Sadaka, Jennifer -JLT

From: McLean, Mark G [c=CA;a=GOVMT.CANADA;p=GC+DFO.MPO;o=XMAR;s=McLean;g=Mark;i=G;]
Sent: August 3, 2006 1:50 PM
To: Comments@wpq-jointreview.ca; Myles,Debra [CEAA]
Cc: Potter, Ted; FREEMAM@tc.gc.ca; McAllister,Andrew: NRCAN; McDonald,Derek [CEAA]; Denning, Allison: HC
Subject: DFO Comments on the Whites Point Quarry and Marine Terminal EIS

Attachments: DFO Comments on Whites Point Quarry EIS Aug 2006.pdf

Debra:

Please find attached DFO's comments on the Whites Point Quarry and Marine Terminal EIS. Please contact me if you have any questions. Thank you.

DFO Comments on Whites Point Q...

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File No :
03-FCR-020

Ms. Debra Myles, Panel Manager
Whites Point Quarry and Marine Terminal Project - Joint Review Panel
c/o Canadian Environmental Assessment Agency
160 Elgin Street
Ottawa, ON
K1A 0H3

Dear Ms. Myles:

Fisheries and Oceans Canada (DFO) staff have completed review of the Environmental Impact Statement (EIS) for the Whites Point Quarry and Marine Terminal Project. In this regard, I am pleased to provide the attached comments for the Joint Review Panel's consideration in its assessment of this project.

DFO has primarily focused the review on relevant aspects of our mandate which includes the study, conservation and protection of aquatic ecosystems, the conduct of scientific research and related activities, and the management of the commercial, recreational and Aboriginal fisheries.

Departmental staff are prepared to provide additional information on our mandate and comments with respect to the EIS at the Panel's request. If you have any questions, please contact Mr. Mark McLean, Senior Environmental Analyst with the Environmental Assessment and Major Projects Division at (902) 426-9898.

Yours sincerely,

Faith G. Scattolon
A/Regional Director-General
Maritimes Region

Attachment

cc: Ted Potter
Mark McLean

Fisheries and Oceans Canada

Comments on the Whites Point Quarry and Marine Terminal Project to the Joint Review Panel

August 2006

The Department of Fisheries and Oceans (DFO), has determined under the *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements of the Canadian Environmental Assessment Act* that we are a Responsible Authority (RA) under the *Canadian Environmental Assessment Act* (*CEAA*) for the environmental assessment of this project. In addition to being an RA, DFO is also in possession of expert information on the environmental assessment for this project.

DFO provides the following comments on the Whites Point Quarry and Marine Terminal Environmental Impact Statement (EIS), dated March 31, 2006. These comments have been compiled from within various divisions of DFO in order to provide the Joint Review Panel with scientific and resource management information to assist the Panel in their environmental assessment review of the Whites Point Quarry and Marine Terminal Project.

While DFO has expertise in areas of aquatic sciences, it should be noted that there are areas where the current scientific knowledge on specific issues is limited. Such is the case for the current understanding of the behavioral impacts of noise on marine mammals and fish. For these areas DFO has provided the current information in our possession but are unable to provide conclusive information on the potential impacts without further research which may or may not increase our current understanding of these issues.

Below are detailed comments on various sections of the EIS followed by general comments on the conclusions, mitigation and monitoring.

VOLUME 1 – Plain Language Summary

Page 12 – In Table 2, Part 1, the proponent should explain why neutral effects are assigned a time frame. If there is no effect (i.e., neutral), then there should be no duration.

Page 23 – Although generally accepted that socket drilling is less noisy than pile driving, the impact and duration of the installation of the piles should described.

Page 27 – The document states, "New sediment ponds comprising 20 acres of surface water will create aquatic/wetland habitat." What species would be expected to use this habitat? Would there be any treatment (chemical, biological or physical) of the settling pond that could have an impact on this created habitat or the species that would use it?

Page 28 - Section 7.5 Fishing – The list of potential effects in this section deals primarily with environmental effects on fish and habitat, rather than conflicts with or potential effects on fishing activities. For example, Section 9 goes into some detail on these issues (e.g., good communication with fishers and compensation for gear damage) yet no mention of this is made in the Summary.

Page 29 – Paragraph 1 – The proponent is not required under the *Fisheries Act* to provide habitat compensation, it is rather in accordance with DFO's Policy for the Management of Fish Habitat to strive to achieve the guiding principle of no net loss of productive capacity of fish habitat through habitat replacement or compensation.

Page 29 – Paragraph 3 – The wording here regarding "a safety factor of three for separation distance" should be clarified to reflect the statements in the Blasting Protocol in Appendix 9 of the EIS.

Page 29 – The document states "Bilcon has received approval in principle for the Fish Habitat Compensation Plan which involves installing fish shelters and creating habitat on the pipe piles themselves." This statement appears in several sections of the EIS and in at least one instance the document states DFO has approved the Fish Habitat Compensation Plan (Volume VII, Chapter 11, page 5). As stated in a letter from DFO to Bilcon of Nova Scotia dated November 24, 2005 (found in Appendix 21 of the EIS) "based on the preliminary information provided, the Department of Fisheries and Oceans is satisfied that the overall components of the proposed habitat compensation plan would meet the requirements and objectives of the Policy for the Management of Fish Habitat under the *Fisheries Act*." This statement is not an approval in principle or otherwise.

Page 33 – The proponent states that "North Atlantic right whale sightings in the Whites Cove area will be communicated to the ships captain before the ship exits the inbound shipping lane (see Map 4) or leaves the marine terminal for the outbound shipping lanes." Who will do the sightings and at what times? If a North Atlantic right whale is sighted, what would be the course of action, understanding that Bilcon of Nova Scotia is not the operator of the vessels? What will be the accuracy of a trained observer in poor weather conditions? Is there a contingency plan for this situation?

Section 7.9 Employment and the Economy – There is only one statement on the fishery, "There is no evidence that the operation of the quarry will affect either the fishery or the tourism industry." Yet it seems fairly clear that the marine terminal and shipping will interact with and impact fishing activities. This statement should be supported by further information/documentation particularly when the first paragraph on this page states that the lobster industry has increased significantly in this area. If it can not be supported then statement "there is no evidence that the operation of the quarry will affect the fishery" should be retracted.

VOLUME II – EIS Guidelines Referenced to the EIS Document

Page 7 – The document indicates that produce maps are found in Volume II. This should indicate Volume III.

VOLUME III – Maps

Map 2A – Property Ownership – This map shows lands owned by the proponent or companies connected to the proponent. Is there any indication at this time that the project will eventually extend into those areas?

Map 6B – Business and Services – This map depicts aquaculture sites, wharves and processing plants but no maps showing fishing areas were produced. Source material from interviews, meetings, socio-economic profiles, field observations and traditional community ecological knowledge could have been mapped to illustrate the text descriptions (e.g., herring nets, customary lobster grounds, other trap and longline areas). Mapping these uses would help lend visual support to the conclusions of "insignificant negative impact".

Map 12 – Physical Resources – The proponent should state what the polygon in the centre of the property represents? Is this the original 3.9 ha quarry?

Map 15 – Digby Neck – Important Freshwater Wetlands – There is no indication as the meaning of the score in the legend.

Map 21 – Marine Mammal and Seabird Observations – Other species of whale that are not listed on the map have been seen in this area. In particular, humpbacks, fin backs and sei whales have been seen. Additional data are available from sources such as the Brier Island Whale and Seabird Cruises which cover some of the area depicted and the International Fund for Animal Welfare (IFAW) 2006 right whale survey also covered some of this area.

Map 23 – Leatherback Turtles – The proponent should provide information on the timing of these records, including seasonal occurrences.

Map 25 – Right Whale Density – This map appears to be accurate but there is newer data from the same source since 2000 which should be considered.

Map 26 – Atlantic Salmon Rivers of the Inner Bay of Fundy – Context for this map has not been provided (i.e., what is the map meant to represent). A more descriptive caption or title would be helpful. For example, the rivers depicted here appear to be rivers for which an electrofishing survey or reported recreational catch were available to indicate the past presence of Atlantic salmon. This does not necessarily capture all rivers that may support inner Bay of Fundy populations of Atlantic salmon.

