5.8E-10	9.9E-10	1.4E-10
Canadian Residents	Annual	4.7E-10	7.7E-10	9.6E-11
U.S. Residents	Annual	5.2E-10	7.6E-10	1.2E-10

Table IR13-08-5 Incremental Lifetime Cancer Risk Values – Diesel Particulate Matter (DPM)

Receptor	Averaging Time	ILCR – DPM		
		Future without Project	Future with Project	Construction
TFN	Annual	9.0E-07	1.2E-06	2.6E-07
Farmers	Annual	9.6E-07	1.3E-06	3.1E-07
Canadian Residents	Annual	1.0E-06	1.2E-06	3.1E-07
U.S. Residents	Annual	1.5E-06	1.7E-06	4.4E-07

Table IR13-08-6 Incremental Lifetime Cancer Risk Values – Formaldehyde

Receptor	Averaging Time	ILCR - Formaldehyde		
		Future without Project	Future with Project	Construction
TFN	Annual	4.5E-09	7.3E-09	1.2E-09
Farmers	Annual	5.7E-09	9.4E-09	1.6E-09
Canadian Residents	Annual	4.5E-09	7.3E-09	1.2E-09
U.S. Residents	Annual	5.1E-09	7.0E-09	1.2E-09

Table IR13-08-7 Incremental Lifetime Cancer Risk Values – Naphthalene

Receptor	Averaging Time	ILCR – Naphthalene		
		Future without Project	Future with Project	Construction
TFN	Annual	2.2E-09	3.6E-09	4.7E-10
Farmers	Annual	2.9E-09	4.8E-09	6.9E-10
Canadian Residents	Annual	2.2E-09	3.6E-09	4.7E-10
U.S. Residents	Annual	2.3E-09	3.2E-09	5.5E-10

Table IR13-08-8 Incremental Lifetime Cancer Risk Values – Nasal Tumours[2]

Receptor	Averaging Time	ILCR – Nasal Tumours		
		Future without Project	Future with Project	Construction
TFN	Annual	7.6E-09	1.2E-08	1.8E-09
Farmers	Annual	9.6E-09	1.6E-08	2.5E-09
Canadian Residents	Annual	7.6E-09	1.2E-08	1.8E-09
U.S. Residents	Annual	8.4E-09	1.2E-08	2.0E-09

Table IR13-08-9 Incremental Lifetime Cancer Risk Values - Lung Tumours[3]

Receptor	Averaging Time	ILCR – Lung Tumours		
		Future without Project	Future with Project	Construction
TFN	Annual	9.2E-07	1.2E-06	2.7E-07
Farmers	Annual	9.8E-07	1.3E-06	3.2E-07
Canadian Residents	Annual	1.1E-06	1.3E-06	3.2E-07
U.S. Residents	Annual	1.5E-06	1.8E-06	4.5E-07

[2] acetaldehyde plus formaldehyde.
[3] benzo[a]pyrene plus DPM.

Table IR13-08-10 Incremental Lifetime Cancer Risk Values – Leukemia[4]

Receptor	Averaging Time	ILCR – Leukemia		
		Future without Project	Future with Project	Construction
TFN	Annual	1.0E-09	1.7E-09	2.2E-10
Farmers	Annual	1.2E-09	2.1E-09	3.2E-10
Canadian Residents	Annual	1.0E-09	1.7E-09	2.2E-10
U.S. Residents	Annual	1.2E-09	1.8E-09	3.0E-10

References

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Appendices

Appendix IR13-08-A Predicted Incremental Lifetime Cancer Risk Values

[4] benzene plus 1,3 butadiene.

APPENDIX IR13-08-A

PREDICTED INCREMENTAL LIFETIME CANCER RISK VALUES

Table IR13-08-A1 Chronic Inhalation Exposure and Lifetime Cancer Risk (LCR) Under Future Conditions (2025) Without the Project (Expected Conditions)

Receptor	DPM		Benzene		Benzo[a]pyrene		1,3-Butadiene		Acetaldehyde		Formaldehyde		Naphthalene		Nasal Tumours	Lung Tumours	Leukemia
	CHRONIC Annual		CHRONIC Annual		CHRONIC Annual		CHRONIC Annual		CHRONIC Annual		CHRONIC Annual		CHRONIC Annual				
	Future without Project modelled (µg/m³)	ILCR	Future without Project modelled (µg/m³)	ILCR	Future without Project modelled (ug/m³)	ILCR	Future without Project modelled (µg/m³)	ILCR	Future without Project modelled (µg/m³)	ILCR	Future without Project modelled (µg/m³)	ILCR	Future without Project modelled (µg/m³)	ILCR	ILCR	ILCR	ILCR
Ladner	0.01	2.6E-07	2.57E-04	1.2E-10	0.000001	4.6E-09	5.01E-05	1.0E-10	1.16E-03	2.0E-10	3.29E-03	1.0E-09	2.34E-04	4.9E-10	1.7E-09	2.6E-07	2.3E-10
Farmer 1	0.02	5.2E-07	6.27E-04	3.0E-10	0.000002	1.0E-08	1.30E-04	2.7E-10	2.91E-03	4.9E-10	8.40E-03	2.6E-09	6.25E-04	1.3E-09	4.4E-09	5.3E-07	5.7E-10
Tsawwassen First Nation	0.04	9.0E-07	1.12E-03	5.4E-10	0.000003	1.8E-08	2.23E-04	4.7E-10	5.05E-03	8.5E-10	1.45E-02	4.5E-09	1.07E-03	2.2E-09	7.6E-09	9.2E-07	1.0E-09
Farmer 2	0.04	8.2E-07	1.06E-03	5.1E-10	0.000003	1.6E-08	2.15E-04	4.5E-10	4.85E-03	8.2E-10	1.40E-02	4.4E-09	1.04E-03	2.2E-09	7.4E-09	8.3E-07	9.6E-10
Farmer 3	0.05	9.6E-07	1.32E-03	6.3E-10	0.000004	1.9E-08	2.81E-04	5.8E-10	6.25E-03	1.1E-09	1.82E-02	5.7E-09	1.38E-03	2.9E-09	9.6E-09	9.8E-07	1.2E-09
Beach Grove	0.02	3.8E-07	3.85E-04	1.9E-10	0.000001	6.9E-09	7.41E-05	1.5E-10	1.72E-03	2.9E-10	4.86E-03	1.5E-09	3.45E-04	7.2E-10	2.5E-09	3.9E-07	3.4E-10
Boundary Bay	0.02	4.2E-07	3.90E-04	1.9E-10	0.000001	7.2E-09	7.29E-05	1.5E-10	1.73E-03	2.9E-10	4.81E-03	1.5E-09	3.34E-04	7.0E-10	2.5E-09	4.3E-07	3.4E-10
Tsawwassen	0.05	1.0E-06	1.07E-03	5.1E-10	0.000004	1.8E-08	1.96E-04	4.1E-10	4.47E-03	7.6E-10	1.25E-02	3.9E-09	8.75E-04	1.8E-09	6.5E-09	1.1E-06	9.2E-10
Point Roberts 1	0.03	5.5E-07	4.70E-04	2.3E-10	0.000002	9.0E-09	8.69E-05	1.8E-10	2.08E-03	3.5E-10	5.75E-03	1.8E-09	3.93E-04	8.2E-10	3.0E-09	5.5E-07	4.1E-10
Point Roberts 2	0.07	1.5E-06	1.37E-03	6.6E-10	0.000005	2.6E-08	2.50E-04	5.2E-10	5.88E-03	9.9E-10	1.63E-02	5.1E-09	1.12E-03	2.3E-09	8.4E-09	1.5E-06	1.2E-09
Delta Hospital	0.01	2.2E-07	2.08E-04	1.0E-10	0.000001	3.8E-09	4.02E-05	8.4E-11	9.44E-04	1.6E-10	2.65E-03	8.3E-10	1.87E-04	3.9E-10	1.4E-09	2.2E-07	1.8E-10
Air Quality Station T39	0.05	1.0E-06	9.65E-04	4.6E-10	0.000003	1.7E-08	1.78E-04	3.7E-10	4.14E-03	7.0E-10	1.15E-02	3.6E-09	8.01E-04	1.7E-09	6.0E-09	1.0E-06	8.3E-10

Table IR13-08-A2 Chronic Inhalation Exposure and Lifetime Cancer Risk (LCR) Under Future Conditions (2025) With the Project

Receptor	DPM		Benzene		Benzo[a]pyrene		1,3-Butadiene		Acetaldehyde		Formaldehyde		Naphthalene		Nasal Tumours	Lung Tumours	Leukemia
	CHRONIC Annual		CHRONIC Annual		CHRONIC Annual		CHRONIC Annual		CHRONIC Annual		CHRONIC Annual		CHRONIC Annual				
	Future with Project modelled (µg/m³)	ILCR	Future with Project modelled (µg/m³)	ILCR	Future with Project modelled (µg/m³)	ILCR	Future with Project modelled (µg/m³)	ILCR	Future with Project modelled (µg/m³)	ILCR	Future with Project modelled (µg/m³)	ILCR	Future with Project modelled (µg/m³)	ILCR	ILCR	ILCR	ILCR
Ladner	0.02	3.2E-07	4.68E-04	2.3E-10	0.000001	6.9E-09	8.47E-05	1.8E-10	1.82E-03	3.1E-10	5.15E-03	1.6E-09	3.72E-04	7.7E-10	2.7E-09	3.3E-07	4.0E-10
Farmer 1	0.03	6.9E-07	1.14E-03	5.5E-10	0.000003	1.5E-08	2.25E-04	4.7E-10	4.80E-03	8.1E-10	1.39E-02	4.4E-09	1.05E-03	2.2E-09	7.3E-09	7.0E-07	1.0E-09
Tsawwassen First Nation	0.06	1.2E-06	1.90E-03	9.2E-10	0.000005	2.5E-08	3.71E-04	7.7E-10	8.08E-03	1.4E-09	2.34E-02	7.3E-09	1.75E-03	3.6E-09	1.2E-08	1.2E-06	1.7E-09
Farmer 2	0.05	1.1E-06	1.87E-03	9.0E-10	0.000004	2.2E-08	3.75E-04	7.8E-10	8.15E-03	1.4E-09	2.38E-02	7.4E-09	1.80E-03	3.7E-09	1.3E-08	1.1E-06	1.7E-09
Farmer 3	0.06	1.3E-06	2.30E-03	1.1E-09	0.000005	2.6E-08	4.74E-04	9.9E-10	1.02E-02	1.7E-09	2.99E-02	9.4E-09	2.28E-03	4.8E-09	1.6E-08	1.3E-06	2.1E-09
Beach Grove	0.02	4.7E-07	6.84E-04	3.3E-10	0.000002	1.0E-08	1.23E-04	2.6E-10	2.64E-03	4.5E-10	7.46E-03	2.3E-09	5.37E-04	1.1E-09	3.9E-09	4.8E-07	5.8E-10
Boundary Bay	0.02	5.1E-07	6.99E-04	3.4E-10	0.000002	1.1E-08	1.20E-04	2.5E-10	2.59E-03	4.4E-10	7.23E-03	2.3E-09	5.08E-04	1.1E-09	3.8E-09	5.2E-07	5.9E-10
Tsawwassen	0.06	1.2E-06	1.68E-03	8.1E-10	0.000005	2.6E-08	2.95E-04	6.2E-10	6.37E-03	1.1E-09	1.79E-02	5.6E-09	1.27E-03	2.7E-09	9.3E-09	1.3E-06	1.4E-09
Point Roberts 1	0.03	6.4E-07	8.01E-04	3.8E-10	0.000003	1.3E-08	1.36E-04	2.8E-10	2.96E-03	5.0E-10	8.20E-03	2.6E-09	5.67E-04	1.2E-09	4.2E-09	6.5E-07	6.7E-10
Point Roberts 2	0.08	1.7E-06	2.14E-03	1.0E-09	0.000007	3.6E-08	3.67E-04	7.6E-10	8.04E-03	1.4E-09	2.23E-02	7.0E-09	1.55E-03	3.2E-09	1.2E-08	1.8E-06	1.8E-09
Delta Hospital	0.01	2.7E-07	3.83E-04	1.8E-10	0.000001	5.8E-09	6.80E-05	1.4E-10	1.46E-03	2.5E-10	4.12E-03	1.3E-09	2.94E-04	6.1E-10	2.1E-09	2.8E-07	3.3E-10
Air Quality Station T39	0.06	1.2E-06	1.55E-03	7.4E-10	0.000005	2.5E-08	2.70E-04	5.6E-10	5.84E-03	9.9E-10	1.63E-02	5.1E-09	1.15E-03	2.4E-09	8.5E-09	1.2E-06	1.3E-09

Table IR13-08-A3 Chronic Inhalation Exposure and Lifetime Cancer Risk (LCR) – Construction Phase

Receptor	DPM		Benzene		Benzo[a]pyrene		1,3-Butadiene		Acetaldehyde		Formaldehyde		Naphthalene		Nasal Tumours	Lung Tumours	Leukemia
	CHRONIC Annual		CHRONIC Annual		CHRONIC Annual		CHRONIC Annual		CHRONIC Annual		CHRONIC Annual		CHRONIC Annual				
	Construction (µg/m³)	ILCR	Construction (µg/m³)	ILCR	Construction (ug/m³)	ILCR	Construction (µg/m³)	ILCR	Construction (µg/m³)	ILCR	Construction (µg/m³)	ILCR	Construction (µg/m³)	ILCR	ILCR	ILCR	ILCR
Ladner	0.03	7.8E-08	0.0010	6.0E-11	0.000002	1.0E-09	0.0001	2.3E-11	0.0020	4.2E-11	0.01	3.9E-10	0.0004	1.1E-10	5.5E-10	7.9E-08	8.4E-11
Farmer 1	0.06	1.6E-07	0.0010	6.0E-11	0.000005	3.2E-09	0.0002	6.0E-11	0.0060	1.3E-10	0.02	7.8E-10	0.0011	3.0E-10	1.2E-09	1.6E-07	1.2E-10
Tsawwassen First Nation	0.10	2.6E-07	0.0020	1.2E-10	0.000007	4.9E-09	0.0004	9.6E-11	0.0090	1.9E-10	0.03	1.2E-09	0.0018	4.7E-10	1.8E-09	2.7E-07	2.2E-10
Farmer 2	0.09	2.3E-07	0.0020	1.2E-10	0.000007	4.7E-09	0.0004	9.1E-11	0.0090	1.9E-10	0.02	7.8E-10	0.0017	4.5E-10	1.4E-09	2.4E-07	2.1E-10
Farmer 3	0.12	3.1E-07	0.0030	1.8E-10	0.000015	1.0E-08	0.0005	1.4E-10	0.0120	2.5E-10	0.04	1.6E-09	0.0026	6.9E-10	2.5E-09	3.2E-07	3.2E-10
Beach Grove	0.04	1.0E-07	0.0010	6.0E-11	0.000002	1.4E-09	0.0001	3.6E-11	0.0040	8.4E-11	0.01	3.9E-10	0.0006	1.7E-10	6.4E-10	1.1E-07	9.7E-11
Boundary Bay	0.05	1.3E-07	0.0010	6.0E-11	0.000002	1.3E-09	0.0001	3.6E-11	0.0040	8.4E-11	0.01	3.9E-10	0.0007	1.7E-10	6.5E-10	1.3E-07	9.7E-11
Tsawwassen	0.12	3.1E-07	0.0020	1.2E-10	0.000005	3.3E-09	0.0003	8.9E-11	0.0090	1.9E-10	0.02	7.8E-10	0.0016	4.1E-10	1.4E-09	3.2E-07	2.1E-10
Point Roberts 1	0.06	1.6E-07	0.0010	6.0E-11	0.000002	1.3E-09	0.0002	4.2E-11	0.0040	8.4E-11	0.01	3.9E-10	0.0008	2.0E-10	6.7E-10	1.6E-07	1.0E-10
Point Roberts 2	0.17	4.4E-07	0.0030	1.8E-10	0.000006	3.6E-09	0.0005	1.2E-10	0.0120	2.5E-10	0.03	1.2E-09	0.0021	5.5E-10	2.0E-09	4.5E-07	3.0E-10
Delta Hospital	0.03	7.8E-08	0.0004	2.4E-11	0.000001	7.8E-10	0.0001	2.1E-11	0.0020	4.2E-11	0.01	3.9E-10	0.0004	9.2E-11	5.2E-10	7.9E-08	4.5E-11
Air Quality Station T39	0.11	2.9E-07	0.0020	1.2E-10	0.000004	2.9E-09	0.0003	8.3E-11	0.0080	1.7E-10	0.02	7.8E-10	0.0015	3.9E-10	1.3E-09	2.9E-07	2.0E-10

IR13-09 Human Health Risk Assessment – Ingestion Rates – Farmers

Information Source(s)

EIS Volume 4: Section 27 Appendix 27-A; Appendix B of Appendix 27-A: *Multi-Media Model and Risk Characterization Results and Sample Calculations*

Panel Information Request IR12-02 and IR12-04 (CEAR 1206)

Context

Health Canada indicated that there is uncertainty associated with the farmer ingestion rates provided in Appendix 27-A, and they are incorrectly sourced from a Health Canada Document (2007).

The Panel has requested in information request IR12-02 and IR12-04 that more appropriate consumption rates be used to assess the potential effects to human health from the consumption of marine resources.

Confirmation and/or adjustment to consumptions rates for farmers should be provided in the Multi-Media Model and Risk Characterization *(*Appendix B of Appendix 27-A).

Information Request

Discuss the accuracy of the food consumption rates for the farmers harvesting in proximity to the proposed Project site (Receptors F1, F2, F3).

Based on more appropriate consumption rates for farmers update the multi-media assessment.

Update Appendix 27-A "Air Quality Human Health Technical Report", where appropriate.

VFPA Response

Clarification

The ingestion rates provided in EIS Appendix 27-A, Section 3.5.3, Table 8, page 23, for farmers were incorrectly referenced as being sourced from Health Canada (2007). The correct reference for these ingestion rates is U.S. Environmental Protection Agency (EPA; 2005), specifically Chapter 6, Section 6.2.2.2, Table 6-1, page 6-7.

In the absence of similar data for Canadian farmers, the U.S. EPA (2005) ingestion rates were used to determine mean ingestion rates for the various farmer age groups assessed in the multi-media exposure model (EIS Appendix 27-A). The U.S. EPA farmer ingestion rates are provided below, in number of servings per week, in **Table IR13-09-1**, and in grams per day

(g/day) in **Table IR13-09-2**. These are consistent with the ingestion rates used in the Air Quality human health risk assessment (HHRA; EIS Appendix 27-A, Table 8, page 23).

Table IR13-09-1 Mean Ingestion Rates for U.S. Farmers (Servings per Week)

Farmer Ingestion Rate (grams per serving)	U.S. Farmers (Servings per Week)		
	Infant	Child	Adult
Beef (113.4 g servings)	0	0.7	5.3
Milk (250 g servings)	0	10.5	29.5
Chicken (113.4 g servings)	0	0.4	2.8
Eggs (85 g/egg)	0	0.7	4.3
Pork (113.4 g servings)	0	0.4	2.4

Source: U.S. EPA 2005.

Table IR13-09-2 Mean Ingestion Rates[a] Assumed for Canadian Farmers (g/day)

Farmer Ingestion Rate (g/day)	Canadian Farmers				
	Infant	Toddler[b]	Child	Teen[c]	Adult
Beef (113.4 g servings)	0	11.3	11.3	85.9	85.9
Milk (250 g servings)	0	375.0	375.0	1053.6	1053.6
Chicken (113.4 g servings)	0	6.5	6.5	45.4	45.4
Eggs (85 g/egg)	0	8.5	8.5	52.2	52.2
Pork (113.4 g servings)	0	6.5	6.5	38.9	38.9

Source: U.S. EPA 2005.

Notes: a. Ingestion rate = (g/serving x # of serving per week) / 7 days per week.
b. Assumed same intake rate as for child.
c. Assumed same intake rate as for adult.

Discuss the accuracy of the food consumption rates for the farmers harvesting in proximity to the proposed Project site (Receptors F1, F2, F3).

Based on more appropriate consumption rates for farmers update the multi-media assessment.

The U.S. EPA (2005) identified ingestion rates specific to farmers. As described in Chapter 4 of U.S. EPA (2005), standardised generic exposure scenarios were developed to be appropriate for a broad range of scenarios "…with a level of protectiveness intended to address potential receptors not directly evaluated". The farmer exposure scenario assumed that a farming or ranching family could be exposed and therefore includes the following exposure pathways:

- Direct inhalation of vapours and particles (acute and chronic inhalation);
- Incidental ingestion of soil;
- Ingestion of homegrown produce (i.e., fruits and vegetables);
- Ingestion of homegrown beef;
- Ingestion of milk from homegrown cows;

- Ingestion of homegrown chicken;
- Ingestion of eggs from homegrown chickens;
- Ingestion of homegrown pork; and
- Ingestion of breast milk (infant of the Farmer) (U.S. EPA 2005).

The farmer exposure scenario conservatively assumes that all of the portions of the farmer's diet that come from homegrown food are impacted by Project emissions. Since the farming in the local assessment area is primarily commercial agriculture, it is unlikely that the exposure pathways considered will underestimate current and future risk for farmer receptors. The consumption rates used in the EIS for the 'farmer' receptor based on exposure pathways listed above were appropriate, and as such an update to the multi-media assessment based on revised farmer ingestion rates is not required.

Update Appendix 27-A "Air Quality Human Health Technical Report", where appropriate.

The response to IR12-02 considers an updated consumption rate of 51 g/day for crab and bivalve shellfish, to reflect information provided by Indigenous groups. For consistency, the multi-media assessment of the Air Quality HHRA has also been updated (below) using the same consumption rate for shellfish. The original (EIS) and revised consumption rates for different age groups are shown in **Table IR13-09-3**; the EIS and revised exposure doses from the ingestion of shellfish are provided in **Table IR13-09-4**; and the EIS and updated risk quotients (RQs) are provided in **Table IR13-09-5**. Health risks were compared to an updated RQ threshold of <0.2, as requested in IR13-07[1]. The predicted chronic multi-media RQ values for formaldehyde were all below 0.2 (ranging from 0.0007 to 0.03), as reported in Table 32, Section 4.2.5 of EIS Appendix 27-A. No human health risks were predicted from exposure to formaldehyde via the multi-media exposure pathways in the updated assessment.

The incremental lifetime cancer risk (ILCR) values predicted as a result of exposure to benzo[a]pyrene via multiple media pathways, taking into account the higher shellfish ingestion rate as noted in IR12-02 (**Table IR13-09-6**), were below the Health Canada threshold for a negligible ILCR of $1x10^{-5}$ (Health Canada 2012). No human health risks were predicted from exposure to benzo[a]pyrene via the multi-media exposure pathways in the updated assessment.

[1] No measured or literature data were available to describe background concentrations of the non-carcinogenic, non-volatile compounds of potential concern (COPCs) contained in Project emissions (i.e., formaldehyde) in plants and soil in the local assessment area, in order to provide a Project plus background multi-media exposure. As identified in IR13-07, it is therefore more appropriate to compare the RQs determined for formaldehyde to RQ threshold of 0.2, which considers other pathways and/or sources of contamination, than the RQ of 1.0 used in the EIS, which is appropriate when considering incremental (Project only) exposure.

Table IR13-09-3 EIS and Updated Shellfish Ingestion Rates for Indigenous Groups (g/day)

	Toddler	Child	Teen	Adult
EIS Air Quality Multi-media Assessment[a]	19	21	27	28
Revised Air Quality Multi-media Assessment	26	42	51	51

Notes: a. Based on Health Canada (2007; assuming 2 meals per week).

Table IR13-09-4 EIS and Updated Shellfish Exposure Dose for Indigenous Groups (mg/kg/d)

	Toddler	Child	Teen	Adult
EIS Air Quality Multi-media Assessment	5.17E-11	4.52E-11	3.57E-11	2.38E-10
Revised Air Quality Multi-media Assessment	7.03E-11	8.85E-11	6.77E-11	4.29E-10

Table IR13-09-5 Maximum EIS and Updated Benzo[a]pyrene Risk Quotient per 100,000

Receptor	EIS Air Quality Multi-media Assessment	Revised Air Quality Multi-media Assessment
TFN	8E-05	1E-04
TFN (maximum point of impingement (MPOI) over land)	1E-04	2E-04

Table IR13-09-6 Maximum Air Quality HHRA and Revised Benzo[a]pyrene ILCR

Receptor	EIS Air Quality Multi-media Assessment	Revised Air Quality Multi-media Assessment
TFN	8E-10	1E-09
TFN (MPOI over land)	1E-09	2E-09

References

Health Canada. 2007. Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption. Bureau of Chemical Safety, Food Directorate, Health Products and Food Branch. Available at http://hc-sc.gc.ca/fn-an/pubs/mercur/merc_fish_poisson_e.html. Accessed June 2014.

Health Canada. 2012. Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), Version 2.0. Federal Contaminated Site Risk Assessment in Canada. Available at http://publications.gc.ca/collections/collection_2012/sc-hc/H128-1-11-632-eng.pdf. Accessed September 2018.

U.S. Environmental Protection Agency (EPA). 2005. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities. U.S. EPA, Office of Solid Waste, EPA530-R-05-006. Available at http://www.epa.gov/osw/hazard/tsd/td/combust/risk.htm. Accessed May 2014.

IR13-10 Human Health Risk Assessment – Air Quality – Effects of the Project and Cumulative Effects

Information Source(s)

EIS Volume 2: Appendix 9.2-A: Air Quality Study

EIS Volume 4: Appendix 27-A: Air Quality Human Health Risk Assessment Technical Report

Responses to Information Requests from the Review Panel (CEAR 1188)

EIS Guidelines: Section 12.1.1

Proponent Response to Follow-up Additional Information Requirements of December 4, 2015 – Schedule 13-10: Human Health Total Cumulative Effects Assessment (CEAR 412)

Context

In Appendix 27-A, for the Air Quality Human Health Risk Assessment, the Proponent assessed three scenarios for the operation phase: Existing case (2010), Future case without Project (the existing Roberts Bank terminals and B.C. Ferries Terminal in 2025), and Future case with Project (existing Roberts Bank terminals and B.C. Ferries Terminal in conjunction with RBT2 in 2025). The ambient pollutant concentrations for the Project alone were represented by the difference between the future case with the Project and the future case without the Project.

For the construction phase, the Proponent provided three scenarios: average day scenario – Project construction only; average day scenario – construction plus expected conditions (i.e. existing Roberts Bank terminals and B.C. Ferries Terminal in 2025); and peak day scenario – Project construction only. The Panel notes that the Proponent provided cumulative results for NO_2 in responses to Information Request IR27 (CEAR 1188).

The Proponent did not include cumulative effects scenarios in Appendix 27-A but provided additional information in response to IR13 (CEAR 412). The Proponent stated in the cumulative effects assessment for human health that the only residual health effect associated with air quality changes was expected to occur only for potential exposure to dust during construction, at a specific location over water between the Project marine terminal and Westshore terminals. However, the Proponent determined that the residual effects of the proposed Project were not likely to be measurable due to the conservativism of the air quality modelling and did not carry the cumulative effects assessment further.

The EIS Guidelines Section 12.1.1 required that residual effects, even if very small or deemed insignificant, be described. This is particularly important in consideration of cumulative effects assessment, where small residual project effects could combine with effects of other projects and activities that have been or will be carried out. For human health, the cumulative effects scenario needs to be calculated for all the receptors potentially affected by the Project air emissions regardless of whether the Project-only effects were likely to cause a measurable effect on human health for both phases of the Project (i.e. construction and operation). The

Project only effects should also be presented separately to better characterize and contextualize the results.

Information Request

Using the updated results of the air quality assessment (IR13-02, IR13-03 and CEAR 1188), revise the human health risk assessment for the following scenario for the construction and operation phases:

- Future case without Project
- Project alone
- Future case with Project
- Future case with Project with other projects and activities (cumulative scenario)

Provide results that can be compared against the most stringent exposure limits as appropriate (i.e. max vs 98th percentile depending on the pollutant).

When revising the air quality human health risk assessment, consider additional instructions included in IR13-04, IR13-05, IR13-06, IR13-07, and IR13-08.

VFPA Response

Clarification

The VFPA has reviewed the information request and context and provides the clarifications below to address the request and provide rationale for the approach taken.

IR6-27 (CEAR Document #1188) – Air Quality Cumulative Assessment

Cumulative NO_x predictions in the response to IR6-27 (CEAR Document #1188[1]) are specific to the air quality intermediate component assessment. The cumulative analysis of air quality is not carried forward (in EIS or information request responses) to the health assessment because residual effects of exposure to air emissions on human health are unlikely to occur, as explained further below.

Rationale for Exclusion of Residual Air Quality Human Health Effect from Assessment of Incremental Cumulative Effects

The rationale for the exclusion of the residual health effect due to exposure to air emissions from the cumulative effects assessment is provided in Section 27.0 of the EIS, Table 27-21. This rationale was clarified when a revised EIS Section 27.0 was submitted to the Canadian Environmental Assessment (CEA) Agency on June 1, 2016, as follows:

> "*The residual effect on human health from air emissions is determined to be unlikely to occur; therefore, it is also unlikely that any other activity or project*

[1] CEAR Document #1188 From the Vancouver Fraser Port Authority to the Review Panel re: Response to IR6-04, IR6-05, IR6-10, IR6-11, IR6-12, IR6-14, IR6-21, IR6-22, IR6-23, IR6-24, IR6-25, IR6-27, IR6-28, IR6-29, IR6-31, IR6-32, IR6-34, IR6-35, and IR6-37 (See Reference Document #991).

will contribute airborne contamination of fine particulates associated with fugitive dust that would interact cumulatively with the effects of the Project."

A residual effect that is determined to be unlikely to occur is not carried forward for a cumulative assessment, as per federal guidance for cumulative effects assessments, including the CEA Agency's Operational Policy Statements *Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under CEAA 2012* and *Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012*. According to these policy statements, residual effects of the Project must be considered in an assessment of cumulative effects, *if the residual effects are considered likely to occur*. As noted in the EIS, the residual effects of the Project on human health related to air emissions are not considered likely to occur.

As stated in EIS Section 27.8, the definition of a 'likely' residual effect is one that:

"is commonly observed in similar development scenarios, is supported by quantitative modelling, or has already been observed in relation to the proposed Project. An effect is considered unlikely if it does not meet at least one of these three conditions."

The determination of likelihood for the residual effect on human health from air emissions is provided in Section 27.9.2.1 of the EIS. The residual effect on human health related to air emissions is determined to be unlikely because the predicted area where fine particulate matter could exceed the 1-hour ambient air quality objective (AAQO) is very small, comprising an area between the proposed RBT2 terminal footprint and the Westshore Terminals area. Exposure is unlikely to occur as this area is within the expanded navigational closure area for recreational and commercial fishing and seafood harvesting during construction, and use of waters in this area for other purposes is unlikely considering the vessel traffic and presence of other equipment during construction activities. Furthermore, the estimates of airborne concentrations are conservatively over-predicted, as described in the response to IR6-22 (CEAR Document #1188).

IR13-02 – Additional Air Quality Receptors

As explained in the response to IR13-02 (CEAR Document #1333[2]), the air quality model included over 8,600 receptor points. In order to characterise Project-related air quality changes where human receptors are anticipated to be, 18 discrete receptors were identified in the EIS, and an additional 52 receptors were identified in information request responses, including IR6-14 (2 receptors; CEAR Document #1188) and IR13-02 (50 receptors; CEAR Document #1333). Additional detail on the predicted air quality concentrations near each of these receptors is provided in the response to IR13-02 (CEAR Document #1333); however, the response is based on the air quality modelling results of the EIS and does not contain new air quality results, and therefore a revised air quality human health risk assessment (HHRA)

[2] CEAR Document #1333 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR7-31, IR11-02, IR11-11, IR11-20, IR12-05, IR13-02, IR13-03, IR13-15, and IR13-18 (See Reference Documents #1000, #1179, #1206 and #1228).

is not warranted. As illustrated in the response to IR13-02 (CEAR Document #1333), Project-related changes in air quality are not predicted to result in human health effects at any of the 70 receptor points. A human health effect is predicted only during construction at the maximum point of impingement (MPOI) over water near the terminal, where human receptors are not anticipated to be (and therefore the effect is unlikely to occur)[3]. This effect was assessed in EIS Section 27.6.2.

IR13-03 – Coal Dust

As stated in the response to IR13-03 (CEAR Document #1333), particulate matter emissions from coal dust from Westshore Terminals are included in the particulate matter concentrations presented for existing conditions, expected conditions (future without the Project), and future with the Project construction and operation scenarios, as part of the 98th percentile background concentrations. Background concentrations were determined from observations at air quality monitoring Station T39 and were combined with model results for each temporal case.

An analysis of potential increases in coal dust with increased throughput at Westshore Terminals was conducted and is presented in Appendix H of EIS Appendix 9.2-A. While an increase in the amount of coal shipped through Westshore Terminals is predicted, and this will increase fugitive dust emissions from coal handling operations, the total amount of stockpiled coal exposed to wind erosion is assumed to remain relatively unchanged, as explained in Appendix H of EIS Appendix 9.2-A. Based on the results of recent studies, the contribution of coal dust to $PM_{2.5}$ exposure is expected to be relatively low. Additional detail is provided in the response to IR13-03 (CEAR Document #1333), and no additional air quality analysis or modelling of coal dust was conducted for that response; therefore, there are no new air quality assessment results that would warrant a revised air quality HHRA.

IR13-07 – Risk Quotient of ≤0.2

As stated above, a re-assessment of health risks related to air quality has not been conducted for the reasons described. However, in order to address the request to consider a risk quotient (RQ) of ≤0.2 for non-carcinogenic compounds of potential concern (COPCs) that can be found in multiple mediums (e.g., commercial food, drinking water, and soil), the VFPA confirms that all multi-media RQs for predicted Project-related effects as presented in the EIS were below 0.2 (EIS Appendix 27-A, Table 32), as explained in the response to IR13-09. As discussed in the response to IR13-07, an RQ of ≤0.2 is not applicable to the direct inhalation pathway.

In developing this response, the following information requests were considered, in addition to those outlined above: IR13-04, IR13-05 (CEAR Document #1328[4]), IR13-06, and IR13-08.

[3] As noted in the response to IR6-28 (CEAR Document #1188), in consideration of RBT2 construction workers and employees at Westshore Terminals, air quality at this location that would be subject to workplace exposure criteria set by WorkSafeBC.

[4] CEAR Document #1328 From the Vancouver Fraser Port Authority to the Review Panel: Response to Information Requests IR11-03, IR11-04, IR11-09, IR11-10, IR13-05 and IR13-26 (see Reference Documents #1179 and #1228).

For the reasons provided above, and described in greater detail within each response, a revised HHRA for air quality, construction and operation, for the temporal cases of Future case without Project, Project alone, and Future case with Project, has therefore not been conducted, and the information requests listed do not apply to this response.

IR13-11 Human Health Risk Assessment – Crab Contamination – TEQs

Information Source(s)

Health Canada: Submission to the Review Panel (CEAR 1225)

Appendix IR4-33-B, Table IR4-33-B2 (CEAR 1078)

Context

Appendix IR4-33-B, Table IR4-33-B2 (CEAR 1078) provides the measured concentrations of Polychlorinated Biphenyl (PCBs) for each crab hepatopancreas sample collected from the three sites (RBT2, ITP and reference sites). The Table also provides "total toxic equivalents (TEQs)" concentrations for each sample which, according to the Proponent, were calculated in accordance with the latest World Health Organization study (WHO, 2005) that derives toxic equivalency factors (TEF) for Polychlorinated dibenzodioxins (PCDDs), Polychlorinated dibenzofurans (PCDFs)Fs and dioxin-like PCBs. Total TEQ concentrations typically refer to PCDDs, PCDFs and dioxin-like PCB concentrations, however, Table IR4-33-B2 does not provide the results for individual PCDD and PCDF congeners which are needed to calculate total TEQ. Non-dioxin-like PCB concentrations alone are not typically expressed on a TEQ basis.

The Proponent also provides a summary of results for "PCB concentrations expressed as TEQ". However, the TEQ ranges and averages provided by the Proponent for each sample site differ from the TEQ values provided in Table IR4-33-B2.

Health Canada stated that without the concentrations of individual PCDD and PCDF congeners being provided for each sample, it is difficult to interpret the reported total TEQ concentrations and to make a determination of the significance on human health.

Information Request

Report, in tabular format, the individual congener concentrations associated with reported TEQ values.

Based on reported concentrations of individual PCDD and PCDF congeners, provide a discussion on the toxicity of crab hepatopancreas and the potential health effects.

VFPA Response

The Preamble to Shellfish-related Information Requests provides context related to the scoping of the human health assessment in EIS Section 27.0 and the rationale for completing a quantitative human health risk assessment (HHRA) as part of the characterisation of existing conditions, to address concerns raised by Indigenous groups. This response provides additional information related to characterising health risks in existing conditions.

This response is provided in two parts. Part 1 addresses the individual polychlorinated biphenyl (PCB) congeners used to calculate the toxicity equivalency (TEQ) values presented in the response to IR4-33 (CEAR Document #1078[1]). Part 2 provides a prediction of the risks to human health using TEQ values. Based on these results, and additional studies identified in the literature, a qualitative discussion is provided on the inferred potential health effects related to polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) in crab hepatopancreas at Roberts Bank.

Part 1 – Report, in tabular format, the individual congener concentrations associated with reported TEQ values.

As requested in IR4-33 (CEAR Document #1078), concentrations of individual PCB congeners, polycyclic aromatic hydrocarbons (PAHs), and trace elements were analysed in crab hepatopancreas. Samples were collected in the summer of 2017 as outlined in Appendix IR12-02-A. The table in **Appendix IR13-11-A** provides the analysis results of individual PCB congeners as well as the total of non-coplanar PCBs and the calculated TEQ for the coplanar (dioxin-like) PCBs. These were carried forward as the exposure concentrations in the assessment of risks to human health from ingestion of PCBs in crab hepatopancreas tissue as presented below and in the response to IR12-02.

Part 2 – Based on reported concentrations of individual PCDD and PCDF congeners, provide a discussion on the toxicity of crab hepatopancreas and the potential health effects.

The contaminants included in the hepatopancreas tissue analysis are those previously requested in IR4-33 (CEAR Document #1078). PCDD and PCDF congeners were not measured in the hepatopancreas tissue collected at Roberts Bank, and therefore individual congeners have not been reported. However, the potential health risks associated with persistent organic pollutants (POPs) like PCDDs and PCDFs were assessed by evaluating potential health effects from consumption of PCBs in crab hepatopancreas, as discussed below. Based on these results, and additional studies identified in the literature, further discussion is provided on the inferred potential health effects related to PCDD and PCDFs in crab hepatopancreas.

Part 2a – Risks to Human Health based on Reported TEQ values (Existing Conditions)

Risks to human health under existing conditions from ingestion of PCBs in crab hepatopancreas were assessed using average PCB concentrations from 2017 tissue data and the same methodology presented in IR12-02. Samples with non-detectable levels of PCBs were considered to be present at a concentration equal to one half the detection limit (i.e., ½ method detection limit).

[1] CEAR Document #1078 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR4-33, IR5-01, IR5-12, IR5-15, IR5-16, IR5-23, IR5-24, IR5-32, IR5-33, IR5-34, IR5-35, IR5-36, IR6-26, IR7-03, and IR7-05 (See Reference Documents #946, #975, #991, and #1000).

Coplanar and non-coplanar PCBs in tissues were assessed separately using corresponding toxicological reference values (TRVs) specific to the different modes of toxicity for each category of PCB. Coplanar PCBs have a similar mechanism of action to dioxins and furans and have been assessed using Toxicity Equivalent Factors (TEF) adopted by the World Health Organization and as reported by Van den Berg et al. (2005). Resulting TEQs were used to represent exposure concentrations equivalent to TCDD (2,3,7,8-tetrachlorodibenzodioxin) for comparison against the TRV of 2.30E-09 mg/kg-bw/day (Health Canada 2010). Non-coplanar PCBs were assessed using the average total as the exposure concentration and comparing the daily intake against the corresponding TRV of 0.00013 mg/kg-bw/day (Health Canada 2010).

A summary of risk quotients (RQs) calculated in the response to IR12-02 for risk to human health associated with existing conditions from ingestion of PCBs in crab hepatopancreas is provided in **Table IR13-11-1** below. RQs for both coplanar and non-coplanar PCBs fall well below the acceptable risk threshold of 0.2.[2]

Table IR13-11-1 Summary Risk Quotients for Hepatopancreas Consumption (Existing Conditions)

Substance	Age Group	Risk Quotient
PCBs (Dioxin-like, Coplanar)	Adult	0.006
	Toddler	0.014
PCBs (Non-coplanar)	Adult	0.012
	Toddler	0.027

Part 2b – Inferred Risks to Human Health from PCDDs and PCDF congeners in Crab Hepatopancreas at Roberts Bank

As previously stated, PCDDs and PCDFs have not been analysed in crab hepatopancreas at Roberts Bank by the VFPA. However, in response to this information request, risk to human health from PCDDs and PCCDFs has been inferred based on the results of the assessment related to PCBs and a relevant study identified in a literature review.

To qualitatively assess risk to human health from PCDDs/PCDFs in tissues at Roberts Bank, it is important to consider the magnitude in which they are likely to be present in each medium. Historically, point sources of these substances included pulp and paper mills, wood treatment facilities (dioxins were a contaminant of pentachlorophenol wood preservative), some chemical manufacturing, and metal smelting. These types of sources do not presently, and did not historically, exist in the vicinity of Roberts Bank. However, PCDDs and PCDFs are known POPs and have likely been introduced to Roberts Bank sediments in trace amounts as

[2] As explained in the response to IR13-07, a RQ of 1 is an appropriate risk threshold if the exposure pathway assessed (in this case consumption of shellfish from Roberts Bank) is the only source of the contaminant. A RQ of 0.2 is an appropriate risk threshold when there is a need to account for other sources of exposure to the same contaminant, for example, from consumption of other foods or exposure through other pathways.

a result of the ubiquitous pattern of long-range atmospheric and ocean transport, as well as through suspended sediments discharged from the Fraser River to the Strait of Georgia. The concentrations are generally expected to be low (parts per trillion to parts per quadrillion range). PCBs are also a POP, and in the absence of data for PCDDs and PCDFs in sediment, represent a good proxy for the larger suite of globally re-distributed substances including PCDDs/PCDFs.

As discussed in IR5-37 (CEAR Document #1167[3]) and IR11-23 (CEAR Document #1275[4]), extensive effort was made to study PCB congener distributions in various sediments to evaluate how these POPs are distributed in the Fraser River delta. These studies demonstrate that the surficial sediments at Roberts Bank and sediments within the Fraser River watershed have the same concentrations of PCBs when normalised against sediment particle size and organic carbon content. The results show that PCBs are an appropriate indicator of potential impacts to sediment quality associated with POP contamination for long-range atmospheric and oceanic deposition. In the absence of any point source of PCDDs/PCDFs near Roberts Bank, this finding would also apply to PCDDs/PCDFs, meaning they would be found in sediments at Roberts Banks at levels similar to those discharging from the Fraser River.

To evaluate the potential risks associated with PCDDs/PCDFs in sediment at Roberts Bank, a literature search was completed to identify studies that examined exposure to PCDDs/PCDFs in shellfish in B.C. coastal Indigenous communities. An appropriate study (Porter 2014) was found that evaluated the risks from consumption of POPs in seafood for five costal Vancouver Island Indigenous communities studied in the Traditional Seafoods Project report[5]. Two of the five communities studied were located near pulp mills (Campbell River and Nanaimo), which were significant sources of PCDDs/PCDFs and, therefore, the results of this study are expected to be biased high with respect to PCDD/PCDF concentrations compared with Roberts Bank.

The Porter (2014) study analysed tissue from butter clams, crab muscle, sockeye salmon, and harbour seals and found that PCDD/PCDFs were present in tissue at levels substantially lower than other POPs. For crab tissue (meat), the calculated exposure dose of PCDDs/PCDDFs was 0.02% that of dioxin-like PCBs and the corresponding contribution to RQs calculated using the TEQ method were less than or approximately equal to those calculated for dioxin-like PCBs. It is reasonable to assume that the same ratio would also be observed in hepatopancreas since both PCDDs/PCDFs and co-planar PCBs have similar structure and are metabolised similarly. Extrapolating the results of the Porter (2014) study to the RQs for dioxin-like PCBs presented above in **Table IR13-11-1**, it is reasonable to infer that the combined risk to human health from PCDDs, PCDFs, and dioxin-like PCBs in crab

[3] CEAR Document #1167 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR5-37, IR5-42, IR5-48, IR5-49, IR5-51, IR5-52, IR6-30 and IR8-10 (See Reference Documents #975, #991 and #1071).
[4] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).
[5] The applicability of the Traditional Seafoods Project report is discussed in the response to IR12-02.

hepatopancreas would be no more than two times higher than those presented above, and therefore expected to be below risk thresholds.

References

Health Canada. 2010. Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors, V2, Federal Contaminated Site Risk Assessment in Canada.

