

## INVENTORY OF POTENTIAL IMPACTS AND MITIGATION MEASURES

### OCEAN DISPOSAL OF FISH WASTE

#### PHASE A      IMPACT OF LOADING AND TRANSPORTATION<sup>1</sup>

##### On hydrodynamics, ice and sedimentology

Ref. <sup>2</sup>	POTENTIAL IMPACTS	CUMULATIVE <sup>3</sup>	MITIGATION MEASURES
N/A	The transportation of fish waste to the dumping site is not likely to have an impact on hydrodynamic or sedimentological conditions.	--	N/A

##### On the characteristics and quality of the ocean floor

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
N/A	The transportation of fish waste to the dumping site is not likely to have an impact on the characteristics or quality of the ocean floor.	--	N/A

##### On water quality

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
N/A	The transportation of fish waste to the dumping site is not likely to have an impact on water quality.	--	N/A

<sup>1</sup> "Transportation" includes both land and water transportation.

<sup>2</sup> The reference numbers correspond to the numbers in Section 2 of the questionnaire (ENVIRONMENTAL ASSESSMENT).

<sup>3</sup> In the column 'Cumulative', the word "Potential" indicates that the impact is likely to cumulate with similar impacts associated with the same or other projects in the area. The numbers refer to more detailed information provided after the tables.

### On terrestrial flora and fauna

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
N/A	Land transportation of fish waste is not likely to have an impact on terrestrial flora or fauna, since the small number of vehicles involved will use existing roads.	--	N/A

### On marine wildlife and habitats

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
A-1a	Land transportation of fish waste is not likely to have an impact on marine wildlife or habitats. Only water transportation may have an impact.	Potential <b>2.01</b>	<ul style="list-style-type: none"> <li>As a precaution, if marine mammals are observed in the vicinity, reduce the speed of the ship or delay the trip by a few minutes.</li> </ul>
	<p>a) <u>Disturbance of marine mammals</u></p> <p>The transportation of fish waste to the dumping site could disturb marine mammals (whales or seals in the area, seal haulouts). However, given that marine mammals can avoid disturbed areas and that the trips made for transporting fish waste are few and far between, this impact will generally be negligible.</p>		
A-1b	<p>b) <u>Effects on fish and marine habitat</u></p> <p>Transporting fish waste by boat is not likely to have an impact on fish or marine habitat.</p>	--	N/A

### On birds and coastal habitat

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
A-2	<p><u>Disturbance of birds by noise and traffic</u></p> <p>During the transportation of the waste to the dumping site, birds (gatherings or colonies) may be disturbed by the movements of the ships or barges, and by the noise of the engines.</p>	Potential <b>2.02</b>	<ul style="list-style-type: none"> <li>Avoid marine bird gathering sites or periods.</li> </ul>
	<p><i>Case 1: There are important gathering sites on the route taken</i></p> <p>The transportation equipment may disturb marine birds (e.g., colonies, rafts of male eider ducks in summer). However, the impact will be minor to negligible, given the short duration and infrequency of the disturbance.</p>		
	<p><i>Case 2: There are no bird gathering sites in the vicinity</i></p> <p>There are no bird gathering sites or habitats in the vicinity or on the route taken by the equipment to the dumping site. No impact is anticipated.</p>		

**On recreational activities (swimming, water sports, sport fishing, hunting, etc.)**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
A-3	<p>a) <u>Disturbance of recreational activities during land transportation</u> Land transportation of fish wastes involves few vehicles and the routes taken are high-traffic thoroughfares. No impact is anticipated on recreational activities.</p> <p>b) <u>Disturbance of recreational activities during loading</u> <i>Case 1: Activities on the dock</i> During the loading of fish waste, activities on the dock (fishing, underwater diving, boarding ships for cruises, etc.) could be disturbed by congestion on the dock, restricted access to docking areas and odours. The significance of the impact will depend on the duration of the loading activities, the level of congestion on the dock and its approaches and the duration for which the fish waste is stored on the dock.</p> <p><i>Case 2: Activities carried out in the vicinity of the dock</i> Activities carried out in the vicinity of the dock could be disturbed, particularly by the noise caused by the loading activities. The impact will be minor, even negligible, since the operations will be short term and will be carried out in specific locations generally used for this purpose.</p> <p>c) <u>Disturbance of activities during water transportation</u> <i>Case 1: Recreational activities are carried out in the vicinity</i> The transportation equipment may disturb recreational activities (water sports, diving, swimming, etc.) carried out in the vicinity (noise and congestion). The impact will be minor, even negligible, since the trips required for transporting fish waste are few and far between.</p> <p><i>Case 2: No recreational activities are carried out in the vicinity</i> No impact is anticipated on these elements.</p>	<p>--</p> <p>Potential <b>3.01</b></p> <p>Potential <b>3.01</b></p> <p>Potential <b>3.01</b></p> <p>--</p>	<p>N/A</p> <ul style="list-style-type: none"> <li>• Avoid periods and areas of heavy recreational use.</li> <li>• Minimize the duration for which waste is stored on the dock.</li> <li>• Minimize the duration of loading activities.</li> <li>• Inform dock users of the date and duration of the operations.</li> </ul> <p>• No particular measure, given the insignificance of this impact.</p> <ul style="list-style-type: none"> <li>• Avoid periods and areas in which recreational activities are carried out.</li> </ul> <p>N/A</p>