Atlantic salmon migration routes, as depicted on this map, are theoretical, incomplete and do not cover all life-history stages.

Map 31 – Blast Monitoring – Should this map be titled, "Initial Blast Monitoring and Observation Monitoring Area" or will this monitoring area remain in place for all blasts? Blast locations are not clearly indicated on this map. If this is not intended to depict the initial blast monitoring, where is this information presented? It should include underwater sound level monitoring out to the margin of the North Atlantic Right Whale Conservation Area as stated in Blasting Protocol.

VOLUME IV – Chapter 1

Page i – DFO should be Fisheries and Oceans Canada, not Department of Fisheries and Oceans.

Title Page for Table ECM – 1 is incorrect – it should be ECM – 1 not 2 and title should read "Environmental Component Mitigation"

Table ECM – 1 Summary Table – Page 6 – Does the proponent anticipate that dredging will be required at any point during the life of the project?

Table ECM – 1 Summary Table – Page 7 – The document states, "If unexpected turbidity conditions develop during installation of the pipe piles for the marine terminal exceeding CCME Guidelines, controls such as silt curtains will be implemented." How practical would the use of silt curtains be in the Bay of Fundy? Does the proponent know of examples of silt curtains used in this or similar environments?

Table ECM – 1 Summary Table – Page 8 – The proponent should also indicate the duration of construction in addition to the frequency of blasting during construction which is described as once per week elsewhere in the document. They should also indicate the relative size of the blasts during construction as compared to those described in the initial blasting plan. Will the construction blasts be monitored?

Table ECM – 1 Summary Table – Page 13 – The document states, "During the infrequent, once per week, vessel arrival and departure, a trained observor will be stationed on the ship loader and if marine mammals or waterbirds are sighted, their location will be communicated to the ship's captain." What is the mitigation action if marine mammals or waterbirds are sighted?

Table ECM – 1 Summary Table – Page 13 – Under Species at Risk there is no mention of marine mammal species at risk such as the North Atlantic Right Whale, Blue Whale, Fin Whale or Harbour Porpoise. These should be recognized as species at risk under this section of the table.

Table ECM – 1 Summary Table – Page 14 – The document states, "An additional mitigative measure will be adopted of three times the designated setback indicated in the "Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters" from the blast to fish habitat during times of the year when inner Bay of Fundy Atlantic salmon could be present in these coastal waters." More details are required for this mitigation measure. What are the times of the year when inner Bay of Fundy Atlantic salmon could be present in these coastal waters? What are the separation distances during other times of the year?

Table ECM – 1 Summary Table – Page 15 – More information is required on the marine mammal observers (e.g., training, experience, equipment, limitations, etc.).

Table ECM – 1 – Page 20 – Coordination of shipping with local fishers – Will there be exclusion zones setup during inbound/outbound shipping, approaches and departure?

Table ECM – 1 – Page 21 & 22 – "Contaminates" should be Contaminants.

Table ECM – 2 – Page 3 – The proponent should explain why is it "No" to Fish Habitat Compensation during the construction phase. Could compensation not be monitored during the construction phase? Also why is it "No" to Initial Blast Monitoring regulatory requirement? Some of this monitoring is to ensure compliance with SARA.

Table C1 – Commitments Table – Page 7 – This table only includes the lobster fishery. Is there the potential for damage to other gear types? Can the "lobster trap fund" be used to compensate for other gear losses? Commitment 11.3 makes the very specific commitment that carriers will enter and leave on "the same predetermined bearing." Will this final route be determined with input from local fishers?

Table C1 – Commitments Table – Page 7 – The proponent has not received approval in principle for the compensation plan and the development of the plan is associated with DFO's Policy document not the *Fisheries Act*.

VOLUME IV – Chapter 3

Page 6 – The document states, "Where there is uncertainty with respect to the effectiveness of measures that are used to prevent serious or irreversible environmental damage, Bilcon will take an adaptive management approach." Given the uncertainty surrounding potential behavioural impacts on marine mammals from blasting and impacts on lobster from blasting, what potential adaptive management strategies could be applied if the project was shown to have an adverse effect, behavioural or otherwise, on an endangered marine mammal or lobster population?

VOLUME IV – Chapter 6

Page 21 – "The intertidal zone – (see photo) is comprised mainly of bedrock outcrops with a cobble zone at Whites Cove." The proponent should indicate which photo (i.e., page, section, etc.).

Page 31 – The document states, "Information on the environmental assessment Review Panel process is available on the Environment Canada (EC) website: www.ec.gc.ca and Canadian Environmental Assessment Act (CEAA) website: www.ceaa.gc.ca and is specified below." The information is found on the CEAA website, Nova Scotia Environment and Labour website (http://www.gov.ns.ca/enla/ea/whitespointquarry.asp) and the Joint Panel's website (http://www.wpq-jointreview.ca/site/sommaire.en.php3), not Environment Canada's site.

Page 43 – Protection of Species at Risk – the proper wording here is: the Minister of Fisheries and Oceans is the "Competent Minister" with respect to aquatic species at risk.

Page 43 – *Species at Risk Act* (SARA) – DFO is developing a recovery strategy for the North Atlantic right whale, which will contain information and recommendations that may guide the issues that need to be considered if the project proceeds. Related documents, such as Allowable Harm Assessments (Allowable Harm Assessment for north Atlantic right whale is scheduled to be completed in the fall of 2006), should be used as potential criteria for assessing adverse and significant effects as required in Section 79(2).

The proponents should also consider the potential for the future listing of species at risk as much as possible. The species that DFO considers for listing under SARA are initially assigned a status (extirpated, endangered, threatened, etc.) by the Committee for the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC posts their candidate list for assessments at the following link: http://www.cosewic.gc.ca/eng/sct3/index_e.cfm. The SARA registry also provides information on what species DFO is considering for listing under SARA: http://www.sararegistry.gc.ca/default_e.cfm.

If a species is added to the list of wildlife species at risk during the lifetime of any project, the project must be compliant with SARA with respect to these species regardless of the outcome of the completed Environmental Assessment. The proponent should demonstrate that they understand the prohibition and know that Critical Habitat could come into effect during the lifetime of the project if it is identified in a Recovery Strategy or Action Plan. To address this issue, a commitment should be made by the proponent to ensure compliance with SARA during the lifetime of the project if it proceeds. At regular times (e.g., yearly) between now and the completion of the project, the proponent should evaluate whether any newly listed species is likely to be found within the project area, and if so, engage the regulatory agencies in determining what is required to ensure that the project remains in compliance with SARA.

Table 6A – Page 47 – Under the Species at Risk section, DFO should be included as one of the Agencies in addition to Environment Canada.

Page 48 – *Navigable Waters Protection Act* is administered by Transport Canada only.

Table 6A – Relevant Legislation – This section does not mention the *Fisheries Act*. Also that Environment Canada is responsible for Pollution Prevention Provisions of *Fisheries Act*.

Page 50 –The proponent should indicate who issues the Water Lot Lease?

Page 51 – The item in Table 6B "The Release from EA Environment Act EC and Regulalations" is not clear (also Regulations is misspelled). Also the Review Panel is not a responsible authority under *CEAA*.

Page 51 – Table 6B – The column, "When Required" repeats the information in the first column and does not indicate when these regulatory permits or approvals are required.

Table 6B – Page 51 – Remove DFO and replace with Transport Canada in section on "Permit for Construction within Navigable Waters".

VOLUME V – Chapter 7

Page 10 – For the section on Alternative Means was any consideration given by the proponent to scheduling certain production activities (e.g., blasting) outside of ecologically sensitive times of the year?

Page 15 – The document states, "Blasting will not be conducted during periods of fog or atmospheric inversions and will be delayed until clear weather prevails." What does the proponent consider as fog conditions (e.g., level of visibility) given that there could be "fog" conditions in the area for days or longer. How would blasting be coordinated around these weather conditions? How long can the blast holes be left filled before they create a safety and/or environmental issues? Would these limitations force the proponent to blast in fog conditions?