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Appendices

Appendix IR13-11-A Coplanar and Non-Coplanar PCBs in Crab Hepatopancreas

APPENDIX IR13-11-A
COPLANAR AND NON-COPLANAR PCBS IN CRAB HEPATOPANCREAS

Table IR13-11-A1 Coplanar and Non-Coplanar PCBs (pg/g) in Crab Hepatopancreas from Roberts Bank (2017)[1]

Substance	WHO 2005 TEF	RBT2-POOL1	RBT2-POOL2	RBT2-POOL3	RBT2-POOL4	ITP-POOL1	ITP-POOL2	ITP-POOL3	ITP-POOL4
PCB-77	**0.0001**	25.9	34	23.3	15.8	13.3	50.6	11.4	11.1
PCB-81	**0.0003**	1.68	1.71	1.68	1.07	0.796	2.14	0.555	0.604
PCB-105	**0.00003**	520	604	405	426	372	1010	259	282
PCB-114	**0.00003**	41.3	35.1	27.3	32.8	22.3	60	14.4	17
PCB-118	**0.00003**	1360	1580	1090	1200	991	2780	698	816
PCB-123	**0.00003**	24.6	28.8	21.3	16.1	19.3	53.4	11.6	15.7
PCB-126	**0.1**	*1.57*	*1.025*	*1.235*	*1.43*	*1.21*	*3.45*	*0.685*	*0.71*
PCB-156 + 157	**0.00003**	301	244	168	217	175	414	113	128
PCB-167	**0.00003**	89.5	104	77.9	67.4	64.6	184	49.7	59.9
PCB-169	**0.03**	*1.375*	*0.89*	*1.24*	*1.01*	*0.97*	*2.05*	*0.895*	*0.62*
PCB-189	**0.00003**	22.2	16.1	15.2	17.3	15.5	31.6	10.5	11.6
Total TEQ (ND=1/2 DL)		**0.272**	**0.211**	**0.218**	**0.234**	**0.201**	**0.548**	**0.131**	**0.131**
PCB-1	-	0.37	0.317	0.658	0.538	0.525	0.48	0.605	0.605
PCB-2	-	0.222	0.198	0.31	0.301	0.318	0.252	0.302	0.388
PCB-3	-	0.303	0.301	0.464	0.354	0.351	0.251	0.348	0.444
PCB-4	-	5.45	3.97	7.09	4.06	1.69	2.4	2.74	2.83
PCB-5	-	*0.0388*	*0.072*	0.095	*0.03435*	*0.03305*	*0.03605*	*0.0565*	*0.0313*
PCB-6	-	1.3	0.944	1.8	1.08	0.535	0.788	0.761	0.673
PCB-7	-	0.2	0.182	0.233	0.186	0.104	0.115	0.141	0.162
PCB-8	-	5.78	4.35	8.37	4.44	1.91	2.73	2.86	2.8
PCB-9	-	0.106	*0.0635*	0.186	0.109	0.073	0.067	*0.051*	0.095

[1] Italic text indicates concentrations calculated as ½ the detection limit.

Substance	WHO 2005 TEF	RBT2-POOL1	RBT2-POOL2	RBT2-POOL3	RBT2-POOL4	ITP-POOL1	ITP-POOL2	ITP-POOL3	ITP-POOL4
PCB-10	-	0.136	*0.066*	0.271	0.12	*0.0304*	0.073	*0.052*	0.124
PCB-11	-	19	16.9	22.6	17.5	8.42	8.35	10.5	9.52
PCB-12 + 13	-	0.731	0.516	0.667	0.449	0.279	0.282	0.307	0.265
PCB-14	-	*0.03565*	*0.066*	*0.0391*	*0.0316*	*0.0304*	*0.03315*	*0.052*	*0.0288*
PCB-15	-	8.11	7.6	6.9	4.61	3.09	8.66	19.9	3.87
PCB-16	-	13.6	8.46	13	7.79	2.77	4.11	4.41	4.58
PCB-17	-	20.6	13.6	21.4	11.8	3.77	7.85	8.1	7.22
PCB-18 + 30	-	45.7	29.2	44.1	24.5	11.9	20	15.4	16.8
PCB-19	-	0.775	0.616	1.16	0.484	0.431	0.445	0.189	0.354
PCB-20 + 28	-	157	189	166	131	78.9	296	225	90.7
PCB-21 + 33	-	17.2	11.4	18	10	3.87	8.09	6.38	6.51
PCB-22	-	25.1	19	27.1	16.6	6.95	22.7	18.3	11
PCB-23	-	*0.079*	*0.0815*	*0.095*	*0.054*	*0.027*	*0.02665*	*0.0478*	*0.0314*
PCB-24	-	0.35	0.197	0.37	0.221	0.115	0.109	0.151	0.109
PCB-25	-	5.32	3.26	5.44	3.22	1.52	3.39	2.51	2.28
PCB-26 + 29	-	15.4	10.4	16.8	11.3	4.95	11.1	6.85	6.71
PCB-27	-	5.16	4.37	5.09	3	1.57	2.94	3.04	2.53
PCB-31	-	121	109	113	64.7	27.8	162	196	51
PCB-32	-	12.1	8.81	20.9	8.57	4.52	10.5	6.25	9.4
PCB-34	-	0.345	0.234	0.501	0.283	0.166	0.232	0.188	0.138
PCB-35	-	1.05	0.519	1.21	0.683	0.262	0.188	0.714	0.39
PCB-36	-	0.504	0.563	0.928	0.415	0.232	*0.024*	0.16	*0.02815*
PCB-37	-	20.6	26.6	15.4	12.2	6.42	29.6	18.9	7.92
PCB-38	-	*0.076*	*0.0785*	*0.0935*	*0.053*	*0.02655*	0.186	*0.04705*	*0.0309*
PCB-39	-	1.91	1.71	1.54	0.964	0.44	1.08	0.722	0.616

Substance	WHO 2005 TEF	RBT2-POOL1	RBT2-POOL2	RBT2-POOL3	RBT2-POOL4	ITP-POOL1	ITP-POOL2	ITP-POOL3	ITP-POOL4
PCB-40 + 41 + 71	-	93.3	64.1	100	50.3	25.2	71.5	45.5	37.8
PCB-42	-	67.5	45.9	65.5	34.2	25	73.3	43.9	23
PCB-43	-	11.4	13.1	12.4	6.31	4.35	15	18.8	4.88
PCB-44 + 47 + 65	-	442	362	353	271	189	506	292	154
PCB-45 + 51	-	10.6	6.29	12.1	5.45	3	5.98	2.93	3.96
PCB-46	-	2.11	1.25	2.37	0.97	0.657	1.09	0.476	0.717
PCB-48	-	39.5	33.9	38.6	19.2	6.8	16.1	12.8	12.8
PCB-49 + 69	-	274	181	232	134	80.1	398	194	104
PCB-50 + 53	-	10.5	6.67	11.7	4.66	4.1	7.81	2.61	3.81
PCB-52	-	797	636	574	407	330	1050	606	277
PCB-54	-	*0.025*	*0.02495*	*0.02385*	*0.0246*	*0.02485*	*0.024*	*0.0248*	*0.02485*
PCB-55	-	6.1	6.44	6.42	4.62	3.45	10.5	3.13	3.21
PCB-56	-	59.6	40.5	65	35	17.7	53.7	24.3	24.3
PCB-57	-	0.665	*0.615*	1	0.6	0.433	*0.515*	0.334	0.367
PCB-58	-	1.68	1.5	1.72	1.13	0.988	1.73	1.1	0.779
PCB-59 + 62 + 75	-	30.9	24.5	28.3	17.2	10.6	31.1	18.1	13.6
PCB-60	-	84	103	85.5	68.6	48.8	153	44.1	47.9
PCB-61 + 70 + 74 + 76	-	602	596	577	441	230	924	329	278
PCB-63	-	26.6	29.4	24.5	16.4	10.1	55.2	20.5	14.2
PCB-64	-	174	139	157	93.8	64.3	244	144	66
PCB-66	-	284	358	307	241	160	604	165	165
PCB-67	-	4.95	2.16	5.24	2.99	1.45	3.21	1.69	2
PCB-68	-	7.31	5.52	8.55	7.08	5.24	17.8	5.47	5.12
PCB-72	-	7.7	6.21	8.43	6.05	4.78	16.9	6.44	4.6

Substance	WHO 2005 TEF	RBT2-POOL1	RBT2-POOL2	RBT2-POOL3	RBT2-POOL4	ITP-POOL1	ITP-POOL2	ITP-POOL3	ITP-POOL4
PCB-73	-	10.4	7.99	6.25	4.57	4.44	12.3	6.36	3.28
PCB-78	-	*0.21*	*0.585*	*0.163*	*0.1065*	*0.07*	*0.515*	*0.1115*	*0.1645*
PCB-79	-	11.7	13.4	9.36	7.88	6.83	16.7	5.77	4.9
PCB-80	-	*0.202*	*0.565*	*0.1545*	0.607	*0.0695*	*0.485*	*0.1055*	*0.1555*
PCB-82	-	54.1	35.9	47.3	25.9	23.8	56.4	20.9	18.1
PCB-83 + 99	-	2480	1420	1150	1570	1200	2500	684	787
PCB-84	-	107	99.5	95.5	52.2	47	98.3	44.7	39.8
PCB-85 + 116 + 117	-	399	319	270	295	239	511	154	161
PCB-86 + 87 + 97 + 109 + 119 + 125	-	615	519	501	363	310	896	263	251
PCB-88 + 91	-	121	108	111	90.3	81.4	242	63.9	69.1
PCB-89	-	*0.413*	0.545	1.08	0.474	*0.2615*	*0.42*	*0.187*	0.241
PCB-90 + 101 + 113	-	1760	1630	1250	1370	1090	3150	835	867
PCB-92	-	303	292	254	221	211	465	174	139
PCB-93 + 95 + 98 + 100 + 102	-	603	461	554	331	305	861	288	248
PCB-94	-	2.18	2.18	2.44	1.05	1.15	2.56	1.12	1.05
PCB-96	-	0.483	0.268	0.731	0.259	0.251	0.483	*0.0535*	0.231
PCB-103	-	12.2	12.8	13.8	9.12	8.25	26.3	6.61	8.39
PCB-104	-	0.142	*0.048*	0.1	0.074	*0.0294*	0.148	*0.0515*	*0.0334*
PCB-106	-	*1.285*	*0.855*	*0.965*	*1.13*	*0.97*	*2.67*	*0.55*	*0.525*
PCB-107	-	133	139	98.3	84.7	81.7	266	76.9	76.7
PCB-108 + 124	-	39.1	44.1	31.5	21	18.9	61	18.2	14.5
PCB-110 + 115	-	1190	1140	877	660	658	1980	562	532

Substance	WHO 2005 TEF	RBT2-POOL1	RBT2-POOL2	RBT2-POOL3	RBT2-POOL4	ITP-POOL1	ITP-POOL2	ITP-POOL3	ITP-POOL4
PCB-111	-	3.63	3.41	2.69	3.06	2.83	6.75	2.27	2.43
PCB-112	-	*0.269*	*0.0915*	*0.1765*	*0.112*	*0.1575*	*0.253*	*0.1125*	*0.062*
PCB-120	-	2.88	1.93	3.47	2.91	3.27	7.1	0.917	1.62
PCB-121	-	0.682	0.38	0.746	1.08	0.643	1.61	*0.1315*	0.252
PCB-122	-	9	8.28	6.87	4.14	3.57	8.45	2.14	3.19
PCB-127	-	5.53	3.51	2.53	2.97	2.55	*2.91*	1.31	1.41
PCB-128 + 166	-	495	332	307	382	325	657	177	208
PCB-129 + 138 + 160 + 163	-	5630	2970	2590	3250	3090	5870	1660	1970
PCB-130	-	245	145	131	122	121	304	83.6	110
PCB-131	-	10.9	12.3	10.3	6.06	5.8	15.4	4.61	4.16
PCB-132	-	349	266	282	203	199	540	149	150
PCB-133	-	144	81.4	66.1	82.5	78.2	144	43.8	54.6
PCB-134 + 143	-	60.6	72.7	54.2	30.7	37.7	80.8	34.4	27.3
PCB-135 + 151 + 154	-	797	737	662	530	520	1140	387	377
PCB-136	-	79.8	61	75.6	47.2	46.7	84.7	31.8	33.7
PCB-137	-	184	96	95.7	120	102	181	58	67.7
PCB-139 + 140	-	44.3	27.5	29.5	23.8	22.2	49.8	12.3	19.5
PCB-141	-	229	210	198	143	153	405	124	120
PCB-142	-	*2.33*	*0.68*	*1.255*	*0.267*	*0.705*	*0.4915*	*0.4665*	*0.675*
PCB-144	-	58.5	53.2	49.9	39.4	36.7	98.1	23.3	29.7
PCB-145	-	*0.04635*	*0.0695*	*0.0442*	*0.03675*	*0.03395*	*0.02965*	*0.0565*	*0.04175*
PCB-146	-	1240	589	591	742	661	1280	385	508
PCB-147 + 149	-	1590	1530	1310	1070	947	2590	711	794

Substance	WHO 2005 TEF	RBT2-POOL1	RBT2-POOL2	RBT2-POOL3	RBT2-POOL4	ITP-POOL1	ITP-POOL2	ITP-POOL3	ITP-POOL4
PCB-148	-	7.17	6.16	7.16	5.1	6.1	14.7	3.56	4.98
PCB-150	-	3.74	3.56	3.91	2.67	3.02	8.15	1.71	2.78
PCB-152	-	0.433	0.441	0.485	0.29	0.281	0.521	0.196	0.205
PCB-153 + 168	-	7350	3120	2840	3640	3570	6180	1800	2360
PCB-155	-	7	4.85	6.38	6.2	3.95	8.62	2.55	3.73
PCB-158	-	220	159	154	155	133	314	82.4	104
PCB-159	-	*1.385*	*0.4035*	11.5	7.81	8.78	20.9	5.43	5.91
PCB-161	-	*1.415*	*0.4135*	*0.86*	*0.1825*	*0.483*	*0.3365*	*0.3195*	*0.4625*
PCB-162	-	8.81	10	7.39	6.73	7.55	18.7	6.3	7.06
PCB-164	-	92.1	100	94	68.9	77.3	207	55.4	61.2
PCB-165	-	13	6.25	5.82	7.96	7.45	12.7	3.42	4.9
PCB-170	-	748	321	304	348	360	587	184	216
PCB-171 + 173	-	197	124	104	110	107	201	55.9	63.4
PCB-172	-	172	79.4	78.6	90.8	84.9	147	48.9	62
PCB-174	-	263	201	217	153	172	368	109	107
PCB-175	-	23	17.9	18	16	15.9	34.3	9.63	12.5
PCB-176	-	33.1	28.3	31.1	22.6	19.8	55.7	14.6	15
PCB-177	-	433	275	221	222	222	496	138	165
PCB-178	-	372	201	184	230	214	390	119	143
PCB-179	-	168	164	145	114	113	211	80.5	69.1
PCB-180 + 193	-	2510	1130	1030	1270	1240	1980	644	797
PCB-181	-	7.35	4.19	3.3	4.24	3.68	6.09	2.08	2.4
PCB-182	-	*0.067*		*0.0655*	*0.058*	*0.057*	*0.09*	*0.061*	*0.0383*
PCB-183 + 185	-	643	304	305	338	341	567	154	218
PCB-184	-	11.8	7.87	8.46	7.72	5.57	11.5	3.66	5.3

Substance	WHO 2005 TEF	RBT2-POOL1	RBT2-POOL2	RBT2-POOL3	RBT2-POOL4	ITP-POOL1	ITP-POOL2	ITP-POOL3	ITP-POOL4
PCB-186	-	*0.066*	*0.0785*	*0.0555*	*0.04915*	*0.04825*	*0.0765*	*0.0515*	*0.0325*
PCB-187	-	2150	1090	1080	1390	1230	2230	684	838
PCB-188	-	4.01	3.49	4.03	3.79	4.2	8.06	2.53	3.3
PCB-190	-	175	88.5	67.5	87.3	70.8	150	46.4	47.5
PCB-191	-	38.5	18.7	14.4	17.5	15.4	27.8	9.17	10.2
PCB-192	-	*0.063*	*0.0745*	*0.0575*	*0.051*	*0.05*	*0.079*	*0.0535*	*0.0337*
PCB-194	-	356	155	185	175	207	276	103	128
PCB-195	-	113	43.5	61	52.8	60.5	92.2	31.1	37
PCB-196	-	211	86.9	107	109	88.6	156	51.1	68.5
PCB-197 + 200	-	32.3	19.1	30.7	25.5	22	43.5	14.8	15.6
PCB-198 + 199	-	520	201	235	211	209	367	131	163
PCB-201	-	35.1	27.2	31.4	28.1	26.9	52.8	16.1	20.1
PCB-202	-	184	86.1	93.4	126	111	167	57.3	64.7
PCB-203	-	324	124	152	160	137	240	80.7	96.1
PCB-204	-	0.704	0.427	0.505	0.617	0.5	0.6	0.23	0.375
PCB-205	-	15.7	6.87	8	7.32	8.7	12.3	4.36	4.91
PCB-206	-	132	54.8	68.9	57.3	70.5	88.8	37.3	48.2
PCB-207	-	13.5	6.28	9.28	8.67	8.7	11.6	4.7	6.25
PCB-208	-	47.2	19.5	26.9	24.4	27.6	36	14.2	20.4
PCB-209	-	44.3	16.6	27.4	21.4	24.9	28.7	14.7	19.4
Total non-coplanar PCBs (ND=1/2 DL)		**4.03E+04**	**2.49E+04**	**2.29E+04**	**2.35E+04**	**2.11E+04**	**4.53E+04**	**1.45E+04**	**1.52E+04**

IR13-12 Human Health Risk Assessment – Shellfish contamination, Cadmium Concentrations

Information Source(s)

Health Canada: Submission to Review Panel (CEAR 1225)

EIS Volume 4: Appendix 27-C *Roberts Bank 2 Technical Report - Shellfish Harvesting Potential and Contaminant-Related Consumption Risks at Roberts Bank*

Context

Appendix IR4-33-B, Table IR4-33-B4 (CEAR 1078) presented measured cadmium concentrations in crab hepatopancreas. Based on those results, Health Canada recommended that the Proponent consider cadmium as a COPC for further assessment in the HHRA. Assuming a conservative consumption of 20 g of crab hepatopancreas per day (which Health Canada previously determined to represent the average mass of hepatopancreas tissue from one adult crab), exposure to cadmium could exceed a dose of 'no toxicological significance' to human health.

As such, Health Canada considered that cadmium exposure from traditional foods should be assessed for potential human health risk using the consumption patterns for those who harvest and consume traditional foods from the proposed Project area.

In IR12-04, the Panel requested that the Proponent revise the assessment of the potential effects on human health from marine resource contamination for both Indigenous and non-Indigenous populations.

Information Request

In the human health risk assessment on shellfish contamination, include the cadmium exposure in crab muscle and hepatopancreas using a consumption rate of 20 g of crab hepatopancreas per day and a conservative consumption of crab muscle tissue.

Revise the assessment of the potential effects on human health from marine resource contamination from crab muscles tissue and hepatopancreas, as requested in IR12-02 and IR12-04.

VFPA Response

The Preamble to Shellfish-related Information Requests provides context related to the scoping of the human health effects assessment in EIS Section 27.0 and the rationale for completing a quantitative human health risk assessment (HHRA) as part of the characterisation of existing conditions, to address concerns raised by Indigenous groups. This response includes additional analysis related to existing conditions, including a supplemental sensitivity analysis for risk associated with cadmium in crab hepatopancreas.

The revised HHRA for marine foods for existing conditions provided in the response to IR12-02 and IR13-11 includes cadmium (as well as polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and select metals) and assumes a crab hepatopancreas consumption rate of 4.3 g/day and a crab muscle tissue consumption rate of 51 g/day. These rates are appropriate for evaluating potential health effects associated with long-term chronic exposure, and detailed rationale is provided in the response to IR12-02.

As supplemental information to the sensitivity analysis provided in the response to IR12-02, an analysis of risks from cadmium to humans consuming 20 g/day (0.020 kg/day) of hepatopancreas has been completed. As context, this rate is based on the assumption that the approximate weight of the hepatopancreas in one adult Dungeness crab is 20 g and an individual would consume this amount everyday. It is reasonable to assume that individuals will not just consume hepatopancreas, but will also eat the meat of the crab during a meal. Therefore, in order to consume 20 g/day of hepatopancreas, an individual is also expected to eat 200 g/day of meat[1], or the equivalent of one whole crab. This consumption rate is approximately four times higher than the consumption rate selected for the shellfish reassessment (IR12-02) and approximately two times higher than the highest reported value (104 g/day) consumption rate considered in the response to IR12-02, including the sensitivity analysis. Furthermore, based on a hepatopancreas consumption rate of 4.3 g/day, which represents the 95th percentile value reported by Wiseman and Gobas (2002) as referenced in IR12-02, it is estimated that an individual would consume approximately 78 crab per year or and average of 1.5 crab per week. The available data indicate that consumption of 20 g of hepatopancreas every day would be an overly conservative and unrealistic daily consumption rate.

The analysis was completed using the exposure concentrations, toxicity reference value and receptor characteristics outlined in Appendix IR12-02-A. The resulting risk quotients (RQs) based on existing conditions are provided in **Table IR13-12-1**. Shading represents a RQ exceeding a threshold of 0.2 and shading with bold font represents a RQ exceeding a threshold of 1.0. These risk estimates are based on the assumption that individuals are harvesting 100% of the crab hepatopancreas they consume from the Project area, which, through consultation inputs, is generally understood not to be the case (see IR12-02 for detail).

[1] 200 g is the approximate average weight of picked meat from a Dungeness crab.

Table IR13-12-1 Risk Quotients for Cadmium in Crab Hepatopancreas (20 g/day) – Existing Conditions

Substance	Age Group	Body Weight (kg)	Intake[a] (kg/day)	Average Crab Hepatopancreas Concentration (mg/kg)	Risk Quotient
Cadmium	Adult	70.7	0.020	1.84E	0.52
	Teenager	59.7	0.020		0.62
	Child	32.9	0.017		0.98
	Toddler	16.5	0.010		**1.11**

Note: a. Adjusted based on age-specific consumption values provided in Appendix 27-C of the EIS.

References

Wiseman, C. L. and F. A. Gobas. 2002. Balancing Risks in the Management of Contaminated First Nations Fisheries. International Journal of Environmental Health Research 12, 331–342.

IR13-13 Human Health Risk Assessment – Shellfish Contamination – Cumulative Effects Assessment

Information Source(s)

Revised Section 27 and Appendix 27-C

Proponent Response to Follow-up Additional Information Requirements of December 4, 2015 Human Health Total Cumulative Effects Assessment (CEAR 412)

Panel Information Request IR12-04 (CEAR 1206)

EIS Guidelines: Section 12.1.1

Health Canada: Submission to the Review Panel (CEAR 548)

B.C. Ministry of Health: Submission to the Review Panel (CEAR 629)

Context

Information request IR12-04 (CEAR 1206), requested the Proponent revise its assessment of the potential effects on human health from marine resource contamination for both Indigenous and non-Indigenous populations.

In Section 27 and Appendix 27-C of the EIS, the Proponent presented a human health risk assessment (HHRA) associated with the gathering and consumption of shellfish from the Roberts Bank area. The HHRA was focused on bivalve shellfish and Dungeness crabs, which have traditionally been an important marine resource for coastal Indigenous communities. The Proponent concluded that the potential effects on human health from the construction and operation of the proposed Project were negligible. Based on this conclusion, the Proponent did not carry forward any potential Project effects to the significance determination and to the cumulative effects assessment. However, several participants including Health Canada and the B.C. Ministry of Health commented on the methodology and conclusions of the HHRA.

Based on the revised assessment the Proponent must determine the significance of any newly identified residual effects and undertake a cumulative effects assessment. The EIS Guidelines Section 12.1.1 require that residual effects, even if very small or deemed insignificant, be described. This is particularly important in consideration of cumulative effects assessment, where small residual project effects could combine with effects of other projects and activities that have been or will be carried out.

Information Request

Based on conclusions from the revised human health risk assessment in response to IR12-02 and IR12-04, IR13-11 and IR13-12 determine the significance of all residual effects and the cumulative effects that are likely to result from the proposed Project in combination with other certain and reasonably foreseeable projects and activities that have been or will be carried

out that have the potential to affect human health associated with the gathering and consumption of shellfish.

The results and assessment of effects should be presented in a manner that differentiates between Indigenous and non-Indigenous people.

VFPA Response

The Preamble to Shellfish-related Information Requests provides context related to the scoping of the human health effects assessment (HHRA) in EIS Section 27.0 and the primary rationale for a negligible potential effect on human health related to shellfish consumption. This response outlines the conclusion that a characterisation of residual effects, determination of significance, and assessment of cumulative effects are not required for the shellfish consumption potential effect pathway. To respond to this information request, the VFPA has considered conclusions from work undertaken to respond to IR12-02, IR12-04, IR13-11, and IR13-12.

The response to IR12-02 provides an updated HHRA for existing conditions, for health risk related to shellfish consumption. The updated analysis incorporates a higher shellfish consumption rate (51 g/day) to reflect information provided by Indigenous groups harvesting in the local assessment area. The updated existing conditions HHRA also applies a lower risk quotient threshold (≤0.2), as well as analysis of polychlorinated biphenyls (PCBs) in crab hepatopancreas as requested in IR13-11, and cadmium as requested in IR13-12. The conclusions of the revised HHRA are consistent with those of EIS Appendix 27-C, indicating that existing health risks are minimal, as risk quotients for existing conditions marginally exceed thresholds.

The response to IR12-04 provides further detail to support the rationale for a negligible potential effect of the Project, related to Project construction activities. The response includes consideration of the results of sediment analysis in the response to IR11-23 (CEAR Document #1275[1]), as requested, as well as additional lines of evidence. As outlined in the Preamble to Shellfish-related Information Requests, and described in detail in the response to IR12-04, the sediments at Roberts Bank are not considered contaminated, as they meet applicable benchmarks or are reflective of natural background conditions. Based on these results, as well as the additional lines of evidence provided in the response to IR12-04, the health effects associated with consumption of shellfish exposed to resuspension of sediments during construction are predicted to be negligible.

The EIS conclusion of a negligible potential effect for the sub-component of 'exposure to shellfish contamination' remains unchanged. Because a measurable potential effect is not predicted, there are also no predicted residual effects, and a determination of significance of residual effects and an assessment of cumulative effects are not required.

[1] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).

IR13-14 Human Health Risk Assessment – Terrestrial and Aquatic Vegetation – Food Security, Cumulative Effects Assessment

Information Source(s)

EIS Volume 5: Section 32.2.6.2

EIS Volume 4: Section 27.10

Malahat First Nation: Submission to the Review Panel (CEAR 621)

Review Panel Information Request IR10-26 (CEAR 1131)

Review Panel Information Request IR12-01 (CEAR 1206)

Context

The Proponent noted that aquatic plants, including attached and detached kelp and seaweeds are harvested throughout the year in the Tsawwassen Fishing Area, but that this has not occurred since the Tsawwassen First Nation Final Agreement came into effect in 2007. Tsawwassen elders indicated that bulrushes are used for basketry and curative properties and that seaweed once grew along the shoreline, but they were not aware of any remaining harvesting locations.

The Musqueam First Nation indicated that Brunswick Point is an important area for both harvesting aquatic and terrestrial plants for Food, Social, and Ceremonial and manufacturing purposes, including cattail, tule, and grasses. Other important locations include Westham Island, Canoe Passage, Ladner, Musqueam Indian Reserve IR.4 and Ladner.

In addition, numerous other Indigenous groups harvest terrestrial and aquatic vegetation throughout the Local Assessment Area, as well as in and near coastal communities along the marine shipping route.

However, Section 27.6.1.5 of the EIS indicated that "based on information considered in the Current Use assessment, there are no anticipated residual effects to most traditional food sources, including marine vegetation…".

The Panel previously requested an assessment of food security in IR12-01 and information on the future availability of marine preferred resources (including plants) in IR10-26. Any residual effects from Project-related activities that result in the interruption of or displacement of preferred past, present and future use places and the ability to access said places for food harvesting purposes should be considered a measurable effect.

In consideration of the above, a cumulative effects assessment on impacts to food security and availability of terrestrial and aquatic vegetation resources for both the proposed Project Area and its associated marine shipping area is required.

Information Request

For each Indigenous group identified as having residual effects on food security, availability and quality in response to IR12-01, and for all residual effects on the potential loss of practices due to restricted access to plants traditionally harvested and reasonably expected to resume harvesting in the future in response to IR10-26, provide a cumulative effects assessment to address the following:

- effects as a result of the Project and/or marine shipping associated with the Project, in combination with past, present, and future projects or activities that have the potential to affect the availability and quality of terrestrial and marine vegetation and an Indigenous group's ability to harvest; and,
- mitigation measures and their effectiveness on Project-specific and cumulative effects of an Indigenous group's ability to harvest terrestrial and marine vegetation in relation to potential decreased food security.

VFPA Response

The response to IR12-01 provides additional detail on the assessment of human health effects related to the food security sub-component, indicating by Indigenous group and by harvested resource whether the Project is predicted to have a measurable effect on the indicators for a food security effect, including potential changes in access to, availability of, or quality of traditional foods. A residual effect on human health related to the food security sub-component is not predicted. Therefore, a cumulative effects assessment of Project-related effects on food security is not required.

The VFPA acknowledges the importance of traditional subsistence foods to Indigenous groups, as noted in the EIS and Marine Shipping Addendum. As described in EIS Section 27.5.7, and in the responses to AIR-12.04.15-31 (CEAR Document #388[1]), and MSA IR-02.24.16-11 (CEAR Document #391[2]), Indigenous groups have reported substantial changes over time in relation to the access to, availability of, and quality of traditional foods. This indicates that food security has been, and continues to be, affected by environmental changes related to regional development. Indigenous groups have also indicated a desire to resume use of traditional food resources, and to increase their reliance on traditional food in the future, as stated in the response to IR10-26 (CEAR Document #1275[3]). In relation to changing access to preferred harvesting locations, including Canoe Passage and Roberts Bank, several Indigenous groups have suggested a regional cumulative effects assessment. The VFPA is supportive of a regional cumulative effects assessment on food security, which would be best conducted collaboratively by Indigenous groups, health authorities, and relevant government

[1] CEAR Document #388 From Port Metro Vancouver to the Canadian Environmental Assessment Agency re: Completeness Review - Responses to Additional Information Requirements Follow-Up (See Reference Document # 345) including 22 Technical Data Reports.
[2] CEAR Document #391 From Port Metro Vancouver to the Canadian Environmental Assessment Agency re: Marine Shipping Addendum Completeness Review - Responses to Additional Information Requirements (See Reference Document #386).
[3] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).

authorities and would be beyond the scope of the RBT2 project and environmental assessment. Indigenous groups' determinant of health data is sensitive and considered confidential in most cases, and Indigenous group involvement in such a study would be required to meet Ownership, Control, Access and Possession rights (FNIGC 2014). As trained health service providers, health authorities are arguably in the best position to protect Indigenous determinant of health data for use in such a study. Health authorities are responsible for regional food security planning, and regional food security for Indigenous groups is a recognised determinant of British Columbia Indigenous health. If such a regional assessment were conducted, the VFPA would welcome the opportunity to participate, collaborate, and discuss approaches to support Indigenous groups in meeting their food security priorities.

References

The First Nations Information Governance Centre (FNIGC). 2014. Ownership, Control, Access and Possession (OCAP™): The Path to First Nations Information Governance. Available at https://fnigc.ca/sites/default/files/docs/ocap_path_to_fn_information_governance_en_final.pdf. Accessed August 2018.

IR13-15 Human Health – Health inequity – Effects and Cumulative Effects Assessment

Information Source(s)

EIS Volume 4: Sections 27.5.8; Section 27.6.5; Section 27.7.4; Section 27.8.3; Figure 27-1

Context

In Section 27 of the EIS, the Proponent concluded that, in general, the population in the Local Assessment Area (LAA) enjoys relatively high levels of health, with the greatest burden of illness coming from chronic conditions. The health of the general population was therefore likely to be resilient to small changes in environmental or social conditions or to be able to adapt effectively to stress and adversity. The Proponent also underlined that a number of potentially more vulnerable populations were likely to be less resistant to small changes in environmental or social conditions, either because they already faced a higher burden of environmental or social risk factors, or because they have lower biological resistance. These include seniors, children, and people with pre-existing conditions.

The Proponent included the Tsawwassen First Nation and the Musqueam Indian Band as vulnerable groups, as they ranked lower in key determinants of health inequity such as income, employment and education, and had a higher proportion of children than the comparison populations of the region, Vancouver and B.C. The other vulnerable groups in the LAA were lone-parent families and children aged 12 to 19.

However, the significant adverse residual effects were characterized in terms of the effect on the health of the population as a whole, not taking vulnerable groups into consideration. Significance relied on established thresholds for the acceptability of a health risk across a population for indicators such as air quality and noise. An effect could also be deemed significant if there was a measurable change in a health indicator at the population level, for instance stress and annoyance.

The Proponent considered the adverse effect that may be experienced by an individual, whereas significance of the effect was predicted based on the potential for change in population health status as a whole.

Further, the Proponent concluded that because of 'accommodations related to employment, training and contracting opportunities' for the two Indigenous groups living in the LAA, there would be no measurable adverse residual effects on health inequity. Yet, there was no indication which vulnerable group(s) among the Tsawwassen First Nation and the Musqueam Indian Band would specifically benefit from these accommodations.

The Proponent concluded that the proposed Project had the potential to result in both positive and adverse effects on health inequity based on the extent to which vulnerable groups could experience greater health benefits from Project-related employment income, whether the Project resulted in avoidance of foods or stress annoyance from noise and light for those living in proximity to the Project site.

There is no indication as to how the sum of health risk factors, stress and annoyance and health inequity would be significant for a vulnerable group.

The Proponent used a large spatial boundary for the Human Health Local Assessment Area which included populations of Vancouver, the Gulf Islands and part of Vancouver Island. Using this approach, the direct effects on populations close to the Project, such as Delta and the community of Tsawwassen, Richmond, and Tsawwassen First Nation land, although mentioned as potentially being affected by noise and air pollution, are not reflected adequately.

An assessment is required to determine the significance of residual effects on health inequity, using health and poverty indicators to establish profiles for populations at risk of health effects. The assessment is required for vulnerable groups and the population in general close to the Project site, taking into account the sum of all potential health effects from the Project.

Information Request

Using existing data, provide and discuss the profile of vulnerable groups close to the proposed Project site. Compare them with populations in general (Indigenous and non-Indigenous) located in Delta, Tsawwassen community, Richmond, and Tsawwassen First Nation land. Include poverty indicators used, such as percentages of one-parent family, children suffering from food insecurity, and populations receiving unemployment benefits.

Reassess the level of significance for residual effects on health inequity for vulnerable groups and the general populations in proximity to the Project site taking into account the sum of all potential health effects of the Project. Indicate other mitigation measures than potential economic benefits.

Where there is a residual effect on vulnerable groups or the populations residing in proximity to the Project site, provide a cumulative effects assessment. Include a consideration of how health inequity:

- has been affected by past projects and activities;
- could be further affected by the residual effects of the Project; and,
- could be further affected by other certain and reasonably foreseeable projects and activities.

VFPA Response

Using existing data, provide and discuss the profile of vulnerable groups close to the proposed Project site. Compare them with populations in general (Indigenous and non-Indigenous) located in Delta, Tsawwassen community, Richmond, and Tsawwassen First Nation land. Include poverty indicators used, such as percentages of one-parent family, children suffering from food insecurity, and populations receiving unemployment benefits.

The requested information is provided in the human health assessment (EIS Section 27.5), which presents an overview of the existing conditions for human health, including identification of potentially vulnerable groups among residents within the local assessment area (LAA) and Indigenous groups in proximity to the Project. This section presents the most granular level of data available for distinct Indigenous and non-Indigenous populations within the LAA.

The profile of vulnerable groups close to the proposed Project site is discussed in EIS Sections 27.5.8 and 27.6.5. Specifically, EIS Table 27-11 includes the information requested above: data on unemployment, income, and educational attainment for Musqueam First Nation, Tsawwassen First Nation, Delta, Metro Vancouver, and B.C. as a whole. In addition, EIS Table 27-12 presents last available data on food insecurity at the most granular level available, including for children aged 12 to 19[1], by Health Service Delivery Area (HSDA) and in comparison to B.C. as a whole. The response to IR-7.31.15-28 (CEAR Document #314[2]) summarises how the relevant sections of the human health assessment address differential conditions and effects between Indigenous and non-Indigenous populations.

EIS Section 27.5.8 identifies specific vulnerable groups and describes conditions that contribute to vulnerability for each group. The section identifies the following groups as potentially more vulnerable:

- The population of Tsawwassen First Nation and Musqueam First Nation because they experience poorer outcomes for key determinants of health (income, employment, education) and have a higher proportion of children than the comparison populations;
- Lone-parent families and females due to disparities in income as compared to families and males; and
- Children ages 12 to 19 in Fraser South, due to demonstrated high levels of food insecurity (Foster et al. 2011).

Vulnerable status is important to acknowledge as people who fall into this category may be differentially or disproportionately affected by Project-related effects. That said, it is also important to ensure linkage with such effects. In other words, not all vulnerable populations will be at risk to or benefit from all potential Project effects. Table 27-15 in Section 27.6.5 of the EIS describes which groups of people are most likely to experience positive health effects and which are most likely to experience negative effects as a result of the Project. This includes exposure to noise, exposure to air emissions, stress and annoyance, economic-related health effects, impacts on food security, and impacts on health care services.

As outlined in EIS Table 27-15 and the accompanying narrative, people who are likely to experience health benefits from the Project are those who have sufficient education and experience to gain Project-related employment. As indicated, "The potential adverse effects of the Project are most likely to be experienced by those people who live in closest proximity to Project area, or who use the LAA for subsistence food harvesting." EIS Section 27.6.5 further discusses how different vulnerable groups are likely to be affected, and the barriers that may exist to them realising Project-related benefits. The section concludes that there is potential for the Project to contribute to health inequity. These effects are anticipated to be minor to moderate in nature and therefore mitigation measures have been proposed

[1] Note that data for younger children is not available.
[2] CEAR Document #314 From Port Metro Vancouver to the Canadian Environmental Assessment Agency re: Completeness Review - Responses to Additional Information Requirements (See reference document # 271) for the Environmental Impact Statement.

(summarised in EIS Table 27-16). Residual health-related effects are anticipated to be negligible.

Reassess the level of significance for residual effects on health inequity for vulnerable groups and the general populations in proximity to the Project site taking into account the sum of all potential health effects of the Project. Indicate other mitigation measures than potential economic benefits.

A measurable residual effect of the Project on health inequity is not anticipated. As described in EIS Section 27.7.4, potential effects on health inequity will be mitigated through employment, training, and contracting opportunities proposed for Indigenous groups, so that more positive effects of the Project can be realised. In addition to these economic benefits, the assessment described in the EIS indicates that mitigation for all other health sub-components and sub-components that are related to the health inequity effect prediction[3] will also reduce or avoid adverse effects, such that the residual health inequity is sufficiently mitigated.

These other measures are summarised in EIS Table 27-16 and include the following[4]:

- Noise management plans to address potential health effects from noise exposure, and stress and annoyance related to noise;
- Air quality and fugitive dust control plan, and air quality compliance monitoring during construction and operation comparing measured air contaminant levels to the most stringent criteria to address potential health effects related to air emissions;
- Light management plans to address potential stress and annoyance related to light; and
- Awareness and education measures, including sharing study results, to address stress and annoyance related to perception of shellfish contamination.

A follow-up program for human health will also be developed to verify effect predictions and mitigation effectiveness, and to outline the process for adaptive management of any unanticipated effects. As described in the response to IR13-30 (CEAR Document #1331[5]), the details of the follow-up program elements for human health are under development. However, the preliminary approach will consider some or all of the following:

- Verification of air quality effect predictions – This follow-up program element will rely on the Air Quality Compliance Monitoring Plan, which will include data relevant to health thresholds. If an exceedance attributable to the Project is demonstrated as part of the Construction or Operation Air Quality Compliance Monitoring Plan, a resulting follow-up program and, as required, appropriate adaptive management measures for health effects will be implemented;

[3] These sub-components include exposure to noise, exposure to air emissions, stress and annoyance from noise, light, and perception of shellfish contamination.
[4] Refer to the response to IR13-30, Appendix IR13-30-A (CEAR Document #1331), for most recent information on these measures.
[5] CEAR Document #1331 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR13-29 and IR13-30 (See Reference Document #1228).

- Verification of noise-related effect predictions – Monitoring of L_n levels as measured by VFPA permanent noise monitoring stations, and possibly periodic monitoring at residences and/or noise sources; and
- Verification of effectiveness of noise-related mitigation – Nighttime noise levels as measured by VFPA permanent noise monitoring stations, and possibly periodic monitoring at residences and/or noise sources.

See the response to IR12-06 (CEAR Document #1275[6]) for an example of the process for noise-related complaints, and the mechanisms available to those in close proximity to the Project (including vulnerable groups) to provide feedback to the VFPA on Project-related impacts to health and well-being. The VFPA is currently working with Indigenous groups to establish an Indigenous Advisory Committee as described in IR10-11 (CEAR Document #1275) and IR13-30 (CEAR Document #1331) through which any unanticipated effects can be identified, and additional mitigation or adaptive measures be implemented as required.

As indicated in EIS Section 27.7.4, mitigation, including economic benefits and the suite of other mitigations listed in EIS Table 27-16, proposed to address potential effects on health inequity are anticipated to be effective, and the residual effect on health inequity is predicted to be negligible and not detectable at the population level.

Given that a measurable residual effect on human health related to health inequity is not anticipated, a characterisation of residual effects and a determination of significance are not required.

Where there is a residual effect on vulnerable groups or the populations residing in proximity to the Project site, provide a cumulative effects assessment. Include a consideration of how health inequity: has been affected by past projects and activities; could be further affected by the residual effects of the Project; and, could be further affected by other certain and reasonably foreseeable projects and activities.

A residual effect on human health via the health inequity pathway, considering vulnerable groups, is not predicted. Therefore, a cumulative effects assessment is not required.

References

Foster, L. T., C. P. Keller, B. McKee, and A. Ostry. 2011. BC Atlas of Wellness – 2nd Edition. Western Geographical Press, Department of Geography, University of Victoria. Victoria, B.C.

[6] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228)

IR13-16 Marine Commercial Use – Seafood Harvesting

Information Source(s)

EIS Volume 4: Sections 21 and 24

EIS Volume 5: Section 32

Proponent Response to Follow-up Additional Information Requirements of December 4, 2015, IR13 (CEAR 388)

Area I Crab Fisherman Association: Submission to the Review Panel (CEAR 1208)

Tsawwassen First Nation: Submission to the Review Panel (CEAR 997)

Responses to Information Request from the Review Panel IR7-34 (CEAR 1172)

Context

As described in Section 21 of the EIS, the navigational closure area (NCA) for commercial crab harvesting covers a total area of 715 ha. To accommodate construction and operational activities of the proposed Project, the Proponent proposed an expansion of the NCA by 352 ha during construction and by 232 ha during operation (Figure 21-8).

Section 21 of the EIS assessed the potential effects of the Project on commercial seafood harvesting resulting from construction and operation activities, the construction of the Robert Bank Terminal, the expansion of the NCA, and the increase in vessel movement. The assessment concluded that there was a residual adverse effect of the Project due to the displacement of commercial crab harvesters and an associated reduction of harvests and revenues arising from Project-induced effects. The Proponent's proposed mitigation included working with DFO to consult with commercial crab harvesters and indigenous groups to identify and implement feasible mitigation (Table 21-7). The displacement of commercial crab harvesting and a cumulative effects assessment were determined to be not significant due to the following:

- Dungeness crabs are known to move substantial distances to baited traps; and,
- Displaced crab harvesters can move to an open crab harvesting area within Crab Management Area I.

The Area I Crab Fisherman Association (CEAR 1208), provided the view that displacing crab harvesting activity to another open area in the local assessment area, or another open crab harvesting area within Crab Management Area I or to another Crab Management Area simply provides an equal level of displacement removed from other commercial fishers currently harvesting in those alternative areas. The Association concluded that protecting and retaining commercial crab fishing grounds around the Project structure is required to mitigate the long term significant impact on commercial crab fishers of the Project. In order to mitigate the effect, the Association have proposed the establishment of a Roberts Bank Navigational

Limited Access Fishing Area (RBNLAFA) within the NCA that would be zoned as a crab fishing no float zone to eliminate navigational hazards.

The Tsawwassen First Nation and other authorized Indigenous groups actively practice no-float Food, Social, and Ceremonial (FSC) crab fishing within the existing NCAs. The NCAs serve as a partial crab refuge and the Tsawwassen's FSC crab catches (CEAR 997) were approximately 2.8 times higher inside than outside the NCA. Tag recovery data showed that male crabs which moved in and out of the current NCA were quickly harvested by the commercial or FSC fishery. Given these results, it was predicted that an expanded NCA would likely continue to provide legal protection to males from harvest in the commercial fishery throughout the fishing season.

Information is required to determine whether the proposal from the Area I Crab Fishing Association can be accommodated without affecting present FSC catches within the NCAs. An update on ongoing consultation between the Proponent, Fisheries and Oceans Canada, the commercial crab harvesters, the Tsawwassen First Nation and any other Indigenous group harvesting within and outside the NCAs is also required.

Information Request

Provide clarification on:

- whether the proposal from the Area I Crab Fishing Association can be accommodated without affecting present Food, Social, and Ceremonial (FSC) catches within the navigational closure areas (NCAs); and,
- an update on ongoing consultation between the Proponent, Fisheries and Oceans Canada, the commercial crab harvesters, Tsawwassen First Nation and any other Indigenous groups on measures to mitigate competitive interactions between commercial and FSC harvesters due to overlap in harvesting practices within and outside the NCAs.

VFPA Response

Clarification

The VFPA acknowledges the letter submitted to the Panel from by the Area I Crab Fisherman Association (AICFA) (CEAR Document #1208[1]) in response to IR7-33 (CEAR Document #1172[2]) and has provided clarifications in its letter to the Review Panel dated November 2, 2018.

[1] CEAR Document #1208 From the Area I Crab Fisherman Association to the Review Panel re: Comments on the Roberts Bank Terminal 2 Project.
[2] CEAR Document #1172 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR5-50, IR7-07, IR7-33, IR7-34, IR7-35, and IR7-43 (See Reference Documents #975 and #1000).

Part 1 – Provide clarification on whether the proposal from the Area I Crab Fishing Association can be accommodated without affecting present Food, Social, and Ceremonial (FSC) and catches within the navigational closure areas (NCAs).

In reviewing the proposal from AICFA (CEAR Document #1208, Appendix A), it is the VFPA's understanding that AICFA is proposing a "Roberts Bank Navigational Limited Access Fishing Area" (RBNLAFA) that would allow commercial harvesters to harvest in the proposed navigational closure expansion areas[3]. The proposed NCA for commercial crab harvesting, described in EIS Section 21.0 would be an expansion of the existing NCA for commercial crab harvesting at Roberts Bank, where crab harvesting under commercial licenses is not currently permitted, but is permitted under domestic or food, social, and ceremonial (FSC) licences without the use of floats.

The VFPA notes that, as described in EIS Section 32.2.7.1 and clarified in the responses to IR10-07 (CEAR Document #1275[4]) and IR13-23 pertaining to potential increased competition between crab harvesters, the measure that would support the continuation of the current practice of no-float domestic and FSC crab harvesting only within the proposed NCA for commercial crab harvesting was one of several proposed measures to address potential effects of the Project on harvesting crab for domestic or FSC purposes. The VFPA also noted in the response to IR10-07 (CEAR Document #1275) that, in addition to a suite of measures proposed in EIS Section 32.2.7 (and further discussed in responses to information requests in Package 10), FSC harvesting takes priority, after conservation, over other uses of the resource pursuant to Fisheries and Oceans Canada's (DFO's) Aboriginal Fisheries Strategy, implemented following the Supreme Court of Canada's ruling in *R. v. Sparrow* [1990] 1 SCR 1075.

