GriegTable 1. Response to Atlantic Salmon Federation (ASF) comments in Appeal document received on October 25, 2018.

Requirement (ASF Appeal Comments)	Status in the EIS (ASF Appeal Comments)	Government Response to ASF Appeal Comments
1. Collection of necessary data **The EIS guidelines shall include a requirement to outline the design of studies necessary to provide additional information for the preparation of an environmental impact statement (EA Regs 8(1)(c)).** **The rationale for a component study is based on the need to obtain additional data to determine the potential for significant effects and to provide the necessary baseline information for monitoring programs (guidelines p. 22).** **Using qualitative and/or quantitative surveys, the EIS shall include a description of the existing biophysical and socio-economic environment that will be affected or might reasonably be expected to be affected by the undertaking. If the information available is insufficient or no longer representative, the proponent shall complete the description of the environment by conducting original surveys and research (guidelines 4.2).** **The key reason why the EA Division recommended an EIS rather than an Environmental Preview Report after the screening review was "because the information for areas of further study (e.g., baseline wild salmon data and other recommendations in the CSAS report) are not readily available" (Report by Mr. Eric Watton, EA Division, to Minister, July 22, 2016; p. 48).**	**Proponent acknowledges "There are a number of data gaps related to the wild Atlantic salmon stocks in Placentia Bay. Key gaps include: (1) data related to the migration routes of wild salmon, both smolts and returning adults, within Placentia Bay; (2) data related to the time spent by and activities of wild salmon within Placentia Bay; and (3) data related to the ecological interaction between wild salmon and escaped farmed salmon." (EIS p. 344).** **The Wild Salmon Component Study is "a desktop study of information and literature" with no additional information collected or presented that was not available to the proponent at the time of the screening review. The proponent made no effort to conduct original research to collect the data necessary to fill the identified data gaps.** **The requirements of the proponent to "obtain additional data to determine the potential for significant effects and to provide the necessary baseline information for monitoring programs" and to "complete the description of the environment by conducting original surveys and research" have not been met** (as per guidelines 4.2).	Section 4.2 of the EIS guidelines instruct the proponent to describe relevant aspects of the existing environment prior to implementation of the undertaking, which constitute the reference state of the environment. The guidelines direct that the EIS shall use qualitative and/or quantitative surveys to describe the existing biophysical and socio-economic environment that will be affected or might reasonably be expected to be affected, directly or indirectly, by the undertaking. Section 4.3 of the guidelines instruct the proponent to provide component studies to address baseline data requirements that support the evaluation of environmental effects and/or the development of mitigation measures and follow-up monitoring programs. The guidelines inform that the rationale for a component study is based on the need to obtain additional data to determine the potential for significant effects on a valued ecosystem component (VEC) due to the proposed undertaking, and to provide the necessary baseline information for monitoring programs. The proponent conducted the following four component studies, as required by the guidelines, to provide the baseline information needed to determine the potential for significant effects on valued ecosystem components (VECs) due to the undertaking, and to provide the necessary baseline information for monitoring programs: • The Wild Atlantic Salmon Component Study; • The Fish and Fish Habitat Component Study; • The Cultural, Recreational, and Commercial Importance of the Waters of Placentia Bay; and • The Aqualine Midgard Sea-Cage Study. The response to the appeal (attached) provides samples of the data collected by the proponent to describe the reference condition of the marine environment in Placentia Bay, prior to project activities.

In discussing the Watton Report, the Newfoundland and Labrador Court of Appeal clearly acknowledged that the need for further research to address many uncertainties, knowledge gaps, and recommendations was a key reason for why an EIS was required (Newfoundland and Labrador (Environment and Climate Change) v. Atlantic Salmon Federation (Canada), 2018 NLCA 53: paragraphs 180-187)		

Requirement (ASF Comments)	Status in the EIS (ASF Comments)	Response to ASF Comments
2. Focus on Wild Atlantic Salmon in Placentia Bay **The component study shall provide a detailed description of the status of wild Atlantic salmon in Placentia Bay (guidelines 4.3.1).**	**EIS p. 173 – proponent acknowledges that there is "limited information related to wild Atlantic salmon specifically in Placentia Bay". Consequently, the required focus on salmon <u>in Placentia Bay</u> is largely ABSENT.**	Section 4.3.1 of the guidelines requires the proponent to *"provide a detailed description of the status of wild Atlantic salmon in Placentia Bay."* The proponent provided this description. For example, the Wild Atlantic Salmon Component Study cites information from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2010), recent research from DFO (DFO 2017a), recreational fishing data, and counting fence data to characterize populations, abundance, and distribution of wild Atlantic salmon in the study area. Section 5.0 of the guidelines instruct that *"Information gaps from a lack of previous research or practice shall be described indicating baseline information which is not available or existing data which cannot accurately represent environmental conditions in the study area over the entire year. If background data have been extrapolated or otherwise manipulated to depict environmental conditions in the study area, modeling methods and equations shall be described and include calculations of margins of error and/or confidence limits"*. For example, section 4.1.1 of the Wild Atlantic Salmon Component Study acknowledges that there is limited information related specifically to wild Atlantic salmon in Placentia Bay, and informs that some information is focused on the greater demographic of the South Newfoundland population of Atlantic salmon, to which Placentia Bay salmon belong. The proponent extrapolates the available information on the status of wild Atlantic salmon in the greater demographic of the South Newfoundland population, and assumes that existing trends will be applicable to wild Atlantic salmon in Placentia Bay. For example, the Wild Atlantic Salmon Component Study cites information from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2010), recent research from DFO (DFO 2017a), recreational fishing data, and counting fence data to characterize populations, abundance, and distribution of wild Atlantic salmon in the study area. COSEWIC (2010) identifies that the number of mature Atlantic salmon in the South Newfoundland population, as estimated in 2007, ranged between 21,866 and 29,711. The EIS reports that the preliminary 2017 estimated range of the number of mature Atlantic salmon in Placentia Bay stocks, which are a component of the South

		Newfoundland population, is 2,828–5,099. However, these estimates will likely change as DFO processes more of the 2017 angling data and refines its exploitation rates for 2017. The EIS indicates that the final 2016-estimated range of the number of mature Atlantic salmon in Placentia Bay stocks is 4,981–9,388. Section 4.8 of the EIS advises that, *"Existing environmental conditions have been described for the Study Area. However, there are information or data gaps for each VEC. These data gaps affect the level of confidence in the effects predictions. The key data gaps summarized below* [s.4.8.1-4.8.3] *were taken into consideration when assessing effects of the Project on VECs"*.