Page 15 – What are the proponent's contingency plans for storm surges in excess of normal averages and storm flood events greater than the 10 year average? These larger more extreme events are likely to be more frequent in the future.

Page 15 – Section 7.2.1 Potential Environmental Effects on the Project does not describe in any detail the impact of long periods of fog on blasting, impacts of the weather on shipping (fog, wind, waves, icing, etc.). The proponent should provide this information.

VOLUME V – Chapter 8

Page 12 – According to the "Issues Scoping" section consultants met with Whites Cove lobster fishermen three times: Nov. 2003; Feb. 2004; and March 2004. Are these the licensed fishers who fish lobster near the proposed marine terminal? Harvester operations will need to adapt to the marine terminal and new vessel traffic patterns – has this been discussed and supported? Was the displaced effort a concern for harvesters?

Page 14 – The website http://www.Bilconof.ns.ca/ is not working as of July 25, 2006.

Page 22 – Various "Business Meetings" and "Focus Groups" were held. Meetings included six fishing processing operators but no fishing associations. Focus Groups included the Full bay Scallop Association. Although "Bilcon has made an effort to invite any and all interested parties or individuals to become involved in the project", no specific mention is made of licensed harvesters in this Section. Did the Whites Cove meetings described above adequately engage individuals using areas near the project site and in the proposed shipping route?

Page 33 – The document states that the marine infrastructure would be left in place at the time of decommissioning. If this project proceeds, the fate of the marine infrastructure would have to be evaluated by regulators at the time of decommissioning.

VOLUME VI – Chapter 9

9.1 Physical Environment and Impact Analysis

Page 14 – The chart showing hours with visibility appears to be based on 24 hours per day. It is unclear how this information can be used to determine the number of fog-free days during daylight hours (presumably blasting would only take place during daylight hours when sighting of marine mammals would be practical). Is it possible for the proponent to determine the average number of daylight hours per month when the visibility is reduced enough to prevent blasting? As the information is currently presented, for the month of July the visibility is less than 1 km for approximately 20% of the time on average. How would this potentially affect blasting during this month? Are blasting contractors flexible enough to schedule their activities around weather? How long doe it take to fill the holes to be ready for blasting? The proponent should describe in detail the limitations on operations anticipated from fog or other weather conditions.

Page 28 – The document states, "The quarry could be part of a long term, comprehensive strategy to protect the local water supply from the seawater intrusion that could result from the unregulated pumping from the deep industrial wells in the area." The proponent should indicate the location of any current or proposed deep industrial wells in the area.

Page 39 – It is noted that the fuel storage will be within the Little River Watershed. The proponent should provide more information on the fuel storage, such as fuel type,

volume, storage method (above or below ground and tank material), safety and containment features.

Page 39 – The proponent states that "no transmission of loss of ground water from the Little River watershed is expected during quarrying". This information should be confirmed with Natural Resources Canada and Nova Scotia Environment and Labour to confirm there would be no water losses from the Little River as a result of any quarry activities.

Page 57 – The proponent should describe the predicted impact of wind and wave conditions on any potential marine mammal monitoring for shipping or blasting? If fog reduces the ability to blast 20% of the time in July, what is the impact of fog combined with high wind and waves?

9.2 Biological Environment and Impact Analysis

9.2.2 Aquatic Ecology – On-site Freshwater

Page 48 – For surface water impacts, as mentioned previously, if there is no effect what is the purpose of providing duration and scale for the effect?

9.2.3 Aquatic Ecology – Marine Intertidal Zone

Page 49 – Section 9.2.3 – Marine Intertidal Zone – This section provides a reasonable summary of the marine intertidal zone and the proponent has collected data directly from the site. Since there is no infilling planned, it is agreed that habitat disturbance from construction of conveyor system supports is likely to be short lived and limited in extent. A concern is the reliability of the containment system for aggregates being transported to the ship. From the description provided, it is difficult to judge whether the containment system would be fully secure.

Page 52 – One statement on lobsters is a bit broad, "Lobsters also rely on macroalgal habitat during various stages of their life cycle and ducks forage for amphipods and periwinkles living in the rockweed community." This statement infers that rockweed is a habitat for lobsters. Intertidal seaweeds are not typically considered lobster habitat; however, subtidal kelps are considered to be lobster habitat.

Page 54 – For the monitoring of Total Suspended Solids (TSS), the proponent states that "the frequency of monitoring will be monthly, with a monthly report…" Monitoring should be more frequent (including monitoring after significant weather events) to predict potential impacts.

9.2.4 Aquatic Ecology – Coastal Nearshore Marine

Page 58 – Section 9.2.4.0.3 – Plankton community – This description of the plankton community is quite adequate. In paragraph 2, it seems unnecessary to call zooplankton both "small" and "microscopic"; either one alone would suffice.

Page 66 – Is the proponent able to provide copies of the video transects?

Page 66 – Under macroalgal production, the EIS contains the statement, "that the Digby area contains significant stands of macroalgae with biomass of up to 20 kg/m^{-2} wet weight and estimated seaweed net production along the shorelines of the Outer Bay of Fundy to be about 845 $gCm^{-2}yr^{-1}$." The proponent should provide the significance of this information in relation to the project.

Page 74 – The proponent uses the term 'salmonid' habitat, when discussing the likelihood of suitable habitat for the three watercourses on site. DFO has an interest in conserving all fish habitat. DFO has concluded that the watercourse in the active quarry area is not suitable for fish habitat, including habitat for species other than salmonids. The proponent should describe the likelihood of fish habitat in general for the other two watercourses in the area of the project.

Page 75 – What was the total search effort (in hours) for marine mammals conducted by the proponent? What equipment what used and how many individuals were searching? What are the qualifications and/or experience in those individuals searching for or identifying marine mammals? What was the confidence level in identifying species sighted? What were the visibility and weather conditions during the sighting efforts?

Page 90 – Did the proponent conduct any analysis of the lobster catches in the immediate area of the project?

Page 95 – The document states, "If marine mammals or waterbirds are sighted, communications regarding their location will be transmitted to the captain of the vessel." What action would be taken by the proponent if a marine mammal or waterbird is sighted? Would mitigation apply to all marine mammals or just those listed as endangered?

Page 95 – The proponent should indicate what training or experience the marine mammal observer would need to have as a minimum?

Page 95 – The proponent should explain how marine mammal monitoring will be conducted from the work boat during period of low visibility?

Page 95 – Paragraph 3 – It is presume that the reference to "noise from land-based activities" does not include noise from blasting. If this is correct then last sentence in paragraph can remain.

Page 95 – Section 9.2.4.4 – This section contains the statement "If excessive change occurs in the turbidity levels 100 m (330 ft.) from the construction site that differs from existing conditions (i.e. distinct colour differences) as a result of the drilling activities, the work will be stopped and turbidity levels will be assessed in relation to marine aquatic life guidelines." The commitment on page 54 reads, "A water quality monitoring program within the intertidal zone in Whites Cove will be implemented by Bilcon of Nova Scotia Corporation during construction of the conveyor supports. This program will include monitoring of Total Suspended Solids (TSS) within the intertidal marine environment." The proponent should indicate the relationship between intertidal and near-shore monitoring (i.e., will high TSS levels recorded in the intertidal result in monitoring of the near-shore environment as well).

Page 96 – It is not clear from Section 9.2.4.5 what period of low biological activity the document is referring to. The proponent should indicate the period by date and provide data to support that this is a period of low biological activity.

Page 96 – The proponent should provide a speed or a range of speeds in place of "slow speed" when referring to the speed of the vessels.

9.2.5 Fish – Endangered

Page 97 – Section 9.2.5 Fish – Endangered – The Recovery Strategy for inner Bay of Fundy salmon is currently being redrafted, which may include identification of critical habitat. (See comments on Reference Document 25).

Section 9.2.5 – As stated in the Notes from the Meeting Between DFO-HMD and Bilcon of Nova Scotia December 10, 2004 (see Appendix 9 of EIS), DFO remains of the opinion that historic fishing, scientific sampling and theoretic modeling indicates that there could be migrating inner Bay of Fundy Atlantic salmon in the Whites Point, Digby Neck area from May until October.