Based on information provided by Indigenous groups during the preparation of the EIS and received subsequent to the submission of the EIS—including but not limited to the Dungeness Crab Abundance and Movement Study in the Roberts Bank Terminal 2 Project Area submitted by Tsawwassen First Nation (CEAR Document #997[5])—the VFPA is of the view that opening up the proposed NCA to crab harvesting under commercial licences could potentially affect domestic or FSC harvesting at Roberts Bank during the commercial season as a result of increased competition. Any discussion of whether the AICFA's proposed RBNLAFA could be accommodated would require consultation with Indigenous groups, DFO (the federal agency responsible for the management and enforcement of fishery regulations and gear), Transport Canada (TC) (the federal agency responsible for marine navigation and safety), and AICFA and commercial harvesters.

[3] Referred to as navigational closure areas (NCAs) in information request and in this response.
[4] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).
[5] CEAR Document #997 From Tsawwassen First Nation to the Review Panel re: Tsawwassen First Nation independent study on crab and crab habitat.

The VFPA continues to consult with Indigenous groups, DFO, TC, and AICFA on measures to address potential increased competition (see Part 2 of the response to this information request for a summary of consultation and engagement activities).

Part 2 – Provide clarification on an update on ongoing consultation between the Proponent, Fisheries and Oceans Canada, the commercial crab harvesters, Tsawwassen First Nation and any other Indigenous groups on measures to mitigate competitive interactions between commercial and FSC harvesters due to overlap in harvesting practices within and outside the NCAs.

The VFPA has continued to work with Indigenous groups, DFO, TC, and commercial crab harvesters through AICFA to share information and provide opportunities for questions and discussions related to mitigation of effects on crab harvesting and potential competition between commercial and FSC harvesters. A summary of consultation and engagement activities undertaken post-EIS submission pertaining to commercial crab harvesting were outlined in the response to IR7-34 (CEAR Document #1172). Subsequent to that response, the VFPA has undertaken the following consultation activities with respect to potential effects on crab harvesting:

- Continued consultation with AICFA directors to discuss the results of the additional analysis of the electronic monitoring data (discussed in IR7-33 of CEAR Document #1172) and mitigation options (see IR7-34 of CEAR Document #1172);
- Offers of consultation with individual Indigenous groups with Crab Management Area I Commercial Crab Licences;
- Further regulatory agency consultation with DFO and TC;
- In response to questions raised through meetings with Indigenous groups, the VFPA developed the RBT2 crab information package, which provided an overview of the crab assessment and mitigation presented in the EIS as well as summaries of two information responses submitted by the VFPA to the Panel (IR4-33 of CEAR Document #1078[6] and IR4-34 of CEAR Document #1051[7]). The updated information package was provided on April 12, 2018 to the following Indigenous groups:
    - Tsawwassen First Nation;
    - Musqueam First Nation;
    - Semiahmoo First Nation;
    - Tsleil-Waututh Nation;
    - Cowichan Tribes;
    - Halalt First Nation;
    - Penelakut Tribe;
    - Stz'uminus First Nation;
    - Lake Cowichan First Nation ;

[6] CEAR Document #1078 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR4-33, IR5-01, IR5-12, IR5-15, IR5-16, IR5-23, IR5-24, IR5-32, IR5-33, IR5-34, IR5-35, IR5-36, IR6-26, IR7-03, and IR7-05 (See Reference Documents #946, #975, #991, and #1000).

[7] CEAR Document #1051 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Request Package 4 (See Reference Document #946).

- Lyackson First Nation;
- Métis Nation British Columbia;
- Hwlitsum;
- Tsawout First Nation;
- Pauquachin First Nation;
- Tsartlip First Nation;
- Tseycum First Nation; and
- Malahat Nation; and

- The VFPA held an Indigenous Advisory Forum (IAF) in September 2018, as described in greater detail in the response to IR13-30 (CEAR Document #1331[8]). A complete summary of the IAF event will be included in a forthcoming summary report, which will be submitted to the Panel registry. The topic of crab and crabbing was one of the four key topics discussed (see crab assessment overview attached in **Appendix IR13-16-A**). The discussions focused on mitigation, offsetting, and follow-up programs, and the AICFA's proposed RBNLAFA was included in the options raised for consideration. A limited number of comments were received directly on the RBNLAFA proposal, and requests for separate one-on-one discussions were made by Indigenous groups that may have commercial crab harvesting, and domestic or FSC interests at Roberts Bank. These meetings are being planned and input received will be considered as part of the VFPA's ongoing evaluation of mitigation suggestions. Refer to the responses to IR10-11 and IR10-12 (CEAR Document #1275) for further information about the VFPA's plans for ongoing consultation with Indigenous groups.

Appendices

Appendix IR13-16-A Roberts Bank Terminal 2 Project Crab Assessment Overview

[8] CEAR Document #1331 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR13-29 and IR13-30 (See Reference Document #1228).

APPENDIX IR13-16-A
ROBERTS BANK TERMINAL 2 PROJECT
CRAB ASSESSMENT OVERVIEW

Crab assessment overview

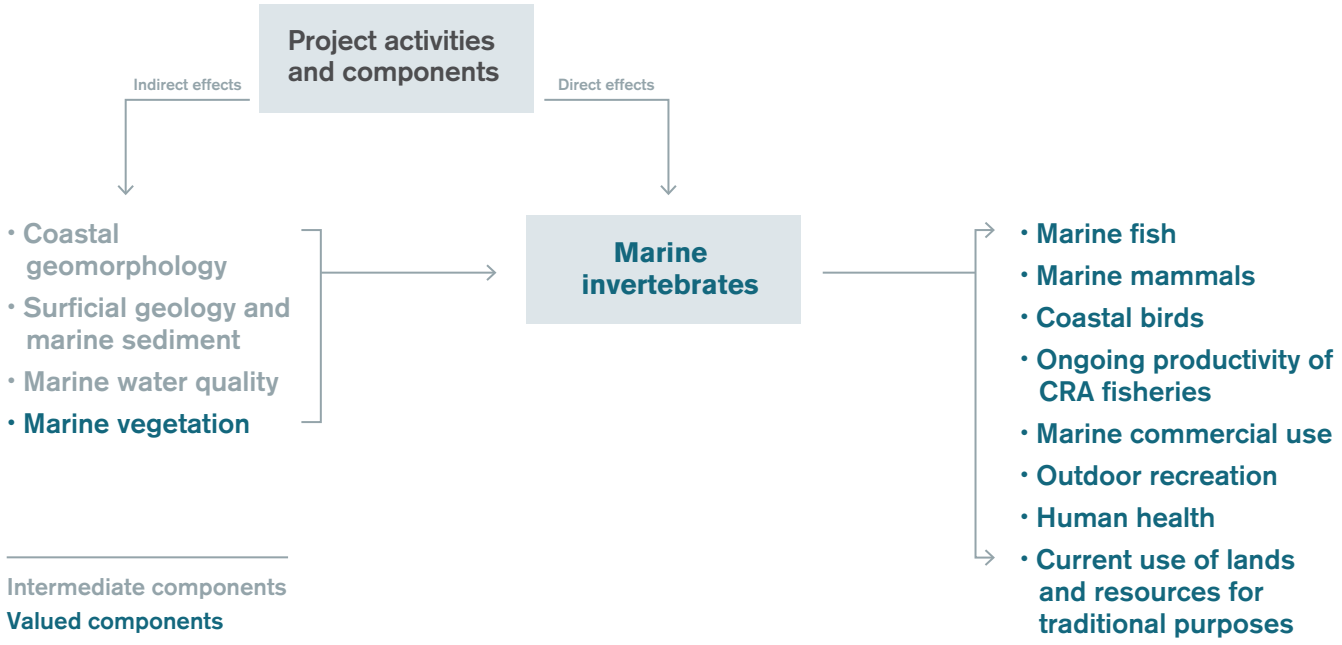
Crab

Dungeness crab (crab) populations at Roberts Bank support commercial, Indigenous and recreational fisheries. An assessment was undertaken to determine the potential effects of the Roberts Bank Terminal 2 Project (the Project) on marine invertebrates, including crab. The marine invertebrates assessment was included in the Project's Environmental Impact Statement (EIS), submitted in March 2015.

The results of the marine invertebrates assessment were considered across the assessments of other valued components, and were included in the EIS sections listed below.

- Ongoing Productivity of Commercial, Recreation and Indigenous Fisheries (Section 16);
- Marine Commercial Use (Section 21);
- Outdoor Recreation (Section 24);
- Human Health (Section 27); and
- Potential or established Indigenous and treaty rights and related interests, including current use of lands and resources for traditional purposes (Section 32).

The assessments of the potential effects of the Project on crab considered abundance, density and suitable habitat area, productivity of the species, commercial crab harvesting, recreational crab harvesting, health effects related to shellfish contamination and food security, and potential changes in availability, access and quality of traditional food.



Potential effects

Interactions between the Project components and activities and crab were considered and the following potential effects were identified in the EIS:

- **Marine Invertebrates (Crab) (Section 12)**
  Potential minor productivity loss for crab from direct mortality during the construction phase associated with terminal land development, causeway widening and tug basin expansion activities; potential minor productivity losses during operation and in the long term from Project footprint-related losses of subtidal sand habitat, and reduced prey base (bivalves);
- **Ongoing Productivity of Commercial, Recreation and Indigenous Fisheries (Section 16)**
  Potential changes in productivity of commercial, recreational, and Indigenous crab fisheries, represented by Dungeness crab;
- **Marine Commercial Use (Section 21)**
  Potential displacement of commercial crab harvesting during construction and operation, resulting in a change of harvesting area, total harvest, and revenue, due to the Project footprint and the proposed expansion of the area closed to commercial crabbing;
- **Outdoor Recreation (Section 24)**
  Potential changes in harvesting area use and access for recreational marine fish and seafood harvesting as a result of the Project footprint, and the proposed expansion of the area closed to recreational crabbing;
- **Human Health (Section 27)**
  Negligible potential effects on food security, including traditional food such as crab; Negligible potential effects related to consumption of contaminated shellfish including crab; Negligible potential effects of stress and annoyance related to perception of shellfish contamination; and
- **Indigenous and Treaty Rights and Related Interests, Including Current Use of Lands and Resources for Traditional Purposes (Section 32)**
  Negligible potential changes in the availability and quality of preferred Current Use resources, specifically crab.

Mitigation measures

In the EIS, measures were proposed to avoid, reduce, or offset potential effects of Project components and activities on crab. These measures include Project design, management plans, topic specific mitigation, and offsetting.

Follow-up program elements

In addition to environmental management plans and mitigation VFPA is committed to developing and implementing a follow-up program for the Project. In some cases, follow-up program elements were proposed in the EIS to verify effects predictions and to verify the effectiveness of proposed mitigation measures.

Summary of residual effects

With the implementation of appropriate mitigation measures as identified in the EIS and summarised in the table below, residual effects of the Project related to crab are as follows:

- **Marine Invertebrates (Section 12)**
  No measurable residual effects are anticipated for crab as a result of construction activity, through use of timing windows and crab salvages; Residual loss of productivity, however, is expected with the loss of suitable habitat due to construction of the Project footprint and ongoing through the operations phase. This residual effect is not significant;
- **Ongoing Productivity of Commercial, Recreation and Indigenous Fisheries (Section 16)**
  No residual effects are predicted, as Project-related effects to the ongoing productivity of crab fisheries are anticipated to be negligible;
- **Marine Commercial Use (Section 21)**
  Residual displacement of commercial crab harvesting, and associated loss in landings and revenue, is expected due to the terminal footprint and expansion of navigational closure area. The residual effect is not significant;
- **Outdoor Recreation (Section 24)**
  Negligible residual effects of the displacement of recreational crab harvesting, due to the terminal footprint and expansion of navigational closure area;
- **Human Health (Section 27)**
  No residual effects are predicted, as potential effects on health related to consumption of contaminated crab are anticipated to be negligible; and
- **Potential or established Indigenous and treaty rights and related interests, including current use of lands and resources for traditional purposes (Section 32)**
  No residual effects are predicted, as potential effects on the availability and quality of preferred Current Use resources are anticipated to be negligible.

What we've heard

As a part of our ongoing consultation since EIS submission, we've received extensive comments from Indigenous groups, regulators and stakeholders about the importance of and potential Project effects on, crab. We've also received suggestions for further mitigation measures for consideration, in addition to the mitigation measures proposed in the EIS.

The following tables provide an overview of:

- Mitigation measures, environmental management programs, offsetting and follow-up program elements proposed in the EIS.
- Suggestions received on these proposed elements through meetings, registry postings, and information requests and are being evaluated with consideration of technical and economic feasibility, and informed through ongoing consultation.

Crab related mitigation measures

Project design

Mitigation measures proposed by VFPA in the EIS	Mitigation measures heard by VFPA since EIS submission
1. Project design and construction methods intended to reduce environmental effects • Placement of terminal in subtidal waters to reduce habitat effects • Reduced footprint of causeway widening to reduce habitat effects • Rounded northwest terminal corner to reduce scour and habitat effects • Incorporation of rocky shoreline in terminal perimeter to provide habitat • Alignment of construction activities to avoid gravid crab sensitive windows for Dungeness crab	**1. Request for removal of intermediate transfer pit (ITP)** *Source: Tsawwassen First Nation, other Indigenous groups during consultation with the VFPA.* As a result of work undertaken in 2017 to address Tsawwassen First Nation and regulator concerns and reduce the Project's environmental effects, including those effects related to crab, the VFPA determined that the use of the ITP for temporary storage is no longer required to support construction of the Project. **Status: COMPLETE: ITP removed from Project components (Post-EIS Submission).[1]**

[1]See *Preamble in Support of Responses to IR3-25 to IR3-40* in CEAR #984, and *Project Construction Update* in CEAR #1210 for more information.

Environment management plans (EMPs)

EMP measures proposed by VFPA in the EIS	EMP-related measures heard by VFPA since EIS submission
1. Construction Environmental Management Plan and associated sub-plans Construction Compliance Monitoring Plan; Environmental Training Plan; Dredging and Sediment Discharge Plan; Sediment and Erosion Control Plan; Marine Species Salvage Plan (i.e., crab salvages); Hazardous Materials and Waste Management Plan; Spill Preparedness and Response Plan; Communications Plan. **2. Operation Environmental Management Plan and associated sub-plans** Operation Compliance Monitoring Plan; Environmental Training Plan; Hazardous Materials and Waste Management Plan; Spill Preparedness and Response Plan.	**1. Bait outside of Project area for crab salvage plan** *Source: Musqueam First Nation, during consultation with the VFPA.* Musqueam First Nation made the suggestion to, in implementing the marine species salvage plan, bait crab traps outside the Project area to draw crabs away, as opposed to baiting within the Project area, and relocating them. This would avoid the need to handle crabs during crab salvage. **Status: Undergoing consultation and evaluation.**

Topic specific mitigation

Mitigation measures proposed by VFPA in the EIS

1. Communication and engagement

Engage with commercial, recreational and Indigenous crab harvesters (through DFO) regarding:

- Timing and spatial area of proposed navigational closure expansion, and any questions or concerns about the closure; and access.
- Restrictions and procedures for maintenance of safety for commercial crab harvesting activity.
- Implementation of any mitigation measures (where identified and agreed upon through this consultation process) to address effects from displacement of commercial crab harvesting.

2. Awareness and education measures

Sharing results of studies that have been undertaken regarding contamination levels in food sources, such as Dungeness crab, to address health effects related to perceived contamination.

Mitigation measures heard by VFPA since EIS submission

1. Adjust proposed navigational closure area expansion with consideration of commercial harvesting during Project operations
Source: Tsawwassen First Nation, submission to Panel in CEAR #997.

Through the independent panel review process, Tsawwassen First Nation submitted a study titled "Dungeness Crab Abundance and Movement Study in the Roberts Bank Terminal 2 Project Area (March 2018)". The study indicated that additional measures may be required to mitigate the loss of food, social, and ceremonial crab fishing area due to the Project and ensure access to the resource, without competition with the commercial fishery.

Status: Undergoing further analysis, and consultation and evaluation.

2. Navigational Limited Access Fishing Area (multi-user system during operations).
Source: Commercial crab harvesters in submission to panel in CEAR #1208.

Proposal to establish a Navigational Limited Access Fishing Area in area where tug assisted container vessel movements occur (proposed expansion of the navigational closure area), to allow crab fishing (including commercial) with no floats. An adjacent float zone would allow commercial harvesters to access traps within the closure. A notification mechanism (e.g., transit light or phone app notification) would be created to indicate to commercial harvesters when harvesting is not allowed within the navigational closure area due to incoming and/or outgoing container terminal vessel traffic.

Status: Undergoing consultation and evaluation.

3. Financial compensation for commercial crab harvesters
Source: Malahat First Nation during consultation with VFPA.

Compensation measures have been raised, including the purchase of Area I crab harvesting license(s) and/or financial compensation of Project effect on commercial crab harvest landings/revenues.

Status: Undergoing consultation and evaluation.

4. Crab hatchery to support crab population
Source: Tsawwassen First Nation during consultation with VFPA.

Suggestion to investigate opportunity to develop a crab hatchery at Roberts Bank to help reduce potential loss of crab.

Status: Undergoing consultation and technical feasibility evaluation.

Offsetting

Offsetting measures proposed by VFPA in the EIS	Offsetting suggestions heard by VFPA since EIS submission
1. Measures to offset Project effects on crab habitat Creation of eelgrass habitat including to mitigate adverse effects on the ongoing productivity of crab populations and associated crab fisheries (including commercial, recreational and Indigenous).	**1. Request for a net gain of eelgrass habitat** *Source: Tsleil-Waututh Nation, during consultation with the VFPA.* Tsleil-Waututh Nation has indicated it would like to see a net gain of eelgrass habitat through habitat offsetting. Tsleil-Waututh Nation also suggested that eelgrass not be transplanted from the Burrard Inlet, as that could threaten the viability of the species within that area, and suggested that a back-up plan be in place if eelgrass transplants prove unsuccessful as an offsetting measure. **Status: Undergoing consultation and technical feasibility evaluation.**

Crab follow-up program elements

Follow-up program elements proposed by VFPA in the EIS	Follow-up suggestions VFPA has heard since EIS submission
1. Follow-up monitoring for crab (Section 12) Follow-up monitoring of Dungeness crab will take place before and during construction, and during operations. **2. Ongoing consultation with Indigenous groups (Section 32)** Ongoing consultation with Indigenous groups specifically to identify unforeseen effects on Current Use, or impacts on rights.	**1. Suggestion to tag crab to monitor mitigation effectiveness** *Source: Musqueam First Nation, in consultation with the VFPA.* Indigenous groups suggested monitoring to evaluate effectiveness of the crab salvage mitigation, involving tagging crab to determine residence times and seasonal movements. **Status: Undergoing consultation and evaluation.**

Ongoing work

Below is an overview of the studies and analysis undertaken since submission of the EIS, related to crab and includes studies that support responses to information requests from the Review Panel as part of the environmental assessment process.

New data analysis:

- With support from the Area I Crab Fisherman Association, the port authority analysed electronic monitoring crab harvesting data in order to further inform understanding of commercial harvesting in the Roberts Bank area. This analysis helped inform the port authority's response to IR7-33 (CEAR #1172).
- Review of other new studies with regard to impacts of the project as they become available. For instance the March 2017 Dungeness Crab Abundance and Movement Study in the Roberts Bank Terminal 2 Project Area undertaken by LGL Limited on behalf of the Tsawwassen First Nation.

Field studies and health analysis:

- Since the EIS was submitted, the port authority has undertaken field studies on crab (black crab and crab hepatopancreas) and shellfish. The results of these studies have been shared through public postings to the Canadian Environmental Assessment Agency registry as responses to IR4-33 (CEAR #1078) and IR4-34 (CEAR #1051).

Next steps

The port authority is committed to ongoing engagement with commercial, recreational, and Indigenous crab harvesters, as well as regulators on crab.

Following the Indigenous Advisory Forum, the port authority will share the input received with forum participants and the Review Panel, at which time it will be posted to the CEAA registry.

Additionally, the port authority will continue to review suggestions regarding potential mitigation, including evaluating the technical and economic feasibility and applicability to the Project.

IR13-17 Marine Vegetation – Wetlands and Blue and Red listed communities, Cumulative Effects Assessment

Information Source(s)

EIS Volume 3: Section 11

Proponent Response to Follow-up Additional Information Requirements of December 4, 2015, IR13 (CEAR 388)

Environment and Climate Change Canada Response to IR-08 (CEAR 1109)

Panel Information Request IR11-21 (CEAR 1179)

Context

The Proponent, in Section 11 of the EIS, concluded that the only residual effect for marine vegetation was on marine biofilm assemblage composition due to predicted changes in salinity. A cumulative effects assessment for the residual effect was provided in Schedule 13-1 of IR-13 (CEAR 388).

The Panel, in Package 11 IR 11-21 "Marine Vegetation – Effects Assessment for Wetlands" and 11-22 "Marine Vegetation – Blue and Red Listed Wetland Communities" (CEAR 1179), requested additional information on marine vegetation based on advice received from Environment and Climate Change Canada (ECCC). ECCC noted that the intertidal sand and mud flats in the Local Assessment Area (LAA), as well as the intertidal marsh, were considered wetlands under the Canadian Wetland Classification System, and that predicted gains in productivity and proposed offset plans were inadequate to substantiate the lack of residual environmental effects on wetlands and wetland functions (CEAR 1109). Information Request IR11-22 requested additional information on at-risk marsh communities that are red- and blue-listed provincially in British Columbia.

If the Proponent's revised assessment in response to IRs 11-21 and 11-22 identifies residual effects, a cumulative effects assessment for wetlands would be required.

Information Request

For all residual effects identified in the supplemental wetlands effects assessment requested in IR11-21, and the effects assessment on blue and red listed estuarine wetland communities requested in IR11-22, provide a cumulative effects assessment that considers:

- how wetlands and red and blue-listed plant communities have been affected by past projects and activities;
- how wetlands and red and blue-listed plant communities could be further affected by the Project; and,
- how other certain and reasonably foreseeable projects and activities may also affect wetlands and red and blue-listed plant communities.

VFPA Response

For all residual effects identified in the supplemental wetlands effects assessment requested in IR11-21, and the effects assessment on blue and red listed estuarine wetland communities requested in IR11-22, provide a cumulative effects assessment that considers how wetlands and red and blue-listed plant communities have been affected by past projects and activities

As outlined in IR-7.31.15-22 of CEAR Document #314[1], eight red and/or blue-listed wetland communities occur in the local assessment area (LAA), all of which are associated with intertidal marsh. Appendix IR11-21-A Section 4.2 of the response to IR11-21 describes how wetlands, including intertidal marsh, have been affected by past projects and activities. Red and blue-listed plant communities are included, and assessed in the updated Wetland Functions Assessment (Appendix IR11-21-A). Additionally, a discussion of factors contributing to the listing of marsh wetland communities is provided in the response to IR11-22 (CEAR Document #1275[2]).

For all residual effects identified in the supplemental wetlands effects assessment requested in IR11-21, and the effects assessment on blue and red listed estuarine wetland communities requested in IR11-22, provide a cumulative effects assessment that considers how wetlands and red and blue-listed plant communities could be further affected by the Project

Appendix IR11-21-A Section 5 describes and assesses how wetlands could be further affected by the proposed Project. Again, red and blue-listed plant communities are included, and assessed, within the intertidal marsh wetland type. Additionally, an effects assessment specific to the provincially-listed plant communities is provided in the response to IR11-22 (CEAR Document #1275).

For all residual effects identified in the supplemental wetlands effects assessment requested in IR11-21, and the effects assessment on blue and red listed estuarine wetland communities requested in IR11-22, provide a cumulative effects assessment that considers how other certain and reasonably foreseeable projects and activities may also affect wetlands and red and blue-listed plant communities.

The Wetland Functions Assessment (Appendix IR11-21-A) predicted no residual adverse effects to wetland function for sandflat, mudflat, and eelgrass wetlands after taking mitigation, including offsetting, into account. In the case of intertidal marsh wetlands, which include provincially red and blue-listed communities, net gains in both function (see Appendix IR11-21-A Section 7.1) and productivity (see EIS Section 11.6.3.2) were predicted. A cumulative effects assessment is not required for intertidal marsh as there is no residual

[1] CEAR Document #314 From Port Metro Vancouver to the Canadian Environmental Assessment Agency re: Completeness Review - Responses to Additional Information Requirements (See reference document # 271) for the Environmental Impact Statement.
[2] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).

adverse effect, hence, no measurable or detectable contribution to cumulative effects. In light of the ecological importance of intertidal marsh wetlands/habitats in the LAA, the VFPA has committed to monitoring the effectiveness of onsite intertidal marsh offsetting habitat as part of the RBT2 Follow-up Program (Appendix IR13-30-C of CEAR Document #1331[3]). The VFPA will respond to, and rectify, any deficiencies (if they occur) via an adaptive management approach.

[3] CEAR Document #1331 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR13-29 and IR13-30 (See Reference Document #1228).

IR13-18 Marine and Land-based Outdoor Recreation – Cumulative Effects Assessment

Information Source(s)

EIS Volume 4: Section 24.5.2; Section 24.6; Section 24.7; Figure 24-1

Proponent Response to Additional Information Requirements of July 31, 2015, (CEAR 314) IR12

Proponent Response to Follow-up Additional Information Requirements of Dec 4, 2015 (CEAR 388) IR13

Proponent Response to Review Panel Information Request IR7-43 (CEAR 1172)

Proponent Response to Review Panel Information Request IR8-10 (CEAR 1167)

Proponent Response to Review Panel Information Request IR7-01 (CEAR 1104)

Context

The Proponent identified four pathways of interaction between the proposed Project and outdoor recreation: area used, access, resource availability, and quality of environmental setting. For all four pathways, only recreational marine fish and seafood harvesting was identified as resulting in a potential adverse effect.

With respect to marine based outdoor recreation, the Proponent, in Section 24 of the EIS, indicated that the existing navigational closure area (NCA) for recreational crab harvesting prevents recreational crab harvesting in 502.9 ha of marine waters within the LAA. The Proponent proposes to expand the recreational navigational closure by 399 ha during construction and 279 ha during operation.

The Proponent concluded that there would be no measurable adverse residual effect on recreational crab harvesters with the following proposed mitigation measures in place:

- Inform marine recreational harvesters about the nature, location, status, and progress of construction work;
- Communicate access restrictions and procedures for maintenance of safety;
- Provide a process for recreational crab harvesters to ask questions and submit concerns; and,
- Work with Fisheries and Oceans Canada to ensure necessary consultation with recreational crab harvesters concerning the proposed navigational closure expansion.

With respect to land based outdoor recreation, the Proponent used visual resources and noise and vibration as indicators to assesses the quality of experience of the environmental setting. The Proponent proposed crane-color-optimisation to reduce contrast and enhance blending with the landscape during daytime, and orientation and control of light levels and shielding during nighttime. The Proponent considered that there were no effects on the quality of the experience since the prediction for noise increase would be less than 3dBA. The Proponent

indicated (CEAR 314) that these measures would be effective and therefore residual effects on outdoor recreation were negligible.

The Panel notes that the re-calculation of predicted worse-case noise levels using the CONCAWE method indicated that sound levels have the potential to increase by up to 5.7dBA for the operation phase and by up to 6.6dBA during construction. The components of noise and visual resources could be relevant for the quality of experience to users of the Tsawwassen Sea Dyke and Brunswick Point Trail and to residents in the Tsawwassen community in Delta and of Tsawwassen First Nation land utilising available parks for leisure or fitness training.

The Panel questions the effectiveness of the proposed mitigation measures, particularly where the Proponent relies on communication plans that are not yet developed or communicating with organizations that are not formally organized.

Information Request

Provide an effects assessment that characterizes the residual effects and the significance of those effects for the following outdoor recreation activities:

- recreational crab harvesting in relation to access and displacement, loss of harvesting area and resource availability; and,
- marine and land-based outdoor recreational activities in relation to the quality of experience of the environmental setting.

Where there is a residual effect on Outdoor Recreation, provide a cumulative effects assessment which includes past, present and reasonably foreseeable future projects and activities located in the marine and land-based Outdoor Recreation Local Assessment Areas.

VFPA Response

Clarification

The VFPA would like to clarify the following statements from the context to this information request:

> *The Proponent identified four pathways of interaction between the proposed Project and outdoor recreation: area used, access, resource availability, and quality of environmental setting. For all four pathways, only recreational marine fish and seafood harvesting was identified as resulting in a potential adverse effect.*

In the assessment of outdoor recreation (EIS Section 24.0), four pathways of interaction between the proposed Project and outdoor recreation were identified: area use, area access, resource availability, and quality of environmental setting. These four pathways were assessed for the four sub-components of the outdoor recreation valued component, as outlined in EIS Table 24-1. One Project effect on outdoor recreation was identified for one sub-component, recreational marine seafood harvesting, via two effect pathways (area use and access) as described in EIS Sections 24.6.5.2 and 24.7.1.

The Proponent considered that there were no effects on the quality of the experience since the prediction for noise increase would be less than 3dBA. The Proponent indicated (CEAR 314) that these measures would be effective and therefore residual effects on outdoor recreation were negligible.

As described in EIS Section 24.6, predicted Project-related changes in noise levels at various outdoor recreation locations would vary in magnitude depending on distance from the Project. The predicted changes in noise levels were below 3 dBA in a majority of the areas most highly used for marine and land-based recreation in the local assessment area (LAA). As described in EIS Sections 24.6.1, 24.6.2.2, 24.6.3, and 24.6.4, even though perceptible changes to noise conditions are anticipated during Project construction and operation, Project effects on the quality of the environmental setting for the four outdoor recreation sub-components (i.e., recreational boating and windsport activities, recreational marine fish and seafood harvesting, recreational hunting, and other land-based outdoor recreation) due to change in noise conditions were identified as negligible, since the resulting environmental setting will be consistent with the industrialised character of the existing environmental setting at Roberts Bank.

Part 1 – Provide an effects assessment that characterizes the residual effects and the significance of those effects on recreational crab harvesting in relation to access and displacement, loss of harvesting area and resource availability

The VFPA has a high level of confidence in the outdoor recreation assessment conclusions described in the EIS, including the prediction of a Project-related effect on recreational seafood (crab) harvesting and effectiveness of the proposed mitigation. As indicated in EIS Section 24.6.5.2, a minor adverse effect on recreational seafood (crab) harvesting access, displacement, and loss of harvesting area is anticipated from the proposed recreational crab navigational closure expansion. The proposed mitigation measures as outlined in EIS Section 24.7.1 are expected to be effective and result in a negligible residual effect. Proposed mitigation measures include the following:

- Communications with recreational crab harvesters through the Project Communications Plan;
- Targeted communications with recreational harvesters on timing, spatial area, and access restrictions from the proposed recreational crab harvesting navigational closure expansion; and
- Identification of additional mitigation (where identified and agreed upon by the VFPA, Fisheries and Oceans Canada (DFO), and recreational crab harvesters).

These proposed consultation measures provide an opportunity to address concerns raised by recreational crab harvesters if they arise. However, it is assumed that the likelihood of additional mitigation measures being required is low and that without the identification and implementation of additional mitigation measures, residual effects are still anticipated to be negligible. This conclusion is based on the following considerations:

- Recreational crab harvesters are not limited to harvesting in specific management areas (i.e., ability to harvest elsewhere is greater) and can harvest all year round; and

- With the implementation of the proposed recreational crab harvesting navigational closure expansion, recreational crab harvesters will still be able to use the inter-causeway area and waters near the BC Ferries Terminal where recreational crab harvesting is concentrated in the LAA, as well as areas to the west of the navigational closure expansion (as described in EIS Section 24.6.5.2).

Since submission of the EIS, the VFPA has engaged with DFO to understand DFO consultation programs with recreational crab harvesters and associated opportunities for VFPA engagement. The VFPA plans to engage with recreational harvesters to share information and request feedback and comments.

The VFPA is confident that potential Project effects on recreational crab harvesting in relation to harvesting area use, access, and displacement will be sufficiently mitigated through the measures proposed. With a negligible residual effect, further assessment is not required, and a characterisation of residual effects and determination of significance has not been conducted.

Part 2 – Provide an effects assessment that characterizes the residual effects and the significance of those effects on marine and land-based outdoor recreational activities in relation to the quality of experience of the environmental setting.

The VFPA interprets this portion of the information request to be requesting a revised assessment of Project effects on marine and land-based outdoor recreational environmental setting based noise levels predictions generated using the CONCAWE method as per the response to IR7-01 (CEAR Document #1104[1]). As described in detail in the response to IR12-05, applying the CONCAWE model with meteorological category 6 is not considered appropriate methodology for predicting Project-related noise. As such, the original predictions of future noise levels provided in EIS Section 9.3 are considered the appropriate levels for understanding and assessing change in noise conditions, and the effect of this change on outdoor recreational environmental setting at land-based and marine-based outdoor recreational use areas in the LAA. Therefore, a revised assessment of effects has not been conducted.

The conclusions of the outdoor recreation assessment, including the negligible potential effect determination for the environmental setting effect pathway related to change in noise levels for all outdoor recreation sub-components, remain unchanged from the EIS (Section 24.0). As no residual effects on outdoor recreation are identified, a cumulative effects assessment that includes past, present, and reasonably foreseeable future projects and activities located in the marine and land-based outdoor recreation LAA is not required.

[1] CEAR Document #1104 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR6-08, IR7-01, IR7-02, IR7-08, IR7-36, and IR7-39 (See Reference Documents #991 & #1000).

IR13-19 Cultural and Physical Heritage Resources – Wave Environment, Cumulative Effects Assessment

Information Source(s)

Marine Shipping Addendum: Section 9.4; Section 9.5

Proponent Response to Review Panel Information Request IR7-20 (CEAR 1141)

Proponent Response to Review Panel Information Request IR4-04 (CEAR 1051)

Review Panel Information Request Package 10 (CEAR 1130)

Malahat First Nation Submission (CEAR 621 and 378)

Context

The Proponent provided information on the expected change in the wave environment, the planned fleet distribution, and number of vessel calls and movements over several future scenarios, including in response to IR 4-04, part 01 and 02. The Proponent also provided planned shipping routes and the number of vessels expected in the marine shipping area associated with the proposed Project.

The Proponent concluded that the potential wake-related effects on archaeological and heritage resources were negligible, and therefore mitigation measures were not required.

The Pacheedaht First Nation documented wave and boat-related damage to intertidal and shoreline habitat and damage to shoreline archaeological sites in the Pacheedaht's or other nations traditional territory. The Lyackson First Nation and the Tsleil-Waututh First Nation also expressed concerns with respect to cumulative effects on their cultural and spiritual sites and the Malahat First Nation noted the potential for further erosion from cumulative impacts to sites of importance defining cultural landscapes.

In information request IR10-21 the Panel requested the following information:

- A complete description of and maps showing sites of physical and cultural importance to Indigenous people located on the shores of the marine shipping area and in the shipping lanes for each group (including identification of the sites); and,
- An assessment of the effects of the potential loss of sites of physical or cultural importance to Indigenous peoples resulting from natural and ship-wake waves greater than 10 cm.

Further, in response to Panel information request IR7-20, the Proponent considered that the shoaling effect had the potential to result in slightly higher breaking waves on the shore than had been previously anticipated.

The Panel considers that there is a potential to create further erosion and a cumulative effects assessment on physical and cultural heritage sites resulting from changes in the wave environment is required.

Information Request

Based on information found in Package 10 on current use and in Package 7 on the wave environment, provide an assessment of the effects of shoaling on shoreline structures and sites of physical and cultural heritage importance to identify any residual effects and the significance of those effects.

Where residual effects are identified, provide a discussion of the cumulative effects of shoaling on shoreline structures and sites of physical and cultural heritage importance.

VFPA Response

Based on information found in Package 10 on current use and in Package 7 on the wave environment, provide an assessment of the effects of shoaling on shoreline structures and sites of physical and cultural heritage importance to identify any residual effects and the significance of those effects.

From the point of view of physical processes at a shoreline, vessel wake-generated waves arriving at a shoreline have the same interaction as wind-generated waves arriving at a shoreline. Additional information regarding the wave environment effects assessment, provided in the VFPA's responses to IR7-13 to IR7-23 (CEAR Document #1141[1]), does not change the conclusions regarding potential effects on shoreline structures and sites of physical and cultural heritage importance, as described in Marine Shipping Addendum (MSA) Section 9.4. The rationale for the approach to assessing wake for the wave assessment is summarised in the Preamble for IR7-13 to IR7-23 (CEAR Document #1141), as well as in the VFPA's response to IR10-23.

Detailed investigations of the nearshore wave interactions (i.e., shoaling, reflection, and refraction) were not conducted for the MSA since these processes are occurring in relation to the existing wave climate and are unaffected by Project-associated vessels. The response to IR7-20 (CEAR Document #1141) provides an analysis of wave shoaling for varying wave periods for each of four deepwater wave heights. The analysis concludes that based on a comparison of vessel-wake generated waves[2] with a wave period of 4.2 seconds, shoaled vessel-wake waves would be similar to wind-wake waves with a 4.0 second wave period, and could be 6 cm to 10 cm larger than shoaled wind-generated waves with a 2 second wave period, depending on the deepwater wave height. As stated in the response to IR7-23 (CEAR Document #1141), the interactions of wake-generated waves with shorelines are well within

[1] CEAR Document #1141 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR2-01a, IR7-04, IR7-13 to IR7-23 (See Reference Documents #991 & #1000).
[2] For all vessel-generated waves, including future waves from Project-associated vessels.

the range of existing wind-generated wave climate[3]. Based on these results, there are no effects of marine shipping associated with the Project on shoreline processes and a reassessment is not required (see responses to IR7-20 and IR7-23 of CEAR Document #1141).

In consideration of updated baseline information as requested, the conclusions of the MSA assessment on archaeological and heritage resources remain unchanged; no measurable effects to shoreline structures and sites of physical and cultural heritage importance are predicted.

Where residual effects are identified, provide a discussion of the cumulative effects of shoaling on shoreline structures and sites of physical and cultural heritage importance.

No residual effects are identified and therefore no discussion is provided of the cumulative effects of shoaling on shoreline structures and sites of physical and cultural heritage importance.

[3] As described in the response to IR7-21 (CEAR Document #1141), assuming that Project-associated vessel movements generate 2,600 waves in a year, the number of wake-generated waves is slightly less than the number of waves generated in a three hour wind event (i.e., 2,700 waves, assuming that 900 waves are generated per hour with a wave period of 4 seconds). Table 7.2-5 of the MSA showed that 99.5% of the shoreline in Zones 1, 2, and 3 of Segment B are predicted to receive wake waves equal to or smaller than 0.25 m. Based on the maximum wave height of 2.7 m recorded at the New Dungeness wave buoy in 2012, the maximum 2012 hindcast wave heights at Zones 1, 2, and 3 were 1.2 m, 1.1 m, and 2.2 m respectively. Therefore, vessel wakes from Project-associated vessels are not expected to have a physical effect on shorelines.

IR13-20 Current Use of Lands and Resources for Traditional Purposes – Access to Preferred Locations – Wave Environment – Cumulative Effects Assessment

Information Source(s)

Marine Shipping Addendum: Section 7; Appendix 7.2-A; Section 9.5

EIS Volume 2: Appendix 9.2-A, Sections 2.1 and 2.3

EIS Volume 5: Section 32.2.6.4

Review Panel Information Request Package 10 (CEAR 1130)

Malahat First Nation Submission (CEAR 621 and 378)

Proponent Response to Additional Information Requirements of Dec 4, 2015, IR13 (CEAR 388)

Context

Section 9.5 of the MSA considered the current use of lands and resources for traditional purposes by Indigenous people within the marine shipping area associated with the proposed Project. The Proponent described two potential pathways for an effect on access to current use locations:

- temporary displacement of activities; and,
- access to and use of locations resulting from ship-generated wake.

Indigenous groups reported interactions from ship movements in existing shipping lanes on current use locations, such as marine harvesting areas and travel ways in each of the shipping segments and within the Roberts Bank area.

For instance, the Pacheedaht First Nation indicated that the presence of existing international shipping lanes interfered with harvesting activities at Swiftsure Bank; the Tseycum First Nation indicated they fish for sockeye in Segment B, following the salmon migration; the Pauquachin First Nation indicated that existing vessel traffic in Segment A factors into their route planning; the Cowichan Nation Alliance indicated that shipping traffic has affected their Tribal Journeys in the marine shipping area; the Malahat First Nation indicated that the Proponent did not consider the frequency at which Indigenous groups based on Vancouver Island cross the Strait of Georgia, and; the Lyackson First Nation expressed concerns with respect to risk to safety due to an increase in large vessel traffic.

Indigenous groups indicated that any Project-related activity resulting in an effect on the ability of an Indigenous group to access preferred travel-ways in order to access harvesting or cultural and spiritual sites is considered a measurable effect and must be acknowledged and mitigated appropriately.

The Proponent indicated that because of the Collision Regulations under the *Canada Shipping Act*, *2001*, which requires that smaller vessels give way to larger ones, Project-associated shipping is likely to temporarily displace current use occurring within shipping lanes, as is the case with existing shipping. The Proponent suggested regulatory authorities consider mitigation measures such as a communication plan and further consultation with Indigenous groups to mitigate effects of increases in ship pass-by on current use.

In IR10-16, the Panel requested the Proponent provide the following information:

- the current activities taking place during the day or the night with a quantification of day and night duration;
- the access required within, outside or through the shipping lanes;
- the seasons that activities are practised;
- the frequency that each Indigenous group crosses the shipping lanes in the marine shipping area; and,
- the minimum and maximum number of vessels per hour in the shipping lanes, by Segment, encountered by Indigenous fishing vessels for current use activities in relation to the shipping associated with the Project.

In consideration of the above missing information, and in view that mitigation measures proposed by the Proponent are outside its control, a cumulative effects assessment on Indigenous current use resulting from ship movements within the shipping lanes, ship pass-by and changes in the wave environment is required.

Information Request

In addition to the information requested in Package 10, provide the following for each applicable Indigenous group in Attachment 2:

- a discussion of the effects from the cumulative change in the wave environment on current use activities, access, and navigation. Incorporate seasonal change to the wave environment and seasonal harvesting activities that take place in the shipping lanes or that require crossing the shipping lanes to access preferred sites;
- a discussion of how increases in ship movement as a result of the proposed Project or marine shipping associated with the Project, in combination with past, present, and future increases in ship movements has the potential to impact an Indigenous group's perception of sense of place or changes to risks to safety and security in the wave environment; and,
- a discussion on the effectiveness of project-specific mitigation[1] in relation to protection of access to current use resources.

Where there is a residual effect on current use identified in responses to Package 10, provide a cumulative effects assessment which includes:

- a discussion on changes in access to current use locations; and,
- a discussion on changes to perception of risks to safety and security related to access to current use locations.

[1] The original information request as posted (CEAR Document #1228) did not include the word 'mitigation'. This was assumed to be a typographical error, and the word 'mitigation' has been added.

VFPA Response

The VFPA notes that reports by Indigenous groups of existing interactions between vessel movements in existing shipping lanes and locations for the current use of lands and resources for traditional purposes (Current Use) were included in the group-specific existing conditions summaries in EIS Section 32.2.4, Additional Information to the EIS – *WSÁNEĆ* Nation (AIEIS, CEAR Document #930[2]) Section 7.2.4, Marine Shipping Addendum (MSA) Section 9.5.4, and Additional Information to the MSA – Musqueam First Nation and Tsleil-Waututh Nation (AIMSA, CEAR Document #572[3]) Section 7.2. As noted in the responses to IR10-06 and IR10-13 of CEAR Document #1275[4] (as well as related responses, including IR10-16 of CEAR Document #1275), these baseline summaries contain the extent of information known to the VFPA, or that the VFPA is in a position to provide[5], regarding each Indigenous group's past, present, and desired future use, including Indigenous group perspectives on factors contributing to cumulative changes to date on their use at Roberts Bank and in the marine shipping area. Accordingly, the baseline summaries described available information on existing interactions between vessel movements and marine harvesting areas and travel ways in each of the shipping segments within the marine shipping area and within the Roberts Bank area, including but not limited to the specific reports of existing interactions identified in the context to this information request.

The assessment of the potential effects of vessel movements as a result of the proposed Project on Current Use access and quality of experience (e.g., sense of place, risks to safety and security) within the Roberts Bank area was presented in EIS Sections 32.2.6.1 and 32.2.6.4 and AIEIS Sections 7.2.6.1 and 7.2.6.4. The assessment of the potential effects of vessel movements as a result of marine shipping associated with the Project on Current Use access and quality of experience in relation to the marine shipping area, including in consideration of the wave environment, was presented in MSA Section 9.5.5 and AIMSA Section 7.3. Refer to Appendix IR10-A of CEAR Document #1275 for group-specific

[2] CEAR Document #930 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Additional Information on the WSÁNEC Nation requested by the Canadian Environmental Assessment Agency on January 13, 2016 (See Reference Document #383).
[3] CEAR Document #572 From the Vancouver Fraser Port Authority to the Review Panel re: Response to the Additional Information to the Marine Shipping Addendum on the Musqueam First Nation and Tsleil-Waututh Nation requested by the Canadian Environmental Assessment Agency on January 13, 2016 (See Reference Document #383) (NOTE: Title of post updated February 16, 2017).
[4] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).
[5] As noted in responses to information requests within Package 10, including Part 1 of the responses to IR10-06 and IR10-13 (CEAR Document #1275), some of the baseline information provided to the VFPA by Indigenous groups regarding the use of lands and resources for traditional purposes may be sensitive or confidential, and therefore is not appropriate for the VFPA to release in a response to an information request, which will become part of the public record. The VFPA has stated that it leaves it to the discretion of Indigenous groups to provide the requested information directly to the Review Panel for its consideration.

assessments in relation to access and quality of experience (specifically, line items IR10-06, IR10-08, IR10-13, and IR10-15 in each group's assessment table).

The VFPA has reiterated its views on the effectiveness of mitigation measures proposed or suggested to address potential access and quality of experience effects in relation to the Project and marine shipping associated with the Project in the responses to IR10-09, IR10-11, IR10-12, and IR10-17 (CEAR Document #1275). For reasons discussed in those responses, the VFPA remains of the view that there will be no residual effects on Current Use as a result of the Project or marine shipping associated with the Project for any Indigenous group with the implementation of the proposed or suggested measures.