Requirement (ASF Comments)	Status in the EIS (ASF Comments)	Response to ASF Comments
3. Specific aspects of Placentia Bay salmon biology and ecology **The component study shall include a characterization of the current distribution, abundance, genetic population structure, morphology, health and fitness and migratory patterns of wild Atlantic salmon in the waters of Placentia Bay (guidelines 4.3.1(a))**	***Current distribution* – locations of salmon rivers flowing into Placentia bay is provided (EIS p. 174). Distribution of wild salmon in the waters of Placentia Bay is ABSENT.** ***Abundance* – an estimate is provided (EIS p. 176) but not backed by any scientific data.**	The rational for requiring the EIS to characterize specific factors in the waters of Placentia Bay was to ensure that the proponent considered the scope of the project beyond the immediate marine sea cage sites. The proponent did not always isolate their description to Placentia Bay, for some topics Grieg NL provides available information on the status of wild Atlantic salmon in the greater demographic of the South Newfoundland population, of which wild Atlantic salmon in Placentia Bay are a part. **Current Distribution** – Section 4.1.2 of the Wild Atlantic Salmon Component Study informs that "*the range of the South Newfoundland population of Atlantic salmon extends from Mistaken Point on the Avalon Peninsula to Cape Ray at the southwestern extreme of the island of Newfoundland; essentially the entire south coast of Newfoundland*". Section 4.1.2 of this Study notes that there are 104 rivers identified on the South coast of Newfoundland, of which 48 are scheduled salmon rivers. The study further notes that there are 20 scheduled salmon rivers and at least four non-scheduled salmon rivers in Placentia Bay. Figure 4.2 illustrates the locations of scheduled and non-scheduled salmon rivers in Placentia Bay. Table 4.2 provides the names and location coordinates for the 20 scheduled and four non-scheduled rivers in Placentia Bay. The rivers represent the available distribution areas of wild Atlantic salmon within Placentia Bay. **Abundance** – This Study cites information from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2010), recent research from DFO (DFO 2017), provides the

		recreational fishing data, and counting fence data to characterize populations, abundance, and distribution of wild Atlantic salmon in the study area. DFO is the federal lead on managing fisheries resources and as part of that mandate completes population estimates. As a result, section 4.1.5 of the Wild Atlantic Salmon Component Study provides the DFO estimates for the number of mature Atlantic salmon in Placentia Bay for 2016, as well as the DFO preliminary 2017 estimated range of the number of mature Atlantic salmon in Placentia Bay. Table 4.1 presents recreational angling data for 18 of the 20 scheduled salmon rivers in Placentia Bay during the 2012–2016 period, and indicates that recreational salmon fishing data for most rivers in Placentia Bay are probably the best available indicator of salmon abundance within the Study Area as a whole. Section 4.1.5. also provides details on the current data from the operating counting fence in Northeast River in Placentia Bay, stating "*There was a counting fence on Northeast River during 1984–2002, but the salmon stock was not assessed again until 2015*." This section states that the "*Northeast River had particularly low returns in 2017, about 80% fewer salmon returning than what was projected*." and that "*Despite the lack of a five-year mean of returns, it was determined that Northeast River had achieved 438% of its egg conservation requirement, placing it in a "Healthy Zone" in terms of DFO's Precautionary Approach Framework (G. Veinott, DFO, pers. comm., 5 March 2018; Veinott et al. 2018). Nonetheless salmon returns to this river in 2017 declined by approximately 58% compared to returns in 2016 (G. Veinott, DFO, pers. comm., 5 March 2018). Low marine survival is suggested as one of the primary reasons for the low numbers of returning salmon to Northeast River and other rivers in Placentia Bay (Robertson et al. 2017; Veinott et al. 2018)."* Section 4.1.5. also advises that COSEWIC (2010) identifies that the number of mature Atlantic salmon in the South Newfoundland population, as estimated in 2007, ranged between 21,866 and 29,711. The EIS reports that the preliminary 2017 estimated range of the number of mature Atlantic salmon in Placentia Bay stocks, which are a component of the South Newfoundland population, is 2,828–5,099. However, these estimates will likely change as DFO processes more of the 2017 angling data and refines its exploitation rates for 2017. The EIS indicates that the final 2016-estimated range of the number of mature Atlantic salmon in Placentia Bay stocks is 4,981–9,388.

	Genetic population structure **– a reference is made to existing data on the genetic population structure of wild Atlantic salmon on the south coast of Newfoundland (EIS p. 175), but no data are provided. Characterization of the genetic population structure of wild salmon in the waters of Placentia Bay is ABSENT.**	**Genetic Population Structure** – The proponent provides available information on the status of wild Atlantic salmon in the greater demographic of the South Newfoundland population, of which wild Atlantic salmon in Placentia Bay are a part. For example, Section 4.1.4 of the Wild Atlantic Salmon Component Study informs that "*The genetic structure of the South Newfoundland Atlantic salmon population has been described by Verspoor (2005), Adams (2007), and Palstra et al. (2007) in COSEWIC 2010). They suggest that there are fewer genetic differences among the fish in the South Newfoundland population compared with other populations on the island."* In addition, The Wild Atlantic Salmon Component Study advises that, because of genetic analyses conducted on juvenile salmon from Fortune Bay and Bay d'Espoir in 2015 and 2016, *"35% of all juveniles found in 17 of the 18 sampling locations were either farmed salmon or first- or second-generation hybrids*". This presents a reality that salmon swimming in the marine and freshwaters of Placentia Bay may be farmed salmon, and/or hybrids of farmed salmon from other aquaculture projects using non-sterile salmon, and may not facilitate the ease of identification of a farmed fish from this undertaking. DFO advised the environmental assessment committee Chair on August 22, 2018 that "*DFO Science are collecting baseline genetic data for wild Atlantic Salmon in Placentia Bay as part of a Program for Aquaculture Regulatory Research (PARR) funded 3-year project from 2017-2019. The PARR program involves sampling juvenile salmon from 26 rivers and scanning their genomes to gain a better understanding of how wild salmon are adapted to the local environment as well as calculating genetic estimates of abundance*." Genetic structure would not have been included in section 4.3.1 (a) of the EIS Guidelines had the information on the on-going DFO PARR program been available to the environmental assessment committee prior to the issuance of the EIS Guidelines. The baseline genetic structure of wild Atlantic salmon in Placentia Bay will be known prior to stocking sea cages and will be used to inform the follow-up monitoring regarding genetic interactions between triploid-farmed salmon and wild Atlantic salmon in Placentia Bay.
	Morphology **– ABSENT.**	**Morphology** – The purpose of requiring the EIS to describe the morphology of wild Atlantic salmon in Placentia Bay is to facilitate the ease of distinguishing wild Atlantic salmon in Placentia Bay from escaped farm salmon from the undertaking, and to enhance opportunities for recapture. The Wild Atlantic Salmon Component Study indicates that, because of genetic analyses conducted on juvenile salmon from Fortune Bay and Bay d'Espoir in 2015 and 2016, 35% of all juveniles found in 17 of the 18 sampling locations were either farmed salmon or first- or second-generation hybrids. This presents a reality that salmon swimming in the marine and freshwaters of Placentia Bay may be farmed salmon, and/or hybrids of farmed salmon from other aquaculture