Page 101 – The proponent states that, "No elevated inorganic sediment accumulation in tide pools located within the influence of the operating four hectare quarry was evident." The guidelines are for total suspended solids, not only inorganic solids. The separation of the organic and inorganic components may provide some indication of the source of sediments, but it is not clear evidence as to where the organic and inorganic material originated from.

9.2.6 Fish – Threatened and Special Concern

Page 103 – Section 9.2.6 Fish – Threatened and Special Concern – No information is provided on Atlantic whitefish which is listed as endangered on SARA schedule 1. St. Mary's Bay/Digby Neck are within the historic extent of occurrence of Atlantic Whitefish and could be again should repatriation of the species to the Tusket Watershed proceed.

While spawning habitat requirements of Atlantic cod are not fully understood, there may be other habitat requirements that could have been described here. For example:

> "The habitat most likely to be critical and potentially limiting for Atlantic cod may well be the vertical, 'three-dimensional' structures provided by plants, rocks, physical relief, and corals. In addition to providing protection from predators, such physical heterogeneity would almost certainly provide habitat for small fish and invertebrates, organisms upon which juvenile cod could feed." (COSEWIC, 2003)

Section 9.2.5 and 9.2.6 discuss potential impacts of the project on COSEWIC and/or SARA listed species that occur in the vicinity of the project area. At least three COSEWIC-assessed species that are known to occur in the Bay of Fundy have been omitted (these species have also been omitted from the table in Appendix 39). These are Winter Skate (Special Concern, assessed May 2005), Atlantic Wolffish (Special Concern, assessed May 2004) and Porbeagle Shark (Endangered, assessed May 2004). The EIS should include a discussion of potential impacts on these species. In addition to the two species mentioned above, a number of species that occur in the Bay of Fundy were assessed by COSEWIC in April 2006. Since this meeting occurred after the publication of the EIS, it is understandable that these species are not discussed in the document. Recently-assessed species that may occur in or around the project area include: White shark (Endangered), Shortfin Mako (Threatened), Blue Shark (Special Concern), and American Eel (Special Concern). To the extent possible, impacts on these species should be considered. As discussed earlier, the proponent is responsible for ensuring the project complies with SARA requirements for newly listed species throughout the lifetime of the quarry.

Page 104 – The document states, "Implementation of the proposed Fish Habitat Compensation Plan will provide three times the bottom habitat lost by construction of the marine terminal. Enhanced pelagic fish habitat is also part of the compensation plan." Compliance and effectiveness monitoring would need to be required as part of any fish habitat compensation to confirm the success of the compensation.

Page 104 – Section 9.2.6.3/.4 – Mitigation / Monitoring – The focus should have been on Blasting Controls that will be implemented to protect these threatened species.

<u>9.2.8 Marine Reptiles – Endangered (leatherback turtle)</u>

Page 109 – Section 9.2.8 – Marine Reptiles – In general, this section was not well referenced and contains several inaccuracies. For example, in the first paragraph on page 109, *Lepidochelys kempi* should be referred to as Kemp's Ridley instead of Ridleys. In addition, the COSEWIC assessment for loggerheads was deferred – it was not assessed at the May 2006 meeting. There is no further mention of loggerhead turtles. There have been very few sightings of leatherback turtles in the Bay of Fundy. It should be noted that CITES does not list species (i.e., does not itself determine whether a species is

endangered or not); the IUCN and COSEWIC list species. The first paragraph on page 110 provides no discussion of the extent of the survey coverage in either time or space. The second paragraph states that "leatherback turtles are fast and deep swimmers," but provides no reference. This information does not reflect DFO's current understanding.

The leatherback turtle sightings information could be updated since data presented only shows 1990s.

Page 110 – The proponent should still include mitigation such as no blasting if any endangered species is sighted in the monitoring zone, however unlikely. Noise has unknown effects on marine turtles and precautionary measures should be taken.

9.2.9 Fish Habitat – Blasting

9.2.9 Fish Habitat – Blasting – Most assertions in this section are based on the acoustic model study by D. Hannay, JASCO Research and D. Thomson, LGL Ltd. titled "Peak Pressure and Ground Vibration Study of White's Cove Quarry Blasting Plan". Comments on this study have been provided previously by DFO (See Appendix 9 of EIS).

Several issues were earlier identified in regard to this study, the most important pertaining to apparent quantitative inaccuracies in assessing how P (compressional) to S (shear) wave conversions at the water sediment interface would enhance the amplitude of P waves transmitted into the water. The conclusion was that the Hannay & Thomson study probably overestimated the compressional wave amplitudes transmitted into the water column. This would tend to strengthen the statement that the model presented represents a "worst case situation" (last paragraph on page 112).

Sub-section 9.2.9.2 – This section states, "this is within the 100.5 m (330 ft.) at the point of producing 13 mm/s in the guideline/threshold criteria." This statement, as presented, is confusing. Direct reference to the Thomson & Hannay study clarifies the statement: The DFO Guidelines for Explosives in Canadian Waters (Wright and Hopky, 1998) predicts a 45 kg charge should produce a ground velocity of 13 mm/s at 100.5 m range. It is encouraging that the CONWEP model as applied by Thomson & Hannay and the DFO Guidelines model yield reasonably similar distances (118 m vs. 100.5 m respectively) for the 13 mm/s ground velocity criteria.

Sub-section 9.2.9.3 – This section states, "the explosive ANFO will be used whenever possible." Does this imply that the quarry operator reserves the right to use more powerful explosives for some blasts? The Hannay & Thomson study considered only ANFO explosives. It is also asserted that "ANFO" has a lower yield per equivalent weight than TNT, which was used to derive the DFO Guidelines. Without the benefit of data on comparative yields, TNT does have a significantly higher detonation velocity (about 22,800 fps) than ANFO (variable with charge geometry and fuel type but typically 13,000 – 15,000 fps).

9.2.9.3 – Mitigation – The proponent should have made reference to the Blasting Protocol document in Appendix 9 that indicates further mitigation such as triple the horizontal distance and decking of charges.

Sub-section 9.2.9.4 – This section states, "monitoring for peak pressure and ground vibration will be conducted at locations in one meter of water depth in the tidal zone and at approximately 170m (560 ft.) and 500 m (1640 ft.) from the detonation site." Are both ground vibration and pressure to be measured at these sites? Will the ground vibration be measured underwater or at an equivalent distance on land? If the blast is conducted within 3 hours of low tide there will only be a 0 – 1.5m water depth at 170m range so measuring at 1m depth (if the water is indeed this deep) may be reasonable. At 500m range, the water depth could be in the vicinity of 10m. At 500m range, blast pressure measurements should be made near-bottom rather than at 1m depth where the direct wave and surface reflection will be expected to nearly cancel. Near-bottom, the pressure levels will maximize. These monitoring considerations need to be clarified.

In regard to the models employed, it should be kept in mind that the geometries assumed constitute only an idealized 2-dimensional approximation to a 3-dimensional reality. This is particularly true in modeling the propagation of the pressure wave across the bottom interface at very low grazing angles and where surface reflection multi-path is also very important. Clearly, the real bottom interface (and often the surface interface) is rough and of variable slope on sufficiently small spatial scales. A factor of 2 uncertainty in the resulting pressure field is probably not unreasonable. Since the model parameters were selected fairly conservatively, and in light of the fact that the Hannay & Thomson model would appear to overestimate the theoretical pressure, there seems to be minimal cause for concern in terms of direct harm to fish. Predicted peak ground velocities could be expected to have smaller associated uncertainties than water column pressures since the geometry essential to their calculation is simpler. Nevertheless, because of inherent uncertainties in any physical model, monitoring is recommended if the project proceeds. It should be noted that the 100 kPa criteria pertains to lethal or obvious sub-lethal injury to fish and not to more subtle behavioural effects, which if they do exist, are likely to be transitory considering frequency of quarry blasting.

9.2.10 Blasting – American Lobster

Page 115 – Section 9.2.10 – Blasting, American Lobster – See DFO comments on the proponent's proposed initial blast in Reference Document 24 of the EIS (page 29 of this document).