As specifically discussed in the responses to IR10-06 (Part 5) and IR10-13 (Part 3, (3)(a)(ii)) of CEAR Document #1275, and reflected in other responses within Package 10 and Package 13, a cumulative effects assessment was only carried out when a residual adverse effect of the Project or marine shipping associated with the Project was predicted and the residual adverse effect was considered likely to interact cumulatively with the effects of other projects and activities that have been or will be carried out.

As no residual effects on Current Use access or quality of experience are identified in the responses within Package 10, as noted by references to specific information requests within Package 10 above, a cumulative effects assessment is not required.

IR13-21 Current Use of Lands and Resources for Traditional Purposes – Access to Preferred Current Use Fishing Locations at Lower Fraser River area (South Arm, Canoe Passage), Roberts Bank and Marine Fish LAA; Cumulative Effects Assessment

Information Source(s)

EIS Volume 5: Sections 32.2.4.1 and 32.2.6.1; Figure 32.1

Responses to Review Panel Request for Information: Métis Nation British Columbia (CEAR 1099); Lake Cowichan First Nation (CEAR 1101); Cowichan Nation Alliance (CEAR 1108)

Review Panel Information Request Package 10 (CEAR 1130)

Context

In Section 32 of the EIS, the Proponent quoted the Tsawwassen First Nation as saying that changes in current flows and sediment buildup in Canoe Passage over the past 20 years have resulted in the loss of an important travel corridor during low tide to access the South Arm of the Fraser River. Access to the Fraser River, an important fishing area, now involves a longer route that transits the area between the B.C. Ferries Terminal and the Tsawwassen Water Lot south of the ferry terminal, the navigational closure area between the existing terminals and the international border, and the area within the proposed Project footprint. Additionally, navigation must take place as close as possible to the terminals to avoid shipping lanes, large vessel traffic and steer clear of shallow waters.

In Section 32.2.6.1, the Proponent indicated that the marine fish Local Assessment Area (LAA) was harvested by Indigenous groups for salmon and ground fish. The Proponent noted that harvesting of ground fish was heavily restricted due to conservation concerns. Areas northeast of the LAA, such as Canoe Passage, and other areas within the South Arm of the Fraser River, appeared to be preferred fishing locations for Indigenous groups. Specific types of ground fish (sturgeon, sole, flounder), forage fish, including eulachon and herring, and salmon were harvested in these areas. Although Project-related effects on access to these current use locations were expected to be negligible during construction and operation, no conclusion was made for effects to the marine fish LAA.

The Panel is aware that some Indigenous groups, such as the B.C. Metis Nation, the Cowichan Tribes and the Lake Cowichan First Nation use the marine fish LAA in addition to Canoe Passage and other areas within the South Arm of the Fraser River. Further, some Indigenous groups underlined the fact that, over the years, easy access to their preferred fishing sites is declining.

A cumulative effects assessment on Indigenous groups' navigation in the Lower Fraser River (South Arm, Canoe Passage), Roberts Bank and the marine fish LAA and access to, domestic and Food, Social, and Ceremonial fishing activities is required.

Information Request

In addition to the information requested in Package 10, provide the following for each applicable Indigenous group in Attachment 2:

- a discussion of the effects as a result of the past changes on current use activities, access, navigation, and travel corridors, including seasonal harvesting activities;
- a discussion of how increases in ship movements as a result of the proposed Project or marine shipping associated with the Project, in combination with past, present, and future increases in ship movements have the potential to affect an Indigenous group's perception of changes in risks to safety and security of fishing areas or travel corridors; and,
- a discussion of the effectiveness of Project-specific and cumulative mitigation measures in relation to protection of access to current use resources.

Where there is a residual effect on current use identified in responses to Package 10 provide a cumulative effects assessment which includes:

- a discussion on current use in terms of changes in access to current use locations; and,
- an assessment of the socio-economic consequences, of the existing and proposed navigational closures on Indigenous, domestic and Food, Social, and Ceremonial fishing activities.

VFPA Response

The VFPA notes that Indigenous group perspectives of past changes to activities, access, navigation, and travel corridors for traditional purposes, including seasonal harvesting, at locations in the Lower Fraser River area (South Arm, Canoe Passage), Roberts Bank, and marine fish local assessment area (LAA)—including declines in this use over time and the effects of existing navigational closures to commercial and recreational crab harvesting—were included in the group-specific existing conditions summaries in EIS Section 32.2.4, Additional Information to the EIS – *W*SÁNEĆ Nation (AIEIS, CEAR Document #930[1]) Section 7.2.4, Marine Shipping Addendum (MSA) Section 9.5.4, and Additional Information to the MSA – Musqueam First Nation and Tsleil-Waututh Nation (AIMSA, CEAR Document #572[2]) Section 7.2.[3]

[1] CEAR Document #930 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Additional Information on the WSÁNEC Nation requested by the Canadian Environmental Assessment Agency on January 13, 2016 (See Reference Document #383).
[2] CEAR Document #572 From the Vancouver Fraser Port Authority to the Review Panel re: Response to the Additional Information to the Marine Shipping Addendum on the Musqueam First Nation and Tsleil-Waututh Nation requested by the Canadian Environmental Assessment Agency on January 13, 2016 (See Reference Document #383) (NOTE: Title of post updated February 16, 2017).
[3] As many Indigenous groups listed in Attachment 2 were considered in multiple filings (i.e., EIS/MSA, EIS/AIMSA, MSA/AIEIS), their perspectives of past changes on activities, access, navigation, and travel corridors for traditional purposes, including seasonal harvesting, in the Lower Fraser River area (South Arm, Canoe Passage), Roberts Bank, and marine fish local assessment area—which all lie outside (i.e., north) of the marine shipping area—may be included in the MSA or AIMSA, especially where that information had not been previously reported in the EIS.

The VFPA notes that the context to this information request states that potential Project-related effects on access to fishing locations in the Lower Fraser River (South Arm, Canoe Passage) were expected to be negligible but that no conclusion was made for potential effects on access to fishing locations within the marine fish LAA.

The VFPA wishes to clarify that EIS Section 32.2.6.1 did make a conclusion in relation to the marine fish LAA as follows (pp. 32-101 to 32-102):

> *"With regard to marine fish, salmon and groundfish (including reef fish, flat fish, and demersal fish) are or have been harvested by [Indigenous] groups within the marine fish LAA; however, harvesting of groundfish is heavily restricted due to conservation concerns. Areas northeast of the LAA, specifically Canoe Passage and other areas within the South Arm of the Fraser River, have been identified by [Indigenous] groups as specifically important for harvesting salmon, specific types of groundfish (sturgeon, sole, flounder), and forage fish, including eulachon and herring. [EIS]* ***Section 21.0 Marine Commercial Use*** *indicates that Project-related effects on access and navigation for commercial salmon harvesters, including [Indigenous] commercial salmon harvesters, are considered negligible, as the focus of the commercial fishing effort, like [Indigenous] fishing [i.e., for current use of lands and resources for traditional purposes (Current Use)], is located away from the marine fish LAA. [EIS]* ***Section 24.0 Outdoor Recreation*** *also predicts negligible effects to recreational salmon fishing, but for slightly different reasons (a small amount of recreational salmon fishing will likely be displaced by the Project footprint, but the overall level of fishing within the Marine Outdoor Recreation LAA, centred on Roberts Bank, is not expected to change; see [EIS]* ***Section 24.6.5 Outdoor Recreation, Recreational Marine Fish and Seafood Harvesting Potential Effect #1 – Changes in Harvesting Area Use and Access****). For reasons similar to both assessments, and given that Canoe Passage and the Fraser River appear to be preferred for [Indigenous] fishing purposes (at least for species that are harvested in relatively higher numbers and more often), Project-related effects on access to Current Use locations for fishing are expected to be negligible during construction and operation."*

This 'negligible' conclusion (before the application of Current Use-specific mitigation) relates to access to fin-fishing locations reported by Indigenous groups as occurring in the marine fish LAA, not the Lower Fraser River (South Arm, Canoe Passage), as the LAA for Current Use was defined as follows: *"Each [Indigenous] group's asserted or established traditional territory or otherwise defined area of use, with the LAAs for biophysical resources linked to Current Use [in this case the marine fish LAA] serving as the Project assessment focal area for the assessment of potential effects to Current Use of those resources"* (EIS Section 32.2.2.1,

p. 32-18). Appendix IR10-A (CEAR Document #1275[4]) presents group-specific assessments of potential Project-related access effects (specifically, line item IR10-06 in each group's assessment table). For Tsawwassen First Nation, the potential access effect on their travel route to the Fraser River (referred to in the context to this information request) was assessed separately of potential access effects on fin-fishing locations, as Tsawwassen First Nation reported that the route was used for traditional canoe journeys. The potential effect on access to that route for canoe journeys was predicted to be measurable before the application of Current Use-specific mitigation (refer to EIS Section 32.2.6.1, p. 32-104, and to line item IR10-06 of the assessment table for Tsawwassen First Nation in Appendix IR10-A of CEAR Document #1275).[5]

As discussed in the response to IR13-20, the assessment of the potential effects of ship movements as a result of the proposed Project on Current Use access to preferred locations (including, as it relates to this information request, fin-fishing areas and travel corridors), and quality of experience (e.g., perception of risks to safety and security) while at these locations, was presented in the EIS Sections 32.2.6.1 and 32.2.6.4 and AIEIS Sections 7.2.6.1 and 7.2.6.4. As reviewed in the responses to IR10-06 (CEAR Document #1275; Part 3) and IR10-07 (CEAR Document #1275), existing access/displacement effects were considered in the evaluation of Project-related effects on access to Current Use locations for domestic or food, social, and ceremonial (FSC) harvesting, as well as indirect socio-economic consequences as a result of those potential access effects. Refer to Appendix IR10-A (CEAR Document #1275) for group-specific assessments in relation to access and quality of experience (specifically, line items IR10-06, IR10-07, and IR10-08 in each Table 1-A and Table 1-B Indigenous group's assessment table).

The VFPA has reiterated its views on the effectiveness of mitigation measures proposed to address potential Project-related effects on Current Use in the responses to IR10-09, IR10-11, and IR10-12 (CEAR Document #1275). As reviewed in the responses to IR10-06 (Part 3), IR10-07, and IR10-08 (CEAR Document #1275), given the anticipated effectiveness of these measures, no residual effects on Current Use are expected for any Indigenous group with the implementation of the proposed measures.

As specifically discussed in the response to IR10-06 (CEAR Document #1275; Part 5), and reflected in other responses within Package 10 and Package 13, a cumulative effects assessment was only carried out when a residual adverse effect of the Project was predicted and the residual adverse effect was considered likely to interact cumulatively with the effects of other projects and activities that have been or will be carried out.

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[4] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).

[5] A discussion of the route and its use for traditional canoe journeys by Tsawwassen First Nation is discussed in EIS Section 32.2.4.1, p. 32-42, and in the response to IR7-38 (CEAR Document #1116). The VFPA notes that Tsawwassen First Nation had reported that their fishing vessels are moored at docks in the Fraser River (refer to EIS Section 32.2.4.1, p. 32-41), from where they access their important fishing areas in the Fraser River.

As no residual effects on Current Use are identified in the responses within Package 10, a cumulative effects assessment is not required.

IR13-22 Current Use of Lands and Resources for Traditional Purposes – Quality and Availability of Preferred Resources, Cumulative Effects Assessment

Information Source(s)

Marine Shipping Addendum: Section 9.5

EIS Volume 4: Section 27.10

EIS Volume 5: Section 32.2.4.1

Proponent Response to Follow-up Additional Information Requirements of December 4, 2015 (CEAR 388): Appendix AIR31-A

Proponent Response to Follow-up Additional Information Requirements of February 24, 2016 (CEAR 391): Appendix MSA IR11-A

CEAR 733

EIS Guidelines: Sections 9.1.8 and 12.1.2

CEAR 526

CEAR 621

Proponent Response to Review Panel Information Request IR4-04 (CEAR 1051)

Review Panel Information Request Package 10 (CEAR 1130)

Context

Concerning a potential change in the quality of resources, the Proponent reported, in Section 9.5.5.1 of the MSA, examples from Indigenous groups attesting to sanitary restrictions or closure or avoidance of country food considered contaminated or polluted.

The Proponent considered that compliance with pollution prevention provisions of the *Canada Shipping Act, 2001* and MARPOL by Project-associated marine vessels would prevent harmful changes in marine water quality. A change in marine water quality is therefore not anticipated as a result of Project-associated vessel transit activities.

In the Human Health assessment, the Proponent indicated that existing levels of contaminants in marine resources within the marine shipping area were below thresholds of concern for human health. Since only low incremental emissions of contaminants of potential concern and particulate matter are expected from Project-associated shipping, the uptake of contaminants in shellfish and finfish from an increase in marine shipping associated with the Project was expected to be negligible. Accordingly, adverse health effects from consumption of these

resources were not expected as a result of an increase in marine shipping associated with the Project.

However, some submission from Indigenous groups stated that cumulative effects from past, present and future projects were ignored in the assessment. Following are examples of concerns with regards to the erosion of quality of country foods from Indigenous groups:

- The Tsawwassen First Nation noted that bivalve harvesting is prohibited in the Local and Regional Assessment Areas (LAA, RAA) due to ongoing sanitary and bio-toxic shellfish closures;
- The Lyackson First Nation reported a change in taste to marine resources due to existing pollution;
- The Esquimault Nation once harvested seaweed and other aquatic plants for healing purposes but no longer harvest these resources as a result of contamination concerns; and,
- The T'Sou-ke Nation has reported concerns about current levels of mercury contamination in seals which has led to avoidance of seals as a traditional food source. Contamination of inner Sooke Harbour has forced the T'sou-ke First Nation to rely more heavily on marine species that migrate through the less contaminated outer harbor.

The Proponent indicated that Indigenous groups reported specific interactions between existing shipping vessel movements and the availability of marine vegetation, invertebrates and fish currently used. However, the Proponent predicted that 1.5 Project-associated ship movement per day to the existing vessel traffic volume would not contribute to effects on marine mammals or marine birds. No evaluation was presented for marine fish.

For the Musqueam Indian Band, the lack of culturally appropriate effects assessment overlooked the potential effects to sufficiency of resources, preferred harvesting locations or methods, or the Indigenous perspective. The EIS also failed to adequately consider adverse Project and cumulative effects on the Musqueam Indian Band's current use activities outside the LAA, such as effects to fish that migrate into the mouth of the Fraser River.

They were other examples from Indigenous groups reported by the Proponent indicating concerns on potential reduction of availability of resources, such as:

- Declines in Fraser River salmon stocks was identified by Tsawwassen First Nation as a reason for increased harvesting of crabs;
- The Tsawwassen First Nation considered that low numbers of eulachon are a concern and believe that a Project effect, however small, could be a possible tipping point leading to the total collapse of the Fraser River population of this species;
- The Hwlitsum First Nation reported that in the 1950s and 1960s, fishing supported a "lucrative lifestyle," but since then changes have destroyed or diminished the ability to harvest marine resources in certain areas, including near the existing Roberts Bank terminals;
- The Pauquachin First Nation indicated that chiton, octopus, and sea urchin, all reported delicacies, are now difficult to find; and,
- The Tsawout First Nation indicated that herring has steadily declined in availability in recent decades.

Considering that mitigation measures identified by the Proponent for the protection of the quality of resources are outside the Proponent's control in the marine shipping area associated with the Project, and the fact that availability of resources must be looked at in terms of

sufficiency, a cumulative effects assessment on the quality and availability of preferred resources by Indigenous groups is required.

Information Request

In addition to the information requested in Package 10, provide the following for each applicable Indigenous group in Attachment 2:

- a discussion of the effects as a result of the past changes in the ability of Indigenous groups to use and rely on resources, including diversity, quantity, quality and the availability of marine resources and habitat in culturally important areas used by Indigenous peoples, including marine harvesting, fishing, and hunting;
- a discussion of how increases in shipping as a result of the proposed Project or marine shipping associated with the Project, in combination with past, present, and future projects or activities have the potential to affect an Indigenous group's perception of the quality of marine resources; and,
- a discussion of the required mitigation measures and the effectiveness of those measures in relation to protection of quality of marine resources.

Where a residual effect on the quality and availability of marine resources is identified in the response to Package 10, provide a cumulative effects assessment which includes a discussion on current use in terms of changes in diversity, sufficiency, quality and availability of marine resources and habitat in preferred areas used by Indigenous peoples, including marine harvesting, fishing, and hunting.

VFPA Response

To clarify information contained within the context to this information request,[1] the VFPA notes that the availability of marine resources for current use of lands and resources for traditional purposes (Current Use) included an assessment related to marine fish and fish habitat, which covered marine vegetation, marine invertebrates, and marine fish (see Marine Shipping Addendum (MSA) Section 9.5.5, p. 9.5-131 to 9.5-132, and AIMSA[2] Section 7.3.2). This assessment immediately precedes the assessments related to the availability of marine mammals and marine birds.

Reports by Indigenous groups of past use of resources for traditional purposes—including diversity, quantity, quality, and the availability of marine resources and habitat in culturally important areas used by Indigenous peoples, including for marine harvesting, fishing, and hunting—were included in the group-specific existing conditions summaries in EIS Section 32.2.4, Additional Information to the EIS – *W*SÁNEĆ Nation (AIEIS, CEAR Document

[1] The context to this information request states that the Proponent predicted that Project-associated ship movements would not contribute to effects on marine mammals or marine birds, and that no evaluation was presented for marine fish. The VFPA assumes the Review Panel is referring to the assessment of the availability of these resources for use by Indigenous groups, which, for marine shipping associated with the Project, was contained in MSA Section 9.5 and AIMSA Section 7.0.
[2] Additional Information to the MSA – Musqueam First Nation and Tsleil-Waututh Nation (AIMSA; CEAR Document #572).

#930[3]) Section 7.2.4, MSA Section 9.5.4, and AIMSA Section 7.2 (CEAR Document #572[4]). These summaries also included Indigenous group perspectives on factors contributing to changes over time in their use of (and ability to rely on) resources, such as declines in resource availability and quality. These perspectives included but were not limited to the specific concerns noted in the context to this information request.

As noted in the responses to IR10-06 and IR10-13 (CEAR Document #1275[5]), these summaries contain the extent of information known to the VFPA, or that the VFPA is in a position to provide, regarding each Indigenous group's past, present, and desired future use in the vicinity of the Project or in the marine shipping area.

The assessment of the potential effects of the Project on Current Use, including the availability and quality of Current Use resources, was presented in EIS Section 32.2.6 and AIEIS Section 7.2.6. The assessment of the potential effects of marine shipping associated with the Project on Current Use, including the availability and quality of Current Use resources, was presented in MSA Section 9.5.5 and AIMSA Section 7.3. Existing effects on Indigenous groups' perceptions of the quality of marine resources, as provided in the baseline summaries, were considered in the Current Use analysis (refer to EIS Section 32.2.6.3, p. 32-108; EIS Section 32.2.6.4, p. 32-111; MSA Section 9.5.5.1, p. 9.5-135; and AIMSA Section 7.3.3). Refer to Appendix IR10-A of CEAR Document #1275 for group-specific assessments in relation to availability and quality of Current Use resources (specifically, line items IR10-06 and IR10-13 in each group's assessment table).

The VFPA has reiterated its views on the effectiveness of mitigation measures proposed or suggested to address potential effects on Current Use in relation to the Project and marine shipping associated with the Project in the responses to IR10-09, IR10-11, IR10-12, and IR10-17 (CEAR Document #1275). For reasons discussed in those responses, the VFPA remains of the view that there will be no residual effects on Current Use for any Indigenous group with the implementation of the proposed or suggested measures. Such measures include, but are not limited to, the protection of the availability and quality of resources.

As specifically discussed in the responses to IR10-06 (Part 5) and IR10-13 (Part 3(a)(ii)) of CEAR Document #1275, and reflected in other responses within Package 10 and Package 13, a cumulative effects assessment was only carried out when a residual adverse effect of the Project or marine shipping associated with the Project was predicted and the residual adverse

[3] CEAR Document #930 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Additional Information on the WSÁNEC Nation requested by the Canadian Environmental Assessment Agency on January 13, 2016 (See Reference Document #383).
[4] CEAR Document #572 From the Vancouver Fraser Port Authority to the Review Panel re: Response to the Additional Information to the Marine Shipping Addendum on the Musqueam First Nation and Tsleil-Waututh Nation requested by the Canadian Environmental Assessment Agency on January 13, 2016 (See Reference Document #383) (NOTE: Title of post updated February 16, 2017).
[5] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).

effect was considered likely to interact cumulatively with the effects of other projects and activities that have been or will be carried out.

As no residual effects on Current Use resource availability or quality are identified in the responses within Package 10, a cumulative effects assessment is not required.

IR13-23 Current Use of Lands and Resources for Traditional Purposes – Availability of Preferred Resources – Crab; Cumulative Effects Assessment

Information Source(s)

EIS Volume 5: Section 32

Proponent Response to Follow-up Additional Information Requirements of December 4, 2015 (CEAR 388): IR13

CEAR 997

CEAR 1208

Review Panel Information Request Package 10 (CEAR 1130)

Context

As presented in Section 32 of the EIS, the Proponent proposed expanding the existing navigational closure area (NCA) by 352.9 ha. While the proposed extension to the NCA would not apply to crab harvesting for domestic or Food, Social and Ceremonial (FSC) purposes by Indigenous groups, it would apply to Indigenous groups or persons harvesting under commercial (including communal commercial) licenses.

FSC crab harvesting is permitted both within and outside the NCA. In section 32 of the EIS, the Proponent concluded that the expansion of the NCA would be beneficial to Indigenous groups harvesting crab within the Local Assessment Area for FSC purposes due to the exclusion of commercial and recreational harvesters, and therefore there would be no measurable residual effect.

However, several Indigenous groups expressed concern with the Proponent's conclusion. The Tsleil-Waututh Nation and the Penelakut Tribe noted that the future ability to harvest due to changes in access during construction and operation is an issue. The Tsawwassen First Nation concluded that the gain in area available for FSC crab harvesting comes at the expense of high quality habitat that would be lost to the Project terminal. The Tsawwassen First Nation indicated this is a preferred crab harvesting location for FSC fishermen and that the proposed configuration of the expanded NCA does not adequately offset the loss in FSC harvesting opportunity and catch.

Information Request

For each applicable Indigenous group listed in Attachment 2 and in consideration of Package 10, provide:

- an assessment of proposed Project effects on applicable Indigenous groups' ability to harvest crab for Food, Social and Ceremonial (FSC) purposes;

- an assessment of the past changes on Indigenous groups' ability to harvest crab for FSC purposes; and,
- the proposed mitigation measures and their effectiveness to maintain the availability of these resources based on ongoing discussions with Indigenous groups and Fisheries and Oceans Canada.

Where there is a residual effect on current use identified in response to Package 10, provide a cumulative effects assessment which includes how the Project and its associated marine shipping, in combination with past, present, and future increases in shipping activities have the potential to affect Indigenous harvesting activities. Include a discussion on the perception in the change to risk in safety and security related to this experience.

VFPA Response

The VFPA wishes to clarify that the proposed navigational closure expansion (proposed closure) was one of several measures proposed by the VFPA in EIS Section 32.2.7.1 to address potential effects on access to current use of lands and resources for traditional purposes (Current Use) locations as a result of the Project, including for the purposes of harvesting crab for domestic or food, social, and ceremonial (FSC) reasons. The proposed closure was therefore not the sole reason for the conclusion of no residual effect in relation to domestic/FSC access. Moreover, the VFPA wishes to clarify previous responses to information requests (e.g., AIR-12.04.15-29 and AIR-12.04.15-30 of CEAR Document #388[1]) that explained that the measures presented in EIS Section 32.2.7 were intended to be considered in the aggregate,[2] meaning that, in terms of the ability to harvest crab for domestic/FSC purposes, measures related to access to crab harvesting locations, as well as the availability and quality of crab and experience of harvesting at those locations, were all taken into consideration when drawing conclusions for each Indigenous group (i.e., originally presented in EIS Section 32.2.6, p. 32-100, and reiterated in AIR-12.04.15-30, Table AIR30-1 (CEAR Document #388)).

The VFPA notes that Indigenous group perspectives of past changes on their ability to harvest crab at Roberts Bank were included in the group-specific existing conditions summaries in EIS Section 32.2.4, Additional Information to the EIS – *WSÁNEĆ* Nation (AIEIS, CEAR Document #930[3]) Section 7.2.4, Marine Shipping Addendum (MSA) Section 9.5.4, and Additional

[1] CEAR Document #388 From Port Metro Vancouver to the Canadian Environmental Assessment Agency re: Completeness Review - Responses to Additional Information Requirements Follow-Up (See Reference Document # 345) including 22 Technical Data Reports.
[2] For example, the response to AIR-12.04.15-29 states "The mitigation approach applied to the Current Use assessment recognises the strong interrelationships across all Current Use indicators for Current Use; therefore, the proposed measures are intended to be applied in the aggregate" (p. 18). The response to AIR-12.04.15-30 states "All four [Current Use] indicators were selected to assess potential effects that could lead to… a change in activity or outcome levels (i.e., changes in access, availability or quality of resources, or quality of experience), and that could therefore potentially compromise the traditional or cultural purposes underlying that use" (p. 3).
[3] CEAR Document #930 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Additional Information on the WSÁNEC Nation requested by the Canadian Environmental Assessment Agency on January 13, 2016 (See Reference Document #383).

Information to the MSA – Musqueam First Nation and Tsleil-Waututh Nation (AIMSA, CEAR Document #572[4]) Section 7.2.[5]

As discussed in the response to IR13-20 and reiterated in the response to IR13-21, the assessment of the potential effects of the proposed Project on Current Use access to preferred locations (including, as it relates to this information request, domestic/FSC crab harvesting locations), and quality of experience (e.g., perception of risks to safety and security) while at these locations, was presented in EIS Sections 32.2.6.1 and 32.2.6.4 and AIEIS Sections 7.2.6.1 and 7.2.6.4. As reviewed in the responses to IR10-06 (Part 3) and IR10-07 of CEAR Document #1275[6], existing access/displacement effects were considered in the evaluation of Project-related effects on access to Current Use locations for domestic or FSC harvesting, as well as indirect socio-economic consequences as a result of those potential access effects. Refer to Appendix IR10-A of CEAR Document #1275 for group-specific assessments in relation to access and quality of experience (specifically, line items IR10-06, IR10-07, and IR10-08 in each Table 1-A and Table 1-B Indigenous group's assessment table).

The VFPA has reiterated its views on the effectiveness of mitigation measures proposed or suggested to address potential effects on Current Use in relation to the Project in the responses to IR10-09, IR10-11, and IR10-12 (CEAR Document #1275). For reasons discussed in those responses, the VFPA remains of the view that there will be no residual effects on Current Use for any Indigenous group with the implementation of the proposed measures, including but not limited to the ability to harvest crab for domestic/FSC purposes at preferred locations.

As specifically discussed in the responses to IR10-06 (Part 5; CEAR Document #1275), and reflected in other responses within Package 10 and Package 13, a cumulative effects assessment was only carried out when a residual adverse effect of the Project was predicted and the residual adverse effect was considered likely to interact cumulatively with the effects of other projects and activities that have been or will be carried out.

As no residual effects on the ability of Indigenous groups to harvest crab for domestic or FSC purposes are identified in the responses within Package 10, a cumulative effects assessment for Current Use that includes discussion of changes in Indigenous harvesting activities is not required.

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[4] CEAR Document #572 From the Vancouver Fraser Port Authority to the Review Panel re: Response to the Additional Information to the Marine Shipping Addendum on the Musqueam First Nation and Tsleil-Waututh Nation requested by the Canadian Environmental Assessment Agency on January 13, 2016 (See Reference Document #383) (NOTE: Title of post updated February 16, 2017).

[5] As many Indigenous groups listed in Attachment 2 were considered in multiple filings (i.e., EIS/MSA, EIS/AIMSA, MSA/AIEIS), their perspectives of past changes on the ability to harvest crab for FSC purposes at Roberts Bank may be included in the MSA or AIMSA, especially where that information had not been previously reported in the EIS.

[6] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).

IR13-24 Current Use of Lands and Resources for Traditional Purposes – Availability of Preferred Resources – Marine Mammals; Cumulative Effects Assessment

Information Source(s)

EIS Volume 3: Section 14.6.1.3

EIS Volume 5: Section 32.2.4.2

Marine Shipping Addendum: Section 9.5.5.1

Review Panel Information Request Package 10 (CEAR 1130)

Malahat First Nation Submission to the Review Panel (CEAR 621)

Musqueam Indian Band Submission to the Review Panel (CEAR 776)

T'Sou-ke First Nation Submission to the Review (CEAR 1107)

Pacheedaht First Nation Submission to the Review Panel (CEAR 1118)

Context

The Proponent, in Section 32 of the EIS, stated that the effect of a change in the availability of marine mammals for current use activities is negligible and therefore it was not considered further in the assessment.

However, the majority of Indigenous groups reported hunting marine mammals as a past activity and indicated that they would like to resume hunting mammals in the future. The Pacheedaht First Nation and the Ditidaht First Nation continue to consider harvesting of whales an important cultural practice.

In addition, numerous Indigenous groups have strong cultural and spiritual ties to marine mammals. For example:

- The T'Sou-ke First Nation indicated that Southern Resident Killer Whales are an integral part of their customs, practices, traditions, and spirituality;
- The Pacheedaht First Nation and the Ditidaht First Nation consider whales an important part of their culture;
- The Malahat First Nation consider whale viewing in Segment B a current cultural practice; and,
- The Tsleil-Waututh First Nation indicated a deep cultural or spiritual connection that past, current, and future members may have with marine mammals.

Musqueam First Nation indicated that seal and sea lion meat is valued as a food source, and whiskers have important ceremonial functions. However, at present, the meat of the seals is

high in pollutants. Resuming the harvest of marine mammals, while desired, is dependent on contamination and conservation concerns being alleviated.

Information Request

In addition to the information requested in Package 10 provide the following for each applicable Indigenous group in Attachment 2:

Where there is a residual effect on marine mammals that may be tied to current use, including effects to resources, cultural practices, or experience identified in response to Package 10, provide a cumulative effects assessment which includes:

- the effect on marine mammals from the existing terminals, increasing vessel traffic, restrictions due to contamination and conservation concerns, recovery strategies and associated action plans, and management plans;
- a discussion of how the proposed Project and its associated marine shipping, in combination with past, present, and future increases in shipping activities may impact the quality of an Indigenous group's current use experience relating to cultural practices and harvesting of marine mammals;
- a discussion of changes to availability of marine mammals; and,
- a discussion on changes to perception of risks to safety and security and access to marine mammal harvesting locations.

VFPA Response

The VFPA notes that reports by Indigenous groups of the cultural and spiritual importance of marine mammals for traditional purposes—including but not limited to their value as a food source and for ceremonial functions—were included in the existing conditions (baseline) summaries of each Indigenous group's current use of lands and resources for traditional purposes (Current Use) in the EIS (EIS Section 32.2.4), Additional Information to the EIS – *W*SÁNEĆ Nation (AIEIS, CEAR Document #930[1]; AIEIS Section 7.2.4), Marine Shipping Addendum (MSA; MSA Section 9.5.4), and Additional Information to the MSA – Musqueam First Nation and Tsleil-Waututh Nation (AIMSA, CEAR Document #572[2]; AIMSA Section 7.2). This information was presented under the 'Marine Mammal' subsection of each of these summaries, which also included Indigenous group perspectives on factors contributing to changes over time in their use of marine mammals, such as declines in their numbers and quality, as well as their desire to resume marine mammal harvesting. The VFPA notes that these perspectives included but were not limited to the specific concerns noted in the context to this information request.

[1] CEAR Document #930 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Additional Information on the WSÁNEC Nation requested by the Canadian Environmental Assessment Agency on January 13, 2016 (See Reference Document #383).
[2] CEAR Document #572 From the Vancouver Fraser Port Authority to the Review Panel re: Response to the Additional Information to the Marine Shipping Addendum on the Musqueam First Nation and Tsleil-Waututh Nation requested by the Canadian Environmental Assessment Agency on January 13, 2016 (See Reference Document #383) (NOTE: Title of post updated February 16, 2017).

As noted in the responses to IR10-06 and IR10-13 of CEAR Document #1275[3] (as well as related responses, including IR10-16 of CEAR Document #1275), these summaries contain the extent of information known to the VFPA, or that the VFPA is in a position to provide, regarding each Indigenous group's past, present, and desired future use, including as it relates to marine mammals.

As noted in the response to IR13-20, the assessment of the potential Project-related effects on Current Use access to and quality of experience at preferred Current Use locations (i.e., in relation to risks to safety and security), was presented in the EIS Sections 32.2.6.1 and 32.2.6.4 and AIEIS Sections 7.2.6.1 and 7.2.6.4. The assessment of the potential effects on Current Use access to, and quality of experience at, preferred locations in the marine shipping area was presented in MSA Section 9.5.5 and AIMSA Section 7.3.

As noted in the response to IR13-22, the assessment of the potential effects of the Project on the availability and quality of Current Use resources (including marine mammals), was presented in EIS Section 32.2.6 and AIEIS Section 7.2.6.[4] The assessment of the potential effects of marine shipping associated with the Project on the availability and quality of Current Use resources (including marine mammals) was presented in MSA Section 9.5.5 and AIMSA Section 7.3.

Indigenous groups' perspectives on existing effects on the availability and quality of marine mammals, and on each Indigenous group's access to marine mammal harvesting locations, their quality of experience while harvesting at those locations (including changes in perception of risks to safety and security), as well as on other cultural practices associated with marine mammals—as provided in the baseline summaries—were considered in the Current Use analysis (refer, for example, to EIS Section 32.2.6.1, p. 32-101, with regard to access to marine mammal harvesting locations; EIS Section 32.2.6.2, p. 32-107, with regard to availability of marine mammals for harvesting and for ceremonial use; EIS Section 32.2.6.3, p. 32-108, with regard to quality of marine mammals for consumption; EIS Section 32.2.6.4, p. 32-111, with regard to perceptions of risk to safety and security; and MSA Section 9.5.5.1, pp. 9.5-132 to 9.5-134, for an extended discussion of the importance of marine mammals to Indigenous groups and potential Project-associated shipping effects). Refer to Appendix IR10-A of CEAR Document #1275 for group-specific assessments in relation to access to Current Use locations, availability and quality of Current Use resources, and quality of experience, including cultural considerations linked to access and the availability and quality

[3] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).

[4] The assessment of the potential effects of the Project and marine shipping associated with the Project on the availability and quality of marine mammals for traditional purposes took into account the results of the marine mammals assessment. Information on potential residual and cumulative effects from the Project and Project-associated shipping to marine mammals were presented in EIS Section 14.0, Schedule 13-4 of AIR-12.04.15-13 (CEAR Document #388), MSA Section 8.2, and information responses to the Review Panel (IR5-53 of CEAR Document #1159 and IR5-37 of CEAR Document #1167).

of resources (see line items IR10-06 through IR10-08 and IR10-13 through IR10-16 in each group's assessment table).

The VFPA has reiterated its views on the effectiveness of mitigation measures proposed or suggested to address potential effects on Current Use in relation to the Project and marine shipping associated with the Project in the responses to IR10-09, IR10-11, IR10-12, and IR10-17 (CEAR Document #1275). For reasons discussed in those responses, the VFPA remains of the view that there will be no residual effects on Current Use for any Indigenous group with the implementation of the proposed or suggested measures, including but not limited to in relation to the protection of the availability and quality of resources, as well as access to and quality of experience at locations associated with those resources.

As specifically discussed in the responses to IR10-06 (Part 5) and IR10-13 (Part 3(a)(ii)) of CEAR Document #1275, and reflected in other responses within Package 10 and Package 13, a cumulative effects assessment was only carried out when a residual adverse effect of the Project or marine shipping associated with the Project was predicted and the residual adverse effect was considered likely to interact cumulatively with the effects of other projects and activities that have been or will be carried out.

As no residual effects on Current Use access, resource availability or quality, or quality of experience are identified in the responses within Package 10, a cumulative effects assessment is not required.

IR13-25 Current Use of Lands and Resources for Traditional Purposes – Quality of Current Use Experience, Cumulative Effects Assessment

Information Source(s)

Marine Shipping Addendum: Section 9.5

EIS Guidelines – Section 9.1.8

Review Panel Information Request Package 10 (CEAR 1130)

CEAR 233

CEAR 672

CEAR 1150

Context

In submissions received by the Panel, Indigenous groups raised concerns with respect to cumulative effects on the quality of their current use experience and noted that cumulative effects on the current use experience from existing projects and activities are already at an unacceptable level, so that any additional effects would further degrade already unacceptable conditions.

- The Musqueam First Nation reported increasing vessel traffic has led to more vessel interactions, loss of fishing gear, and safety concerns; and,
- The Malahat First Nation noted the potential for further cumulative impacts on the quality of current use experience within the marine shipping area through changes to light, noise, or air emissions and increased risk to safety on water.

The Pacheedaht First Nation's fishers on Swiftsure Bank noted that on calm foggy days, waves generated by passing vessels can create unanticipated boat motions, creating the threat of capsize, injury from falls inside the boat, or falling outside the vessel. Fishers therefore must take measures (radar, extreme vigilance, avoid fishing in fog, altering traditional fishing methods, as well as avoidance of traditional fishing areas), and accept heightened risk in order to engage in traditional fishing activities at Swiftsure Bank. Pacheedaht fishers have indicated they seldom bring elders or youth with them to Swiftsure Bank, which has deteriorated the traditional intergenerational transfer of knowledge concerning fishing at the Bank.

In consideration of the above, a cumulative effects assessment on impacts to Indigenous current use quality of experience for both the Project Area and the marine shipping area associated with the Project is required.

Information Request

In addition to the information requested in Package 10, provide the following for each applicable Indigenous group in Attachment 2:

- a discussion of effects on the quality of current use experience resulting from past changes in marine shipping activities; and,
- a discussion of how increases in shipping as a result of the proposed Project or the marine shipping associated with the Project, in combination with past, present, and future increases in activity has the potential to affect the quality of an Indigenous group's current use experience including perception of sense of place, or sensory environment or, changes to risks to safety and security related to this experience.

Where there is a residual effect on current use in response to Package 10, provide a cumulative effects assessment which includes a discussion on changes to sense of place, perception of risks to safety and security, sensory environment, and on quality of current use experience.

VFPA Response

The VFPA notes that reports by Indigenous groups that existing shipping-related effects on the quality of their experience while engaged in current use of lands and resources for traditional purposes (Current Use) are at an unacceptable level—including but not limited to the specific reports identified in the context to this information request—were included in the group-specific existing conditions summaries of Current Use in EIS Section 32.2.4, Additional Information to the EIS – *W*SÁNEĆ Nation (AIEIS, CEAR Document #930[1]) Section 7.2.4, Marine Shipping Addendum (MSA) Section 9.5.4, and Additional Information to the MSA – Musqueam First Nation and Tsleil-Waututh Nation (AIMSA, CEAR Document #572[2]) Section 7.2.

The assessment of the potential effects of the proposed Project on the quality of Current Use experience—specifically, in relation to this information request, changed sense of place, risks to safety and security (e.g., from increased vessel traffic on the water), and sensory disturbance from light, noise, vibration—was presented in EIS Section 32.2.6.4 and AIEIS Section 7.2.6.4. The assessment of the potential effects of marine shipping associated with the Project on the quality of Current Use experience—specifically, under the headings noise, light, and air quality considerations, safety considerations, and cultural landscape considerations—was presented in MSA Section 9.5.5 and AIMSA Section 7.3. Refer to

[1] CEAR Document #930 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Additional Information on the WSÁNEC Nation requested by the Canadian Environmental Assessment Agency on January 13, 2016 (See Reference Document #383).
[2] CEAR Document #572 From the Vancouver Fraser Port Authority to the Review Panel re: Response to the Additional Information to the Marine Shipping Addendum on the Musqueam First Nation and Tsleil-Waututh Nation requested by the Canadian Environmental Assessment Agency on January 13, 2016 (See Reference Document #383) (NOTE: Title of post updated February 16, 2017).

Appendix IR10-A of CEAR Document #1275[3] for group-specific assessments in relation to the quality of Current Use experience (i.e., line items IR10-08 and IR10-15 in each group's assessment table).

The VFPA has acknowledged in responses to information requests in Package 10 that Indigenous groups have said that any additional effects on their Current Use, whether as a result of the Project and/or marine shipping associated with the Project, would further degrade already unacceptable conditions (e.g., see response to IR10-06 and IR10-13 of CEAR Document #1275, which are cross-referenced in the responses to IR10-08 and IR10-15 of CEAR Document #1275 relating to the quality of Current Use experience).

The VFPA has reiterated its views on the effectiveness of mitigation measures proposed or suggested to address potential quality of experience effects on Current Use as a result of the Project and marine shipping associated with the Project in the responses to IR10-09, IR10-11, IR10-12, and IR10-17 (CEAR Document #1275). For reasons discussed in those responses, the VFPA remains of the view that there will be no residual effects on Current Use for any Indigenous group with the implementation of the proposed or suggested measures.

As specifically discussed in the responses to IR10-06 (Part 5) and IR10-13 (Part 3(a)(ii)) of CEAR Document #1275, and reflected in other responses within Package 10 and Package 13, a cumulative effects assessment was only carried out when a residual adverse effect of the Project or marine shipping associated with the Project was predicted and the residual adverse effect was considered likely to interact cumulatively with the effects of other projects and activities that have been or will be carried out.

As no residual effects on the quality of Current Use experience are identified in the responses within Package 10, a cumulative effects assessment is not required.

[3] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).

IR13-26 Accidents and Malfunctions: Fate of Oil Spills

Information Source(s)

EIS Volume 5: Section 30, Appendix 30-B

Marine Shipping Addendum: Section 10, Appendix 10-B

Transport Canada Response to IR-14 (CEAR 1204)

Review Panel Information Requests IR11-03 (CEAR 1179)

Context

As part of Transport Canada's response to information request TC IR-14 (CEAR 1204), Natural Resources Canada provided the following observation with respect to its review of Appendix 30-B of the EIS and Appendix 10-B of the Marine Shipping Addendum:

"[…] there was little discussion of how the variability of heavy oil properties (e.g. viscosity, density etc.) affect the variability of the fate and behaviour of the oils (e.g. sinking behaviour of bunker fuel or dispersion of diesel fuel etc.) over the range of water environments reported by the proponent."

In Package 11 (CEAR 1179), IR11-03 "Accidents and Malfunctions - Effects Assessment, Potential Contaminant Release" requested additional information on the characteristics of contaminants potentially released, including the types of pathways of effect to environmental components and the potential effects associated to spills. IR11-03 was requested to consider how the range of water temperatures and salinities in the marine shipping area would influence the fate and behaviour of spills.

Information Request

In response to IR11-03, include a discussion on the variability in the fate and behaviour of potentially released contaminants, including oils, in relation to the range of water temperatures and salinities in the marine shipping area.

Clarify how variability in oil physical properties, and hence behaviour in the marine environment relates to response strategies for the water environments within the marine shipping area, as well as potential persistence in the environment.

VFPA Response

In response to IR11-03, include a discussion on the variability in the fate and behaviour of potentially released contaminants, including oils, in relation to the range of water temperatures and salinities in the marine shipping area.

The response to IR11-03 includes a discussion on the variability in the fate and behaviour of potentially released hazardous and noxious substances, as well as oils, in relation to the range of water temperatures and salinities in the marine shipping area.

Clarify how variability in oil physical properties, and hence behaviour in the marine environment relates to response strategies for the water environments within the marine shipping area, as well as potential persistence in the environment.

Sections 3.1.1 and 3.1.2 in Marine Shipping Addendum (MSA) Appendix 10-B describe the physical and chemical properties and likely fate and behaviour of light and heavy fuel oils in the marine environment, respectively. The response to IR11-04 provides an overview of light versus heavy fuel oil characteristics, including a comparison of the potential environmental effects of light versus heavy fuel spills based on the persistence[1] of a spill, as well as severity (i.e., acute toxicity and mechanical injury). As documented in EIS Appendix 30-B, the persistence of heavy fuel oil on the sea surface would cause it to travel further than light fuel oils. The unique features and conditions of the environment where an oil spill takes place have been identified as being at least as important as the type of oil in determining effects on aquatic ecosystems (refer to the response to IR11-04 for more information), and also in determining the response strategy.

Response strategies would consider the type of oil spilled and expected behaviour based on environmental conditions at the time of the incident and in the days that follow, as well as the sensitivity of the environment at and proximal to the spill location (including areas down-wind and down-current). As outlined in the response to IR11-04, control and containment of an oil spill are the first response priorities, followed by the implementation of Geographic Response Strategies, which are used during the first 24 hours of a response to protect sensitive areas threatened by an oil spill. For more information on the Geographic Response Strategies being developed under Western Canada Marine Response Corporation's[2] Coastal Response Program, refer to the response to IR11-04.

[1] Length of time the spilled oil is known to (or likely to) persist in a variety of habitat types.
[2] WCMRC is the Transport Canada-certified marine response organisation on Canada's west coast. Their mandate is to ensure there is a state of preparedness in place when a marine spill occurs and to mitigate the impacts on B.C.'s coast. This includes the protection of wildlife, economic and environmental sensitivities, and the safety of both responders and the public.

IR13-27 Accidents and Malfunctions – Concept of Resilience, Marine Commercial Use and Current Use of Lands and Resources for Traditional Purposes

Information Source(s)

EIS Volume 2 : Section 8.1.7

MSA Volume 1 : Section 6.6

MSA Volume 2: Section 10.5.9.6; Section 10.5.10.6; Section 10.5.13.4

Context

In Section 10 of the MSA, the Proponent evaluated two worst-case scenarios of container ships associated with the proposed Project:

- Hard grounding resulting in a spill; and,
- Collision between a container ship and a small vessel

The Panel notes that the Proponent made extensive use of the concept of resilience as context to assess residual environmental effects resulting from these scenarios on Marine Commercial Use and Current Use components. In Section 10.5.9.6, resilience was defined as the potential for communities to effectively adapt to stress and adversity. The Proponent stated that a major difference between Indigenous and non-Indigenous communities in the marine shipping area associated with the proposed Project, based on past experiences, could be in their resilience.