		projects using non-sterile salmon, and may not facilitate the ease of identification of a farmed fish from this undertaking. In order to achieve the objective of identifying an escaped farmed salmon from this undertaking, the Minister's letter of release requires the proponent, as a condition of release, to mark all imported and grown in province Atlantic salmon smolt for ease of identification in recapture. The objective of the guideline requirement is met – that escaped and recaptured farmed salmon can be positively identified as originating from this undertaking.
	***Health and fitness* – ABSENT.**	**Health and Fitness –** Section 4.2 of the Wild Atlantic Salmon Component Study informs that *"Hybrid salmon resulting from the breeding of farmed fish with wild fish may have reduced fitness (i.e., outbreeding depression) and ability to adapt to environmental conditions (including resistance to disease) compared to wild Atlantic salmon. This can directly affect survivability (DFO 2013). The effects of interbreeding on the fitness and ability of hybrids to adapt to their local surroundings is unpredictable, however, and may not be fully realized until the arrival of second generation hybrids (Verspoor et al. 2015).*" Section 4.8.1 of the Wild Atlantic Salmon Component Study advises that, *"Although mitigation measures and monitoring procedures are planned to prevent fish escapes, it is still possible that some salmon may escape from the sea cages. The concern is that released salmon may affect the genetic integrity and biological fitness (via reproductive interference) of wild Atlantic salmon in Placentia Bay. To minimize this risk, Grieg NL will be using fertilized triploid (sterile and all-female) Atlantic salmon eggs (European strain) supplied from an accredited and approved company called Stofnfiskur (based in Iceland)"*.
	***Migratory patterns* – ABSENT. Proponent acknowledges that there is no existing data on salmon migratory patterns in Placentia Bay (EIS p. 175).**	**Migratory Patterns** – Section 4.1.3 of the Wild Atlantic Salmon Component Study explains that, *"Most Atlantic salmon are anadromous, meaning that mature fish migrate from the marine environment into freshwater systems to spawn. After hatching, Atlantic salmon spend several months to several years in their natal freshwater habitat, developing through various life history stages. Once development to smolt stage has occurred, salmon migrate downstream to the ocean to begin the marine phase of their life history. Once at sea, Atlantic salmon typically exhibit large-scale migrations, overwintering in feeding grounds off Labrador and western Greenland (COSEWIC 2010).Upon sexual maturation, the salmon return to their natal freshwater habitat to spawn. Low marine survival for overwintering salmon is considered one of the greatest threats to wild Atlantic salmon abundance in Newfoundland and Labrador (DFO 2017a). Mature salmon typically return to freshwater during May–October. Based on data collected at counting fences established on some of the scheduled salmon rivers in Newfoundland, most returning Atlantic salmon migrate upstream during late-June to mid-July (Dempson et al. 2017). Spawning usually*

		occurs in October and November (Scott and Scott 1988; COSEWIC 2010), after which spent salmon will either return to sea or stay in freshwater until the following spring (COSEWIC 2010)". *"During migrations between the rivers and the ocean, salmon typically swim in the upper 10 m of the water column, sometimes as close as 2–3 m from the surface (Renkawitz et al. 2012; Thorstad et al. 2012; Godfrey et al. 2015)"*. Section 4.4 of this Study describes the potential effect of proximity of sea cages to salmon rivers. This section references studies which suggest that "*the closer sea cages are located to rivers, the higher the potential for escaped farmed salmon to enter the freshwater systems and interact with the wild fish (Carr et al. 1997). However, there is no reason to believe that farmed salmon escapees are not capable of moving to rivers some distance from sea cage sites (Hansen and Youngson 2010; Solem et al. 2013). The likelihood that escaped farmed salmon will enter freshwater systems will depend primarily on the life stage of the fish and the timing of the escape. More mature escaped salmon tend to enter nearby rivers than juvenile salmon (Skilbrei et al. 2015). It is thought that juveniles that escape in the spring are more likely to enter the rivers than those that escape at other times of the year (Skilbrei et al. 2015)."* Section 4.2 of this Study references research conducted by Glover et al. (2016), which concluded that *"sterile triploid salmon do not appear to be as motivated to enter freshwater as diploid farmed salmon, particularly the females".* This section also references research by Cotter et al. (2000) who *"conducted an experimental release of diploid and triploid salmon to determine differences in rate of return to freshwater. They found that triploid fish returned at a rate four times lower than that of diploid fish".* In addition to describing the migratory patterns of wild Atlantic salmon in Newfoundland, section 4.4 of this Study describes the location of salmon rivers in Placentia Bay. Figure 4.2 illustrates the locations of scheduled and non-scheduled salmon rivers in Placentia Bay, and the location coordinates of the rivers in Placentia Bay are provided in Table 4.2. The rivers represent available migration routes for wild Atlantic salmon in Placentia Bay. The EIS acknowledges data gaps for baseline and effects information for each valued ecosystem component under consideration, and identifies that the data gaps affect the level of confidence in the effects predictions. Section 4.8 of the EIS describes the key data gaps that were taken into consideration when assessing effects of the undertaking. When describing the overall conclusions of the EIS, section 7.9 indicates that data gaps, particularly those related to wild Atlantic salmon migration routes and the degree of ecological interaction between wild salmon and escaped

		farmed salmon, limit the confidence in some effects predictions. The EIS informs that follow-up monitoring will be conducted to validate effects predictions of planned project activities in proximity to sea cage sites.