9.2.11 Blasting – Marine Mammals

Page 118 – Section 9.2.11 – Blasting, Marine Mammals – See DFO advice (dated February 10, 2006) on the Blasting Plan by Bilcon of Nova Scotia Corporation, May 2005 (in Appendix 9 of EIS).

Page 122 – DFO has not formally "accepted" 180 and 190dB as acceptable thresholds for sound exposure of toothed whales and pinnipeds.

Page 122 – With respect to duration, it is suggested that seismic persists "for hours on end" whereas a blasting event will be over in less than a second. This is a valid comparison for duration, but it ignores intensity and waveform. In the case of seismic airguns, there is a very slow rise time that is thought to have less impact on swim bladders and other tissues/organs. With explosives, however, there is a very sharp rise time that introduces peak pressure quite suddenly. Therefore the comparison may not be entirely appropriate for short distances from the source.

Noise monitoring at far-field (i.e., greater than 500m) locations has not been proposed as was recommended in the DFO advice on blasting dated February 10, 2006. Monitoring of the seal colony in the Blasting Plan (Appendix 9 of the EIS) should have been also noted in this section. As well, the Blasting Protocol indicates that underwater blast sound levels will be monitored at the margin of the North Atlantic Right Whale Conservation Area during the initial blast. This should have been indicated in section 9.2.11.4 on page 124.

Page 123 – The proponent should provide clarification on where location of the 500m setback radius is measured from (i.e., does this mean 500m from shore or from the blast location on land).

Page 123 – What evidence does the proponent have that indicates an observer can accurately identify a marine mammal at 2500 meters? If there is no evidence, the proponent should confirm with marine mammal researchers on the ability to make identifications and in what conditions would this ability be limited.

Map 31 – It would be useful for the proponent to illustrate the 2500m buffer.

Section 9.2.11.5 – The EIS concludes that blasting will result in an "insignificant negative impact" on at-risk marine mammals. For the purposes of SARA Section 79, the fact that these impacts are deemed to be insignificant does not change the requirement that measures be taken to avoid or lessen the effects and that the effects be monitored. SARA requires that all adverse effects on species at risk be avoided or lessened and monitored, regardless of their significance.

The mitigation measures proposed for blasting impacts on species at risk, if applied rigorously, should help to lessen adverse effects on species at risk given the right conditions. One of the key mitigation measures proposed for blasting impacts on marine mammals is the establishment of "safety zones" around the blast site. Blasts will not be conducted if marine mammals are present in these safety zones. The EIS proposes that the presence of marine mammals will be determined by an onshore observer equipped with binoculars. The document notes that this approach is expected to reduce harmful impacts on marine mammals "under good visibility conditions."

Visibility around Digby Neck is not always good. If the proponent intends to blast during periods of low-visibility (e.g., fog, rain, high waves, low-light), the EIS should specify what mitigation measures will be taken. This is consistent with requirements for other activities that result in intense marine noise. For example, the *Statement of Canadian Practice on the Mitigation of Seismic Noise in Marine Waters* requires that operators use passive acoustic monitoring in addition to visual observations during reduced visibility in areas frequented by marine mammals that vocalize. It should be noted that the effectiveness of passive acoustic monitoring for determining the presence of right whales is still being studied, and that it cannot be used reliably to confirm their absence since right whales may only vocalize occasionally. Nonetheless, it may be more effective than visual surveys during low visibility.

To be compliant with Section 79 of SARA, monitoring of the effect of blasting on marine mammal species at risk would need to be conducted if the project proceeds. The EIS proposes only to monitor the initial series of blasts to confirm sound propagation models and establish a baseline. While this may be a useful activity, monitoring the initial blasts is not sufficient. Monitoring of pressure/vibration/sound from blasting should be conducted at various times of the year at locations deemed appropriate by DFO and should continue for a sufficient length of time to draw reasonable conclusions. In addition to monitoring pressure and vibration, there is a need to monitor actual effects on species at risk to satisfy SARA requirements. According to the Canadian Wildlife Service's *Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada,* "actual effects on species should be monitored to verify the accuracy of predictions and warn of impending harm to individuals or populations, community degradation or loss of ecosystem function." This could involve, for example, monitoring marine mammal behaviour through visual or acoustic observations prior to and after blasting events to verify conclusions of no adverse behavioural effect.

Also, monitoring should be conducted to confirm the effectiveness of the mitigation measures. In this regard, the CWS best practice guide states that "as a priority, mitigation measures designed to protect wildlife at risk should be monitored to verify their effectiveness." For the Whites Point Quarry, this should include confirming the effectiveness of methods used to determine the presence/absence of marine mammals in the blasting safety zone. Details should be provided as to what course of action will be taken if monitoring determines that the sound propagation models used in the EIS are inaccurate, the mitigation measures prove ineffective, or the effects are greater than expected. For example, what if the underwater sound pressure levels are greater than predicted? It would be useful to see some details on the "future adaptive management practices" that are being considered pending the initial blast monitoring (e.g., will the safety radii be adjusted?).

Page 124 – The EIS states that if local whale watching operators report right whale sightings in the near-shore area, "verification of right whale activity within the 2500m safety zone will be conducted prior to any blasting activity". It is unclear how this "verification" would differ from the regular pattern of visual observation proposed prior

to and after all blast events. Clarification of this term would be useful. This raises several questions of methodology which should be considered by the proponent. For example, if whale watching operators report Right whale activity in nearshore waters, how exactly will the observer verify activity within the 2500 m area?

It should also be noted that relying upon reports from researchers and whale watching is questionable. These activities may not be conducted year round and they can take place well away from the project area. What will happen when an at-risk species enters the 2500 m radius but there are no reports of nearshore whale activity and thus no trigger for observation out to 2500 m? Under these circumstances will an at-risk species be detected before it enters the normal 500 m observation area? What are the risks of unobserved animals between 500-2500 m being exposed to a blast?

Page 124 – The blast monitoring locations on Map 31 do not appear to correspond with the location indicated by the proponent. The proponent should provide a diagram of the proposed initial blast site with the location of the blast monitoring locations. Does the proponent plan to monitor blasts at the limits 500 and 2500 meter marine mammal observation area to determine if these limits are appropriate? The underwater sound level monitoring was proposed at these limits in the Blasting Protocol.

Page 124 – The proponent needs to provide more information on the proposed blast monitoring program (e.g., what equipment will be used, what time of year, impact of water temperature on the results, any observations of seals during blasts and any proposed action if the blast noise levels exceed those predicted in the EIS).

Page 124 – If the monitoring zones are calculated from the blast location, the proponent should explain how the marine mammal monitoring zones are determined given that the blast will not be a single point but a series of blasts.

9.2.11 – The information contained in the SARA table has or will soon change. A decision on Fin Whale is expected by August 16th, 2006. The Minister of Environment recommended that this species be listed as Special Concern on June 10. Harbour porpoise has been referred back to COSEWIC for further consideration, and a listing decision is therefore not expected in the near future. The COSEWIC status of the Western North Atlantic Humpback Whale is "not at risk" rather than "not assigned."

9.2.13 Ship Interactions – North Atlantic Right Whale

Page 128 – Section 9.2.13 – The EIS defines the possible area of effects for ship/whale interactions as the area between the shipping lanes and the quarry. This area is chosen because "Vessels arriving and departing the Whites Point marine terminal are 'rule' vessels (vessels >20m in length and >300 gross registered tonnes)". However, the guidelines for the EIS acknowledge that the spatial boundaries of the assessment will vary depending on the VEC and will extend beyond the project site in many instances. One of the criteria proposed for determining appropriate boundaries is "the physical

extent (terrestrial and marine) of the proposed Project, including any offsite facilities or activities (such as shipping)." Based on the data provided in the EIS, it would appear more likely that vessels en route to or from the quarry would interact with whales while in the shipping lanes rather than after turning in towards the marine terminal. Also, it is unclear why the size and weight of the vessels is the appropriate determinant of the area of effects for ship/whale interactions.