**On commercial activities (fishing, navigation and aquaculture)**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
A-4	a) <u>Disturbance of commercial activities during land transportation</u> Land transportation of fish waste is not likely to have an impact on commercial activities.	--	N/A
	b) <u>Disturbance of commercial activities during loading</u> The presence and operation of equipment at the dock (trucks, barges, ships) could cause temporary problems for commercial fishing activities (e.g., docking, unloading of catches, refueling, etc.) due to a total or partial restriction on access to the dock, approaches and docking areas. The significance of the impact will vary depending on the duration of the operations, the degree of congestion on the dock and the extent of the commercial activities carried out on the dock.	Potential <b>4.01, 4.02</b>	<ul style="list-style-type: none"> <li>• Avoid sites and periods of heavy commercial activity.</li> <li>• Inform users of the dock and approaches of the date and scope of the operations.</li> </ul>
	c) <u>Disturbance of commercial activities during water transportation</u> The transportation equipment may disturb commercial activities (fishing, aquaculture, water transportation, etc.) carried out in the vicinity (congestion of waterways). The impact will be negligible, since the transportation of fish waste involves very few, infrequent trips, which occur in sectors designed for navigation.	--	<ul style="list-style-type: none"> <li>• Avoid areas and periods of heavy activity.</li> <li>• In cases where disturbances of specific fishing or aquacultural activities are inevitable, inform the individuals concerned of the operations beforehand.</li> </ul>

**On heritage and protected areas**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
N/A	The transportation of fish waste is not likely to have an impact on heritage or protected areas.	--	N/A

**On aesthetic and scenic resources**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
A-5	Transportation and loading of fish waste are unlikely to have a significant impact on aesthetic or scenic resources, since the activities are short term, involve little equipment and are carried out in areas designed for this type of activity.	--	N/A

**On quality of life**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>A-6a</b>	<p>a) <u>Disturbance by noise and dust generation</u>                      The transportation and loading of fish waste are likely to have an impact on the quality of life of nearby residents, due to the noise of the vehicles and equipment or the generation of dust by the trucks. However, given the small number of trips involved, the impact may be considered negligible, particularly since the activities will be carried out in a sector where there is already a certain level of activity.</p>	Potential <b>6.01</b>	N/A
<b>A-6b</b>	<p>b) <u>Traffic</u>                      The traffic caused by the project may cause heavy congestion of thoroughfares and access roads to the dock. In general, however, the impacts will be minor given the small volume of traffic in question and the roads used.</p>	Potential <b>6.01</b>	N/A
<b>A-6c</b>	<p>c) <u>Odour problems</u>                      It is likely the fish waste will give foul bad odours during loading into the trucks, transfer to the barges and storage on the dock. However, the odours will be temporary and will become indistinguishable from the odours already present in the vicinity of the fish processing plant or on the dock. The impact is considered minor.</p>	Potential <b>6.01</b>	<ul style="list-style-type: none"> <li>• Minimize the duration of storage at loading areas.</li> <li>• Trucks must be airtight to avoid leaks during transportation.</li> </ul>
<b>A-6d</b>	<p>d) <u>Vermin problems</u>                      Storage of fish waste is likely to attract vermin, particularly gulls, which can have an impact on the quality of life in the vicinity of the site.</p>	Potential <b>6.01</b>	<ul style="list-style-type: none"> <li>• Minimize the duration of storage at loading areas.</li> </ul>

**On existing infrastructure (sea water intakes, outfalls, etc.)**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>A-7</b>	The equipment will not go near the water intakes or drainage channels. As a result, no impact is anticipated.	--	N/A