Requirement (ASF Comments)	Status in the EIS (ASF Comments)	Response to ASF Comments
4. Genetic and Ecological Interactions in Placentia Bay **The component study shall include a discussion of genetic and ecological interactions of farmed salmon escapees on wild Atlantic salmon in Placentia Bay (guidelines 4.3.1(b))**	**There is a general discussion about genetic and ecological interactions between wild and farmed salmon (WAS component study section 4.2).** **However, the required discussion of genetic and ecological interactions <u>in Placentia Bay</u> is ABSENT.**	Section 4.2 of the Wild Atlantic Salmon Component Study discusses the genetic and ecological interactions of farmed salmon escapees and wild salmon. This section describes the potential genetic effects of genetic introgression, and the subsequent effects on the health, fitness, and survivability of hybrids. The section discusses competition for food and space as a potential ecological interaction between escaped farmed salmon and wild salmon, principally in freshwater systems but also, to a lesser degree, in the marine environment. This Study informs that, *"Since European-origin farmed salmon have never been utilized in Newfoundland, there is no available information concerning the genetic and ecological interactions between farmed European salmon and wild Newfoundland salmon".* This statement is reiterated in the Canadian Science Advisory Secretariat report on the Proposed Use Of European-Strain Triploid Atlantic Salmon In Marine Cage Aquaculture In Placentia Bay, NL (CSAS 2016/034), which states that, *"As triploid and European-origin salmon have not previously been used in the NL aquaculture industry, the ecological and indirect genetic risks relative to diploids are largely unknown"* (p. 7, CSAS 2016/034). This Study informs that *"Mitigating escapes of farmed Atlantic salmon is important because interactions between escapees and wild salmon can result in negative genetic and ecological effects on the wild fish (Naylor et al. 2005; Ferguson et al. 2007; Verspoor et al. 2015; Glover et al. 2017). Morphological, behavioural and ecological traits can be affected as a result of breeding between farmed Atlantic salmon and wild salmon, thereby potentially causing negative impact on the character, abundance, and survivability of wild salmon stocks (Cairns 2001; Ferguson et al. 2007; Jensen et al. 2010; Verspoor et al. 2015)".* Grieg NL has proposed several measures to mitigate the genetic and ecological effects of escaped farm on wild Atlantic salmon, including but not limited to: (i) the use of all-female sterile triploid salmon for the duration of the project;(ii) an Aqualine Midgard sea cage that has the ability to raise the bottom of the cage to facilitate mechanical transfer of farmed salmon through a pipe and to a well-boat at harvest to reduce potential of escapes (the Department of Fisheries and Land

		Resources advises that the proposed sea cage is more robust than those currently used in the NL Aquaculture industry); and (iii) enhanced monitoring of sea cages using underwater cameras to ensure the integrity of sea cages. Section 4.2 of this Study indicates that *"A number of publications (DFO 2013; Benfey 2015; Fjelldal et al. 2014; Verspoor et al. 2015) recommend the use of all-female triploids as an effective measure to restrict genetic interactions between farmed salmon and wild salmon. Triploidy creates a "genetic containment" thereby minimizing the chances of escaped farmed salmon mating and reproducing with wild salmon (Benfey 1998)"*. The CSAS 2016/034 report informs that "*The use of triploid European- or North American-origin salmon considerably removes or reduces direct genetic impacts and was identified during the 2013 DFO CSAS process as a possible mitigation measure (Figure 4; Verspoor et al. 2015). Indirect genetic and ecological impacts would be further reduced by the use of all-female triploids".* Reporting on the genetic and ecological effects of escaped female triploid salmon falls under the category of follow-up monitoring. The proponent is required, as a condition of release, to develop an environmental effects monitoring plan (EEMP) for several aspects of the undertaking, to verify the accuracy of the predictions made in the assessment of the effects as well as the effectiveness of the mitigation measures. Included in this condition is the requirement for the proponent to monitor, document, and mitigate the effects of genetic and ecological interactions of escaped farmed fish on wild salmon. The EEMP shall be developed in consultation with applicable Government divisions and receive the required approval prior to the start of hatchery operations. Section 7.4 of the guidelines describes the information to be included in the EEMP, and requires the proponent to prepare and submit the EEMP subsequent to the completion of the EIS, but before the initiation of project construction. This is the usual course of action in provincial and federal environmental assessments.

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5. Literature review of disease and parasite impacts	**There is a brief discussion and reference to the literature acknowledging that sea lice can spread from farmed to wild salmon (WAS component study 4.3.1).**	Section 4.3 of the Wild Atlantic Salmon Component Study describes the findings of several studies relative to the effects of sea lice and disease from farmed salmon to wild Atlantic salmon. The section explains that *"Atlantic salmon stocked in sea cages are initially sea lice-free. However, they can be infected with sea lice from other fish farms or from wild Atlantic salmon that also act as hosts for the parasites. Some studies have examined the parasite loading of farmed fish and*

The component study shall include a literature review of the effects of disease and parasites from farmed salmon on wild Atlantic salmon (guidelines 4.3.1(c)) **Preserving the biological fitness of wild Atlantic salmon to be considered in selecting key issues (guidelines 4.1)**	**There is list of pathogens that are commonly found in farmed salmon (WAS component study 4.3.2).** **The required literature review of the effects of disease and parasite transfer on wild salmon is ABSENT. i.e., no review of the extensive literature demonstrating the significant negative effects of parasite and disease transfer on the biological fitness of wild salmon as per guidelines 4.3.1(c).**	*wild fish associated with the farms and have found that wild fish actually have higher levels of parasite loading than farmed fish (Sepúlveda et al. 2004; Skov 2009; Fernandez-Jover 2010)."* In addition to the list of pathogens commonly found in farmed salmon, section 4.3 of this Study identifies two of the most common sea louse species that infect farmed and wild Atlantic salmon in Atlantic Canada, and informs, among other things, that *"Sea lice are problematic for fish farmers so controlling them is a high priority area of aquaculture research (Rittenhouse et al. 2016). In addition to the external damage that they cause to salmon, they are capable of facilitating the transfer of pathogens which can lead to disease and increased mortality in both farmed and wild salmon (Jensen et al. 2010; DFO 2014; Verspoor et al. 2015). If not controlled, particularly during infestations, sea lice on farmed salmon can increase the abundance of sea lice in the vicinity of sea cages and the probability of sea lice infesting migrating wild salmon passing through the area (Jensen et al. 2010; DFO 2014; Saksida et al. 2015),"*. Furthermore that "*Fish farms can therefore function as potential "reservoirs" for the spread of sea lice to wild salmon (DFO 2014, 2016; Johnson and Jones 2015)"* and describes several factors which influence the extent to which sea lice may proliferate and infect farmed and wild salmon. Section 4.3 describes the findings of a modeling study conducted by Rittenhouse et al. (2016) to determine peak timing of sea lice reproduction in southern Newfoundland and demonstrated that abundance is affected by environmental parameters such as temperature and salinity. This section states that there is "*little information in the primary literature regarding the resistance of triploid Atlantic salmon to pathogens, anecdotal evidence from fish farmers indicates that triploid fish may be less resistant to pathogens and parasites, potentially resulting in increased disease transmission to wild salmon (DFO 2013; Benfey 2015). Some recent studies have provided new information on the comparable susceptibility and resistance of diploid and triploid Atlantic salmon to viruses".* This section further explains that *"Transmission of parasites and pathogens between farmed salmon and wild fishes is likely density-dependent. Generally, the higher the host fish densities, the greater the potential for the spread and persistence of parasites and pathogens to host fishes (Krosek 2017)."* There is risk that disease and parasites may be transferred between farmed and wild Atlantic salmon (as well as other wild fish). There are two primary ways of minimizing this risk, which the EIS identify. The EIS proposes the following mitigations to minimize the risk: 1. Decrease the Potential for Interactions Between Farmed Salmon and Wild Fishes • Siting of sea cage sites a suitable distance from the mouths of salmon rivers;