Page 128 – Section 9.2.13 – Ship Interactions, North Atlantic Right Whale – The EIS indicated that sightings of North Atlantic right whale in the area of proposed operation are relatively low compared to other areas of the Bay of Fundy. DFO and the Right Whale Consortium hold sightings data additional to the SPUE data analyzed in the EIS. These data suggest that right whales are seen occasionally in the area.

Page 133 – The proponent should explain what the statement "this route will be designated" means.

Page 133 – The section on mitigation measures for shipping impacts on Right Whale requires some clarification and further details. It is not entirely clear from the first paragraph, whether the proposed mitigation activities will be carried out or may be carried out. This section proposes that the presence of whales along the proposed ship route be monitored through communication with research and whale watching vessels operating around the project area. Specifics on how the quarry will maintain communication with research vessels and whale watchers, whether the latter have agreed to cooperate with the quarry operators, and whether they are likely to be present in the project area with any frequency is needed (see the note below Fundy Traffic reports). Also, details should be provided on the mitigation measures that will be taken if whales are sighted. And as noted above, research and whale watching may not be conducted year round, unlike quarry operations.

Page 133 – Commercial vessels operating in the shipping lanes and approaches are advised to contact Coast Guard Fundy Traffic if they sight right whales. Fundy Traffic then issues reports to all ships in the area. This would provide a more comprehensive observation source, supplemented by whale watchers and researchers. Also, the main period of concern is May-November for these animals.

Page 133 – The EIS states only that shipping activity will be monitored (i.e., keeping records of arrivals and departures, fulfilling Transport Canada monitoring requirements). SARA requires monitoring of the effect on species at risk. Monitoring measures for shipping impacts on marine species at risk should be added. This should include monitoring the effectiveness of mitigation measures and confirming the effect predictions.

Section 9.2.14 Ballast Water

Page 134 – The summary of invasive species in section 9.2.0 does not mention concerns about the potential for the introduction of disease organisms. Among those mentioned in the reference document (Reference Document 13) is the pathogen thought to be responsible for lobster disease in New Jersey:

> "The greatest immediate concern for the Whites Point ecosystem and fishing community would be the potential introduction of the "pathogen" responsible for the mass lobster mortalities observed in the Long Island Sound area in 1999. Evaluating this risk is, however, very difficult given the current status of the research on this issue" (Carver and Mallet, 2003).

The potential for the transport of this pathogen could be addressed by experts in aquatic animal disease. This potential for introduction of pathogens and other invasives (such as the Asian crab) by this project may be no different than that from existing shipping but this does not appear to be addressed.

Page 136 – The proponent states that they will employ a "reputable bulk carrier" which is required to follow ballast water exchange guidelines. They agree to conduct monitoring at the receiving terminal, and submit a written report to Environment Canada upon completion of the investigations. However, they provide no details of what "upon completion of the investigations" means. The proponent should be more specific about this. They conclude that no mitigation is required and the impact is neutral. While current practices for ballast water management do not eliminate all risks, there is no compelling reason to disagree with their position regarding ballast water control.

Section 9.2.14.1 – Ballast Water Research – This section should note that the Ballast Water Control and Management Regulations do not retain designations for "vulnerable areas" as contained in the draft Annex V of the "Guidelines for the Control of Ballast Water Discharge from Ships in Waters under Canadian Jurisdiction" (2001). As such, the Bay of Fundy is not formally considered a vulnerable area for the purpose of ballast water management and regulation.

A more detailed description of the Ballast Water Control and Management Regulations should be provided by the proponent, particularly the provision requiring the management of ballast water on vessels operating between points south of Cape Cod, Massachusetts and Canadian waters.

The proponent should also note that invasive species may be transferred via hulls of ships, although the primary vector and risk is expected to be via ballast water.

Section 9.2.14.3 – Ballast Water Mitigation – The proponent should state that mitigation will occur through ballast water management on vessels using the marine terminal. The

proponent should also discuss the potential for a ballast water management plan to be incorporated into any shipping agreement.

Page 136 – The requirement for monitoring is not based on community and stakeholder concerns about invasive species resulting from ballast water discharges. The requirement for monitoring is based on the risk of invasive species associated with marine traffic at the terminal. While the commitment to monitoring is recognized, the proponent will have to provide a detailed monitoring plan for review by DFO and other relevant agencies if the project proceeds.

Page 136 – The impact statement is likely valid provided that vessels operate in compliance with ballast water management and control measures. However, the ongoing risk of invasive species posed by vessel traffic in the area should be acknowledged. The determination of magnitude of effects is challenging in that one successful invasion/colonisation (i.e., from one vessel discharge) can lead to local and regional effects.

9.2.15 Noise and Vibration – Marine

Page 137 – Section 9.2.15 concludes that noise from shipping will have a long term, insignificant negative effect on marine organisms. The EIS does not specify which organisms will be affected but it can be assumed that this would include locally occurring species at risk, and especially at risk marine mammals, which are considered to be sensitive to noise. Ambient / ship-induced noise is identified as a potential limiting factor for right whales in the COSEWIC Status Report.

No mitigation for ambient noise is proposed but SARA Section 79 requires that measures be taken to reduce or avoid adverse effects on species at risk. The EIS does note that vessels will reduce their speed after they turn in from the shipping lane, and implies that this will result in noise reduction. This could be viewed as an effort to reduce the adverse effect of noise, as required by Section 79. If so, the proponent should provide more detail on the expected noise levels at the speed at which the vessels will be traveling.

The proposed monitoring of noise levels is supported, but DFO recommendations (in Appendix 9 of EIS) regarding noise monitoring need to be considered. Also, unless it can be clarified that the negative impact of noise will only affect marine organisms that are not SARA-listed, monitoring of the effect of noise on species at risk will be required. This could involve, for example, coupling passive acoustic monitoring and/or visual behavioural monitoring with the noise monitoring system to determine whether the movement of ships is affecting marine mammals.

DFO supports the proposal for sound and vibration monitoring in the water column near the marine terminal but more detail should be provided by the proponent (e.g., target frequencies, duration, seasonality, reporting, continuance etc.). There also seems to be a disconnect between this section and the earlier one on blast monitoring (9.2.11.4). If the

proponent is going to install a semi-permanent acoustic monitoring system, it should be designed so that it can be used to monitor blasting noise as well as more general sound from the terminal operation.

Page 137 – Section 9.2.15 – Noise and Vibration, Marine – In Sub-section 9.2.15.2, it is stated that for a one day sonobuoy deployment within the North Atlantic right whale Conservation Area, sound levels were elevated at both 500 and 100 Hz, the measurement period coinciding with verified high levels of shipping in the area. Upon examination of the literature, the measured noise levels reported in Sub-section 9.2.15.1 at 100 Hz appear to be as much as 10 dB higher than normally expected in corresponding heavy shipping areas in the deep ocean and 20 – 25 dB higher than those anticipated in the same deep ocean areas both measured at sea state zero. The sonobuoy levels are somewhat comparable to older historical acoustic levels measured in shallow waters off New York harbour (Urick 1975); however, one day of recording does not provide a representative sample of baseline noise.

It is reasonable to assume that two bulk carrier transits per week through or close to the Conservation Area would not add greatly to average incremental exposures in the Conservation Area itself. However it should be emphasized that for any individual vessel passage the locally observed noise level and any specific animal exposure will be very dependent on the distance to the vessel and also, at increasing ranges, water depth and other physical variables. As an example, for a freighter traveling at 10 knots Urick (1975) quotes a 100 Hz spectral noise level of 152 dB re 1 μPa2/Hz at 1 yd, which is about equivalent (within 1 dB) to a reference viewing distance of 1m. Crudely assuming single vessel noise to fall-off at a 20 log R rate up to a distance comparable to the water depth, say 200m in the Grand Manan Basin, and at a 10 log R rate for distances beyond 200m, vessel acoustic levels comparable to the above reported 93 to 81 dB ambient would be approached at ranges of 4 to 60 km. What this implies is that at observation ranges up to at least a few kilometers the noise levels from a large ship will almost certainly be above the measured (elevated) ambient background. The last sentence in Sub-section 9.2.15.2 stating "background noise levels are therefore expected to be less than noise levels recorded in the North Atlantic right whale Conservation Area study previously mentioned" is difficult to interpret. This is no doubt true providing acoustic levels are highly averaged over time and space. Levels from one or two close bulk carrier passages will no doubt average to something close to the otherwise ambient levels provided the averaging period is long enough (e.g., one week).