**Risk of spills**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>A-8</b>	During loading and transportation, it is likely that there will be equipment leaks or breakdowns (trucks, barges, ships, etc.) accidents causing a potential hazardous materials spill (petroleum products, fuel, oil, etc.). However, given the small number of trips involved, this impact can be considered negligible, particularly since limited equipment will be used and it will undergo routine maintenance.	--	<ul style="list-style-type: none"><li>• In the event of a spill, immediately inform the authorities of the situation.</li><li>• Ensure proper maintenance of transportation equipment.</li></ul>

**PHASE B      IMPACTS OF THE DISPOSAL AND PRESENCE OF FISH WASTE**

**On hydrodynamics, ice and sedimentology**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>B-1</b>	<p>The disposal of fish waste is not likely to have an impact on the bathymetric, hydrodynamic or sedimentological conditions at the dumping site, particularly if the site is characterized by good dispersal conditions. The waste that is dumped will occupy a very limited area for a period of time and should be quickly assimilated by the ecosystem. If the fish waste is not assimilated, the resulting changes in bathymetric conditions will be localized to the immediate vicinity of the dumping site. As a result, no impact is anticipated on these elements.</p>	--	N/A

**On the characteristics and quality of the ocean floor**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>B-2</b>	<p><u>Accumulation of fish waste</u>                      During dumping of the fish waste, there may be an accumulation of waste in a given location. This is likely to have an impact on the characteristics and quality of the ocean floor.</p> <p><i>Case 1: Fish waste accumulates without being assimilated</i>                      If fish waste is dumped at a site that does not have strong currents, it is likely that it will be not be dispersed upon discharge and will therefore accumulate on the ocean floor. The thickness limits its assimilation into the ecosystem. Its slow rate of decomposition, which can sometimes take several years, results in the formation of a black ooze, suggesting anoxic conditions. Due to the lack of oxygen, this ooze eventually becomes a waste that cannot be used or assimilated by detritivores (Messieh, 1991; Fudge, 1989; Barrie, 1985; McIver and Aggett). In some areas, the black ooze is covered with a thin film of white scum (Fudge, 1989; Barrie, 1985). The scum is reflective and is probably composed of sulphur-oxidizing bacteria (Fudge, 1989). The impact on the characteristics of the ocean floor is, however, localized to the immediate vicinity of the dumping site.</p>	Potential <b>1.01</b>	<ul style="list-style-type: none"> <li>• Select a dumping site and disposal technique that promote dispersal and assimilation of the waste:                             <ul style="list-style-type: none"> <li>• discharge the waste in areas where the prevailing currents are offshore currents, which promote dispersal of the waste and prevent it from being carried back to shore (Messieh, 1991; Fudge, 1989; Barrie, 1985; McIver and Aggett);</li> <li>• for large quantities of waste, dump over a larger area or use a second site to avoid accumulation;</li> <li>• dump fish waste while the vessel is moving to promote dispersal (McIver and Aggett); when discharging from barges with more than one pocket, dumping should be carried out one pocket at a time, with a pause of several minutes between pockets to promote dispersal.</li> </ul> </li> </ul>

**On the characteristics and quality of the ocean floor (continued)**

<b>B-2</b>	<i>Case 2: The waste is dispersed and/or assimilated by the ecosystem</i> Fish waste that is dumped in an area conducive to dispersal (currents) will be dispersed before reaching the ocean floor, settle in thin layers and be quickly assimilated by the ecosystem. As a result, no adverse effects are anticipated on the characteristics of the ocean floor at the dumping site.	--	N/A
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**On water quality**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
N/A	Ocean disposal of fish waste is not likely to have a significant effect on water quality.	--	N/A

**On marine wildlife and habitat**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>B-3a</b>	a) <u>Direct impact on organisms</u> Ocean disposal of fish waste is not likely to have direct adverse effects on marine organisms; the waste loadings may even be beneficial to detritivores.	--	N/A
<b>B-3b</b>	b) <u>Impact on habitats</u> Ocean disposal of fish waste is likely to have an impact on marine habitat at the dumping site. In some cases, a net decline in macrofauna at dumping sites has been noted. However, this change is localized to the immediate vicinity of the dumping site. The extent of the change depends on the type and quality of the habitat (Messieh, 1991; Fudge, 1989; Barrie, 1985).	--	<ul style="list-style-type: none"> <li>In carrying out the work, avoid or take account of important activities for aquatic organisms (e.g., spawning periods and grounds, nursery areas) when justified by the environmental situation.</li> </ul>

**On terrestrial flora and fauna**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
N/A	Ocean disposal of fish waste will have no impact on terrestrial flora or fauna.	--	N/A