		• Reducing the attraction of wild salmon to the sea cages by feed optimization and the cleaning of biofouling from the sea cages; • Removing fish mortalities from the sea cages on a daily basis; and • Fallowing of the sea cage sites to minimize the accumulation of organic material on the seabed. 2. Maintenance of Farmed Salmon Health • Biosecurity measures; • Routine husbandry practice; • Health checks and procedures; • Use of specialized feed and feeding procedures; • Sea lice control procedures; • Water quality monitoring; • Vaccinations; and • Removal and treatment of dead fish. Grieg NL has also committed to implementing a Fish Health Management Plan and all personnel will be trained in its proper procedures.

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6. Proximity of sea cages to wild salmon rivers **The component study shall include a discussion of the proximity of the sea cages to scheduled and non-scheduled rivers and the potential effects on migrating wild Atlantic salmon (guidelines 4.3.1 (d).**	**The distances of proposed sea cage sites to salmon rivers is presented, although some distance are incorrect and some non-scheduled rivers are missing. There is a short discussion which acknowledges that escaped farm salmon may enter salmon rivers (Wild Salmon Component Study 4.4).** **However, the required discussion of the potential effects on migrating wild Atlantic salmon in Placentia Bay is ABSENT.**	Section 4.3.1 of the guidelines requires that the Wild Atlantic Salmon Component Study shall include a discussion of the proximity of the sea cages to scheduled and non-scheduled salmon rivers and potential effects on migrating wild Atlantic salmon. Section 4.4 of this Study describes the potential effect of proximity of sea cages to salmon rivers. This section references studies which suggest that *"the closer sea cages are located to rivers, the higher the potential for escaped farmed salmon to enter the freshwater systems and interact with the wild fish (Carr et al. 1997). However, there is no reason to believe that farmed salmon escapees are not capable of moving to rivers some distance from sea cage sites (Hansen and Youngson 2010; Solem et al. 2013). The likelihood that escaped farmed salmon will enter freshwater systems will depend primarily on the life stage of the fish and the timing of the escape. More mature escaped salmon tend to enter nearby rivers than juvenile salmon (Skilbrei et al. 2015). It is thought that juveniles that escape in the spring are more likely to enter the rivers than those that escape at other times of the year (Skilbrei et al. 2015).*"

		Section 4.2 references a study conducted by Glover et al. (2016), which concluded that "*sterile triploid salmon do not appear to be as motivated to enter freshwater as diploid farmed salmon, particularly the females"*. Additionally, section 4.3.1 informs that "*sea lice on farmed salmon can increase the abundance of sea lice in the vicinity of sea cages and the probability of sea lice infesting migrating wild salmon passing through the area (Jensen et al. 2010; DFO 2014; Saksida et al. 2015).*" *"It is not necessary that farmed fish escape cages to spread sea lice and/or pathogens and disease to wild salmon (Verspoor et al. 2015). In addition to the external damage that they cause to salmon, they are capable of facilitating the transfer of pathogens which can lead to disease and increased mortality in both farmed and wild salmon (Jensen et al. 2010; DFO 2014; Verspoor et al. 2015).*" *"The abundance and density of sea cages containing farmed salmon infected with sea lice will also influence the abundance and degree of sea lice spread (Jansen et al. 2012; Kristopherson et al. 2013 in DFO 2014)".* Section 4.4 of this Study indicates that *"DFO (2016) has proposed that sea cages be located at least 20–30 km from the mouths of salmon rivers to minimize the possibility of farmed escapees interacting with wild salmon stocks".* DFO advises that this document [CSAS 2016/034] does not pose such a distance. The exact wording in the report states that *"Farm-to-salmon river separation distance criteria of 20-30 km have at times been proposed as a measure to reduce wild-farmed salmon interactions" (CSAS 2016/034, p.9).* The EIS states that *"The mouths of the majority of scheduled and non-scheduled salmon rivers in Placentia Bay are located >20 km from a proposed sea cage site".* Figure 4.1 of Wild Atlantic Salmon Component Study map the proposed locations of sea cages and the locations of scheduled salmon rivers in Placentia Bay. Figure 4.2 maps the proposed locations of sea cages and the locations of scheduled and non-scheduled salmon rivers in Placentia Bay. Table 4.2 lists the scheduled and non-scheduled rivers, provides the location coordinates for the rivers, and indicates the distance between the mouths of scheduled and non-scheduled salmon rivers and the proposed sea cage site. A comment in Table 1 of the appeal indicates that some of the distances between sea cage sites and salmon rivers are incorrect and some non-scheduled salmon rivers are missing, however, the comment did not specify which distances are incorrect and which nonscheduled salmon rivers are missing. In response to this comment, the proponent was requested to verify the distances provided in Table 4.2 of the Wild Atlantic Salmon Component Study and to identify the locations of additional non-scheduled rivers in Placentia Bay. In response, Grieg NL provided details on the information presented in Table 4.2 of the EIS and provided details on the following additional non-

		scheduled rivers in Placentia Bay (see revised Table 4.2 and revised Figure 4.1)); identifying the names and locations of the following additional non-scheduled rivers in Placentia Bay: 1. Branch River 2. Lance River 3. Cuslett Brook 4. Little Barasway Brook 5. Fair Haven Brook Branch River, Lance River, and Cuslett Brook are located more than 50 km from any of the proposed sea cage sites. Little Barasway River is located more than 30 km from the proposed sea cage sites at the Rushoon, Merasheen, and Red Island BMAs, and more than 25 km from the proposed Long Harbour sea cage sites. Fair Haven Brook is located more than 40 km from the proposed sea cage sites at the Rushoon and Merasheen BMAs, more than 20 km from the proposed sea cage sites at the Red Island BMA, and more than 10 km from the proposed Long Harbour sea cage sites. The data provided shows that one scheduled salmon river and two non-scheduled salmon rivers of the 30 rivers are located within 10 km of proposed sea cage sites; 21 of the 30 rivers are located more than 20 km from the sea cage sites, and 17 of the 30 rivers are located more than 30 km from the sea cage sites.