In consideration of the existing Canadian and International regulatory framework, the roles of governments and the vessel traffic management frameworks, the context for the collision scenario was considered by the Proponent to be resilient for all marine commercial use sub-components in Section 10.5.10.6. However, the Proponent considered that, in the event a potentially affected commercial vessel is owned by a member of an Indigenous community or operated under an Indigenous commercial fishery association or society, any business revenue reductions due to a collision experienced by the commercial user could also be experienced at the community level to varying degrees. Since the broader community may be highly reliant on the revenues generated by the affected commercial vessel, there could be varying degrees of economic resilience at the community level from a collision.

In Section 10.5.13.4, the Proponent considered the effects on current use resulting from an oil spill to be not resilient after considering the context. This was associated with constraints in using alternative marine areas of equal value and quality and, undertaking collaborative planning, arrangements, compensation, and agreements to reduce effects to acceptable levels. With regards to a collision leading to damage or loss of a vessel or gear, the Proponent considered that the context may range from resilient to not resilient, depending on the capacity of the affected Indigenous group to absorb damage to or loss of a vessel or gear.

Changes to current use for Indigenous populations from a hypothetical heavy fuel oil spill resulting from a ship grounding and from the collision scenario were both determined to be significant. However, there was no assessment for non-Indigenous fishing communities or, an indication as to which Indigenous communities would be resilient or not.

Although the Proponent applied the approach to determining significance as per the Canadian Environmental Assessment Agency Guidelines throughout the EIS and MSA, there was no discussion as to why resilience could be used in the effects assessment for human components, such as the ones above, or an elaboration as to which Indigenous and non-indigenous communities were considered resilient or not.

Information Request

Substantiate the use of resilience in effect assessment of human components.

Discuss how differences in resilience exist within and between Indigenous and non-Indigenous populations who use the marine shipping area associated with the proposed Project.

Based on available socio-economic studies, provide a discussion of the adaptability of users of the marine environment to post-accident scenarios presented in the MSA.

In the case of the evaluation of the scenario of a collision between a Project-associated ship and a small vessel, indicate based on past experience, for which Indigenous and non-Indigenous groups the effect would be considered non-resilient and the associated socio-economic reasons.

VFPA Response

Substantiate the use of resilience in effect assessment of human components.

The consideration of context when characterising residual effects and determining the significance of any adverse residual effects has been an element of assessment methodology in Canada since at least the enactment of the first *Canadian Environmental Assessment Act* (*CEAA*) in 1992. The original *Responsible Authority's Guide* (CEA Agency 1994) directed practitioners to consider ecological context among other criteria when determining significance. The original Reference Guide, *Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects* (FEARO 1994), clarified the consideration of context, stating the following:

> *"The adverse environmental effects of projects may be significant if they occur in areas or regions that:*
>
> - *have already been adversely affected by human activities; and/or*
> - *are ecologically fragile and have little* ***resilience to imposed stresses****."* [emphasis added]

This guidance remained in effect until the enactment of *CEAA 2012*. The new guidance pursuant to *CEAA 2012*, including both the Operational Policy Statement (OPS), *Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under* CEAA 2012, and the Technical Guidance of the same name expanded the concept of context to include both ecological and ***social*** context, clearly intending context to be

considered in relation to effects on both the natural and human environment. The OPS acknowledges that context "may help better characterize whether adverse effects are significant" (CEA Agency 2015, p.5). Further, the current OPS and Technical Guidance reiterates the criteria (i.e., magnitude, extent, timing, frequency, duration, and reversibility) that must be considered when evaluating residual adverse effects and determining significance *for each potentially affected valued component (VC)* (not limited to biophysical VCs). The OPS explicitly refers to "resiliency of the VC and surrounding area to change (for example, considering whether especially vulnerable aspects of the VC are affected)" in relation to magnitude and also recognises the influence on reversibility of "resilience of a VC to imposed stresses and the degree of existing stress on that VC" (CEA Agency 2015, p.9, 11). From this, it is clear that resilience is a factor that should be considered in relation to the residual effect characterisation and determination of significance for both natural and human environment VCs.

This long-standing practice is reflected in the project-specific guidance for the Project. Sections 2.4 and 10.1.1 of the *Updated EIS Guidelines* require the proponent to demonstrate that all aspects of the project have been examined and planned with regard to, among other things, "system tolerance and ***resilience***." Section 13.1.1 of the *Updated EIS Guidelines* specifies the elements that should be used in reaching conclusions on the significance of residual effects, including, among other things, ecological and ***social context***. The methodology used in the assessment of the Project and of Project-associated marine shipping is based on this guidance and was used to assess the effects on *all* VCs and current use of lands and resources for traditional purposes (Current Use), including components of both the natural and human environment.

Discuss how differences in resilience exist within and between Indigenous and non-Indigenous populations who use the marine shipping area associated with the proposed Project.

Based on available socio-economic studies, provide a discussion of the adaptability of users of the marine environment to post-accident scenarios presented in the MSA.

In the case of the evaluation of the scenario of a collision between a Project-associated ship and a small vessel, indicate based on past experience, for which Indigenous and non-Indigenous groups the effect would be considered non-resilient and the associated socio-economic reasons.

The context to the information request states at the end of the first full paragraph:

> *"In [Marine Shipping Addendum (MSA)] Section 10.5.9.6, resilience was defined as the potential for communities to effectively adapt to stress and adversity. The Proponent stated that a major difference between Indigenous and non-Indigenous communities in the marine shipping area associated with the proposed Project, based on past experiences, could be in their resilience."*

The VFPA notes that the language within the information request appears to assume that the description of resilience used in MSA Section 10.9.5.6 in relation to human health was (or should have been) used as the basis for resilience in the effects assessments for the other human components. Consequently, it also appears to assume that all human components

should have elaborated on which Indigenous and non-Indigenous communities were considered resilient or not, and specifically by asking the VFPA to discuss these differences and identify specific groups.

For clarity, MSA Section 10.5.9.6 contains the residual effects assessment and significance determination for the human health VC only. The resilience referred to in that section was specifically related to health resilience, not to resilience of other human components. As noted in EIS Section 8.1.7 and MSA Section 6.6, which describe the methods of the assessment used in the EIS and MSA, the context within which residual effects on a VC are expected to occur was described in the effects assessment for each VC (refer also to the first part of the response to this information request, which substantiates the use of resilience in relation to context for both natural and human components).

Accordingly, for residual effects of marine shipping associated with the Project on users of the marine environment, this component-specific context is described in MSA Sections 10.5.9.6 (human health), 10.5.10.6 (marine commercial use), 10.5.11.6 (outdoor recreation), and 10.5.13.4 (Current Use). The discussions of context within each of these sections consider existing vulnerabilities that could make certain Indigenous or non-Indigenous populations or communities, or sub-groups or individuals within those populations or communities, more or less resilient to and, where required, more or less able to adapt to Project-associated shipping effects on those specific human components. These existing vulnerabilities, which exist in both Indigenous and non-Indigenous populations and communities, include but are not limited to:

- The degree to which a particular user group or individual may rely on components of the natural or human environment that may be affected by marine shipping associated with the Project, as well as the purpose (and number of different purposes) of reliance on these components (e.g., food, cultural expression, personal income, business revenue, personal or group well-being, transportation);
- The degree to which these purposes are already stressed for particular collectives or individuals; and
- Existing structural (e.g., health, social, economic) inequities within and between Indigenous and non-Indigenous populations and communities that may magnify effects for certain populations, communities, sub-groups, or individuals (impact inequity).

In the event of an accident or malfunction, the extent to which these existing vulnerabilities may be stressed for a given population, community, sub-group, or individual will depend on the specific facts of an actual event, including but not limited to the location of the event.[1]

[1] For the hypothetical heavy fuel oil spill scenario, the VFPA identified a specific location for the purposes of assessing potential effects on all natural and human components. As outlined in the responses to IR11-10 (CEAR Document #1328) and IR11-12, for the hypothetical scenario involving a hard grounding resulting in a spill of heavy fuel oil, the effects assessments presented in the MSA for this scenario are representative of the potential significance of effects to biophysical components (which are linked to human components) for a spill elsewhere in the marine shipping area or in other environmental

The accidents and malfunctions assessment was designed to evaluate the effects of a probable worst-case scenario on natural and human components, not the effects of every possible scenario in multiple locations. The results of the scenarios evaluated are considered representative of the potential significance of effects to natural and human components at the component level, recognising that existing vulnerabilities within and between Indigenous and non-Indigenous populations may make certain Indigenous and non-Indigenous users of the marine environment more or less resilient to these effects.

For example, while there is limited comparative quantitative information available on socio-economic aspects of resilience across potentially affected Indigenous and non-Indigenous communities in the marine shipping area, publicly available socio-economic (census) data supports the VFPA's understanding that Indigenous users of the marine environment could potentially experience higher levels of vulnerability (given existing vulnerabilities discussed above) and, in turn, lower levels of socio-economic resilience in the event of a collision or heavy fuel oil spill, compared to the general population of marine users in the marine shipping area. This understanding was factored into the conclusions of the effects assessments for human components that considered both Indigenous and non-Indigenous users of the marine environment (i.e., human health, marine commercial use, outdoor recreation).

With regard to Indigenous groups specifically, during consultation on marine shipping associated with the Project, Indigenous groups expressed the view that a heavy fuel oil spill could occur anywhere along the established shipping lanes within the marine shipping area, which is overlapped by the traditional territory or otherwise defined area of use for each Table 1-C and Table 1-D Indigenous group identified in Attachment 2 to Information Request Package 13. As reviewed in the response to IR10-13 (CEAR Document #1275[2]), Indigenous groups have expressed the view that their ability to engage in use of lands and resources for traditional purposes in their traditional territories or otherwise defined areas of use is already significantly affected by marine shipping and other factors, and that they lacked capacity to effectively adapt or respond to residual effects of a fuel spill on their Current Use, signalling a lack of resilience.

Based on these perspectives provided by Indigenous groups to the VFPA, as well as the response of Indigenous groups to spills in other regions (e.g., the grounding and sinking of the *Queen of the North*, as referenced in MSA Section 10.5.13, pp. 10-145 to 10-146), the VFPA conservatively predicted a significant residual effect on the Current Use of all Table 1-C and Table 1-D Indigenous groups as a result of either a spill or collision (i.e., the VFPA presumed a lack of resilience at the group level to the residual effects of either). For similar reasons, as reviewed in the response to IR12-03 (CEAR Document #1275), the VFPA also

conditions. A specific location was not identified for the hypothetical collision scenario, which was only considered in the effects assessment of the human components.

[2] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).

conservatively considered the significant residual effect of a spill on human health via the food security pathway to apply to all Table 1-C and Table 1-D Indigenous groups.

As the foregoing explains, resiliency, adaptability, and response characteristics to a spill or collision will depend on the specific facts of an actual event, which, although unlikely to occur, could occur anywhere in the marine shipping area. As it is not possible to evaluate every potential event, the VFPA is only in a position to predict resiliency to a residual effect of a hypothetical accident or malfunction, including a collision, at a general level for each human component that considered such effects on users of the marine environment, as originally presented in the assessments of those human components in MSA Section 10.5 and clarified in this response.

References

Canadian Environmental Assessment Agency (CEA Agency). 1994. The Canadian Environmental Assessment Act: Responsible Authority's Guide. Canadian Environmental Assessment Agency. Hull, Quebec. November 1994. 216pp.

Canadian Environmental Assessment Agency (CEA Agency). 2015. The Operational Policy Statement: Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under the Canadian Environmental Assessment Act, 2012. Available at https://www.canada.ca/content/dam/ceaa-acee/documents/ops/ops-determining-designated-project-likely-cause-significant-adverse-environmental-effects-2015.pdf. Accessed November 2018.

Federal Environmental Assessment Review Office (FEARO). 1994. A Reference Guide for the Canadian Environmental Assessment Act: Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects. Prepared by the Federal Environmental Assessment Review Office. November 1994. 16pp.

IR13-28 Project Design – Sea-Level Rise – Environmental Effects

Information Source(s)

EIS Volume 5: Section 31.2.6.1

Roberts Bank Terminal 2 Metocean Desktop Study (CEAR 1223)

Amendment Sections 3.5 and 3.6 "Flood Hazard Area Land Use Management Guidelines" (2018)

Vadeboncoeur, N. (2016): Perspectives on Canada's West Coast region; *in* Canada's Marine Coasts in a Changing Climate, (ed.) D.S. Lemmen, F.J. Warren, T.S. James and C.S.L. Mercer Clarke; Government of Canada, Ottawa, ON, p. 207-252.

Context

In EIS Subsection 31.2.6.1 (Sea Level Rise – Mitigation of Sea Level Rise Effects), the Proponent states, *"As described in Section 4.2.1: Project Description, Marine Terminal, the Project's preliminary design provides for a net sea-level rise of 0.5 meters which takes into account the projected 1.0 meter sea level rise adopted by the Province of British Columbia (Ausenco-Sandwell 2011) while accounting for the drop in sea level in the area associated with settlement (0.5 m) that is anticipated to occur in the same time frame (see EIS Appendix A-4 Basis of Design)"*.

On January 1, 2018, the amended *"Flood Hazard Area Land Use Management Guidelines"* (FHALUM) came into effect for all coastal projects in British Columbia. These new guidelines represent the current best practices in construction and incorporate a sea level rise of 1.0 meters at year 2100 in project design and, are supported by the technical document Vadeboncoeur (2016).

The Panel requires information regarding how risk would be managed if the Proponent does not follow the amended B.C. guidelines.

Information Request

Provide the rationale that supports the selection of the 0.5 meter relative sea level rise adjustment as technically acceptable, given that the amended Flood Hazard Area Land Use Management (FHALUM) guidelines identify a global sea level rise of 0.5 meters by 2050 and 1.0 meter by 2100 relative to the year 2000.

Demonstrate that the flood construction levels and setbacks were established using one of the two methods, (Probabilistic or Combined methods), as outlined in the FHALUM guidelines. Or, alternatively, that the method used in the EIS provides the same result as the FHALUM guidelines methods.

Describe the potential environmental effects resulting from a catastrophic failure of the Project's shoreline structures and facilities (terminal, causeway and tug basin) in the case of an extreme weather event and, based on a project design that assumes a 0.5 meter sea level rise adjustment. Identify the mitigation measures required to prevent any potential environmental effects and their effectiveness.

Indicate whether using a 1.0 meter relative sea level rise adjustment versus the 0.5 meter adjustment at year 2100 would result in any changes to Project (including terminal, causeway and tug basin) design.

Assess any resulting environmental effects from a change in Project design to allow for the 1.0 meter relative sea level rise adjustment.

VFPA Response

Provide the rationale that supports the selection of the 0.5 meter relative sea level rise adjustment as technically acceptable, given that the amended Flood Hazard Area Land Use Management (FHALUM) guidelines identify a global sea level rise of 0.5 meters by 2050 and 1.0 meter by 2100 relative to the year 2000.

The 2018 updated Flood Hazard Area Land Use Management (FHALUM) guidelines are not directly applicable to RBT2. The FHALUM guidelines are intended to help local governments, land-use managers, and approving officers involved in land use planning[1] where more site-specific studies or information is not available (B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development 2018). Further, since the FHALUM guidelines are primarily concerned with public safety and minimising property damage to the immediate and surrounding communities during flooding events, a more conservative approach is taken in the guidance for mitigating sea level rise (SLR) risks than is appropriate for a stand alone industrial facility such as RBT2.

To manage future risks associated with SLR, a long-term staged risk-based approach will be followed by the VFPA for the Project. This approach is consistent with similar developments in other areas of the world, including the Port of Los Angeles, Port of Long Beach, and Port of San Francisco.

The VFPA's risk-based approach to managing SLR for the Project involves the current design that has accommodated up to 0.5 m of SLR, together with the ability to implement SLR mitigation modification measures that would be capable of accommodating SLR of 1 m or more. Such SLR mitigation modification measures could be required as soon as between 2050 and 2070, based upon the current understanding of SLR rates.

Potential measures that could be implemented to mitigate effects arising from SLR include the following:

[1] As outlined in the FHALUM guidelines, the guidelines are applicable to sea level rise planning areas, including those exposed to coastal flood hazards, dyked areas, and inland floodplains adjacent to tidally influenced rivers where potential flood levels will be increased by sea level rise.

a) **Wave Walls:** It is expected additional and higher wave walls along the eastern, southern, and western perimeter of the terminal will be required to mitigate against flooding. An example of such a structure is included in Reference Design Drawing No. 602875593-MA-216 in EIS Appendix 4-B. These walls are expected to be approximately 0.5 m to 1 m high, and constructed of concrete or other suitable material. These walls will be relatively simple additions to the current terminal design, and could be added, replaced, or raised without footprint-related effects to the marine environment.
b) **Larger Linear Drain Outlets:** It is expected that larger drains, especially along the wharf face, will be required to adequately handle the potential increase in water volume in the future. To facilitate this, the drainage portals through the caissons will be initially oversized relative to the immediate volume requirements.
c) **Building Slab Heights:** It is expected the RBT2 terminal buildings constructed for industrial use will meet the specific needs of the initial terminal operator lessee. It is expected that these buildings will be upgraded or replaced with new structures to meet the specific needs of the terminal operator lessee in the 2050s (and beyond) and will integrate the current understanding of SLR at that time.
d) **Additional Fill:** The intermodal rail yard on the terminal and rail and road infrastructure on the widened causeway could be raised with additional fill material and ballast. If this is required in the future, it will likely also be necessary to raise the existing causeway. Raising the causeway (existing and widened sections) to a consistent single elevation would eliminate operational, safety, and drainage issues associated with a stepped causeway (i.e., two elevation heights).
e) **Wet-design Elements:** Equipment and electrical infrastructure such as duct banks, manholes, and in-ground connector pits on the terminal can be designed to accommodate a wet environment with short-term temporary flooding, inundation, or spray. Electrical connections that must be installed in below-ground locations can be fully waterproofed to make them immune to flooding problems and safe to operate under temporary flooding conditions. This is common practice today on terminals throughout the world. While the terminal would not operate during a severe storm (e.g., cranes stowed during high winds), these temporary terminal shut-downs are industry norms and have a negligible overall economic effect. Terminal equipment is expected to be replaced or updated around the 2050 timeframe (i.e., when the original equipment nears the end of its useful life) and appropriate modifications could be made, if necessary, at this time.

The current terminal and causeway designs allow for all or some of these feasible measures to be implemented as required further along in the Project life, such as in the 2050s. None of these SLR mitigation measures would increase the Project footprint or adversely affect the marine environment.

Demonstrate that the flood construction levels and setbacks were established using one of the two methods, (Probabilistic or Combined methods), as outlined in the FHALUM guidelines. Or, alternatively, that the method used in the EIS provides the same result as the FHALUM guidelines methods.

Setbacks for RBT2 have been established using the 2011 B.C. Ministry of Environment *Guidelines for Management of Coastal Flood Hazard Land Use* (Ausenco-Sandwell 2011), as described in the RBT2 Metocean Desktop Study (CEAR Document #1223[2]). The method outlined by Ausenco-Sandwell (2011) is the same as the Combined Method in the FHALUM guidelines. As a result, the location of all occupied buildings adopted in the Project design exceed the 15 m minimum setback requirements stated in the FHALUM guidelines.

The terminal wharf deck and building slab design elevations were determined by a B.C. registered professional engineer experienced in coastal engineering. The FHALUM guidelines (section 4.3) state an exemption from strict Flood Construction Levels (FCLs) for marine terminals: "On-loading and off-loading facilities associated with water-oriented industry…do not require floodproofing". Notwithstanding, further refinement of the final deck and slab elevations will occur during detailed design, but changes are not expected to be material. As indicated above, SLR mitigation measures will be incorporated at the appropriate time in the Project life to manage flood risks.

Describe the potential environmental effects resulting from a catastrophic failure of the Project's shoreline structures and facilities (terminal, causeway and tug basin) in the case of an extreme weather event and, based on a project design that assumes a 0.5 meter sea level rise adjustment. Identify the mitigation measures required to prevent any potential environmental effects and their effectiveness.

A catastrophic failure at RBT2 from 1 m of SLR is not considered plausible based on selected design criteria. The RBT2 buildings and overpass structure are designed to withstand forces arising from an A2475 seismic event. The wharf structure is designed to withstand forces arising from an A1000 event, as well as loads created from the berthing of an 18,000 twenty-foot equivalent unit (TEU) vessel and loads created from the simultaneous mooring of an 18,000 TEU and two 12,000 TEU container vessels. While wave loading is not strictly comparable to seismic, or berthing or mooring loads, wave loading on the structure will be considerably lower than these much larger governing design forces.

Wave overtopping associated with major storms may cause some maintenance issues; however, repairs resulting from the effects of flooding would generally be considered within the realm of the standard maintenance program. As noted above, wet-design elements are proposed to accommodate localised flooding from wave over-topping. To reiterate discussion above, under no circumstances is a catastrophic failure to the Project's shoreline structures from 1 m SLR in combination with an extreme weather event predicted.

[2] CEAR Document #1223 From the Review Panel Secretariat to the Review Panel re: Roberts Bank Terminal 2 Metocean Desktop Study.

Indicate whether using a 1.0 meter relative sea level rise adjustment versus the 0.5 meter adjustment at year 2100 would result in any changes to Project (including terminal, causeway and tug basin) design.

As described above in the response to the first part of this information request, design adjustments for the terminal to accommodate 1 m SLR could include a combination of measures: additional and/or higher wave walls, larger drains, increased building slab heights, additional fill, and wet-design elements. Adjustments to raise the surface elevation of the causeway would include the addition of fill and/or ballast material.

Design adjustments to the tug basin infrastructure to accommodate 1 m SLR are not expected, as it is a floating dock structure. The floats would rise with elevated water levels and the ramp angle would flatten under such conditions. Longer support piles may be needed to avoid the floats from surpassing the height of the pile during extreme events; this will be evaluated during detailed design. These surface and near surface installations or modifications on the terminal or causeway would not increase the Project footprint.

Assess any resulting environmental effects from a change in Project design to allow for the 1.0 meter relative sea level rise adjustment.

As indicated above, the footprints of Project components (terminal, widened causeway, expanded tug basin) will not change as a result of future potential modifications for mitigating higher water levels associated with SLR. Any design modifications are anticipated to occur from and on the land surfaces of the terminal and causeway. Therefore, the environmental effects assessments presented in the EIS and updated in the Project Construction Update (CEAR Document #1210[3]) will not change with such modifications.

References

Ausenco-Sandwell. 2011. Climate Change [Adaptation] Guidelines for Sea Dikes and Coastal Flood Hazard Land Use: Guidelines for Management of Coastal Flood Hazard Land Use. Prepared for B.C. Ministry of Environment. Available at http://www.env.gov.bc.ca/wsd/public_safety/flood/pdfs_word/guidelines_for_mgr_coastal_flood_land_use-2012.pdf. Accessed September 2018.

B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2018. Flood Hazard Area Land Use Management Guidelines. Available at https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/integrated-flood-hazard-mgmt/flood_hazard_area_land_use_guidelines_2017.pdf. Accessed September 2018.

[3] CEAR Document #1210 From the Vancouver Fraser Port Authority to the Review Panel re: Project Construction Update (See Reference Document #995) (NOTE: Updated June 13, 2018).

IR13-29 Environmental Management Plans – Clarifications

Information Source(s)

EIS Volume 5: Section 33.2; Section 33.3.1; Section 33.4.1

Proponent Response to Additional Information Requirements of July 31, 2015, IR12 (CEAR314)

Context

For the construction Compliance Monitoring Plan, the Proponent proposed routine compliance checks of sample collection of measurable parameters at specific locations, their frequencies and durations.

In Section 33.3.1 of the EIS, the Proponent underlined that procedures for the construction environmental monitor, a qualified and independent third-party individual, would be empowered for the intervention in the case of non-compliance, or likely non-compliance with legal requirements or Environmental Monitoring Plans (EMPs). This would include protocols for the environmental monitor and the contractor's collaboration in 'adaptively managing identified issues' (pg.33.6). In Section 33.2 of the EIS, the Proponent stated that the monitors would have the authority to issue stop-work orders if construction activities are deemed to be in non-compliance with the conditions of the proposed Project approvals or requirements contained within the Construction EMPs or, if potentially significant adverse environmental effects are observed.

Clarification is required on the definition of the nature of 'adaptively managing identified issues', the thresholds observed (frequency of exceedances of legal requirements, exemption to conditions of the Project permit, etc.) that would determine stop-work orders.

For the operation Compliance Monitoring Plan, the Proponent reported in Section 33.4.1 of the EIS that its development would be through the Terminal Operator Concessionaire's consultation with the Proponent, the federal agencies, Indigenous groups, the public, and stakeholders, as necessary. The Operation EMP would describe the environmental monitoring and reporting framework in order to verify compliance with the terms and conditions of Project approval and other legislation, industry standards, regulatory requirements, and in accordance with the other sub-plans of the Operation EMP.

To ensure that the Operation EMP objectives are met, it is expected that the Terminal Operator Concessionaire would appoint a qualified individual(s), deemed satisfactory by the Proponent, to oversee the execution of the plan and report on its implementation.

The plan would outline the approach with respect to the scope of monitoring activities to be taken or overseen by the appointed individual(s), including but not limited to the following:

- "Scheduled site inspections to evaluate, rectify, and enhance any mitigation measures being implemented in the field, as well as potential unscheduled inspections as part of auditing as appropriate;
- Routine and event-driven sample collection for the analysis of all Operation EMP parameters to assess if activities are causing any regulatory exceedances..."

There are no specific provisions for stop-work orders in the operation Compliance Monitoring Plan. Further, clarification is required on the activities intended to rectify mitigation measures being implemented in the field and details with respect to their enhancement. Clarification is also needed as to how the Operation EMP and sub-plans without Canadian or provincial regulatory standards would be monitored.

Information Request

Identify the nature of actions involved to 'adaptively manage identified issues', including exemptions to conditions of the Project permit.

Present the situations and the environmental components (Intermediate and Valued Components) during construction that would trigger stop-work orders.

For the operation phase, describe the activities intended to 'evaluate, rectify, and enhance' the mitigation measures being implemented in the field. Identify if these activities, and which ones, would be immediate or on a long-term basis.

Clarify measures to be taken for monitoring the operation environmental management sub-plan which do not have Canadian or provincial regulatory standards.

VFPA Response

Identify the nature of actions involved to 'adaptively manage identified issues', including exemptions to conditions of the Project permit.

The VFPA has committed, as described in Section 33.0 of the EIS and corresponding sections, to developing a comprehensive and robust Construction Environmental Management Plan (EMP) and Operation EMP to protect human and environmental health and safety. These plans, described in Sections 33.3 and 33.4 of the EIS, respectively, are supported by a number of sub-plans, including compliance monitoring plans. At this point in the environmental assessment process, details of the Construction EMP and Operation EMP, including compliance monitoring are not available. While the VFPA has started to engage with Indigenous groups and regulators to develop the content of the plans, these discussions are in the early stages (as discussed in the response to IR10-11 of CEAR Document #1275[1]). In developing detailed plans, the VFPA has committed to the following:

- Meaningfully engaging and consulting with Indigenous groups during the drafting of the EMPs and sub-plans, including the Compliance Monitoring Plans;

[1] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).

- Working with regulators and stakeholders in the drafting of the EMPs and sub-plans, including the Compliance Monitoring Plans;
- Working with the Contractor's lead environmental monitors to oversee the implementation of the management plans and sub-plans to ensure compliance, enforcement, and effective correction actions are effectively addressed;
- Incorporating conditions in the EMPs and sub-plans from permits and authorisations that have not yet been issued; and
- Reflecting in the plans the most recent guidelines and standards in environmental management as close to the anticipated construction date as possible.

Consequently, due to the aforementioned commitments, and as standard practice for major development projects in this phase of assessment, the Construction or Operation EMPs and associated sub-plans, including Compliance Monitoring Plans, continue to be developed with appropriate consultation inputs, considerations, and evaluation. However, the VFPA anticipates, based on standard practice, to make available the details of the EMPs and associated sub-plans prior to construction or operation, respectively, as noted in Section 33.2 in the EIS. Further discussion on the development of the RBT2 Follow-up Program and the long-term approach to adaptive management for the Project is provided in the response to IR10-11 (CEAR Document #1275) and the VFPA's forthcoming response to IR13-30.

Present the situations and the environmental components (Intermediate and Valued Components) during construction that would trigger stop-work orders.

The drafting of the EMPs will be informed by the EIS and subsequent work completed during the sufficiency stage to ensure that monitoring captures and addresses Project-specific effects. An important component of EMPs and effective construction environmental management is clearly articulating roles and responsibilities and ensuring key personnel have the authority to issue stop-work orders. Stop-work orders are issued when a regulatory non-compliance, and/or adverse human health or environmental effect cannot be rectified without halting the source or cause. At this time, the details of the Construction EMP and associated Compliance Monitoring Plans are not yet developed, including details on the situations and the environmental components (intermediate and valued components) during construction that would trigger stop-work orders. However, the VFPA assures the Review Panel that the RBT2 Construction Compliance Monitoring Plan will clearly describe the roles and responsibilities for issuing stop-work orders; the nature within which they would be issued; and any exemptions.

The Construction Compliance Monitoring Plan will provide additional detail in relation to commitment 3.4 made within EIS Table 35-2, which states "[The VFPA] will ensure the construction Environmental Monitor has the authority to issue stop-work orders if construction activities are deemed to be in non-compliance with the conditions of Project approvals or requirements contained within the Construction EMP, or if potentially significant adverse environmental effects are observed." The additional details will describe how the VFPA will grant the authority to key personnel to halt any works or activities that have the potential to lead to non-compliance with regulatory requirements and/or adverse effects to the environment or human safety risk.

For the operation phase, describe the activities intended to 'evaluate, rectify, and enhance' the mitigation measures being implemented in the field. Identify if these activities, and which ones, would be immediate or on a long-term basis.

Compliance monitoring (via the Compliance Monitoring Plan) and mitigation effectiveness monitoring (via the Follow-up Program), during operation as during construction, will inform adaptive management. Monitoring results will assist with determining, through systematic evaluation, when additional or revised measures are required to rectify and/or enhance current mitigation measures to achieve the outcomes predicted in the EIS, or when additional or revised measures are required to ensure compliance with the terms and conditions of Project approval and other legislation, industry standards, and with the other sub-plans of the Construction or Operation EMPs. As noted in Section 33.2 of the EIS, the Operation and Construction Compliance Monitoring Plans will describe the locations, frequencies, and durations of the compliance activities. Due to the Project planning timeline and consultation commitments described above and in the response to IR10-12 (CEAR Document #1275) the plans are not available at this time. However, the VFPA has demonstrable experience in 'adaptively managing identified issues' and a corporate mandate under the *Canada Marine Act* to, among other things, protect the environment.

The adaptive management strategy (AMS) for the Deltaport Third Berth Project (DP3) is one such example, and is discussed in detail in response to IR10-11 (CEAR Document #1275), which had as one of its objectives to monitor the effectiveness of mitigation measures and identify and rectify unforeseen project effects.[2] As requested, a specific example of the program's ability to 'evaluate, rectify and enhance,' the DP3 AMS program detected a small scale, localised change related to DP3 construction behind the tug basin. Construction had restricted drainage in this area resulting in poor water quality as detected through monitoring, which in turn affected adjacent eelgrass. As an outcome of construction monitoring, this issue was detected and the adaptive measure of installing a swale in the tug basin berm mitigated the drainage and water quality issues in this area. Subsequent monitoring results indicate that the eelgrass has recovered.

Clarify measures to be taken for monitoring the operation environmental management sub-plan which do not have Canadian or provincial regulatory standards.

In addition to monitoring compliance with regulatory requirements, standards, and any project conditions included in the decision statement, the Compliance Monitoring Plans will include monitoring of the implementation of mitigation measures within the EMPs and sub-plans, including mitigation that may not be directly related to regulatory requirements. Measures not directly related to regulatory standards may include measures addressing typical environmental management, health and safety management, as well as measures as raised during consultation by Indigenous groups, regulators, and stakeholders.

[2] As discussed in the response to IR10-11 (CEAR Document #1275), the Canadian Environmental Assessment Agency guidance on Follow-up Program adaptive management measures references DP3 as a case study (CEA Agency 2009).

References

Canadian Environmental Assessment Agency (CEA Agency). 2009. Operational Policy Statement. Adaptive Management Measures under the *Canadian Environmental Assessment Act*. Available at https://www.ceaa-acee.gc.ca/Content/5/0/1/50139251-2FE4-4873-B6A1-A190C103333D/Adaptive_Management_Measures_under_the_CEAA.pdf. Accessed September 2018.

IR13-30 Compilation of Environmental Management Plans, Mitigation Measures, and Follow-Up Programs

Information Source(s)

Proponent Response to Additional Information Requirements of July 31, 2015 (CEAR 314): IR12

EIS Volume 5: Section 33, Appendix 33-A; Section 35, Table 35-1 and Table 35-2

EIS, Mitigation Sections (various)

Marine Shipping Addendum, Mitigation Sections (various)

Proponent Responses to Panel Information Requests (various)

Proponent further Commitment(s) during Public Hearing

Context

The Proponent has provided information on environmental management plans, which often include mitigation measures as well as elements of follow-up programs. This information is found in numerous locations, including but not limited to, the mitigation sections of each chapter within the main text of the EIS, Section 33 and Appendix 33-A of the EIS, Table 35-1 and Table 35-2 of Section 35 of the EIS, and the response to information request IR12 of CEAR 314. Information was also provided in response to the Review Panel's information requests. A compilation of this information would assist the Review Panel and participants to the environmental assessment of the Project and marine shipping associated with the Project in having comprehensive information on mitigation and follow-up measures for the proposed Project.

In many cases, the measures presented as part of the various environmental management plans were described as mitigation measures, however, they are often in actuality elements of a follow-up program. Under the *Canadian Environmental Assessment Act, 2012*, mitigation measures are defined as measures for the elimination, reduction or control of the adverse environmental effects of a designated project and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means. A follow-up program is a program for (a) verifying the accuracy of the environmental assessment of a designated project, and (b) determining the effectiveness of any mitigation measures.

For example, although compliance monitoring was listed as a mitigation measure in Table IR12-A of the response to IR12 (CEAR 314), this would fall under a follow-up program.

Therefore, mitigation measures and follow-up programs should be presented separately for each environmental component of the proposed Project and marine shipping associated with the Project to facilitate the Review Panel's analysis of potential environmental effects. Where mitigation measures and elements of a follow-up program were tied to an environmental

management plan or other plans, such as the Offsetting Plan, the Proponent should specify in which environmental management plan they are anticipated to be found.

The intent of this information request is to generate a comprehensive and up-to-date compilation of the information provided by the Proponent regarding mitigation measures and follow-up programs. It is understood that information will continue to be provided in response to the Panel's information requests and future commitments made by the Proponent, such as during Public Hearing. Therefore, completion of this information request will be an iterative process but should be finalized for the final session of the Public Hearing.

Information Request

Using the attached templates, provide a compilation of the mitigation measures for each environmental component (both intermediate and valued components) affected by the proposed Project (Attachment #3) and marine shipping associated with the Project (Attachment #4). Include mitigation measures that reduced the adverse effect to a negligible residual adverse effect.

Using the attached templates, provide a compilation of the elements of a follow-up program that are to be applied for each environmental component affected by the proposed Project (Attachment #5) and marine shipping associated with the Project (Attachment #6).

VFPA Response

Clarification

The VFPA wishes to clarify and distinguish between the following terms presented in the context of this information request: environmental management plans, compliance monitoring, and the Follow-up Program.

Environmental Management Plans

Environmental management plans (EMPs) are documents that describe the management practices that will be implemented during construction and/or operation to avoid, reduce, or eliminate or control environmental effects and protect human health. As described in the response to IR13-29, RBT2 construction and operation EMPs will be developed based on input received during the panel review process and into the permitting stage, including input received through engagement with Indigenous groups and regulators. The Construction and Operation Environmental Management Plans described in Section 33.3 and 33.4 of the EIS, respectively, will include a number of sub-plans, including compliance monitoring plans for construction and operation as discussed below.

Construction and Operation Compliance Monitoring Plans

Based on the Canadian Environmental Assessment Agency's (CEA Agency's) policy and guidance, environmental monitoring (referred to in previous guidance as compliance monitoring) is defined as:

> *"periodic or continuous surveillance or testing of one or more environmental components according to a pre-determined schedule. Monitoring is usually*

conducted to determine the level of compliance with stated requirements, or to observe the status and trends of a particular environmental component over time" (CEA Agency 2015).

In the VFPA's view, construction and operation compliance monitoring plans comprise mitigation because they generate information about whether prescribed management practices are being implemented, and whether components of the receiving environment are within prescribed limits, so that pre-defined corrective action can be taken. Thus, the implementation of compliance monitoring plans, and associated corrective actions, serve to avoid or reduce Project-induced changes to intermediate components (ICs), thus mitigating potential consequential impacts to receptor valued components (VCs).

The VFPA and its contractors will conduct a wide range of compliance monitoring to verify adherence with legislation, Decision Statement requirements, permits and authorisations, EMPs, etc. As an example, this type of compliance monitoring is typically undertaken with respect to emissions or discharges from a project to ensure components of the receiving environment, usually ICs such as water or air quality, remain within or comply with applicable regulatory thresholds, guidelines, or standards (or limits that may be set in permits, licences, and approvals). Compliance monitoring consists primarily of standard and well-proven practices. The implementation of compliance monitoring generally serves to *increase* confidence that mitigation measures will be effective, as they inform adaptive management, indicating when additional measures are required to achieve compliance.

Follow-up Program

As noted in the context to this information request, a Follow-up Program (FUP) under the *Canadian Environmental Assessment Act* (*CEAA*)*, 2012 is* "a program for *verifying the accuracy* of the environmental assessment of a designated project, and determining the *effectiveness* of any mitigation measures" (emphasis added). A FUP is focused on confirming predictions, after mitigation is applied, of Project-related effects to VCs, "particularly in areas where scientific uncertainty exists in the prediction of effects", as stated in section 10.1.1 of the Project *EIS Guidelines*. A FUP may also be designed to monitor the implementation of mitigation measures resulting from engagement with Indigenous groups, as stated in section 11.4 of the *EIS Guidelines*. A monitoring element as part of a FUP involves field measurements of a variety of parameters that collectively confirm predictions made about a VC or aspects of that component. Where results from a monitoring element, as part of the FUP, indicates a material adverse departure from predictions, an adaptive management approach is employed that considers whether additional or modifications to existing mitigation measures are required to reduce unanticipated effects for consistency with predictions.

In summary, the Construction Compliance Monitoring Plan (EIS Section 33.3.1) is separate and distinct from the RBT2 FUP (EIS Section 33.5). Nevertheless, as noted in EIS Section 33.5, the RBT2 FUP document will provide a "description of where the RBT2 construction or operation monitoring program overlaps with the Follow-up Program's objectives, noting any logistical or empirical synergies".

Overview of Response Approach

Since the submission of the EIS, the VFPA has continued to work on evaluating and identifying mitigation measures, and evaluating RBT2 FUP elements, to reflect updated project design; the results of and information from additional studies completed since EIS submission; submissions to the CEA Agency Registry, and information received during consultation and engagement with Indigenous groups, regulators, and stakeholders.

The information presented in this response represents the most up-to-date information regarding proposed or suggested mitigation measures and FUP elements and thus supersedes all other information presented previously. Nevertheless, as noted by the Panel, the tables appended to this response should be considered draft as they remain a work in progress and will be updated based on new information received, and ongoing and future evaluation.

The VFPA will provide the Panel with updated tables for mitigation and FUP elements prior to the Panel Hearing to reflect any further changes as a result of ongoing consultation, evaluation, and planning appropriate for the Project phase. The VFPA is also undertaking the additional step of advancing the mitigation measures to be stated as clear, measurable Project commitments in advance of the Panel Hearing, as noted above. This will provide further clarity for Panel members, Indigenous groups, agencies, and other parties about the mitigation that the VFPA will implement to avoid, reduce, or eliminate adverse effects of construction and operation of the Project. Currently, the mitigation measures are presented in 'environmental assessment level' language as is typical for this phase of the Project. The VFPA will work to develop specific, measurable, achievable, realistic, and timebound (S.M.A.R.T) mitigation measures in advance of the hearings.

The body of this response includes a summary of input received from Indigenous groups to date, including at the recent Indigenous Advisory Forum, a summary of the changes to mitigation measures and FUP elements since EIS and Marine Shipping Addendum (MSA) submission, and explanatory notes related to the VFPA's approach to presenting requested information in the appendices referenced. The requested information is provided in the following appendices:

- **Appendix IR13-30-A –** A compilation of mitigation measures and other commitments pertaining to the RBT2 Project;
- **Appendix IR13-30-B –** A compilation of mitigation measures and other commitments pertaining to marine shipping associated with the Project; and
- **Appendix IR13-30-C –** A compilation of FUP elements pertaining to the RBT2 Project.

The VFPA has not identified any FUP elements for marine shipping associated with the Project, as it is outside the care and control of the VFPA, as outlined in the response to IR10-20 (CEAR Document #1275[1]. As such, Attachment 6 of Information Request Package 13: *Template for*

[1] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).

Use in Compiling Information on the Follow-up Program for Marine Shipping Associated with the Project has not been included in this response. However, the VFPA is engaged in a number of regional and multi-stakeholder initiatives related to marine shipping, as described below.

Input from Indigenous Advisory Forum

As noted in the responses to IR10-11 and 10-12 (CEAR Document #1275), the VFPA has engaged with, and will continue to engage with, Indigenous groups concerning mitigation measures and FUP elements related to the Project.

In September 2018, the VFPA hosted a two-day Indigenous Advisory Forum (IAF), at which input was sought on proposed mitigation and FUP elements related to four topics: marine mammals, marine fish, crabs, and human health. These priority topics were selected based on feedback provided by Indigenous groups in advance of the IAF. The VFPA sought input on improvements, refinements, and additions to the mitigation measures and FUP elements described in the EIS, and those suggested and posted to the registry since submission of the EIS. Changes and refinements made based on input received at the IAF are referenced within the two sub-sections that follow.

Summary of Changes to Mitigation Measures

Compilations of mitigation measures for the RBT2 Project, and marine shipping associated with the Project, are presented in tables in **Appendix IR13-30-A** and **Appendix IR13-30-B**, respectively. The measures in these tables include refinements to the mitigation measures proposed in the EIS and MSA documents, as well as additional proposed mitigation commitments presented in responses to information requests submitted to date. The refinements represent the VFPA's current commitments, which supersede those described in the EIS and MSA. Refinements and additional commitments have been included based on consideration of input from regulators, Indigenous groups, and stakeholders. Changes to proposed mitigation measures include, but are not limited to, the following:

- Additional detail on specific mitigation measures for coastal birds, as detailed in the response to IR9-01 and IR9-02 (CEAR Document #1322[2]);
- Additional detail on marine mammal observation plan, as detailed in the responses to IR5-49 (CEAR Document #1167[3]) and IR5-50 (CEAR Document #1172[4]); and
- Additional detail on crab salvage mitigation, based on feedback from Indigenous groups.

[2] CEAR Document #1322 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR9-01 to IR9-04, IR10-01, IR10-27, IR10-28, IR11-06, IR11-24, IR12-08, and IR12-12 (See Reference Documents #1122, 1130, 1179, and 1206).
[3] CEAR Document #1167 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR5-37, IR5-42, IR5-48, IR5-49, IR5-51, IR5-52, IR6-30 and IR8-10 (See Reference Documents #975, #991 and #1071).
[4] CEAR Document #1172 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR5-50, IR7-07, IR7-33, IR7-34, IR7-35, and IR7-43 (See Reference Documents #975 and #1000).

Summary of Changes to Follow-up Program Elements

The draft FUP elements presented in **Appendix IR13-30-C** are preliminary and will continue to be updated and revised to reflect new information and input from ongoing engagement and consultation, and will also reflect conditions stipulated within approvals and permits, if and when issued. As the Panel notes, the RBT2 FUP is a work in progress and thus will continue to be developed and refined pre- and post-Panel Hearing through to the start of the construction phase, should the Project proceed.

As part of the continued evolution of the environmental assessment process, the VFPA has been evaluating and examining the initial proposed FUP program, as described in Appendix 33-A of the EIS, to ensure it focuses on remaining uncertainties with the Project's effect predictions and effectiveness of mitigation. An evaluation of the proposed FUP elements has considered updated information on revised Project design; additional information obtained from field studies, literature, or other sources; and the conservatism applied in the assessment of effects or application of mitigation. The evaluation also carefully considered whether each proposed FUP element could effectively serve to meet one or both of the defined purposes of a FUP (i.e., to verify the accuracy of the effect predictions and/or to determine the effectiveness of a mitigation measure). This was examined by first confirming whether a change in the environmental component or specific parameter of interest could be quantitatively measured and secondly whether the measured change could then be isolated and causally linked and attributed to the Project (i.e., to confirm a change—or effect—was caused by the Project). If either of these requirements is not met, then a FUP element cannot fulfill the purpose of a FUP as defined by *CEAA 2012*. Based on additional work completed since submission of the EIS, many of the FUP elements submitted within the EIS remain the same and some of the elements of the FUP have been modified. The description of the proposed FUP elements is provided within the table in **Appendix IR13-30-C**. A summary of changes to proposed FUP elements is provided below by VC, as applicable.

Marine Vegetation

The proposed FUP for marine vegetation is now focused on eelgrass and intertidal marsh, for the reasons explained below.

Appendix 33-A of the EIS proposed a FUP element to monitor changes in biofilm assemblage composition due to predicted changes in salinity with the Project. Since the submission of the EIS, between 2016 and 2018, three years of additional biofilm baseline studies were conducted to test the assumption that salinity affects biofilm assemblage composition, specifically that there are different freshwater and marine-influenced biofilm communities each with different levels of energetic value (i.e., fatty acid abundance). Although undertaken while the environmental assessment process is ongoing, these additional studies perform the same function as a FUP as they were designed to verify the underlying effect pathway and hence the effect prediction that salinity affects biofilm assemblage composition. Data collected and analysed from 2016 and 2017 provide concrete evidence that biofilm is adapted to

different salinity conditions in an estuarine environment (CEAR Document #1110[5] and CEAR Document #1215[6]). Moreover, there is no difference in biofilm community composition across the salinity gradient within the local assessment area (LAA) during spring freshet (i.e., the period of lower salinity conditions). Hence, there is no evidence that biofilm assemblages and composition differ under different and highly varied salinity gradients during the spring freshet contrary to what was previously believed. Lastly, with additional years of salinity monitoring, the VFPA has more confidence that the predicted salinity changes attributable to the Project will not result in biofilm productivity differing from the range currently experienced naturally under existing salinity conditions, as comparable levels of biofilm have been documented in freshwater habitats close to the Fraser River and marine habitats close to the Roberts Bank causeway (~3 km away) (CEAR Documents #1110 and #1215). It is expected that the 2018 biofilm results will be shared to the registry at the end of November 2018.