**On birds and coastal habitat**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>B-4</b>	Coastal habitats could be disturbed in cases where a large volume of fish waste is recently washed ashore by currents. The decomposition of the organic matter, combined with the presence of gulls attracted by this source of food, could have an impact on the environment. In most cases, however, the impact would be negligible.	--	<ul style="list-style-type: none"> <li>• Dump the waste in sectors where the currents are such that the waste is carried offshore.</li> </ul>

**On recreational activities (swimming, water sports, sport fishing, hunting, etc.)**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>B-5</b>	<p><u>Disturbance of recreational activities by the presence of floating waste</u></p> <p>The presence of fish waste floating on the surface or washed up on shore is likely to have an impact on recreational activities carried out in, on or near the water (swimming, canoeing, windsurfing, personal watercraft use, underwater diving, sport fishing from boats or the dock, hunting, etc.). The presence of gulls would be likely (Joly, 1989).</p> <p>The decomposition of fish waste will have impacts on the recreational environment, including odour problems, aesthetic problems and poor sanitary conditions at the sites. In addition, the accumulation of fish waste along the shoreline may promote the proliferation of bacteria and parasites and attract rodents and scavenger birds (gulls, Corvidae, etc.). These factors are likely to detract from the recreational value of the area (Messieh, 1991; Fudge, 1989; Barrie, 1985).</p>	Potential <b>3.01</b>	<ul style="list-style-type: none"> <li>• Select a dumping site and disposal technique that promote the dispersal and assimilation of the waste: <ul style="list-style-type: none"> <li>• discharge the waste in areas where the prevailing currents are offshore currents, which promote dispersal of the waste and prevent it from being carried back to shore (Messieh, 1991; Fudge, 1989; Barrie, 1985; McIver and Aggett);</li> <li>• for large quantities of waste, dump over a larger area or use a second site;</li> <li>• dump fish waste while the vessel is moving to promote dispersal; when discharging from barges with more than one pocket, dumping should be carried out one pocket at a time, with a pause of several minutes between pockets to promote dispersal (McIver and Aggett).</li> </ul> </li> <li>• Minimize the quantities of floating waste: <ul style="list-style-type: none"> <li>• dispose of fish waste within 24 of catching to minimizes bloating of the swim bladder (phenomenon which causes fish waste to float) (McIver and Aggett);</li> <li>• where fish waste cannot be disposed of quickly after catching, store it in a manner which prevents or reduces bloating and decomposition (e.g., by grinding) (McIver and Aggett).</li> </ul> </li> </ul>

**On commercial activities (fishing, navigation and aquaculture)**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>B-6</b>	<p><u>Disturbance due to dispersal of the waste</u>                      The dispersal of fish waste around the dumping site is likely to have an impact on fishing and aquacultural activities: the fixed gear or aquacultural equipment of fishermen and aquacultural producers could become fouled by accumulations of fish waste. It should be noted that calcareous shells are not readily degraded (e.g., crab waste). This requires follow-up, since large quantities may foul fishing nets (Fudge, 1989).</p>	Potential <b>4.01, 4.02</b>	<ul style="list-style-type: none"> <li>• Avoid areas and periods of heavy activity.</li> <li>• Where the disturbance of fishing or aquacultural activities is unavoidable, inform the individuals concerned of the work beforehand.</li> <li>• Do not discharge waste near or on fishing grounds.</li> </ul>

**On heritage and protected spaces**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>B-7</b>	<p><u>Presence of fish waste disposed of in a protected area</u>                      The disposal of fish waste could have effects if they are transported to protected areas. In most cases, the impact will be negligible.</p>	Potential <b>5.01</b>	<ul style="list-style-type: none"> <li>• Discharge the waste at sites that promote dispersal offshore.</li> </ul>