Requirement (ASF Comments)	Status in the EIS (ASF Comments)	Response to ASF Comments
7. Predicted future condition of the environment. **An EIS shall include a description of the predicted future condition of the environment that might reasonably be expected to occur within the expected life span of the undertaking, if the undertaking was not approved (EPA 57 (d. ii)).** **The EIS shall describe the predicted future condition of the environment with respect to key issues, if the project did not proceed (guidelines 6.1).**	**The sections referenced in the EIS Table of Concordance (sections 6.6 and 7.0) do not contain the required information.** **The required description of the predicted future condition of the environment with respect to key issues (e.g., genetic integrity and biological fitness of wild salmon) if the project did not proceed is ABSENT.**	**Alternatives -** Sections 2.7.1 and 2.7.2 of the EIS analyzes the effects of proceeding with the undertaking, versus the alternative of not proceeding with the undertaking in terms of environmental effects, technical feasibility, economic feasibility, market access, and regulatory regime. The evaluation of environmental effects considered the anticipated biophysical effects associated with construction, operation, closure, and decommissioning of the undertaking. Table 2.23 of the EIS provides a summary analysis of alternatives to the proposed undertaking. Section 2.7.2.1 of the EIS explains that *“the Alternative, No Project, has a rating for ‘Environmental Effects’ that is more favourable than that for the Proposed Project. There would be fewer biophysical environment issues associated with the Alternative, No Project than with the Proposed Project. The other four criteria have lower ratings for the Alternative, No Project than for the Proposed Project. There would be a high loss in economics with the absence of the Project, combined with reduced market access for the local industry and reduced exposure to and utilization of the technical innovations associated with the proposed undertaking. The economic*

The predicted future condition of the environment shall include a discussion of Atlantic salmon populations and climate change (guidelines 6.1).	**The required discussion of wild Atlantic salmon and climate change is ABSENT.**	*effect extends beyond the lost opportunity for Grieg NL. The Placentia Bay region would lose employment opportunities related to the RAS Hatchery, as well as jobs on the marine side. A series of contracted services would be lost, as would spin-off opportunities in the processing sector. Overall, the Alternative, No Project is considered less favourable than the Proposed Project*." Section 2.7.3.2 of the EIS explains that the aquaculture industry in Newfoundland imports mixed sex, diploid, non-native Saint John River strain Atlantic salmon (DFO 2013). The non-native Saint John River strain of Atlantic salmon is currently the only strain used in commercial production of Atlantic salmon in Newfoundland and Labrador. Commercial suppliers of this Saint John River broodstock (or eggs) for the Newfoundland salmonid aquaculture industry are limited or are partly-privately owned by aquaculture companies. This ownership might result in limits on the availability of eggs in the future and hence, present a commercial risk to the purchaser. With a single broodstock source (Saint John River) supplying not only Newfoundland but the entire aquaculture industry in Atlantic Canada, should a major disease outbreak occur, it would result in a substantial decrease in the supply of eggs to the industry and could affect the future economic environment of the aquaculture industry. Section 2.7.3.2 of the EIS advises that diploid salmon are fully capable of reproducing and may retain an inclination to return to freshwater to spawn. This increases the risk of compromise to the genetic integrity of wild salmon, i.e., escaped aquaculture fish having the impetus to return to rivers to spawn. **Climate Change –** Section 6.6 of the EIS informs that section 2.7 of Appendix V and Section 4.1.2.4 describe climate change in the North Atlantic and eastern Canada, including, for example, an anticipated sea level rise of ~0.6 m in Placentia Bay by 2081–2100 and recent increases in winter Northern Hemisphere temperatures. Accidents and malfunctions associated with storm, ice, or precipitation-related activity are assessed in Section 7.7". The EIS also states that "*Grieg NL has included consideration of the effects of climate change in choosing a design for sea cages, such as potential storms of increased frequency and severity."* This is for the purpose of reducing the likelihood of escapees impacting wild Atlantic Salmon populations. The Aqualine Midgard Sea Cage Component Study also informs that the proposed sea cages are tested and certified for significant wave heights up to 9 metres, equaling about 17-18 metres maximum wave height. The recent November 14, 2018 storm in Placentia Bay recorded maximum wave heights of 14.81 metres.