If this project were to proceed, it would be advisable to make baseline measurements of bulk carrier noise around the terminal and nearby areas of potential environmental sensitivity. It should be noted that it is not entirely certain that modern bulk carrier generated noise levels would closely approximate those of a "freighter at 10 knots" nor if the general ambient noise levels close to Whites Point would be similar to those measured in the Conservation Area during a period of high shipping density.

Wharf Construction – the effects of noise during this activity seem to be overlooked. The proponent should describe the impact of drilling rock sockets (as compared to pile driving)? Also the impact of the terminal operation, ship loading and the drilling of blast holes should be described.

VOLUME VII – Chapter 9.3 Human Environment and Impact Analysis

Page 81 – 9.3.9.1.3 The proponent states that the gear impact compensation plan has been agreed to by lobster fishers. What agreement was reached? Was this agreement signed by all potentially affected fishers? Did this include potentially affected fishers from other sectors? The proponent should provide more details. Was displacement of fishers from fishing areas from physical components, shipping routes and any exclusion zones also included in this agreement?

Page 85 – With regard to the commercial periwinkle harvesting in the Whites Cove area, DFO does not have any data on this fishery as it is currently not a licensed fishery. Therefore, DFO does not know how many harvesters may be affected. However, this should not be a significant issue if the proponent maintains their commitment to allowing for continued access for harvesters.

In Section 9.3, page 95 the proponent states that, "Discussions are presently in progress concerning a lobster trap fund to be established by Bilcon of Nova Scotia Corporation, and administered by the local lobster fishermen, to provide compensation for lost traps and related gear due to shipping activities." While Section 11, page 46 states, "The fish habitat compensation plan will be implemented upon the Proponent receiving approval for the project, while other compensation agreements will be honoured on an annual basis in the case of the Whites Cove fishers and on an as-required basis in the case of well problems. The Proponent is the subsidiary of a well established New Jersey family-held company which will provide funding for the construction of the Whites Point project ($40.6 CAD million) from its own resources. No specific mechanism is proposed to finance the proposed compensation agreements, other than from on-hand resources.". The proponent should clarify how the fisheries compensation agreement will be established and administered.

Section 9.3.13 Economy – Fishery/Nearshore – This section emphasizes the lobster fishery but the treatment of other fisheries and the spatial extent of the adjacent fishing grounds appear to be somewhat limited.

Section 9.3.13.1 – Economy – Fishery/Nearshore Research – This section presents license statistics by species (18) and type (14) which indicates that fishers are legally entitled to fish for more than what are described as active fisheries (i.e., lobster, herring, mackerel and sea cucumber). The statement on page 92, "These waters have also attracted fishers partaking in a recently established experimental sea cucumber fishery." signifies the likelihood of interest in new and expanding fisheries. Therefore, the

proponent should indicate the potential for future fisheries to develop in the area of the project.

Detail on specific fishing patterns in the waters adjacent to the proposed quarry and terminal appears to have been informed largely by on-site observations in 2002 and 2003. How thorough, frequent and seasonal were those observations? Were traditional users consulted to supplement the observations? Were any other new or traditional fisheries conducted in 2004, 2005 or 2006?

Sea urchin harvest should be given more consideration. The section states that no diving for urchins was observed in this area of the Bay but it is not stated whether there has been effort there in the past or if there is interest amongst harvesters.

Section 9.3.13.2 – Economy – Fishery/Nearshore Analysis – While it seems reasonable to use regional landings to characterize the overall economic impact as localized and insignificant, there may be adverse impacts for individuals and small groups of fishers. On page 95 it is stated that "Construction of the marine terminal and shipping activities may inconvenience the traditional lobster fishery adjacent to Whites Point." For greater certainty and clarity, the exact nature of that "inconvenience" for area fishers could be elaborated.

For example, the section states that the terminal location in depths of 16 metres "...is not expected to disrupt lobster trap setting areas." Next it is suggested that vessel traffic will occur through depths where lobster is fished. What are those depths, how was this information derived and from what source? How important are grounds in the proposed shipping route or within the half mile radius of nearshore surface waters that will be influenced by vessel and loading operations? How much fishable bottom or how many lobster traps are likely to be affected? As mentioned earlier, a map would be helpful to illustrate the grounds.

Fishers can request shipment schedules but it is not made clear whether traps and other gear can be set inside the designated shipping lanes or alternatively, moved in and out to avoid vessel-gear interactions. Will the proposed lobster habitat compensation area be open and accessible for fishing (out of the shipping route etc.)?

Page 95 – With regard to the impact of vessel traffic and loss of fishing gear, compensation may also be required for loss of income (in addition to loss of gear). In addition, the proposed shipping routes appear to be fully contained within Lobster Fishing Area 34, however, if shipping will occur within LFA38, there may be some loss of gear experienced in that fishing area as well.

Section 9.3.13.3 – Economy – Fishery/Nearshore Mitigation – Lobster fishermen requested a wider ship approach/departure area in the vicinity of the marine terminal to "allow traps to be set in an area presently being fished". It is not clear how a wider area will secure customary fishing access. Would it not expand or increase the likelihood of

vessel-gear interactions? A map would help explain this proposal. Also the proponent should explain how fishers will be compensated if they are displaced or prevented from fishing due to exclusion zones.

Page 127 – Section 9.3.18 to 9.3.20 – Contaminants – There is no proposal within this EIS for environmental effects monitoring of the commercially valuable species such as lobster, crab, and scallop that are sensitive to the toxic metal exposures, especially in the Bay of Fundy areas. The monitoring of water quality of outflow from the sediment retention ponds is insufficient to detect the possible problem of contamination associated with quarrying operation. In the study of the selection of bioindicators for monitoring marine environmental quality of the Bay of Fundy, Chou et al. (2003) reported that lobsters from Digby had elevated digestive gland copper (70 µg/g) in comparison to lobsters from Pubnico (10 µg/g). Chou et al. also reported the ineffectiveness of mussels and sediments as reliable indicators of contaminants. Mussels and sediments failed to reveal the problem of high toxic metals in the Bay of Fundy areas. The EIS quotes the Gulfwatch results and states that heavy metal concentrations in blue mussels are near natural levels (Table MC-1, page 128). The report should include recent bioindicator studies by Chou et al. with regard to the contaminant levels in lobsters and crabs from the Bay of Fundy areas. The selection of bioindicators is key to revealing the toxic metal exposure in marine organisms.

VOLUME VII – Chapter 10

Section 10.0.3.3 and 10.0.3.4 – Marine Mammals, Blasting and Ship Interactions

Cumulative impacts due to blasting and vessel traffic are difficult to evaluate. For ship interactions, see comments on Section 9.2.13. The methods proposed for mitigation of possible deleterious effects due to blasting appear appropriate, if undertaken with rigour and in accordance with the recommendations provided above. However, the ability to detect marine mammals in low visibility conditions should be further examined.

Page 5 – The relative increase in shipping for the Bay of Fundy should have been noted in this section as it also appears elsewhere in the document (Chapter 11, page 23).

VOLUME VII – Chapter 11

Page 4 – The proponent should provide more information on how CLC members are selected. Will specific stakeholders be included (e.g., fishers, tour operators, etc.)? Will the public have access to the monitoring reports provided to the CLC?

Page 20 – The proponent should indicate the likelihood of the release of bunker "C" from a malfunction or accident and what impact that would have on aquatic species?

Page 45 – The document states that the loss of fish habitat is an insignificant negative effect. Compensation is required under DFO's Policy and under *CEAA* to mitigate the

loss of fish habitat. Without this compensation the impact to fish habitat could be considered significant.

REFERENCE DOCUMENTS

VOLUME II – Reference Document 8

Interpretation of a sublittoral benthic survey along the shoreline of Whites Point, Digby Neck, Nova Scotia.