**On aesthetic and scenic resources**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>B-8</b>	<p><u>Degradation of aesthetic and scenic resources</u>                      The densest part (head and body) will settle on the ocean floor, while the lighter parts (liver, gonads, stomach, etc.) will be picked up in the water column and carried by wave action and currents (Barrie, 1985). The presence of fish waste floating on the surface and washed up on shore is likely to have an impact on the aesthetic quality of the water and the landscape in general.</p> <p>Decomposition of the waste will have an impact on the quality of the site, including odour problems, aesthetic problems and sanitary conditions at the site (Fudge, 1989). In addition, the accumulation of fish waste on shore may promote the proliferation of bacteria and parasites and attract rodents. These factors will likely detract from the aesthetic value of the sites.</p>	Potential <b>6.01</b>	<ul style="list-style-type: none"> <li>• Select a dumping site and disposal technique that promote dispersal and assimilation of the waste:                             <ul style="list-style-type: none"> <li>• discharge the waste in areas where the prevailing currents are offshore currents, which promote the dispersal of waste and prevent them from being carried back to shore (Messieh, 1991; Fudge, 1989; Barrie, 1985; McIver and Aggett);</li> <li>• for the disposal of large volumes, dump over larger areas or use a second site;</li> <li>• dump fish waste while the vessel is moving to promote dispersal; when discharging from barges with more than one pocket, dumping should be carried out one pocket at a time, with a pause of several minutes between pockets to promote dispersal (McIver and Aggett).</li> </ul> </li> </ul>

**On quality of life**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>B-9</b>	<u>Degradation of the quality of life by the presence of waste washed ashore</u> The decomposition of fish waste washed up on shore could have impacts on quality of life, including odour problems, aesthetic problems and poor sanitary conditions at the site. The accumulation of fish waste on the shore can promote the proliferation of bacteria and parasites and attract rodents and scavenger birds (gulls, Corvidae, etc.).	Potential <b>6.01</b>	<ul style="list-style-type: none"><li>Minimize the quantities of floating waste (see the mitigation measures in this regard under the heading “Aesthetic and scenic resources”).</li></ul>

**On existing infrastructure (sea water intakes, outfalls, etc.)**

Ref.	POTENTIAL IMPACTS	CUMULATIVE	MITIGATION MEASURES
<b>B-10</b>	<u>Fouling of infrastructure</u> The disposal of fish waste could result in the fouling of water intakes or outfalls, particularly where there are large quantities of waste floating on the surface or washed up on shore. However, given the small volumes generally involved, the impact would be negligible in most cases.	--	<ul style="list-style-type: none"><li>In determining the location of the dumping site, avoid all infrastructure, such as sea water intakes, outfalls, etc.</li></ul>

## **POTENTIAL CUMULATIVE IMPACTS**

With respect to all impacts for which it was indicated that there are potential cumulative impacts, the possibility that other activities associated with the project or with other projects may have similar impacts or affect the same resource or the same component of the environment must be evaluated. An impact considered minor within the framework of a project may become more significant if the analysis of the other activities carried out in the sector indicates that the resource or element considered is already affected in different ways.

### **1. Changes in the characteristics of the ocean floor**

- 1.01** If the dump site is used on an ongoing basis, there could be an accumulation of fish waste which, if not dispersed or assimilated by the ecosystem, may result in gradual changes in the ocean floor.

### **2. Disturbance of marine mammals and birds**

- 2.01** Due to their mobility, marine mammals are able to avoid disturbances of the environment. However, when their movements are disturbed by several elements, they may be forced to avoid a particular sector and be prevented from feeding properly.
- 2.02** Birds leave their habitat as soon as it is disturbed. They return soon after the disturbance and generally undergo no effect. However, if they are disturbed on several occasions by various factors, they may be prevented from feeding properly (particularly since repeated displacements require additional energy) or their reproductive success may be affected (e.g., when females abandon their nest momentarily, there is an increased risk of predation or when females are disturbed too often during nest building, they may abandon the breeding site completely).

### **3. Disturbance of recreational activities**

- 3.01** The disturbance of recreational activities is an impact that is likely to be cumulative. It is important to evaluate multiple disturbances that can make an activity no longer attractive. Recreational activities that are carried out in aquatic environments are often limited in space and time (short period of the year), which makes the impact more significant.

**4. Disturbance of fishing or aquacultural activities**

**4.01** The disturbance of fishing activities may be associated with the deterioration of navigation conditions (obstacles, conflicts, etc.), disturbances of fishing conditions at the fishing grounds, declines in fish stocks, etc. Fishermen who are affected by several types of disturbances may see a significant decline in their catch.

**4.02** The success of aquacultural activities is often random and depends on a combination of elements specific to the natural environment; the disturbances caused by human activities in the sector may sometimes have more significant adverse effects than anticipated.

**5. Modification of protected areas**

**5.01** Modification of protected areas, regardless of how minor, contribute to the gradual deterioration of the natural environment.

**6. Aesthetic and scenic resources, quality of life**

**6.01** The quality of sites used by residents or tourists may be affected by different types of low-level disturbances, which, when combined, may have adverse effects. In some cases, the presence of decomposing fish waste may be prompt residents or tourists to frequent other sites.

## **REFERENCES**

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