Requirement (ASF Comments)	Status in the EIS (ASF Comments)	Response to ASF Comments
8. Description of monitoring programs for all harmfull effects and proposed mitigation measures **An environmental impact statement shall include a proposed program of study designed to monitor all substances and harmful effects that would be produced by the undertaking (EPA 57(h)).** **The component study [Wild Atlantic Salmon] shall provide a detailed description of follow-up monitoring that will be conducted to determine the effectiveness of mitigative measures and residual effects (guidelines 4.3.1).** **The EIS shall describe the environmental monitoring and follow-up programs. The purpose is to verify the accuracy of the predictions made in the assessment of effects as well as the effectiveness of the mitigation measures (guidelines 7.4)** **The proponent acknowledges that the principal harmful effects of the project on wild salmon are: 1) genetic introgression; 2) ecological interactions; and 3) transfer of pathogens and parasites to wild salmon (Salmon Component Study p. 38).** **The proponent proposes several mitigation measures to address each of the three principal potential effects they have identified. Those mitigation measures are summarized in EIS Table 8.1 (p. 483). As per the legislation and guidelines cited above, the proponent was therefore required to describe monitoring programs for <u>each</u> of these effects and associated mitigation measures.**	***Genetic introgression* – The proponent proposes to develop a genetic monitoring program in collaboration with DFO (EIS 7.8.2), however no further information provided. The details required under guidelines 7.4 (i. to vii) are ABSENT.** ***Ecological interactions* – description of monitoring program and associated mitigation measures is ABSENT.** ***Transfer of pathogens to wild salmon* - description of monitoring program and associated mitigation measures is ABSENT.** ***Transfer of parasites to wild salmon* - description of monitoring program and associated mitigation measures is ABSENT.**	Section 57 (h) of the *Environmental Protection Act* requires that an EIS shall be prepared in accordance with the guidelines, and shall include a proposed program of study designed to monitor all substances and harmful effects that would be produced by the undertaking. In accordance with the Act, section 7.4 of the guidelines require *that "The EIS shall describe the environmental and socio-economic monitoring and follow-up programs to be incorporated into construction, operation, and maintenance activities. The purpose of the follow-up program is to verify the accuracy of the predictions made in the assessment of the effects as well as the effectiveness of the mitigation measures. The duration of the follow-up program shall be as long as is needed to evaluate the effectiveness of the mitigation measures."* This section requires the EIS to describe the proposed approach for monitoring and lists several components that must be included in the environmental effects monitoring plan (EEMP). The guidelines require the proponent to *"prepare and submit the EEMP subsequent to the completion of the EIS, but before the initiation of project construction".* The EIS states Grieg NL's commitment to follow up monitoring in a number of sections. For example, the Executive Summary states, "*Follow-up monitoring will be implemented to validate predictions regarding the residual effects of planned Project activities on the Fish and Fish Habitat VEC at the sea cage sites. The focus will be on monitoring benthic habitat and water quality at the sea cage sites. Follow-up monitoring with the guidance of DFO and DFLR would also be conducted in the event of an accidental escape of farm fish. This monitoring would include sampling Atlantic salmon in scheduled salmon rivers located nearest the location of the escape in order to determine whether escaped farm salmon have entered the freshwater systems. Sampling would involve collecting and analyzing blood samples, which will provide information such as source of the fish (i.e., wild or farm), the broodstock of the fish, and whether or not the fish is triploid and/or female. If the follow-up monitoring identifies unforeseen negative effects, mitigation measures will be adjusted or new mitigation measures will be implemented and additional follow-up monitoring will be conducted as warranted."* In addition, section 7.8 of the EIS states that, *"Grieg NL will prepare and submit an Environmental Effects Monitoring and Follow-up Program (EEMP) subsequent to the completion of the EIS but prior to initiation of Project construction"* and "*If the follow-up monitoring identifies unforeseen negative effects, Grieg NL commits to an adaptive management approach to address issues. More specifically, mitigation measures will be adjusted or new mitigation measures will be implemented and additional follow-up monitoring will be implemented as warranted."*

		On September 5, 2018, the undertaking was released from environmental assessment with conditions. One of those conditions requires Grieg NL to develop EEMPs for several aspects of the undertaking, to verify the accuracy of the predictions made in the assessment of the effects, as well as the effectiveness of the mitigation measures. Included in this condition is the requirement to monitor, document, and mitigate the effects of genetic and ecological interactions of escaped farmed on wild salmon. The EEMP shall be developed in consultation with applicable Government divisions and receive the required approval prior to the start of hatchery operations. The appeal comments that information describing a program to monitor the effects of the transfer of wild pathogens and parasites from farmed salmon to wild salmon is missing. In accordance with the advice of the Department of Fisheries and Land Resources, it would be very difficult, if not impossible, to monitor the *transfer* of parasites and pathogens from farmed to wild salmon, since parasites and pathogens that affect both farmed and wild salmon occur in the wild. Farmed salmon from the hatchery will have to be certified as disease free (parasites and pathogens) before being transferred to sea cages. Farmed salmon are initially infected with parasites and pathogens from the wild environment. The focus therefore is on preventing infections of farmed salmon and maintaining the health of farmed salmon by implementing measures that prevent and control parasites and pathogens amongst populations of farmed fish. In that regard, Grieg NL has proposed a Fish Health Management Plan, described in Appendix K of the EIS. As part of that plan, Grieg NL will have a private veterinarian, and will have the services of the provincial veterinarian. Section 4.8.3 of the Wild Atlantic Salmon Component Study discusses pathogen and parasite transfer between farmed salmon and wild Atlantic salmon as follows: "*There is risk that disease and parasites may be transferred between farmed and wild Atlantic salmon (as well as other wild fish).*" The EIS proposes the following mitigations to minimize the risk: 1. Decrease the Potential for Interactions Between Farmed Salmon and Wild Fishes • Siting of sea cage sites a suitable distance from the mouths of salmon rivers; • Reducing the attraction of wild salmon to the sea cages by feed optimization and the cleaning of biofouling from the sea cages; • Removing fish mortalities from the sea cages on a daily basis; and • Fallowing of the sea cage sites to minimize the accumulation of organic material on the seabed. 2. Maintenance of Farmed Salmon Health • Biosecurity measures; • Routine husbandry practice;

		• Health checks and procedures; • Use of specialized feed and feeding procedures; • Sea lice control procedures; • Water quality monitoring; • Vaccinations; and • Removal and treatment of dead fish. Each of the eight mitigation measures is further described in the Wild Atlantic Salmon Component Study. Grieg NL has also committed to implementing a Fish Health Management Plan and all personnel will be trained in its proper procedures Grieg NL has proposed four separate BMAs within Placentia Bay because BMAs enhance biosecurity by establishing discreet regions for individual companies. BMAs are recognized as an effective approach to disease management, to mitigate pathogen presence and spread (Chang et al. 2007). With the proper use of BMAs, including Grieg NL SOPs that regulate personnel and equipment transfer between and within BMAs, the risk of disease introduction and spread is reduced. These mitigations are in addition to federal and provincial regulations, including inspections and permits, that ensure all aquaculture facilities operate in a manner that prevents disease spread, such as the National Code on Introductions and Transfers of Aquatic Organisms.