In summary, the results of the additional field studies to date have increased our confidence that salinity changes attributed to the Project will not change biofilm assemblage composition, contrary to the prediction previously described in EIS Sections 11.8 and 11.9. The residual effect prediction on biofilm assemblage composition described in the EIS is now considered conservative. With the aim of focusing the Project FUP where scientific uncertainty exists, the intent of a FUP element designed to verify the effect prediction of Project changes in biofilm assemblage composition, as proposed in EIS Appendix 33-A, has been met with the additional salinity and biofilm studies (2016-2018). However, it is proposed that a FUP with respect to prey availability for western sandpiper be conducted, which would include monitoring of biofilm as prey for that species, as described below.

As with biofilm, eelgrass and intertidal marsh provide ecologically important habitats in the LAA. The VFPA acknowledges the concerns communicated by Indigenous groups, during ongoing consultation and engagement (including at the recent IAF), of the potential loss or degradation of eelgrass habitats, and the possibility of cascading effects to eelgrass-dependent species, if the Project were to proceed. The VFPA is confident in the negligible residual effects prediction for native eelgrass and the effectiveness of proposed avoidance and reduction mitigation measures, including offsetting. Onsite offsetting in the form of eelgrass habitat creation is proposed to mitigate potential effects to other VCs that depend on eelgrass, such as marine invertebrates, marine fish, and coastal birds—this offset will also benefit marine vegetation, as acknowledged in Section 11.7.2.2 of the EIS. The VFPA is proposing a FUP element to evaluate the effectiveness of eelgrass offsetting, as part of mitigation effectiveness monitoring, to address concerns expressed by Indigenous groups, as previously mentioned. This monitoring element will provide the opportunity to adaptively manage for any unforeseen losses of transplanted eelgrass habitat as RBT2 is constructed and operating.

[5] CEAR Document #1110 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Request IR8-04 (See Reference Document #1071).
[6] CEAR Document #1215 From the Vancouver Fraser Port Authority to the Review Panel re: Additional Information in Response to Information Request IR8-04 - 2017 Biofilm Dynamics Technical Data Report (See Reference Documents #1071 and #1110).

Similar to eelgrass effects predictions, the VFPA is confident in the prediction of a net increase in intertidal marsh productivity with the Project as well as in the effectiveness of proposed avoidance and reduction mitigation measures. Further, onsite offsetting in the form of marsh habitat creation is proposed to mitigate potential effects to other VCs that depend on marsh, such as marine invertebrates, marine fish, and coastal birds—this offset will also benefit marine vegetation, as acknowledged in Section 11.7.2.2 of the EIS. However, the VFPA acknowledges the concerns expressed by Environment and Climate Change Canada (ECCC) on the registry (CEAR Documents #1109[7] and #1146[8]), pertaining to the effectiveness of offsetting and, in response, proposes a FUP element to evaluate the effectiveness of intertidal marsh creation, as part of mitigation effectiveness monitoring. Results of the monitoring element will inform the need for any adaptive management, if required.

Coastal Birds

The VFPA is proposing FUP elements for western sandpipers and barn owls and is currently evaluating whether a Project-specific FUP element for diving birds is warranted. Each of these sub-components is discussed below.

Western Sandpipers

The VFPA is confident in the prediction of negligible residual effects to shorebirds with the Project in place, including effects to prey availability (i.e., biofilm and benthic macroinvertebrates). Since the submission of the EIS, confidence in the effects prediction has increased based on the additional extensive empirical studies (including the 2016-2017 additional biofilm studies) and modelling (i.e., 2016-2017 biofilm modelling, as well as the existing shorebird foraging opportunity modelling) that provide evidence that the LAA will continue to be able to support current and historic population levels of migrating western sandpipers with the Project in place. Results from the additional research have documented high biofilm-associated fatty acid levels (including omega-3 fatty acids) across the salinity gradient in areas known to be intensively used by western sandpipers. These studies have confirmed over two years that the primary factor positively influencing fatty acid abundances was the time mudflats were exposed (i.e., not inundated), with water column salinity playing a secondary role. As the Project will not affect the tidal cycle, this research adds further support that biofilm will continue to be able to support western sandpipers if the proposed Project is constructed. Nevertheless, the VFPA recognises the value and importance of food sources to migrating shorebirds and the ecological importance of Roberts Bank, the Project setting, in providing important stopover and overwintering habitat along the Pacific flyway. The VFPA also acknowledges the perceived concerns raised by ECCC in the prediction of negligible residual effects to shorebirds, most notably western sandpipers, as a result of predicted changes in abundance of biofilm and benthic invertebrates (CEAR Document

[7] CEAR Document #1109 From Environment and Climate Change Canada to the Review Panel re: Response to an Information Request issued by the Review Panel on October 12, 2017 (See Reference Document #1070).
[8] CEAR Document #1146 From Environment and Climate Change Canada to the Review Panel re: Response to Information Requests issued by the Review Panel on December 13, 2017 (See Reference Document # 1121).

#581[9]). In response, the VFPA is proposing a FUP element to verify the effects prediction by monitoring western sandpiper prey availability, specifically biofilm and benthic invertebrates.

Barn Owls

The VFPA is also proposing a FUP element to verify the effectiveness of mitigation recently proposed to reduce, control, and offset for barn owl road mortalities associated with the RBT2 Project, as noted in **Appendix IR13-30-A** and explicitly described in IR9-01 (CEAR Document #1322), and to verify the prediction of no residual effect to barn owl productivity. Specifically, the FUP element will determine, over the long term, the effectiveness of nest boxes erected to increase barn owl productivity in the regional assessment area (RAA) and to verify the predictions of negligible Project effect on barn owl productivity by monitoring barn owl mortalities in the Project area.

Diving Birds

In Appendix 33-A of the EIS, a FUP element was identified for diving birds due to predicted productivity losses due to the reduction of available prey, specifically benthic macroinvertebrates. The VFPA remains confident in its prediction of a residual effect; however, the VFPA recognises the perceived uncertainty with the prediction due to the scale of the Project footprint and the cultural value and importance of the species. The VFPA is currently evaluating the technical feasibility of Project-specific follow-up and/or other Project commitments such as additional mitigation including offsetting (e.g., clam gardens). The VFPA has committed to engaging with interested Indigenous groups to evaluate options.

The VFPA will provide an update when providing the updated tables for mitigation and FUP elements prior to the Panel Hearing.

Marine Fish

The VFPA is proposing Project-specific FUP elements for juvenile salmon, forage fish, reef fish, and demersal fish. The VFPA is currently evaluating alternatives to Project-specific follow-up for flatfish and now proposes a regional, multi-stakeholder approach to monitor adult salmon migrating through the LAA in response to regional pressures and concerns. Each of these sub-components is discussed below.

Juvenile Salmon, Forage Fish, Reef Fish, Demersal Fish

For juvenile salmon, forage fish, reef fish, and demersal fish, minor losses in the productivity of each of these sub-components were predicted to potentially result with the Project in place *before* the implementation of mitigation measures. With implementation of mitigation measures, including creation of onsite offsetting habitats, changes in the productivity of juvenile salmon, reef fish, and demersal fish were predicted to be negligible, as described in the EIS. A residual loss in the productivity of forage fish (specifically Pacific herring and Pacific

[9] CEAR Document #581 From Environment and Climate Change Canada to the Review Panel re: Comments on the information relating to the environmental assessment of the Roberts Bank Terminal 2 Project.

sand lance) was predicted to result with the Project; however, it was assessed to be not significant. For example, in the case of juvenile salmon the terminal footprint is predicted to potentially disrupt juvenile salmon migration and access to rearing habitats in the inter-causeway area during construction and operation, which in turn may reduce juvenile salmon productivity. The onsite creation of eelgrass beds and intertidal marshes is proposed to offset the loss of juvenile salmon productivity. These habitats are preferentially occupied and suitable for juvenile salmon foraging and resting. Similarly, for forage fish, reef fish, and demersal fish, onsite habitats will be created to offset the predicted loss of productivity by creating habitats or providing Project design features suitable for spawning, foraging, and resting.

The VFPA is confident in the effects prediction; however, the VFPA recognises that the prediction relies on the effectiveness of mitigation, primarily offsetting. The VFPA proposes Project-specific FUP elements to determine the effectiveness of mitigation, specifically onsite offsetting and Project design features. Currently, offsetting includes the onsite construction of eelgrass, intertidal marsh, sandy gravel beach, and subtidal rocky reefs, and the inclusion of caisson fish refugia in the berth face as part of Project design measures (see EIS Section 13.7). The proposed FUP elements will also provide the opportunity to adaptively manage offsetting success as RBT2 is constructed and operating.

Flatfish

Previously, a FUP element was proposed in EIS Appendix 33-A to address productivity losses to flatfish during construction and operation. In the case of construction effect, the FUP element was proposed to verify the effectiveness of mitigation prescribed to reduce turbidity effects associated with Project construction, specifically the use of the intermediate transfer pit (ITP) for underwater storage and pumping of sand into the Project fill sites. During the recent Project Construction Update (PCU) submission (CEAR Document #1210[10]), the VFPA confirmed that use of the ITP is no longer required thus removing the need for disposal at sea (DAS). Additionally, based on the outcomes of the 2016 Supplemental Geotechnical Investigation Program, the amount of fine material that will be discharged during construction is not expected to exceed 3%, even when considering all sediment sources, including dredgeate from the terminal dredge basin and the tug basin, Fraser River, and existing quarry sand (see PCU Section 3.1.6). As such, the construction turbidity effects prediction presented in the EIS is considered conservative (see PCU Section 3.2.3). Moreover, implementation of a dredging management plan and turbidity compliance monitoring that will be undertaken as part of routine compliance monitoring of measurable water quality parameters will monitor and manage turbidity during construction within biologically relevant thresholds, as noted in **Appendix IR13-30-A**. Consequently, a FUP element to address productivity losses to flatfish during construction is no longer warranted.

The VFPA is confident in the prediction of residual effects to flatfish productivity from the terminal footprint. There is no direct mitigation proposed to reduce, eliminate, or avoid flatfish

[10] CEAR Document #1210 From the Vancouver Fraser Port Authority to the Review Panel re: Project Construction Update (See Reference Document #995) (NOTE: Updated June 13, 2018).

habitat losses including offsetting; however, flatfish will nevertheless benefit from other offsetting features such as sandy gravel beaches, as noted in EIS Section 13.7.6.3. Flatfish are also the most abundant group of marine fish in the Project area due to available suitable habitat. The species also occupies a wide range of habitats and is broadly distributed within and beyond LAA boundaries (in the Salish Sea). Due to these aforementioned factors and the fact that a change in flatfish productivity cannot be feasibly quantitatively isolated and attributed to the Project, a Project-specific FUP element directed to monitor flatfish productivity losses from Project operation is not currently being proposed. However, the VFPA has committed to engaging with interested Indigenous groups to evaluate potential options, including additional mitigation.

The VFPA will provide an update when providing the updated tables for mitigation and FUP elements prior to the Panel Hearing.

Adult Salmon

In the case of adult salmon, the VFPA is confident in the predictions of minor decrease in the productive potential of adult Pacific salmon during construction before mitigation, and a negligible Project-related change before mitigation in adult Pacific salmon productivity during operation. However, the VFPA acknowledges the perceived uncertainty with these predictions communicated by the Indigenous groups at the recent IAF and prior. Indigenous groups have expressed concerns during the Project's consultation process regarding the potential for interaction with the Project of returning adult salmon. Such concerns were outlined in written submissions to the registry (CEAR Documents #231[11] and #776[12]), issues workshops, and the recent IAF. In response to concerns raised by Indigenous groups, the VFPA evaluated the potential for a Project-specific FUP element for adult salmon. During the evaluation process, it was evident that a Project-specific FUP element would not serve well either of the purposes of a FUP as defined in *CEAA 2012*, since the Project contribution to the effect of productivity losses of adult salmon that transit through the LAA during spawning migration is small, and likely indiscernible, relative to the multiple regional factors and pressures contributing to the effect. As such, it was determined that a Project-specific FUP element in respect of this potential effect is not technically feasible.

However, the VFPA understands the ecological, commercial, and cultural importance of adult salmon. The VFPA also recognises the importance of adult salmon, especially Chinook salmon, as a key food source for southern resident killer whales (SRKW). The VFPA is thus currently exploring opportunities to contribute to, support, and/or participate in regional and/or multi-stakeholder initiatives that will inform effective management of adult salmon populations and enhance their productivity. Additionally, the VFPA's Habitat Enhancement Program (HEP) is a Port initiative that focuses on the creation, restoration, and enhancement of habitat for the benefit of fisheries productivity. The HEP continues to actively look for additional opportunities to enhance salmon habitat. The VFPA is also committed to working collaboratively with

[11] CEAR Document #231 From Tsawwassen First Nation to the Canadian Environmental Assessment Agency re: Comment on the Completeness of the Environmental Impact Statement.
[12] CEAR Document #776 From the Musqueam Indian Band to the Review Panel re: Comments on the information relating to the environmental assessment of the Roberts Bank Terminal 2 Project.

Indigenous groups to determine the most effective way of contributing to the recovery of salmon stocks in an environment subject to many regional stressors. Nevertheless, as previously noted, decreases in returning salmon populations migrating into the Fraser River is a regional, multi-stakeholder, and multi-jurisdictional issue, with multiple contributors required to collaborate in the effort to effectively address the issue.

The VFPA will present an update on the regional initiative or approach when providing the updated tables for mitigation and FUP elements prior to the Panel Hearing.

Marine Mammals

A FUP element for marine mammals was proposed in the EIS, as a preliminary measure for further evaluation and consultation. The assessment of Project-related effects on marine mammals (EIS Section 14.0) concluded incremental residual effects of Project operation, related to potential behavioural disturbance from underwater noise, for three representative species: SRKW, humpback whales, and Steller sea lions (EIS Section 14.0). In the case of endangered SRKW, the VFPA recognises that the Project-specific effects are within the context of a species already significantly affected by past projects and activities. For this reason, the cumulative residual effect to SRKW is considered significant. Fisheries and Oceans Canada (DFO) has recently concluded that SRKW are likely facing imminent threat to recovery and current unmitigated threats may make recovery of the population unlikely or impossible, and have subsequently revised the SRKW Recovery Strategy proposing additional federally protected critical habitat (DFO 2018a,b).

Although the VFPA is confident in the prediction of no significant Project effects, in light of the endangered status of SRKW, the VFPA evaluated the feasibility of a Project-specific FUP directed to monitor the change in the acoustic environment during operation resulting in potential behavioural effects or acoustic masking to SRKW. The evaluation concluded that designing a Project-specific FUP element that would effectively identify and quantitatively measure the small incremental change of underwater noise and associated change on SRKW behaviour attributable to the Project above existing conditions would be challenging; the Project contribution to acoustic disturbance to SRKWs is anticipated to be unmeasurable and indistinguishable from other existing regional factors and pressures that are contributing to a lack of population recovery. Based on the evaluation noted above, a Project-specific FUP for residual behavioural or acoustic masking effects on SRKW is not considered to be technically feasible as it could not meet either defined purpose of a FUP. Thus, a Project-specific FUP for the predicted residual effect is not currently proposed.

However, the VFPA takes the issue seriously and shares the concern for the endangered SRKW population. In response, the VFPA is currently exploring opportunities to contribute to, support, and/or participate in regional and/or multi-stakeholder initiatives that will inform effective management of the population. Since the submission of the EIS, there have been a number of Port-led and multi-stakeholder regional initiatives launched to address the current condition of the SRKW population in the Salish Sea. For example, the VFPA-led Enhancing

Cetacean Habitat and Observation (ECHO) Program[13] was developed and implemented in 2014 as a collaborative initiative aimed at better understanding and managing the impact of shipping activities on at-risk whales throughout the southern coast of B.C (IR4-10 of CEAR Document #1051[14]). The long-term goal of the ECHO Program is to (1) understand the potential cumulative effects of commercial vessel traffic on at-risk whales through the southern coast of B.C.; and (2) develop voluntary, practical, and effective mitigation measures that will lead to quantifiable reduction in threats to whales as a result of shipping activities. The ECHO Program has initiated or supported short-term projects, scientific studies, and educational initiatives to fill knowledge gaps necessary to inform the development of credible, science-based threat reduction solutions and management options to reduce cumulative effects of shipping to at-risk whales, with a focus on SRKW.

For example, the ECHO Program implemented a voluntary vessel slowdown trial between August and October 2017. Commercial vessels were asked to slow down to 11 knots through the water in Haro Strait, an important summer feeding area for SRKW, to better understand and measure the level of noise reduction achieved through reduced vessel speed. Data from the trial demonstrated that reducing vessel speeds is an effective way of reducing underwater noise generated by vessels, as well as reducing total underwater noise in nearby critical habitat, which may in turn benefit the behaviour and feeding success of SRKW. Based on analysis of the 2017 data, the ECHO Program identified optimum speeds for different vessel types (between 12.5 knots to 15.0 knots) to reduce underwater noise levels and maximize vessel participation for the 2018 summer season. Between July 1 and October 31, 2018, 54 organisations committed to voluntary slowdown in Haro Strait when SRKW were present and the cumulative vessel participation rate for the first seven weeks of the slowdown was 87%. The ECHO Program will monitor underwater noise levels before, during, and after the slowdown using the hydrophone located at Lime Kiln and SRKW presence will be monitored and recorded by hydrophone and human observers. In addition to the voluntary vessel slowdown in 2018, the ECHO Program also implemented a voluntary lateral vessel displacement trial during August to October 2018 to study how laterally displacing vessels away from known SRKW feeding areas affects underwater noise levels in those foraging areas.[15] At the end of the 2018 slowdown period and lateral displacement trial, an analysis will be conducted by the ECHO Program to evaluate its effectiveness. In addition to these ECHO Program management measures, effective January 1, 2017, the VFPA EcoAction Program includes new incentive criteria to provide harbour dues rate discounts for quieter ships, making Canada the first country in the world, and Port of Vancouver the first port, with a marine underwater noise reduction incentive program.

The VFPA will continue to support the recovery of the SRKW population through participation in initiatives related to the federal Action Plan for SRKW (DFO 2017) and the federal Oceans Protection Plan[16]. The VFPA is also committed to working collaboratively with Indigenous

[13] https://www.portvancouver.com/echo
[14] CEAR Document #1051 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Request Package 4 (See Reference Document #946).
[15] https://www.portvancouver.com/environment/water-land-wildlife/echo-program/2018-underwater-vessel-noise-reduction-initiatives/
[16] https://www.tc.gc.ca/eng/oceans-protection-plan.html

groups to determine the most effective way of monitoring SRKW recovery in an environment subject to many regional stressors. Nevertheless, as previously noted, the endangered SRKW population is a regional, multi-stakeholder, and multi-jurisdictional issue, with multiple contributors required to collaborate in the effort to effectively address the issue.

The regional issue of prey availability for SRKW was also identified during FUP review process, as noted in the Marine Fish section above. Similar to the outcomes of the Project-specific FUP evaluation process to monitor the change in the acoustic environment resulting in marine mammal behavioural or foraging effects, designing a Project-specific FUP element to effectively identify and quantitatively measure the change in prey availability attributable to the Project would not be technically feasible due to the other contributing regional factors and pressures. Consequently, as discussed under adult salmon, the VFPA is currently exploring opportunities to contribute to, support, and/or participate in regional and/or multi-stakeholder initiatives that will inform effective management of adult salmon migration Port-wide, in addition to the Project-specific FUP element linked to juvenile salmon (see Marine Fish section above).

For all the applicable regional initiatives, the VFPA will present an update prior to the Panel Hearing by providing the updated tables for mitigation and FUP elements.

Marine Invertebrates

Follow-up Program elements remain proposed for the Dungeness crab and orange sea pen sub-components of this VC. The VFPA is currently evaluating alternatives to a Project-specific follow-up for bivalves. Each of these sub-components is discussed below.

Dungeness Crab

The VFPA is confident in the residual effects prediction of negligible for Dungeness crab productivity and the effectiveness of proposed avoidance and reduction mitigation measures. Nevertheless, the VFPA recognises the importance of Dungeness crab to Indigenous groups for food, social, and ceremonial purposes, and commercial, recreational, and ecological value in the Project LAA. In response to concerns raised by crab harvesters (Indigenous and non-Indigenous) with regards to the availability of the resource through ongoing consultation and registry postings (CEAR Documents #611[17], #997[18], #1132[19]), the VFPA is proposing a Project-specific FUP element to verify the prediction of negligible effect to juvenile nursery habitat. The Project-specific FUP element proposed considers and reflects input provided by

[17] CEAR Document #611 From the Area I Crab Fisherman Association to the Review Panel re: Comments on the information relating to the environmental assessment of the Roberts Bank Terminal 2 Project.
[18] CEAR Document #997 From Tsawwassen First Nation to the Review Panel re: Tsawwassen First Nation independent study on crab and crab habitat.
[19] CEAR Document #1132 From Tsawwassen First Nation to the Review Panel re: Addendum to the Tsawwassen First Nation independent study on crab and crab habitat (See Reference Document #997).

Indigenous groups prior to and during the recent IAF to select and design monitoring studies that minimises handling of adult crabs during salvages.

Orange Sea Pen

With mitigation, the EIS predicted residual productivity losses in orange sea pens from direct mortality and loss of suitable habitat in the terminal footprint (EIS Section 12.0). The effects prediction relies on transplanting a small portion of the orange sea pen bed within the terminal footprint to nearby suitable sites. A pilot program has been conducted to evaluate the effectiveness of the mitigation measure since there is no precedence of transplanting sea pens in the wild. The VFPA recognises that mitigation is non-standard, and, consequently, proposes to conduct a Project-specific FUP to monitor the effectiveness of sea pen translocation.

Bivalves

As previously mentioned, the VFPA is focusing the Project's FUP in areas where scientific uncertainty exists in the prediction of effects or in the effectiveness of mitigation, as directed in section 10.1.1 of the *EIS Guidelines*. There is little scientific uncertainty in the residual loss of bivalve productivity due to direct mortality and loss of habitat in the Project footprint and reduction in suitable habitat shoreward of the terminal. Hence, the VFPA is confident with the effects prediction after mitigation, primarily standard construction mitigation which will be monitored through compliance monitoring as part of the EMP. Thus, at this time, the VFPA is not proposing a Project-specific FUP element to verify the effect prediction of bivalve productivity losses or to verify the effectiveness of mitigation. Nevertheless, the VFPA recognises the value of bivalves to Indigenous communities for both diet and ceremony, which was underscored at the recent IAF. In response, the VFPA is exploring whether the predicted productivity loss can be further reduced by identifying additional mitigation, including offsetting measures, for example clam gardens, as previously mentioned under diving birds. Potential additional mitigation measures for bivalves will be discussed and evaluated as part of the ongoing engagement and consultation with Indigenous groups.

The VFPA will present an update when providing the updated tables for mitigation and FUP elements prior to the Panel Hearing.

Visual Quality

The FUP element for this VC remains the same as proposed in the EIS. **Appendix IR13-30-C** presents additional information and description of the proposed FUP element. Through past consultation, and again reiterated at the recent IAF, several Indigenous groups have indicated a high level of interest in the FUP element for visual resources, related to light trespass and sky glow. As noted in **Appendix IR13-30-C**, the locations of the proposed follow-up monitoring for light will be informed through consultation with Indigenous groups and interested stakeholders.

Human Health

The FUP element for this VC remains the same as proposed in the EIS. **Appendix IR13-30-C** presents additional information and description of the proposed FUP element, including the

relationship between the human health FUP and the air quality compliance monitoring. Air quality compliance monitoring will be conducted during construction and operation. The results of this monitoring, including comparison of measured contaminant concentrations to applicable air quality criteria, will inform the human health FUP, which would be implemented in the case of exceedance of an applicable threshold related to human health effects. Through past consultation, and at the recent IAF, comments from several Indigenous groups indicated interest in the FUP elements for human health related to air quality and noise. As noted in **Appendix IR13-30-C**, proposed monitoring for air quality and noise are in development, and will be further informed through consultation with appropriate regulators and interested Indigenous groups.

Current Use of Lands and Resources for Traditional Purposes

The VFPA's views on the effectiveness of mitigation measures for current use of lands and resources for traditional purposes (Current Use) is reviewed in the response to IR10-09 (CEAR Document #1275). For transparency and clear communication, a FUP element for Current Use has been included in **Appendix IR13-30-C**. As presented in the response to IR10-11 (CEAR Document #1275), the FUP element will consist of consultation on relevant FUP content, development, and implementation. Consultation will involve implementation of an Indigenous Advisory Committee (IAC), Indigenous representation on the FUP advisory committee (FAC) (as discussed in greater detail in response to IR10-11 of CEAR Document #1275), and ongoing meetings with individual Indigenous groups. Through consultation, the VFPA will work collaboratively with Indigenous groups to address concerns related to the RBT2 FUP raised by Indigenous groups and include FUP elements resulting from Indigenous engagement, as described in section 11.4 of the *EIS Guidelines*.

Approach to Presenting Requested Information

Compilation of Mitigation Measures and Other Commitments

The VFPA has used the templates provided in Attachments 3 and 4 of Information Request Package 13 to capture all mitigation measures for environmental components, as requested, subject to the clarifications and modifications noted below. For the two tables in **Appendices IR13-30-A** and **IR13-30-B**, the VFPA wishes to note the following:

- The VFPA has presented a section at the beginning of the table for Project design optimisation measures, some of which serve to avoid or prevent effects to multiple VCs in some cases;
- The VFPA has presented mitigation measures as applicable to VCs (i.e., one table section for each VC), even when the measure is related to an IC through which the VC is affected. This approach provides a complete compilation of the mitigation measures applicable at the VC level (i.e., encompassing mitigation anywhere on the entire effect pathway leading to effects on the receptor VC), without the duplication of information that would result from including ICs separately; and
- In its instructions, the Panel noted "The residual effect after the mitigation should be described, *where possible in quantitative terms*" (emphasis added). The EIS utilised multiple lines of evidence to determine residual effects and their significance. Because

EIS conclusions were based on a weight of evidence that included both qualitative and quantitative evidence, the VFPA cannot present residual effects after mitigation in quantitative terms. A brief description of the residual effect characterisation is provided, as applicable.

Follow-up Program for the RBT2 Project

The table in **Appendix IR13-30-C** updates and provides additional detail to the information provided in EIS Appendix 33-A, which presented the VFPA's initial, proposed FUP elements based on information available at the time of preparation of the EIS. The VFPA has used the template provided as Attachment 5 of Information Request Package 13 to present the current status of the RBT2 FUP. The following modifications were made to the template in Attachment 5 to ensure clarity with the objectives of a FUP:

- Removed the 'EMP (if applicable)' column. The column title reflects language and terminology associated with EMPs and thus compliance monitoring. As described in the Clarification section of this response, the Project FUP is distinct and separate from EMPs, including compliance monitoring plans. The RBT2 FUP will be developed as a stand-alone deliverable distinct from, but in some cases informed by, the Construction and Operation EMPs, as described in Section 33.5 of the EIS. Similarly, the terms 'Relevant Standards' and 'Guidelines' were removed from the 'Summary Description of Potential Follow-up' column, as these terms are directly associated and relevant to compliance monitoring rather than FUP;
- Clarification of the objective of the 'Phase' column was provided as a footnote to the table to clearly describe that 'Phase' refers to the time periods during which the proposed FUP element would be implemented;
- Removed the term 'Monitoring' in the 'Summary Description of Potential Follow-up' column as not every FUP element is strictly or necessarily linked to specific monitoring parameters. For example, as presented in IR10-11 (CEAR Document #1275), the FUP element for Current Use will consist of consultation on content, development, and implementation for relevant FUP elements rather than directly monitoring distinct parameters; and
- Added the column 'Other Proponent Commitments' present in Attachment 3 of Information Request Package 13. The column was added to reflect that in some circumstances, a Project-specific FUP would not produce information that meets the intended purposes of a FUP as defined by *CEAA 2012*. However, there may be opportunities, other than a Project-specific FUP, to address effects or concerns that are related to regional or broader issues, such as exploring the opportunity to contribute, support, or participate in regional scale initiatives. This is exemplified in the case of adult salmon (see **Appendix IR13-30-C**).

References

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Appendices

Appendix IR13-30-A Compilation of Proposed Mitigation Measures and Other Commitments – RBT2 Project

Appendix IR13-30-B Compilation of Proposed Mitigation Measures and Other Commitments – Marine Shipping Associated with the Project

Appendix IR13-30-C Compilation of Proposed Follow-up Program Elements

APPENDIX IR13-30-A

COMPILATION OF PROPOSED MITIGATION MEASURES AND OTHER COMMITMENTS – RBT2 PROJECT

Appendix IR13-30-A Compilation of Proposed Mitigation Measures and Other Commitments – RBT2 Project

Potential Project-related Effect	Phase: Design	Phase: Construction	Phase: Operation	Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
Project Optimisation – Avoidance Mitigation										
Potential Effects to Multiple Biophysical and Social Valued Components (VCs), and Current Use of Lands and Resources for Traditional Purposes (Current Use)	✓			• Placement of terminal in subtidal waters (Project design mitigation)	Minimise direct intertidal habitat loss Reduce potential for dendritic channel formation Reduce amount of dredging required Reduce potential noise effects to communities	Effective as avoidance of potential adverse effects - based on the analysis presented in EIS Section 5.0 and the response to IR1-07.	Residual effects documented in VC-specific sections below	N/A	Element to be included in final design, for implementation by infrastructure developer	EIS Sections 4.0 and 5.0 (CEAR Document #181[1]) IR1-07 (CEAR Document #897[2])
	✓			• Reduced footprint of causeway widening (Project design mitigation)	Minimise direct intertidal habitat loss Minimise amount of indirect habitat change from altered coastal geomorphic processes	Effective as avoidance of potential adverse effects - based on the analysis presented in EIS Section 5.0 and the response to IR1-07.		N/A	Element to be included in final design, for implementation by infrastructure developer	EIS Sections 4.0 and 5.0 (CEAR Doc #181) IR1-07 (CEAR Document #897)
	✓			• Reduce effects of temporary channel formation	Reduce potential adverse effects of temporary channel formation related to tidal waters drainage during causeway dyke construction	Effective as reduction of temporary effects, through reduction of area affected and duration of effect		The VFPA has committed to ensuring the study and management of potential channel formation that is predicted to occur while the causeway containment dykes are filled with sand, and will incorporate detail design changes as required (IR8-05).	Element to be included in final design, for implementation by infrastructure developer	EIS Section 35.0 (CEAR Document #181) IR8-05 (CEAR Document #1216[3])
	✓			• Rounded northwest terminal corner (Project design mitigation)	Reduced Project-related effects of bed scour post-construction, thereby reducing potential indirect footprint effects	Effective as avoidance of potential adverse effects - based on the analysis presented in EIS Sections 5.0 and 9.5 and IR1-07.		N/A	Element to be included in final design, for implementation by infrastructure developer	EIS Sections 4.0, 5.0, and 9.5 (CEAR Document #181) IR1-07 (CEAR Document #897)

[1] CEAR Document #181 Environmental Impact Statement (Note: the Marine Shipping Addendum was received on October 26, 2015; see reference document # 316).
[2] CEAR Document 897 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Request Package 1 (See Reference Document #559).
[3] CEAR Document #1216 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR8-01, IR8-02, IR8-05, IR8-08, IR10-03, IR10-04 and IR10-5 (See Reference Documents #1071 and #1130).

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Potential Effects to Multiple Biophysical and Social Valued Components (VCs), and Current Use of Lands and Resources for Traditional Purposes (Current Use)	✓			• Incorporation of rocky shoreline in portions of the terminal and causeway perimeters (Project design mitigation)	Increased opportunity for establishment of diverse marine vegetation communities (with subsequent benefits to other marine species)	Effective as intended – proven approach in aquatic environments, especially as compared to vertical wall perimeters. Effective as applied to Deltaport Third Berth Project (DP3), demonstrated by diversity on existing riprap as well as crest protection structure.	Residual effects documented in VC-specific sections below	N/A	Element to be included in final design, for implementation by infrastructure developer	EIS Sections 4.0, 5.0, 11.0, and 17.0 (CEAR Document #181)
	✓			• Project optimisation associated with the Project Construction Update, including: ○ elimination of the intermediate transfer pit; ○ elimination of vibro-replacement in the marine environment; ○ elimination of surface disposal of tug basin dredgeate; ○ reduced overall volume of material discharged as supernatant; ○ reduced intensity of equipment use at the peak of construction; and ○ reduced overall combined number of dredge equipment and tug/barge movements.	Optimise project design based on updated dredging equipment options and engineering analysis Consideration of Tsawwassen First Nation's concerns regarding the intermediate transfer pit	Effective as avoidance of potential adverse effects – based on the analysis presented in the Project Construction Update.		N/A	Element to be included in final design, for implementation by infrastructure developer	Project Construction Update (CEAR Document #1210[4])
Potential Effects to Marine Fish	✓			• Incorporation of fish refuge habitat within caisson face	Increased availability and connectivity of refuge habitat for marine fish, and provides diversity of food sources	Effective as intended – Effective as applied to DP3, demonstrated by observations of use of the refugia by multiple species of fish and increased diversity and abundance of invertebrate community. Abundance and diversity within the cells in the caissons was significantly greater than the surrounding	Residual effects documented in VC-specific sections of table	N/A	Element to be included in final design, for implementation by infrastructure developer	EIS Sections 4.0, 13.0, and 17.0 (CEAR Document #181)

[4] CEAR Document #1210 From the Vancouver Fraser Port Authority to the Review Panel re: Project Construction Update (See Reference Document #995) (NOTE: Updated June 13, 2018).

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
						environment, suggesting the compensatory habitat is functioning as intended.				
Potential Effects to Coastal Birds	✓			• Capping of hollow steel piles	Prevent coastal bird mortalities from entrapment of coastal birds	Effective as avoidance of potential adverse effects – capping of hollow piles is standard practice.	Residual effects documented in VC-specific sections of table	N/A	Element to be included in final design, for implementation by infrastructure developer	EIS Section 15.0 (CEAR Document #181)
Marine Vegetation										
Productivity loss for macroalgae during construction and operation phases		✓		• Compliance checking for water quality • Provisions for intervention in the case of non-compliance	Maintain existing macroalgae productivity through protection of water quality	Effective as intended – proven approach in aquatic environments (i.e., threshold levels for total suspended solids (TSS) / turbidity).	No adverse residual effects anticipated	N/A	Construction Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314[5])
		✓		• Environmental awareness training	Prevent unnecessary disturbance to macroalgae to maintain existing productivity	Effective as intended – minor risk through temporary environmental disturbance should an unauthorised activity occur. Should mitigation measure be ineffective, change in significance of residual effect is not anticipated due to limited spatial and temporal scale of isolated incident.		N/A	Environmental Training Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Compliance checking for water quality • Provisions for intervention in the case of non-compliance	Maintain existing macroalgae productivity through protection of water quality	Effective as intended – regulatory conditions and guidelines for dredging and discharge will apply.		N/A	Dredging and Sediment Discharge Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

[5] CEAR Document #314 From Port Metro Vancouver to the Canadian Environmental Assessment Agency re: Completeness Review - Responses to Additional Information Requirements (See reference document # 271) for the Environmental Impact Statement.

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Productivity loss for macroalgae during construction and operation phases		✓		• Installation and regular inspection of land-based erosion-control measures (e.g., silt fence) • Control of storm water to avoid sensitive environments • Compliance checking for water quality	Maintain existing macroalgae productivity through protection of water quality	Effective as intended – regulatory conditions and guidelines for land development and the maintenance of water quality to prevent sedimentation will apply.	No adverse residual effects anticipated	During the construction phase, stormwater along the widened causeway will be managed using conventional techniques such as silt fences, straw bales, and diversion structures to contain any water within the causeway footprint, where it will either infiltrate into the subgrade below, or be managed within the larger fill areas.	Sediment and Erosion Control Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR4-36 (CEAR Document #1051[6])
		✓	✓	• Maintain inventory of hazardous products on site • Safe storage and handling of hazardous products • Standard practices for onsite fueling of construction equipment	Prevent introduction of deleterious substances to the aquatic environment to maintain habitat quality	Effective as intended – proven approach on construction sites. Relevant legislation, guidelines, and standard management practices will apply.		The VFPA will include non-hazardous waste management practices (that avoid human-wildlife conflicts) in the Hazardous Materials and Waste Management Plan. (IR10-01 – Response to Record of Issues Raised and VFPA Responses – Métis Nation British Columbia)	Hazardous Materials and Waste Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR10-01 – Response to Record of Issues Raised and VFPA Responses – Métis Nation British Columbia (CEAR Document #1322[7])
		✓		• Spill preparedness measures, including equipment staging and personnel training • Development of procedures for spill response and containment, clean-up, and disposal	Minimise direct effects to species and maintain habitat quality through intervention for any released deleterious substances.	Effective as intended – proven approach on construction sites. Relevant regulations, guidelines, and reporting requirements will apply.		N/A	Spill Preparedness and Response Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
			✓	• Site inspections and sample collection to evaluate implemented measures • Provisions for intervention in the case of non-compliance	Maintain existing macroalgae productivity through protection of water quality	Effective as intended – proven approach in aquatic environments (e.g., threshold levels for TSS/turbidity).		N/A	Operation Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
			✓	• Environmental awareness training	Prevent unnecessary disturbance to macroalgae to maintain existing productivity	Effective as intended – minor risk through temporary environmental disturbance should an unauthorised activity occur. Should		N/A	Environmental Training Plan	EIS Section 33.0 (CEAR Doc #181) Appendix IR12-A (CEAR Doc #314)

[6] CEAR Document #1051 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Request Package 4 (See Reference Document #946).
[7] CEAR Document #1322 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR9-01 to IR9-04, IR10-01, IR10-27, IR10-28, IR11-06, IR11-24, IR12-08, and IR12-12 (See Reference Documents #1122, 1130, 1179, and 1206).

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Productivity loss for macroalgae during construction and operation phases						mitigation measure be ineffective, change in significance of residual effect is not anticipated due to limited spatial and temporal scale of isolated incident.	No adverse residual effects anticipated			
			✓	• Spill preparedness measures, including equipment staging and personnel training • Development of procedures for spill response and containment, clean-up, and disposal	Minimise effects through intervention for any released deleterious substances	Effective as intended – proven approach. Relevant legislation, guidelines, and standard management practices will apply.		N/A	Spill Preparedness and Response Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
	✓	✓	✓	• Creation of subtidal rock reef habitat	Provide habitat for attachment and recolonisation to promote increase in macroalgae productivity	Effective as intended – proven approach at Roberts Bank.		N/A	Offsetting Plan (in accordance with *Fisheries Act* requirements)	EIS Section 17.0 and Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR-7.31.15-03 (CEAR Document #314) AIR-12.04.15-03 (CEAR Document #388[8])
Other non-Project commitments	✓	✓	✓	• N/A	N/A	N/A	N/A	The VFPA has a strong history of working with, and funding, interested parties (i.e., BC Spartina Working Group) to help manage English cordgrass at Roberts Bank. The VFPA also understands that funding and management effort will continue for the foreseeable future. (IR-7.31.15-03) The VFPA is committed to monitoring and control of English cordgrass at its on-site habitat enhancement areas (IR-7.31.15-03) Existing English cordgrass within the footprint of the causeway widening will be fully managed and the VFPA will work with the Province's	N/A	IR-7.31.15-03 (CEAR Document #314) AIR-12.04.15-03 (CEAR Document #388)

[8] CEAR Document #388 From Port Metro Vancouver to the Canadian Environmental Assessment Agency re: Completeness Review - Responses to Additional Information Requirements Follow-Up (See Reference Document # 345) including 22 Technical Data Reports.

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
								English cordgrass management program to appropriately dispose of cordgrass within the Project footprint. The VFPA will work and coordinate with the Province's English cordgrass management team prior to and during construction to limit seed dispersal to the extent practical. (AIR-12.04.15-03)		
Changes in biofilm assemblage composition during freshet during construction and operation phases		N/A	N/A	• No mitigation required - Updated analysis indicates changes in salinity do not result in changes to biofilm community composition. No potential adverse effect of the Project is predicted for biofilm assemblage composition related to changes in salinity (see main response to IR13-30 for more information)	N/A	N/A	No adverse residual effects anticipated	N/A	N/A	N/A
Marine Invertebrates										
Productivity loss for bivalve shellfish, Dungeness crabs, and orange sea pens during construction and operation phases		✓		• Alignment of construction activities to avoid fisheries-sensitive windows for Dungeness crabs • Compliance checking for water quality • Provisions for intervention in the case of non-compliance	Reduce direct mortality of crabs (specifically gravid female crabs) below -5.0 m chart datum (CD) water depth through work window restrictions from October 15 to March 30 Maintain existing bivalve shellfish, Dungeness crab, and orange sea pen productivity through protection of water quality	Effective as intended – proven approach in aquatic environments (e.g., threshold levels for TSS/turbidity, DFO-regulated timing windows).	**Residual Effect:** Productivity loss for bivalve shellfish, Dungeness crabs, and orange sea pens during construction and operation phases **Description of Residual Effect:** For infaunal and epifaunal invertebrates, short-term productivity losses associated with construction activities (direct mortality, changes in water quality) will be offset by gains from improved habitat suitability shoreward of the terminal. Overall, a minor increase in productive potential is	N/A	Construction Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Environmental awareness training	Prevent unnecessary disturbance to marine invertebrates to maintain existing productivity	Effective as intended – minor risk through temporary environmental disturbance should an unauthorised activity occur. Should		N/A	Environmental Training Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Productivity loss for bivalve shellfish, Dungeness crabs, and orange sea pens during construction and operation phases						mitigation measure be ineffective, change in significance of residual effect is not anticipated due to limited spatial and temporal scale of isolated incident.	predicted for this sub-component. For bivalve shellfish, residual loss of productivity is expected through (1) direct mortality and loss of habitat in the Project footprint; and (2) reduction in suitable habitat shoreward of the terminal. For Dungeness crab, potential effects of injury and mortality are anticipated to be effectively reduced through avoidance and mitigation, particularly through the use of timing windows and salvages. Residual loss of productivity, however, is expected with the loss of suitable habitat due to the Project footprint. Mitigation will reduce, but not fully avoid, orange sea pen productivity loss; residual productivity loss is anticipated from direct mortality and loss of suitable habitat in the terminal footprint. **Determination:** Not Significant.			
		✓		• Compliance checking for water quality • Provisions for intervention in the case of non-compliance	Maintain existing bivalve shellfish, Dungeness crab, and orange sea pen productivity through protection of water quality	Effective as intended – regulatory conditions and guidelines for dredging and discharge will apply.		N/A	Dredging and Sediment Discharge Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Installation and regular inspection of land-based erosion-control measures (e.g., silt fence) where necessary • Control of stormwater to avoid sensitive environments • Compliance checking for water quality	Maintain existing bivalve shellfish, Dungeness crab, and orange sea pen productivity through protection of water quality	Effective as intended – regulatory conditions and guidelines for land development and the maintenance of water quality will apply.		N/A	Sediment and Erosion Control Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• The environmental management plan (EMP) will identify procedures for a crab Salvage Program and an Orange Sea Pen Transplant Program	Bait crabs away from terminal and causeway containment dykes to local area outside of Project-related disturbance area to partially mitigate construction-related mortality and physical injury Collect and relocate orange sea pens to local area outside of Project-related disturbance area to partially mitigate direct mortality from terminal construction	Effective as intended for crabs – proven approach at Roberts Bank for DP3; effectiveness of mitigation incorporated into environmental assessment as salvages are known to only reduce and not fully mitigate construction-related crab productivity decreases. Therefore, a change in the significance of the residual effect is not anticipated if this mitigation measure is not fully effective in salvaging all crabs from within work zones. Effective as intended for sea pens – a pilot study has confirmed		The VFPA is committed to minimising handling of crab, and to working with Indigenous groups, in implementation of crab salvage mitigation.	Marine Species Salvage Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
						that sea pens can be successfully transplanted in the wild and monitoring of survival success continues. A small portion of the sea pen aggregation is targeted for transplant, and the effectiveness of this measure for a portion of the population was taken into consideration in the effects assessment. Therefore, a change in the significance of the residual effect is not anticipated if this mitigation measure is not fully effective.				
Productivity loss for bivalve shellfish, Dungeness crabs, and orange sea pens during construction and operation phases		✓	✓	• Maintain inventory of hazardous products on site • Safe storage and handling of hazardous products • Standard practices for onsite fueling of construction equipment	Prevent introduction of deleterious substances to the aquatic environment to maintain habitat quality	Effective as intended – proven approach on construction sites. Relevant legislation, guidelines, and standard management practices will apply.	As above.	The VFPA will include non-hazardous waste management practices (that avoid human-wildlife conflicts) in the Hazardous Materials and Waste Management Plan. (IR10-01 – Response to Record of Issues Raised and VFPA Responses – Métis Nation British Columbia)	Hazardous Materials and Waste Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR10-01 – Response to Record of Issues Raised and VFPA Responses – Métis Nation British Columbia (CEAR Document #1322)
		✓		• Spill preparedness measures, including equipment staging and personnel training • Development of procedures for spill response and containment, clean-up, and disposal	Minimise direct effects to species and maintain habitat quality through intervention for any released deleterious substances	Effective as intended – proven approach on construction sites. Relevant regulations, guidelines, and reporting requirements will apply.		N/A	Spill Preparedness and Response Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
			✓	• Site inspections and sample collection to evaluate implemented measures • Provisions for intervention in the case of non-compliance	Maintain existing bivalve shellfish, Dungeness crab, and orange sea pen productivity	Effective as intended – proven approach in aquatic environments (e.g., threshold levels for TSS/turbidity).		N/A	Operation Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
					through protection of water quality					
			✓	• Environmental awareness training	Prevent unnecessary disturbance to bivalve shellfish, Dungeness crab, and orange sea pen to maintain existing productivity	Effective as intended – minor risk through temporary environmental disturbance should an unauthorised activity occur. Should mitigation measure be ineffective, change in significance of residual effect is not anticipated due to limited spatial and temporal scale of isolated incident.		N/A	Environmental Training Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Productivity loss for bivalve shellfish, Dungeness crabs, and orange sea pens during construction and operation phases			✓	• Spill preparedness measures, including equipment staging and personnel training • Development of procedures for spill response and containment, clean-up, and disposal	Minimise direct effects to species and maintain habitat quality through intervention for any released deleterious substances	Effective as intended – proven approach. Relevant legislation, guidelines, and standard management practices will apply.	As above.	N/A	Spill Preparedness and Response Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
	✓	✓	✓	• Creation of eelgrass habitat • Creation of tidal marsh habitat, mudflat, and sandy gravel beach habitat • Creation of subtidal rock reef habitat	Eelgrass – to promote increase in bivalve shellfish (heart cockles) and crab productivity Tidal marsh, mudflat, sandy gravel beach – to promote increase in bivalve shellfish productivity Subtidal rock reef – to promote increase in bivalve shellfish (bay mussel and Pacific oysters) productivity	Effective as intended – these habitats have been proposed as mitigation based on the proven success of previous habitat creation projects within the Fraser River estuary and similar environments.		N/A	Offsetting Plan (in accordance with *Fisheries Act* requirements)	EIS Section 17.0 and EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Marine Fish										
Loss of productivity for marine fish sub-components during construction and operation phases		✓		• Alignment of construction activities to avoid fisheries-sensitive windows for juvenile salmon • Alignment of construction activities to avoid fisheries sensitive window for crab, benefitting marine fish life stages that overlap spatially and temporally • Compliance checking for water quality • Provisions for intervention in the case of non-compliance	Reduce productivity losses for fish during sensitive periods through work window restrictions from March 1 to August 15 above -5.0 m CD water depth Maintain existing marine fish productivity through protection of water quality	Effective as intended – proven approach in aquatic environments (e.g., threshold levels for TSS/turbidity, DFO-regulated timing windows).	**Residual Effect:** Productivity loss for forage fish and flatfish during construction and operations. **Description of Residual Effect:** For Pacific salmon, there is potential that the Project may affect juvenile salmon migration, which would decrease productivity. It is expected that increases in juvenile salmon productivity from increases in prey (e.g., macrofauna, predicted increases in tidal marsh habitat) and from onsite offsetting will counterbalance losses. Overall, predicted net changes in Pacific salmon productive potential from the Project are expected to be negligible, with mitigation. For reef fish and small demersal fish, potential productivity loss from injury and mortality and changes	N/A	Construction Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR4-18 (CEAR Document #1051)
		✓		• Environmental awareness training	Prevent unnecessary disturbance to marine fish to maintain existing productivity	Effective as intended – minor risk through temporary environmental disturbance should an unauthorised activity occur. Should mitigation measure be ineffective, change in significance of residual effect is not anticipated due to limited spatial and temporal scale of isolated incident.		N/A	Environmental Training Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Compliance checking for water quality • Provisions for intervention in the case of non-compliance	Maintain existing marine fish productivity through protection of water quality	Effective as intended – regulatory conditions and guidelines for dredging and discharge will apply.		N/A	Dredging and Sediment Discharge Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Loss of productivity for marine fish sub-components during construction and operation phases		✓	✓	• Orient lights downward and away from residential and marine areas • Use shielding to minimise light trespass • Control light levels and limit light use to areas where activities are occurring, where possible • Use dredge lighting shields to minimise light spilling outside the basic working footprint of the dredge • Where possible use fixtures that emit light at specific wavelengths	Maintain existing marine fish habitat quality and fish productivity by minimising light trespass into marine environment	Effective as intended – as stated in environmental assessment, the effectiveness of lighting mitigation measures on marine fish are not well established, and therefore, this uncertainty has been taken into consideration. Therefore, a change in the significance of the residual effect is not anticipated if these mitigation measures are not fully effective in reducing light in the marine environment.	in the acoustic environment (during construction if impact pile driving is used) will be minimised through mitigation, and the resulting residual effect is considered negligible. For forage fish, potential effects of injury and mortality, acoustic harm, and changes in the light environment are anticipated to be reduced through mitigation. Residual loss of productivity, however, is expected through: (1) minor behavioural disturbance from underwater sound on Pacific herring; (2) reduction in suitable subtidal burying habitat for Pacific sand lance. Mitigation will minimise, but not fully avoid, flatfish productivity loss; residual productivity loss is anticipated from increased TSS and removal of habitat (due to Project footprint). **Determination:** Not Significant.	N/A	Light Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR5-25 (CEAR Document #1153[9]) IR9-02 (CEAR Document #1322)
	✓			• During piling, use of vibratory hammer instead of impact pile driving when practical • Hydrophone monitoring to confirm sound levels remain below thresholds • Implementation of sound reduction or dampening methods or technologies (e.g., bubble curtains) to manage pile-driving sound levels, if required, to lower sound levels below thresholds	To conduct activities under the threshold sound level that may cause harm (injury or mortality) to fish	Effective as intended – proven approach in aquatic environments (existing standard management practices for pile driving activities will apply).		N/A	Underwater Noise Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
	✓			• Installation and regular inspection of land-based erosion-control measures (e.g., silt fence) where necessary • Control of storm water to avoid sensitive environments • Compliance checking for water quality	Maintain existing marine fish productivity through protection of water quality	Effective as intended – regulatory conditions and guidelines for land development and the maintenance of water quality will apply.		N/A	Sediment and Erosion Control Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
	✓			• The EMP will identify procedures for a fish salvage strategy	Fish will be removed prior to infilling of all containment dykes to local area outside of Project-related disturbance	Effective as intended – proven approach at Roberts Bank for Deltaport Third Berth Project; effectiveness of mitigation incorporated into		N/A	Marine Species Salvage Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

[9] CEAR Document #1153 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR5-02, IR5-11, IR5-13, IR5-17, IR5-18, IR5-22, IR5-25, IR5-26, IR5-27, IR5-43, and IR5-44 (See Reference Document # 975).