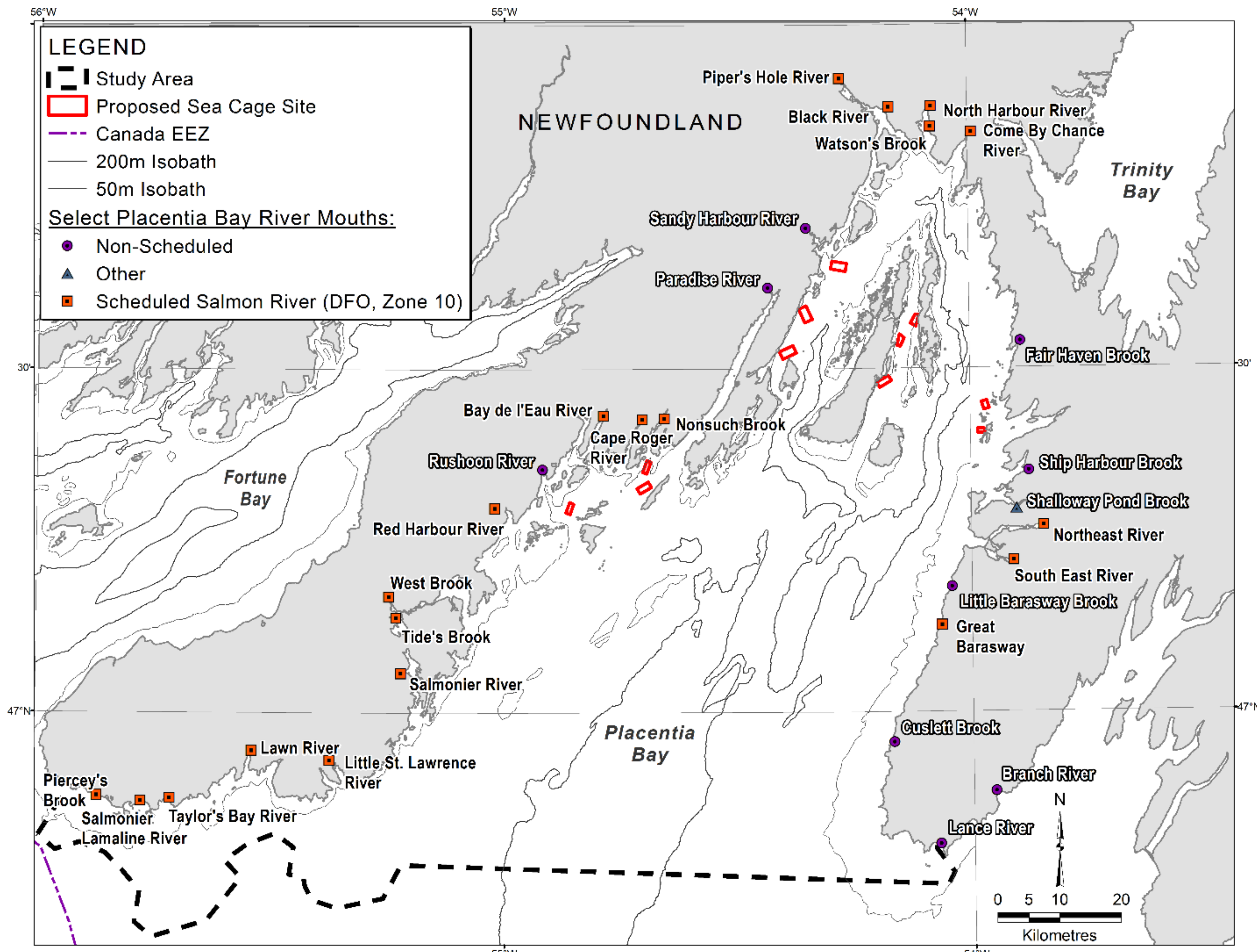
Revised Table 4.2. Distances between the mouths of Placentia Bay scheduled and non-scheduled Atlantic salmon rivers and the locations of the proposed sea cage sites (only distances ≤50 km are included).

River Name	Latitude	Longitude	Rushoon BMA Sea Cage Sites			Merasheen BMA Sea Cage Sites			Red Island BMA Sea Cage Sites			Long Harbour BMA Sea cage Sites	
			Oderin Island	Gallows Harbour	Long Island	Valen Island	Chambers Island	Ship Island	Butler Island	Red Island	Darby Harbour	Brine Island	Iona Island
Branch River[2]	46.88463	-53.95276											
Lance River[2]	46.80823	-54.07151											
Cuslett Brook[2]	46.95660	-54.16846											
Great Barasway Brook	47.12694	-54.06418							50.0	46.6	40.7	36.3	32.1
Little Barasway Brook[2]	47.18256	-54.04225				49.2			43.5	40.6	34.9	30.1	25.8
South East River	47.22044	-53.91008							46.1	43.6	38.6	32.3	27.9
Northeast River	47.27112	-53.84561							49.0	46.4	41.4	35.2	30.8
Shalloway Pond Brook[1]	47.29588	-53.90283							35.9	33.3	29.7	18.9	14.7
Ship Harbour Brook[2]	47.35093	-53.87539							34.0	31.4	28.4	15.6	12.1
Fair Haven Brook[2]	47.53958	-53.89069					49.8	41.3	27.4	25.1	24.1	11.9	16.0
Come By Chance River	47.84405	-53.99102				30.9	40.1	46.6	32.4	36.1	43.2	45.4	49.4
Watson's Brook	47.85175	-54.07990				27.3	36.8	43.5	31.5	35.1	42.3	46.2	
North Harbour River	47.88143	-54.07768				30.5	40.0	46.7	34.8	38.3	45.5	49.6	
Black River	47.88040	-54.16885				43.2	36.5	27.2	36.0	39.5	46.7		
Piper's Hole River	47.92209	-54.27583					44.1	34.8	44.2	47.8			
Sandy Harbour River [2]	47.70454	-54.34960				23.7	17.0	9.2	31.8	35.3	42.6		
Paradise River[2]	47.61809	-54.43211		37.0	39.4								
Nonsuch Brook	47.42857	-54.65585	22.1	8.7	12.1	44.8							
Cape Rodger River	47.42722	-54.70305	18.5	12.3	12.6	48.7							
Bay de l'Eau River	47.43291	-54.78666	16.9	19.8	19.3								
Rushoon River[2]	47.35449	-54.91732	7.8	19.9	19.1								
Red Harbour River	47.29828	-55.01997	11.9	28.7	24.4								
West Brook	47.16920	-55.24673	42.1	45.7									
Tide's Brook	47.13911	-55.23086	39.4	43.0									
Salmonier River	47.05789	-55.22075											
Little St. Lawrence River	46.93138	-55.37257											
Lawn River	46.94551	-55.53826											
Taylor's Bay River	46.87594	-55.71165											
Salmonier Lamaline River	46.87167	-55.77335											
Piercey's Brook	46.87969	-55.86704											

1 denotes non-scheduled river with documented occurrence of Arctic char and rainbow trout.

2 denotes non-scheduled river with documented occurrence of Atlantic salmon.

Yellow highlighting: Sea cage site <10 km from river; Green highlighting: Sea cage site 10-20 km from river; Blue highlighting: Sea cage site 20-30 km from river; Grey highlighting: Sea cage site >30.



Revised Figure 4.1. Locations of sea cage sites relative to scheduled and non-scheduled salmon rivers in Placentia Bay.