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
					area to minimise construction-related mortality and physical injury.	environmental assessment as salvages are known to only reduce and not fully mitigate construction-related fish productivity decreases. Therefore, a change in the significance of the residual effect is not anticipated if this mitigation measure is not fully effective in salvaging all fish from within the work zones.				
Loss of productivity for marine fish sub-components during construction and operation phases		✓		• Maintain inventory of hazardous products on site • Safe storage and handling of hazardous products • Standard practices for onsite fueling of construction equipment	Prevent introduction of deleterious substances to the aquatic environment to maintain habitat quality	Effective as intended – proven approach on construction sites. Relevant legislation, guidelines, and standard management practices will apply.	As above.	The VFPA will include non-hazardous waste management practices (that avoid human-wildlife conflicts) in the Hazardous Materials and Waste Management Plan. (IR10-01 – Response to Record of Issues Raised and VFPA Responses – Métis Nation British Columbia)	Hazardous Materials and Waste Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR10-01 – Response to Record of Issues Raised and VFPA Responses – Métis Nation British Columbia (CEAR Document #1322)
		✓		• Spill preparedness measures, including equipment staging and personnel training • Development of procedures for spill response and containment, clean-up, and disposal	Minimise direct effects to species and maintain habitat quality through intervention for any released deleterious substances	Effective as intended – proven approach on construction sites. Relevant regulations, guidelines, and reporting requirements will apply.		N/A	Spill Preparedness and Response Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
			✓	• Site inspections and sample collection to evaluate implemented measures • Provisions for intervention in the case of non-compliance	Maintain existing marine fish productivity through protection of water quality	Effective as intended – proven approach in aquatic environments (e.g., threshold levels for TSS/turbidity).		N/A	Operation Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
			✓	• Environmental awareness training	Prevent unnecessary disturbance to marine fish to maintain existing productivity	Effective as intended – minor risk through temporary environmental disturbance should an unauthorised activity occur. Should		N/A	Environmental Training Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
						mitigation measure be ineffective, change in significance of residual effect is not anticipated due to limited spatial and temporal scale of isolated incident.				
			✓	• Maintain inventory of hazardous products on site • Safe storage and handling of hazardous products • Standard practices for onsite fueling of operation equipment	Prevent introduction of deleterious substances to the aquatic environment	Effective as intended – proven approach. Relevant legislation, guidelines, and standard management practices will apply.		The VFPA will include non-hazardous waste management practices (that avoid human-wildlife conflicts) in the Hazardous Materials and Waste Management Plan. (IR10-01 – Response to Record of Issues Raised and VFPA Responses – Métis Nation British Columbia)	Hazardous Materials and Waste Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR10-01 – Response to Record of Issues Raised and VFPA Responses – Métis Nation British Columbia (CEAR Document #1322)
Loss of productivity for marine fish sub-components during construction and operation phases			✓	• Spill preparedness measures, including equipment staging and personnel training • Development of procedures for spill response and containment, clean-up, and disposal	Minimise effects through intervention for any released deleterious substances	Effective as intended – proven approach. Relevant legislation, guidelines, and standard management practices will apply.	As above.	N/A	Spill Preparedness and Response Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
	✓	✓	✓	• Creation of eelgrass habitat • Creation of tidal marsh habitat • Creation of mudflat • Creation of sandy gravel beach habitat • Creation of subtidal rock reef habitat	Eelgrass – to promote productivity increases for juvenile salmon, juvenile rockfish, forage fish, and small demersal fish Tidal marsh – to promote productivity increases for juvenile salmon Mudflat – to promote productivity increase in benthic invertebrates, which are food sources for fish Sandy gravel beach – to	Effective as intended – proven approach at Roberts Bank.		N/A	Offsetting Plan (in accordance with *Fisheries Act* requirements)	EIS Section 17.0 and EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
					promote increase in forage fish Subtidal rock reef – to promote increase in reef fish productivity					
Marine Mammals										
Change in acoustic environment resulting in behavioural effects or acoustic masking for southern resident killer whale, North Pacific humpback whale, and Steller sea lion during construction and operation phases		✓		• Compliance checking for underwater noise levels • Provisions for intervention in the case of non-compliance	Maintain existing marine fish productivity (food source) and marine mammal habitat quality	Effective as intended – proven approach in aquatic environments.	**Residual Effect:** Change in acoustic environment resulting in behavioural effects or acoustic masking during operation phase. **Description of Residual Effect:** Potential behavioural disturbance to southern resident killer whale, North Pacific humpback whale, and Steller sea lion from underwater noise during Project operation is of low to moderate magnitude, regional extent, short-term duration, frequent, and reversible. Although behavioural responses	N/A	Construction Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• During piling, use of vibratory hammer instead of impact pile driving when practical • Establish protective buffer zones around Project construction activities • Hydrophone monitoring to confirm sound levels remain below injury and behavioural effect thresholds • Hydrophone monitoring in darkness or weather-induced poor visibility will supplement Marine Mammal Observation Plan • Implementation of sound reduction or dampening methods or technologies (e.g., bubble curtains) to manage pile-driving sound levels, if required, to lower sound levels below injury and behavioural effect thresholds	Reduce potential marine mammal behavioural disturbance and physical injury to hearing caused by an increase in underwater noise Maintain habitat quality	Effective as intended – proven approach in aquatic environments (existing best management practices for pile driving activities will apply).		The VFPA will require that both vibratory and/or impact pile driving during installation of the temporary barge ramps only be conducted during daylight hours. (IR5-49)	Underwater Noise Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR5-49 (CEAR Document #1167[10])

[10] CEAR Document #1167 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR5-37, IR5-42, IR5-48, IR5-49, IR5-51, IR5-52, IR6-30 and IR8-10 (See Reference Documents #975, #991 and #1071).

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Change in acoustic environment resulting in behavioural effects or acoustic masking for southern resident killer whale, North Pacific humpback whale, and Steller sea lion during construction and operation phases		✓		• Marine Mammal Observers (MMOs) to visually and acoustically monitor the buffer zones and record location and behaviour of observed animals • MMOs have the authority to suspend construction activities if marine mammals are within the buffer zone and will recommence the construction activity once the marine mammal has left the buffer zone for 30 minutes.	Reduce potential marine mammal behavioural disturbance and physical injury to hearing caused by an increase in underwater noise	Effective as intended – visual observations are limited by weather-induced limitations and daylight, but in conjunction with acoustic monitoring, marine mammal presence within a buffer zone will be improved.	are predicted from the Project and its associated shipping, the additional disturbance to marine mammals over a year is anticipated to be minimal. RBT2 container ship calls will be of short duration; therefore, behavioural disturbance from Project operation over and above existing conditions is unlikely to affect individual marine mammals such that the survival or recovery of species is jeopardised. **Determination:** Not Significant.	Further to VFPA commitment 2.13 (EIS Table 35-2): • The Construction EMP's Marine Mammal Observation Plan will require MMOs to coordinate with existing whale sighting networks to receive advance warning of southern resident killer whales and other marine mammals approaching the construction area to facilitate mitigation. • The Construction EMP's Marine Mammal Observation Plan will specify that if any killer whale or marine mammal is observed in distress within the prescribed buffer zone, construction activities producing underwater noise will be suspended immediately and notification provided to DFO. • The Construction EMP's Marine Mammal Observation Plan will specify that an appropriately qualified MMO (during the period from May 1 to October 31) or Officer of the Bridge (OB) (during the period from November 1 to April 30) be dedicated to maintain constant observations for detecting southern resident killer whale (or other marine mammals) in the ship's vicinity prior to and during dredging and/or loading of dredgeate conducted in southern resident killer whale critical habitat. (IR5-49)	Marine Mammal Observation Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR5-49 (CEAR Document #1167)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
		✓		• Environmental awareness training	Reduce potential disturbances by increasing individual awareness and knowledge of potential consequences of actions or lack of action in response to an incident	Effective as intended – minor risk through temporary environmental disturbance should an unauthorised activity occur.		N/A	Environmental Training Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR5-50 (CEAR Document #1172[11])
Physical disturbance from vessel strikes for southern resident killer whale and North Pacific humpback whale during construction and operation phases		✓		• Compliance checking for adherence to buffer zones and effectiveness of hydrophone and observer in detecting marine mammal presence • Provisions for intervention in the case of non-compliance	Reduce potential marine mammal physical injury from interactions with vessels Maintain habitat quality	Effective as intended – proven approach in aquatic environments. Application of this measure was not taken into consideration in the determination of the residual effect of vessel strikes, and therefore, if it is ineffective, there would be no change to the determination of no adverse residual effects.	No adverse residual effects anticipated	N/A	Construction Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Environmental awareness training	Reduce potential disturbances by increasing individual awareness and knowledge of potential consequences of actions or lack of action in response to an incident	Effective as intended - application of this measure was not taken into consideration in the determination of the residual effect of vessel strikes, and therefore, if it is ineffective, there would be no change to the determination of no adverse residual effects.		N/A	Environmental Training Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR5-51 (CEAR Document #1167)

[11] CEAR Document #1172 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR5-50, IR7-07, IR7-33, IR7-34, IR7-35, and IR7-43 (See Reference Documents #975 and #1000).

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Physical disturbance from vessel strikes for southern resident killer whale and North Pacific humpback whale during construction and operation phases			✓	• Distribution of a marine mammal awareness pamphlet, "Marine Mammals of the Roberts Bank Area" to marine pilots working within VFPA jurisdiction	Raise awareness of sensitivity of Roberts Bank and surrounding areas to potentially avoid interactions between whales and vessels	Effective as intended - increase awareness of marine pilots to avoid vessel strikes regionally when safe and practicable to do so. Application of this measure was not taken into consideration in the determination of the residual effect of vessel strikes, and therefore, if it is ineffective, there would be no change to the determination of no adverse residual effects.	No adverse residual effects anticipated	Distribution of the marine mammal mariner's guide *Mariner's Guide to Whales, Dolphins, Porpoises of Western Canada*, to marine pilots working within VFPA jurisdiction (Appendix IR4-10-E)	N/A (VFPA initiative, not Terminal Operator EMP)	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR5-51 (CEAR Document #1167)
Coastal Birds										
Productivity loss for coastal bird sub-components during construction and operation phases		✓		• Alignment of construction activities to avoid periods when diving birds are abundant in the area (coincides with Dungeness crab least-risk timing window) • Compliance checking for water quality, above-ground noise, underwater noise • Provisions for intervention in the case of non-compliance	Maintain existing bird productivity by minimising disturbance and through protection of habitat	Effective as intended – proven approach in aquatic environments (e.g., threshold levels for TSS/turbidity).	**Residual Effect:** Productivity loss for diving birds during construction and operation phases. **Description of Residual Effect:** The permanent loss of subtidal soft-bottom habitat for foraging by diving birds equates to the removal of approximately 7% of similar subtidal habitat within the local assessment area (LAA) and 1% of habitat within the regional assessment area (RAA). Given the amount of alternate habitat within the RAA, and in close proximity to the footprint, and the lack of evidence	N/A	Construction Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Environmental awareness training	Reduce potential disturbances by increasing individual awareness and knowledge of potential consequences of actions or lack of action in response to an incident	Effective as intended – minor risk through temporary environmental disturbance should an unauthorised activity occur. Should mitigation measure be ineffective, change in significance of residual effect is not anticipated due to limited spatial and temporal scale of isolated incident.		N/A	Environmental Training Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Productivity loss for coastal bird sub-components during construction and operation phases	✓	✓		• Orient lights downward and away from residential and marine areas • Use shielding to minimise light trespass • Control light levels and limit light use to areas where activities are occurring, where possible • Use dredge lighting shields to minimize light spilling outside the basic working footprint of the dredge. • Where possible, use fixtures that emit light at specific wavelengths	To minimise disorienting effects to birds, thereby maintaining habitat quality and minimise the potential for bird collisions	Effective as intended – research continues on general effects to birds from artificial light, including which wavelengths minimise disorientating effects to birds, which can vary by species. Should mitigation measure be ineffective, change in significance of residual effect is not anticipated, as the determination of significance took into account potential habituation by birds and the (bright) light levels from the existing terminals and the associated incremental increase with the Project.	that diving birds are habitat limited within the LAA, removal of this subtidal habitat is unlikely to negatively affect the long-term productive potential of diving birds within the LAA. **Determination:** Not Significant.	Further to VFPA commitments 2.10 and 2.25 (EIS Table 35-2), the following additional light mitigation measures will be implemented through Project detailed design and the construction and operation-phase Light Management Plans: • Minimise the number of light installations; • Avoid the use of solid burning or slow pulsing warning lights; • Use down-shielded lighting fixtures (or equivalent technology) to further reduce light pollution; • Avoid or restrict the time of operation of exterior decorative lights such as spotlights and floodlights that function to highlight the exterior features of buildings, especially on humid, foggy, or rainy nights, when illumination glow can draw birds from distance; and • In relation to any on-terminal navigational lighting requirements, use the minimum amount of obstruction avoidance lighting on tall structures. The use of only strobe lights at night, at the minimum intensity and minimum number of flashes per minute (longest duration between flashes) allowable by Transport Canada. The use of solid-burning or slow pulsing warning lights at night will be avoided. (IR9-02)	Light Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR9-02 (CEAR Document #1322)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Productivity loss for coastal bird sub-components during construction and operation phases		✓		• Installation and regular inspection of land-based erosion-control measures (e.g., silt fence) where necessary • Control of stormwater to avoid sensitive environments • Compliance checking for water quality	Maintain existing bird productivity by minimising disturbance and through protection of habitat	Effective as intended – proven approach in aquatic environments (e.g., threshold levels for TSS/turbidity).	As above.	N/A	Sediment and Erosion Control Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Maintain inventory of hazardous products on site • Safe storage and handling of hazardous products • Standard practices for onsite fuelling of construction equipment	Prevent introduction of deleterious substances to the environment to maintain habitat quality	Effective as intended – proven approach on construction sites. Relevant legislation, guidelines, and standard management practices will apply.		The VFPA will include non-hazardous waste management practices (that avoid human-wildlife conflicts) in the Hazardous Materials and Waste Management Plan. (IR10-01 – Response to Record of Issues Raised and VFPA Responses – Métis Nation British Columbia)	Hazardous Materials and Waste Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR10-01 – Response to Record of Issues Raised and VFPA Responses – Métis Nation British Columbia (CEAR Document #1322)
		✓		• Spill preparedness measures, including equipment staging and personnel training • Development of procedures for spill response and containment, clean-up, and disposal	Prevent introduction of deleterious substances to the environment to maintain habitat quality	Effective as intended – proven approach on construction sites. Relevant regulations, guidelines, and reporting requirements will apply.		N/A	Spill Preparedness and Response Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Shutdown of equipment and vehicles when not in use • Utilisation of equipment that produces less noise where feasible • Awareness and training for construction crew • Using barriers (e.g., acoustic blankets) to shield wildlife from abrupt loud noise where feasible • Increasing or ramping-up sound levels slowly to allow birds to habituate or temporarily leave the area where feasible • Where possible, implementing measures to minimise impulsive noise	Maintain habitat quality	Effective as intended – minor disturbance as birds can relocate or habituate; should mitigation measure be ineffective, change in significance of residual effect is not anticipated, as the determination of significance took into account the fact that birds have habituated to current noise levels from the existing terminals, and are likely to habituate to any Project-related noise increases.		N/A	Noise Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Productivity loss for coastal bird sub-components during construction and operation phases		✓		• During piling, use of vibratory hammer instead of impact pile driving when practical • Implementation of sound reduction or dampening methods or technologies (e.g., bubble curtains) to manage pile-driving sound levels, if required, to lower sound levels below thresholds	Reduce potential behavioural disturbance and physical injury to hearing caused by an increase in underwater noise Maintain habitat quality	Effective as intended – existing best management practices for pile driving activities will apply.	As above.	N/A	Underwater Noise Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• EMP will specify the sensitive areas (e.g., Roberts Bank wildlife management area (WMA)) to be avoided by marine vessel traffic operating in the Project area during construction • EMP will specify measures to address land-based construction traffic, traffic control, and potential traffic hazards	Reduce potential disturbance and maintain habitat quality	Effective as intended for vessel traffic – published thresholds for noise and visual disturbance do not exist for birds; however, literature indicates minimal effects as long as vessel traffic is restricted to designated areas. The establishment of designated areas will effectively mitigate potential disturbances. Effective as intended for vehicle traffic; measure restricts vessel movements to particular areas/corridors during operation, facilitating habituation and minimising disturbance to birds. Vessels frequenting the Port will follow established corridors as part of operation.		N/A	Land and Marine Traffic Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
			✓	• Site inspections and sample collection to evaluate implemented measures • Provisions for intervention in the case of non-compliance	Maintain existing bird productivity through protection of water quality	Effective as intended – proven approach in aquatic environments (i.e., threshold levels for TSS/turbidity).		N/A	Operation Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
			✓	• Environmental awareness training	Prevent unnecessary disturbance to	Effective as intended – minor risk through temporary		N/A	Environmental Training Plan	EIS Section 33.0 (CEAR Document #181)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
					birds to maintain existing productivity	environmental disturbance should an unauthorised activity occur. Should mitigation measure be ineffective, change in significance of residual effect is not anticipated due to limited spatial and temporal scale of isolated incident.				Appendix IR12-A (CEAR Document #314)
Productivity loss for coastal bird sub-components during construction and operation phases			✓	• Maintain inventory of hazardous products on site • Safe storage and handling of hazardous products • Standard practices for onsite fuelling of operation equipment	Prevent introduction of deleterious substances to the aquatic environment	Effective as intended – proven approach. Relevant legislation, guidelines, and standard management practices will apply.	As above.	The VFPA will include non-hazardous waste management practices (that avoid human-wildlife conflicts) in the Hazardous Materials and Waste Management Plan. (IR10-01 – Response to Record of Issues Raised and VFPA Responses – Métis Nation British Columbia)	Hazardous Materials and Waste Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR10-01 – Response to Record of Issues Raised and VFPA Responses – Métis Nation British Columbia (CEAR Document #1322)
			✓	• Spill preparedness measures, including equipment staging and personnel training • Development of procedures for spill response and containment, clean-up, and disposal	Minimise effects through intervention for any released deleterious substances	Effective as intended – proven approach. Relevant legislation, guidelines, and standard management practices will apply.		N/A	Spill Preparedness and Response Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
			✓	• Optimised tonality of equipment alarms to limit audibility on shore while meeting safety requirements • Operator awareness and training • Regular maintenance of equipment (e.g., lubrication of pulleys and other moving parts, replacement of deteriorated exhaust mufflers, maintaining efficiencies of engines through servicing)	Maintain existing bird productivity by minimising disturbance and maintaining habitat quality	Effective as intended – minor disturbance as birds can relocate or habituate; should mitigation measure be ineffective, change in significance of residual effect is not anticipated, as the determination of significance took into account the fact that birds have habituated to current noise levels from the existing terminals, and are likely to habituate to any Project-related noise increases. Additionally, large		N/A	Noise Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
						amounts of alternate foraging and roosting habitat are available within the LAA, but several kilometres removed from the Project, minimising the frequency and likelihood of coastal bird – Project interactions.				
Productivity loss for coastal bird sub-components during construction and operation phases	✓	✓	✓	• Creation of eelgrass habitat • Creation of tidal marsh habitat • Creation of mudflat • Creation of sandy gravel beach habitat • Creation of subtidal rock reef habitat	Eelgrass – an important food source for waterfowl and brant, and habitat for various prey Tidal marsh – provides food and shelter for many coastal birds Mudflat – promotes productivity increase in marine invertebrates and biofilm, which are food sources for birds Sandy gravel beach – promotes increases in the productivity of food sources (e.g., forage fish, bivalves) Subtidal rock reef – promotes increase in diving bird prey (e.g., bivalve shellfish)	Effective as intended – these habitats have been proposed as mitigation based on the proven success of previous habitat creation projects within the Fraser River estuary and similar environments.	As above.	N/A	Offsetting Plan (in accordance with *Fisheries Act* requirements)	EIS Section 17.0 and EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
	✓	✓	✓	• The VFPA to work collaboratively with appropriate transportation authorities and Canadian Wildlife Service (CWS) to develop and implement measures to mitigate effects to barn owl from vehicle collisions.	Minimise potential of barn owl-vehicle interactions to reduce injury or mortality	Effective as intended – proven approaches have been applied along other linear corridors.		N/A	N/A	EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR9-01 (CEAR Document#1322)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
				Further to VFPA commitment 7.1 (EIS Table 35-2), the VFPA will undertake the following initiatives to mitigate the predicted minor decrease in barn owl productivity, which will also benefit the larger bird community, including barn swallows and short-eared owls: • Connect and collaborate with local authorities to explore speed management within the LAA, as feasible, to decrease the potential for bird-vehicle collisions for multiple avian species, including barn owl; • Manage vegetation within verges associated with the Project's footprint adjacent to terrestrial upland and marsh habitat potentially used by foraging barn owls to decrease its habitat suitability to foraging owls; • Implement measures to increase education and awareness of owl-vehicle collisions along roads to influence driving habits; and • Work with an appropriate third party organisation (e.g., Delta Farmland Wildlife Trust) to increase barn owl productivity through installing and maintaining artificial nest structures as feasible. (IR9-01)						
Ongoing Productivity of Commercial, Recreational, and Aboriginal (CRA) Fisheries										
Change to the ongoing productivity of CRA fisheries		✓	✓	• No mitigation required	N/A	N/A	No adverse residual effects anticipated	N/A	-	-

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Labour Market										
Change in employment during construction and operation		✓	✓	• Positive effect - No mitigation required	N/A	N/A	No adverse residual effects anticipated	The VFPA will continue to consult with Indigenous groups identified in the EIS and AIEIS[12], and advance discussion on economic development opportunities, employment and cultural display opportunities generated by the Project. (EIS Table 35-2) As stated in the response to IR10-28, the VFPA commits to: • Continue to abide by the Memorandum of Agreement in place with Tsawwassen First Nation to accommodate Tsawwassen First Nation for adverse effects of the Project; • Continue to negotiate in good faith with Musqueam First Nation on the development of a Mutual Benefits Agreement for the Project; • Work with Lake Cowichan First Nation and Tseycum First Nation to implement commitments within their respective negotiated Mutual Benefits Agreements; • Continue discussions with groups, including Semiahmoo First Nation, Tsleil-Waututh Nation, Stz'uminus First Nation, Cowichan Tribes, Halalt First Nation, Lyackson First Nation, Penelakut Tribe, Métis Nation British Columbia, Hwlitsum,	N/A	Appendix IR12-A (CEAR Document #314 EIS Table 35-2 (CEAR Document #181) IR10-28 (CEAR Document #1322)
Change in labour income during construction and operation		✓	✓	• Positive effect - No mitigation required	N/A	N/A				

[12] Additional Information to the EIS – *W̲SÁNEĆ* Nation (CEAR Document #930)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Change in training opportunities during construction and operation		✓	✓	• Positive effect - No mitigation required	N/A	N/A	No adverse residual effects anticipated	Tsawout First Nation, Pauquachin First Nation, Tsartlip First Nation, and Malahat Nation on Mutual Benefits Agreements; and • Assist all Indigenous groups identified above in accessing potential economic opportunities resulting from the Project, including contracting opportunities and construction employment opportunities. To support these Indigenous groups in preparing for employment opportunities, the VFPA will provide training funding. To support the development and implementation of plans to facilitate access to such Project-related benefits, the VFPA will continue engagement, initiated in December 2014, with these groups (EIS Section 32.3.3.3; AIEIS Section 7.3.3.3).		
Change in unemployment and participation rates during construction and operation		✓	✓	• Positive effect - No mitigation required	N/A	N/A		The VFPA will develop a monitoring process that will include a requirement within the Infrastructure Developer's contract to collect and report to VFPA annually on Indigenous employment and training matters. Annually, the VFPA will undertake a review of the results of this reported information to determine the degree of compliance with their contract agreement and to identify (and address) any obstacles to implementation and systemic successes or failures. (EIS Table 35-2)		

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Economic Development										
Change in materials, goods and services contracting revenues during construction and operation		✓	✓	• No mitigation required	N/A	N/A	No adverse residual effects anticipated	The VFPA will continue to consult with Indigenous groups identified in the EIS and AIEIS, and advance discussion on economic development opportunities, employment, and cultural display opportunities generated by the Project. (EIS Table 35-2) As stated in the response to IR10-28, the VFPA commits to: • Continue to abide by the Memorandum of Agreement in place with Tsawwassen Fist Nation to accommodate Tsawwassen First Nation for adverse effects of the Project; • Continuing to negotiate in good faith with Musqueam First Nation on the development of a Mutual Benefits Agreement for the Project; • Work with Lake Cowichan First Nation and Tseycum First Nation to implement commitments within their respective negotiated Mutual Benefits Agreements; • Continue discussions with groups, including Semiahmoo First Nation, Tsleil-Waututh Nation, Stz'uminus First Nation, Cowichan Tribes, Halalt First Nation, Lyackson First Nation, Penelakut Tribe, Métis Nation British Columbia, Hwlitsum, Tsawout First Nation, Pauquachin First Nation, Tsartlip First Nation, and Malahat Nation on Mutual Benefits Agreements; and	N/A	EIS Section 33.3 (CEAR Document #314); Appendix IR12-A (CEAR Document #314) EIS Table 35-2 (CEAR Document #181) IR10-27 (CEAR Document #1322)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
								• Assist all Indigenous groups identified above in accessing potential economic opportunities resulting from the Project, including contracting opportunities and construction employment opportunities. To support these Indigenous groups in preparing for employment opportunities, the VFPA will provide training funding. To support the development and implementation of plans to facilitate access to such Project-related benefits, the VFPA will continue engagement, initiated in December 2014, with these groups (EIS Section 32.3.3.3; AIEIS Section 7.3.3.3). The VFPA will develop a monitoring process that will include a requirement within the Infrastructure Developer's contract to collect and report to the VFPA annually on Indigenous employment and training matters. Annually, the VFPA will undertake a review of the results of this reported information to determine the degree of compliance with their contract agreement and to identify (and address) any obstacles to implementation and systemic successes or failures. (EIS Table 35-2)		
Increase in induced output (revenue) during construction and operation		N/A	N/A	• No mitigation required	N/A	N/A	No adverse residual effects anticipated	N/A	N/A	N/A

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Consistency of Project with economic development plans during operation			N/A	• No mitigation required	N/A	N/A	No adverse residual effects anticipated	N/A	N/A	N/A
Marine Commercial Use										
Displacement of commercial crab harvesting, reduction in harvest levels and harvest revenue during construction and operation		✓	✓	• Inform commercial crab harvesters about the nature, location, status, and progress of construction work and operational activities	Minimise effect on commercial crab harvesting by providing timely information about proposed navigational closure expansions and other activities during construction and operation. This will allow commercial crab harvesters to adjust their planned activities in advance.	Effective as intended – it is anticipated that advanced communications of the proposed navigational closure expansions for commercial crab harvesting and associated access restrictions in connection with Project construction and operation would allow commercial crab harvesters to adjust their planned harvesting activities.	**Residual Effect:** Changes in area, harvest, and revenue for commercial crab harvesting during construction and operation. **Description of Residual Effect:** Changes in commercial crab harvesting areas and displacement of commercial crab harvesting activities and consequential adverse effects on harvest and revenue would represent a demonstrable change in magnitude, but remain within historical norms given the implementation of and experience with the current commercial crab navigational closure established in 2009. The effect is limited to the LAA, is continuous, and occurs through construction and operation. **Determination:** Not Significant.	N/A	Communications Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Alignment of construction activities to avoid fisheries-sensitive windows for Dungeness crabs • Compliance checking for water quality • Provisions for intervention in the case of non-compliance	Minimise displacement effect on commercial crab harvest levels by: 1) reducing direct mortality of crabs (specifically gravid female crabs) below -5.0 m CD water depth through work window restrictions from October 15 to March 30; and 2) Maintain existing Dungeness crab productivity through protection of water quality.	Effective as intended – proven approach in aquatic environments (e.g., threshold levels for TSS/turbidity, DFO-regulated timing windows).		N/A	Construction Compliance Monitoring Plan	EIS Sections 21.8 and 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• The EMP will identify procedures for a Crab Salvage Program	Minimise displacement effect on commercial	Effective as intended for crabs – proven		The VFPA is committed to minimising handling of crab, and to working with	Marine Species Salvage Plan	EIS Section 33.0 (CEAR Document #181)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
					crab harvesting by reducing effects to harvestable crab population to be relocated from portion of the proposed navigational closure expansion. Involves the baiting away and relocation of crabs within terminal and causeway containment dykes to local area outside of Project-related disturbance area.	approach at Roberts Bank for DP3.		Indigenous groups, in implementation of crab salvage mitigation.		Appendix IR12-A (CEAR Document #314)
Displacement of commercial crab harvesting, reduction in harvest levels and harvest revenue during construction and operation		✓	✓	• Consult with commercial crab harvesters concerning the proposed navigational closure expansion. Where identified and agreed upon, implement additional mitigation measures with appropriate parties.	Minimise effects through supporting the identification and implementation of feasible measures to mitigate displacement effects	Effective as intended – the VFPA can effectively consult with commercial crab harvesters on the proposed navigational closure expansion. Where identified and agreed upon, the VFPA will work with other parties, including DFO, to implement feasible mitigation to address displacement effects.	As above.	N/A	Mitigation not in EMP	EIS Sections 21.8 and 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Local Government Finances										
Change in local government revenues and expenditures resulting in an effect on local government finances during construction and operation		✓	✓	• No mitigation required	N/A	N/A	No adverse residual effects anticipated	N/A	No mitigation required as positive effect	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Services and Infrastructure										
Constraint on healthcare services capacity and supply during construction and operation		✓	✓	• The EMP will identify measures to prevent, prepare for, respond to, and recover from an emergency • The EMP will identify procedures for notifying and communicating with the Coast Guard, City of Delta, Delta Police Department, Delta Fire and Emergency Services, and the B.C. Ambulance Service	Minimise demands on local health services in the event of an emergency	Effective as intended – standard mitigation measure and proven approach. Relevant legislation, guidelines, and standard management practices will apply.	No adverse residual effects anticipated	N/A	Health and Safety and Emergency Response Management Plan	EIS Sections 23.0 and 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Implement measures to address land-based construction and operation road traffic, traffic control, and potential traffic hazards.	Reduce potential land (road) and marine traffic hazards associated with the Project, which would minimise demands on local health services during construction	Effective as intended – standard mitigation measure and proven approach. Relevant legislation, guidelines, and standard management practices will apply.		N/A	Land and Marine Traffic Management Plan	EIS Sections 23.0 and 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Implement measures to prevent, prepare for, respond to, and recover from an emergency • Implement procedures for notifying and communicating with the Coast Guard, City of Delta, Delta Police Department, Delta Fire and Emergency Services, and the B.C. Ambulance Service	Minimise demands on local emergency services in the event of an emergency	Effective as intended – standard mitigation measure and proven approach. Relevant legislation, guidelines, and standard management practices will apply.		N/A	Health and Safety and Emergency Response Management Plan	EIS Section 33.0 (CEAR Document #181) EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Implement measures to address land-based construction and operation-related traffic, traffic control, and potential traffic hazards	Reduce potential land and marine traffic hazards associated with the Project, which would minimise demands on local health services during construction and operation	Effective as intended – standard mitigation measure and proven approach. Relevant legislation, guidelines, and standard management practices will apply.		N/A	Land and Marine Traffic Management Plan	EIS Section 33.0 (CEAR Document #181) EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Implement measures to inform emergency services regarding the nature, location, status, and progress of construction work	Minimise constraint on emergency services by ensuring timely communication of traffic detours or interruptions	Effective as intended – mitigation measure identified by emergency service providers.		N/A	Communications Plan	EIS Section 33.0 (CEAR Document #181) EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Constraint on healthcare services capacity and supply during construction and operation		✓	✓	• Communication with emergency services on operational plans, activities, timelines, service requirements, and management of emergency service utilisation	Minimise constraint on emergency services by ensuring timely communication about anticipated service demands	Effective as intended – mitigation measure identified by emergency service providers.	No adverse residual effects anticipated	N/A	Health and Safety and Emergency Response Plan	EIS Section 33.0 (CEAR Document #181) EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Police and security management, including site security services, site security systems, and equipment	Minimise demand on police services through provision of independent security services	Effective as intended – as with previous and existing terminal construction and port operations, port infrastructure developer and terminal operator concessionaire will be responsible for project site security coverage, as is standard practice. Relevant legislation, guidelines, and standard management practices will apply.		N/A	Health and Safety and Emergency Response Plan	EIS Section 33.0 (CEAR Document #181) EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Constraint on municipal infrastructure capacity and supply during construction and operation		✓	✓	• Details of expected sources and quantities of construction waste • Measures to minimise waste generation	Minimise demand on municipal services through standard waste management measures	Effective as intended – standard mitigation measure and proven approach. Relevant legislation, guidelines, and standard management practices will apply.	No adverse residual effects anticipated	N/A	Hazardous Materials and Waste Management Plan	EIS Section 33.0 (CEAR Document #181) EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Outdoor Recreation										
Displacement of recreational crab harvesting and reduction in harvest levels during construction and operation		✓		• Alignment of construction activities to avoid fisheries-sensitive windows for Dungeness crabs • Compliance checking for water quality • Provisions for intervention in the case of non-compliance	Minimise displacement effect on recreational crab harvest levels by: 1) reducing direct mortality of crabs (specifically gravid female crabs) below -5.0 m CD water depth through work window restrictions from October 15 to March 30; and 2)	Effective as intended – proven approach in aquatic environments (e.g., threshold levels for TSS/turbidity, DFO-regulated timing windows).	Negligible residual effects anticipated	N/A	Construction Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
					maintaining existing Dungeness crab productivity through protection of water quality					
Displacement of recreational crab harvesting and reduction in harvest levels during construction and operation		✓		• The EMP will identify procedures for a Crab Salvage Program	Minimise effects of displacement by reducing effects to harvestable crab population to be relocated from portion of proposed navigational closure expansion. Involves baiting away for relocation of crabs within terminal and causeway containment dykes to local area outside of Project-related disturbance area.	Effective as intended for crabs – proven approach at Roberts Bank for DP3; effectiveness of mitigation incorporated into environmental assessment as salvages are known to only reduce and not fully mitigate construction related crab productivity decreases. Therefore, a change in the significance of the residual effect is not anticipated if this mitigation measure is not fully effective in salvaging all crabs from within work zones.	Negligible residual effects anticipated	The VFPA is committed to minimising handling of crab, and to working with Indigenous groups, in implementation of crab salvage mitigation.	Marine Species Salvage Plan	EIS Sections 24.0 and 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Inform marine recreational operators about the nature, location, status, and progress of construction work and operational activities	Minimise effect on harvesting by providing timely information about proposed navigational closure expansion and other activities during construction and operation. This will allow recreational crab harvesters to adjust their planned activities in advance.	Effective as intended – it is anticipated that advanced notification of potential regulatory changes in connection with Project construction and operation would allow recreational crab harvesters to adjust their planned activities if they thought necessary to do so.		N/A	Communications Plan	EIS Sections 24.0 and 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Consult with recreational crab harvesters concerning the proposed navigational closure expansion. Where identified and agreed upon,	Minimise effects through supporting the identification and	Effective as intended – the VFPA can effectively consult with recreational crab		N/A	Mitigation not in EMP	EIS Sections 24.0 and 33.0 (CEAR Document #181)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
				implement feasible mitigation with appropriate parties.	implementation of feasible measures to mitigate displacement effects	harvesters on the matter of the proposed navigational closure area expansion. Where identified and agreed upon, the VFPA will work with other parties, including DFO, to implement feasible mitigation to address displacement effects.				Appendix IR12-A (CEAR Document #314)
Visual Resources										
Change in daytime visual resources during construction and operation		✓	✓	• Crane colour optimisation to reduce contrast and enhance blending with the landscape	Minimise visibility of prominent visual features (cranes), by optimising colour to enhance blending with the landscape	Effective as intended – existing research and best practices available on effectively identifying colour of surface treatments to blend with surrounding landscapes.	**Residual Effect:** Change in daytime visual resources during construction and operation. **Description of Residual Effect:** Moderate or low magnitude for multiple daytime visual resources points of reception (PORs). Disturbances will be visible throughout the entire RAA, but discernible effects will be within 8 km from the Project. Effects are long-term and continuous, with partial reversibility. **Determination:** Not Significant.	N/A	Mitigation not in EMP	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Change in nighttime visual resources during construction and operation		✓	✓	• Orient lights downward and away from residential and marine areas • Use shielding to minimise light trespass • Control light levels and limit light use to areas where activities are occurring, where possible • Use dredge lighting shields to minimise light spilling outside the basic working footprint of the dredge. • Where possible, use fixtures that emit light at specific wavelengths	Reduce the light emitted from construction equipment and operation phase activities to reduce changes in sky glow and light trespass	Effective as intended – proven approach. Best practices as recommended by the International Commission on Illumination (CIE), Illuminating Engineering Society of North America (IESNA), and International Dark-Sky	**Residual Effect:** Change in nighttime visual resources during construction and operation. **Description of Residual Effect:** Low magnitude for a singular nighttime visual resources POR. Disturbances will not be perceptible beyond	N/A	Light Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
						Association (IDA) to reduce changes in sky glow and light trespass.	60 km from the Project. Effects are long-term and continuous with partial reversibility. **Determination:** Not Significant.			
Land and Water Use										
Consistency with land use planning designations during construction		✓		• Engagement with land and water users, including dialogue and communications through a mechanism for two-way dialogue and communications about port-related issues in Delta	Reduce potential inconsistencies through identification of opportunities to improve compatibility of port and adjacent land uses	Effective as intended – engagement with land and water users is standard approach to land use planning matters.	No residual effect	The VFPA will continue to update and make information publicly available, as part of its public information commitment. As part of this commitment, the VFPA will implement a mechanism for two-way dialogue and communications about port-related issues in Delta and continue to maintain the VFPA Community Feedback Line (to register and respond to feedback and complaints). (EIS Table 35-2)	Communications Plan	Appendix IR12-A (CEAR Document #314) EIS Table 35-2 (CEAR Document #181)
		✓		• Land Use Planning Approach: Engagement with local governments, Indigenous groups, and other land use authorities, as appropriate, per objective in the VFPA Land Use Plan, when updating or amending Land Use Plan, or determining land use designations	Avoid potential inconsistency through amendments or updates to Land Use Plan, and engagement with appropriate groups about the changes	Effective as intended – engagement with governments with jurisdiction and Indigenous communities is standard approach for land and water use planning matters.		N/A	Communications Plan	EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Disturbance to marine-related industrial uses during construction		✓		• Engagement with land and water users, including dialogue and communications through a mechanism for two-way dialogue and communications about port-related issues in Delta, and use of the VFPA Community Feedback Line	Reduce potential disturbance through engagement to identify and resolve issues	Effective as intended – the measure provides an effective mechanism for marine industrial users to communicate with the Proponent and address potential concerns/questions in a timely and ongoing manner.	No residual effect	The VFPA will continue to update and make information publicly available, as part of its public information commitment. As part of this commitment, the VFPA will implement a mechanism for two-way dialogue and communications about port-related issues in Delta and continue to maintain the VFPA Community Feedback Line (to register and respond to feedback and complaints). (EIS Table 35-2)	Communications Plan	EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Disturbance to marine-related industrial uses during construction							No residual effect	Should unanticipated issues be identified regarding the Project-related construction activities and interaction with existing uses, the VFPA will engage with the land users to consider measures to resolve the issues. (IEIS Table 35-2)		
		✓		• Inform marine commercial operators about the nature, location, status, and progress of construction work	Reduce potential for navigational disturbance, including delays or route changes, by notifying industrial users of construction activities	Effective as intended – the communications plan, in conjunction with the measure above, provides communication to the users that will enable them to plan their activities to avoid interference.		N/A	Communications Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Project-specific mitigations to minimise interference	Reduce potential disturbance by providing guidance to minimise interference with commercial / industrial vessel activity	Effective as intended – managing marine traffic by establishing areas to be avoided will avoid direct interference with other activities.		N/A	Land and Marine Traffic Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Disturbance to protected area (Roberts Bank WMA) during construction		✓		• Engagement with land and water users, including dialogue and communications through a mechanism for two-way dialogue and communications about port-related issues in Delta, and use of the VFPA Community Feedback Line	Reduce potential disturbance through engagement to identify and resolve issues	Effective as intended – engagement with water users is a standard approach to identifying potential matters of concern.	No residual effect	The VFPA will continue to update and make information publicly available, as part of its public information commitment. As part of this commitment, the VFPA will implement a mechanism for two-way dialogue and communications about port-related issues in Delta and continue to maintain the VFPA Community Feedback Line (to register and respond to feedback and complaints). (EIS Table 35-2)	Communications Plan	EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Inform marine recreational operators about the nature, location, status, and progress of construction work	Reduce potential for navigational disturbance, including delays or route changes, by notifying recreational users	Effective as intended – marine recreational users may be able to plan to avoid marine areas with construction activity.		N/A	Communications Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
					of construction activities					
Disturbance to protected area (Roberts Bank WMA) during construction		✓		• Identify areas to be avoided by marine vessel traffic through establishment of restricted access areas	Reduce potential disturbance by providing guidance to avoid construction activity and vessel travel in WMA	Effective as intended – the potential for direct disturbance within protected areas will be avoided.	No residual effect	N/A	Land and Marine Traffic Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Changes in access to community lease lands		✓		• Engagement with land and water users, including dialogue and communications through a mechanism for two-way dialogue and communications about port-related issues in Delta, and use of the VFPA Community Feedback Line	Reduce potential disturbance through engagement to identify and resolve issues	Effective as intended – engagement with water users, in this case Tsawwassen First Nation, is the standard approach to identifying and addressing potential issues. This measure is complemented and supported by other ongoing consultation with Tsawwassen First Nation.	No residual adverse effects anticipated (changed as per Project Construction Update (CEAR Document #1210); formerly "Disturbance to community lease lands during construction – Not Significant"	The VFPA will continue to update and make information publicly available, as part of its public information commitment. As part of this commitment, the VFPA will implement a mechanism for two-way dialogue and communications about port-related issues in Delta and continue to maintain the VFPA Community Feedback Line (to register and respond to feedback and complaints). (EIS Table 35-2)	Communications Plan	EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Inform Indigenous groups about the nature, location, status, and progress of construction work	Reduce potential for navigational disturbance, including delays or route changes, by notifying Indigenous groups (as applicable) of construction activities	Effective as intended – community lease users may be able to plan to avoid marine areas with construction activity.		N/A	Communications Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Identify areas to be avoided by marine vessel traffic through establishment of restricted access areas	Reduce potential disturbance by providing guidance to avoid construction activity and vessel travel that will affect access to the community lease lands	Effective as intended – establishment of an area to be avoided, such that there will continue to be direct access to the community lease without interference from Project vessels, is considered effective.		N/A	Land and Marine Traffic Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Human Health										
Adverse health effects related to air emissions during construction		✓		• Regular inspection and maintenance of construction vehicles and equipment • Avoidance of creating traffic congestion • Restrictions on vehicle idling • Installation of wheel washer or regular sweeping of paved surfaces • Use of water spray to suppress dust on unpaved surfaces and open storage areas • Stabilisation of exposed earthworks	Reduce risk of health effects by reducing air emissions of contaminants and fugitive dust	Effective as intended – proven approach on construction sites.	**Residual Effect:** Adverse health effects related to air emissions during construction. **Description of Residual Effect:** Residual health effect is associated with air quality changes based on predicted exposures during construction of individuals located on the water near the proposed Project terminal. Few people are expected in the influenced area, and they would be present for only limited durations. This effect is based on shorter-term (e.g., 1-h) exposures to fine particulates arising from dust during construction-phase handling of fill material. Any health effects would be highly localised to small areas over water where the smallest particulates occur. Bouts of dust generation that could exceed health thresholds are expected to be short term and infrequent during construction. **Determination:** Not Significant.	N/A	Air Quality and Dust Control Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Compliance checking for air quality during construction and operation	Reduce risk of health effects by contributing to reduction in air emissions through monitoring and adaptive management	Effective as intended – feedback provided through monitoring will facilitate adaptive management.		The Construction and Operation EMP's Compliance Monitoring Plan will include air quality monitoring and reporting during the construction and operation phases of the Project utilising the existing T39 monitoring station. (IR6-37)	Construction and Operation Compliance Monitoring Plan	Appendix IR12-A (CEAR Document #314) IR6-37 (CEAR Document #1188[13])

[13] CEAR Document #1188 From the Vancouver Fraser Port Authority to the Review Panel re: Response to IR6-04, IR6-05, IR6-10, IR6-11, IR6-12, IR6-14, IR6-21, IR6-22, IR6-23, IR6-24, IR6-25, IR6-27, IR6-28, IR6-29, IR6-31, IR6-32, IR6-34, IR6-35, and IR6-37 (See Reference Document #991).

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Adverse health effects related to noise during construction and operation		✓		• Scheduling of higher noise-generating activities during weekdays, and during the daytime • Shutdown of equipment and vehicles when not in use • Utilisation of equipment that produces less noise • Awareness and training for construction crews	Reduce risk of health effects by reducing noise generated during construction	Effective as intended – proven approach on construction sites.	**Residual Effect:** Adverse health effects related to noise during construction and operation. **Description of Residual Effect:** The residual effect is rated low to medium magnitude because, if such effects occur, sleep impairment could present as sleep awakenings in one or two individuals, or as sleep disturbance (a lower-severity effect consisting of increased motility in sleep) that could affect more individuals within the LAA. Residual health effects related to changes in continuous nighttime noise levels during Project operation or construction phase are expected to be localised to a few residences closer to existing roads and rail lines. A very small number of individuals	N/A	Noise Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Compliance checking for above-ground noise	Reduce risk of health effects by contributing to reduction in noise through monitoring and adaptive management	Effective as intended – proven approach for noise monitoring.		N/A	Construction Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314;

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Adverse health effects related to noise during construction and operation		✓	✓	• Inform local residents, Tsawwassen First Nation, and other Indigenous groups about the nature, location, status, and progress of construction work	Reduce potential for exposure to noise from peak construction activity by notifying local residents and Indigenous groups of construction activities	Effective as intended – the communications plan provides communication to residents and Indigenous groups that will enable them to plan their activities to avoid exposure to noise from peak construction activity.	(less than 0.01% of the population) may be Highly Sleep Disturbed. Affected individuals are unlikely to perceive an increase in noise levels and are expected to acclimate to the minor increases in nighttime noise levels. Individuals who do experience sleep impairment may exhibit symptoms such as tiredness, fatigue, and lack of focus. Severe adverse health effects such as cardiovascular effects are unlikely. For most individuals, there would be no change in health effects over background levels. Severity is therefore considered to be medium because, in the worst cases, the residual effects related to noise could result in health effects related to insufficient sleep. Residual health effects in affected individuals	Based on the effectiveness of the communication channels for DP3, the VFPA will carry mechanisms forward for RBT2 including the Delta Community Liaison Committee, the 24-hour Community Response Line, and the dedicated RBT2 Project email address (container.improvement@portvancouver.com). (IR7-11)	Communications Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314 IR7-11 (CEAR Document #1113[14])
			✓	• Optimised tonality for equipment alarms • Operator awareness and training • Regular maintenance of equipment • Advertisement and maintenance of the VFPA Community Feedback Line	Reduce risk of health effects by reducing noise generated during operation	Effective as intended – assuming adequate management and control of implementation.		N/A	Noise Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

[14] CEAR Document #1113 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR6-09, IR6-15, IR6-16, IR6-19, IR7-09, IR7-10, IR7-11, and IR7-32 (See Reference Documents #991 & #1000).

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Adverse health effects related to noise during construction and operation			✓	• Routine instrument-based monitoring	Reduce risk of health effects by contributing to reduction in noise through monitoring and adaptive management	Effective as intended – proven approach for noise monitoring.	could have long-term consequences, lasting for the duration of the Project or until behaviour is modified (e.g., closing windows while sleeping). However, effects are expected to be reversible with changes in behaviour such as closing windows at night or use of sleeping aids (e.g., ear plugs) as may be required. **Determination:** Not Significant.	N/A	Operation Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Adverse health effects due to stress and annoyance during construction and operation		✓	✓	• Orient lights downward and away from residential and marine areas • Use shielding to minimise light trespass • Control light levels and limit light use to areas where activities are occurring, where possible • Use dredge lighting shields to minimise light spilling outside the basic working footprint of the dredge • Where possible, use fixtures that emit light at specific wavelengths	Reduced risk of health effects from stress and annoyance by reducing light as a source of stress and annoyance during construction	Effective as intended – proven approach. Best practices as recommended by the International Commission on Illumination (CIE), Illuminating Engineering Society of North America (IESNA), and International Dark-Sky Association (IDA) to reduce changes in sky glow and light trespass.	No adverse residual effects anticipated	N/A	Light Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Scheduling of higher noise-generating activities during weekdays, and during the daytime • Shutdown of equipment and vehicles when not in use • Utilisation of equipment that produces less noise • Awareness and training for construction crews	Reduce risk of health effects from stress and annoyance by reducing noise as a source of stress and annoyance during construction	Effective as intended – proven approach on construction sites.		N/A	Noise Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A of CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Adverse health effects due to stress and annoyance during construction and operation		✓		• Compliance checking for above-ground noise	Reduce risk of health effects, caused by stress and annoyance from noise, by contributing to reduction in noise through monitoring and adaptive management	Effective as intended – proven approach for noise monitoring.	No adverse residual effects anticipated	N/A	Construction Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Inform local residents, Tsawwassen First Nation, and other Indigenous groups about the nature, location, status, and progress of construction work	Reduce potential for exposure to noise from peak construction activity by notifying local residents and Indigenous groups of construction activities Reduce stress and annoyance from 'the unknown' by providing information about the duration and frequency of noise that will be experienced	Effective as intended – the communications plan provides communication to residents and Indigenous groups that will enable them to plan their activities to avoid exposure to noise from peak construction activity.		Based on the effectiveness of the communication channels for DP3, the VFPA will carry mechanisms forward for RBT2 including the Delta Community Liaison Committee, the 24-hour Community Response Line, and the dedicated RBT2 Project email address (container.improvement@portvancouver.com). (IR7-11)	Communications Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314) IR7-11 (CEAR Document #1113)
			✓	• Optimised tonality for equipment alarms • Operator awareness and training • Regular maintenance of equipment • Advertisement and maintenance of the VFPA Community Feedback Line	Reduce risk of health effects from stress and annoyance by reducing noise as a source of stress and annoyance during operation	Effective as intended – standard noise management measures.		N/A	Operation Noise Management Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
			✓	• Routine instrument-based monitoring	Reduce risk of health effects, caused by stress and annoyance from noise, by contributing to reduction in noise through monitoring and adaptive management	Effective as intended – proven approach for noise monitoring.		N/A	Operation Compliance Monitoring Plan	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Adverse health effects due to stress and annoyance during construction and operation		✓	✓	• Awareness and education measures regarding results of contaminant sampling of edible shellfish	Reduce risk of health effects from stress and annoyance by reducing perception of shellfish contamination as a source of stress and annoyance	Effective as intended – results of shellfish contamination studies can be effectively shared with each interested Indigenous group through ongoing consultation activities.	No adverse residual effects anticipated	N/A	Mitigation not in EMP	EIS Section 33.0 (CEAR Document #181) Appendix IR12-A of CEAR Document #314)
Adverse health outcomes due to changes in health inequity during construction and operation		✓	✓	• Accommodation measures related to Indigenous employment, training, and contracting opportunities	Reduce effects of health inequity by enhancing positive effects for vulnerable populations	Effective as intended – these accommodation measures will reduce adverse effects on health inequity that may occur via employment and income.	No adverse residual effects anticipated	The VFPA will continue to engage in consultation with Indigenous groups identified in this EIS, and advance discussion on economic development opportunities, employment and cultural display opportunities generated by the Project. (EIS Table 35-2)	Mitigation not in EMP	EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Archaeological and Heritage Resources										
Crushing or biological degradation of potential fish trap stakes during construction		✓		• Excavate a test trench, or series of trenches, across the area of archaeological potential to locate potential fish trap stakes, if present	Reduce risk of damage to resources by identifying and removing any resources prior to construction	Effective as intended – proven mitigation and standard practice in construction.	**Residual Effect:** Crushing or biological degradation of potential fish trap stakes during construction. **Description of Residual Effect:** The residual effect would be high in magnitude (due to the structure of an artifact being crushed or degraded), site-specific in extent, and would occur only once (as breakage or decomposition of artifacts is permanent), and irreversible. **Determination:** Not Significant.	N/A	Mitigation not in EMP	EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Reduced access for future archaeological study or preservation of potential fish trap stakes during construction		✓		• Excavate a test trench across the area of archaeological potential to locate potential fish trap stakes, if present, and sample / investigate / preserve fish trap stakes if found	Reduce risk of limiting access for future archaeological study and preservation by mapping and preserving samples of any resources identified	Effective as intended – proven mitigation and standard practice in construction.	**Residual Effect:** Reduced access for future archaeological study or preservation of potential fish trap stakes during construction. **Description of Residual Effect:** The residual effect would be low in magnitude as access will remain outside of the Project footprint, site-specific, would occur only once with construction and be permanent because the area is not likely to be uncovered in future. Reversibility is possible by removing the overburden of fill material. **Determination:** Not Significant.	N/A	Mitigation not in EMP	EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Exposure of potential fish trap stakes during construction		✓		• Annually monitor, for a period of 4 years, predicted tidal erosion and sample/investigate fish trap stakes if found	Reduce risk of limiting access for future archaeological study and preservation by mapping and preserving samples of any resources identified	Effective as intended – proven mitigation and standard practice in construction.	**Residual Effect:** Exposure of potential fish trap stakes during construction. **Description of Residual Effect:** The residual effect is considered to be moderate in magnitude with depth and area of erosion being measurable over time; local in extent and a function of sediment scour and reactivation of the nearby drainage channel; and frequent as exposure would occur gradually and repeatedly. The potential adverse	N/A	Sediment and Erosion Control Plan	EIS Table 35-2 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
							effect would be irreversible. **Determination:** Not Significant.			
Current Use of Lands and Resources for Traditional Purposes (Current Use)										
Changes in access to preferred Current Use locations		✓	✓	• Continue to abide by the Memorandum of Agreement in place with Tsawwassen First Nation to accommodate for effects of the Project	Provide accommodation for potential effects on Current Use	Effective as intended – combined with other mitigation measures proposed for the potential access / displacement effect, effective mitigation is anticipated.	No adverse residual effects anticipated	N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Continuing to negotiate in good faith with Musqueam First Nation on the development of a Mutual Benefits Agreement for the Project	Provide accommodation for potential effects on Current Use	Effective as intended – combined with other mitigation measures proposed for the potential access / displacement effect, effective mitigation is anticipated.		N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Mitigation measures noted above regarding marine commercial use and outdoor recreation to address potential displacement-related effects on commercial and recreational crab harvesting (including Indigenous commercial and recreational crab harvesting)	Minimise effects through identification of feasible measures to mitigate displacement effects	Effective as intended – combined with other mitigation measures proposed for the potential access / displacement effect, effective mitigation is anticipated.		N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Consult with Indigenous domestic or food, social, and ceremonial (FSC) crabbers concerning the proposed expansion of the area closed to commercial and recreational crabbing	Minimise effects through identification of feasible measures to mitigate displacement effects	Effective as intended – combined with other mitigation measures proposed for the potential access/displacement effect, effective mitigation is anticipated.		N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Support Indigenous crabbing for domestic or FSC purposes within the area closed to commercial and recreational crabbing	Reduce displacement effect of terminal by ensuring domestic and FSC crabbing can continue in navigational closure area	Effective as intended – combined with other mitigation measures proposed for the potential access / displacement effect, effective mitigation is anticipated.		N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Changes in access to preferred Current Use locations		✓		• Mitigation measure noted above regarding land and water use to reduce potential disturbance to marine access to Tsawwassen First Nation community lease lands (Tsawwassen Water Lots)	Minimise potential disturbance through provision of timely information to allow for alternate access plans	Effective as intended – combined with other mitigation measures proposed for the potential access / displacement effect, effective mitigation is anticipated.	No adverse residual effects anticipated	N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Develop a communications protocol to inform appropriate Indigenous groups of planned or unplanned events related to Project construction or operation that may affect Current Use access	Minimise potential disturbance through provision of timely information to allow for alternate access plans and confirmation of potential effects and mitigation effectiveness generally	Effective as intended – combined with other mitigation measures proposed for the potential access / displacement effect, effective mitigation is anticipated.		N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Work with appropriate Indigenous groups to develop and implement a communications mechanism (refer to Current Use element of follow-up program in Appendix IR13-30-C) that will support dialogue between the VFPA and Indigenous groups on topics of concern that arise during the construction and initial operation phases	Minimise potential disturbance through provision of timely information to allow for alternate access plans	Effective as intended – combined with other mitigation measures proposed for the potential access / displacement effect, effective mitigation is anticipated.		N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Changes in availability of preferred Current Use resources		✓	✓	• Mitigation measures noted above regarding changes in access to Current Use locations	See above – mitigating potential changes in availability of Current Use resources is predicated by the mitigation of potential changes in access to Current Use locations where those resources are harvested	Effective as intended – see above.	No adverse residual effects anticipated	N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Changes in availability of preferred Current Use resources		✓	✓	• Mitigation measures noted above to reduce Project-related effects to marine resources, including marine vegetation, marine invertebrates, marine fish, marine mammals, and coastal birds	See above – mitigation measures for effects on productivity of marine resources also mitigate potential effects on availability of preferred Current Use resources	Effective as intended – to the extent that these mitigation measures are effective at mitigating effects on marine resources, as described above, they are expected to be effective at mitigating Project-related effects on Current Use of those resources, where augmented with the communication mechanism identified under 'access'.	No adverse residual effects anticipated	N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Share with appropriate Indigenous groups information gained through environmental monitoring and follow-up program to support monitoring, by Indigenous groups, of environmental conditions related to Current Use	Minimise potential effect on marine resource availability by facilitating early identification of any unanticipated outcomes	Effective as intended – participation in monitoring and FUP will allow for identification and management of unanticipated outcomes for Current Use.		N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Work with appropriate Indigenous groups to identify opportunities to participate in environmental monitoring and follow-up program	Minimise potential effect on marine resource availability by facilitating early identification of any unanticipated outcomes	Effective as intended – participation in monitoring and follow-up program will allow for identification and management of unanticipated outcomes for Current Use.		N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
Changes in quality of preferred Current Use resources		✓	✓	• Mitigation measures noted above regarding changes in availability of Current Use resources (which in turn carries forward measures regarding changes in access to Current Use locations)	See above – mitigating potential changes in quality of Current Use resources is predicated by the mitigation of potential changes in access to Current Use locations where those resources are harvested and potential changes	Effective as intended – see above.	No adverse residual effects anticipated	N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
					in availability of Current Use resources at those locations					
		✓	✓	• Mitigation measures noted above regarding human health to address perceived contamination of traditional food sources	Reduced risk of avoidance of preferred Current Use resources through awareness building measures regarding contamination of marine resources	Effective as intended – to the extent that these mitigation measures are effective at mitigating effects on human health, as described above, they are expected to be effective at mitigating effects on Current Use, where augmented with the communication mechanism identified under 'access'.		The information that was provided by Indigenous groups on the topic of country foods is presented in EIS Section 32.2. Should additional information on country food consumption by individual Indigenous groups become available over the course of the environmental assessment, the VFPA will incorporate such information into the assessment as appropriate. (IR-7.31.15-31)	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) IR-7.31.15-31 (CEAR Document #314) Appendix IR12-A (CEAR Document #314)
Changes in quality of preferred Current Use resources		✓	✓	• Mitigation measures noted above regarding changes in quality of Current Use resources (which in turn carries forward measures regarding changes in availability of Current Use resources, which in turn carries forward measures regarding changes in access to Current Use locations, which includes a communications mechanism to support ongoing dialogue between the VFPA and Indigenous groups)	See above – mitigating potential changes in quality of Current Use experience is predicated by the mitigation of potential changes in access to locations where Current Use activities are carried out and the availability and quality of resources that are harvested at those locations	Effective as intended – see above.	No adverse residual effects anticipated	N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓	✓	• Mitigation measures noted above regarding visual resources to reduce Project-related changes in daytime and nighttime visibility	Reduce effect of quality of experience by reducing visibility of features (cranes) and light that could potentially affect quality of experience	Effective as intended – to the extent that these mitigation measures are effective at mitigating effects on visual resources, as described above, they are expected to be effective at mitigating effects on Current Use, where augmented with the communication		N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

Potential Project-related Effect	Phase			Applicable Mitigation Measures	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Changes in quality of preferred Current Use experience						mechanism identified under 'access'.	No adverse residual effects anticipated			
		✓	✓	• Mitigation measures noted above regarding human health to decrease potential effects from Project-related noise, light, perceived shellfish contamination, and air emissions	Reduce effect of quality of experience by reducing factors that could potentially degrade the quality of experience	Effective as intended – to the extent that other mitigation measures are effective at mitigating effects on human health, as described above, they are expected to be effective at mitigating effects on Current Use, where augmented with the communication mechanism under 'access'.		N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)
		✓		• Mitigation measures noted above regarding archaeological and heritage resources to identify and reduce potential damage to fish trap stakes	Reduce effect of quality of experience by reducing factors that could potentially degrade the quality of experience in terms of cultural heritage and transmission	Effective as intended – to the extent that this mitigation is effective at mitigating effects on archaeological and heritage resources, as described above, it is expected to be effective at mitigating effects on Current Use, where augmented with the communication mechanism identified under 'access'.		N/A	Current Use-specific mitigation not in EMP	EIS Table 32-6 (CEAR Document #181) Appendix IR12-A (CEAR Document #314)

APPENDIX IR13-30-B

COMPILATION OF PROPOSED MITIGATION MEASURES AND OTHER COMMITMENTS – MARINE SHIPPING ASSOCIATED WITH THE PROJECT

Appendix IR13-30-B Compilation of Proposed Mitigation Measures and Other Commitments – Marine Shipping Associated with the Project

Potential Project-related Effect	Phase			Applicable Mitigation Measures[1]	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
Marine Mammals										
Behavioural and Acoustic Masking Effects Due to Underwater Noise from Marine Shipping Associated with the Project Physical Disturbance from Vessel Strikes			✓	• No specific mitigation measures were proposed to reduce underwater noise in the marine shipping area. • Distribution of a marine mammal awareness pamphlet "Marine Mammals of the Roberts Bank Area" to marine pilots working within VFPA jurisdiction. While the VFPA does not have jurisdiction of container ships associated with the Project in the marine shipping area, education and awareness of pilots could reduce vessel strike risk outside of VFPA jurisdiction.	Raise awareness of sensitivity of Roberts Bank and the Salish Sea to potentially avoid strikes between whales and vessels.	Distribution of a marine mammal awareness pamphlet: Effective as intended - increased awareness of marine pilots to avoid vessel strikes regionally when safe and practicable to do so. Application of this measure was not taken into consideration in the determination of the residual effect of vessel strikes, and therefore, if it is ineffective, there would be no change to the determination of residual effects from vessel strikes.	**Residual Effects:** Change in acoustic environment resulting in behavioural effects or acoustic masking and physical disturbance/vessel strikes from Project-associated vessels during operation phase. **Description of Residual Effects:** Potential behavioural disturbance to southern resident killer whale, North Pacific humpback whale, and Steller sea lion from underwater noise from Project-associated shipping is of moderate magnitude, local extent, long-term duration, frequent/seasonal, and fully reversible. Although behavioural responses are predicted from Project-associated shipping, the additional incremental disturbance to marine mammals over a year is anticipated to be minimal. Potential physical disturbance from vessel strikes to southern resident killer whale, North Pacific humpback whale, and Steller sea lion during Project-associated shipping is of low to high magnitude, site-specific extent, short-term to permanent duration, infrequent/seasonal, and fully reversible to irreversible. To reflect the range of possible outcomes of a vessel strike on southern resident killer whale, the VFPA notes that, if this unlikely event were to occur, the residual effect could range from low magnitude (if only minor injuries to an individual occurs) to high magnitude (if mortality of a breeding individual occurs). RBT2-associated container ship calls and vessel transit through the marine shipping area will be of short duration, therefore incremental residual effects from marine shipping associated with the Project over and above existing conditions is unlikely to affect individual marine mammals such that the survival or recovery of species is jeopardised.	Distribution of the marine mammal mariner's guide *Mariner's Guide to Whales, Dolphins, Porpoises of Western Canada*, to marine pilots working within VFPA jurisdiction (Appendix IR4-10-E of CEAR Document #1051[2]) The VFPA will work with stakeholders, Indigenous groups, regulators, and the Enhancing Cetacean Habitat and Observation (ECHO) Program to monitor the distribution and abundance of marine mammals within the marine shipping area to identify, prevent, and adaptively manage potential effects of underwater noise and vessel strikes on marine mammals, if they occur.	N/A	MSA Section 8.2.11 (CEAR Document #316[3]) IR5-41 (CEAR Document #1159[4]) IR5-52 (CEAR Document #1167[5])

[1] Suggested by the VFPA for consideration by the appropriate regulatory authorities (refer to the response to IR10-17 of CEAR Document #1275 for further details).
[2] CEAR Document #1051 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Request Package 4 (See Reference Document #946).
[3] CEAR Document #316 Marine Shipping Addendum to the Environmental Impact Statement (see reference document # 181).
[4] CEAR Document #1159 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR5-14, IR5-38, IR5-41, IR5-46, and IR5-53 (See Reference Document #975).
[5] CEAR Document #1167 From the Vancouver Fraser Port Authority to the Review Panel re: Responses to Information Requests IR5-37, IR5-42, IR5-48, IR5-49, IR5-51, IR5-52, IR6-30 and IR8-10 (See Reference Documents #975, #991 and #1071).

Potential Project-related Effect	Phase			Applicable Mitigation Measures[1]	Intent of Mitigation to Reduce Effect	Anticipated Effectiveness and Supporting Rationale	Residual Effect and Significance	Other Proponent Commitments	Applicable EMP or Other Plan(s)	CEAR Reference
	Design	Construction	Operation							
							Determination: Behavioural and Acoustic Masking Effects Due to Underwater Noise from Marine Shipping Associated with the Project – Not Significant Physical Disturbance from Vessel Strikes **-** Not Significant for North Pacific humpback whales and Steller sea lions. When taking the range of magnitude into consideration in determining significance of the residual effect to southern resident killer whale, if this unlikely event were to occur, the significance would also range from Not Significant (if only minor injuries occurred and the residual effect is low in magnitude) to Significant (if mortality of a breeding individual occurs and the residual effect is high in magnitude).			
Current Use of Lands and Resources for Traditional Purposes (Current Use)										
Current Use access and associated Current Use experience (i.e., cultural heritage) effects as a result of a potential Project-associated increases in overlap between Current Use activities and ship pass-bys in established shipping lanes			✓	• Consultation on the development of a potential marine shipping activities communication plan that would provide affected Indigenous groups with real-time information regarding the movement of Project-associated shipping traffic through the marine shipping area, including: ○ the estimated time of arrival of Project-associated container ships and their expected duration of use of the shipping lanes for inbound and outbound movements; and ○ circumstances outside normal operations that might affect the expected frequency or concentration of Project-associated vessel traffic along the shipping routes (e.g., clearing backlogs in shipping traffic due to storms requiring ships to temporarily anchor before proceeding).	Avoid, reduce, or otherwise manage potential Project-associated ship pass-by effects on access too preferred Current Use locations and quality of Current Use experience (cultural heritage) associated with those locations	Effective as intended - based on the nature of the concerns expressed by Indigenous groups to the VFPA regarding existing effects of marine shipping, and potential effects of Project-associated vessel transit (see MSA Section 5.0)	No adverse residual effects anticipated	N/A	N/A	MSA Section 9.5.6 (CEAR Doc#316)
			✓	• Consultation with the affected Indigenous groups to identify measures that would reduce the impact of the international shipping lanes to fishing by Indigenous groups.						

APPENDIX IR13-30-C

COMPILATION OF PROPOSED FOLLOW-UP PROGRAM ELEMENTS

Appendix IR13-30-C Compilation of Proposed Follow-up Program Elements

Potential Adverse Effect	Follow-Up Program Activity	Phase[1]			Objective	Summary Description of Potential Follow-up[2]	Activity to be Developed in Consultation with	CEAR Reference	Other Proponent Commitments[3]
		Pre-Construction	Construction	Operation					
Marine Vegetation									
Terminal, causeway, and expanded tug basin footprints predicted to potentially cause direct mortality and loss of eelgrass habitat.	Determine, over the long term, effectiveness of onsite habitat creation, specifically transplantation of eelgrass beds		✓	✓	Verify mitigation effectiveness	Follow-up Program (FUP) element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following: **Mitigation Effectiveness - Eelgrass transplantation:** 1) mean shoot density of eelgrass (number of shoots/m^2) 2) mean length (cm) and mean width (mm) of mature shoots 3) percent (%) cover by eelgrass	Fisheries and Oceans Canada (DFO), Environment and Climate Change Canada (ECCC), and interested Indigenous groups	N/A	N/A
Causeway footprint may potentially cause direct mortality and loss of intertidal marsh habitat.	Determine, over the long term, effectiveness of onsite habitat creation, specifically transplantation of intertidal marsh		✓	✓	Verify mitigation effectiveness	FUP element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following: **Mitigation Effectiveness - Intertidal marsh transplantation:** 1) physical stability based on observations (including photo documentation) of the transplant site 2) soil characterisation based on particle size, bulk density, pH, salinity, redox potential, soil fertility, etc. 3) vegetation establishment based on a modified Braun Blanquet cover-abundance scale including plant species ID and percent (%) cover (or frequency of occurrence) of each marsh species 4) water quality measurements (temperature, salinity, dissolved oxygen) at all sites of marine fish sampling (see marine fish section below)	DFO, ECCC, and interested Indigenous groups	N/A	N/A
Marine Invertebrates									
Terminal and causeway footprints predicted to potentially cause direct	Verify effects prediction of negligible effect to juvenile nursery habitat	✓	✓	✓	Verify effects predictions	FUP element details, parameters, and locations currently under development.	TBD	TBD	TBD

[1] Project phase refers to the time periods during which the Follow-up Program (FUP) element will be implemented.
[2] Summary description includes presenting the parameters and locations of the FUP element, if available and relevant.
[3] Other Proponent Commitments relate to other mechanisms, actions, or activities that are not Project-specific FUP but will contribute relevant information to the regional issues of concern.

Potential Adverse Effect	Follow-Up Program Activity	Phase[1]			Objective	Summary Description of Potential Follow-up[2]	Activity to be Developed in Consultation with	CEAR Reference	Other Proponent Commitments[3]
		Pre-Construction	Construction	Operation					
mortality and loss of Dungeness crab habitat.						Preliminary approach will consider some or all of the following: **Effect Predictions –Juvenile Crab Productivity:** Verify predictions of continued use of juvenile crab nursery habitat, post-construction. Preliminary approach includes surveys to measure: Densities (# crab/m^2) in different marine vegetation types (e.g., eelgrass, *Ulva*).			
Terminal footprint predicted to potentially cause direct mortality and loss of orange sea pen habitat.	Verify the effectiveness of sea pen translocation, including monitoring for factors that influence the success of the mitigation including: transplant success, recruitment, as well as presence of predators.	✓	✓	✓	Verify mitigation effectiveness	FUP element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following: **Mitigation Effectiveness – Sea Pen Transplant:** 1) density of orange sea pens in transplanted beds (# orange sea pens per m^2) 2) density of orange sea pens in areas adjacent to transplanted beds 3) detections of juvenile orange sea pens 4) detections/densities of orange sea pen predators (e.g., nudibranchs, sea stars)	DFO and interested Indigenous groups	N/A	N/A
Marine Fish									
Terminal footprint predicted to potentially disrupt juvenile salmon migration and access to rearing habitats in the inter-causeway area during construction and operation, which in turn may reduce juvenile salmon productivity.	Determine, over the long term, effectiveness of onsite habitat creation to offset the loss of juvenile salmon productivity, specifically transplantation of eelgrass beds and intertidal marshes, habitats preferentially occupied and suitable for juvenile salmon foraging and resting.		✓	✓	Verify mitigation effectiveness	FUP element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following: **Mitigation Effectiveness - Eelgrass transplantation:** 1) mean shoot density of eelgrass (number of shoots/m^2) 2) mean length (cm) and mean width (mm) of mature shoots 3) percent (%) cover by eelgrass 4) marine fish ID and enumeration **Mitigation Effectiveness - Intertidal marsh transplantation:** 1) physical stability based on observations (including photo documentation) of engineered components of the transplant site	DFO and interested Indigenous groups	N/A	N/A

Potential Adverse Effect	Follow-Up Program Activity	Phase[1]			Objective	Summary Description of Potential Follow-up[2]	Activity to be Developed in Consultation with	CEAR Reference	Other Proponent Commitments[3]
		Pre-Construction	Construction	Operation					
						2) soil characterisation based on particle size, bulk density, pH, salinity, redox potential, soil fertility, etc. 3) vegetation establishment based on a modified Bran Blanquet coverage classification system including plant species ID and percent (%) cover (or frequency of occurrence) of each marsh species 4) marine fish ID and enumeration 5) water quality measurements (temperature, salinity, dissolved oxygen) at all sites of marine fish sampling			
Terminal footprint predicted to potentially cause losses in productivity of adult salmon that transit through the local assessment area (LAA) during spawning migration.	N/A	-	-	-	N/A	N/A	N/A	N/A	The VFPA is confident in its effects predictions but acknowledges the perceived uncertainty with these predictions and recognises the ecological, commercial, and cultural importance of adult salmon, as communicated by Indigenous groups at the recent Indigenous Advisory Forum and prior. However, a Project-specific FUP element for adult salmon would not serve well either purpose of a FUP, since the Project contribution to the effect of productivity losses of adult salmon that transit through the LAA during spawning migration is small, and indiscernible, relative to the multiple regional factors and pressures contributing to the effect. Notwithstanding, the VFPA takes the issue seriously and is currently exploring opportunities to contribute to, support, and/or participate in regional and/or multi-stakeholder initiatives that will inform effective management of the issue Port-wide.
Changes in habitat availability predicted to potentially cause losses in herring productivity.	Determine, over the long term, effectiveness of onsite habitat creation to offset the loss of herring productivity, specifically transplantation of eelgrass beds, habitats preferentially occupied		✓	✓	Verify mitigation effectiveness	FUP element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following:	DFO and interested Indigenous groups	N/A	N/A

Potential Adverse Effect	Follow-Up Program Activity	Phase[1]			Objective	Summary Description of Potential Follow-up[2]	Activity to be Developed in Consultation with	CEAR Reference	Other Proponent Commitments[3]
		Pre-Construction	Construction	Operation					
	and suitable for spawning, foraging, and resting.					**Mitigation Effectiveness - Eelgrass transplantation:** 1) mean shoot density of eelgrass (number of shoots/m^2) 2) mean length (cm) and mean width (mm) of mature shoots 3) percent (%) cover by eelgrass 4) marine fish ID and enumeration			
Terminal and causeway footprints predicted to potentially cause sand lance productivity losses due to the loss of suitable burying habitat.	Determine, over the long term, effectiveness of onsite habitat creation to offset the loss of sand lance productivity, specifically creation of sandy gravel beach, habitat preferentially occupied and suitable for spawning.		✓	✓	Verify mitigation effectiveness	FUP element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following: **Mitigation Effectiveness - Creation of sandy gravel beach:** 1) forage fish embryo ID and enumeration 2) beach characterisation (including sediment grain size composition, elevation, foreshore/backshore description)	DFO and interested Indigenous groups	N/A	N/A
Causeway footprint predicted to potentially cause surf smelt productivity losses due to losses of suitable spawning habitat.	Determine, over the long term, effectiveness of onsite habitat creation to offset the loss of surf smelt productivity, specifically creation of sandy gravel beach habitats preferentially occupied and suitable for surf smelt spawning.		✓	✓	Verify mitigation effectiveness	FUP element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following: **Mitigation Effectiveness - Creation of sandy gravel beach:** 1) forage fish embryo ID and enumeration 2) beach characterisation (including sediment grain size composition, elevation, foreshore/backshore description)	DFO and interested Indigenous groups	N/A	N/A
Terminal footprint predicted to potentially cause reef fish productivity losses due to changes in habitat availability.	Determine, over the long term, effectiveness of onsite habitat creation to offset the loss of reef fish productivity, specifically creation of rocky reefs, habitats preferentially occupied and suitable for reef fish foraging, resting, and spawning.		✓	✓	Verify mitigation effectiveness	FUP element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following: **Mitigation Effectiveness - Construction of subtidal rock reefs:** 1) seasonal reef fish species presence and density (number of fish/100 m^2); species richness 2) seasonal fish habitat characteristics (percent (%) cover by species of algae; presence, relative abundance,	DFO and interested Indigenous groups	N/A	N/A

Potential Adverse Effect	Follow-Up Program Activity	Phase[1]			Objective	Summary Description of Potential Follow-up[2]	Activity to be Developed in Consultation with	CEAR Reference	Other Proponent Commitments[3]
		Pre-Construction	Construction	Operation					
						diversity, richness of invertebrate species) 3) lingcod density (number of lingcod/100 m^2) 4) lingcod egg mass density (number of lingcod egg masses/100 m^2) 5) lingcod egg mass count per unit effort (number of lingcod egg masses sighted per hour)			
Terminal and causeway footprints predicted to potentially cause demersal fish productivity losses due to changes in habitat availability.	Determine, over the long term, effectiveness of caisson fish refugia as habitat for demersal fish to offset the anticipated loss of productivity	✓	✓	✓	Verify mitigation effectiveness	FUP element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following: **Mitigation Effectiveness - Installation of caisson fish refugia:** 1) fish presence and abundance 2) invertebrate abundance (rank), accumulation, and diversity (richness, dominance, evenness)	DFO and interested Indigenous groups	N/A	N/A
Marine Mammals									
Construction and operation of RBT2 predicted to potentially cause changes to the acoustic environment resulting in behavioural effects or acoustic masking for southern resident killer whale, North Pacific humpback whale, and Steller sea lion.	N/A	-	-	-	N/A	N/A	N/A	N/A	Based on additional evaluation, as noted in detail in the text, a Project-specific follow-up program could not meet either defined purposes of FUP as the FUP element could not effectively identify and quantitatively measure the small incremental change in underwater acoustic noise above existing conditions attributable to the Project and potential associated changes to southern resident killer whale behaviour. However, the VFPA takes the issue seriously and is currently exploring opportunities to contribute to, support, and/or participate in regional and/or multi-stakeholder initiatives (e.g., the Enhancing Cetacean Habitat and Observation (ECHO) Program) that will inform effective management of the issue Port-wide, which includes ongoing consultation and opportunities with Indigenous groups.

Potential Adverse Effect	Follow-Up Program Activity	Phase[1]			Objective	Summary Description of Potential Follow-up[2]	Activity to be Developed in Consultation with	CEAR Reference	Other Proponent Commitments[3]
		Pre-Construction	Construction	Operation					
Construction and operation of RBT2 predicted to potentially cause impacts on availability of prey for southern resident killer whale.	N/A	-	-	-	N/A	N/A	N/A	N/A	A Project-specific follow-up program in respect of this potential effect was determined to be not technically feasible. However, the VFPA takes the issue seriously and is currently exploring opportunities to contribute to, support, and/or participate in regional and/or multi-stakeholder initiatives (e.g., the VFPA's Habitat Enhancement Program) that will inform effective management of the issue Port-wide, in addition to the juvenile salmon FUP element. The regional initiative includes ongoing consultation with Indigenous groups.
Coastal Birds									
Terminal and causeway footprints predicted to potentially cause western sandpiper productivity losses due to changes in prey availability.	Verify effects prediction of a negligible effect to the capability of the LAA to support the western sandpiper population with the Project in place.	✓	✓	✓	Verify effects predictions	FUP element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following: **Effect Prediction - Prey Availability Monitoring** Spatial distribution and abundance of biofilm and benthic macroinvertebrates, including: • mg chlorophyll a/m^2 • ug biofilm fatty acids/m^2 • mg macro- and meiofauna invertebrate biomass/m^2	ECCC and interested Indigenous groups	TBD	TBD
Motorized traffic during construction and operation predicted to potentially cause barn owl productivity losses due to owl-vehicle mortalities.	Determine, over the long term, effectiveness of nest boxes erected to increase barn owl productivity in the regional assessment area (RAA).	✓	✓	✓	Verify mitigation effectiveness	FUP element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following: **Mitigation Effectiveness - Nest Box Monitoring:** 1) percentage of occupied nest boxes	ECCC and interested Indigenous groups	TBD	TBD

Potential Adverse Effect	Follow-Up Program Activity	Phase[1]			Objective	Summary Description of Potential Follow-up[2]	Activity to be Developed in Consultation with	CEAR Reference	Other Proponent Commitments[3]
		Pre-Construction	Construction	Operation					
	Verify the predictions of negligible Project effect on barn owl productivity with mitigation applied (speed limit reductions, verge management, education training, and nest box installation).	✓	✓	✓	Verify effects predictions	2) percentage of nests successfully fledging at least one young 3) number of barn owl young fledged/year **Effect Prediction - Monitoring Barn Owl Mortalities:** 1) # owl mortalities/year			
Terminal and causeway footprints predicted to potentially cause diving bird productivity losses due to changes in prey availability.	The VFPA recognises the perceived uncertainty with the prediction due to the scale of the Project footprint and the cultural value and importance of the species. The VFPA is therefore engaging with interested Indigenous groups to evaluate potential Project-specific FUP or other Project commitment. The VFPA will communicate the diving bird specific commitment prior to the Panel Hearing.				TBD	TBD	ECCC and interested Indigenous groups	N/A	As noted, the VFPA recognises the perceived uncertainty and is therefore engaging with interested Indigenous groups to evaluate potential Project-specific FUP or other Project commitment. The VFPA will communicate the diving bird specific commitment prior to the Panel Hearing.
Visual Quality									
Operation of RBT2 predicted to potentially cause increased visibility of artificial light and changes in the character of nighttime viewing.	Monitor and confirm predictions in the changes in lighting zones (light trespass and sky glow) as a result of Project operation.	✓	✓	✓	Verify effects predictions	FUP element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following: FUP element will be designed to verify predicted changes in Environmental Light Classification Zones for parameters of Light Trespass and Sky Glow at select points of reception (POR) to compare with effects predictions. **Light Trespass Monitoring:** Record illuminance levels [lux] at select PORs in the assessment, to be informed through consultation with Indigenous groups and interested stakeholders. **Sky Glow Monitoring:** Record sky glow [%] - percent brightness above natural dark sky at select PORs in the assessment, to be informed through consultation with Indigenous groups and interested stakeholders.	Interested Indigenous groups	N/A	N/A

Potential Adverse Effect	Follow-Up Program Activity	Phase[1]			Objective	Summary Description of Potential Follow-up[2]	Activity to be Developed in Consultation with	CEAR Reference	Other Proponent Commitments[3]
		Pre-Construction	Construction	Operation					
Human Health									
Construction of RBT2 predicted to potentially cause residual adverse health effects due to air emissions, specifically exposure to $PM_{2.5}$ and NO_x in the marine area near the terminal.	Verify predictions of health effects assessment for construction and operation.		✓	✓	Verify effects predictions	FUP element details, parameters, and locations currently under development. Preliminary approach will consider some or all of the following: **Effect Prediction – Air Quality Health Effects:** FUP element will rely on the Air Quality Compliance Monitoring Plan, which will include data relevant to health thresholds. If an exceedance attributable to the Project is demonstrated as part of the Construction or Operation Air Quality Compliance Monitoring Plan, a resulting FUP and, as required, appropriate adaptive management measures for health effects will be implemented.	Health Canada, Metro Vancouver, B.C. Ministry of Health, City of Delta, Tsawwassen First Nation, Musqueam First Nation, and other interested Indigenous groups.	N/A	N/A
Construction and operation of RBT2 predicted to potentially cause adverse health effects related to continuous daytime and nighttime noise, transient and impulsive noise during construction and operation.	Verify predicted health effects of sleep disturbance from nighttime noise during construction and operation.	✓	✓	✓	Verify effects predictions	FUP element currently under development. Preliminary approach will consider some or all of the following: **Effect Prediction - Noise Health Effects:** L_n levels as measured by VFPA permanent noise monitoring stations, and possibly periodic monitoring at residences and/or noise sources. **Mitigation Effectiveness:** L_n levels as measured by VFPA permanent noise monitoring stations, and possibly periodic monitoring at residences and/or noise sources.	Health Canada, City of Delta, Tsawwassen First Nation, Musqueam First Nation, and other interested Indigenous groups	N/A	N/A
	Evaluate effectiveness of noise-reduction measures in the construction and operation noise management plans, specific to night-time noise.				Verify mitigation effectiveness				
Construction and operation of RBT2 predicted to potentially cause adverse health effects related to low frequency noise, transient and impulsive noise during construction and operation.	Verify EIS predictions of negligible health effects related to all other noise indicators (L_d, L_{dn}, low frequency noise, transient and impulsive noise).	✓	✓	✓	Verify effects predictions	FUP element currently under development. Preliminary approach will consider some or all of the following: **Effect Prediction - Nosie Health Effects:** Monitor levels of Ld, Ldn, and low frequency noise, and frequency and	Health Canada, City of Delta, Tsawwassen First Nation and Musqueam First Nation, and other	N/A	N/A

Potential Adverse Effect	Follow-Up Program Activity	Phase[1]			Objective	Summary Description of Potential Follow-up[2]	Activity to be Developed in Consultation with	CEAR Reference	Other Proponent Commitments[3]
		Pre-Construction	Construction	Operation					
	Evaluate effectiveness of noise-reduction measures in the construction and operation noise management plans, related to all types of noise.				Verify mitigation effectiveness	noise level of transient and impulsive noise, as measured by permanent VFPA noise monitoring stations, and/or periodic monitoring at residences and/or noise sources.	interested Indigenous groups		
Current Use of Lands and Resources for Traditional Purposes (Current Use)									
Construction/operation activities predicted to potentially affect physical access to preferred locations for harvesting or other cultural purposes/objectives; availability and/or quality of preferred resources at preferred locations, even where access to those locations is unchanged; and the quality of experience at preferred locations for harvesting or other cultural purposes/objectives.	Consultation and engagement on relevant FUP content, development and implementation with the Indigenous Advisory Committee (IAC).	✓	✓	✓	Verify effects predictions Verify mitigation effectiveness	FUP element will consist of consultation on relevant FUP content development and implementation of all the FUP elements. Consultation will involve implementation of an IAC, Indigenous representation on the FUP advisory committee (as discussed in greater detail in response to IR10-11 (CEAR Document #1275[4]), and ongoing meetings with individual Indigenous groups.	IAC and individual Indigenous groups, including Tsawwassen First Nation, Musqueam First Nation, and other interested Indigenous groups	N/A	N/A

[4] CEAR Document #1275 From the Vancouver Fraser Port Authority to the Review Panel re: Response to Information Requests IR5-01a, IR7-28, IR7-29, IR10-02, IR10-06 to IR10-09, IR10-11 to IR10-26, IR11-07, IR11-22, IR11-23, IR12-03, IR12-06, IR13-01, and IR13-19 (See Reference Documents #1000, 1130, 1179, 1206 and 1228).