This survey was not sufficient to draw the conclusions on the significance of the sublitttoral benthic habitat. The grab samples and video described in this report are restricted to just two days (June 28 and 29, 2002) between 9.5 and 41.5m depth. Only two video transects were taken, 525m and 30m long. Only 12 grabs were attempted, yielding only five actual samples and the sieve size for sample analysis is not stated. According to the maps provided, the short video transect had only one grab sample associated with it and the long video transect had none. Apparently, the camera was drawn through the water too quickly or it was not in focus most of the time.

This information and the points stated below indicate an inadequate sampling design and field execution.

- Shallow areas (<9.5m) were not surveyed, even though that zone can be highly productive and diverse.
- By only sampling on two days in June, seasonal variability was not captured.
- Taking only two video transects and five grab samples is very limited field survey.
- Nets and traps were not deployed, and no useful information on mobile organisms like crabs and fish was obtained.
- Typical analysis of benthic grab samples involves checking for organisms >0.5mm in size. No attempt was made to look for organisms on that scale.

Considering the problems noted, the conclusions section of this report (part 4.0) can not be taken as definitive. The statement on subtidal substrate (coarse sands, gravels and mollusc shell fragments) is likely accurate given the field evidence; however, the statement that "there appears to be little or no infauna" cannot be supported.

VOLUME II – Reference Document 10

Results of a survey of the intertidal marine habitats and communities at a proposed quarry site located in the vicinity of Whites Cove, Digby Neck, Nova Scotia.

The brief survey and transects described in this report are restricted to just two days (June 13 and 14, 2002). Only three transects were made, one in Whites Cove and two outside. All from high tide to low tide mark. Tidal range on the days of sampling is not specified. The description of general shoreline morphology appears to be accurate given the photos provided. By only sampling on two days in June, seasonal variability was not captured. Observations along only three transects is a rather limited survey. The photographs indicate a typical Nova Scotian semi exposed rocky shoreline in healthy condition. Table 1 is a very short listing of marine shoreline plants and animals that could be found almost anywhere in Nova Scotia. The field survey was very cursory and rare / small / cryptic organisms were not sought out, therefore organisms unique or unusual in the area may have been missed.

The observations made on North Brook suggest that "It is unlikely that this stream serves as a significant habitat for salmonids." This may be valid but it can not be confirmed without better sampling over a number of seasons.

Overall, the report provides some indication of the nature of the biological community in the area, but is certainly not definitive. For example, the Laminaria beds noted in the sublittoral may be important habitat to a number of crab or fish species which are not found in abundance in other areas of the coast but the Laminaria beds were not sampled.

VOLUME II – Reference Document 11

Results of a survey of the plankton communities located offshore of a proposed quarry site at Whites Cove, Digby Neck, Nova Scotia.

This report represents a reasonable and competent survey. The spatial and temporal coverage of the survey performed was not detailed, but adequate. The species encountered were as expected from previous studies and appear to be typical of the area. It provides a baseline with which future changes can be examined. There were, however, one or two technical errors:

On page 5 – Section 4.1.3 "*Mesodimium ruben*" is misspelled and incorrectly characterized. The correct spelling is "*Mesodinium rubrum*", although the name has been changed to "*Myrionecta rubra*" (Jankowski, 1976). It is an obligatory phototrophic ciliate that contains endosymbiotic cryptophyte chloroplasts.

On page 5 – Section 4.2 "*Phaeocystis pouchetii*" is not a foramnifera. It is a species of phytoplankton, a member of the Haptophyta. It is found either as solitary flagellated cells (about 3 microns across) or in a colonial form, with individual cells embedded in a gelatinous matrix.

On page 8 – 4th paragraph "*Mesodinium rubren*" is misspelled and wrongly classified as a dinoflagellate (see above).

On page 13 – "Pseudo/Paracalanus" at station S3, the value is written 112,2. I assume it should be 112.2.

On page 14 – "*Microstella*" should be "*Microsetella*"

VOLUME II – Reference Document 12

Results of a Suspended Solids Survey at the Whites Point Quarry.

There are some critical points that should be addressed in this report. The report does not conclusively refute the statement of the DFO inspector that sediment was entering the bay from the Quarry site making it difficult for the proponent to use it as a reference for no impact. Deficiencies in the report need to be addressed. Such as:

The salinity values for the tide pools appear to be wrong. With the exception of stations 2 and 4 which are above the "ordinary high water mark" indicated on the map provided, all others should have been inundated by seawater within 6 hours of sampling. For the tide pools to be fresh, there must be an outside source of freshwater filling them. There are three possible sources: rainfall, groundwater or fresh water runoff from the quarry or other source on land none of which appear likely in this environment.

It is not clear if there is a relationship between the Total Suspended Solids (TSS) in the tide pools and the amount of sediment on the bottom. One would assume that if the material on the bottom is fine-grained, then it settled from the overlying water. No data on the ambient sediment concentrations in the water overlying the pools at high water has been provided. This is a critical parameter for evaluating how much sediment is likely to be deposited in the pools naturally. The material in the tide pool would be expected to start settling as soon as the pool is exposed by the falling tide. The time between exposure and sampling is another critical factor for the interpretation of the data that should be provided. Assuming a standard floc settling velocity of ~1 mm s^{-1}, the deepest pool could be expected to clear within several minutes.

From the photos provided, tide pools 1 and 5 closest to the outfall appear to have elevated sediment concentrations. In the images, they appear to be a cloudy brown which would seem to be unusual for this area. They also appear to be significantly different from the other images provided. Tide pool 5 appears to have sediment on the bottom whereas in tide pool 1 it appears to be suspended. If there is build up of sediment on the bottom, then it could be reasonably assumed that it settled in the tidal pool between inundations. The depth of the newly deposited sediment in the pool could give some indication of the amount of material available in the overlying water. Again, it is critical that the time between sampling and initial exposure of the pool be provided.

Based on the images alone, it is difficult to see how pool 6 can have such a high level of TSS. It appears to be clearer than pool 5.

It should be noted that the receiving environment is very energetic, and that any sediment that enters from the quarry will likely be dispersed. It should also be noted that TSS values can appear to be high when observed optically which might be the case in trying to interpret the photos. This can be due to the presence of very fine grained sediment at low concentration. Depending on the type of treatment being carried out in the quarry's settling basin (no information provided), it is possible that a "stranded" population of very small but optically very significant particles are remaining in suspension. It is unlikely that a significant build up of sediment will occur along the shoreline near the outfall from the settling basin; however, at this time, the report should not be used as the sole basis for such a statement.

VOLUME II – Reference Document 13

A preliminary assessment of the risks of introducing non-indigenous phytoplankton, zooplankton species or pathogens/parasites from South Amboy, New Jersey (Raritan Bay) into Whites Point, Digby Neck, Nova Scotia.

This appears to be a thorough review of the available material. The recommendations are reasonable, again based on the available material.

VOLUME III – Reference Document 19

Erosion, Suspended Sediment and Sediment Transport.

This is a well written description of the general sediment regime for the Bay of Fundy. However, as a document to support the EIS for the Whites Point Quarry and Marine Terminal it has much less merit. While it is interesting to know that sediment concentrations are high in the upper Bay of Fundy and that there are mega ripples and dunes, the information provided does not have direct relevance to the transport of sediment derived from quarry operations. What is happening in the Petitcodiac is irrelevant for sediment transport off of the quarry site. The question that needed to be answered is what would the fate of the 2.5 m^3 of sediment released from the quarry be. It is correct to state that in comparison to the total sediment in the Bay this amount of irrelevant, but if this material was deposited in an area of macrophytes sensitive to TSS, there could be a negative impact.

There is a need for data on the background levels of suspended sediment off of the quarry site and some estimate of the dispersion based on tidal current velocities, wave climate and tidal range for the area of interest. While it may be unlikely that sediment will accumulate in the area, the report fails to make a case for this assumption. Similar to the Brylinski report (Reference Document 12), the overall conclusion that sediment from the quarry will be dispersed is likely correct but the report provided does not support that conclusion.

VOLUME V – Reference Document 24

Whites Cove Quarry Blasting: Potential Impacts on American Lobster

The frequency of blasting and, if predictions of sound intensity are accurate, the intensity of noise generated will be lower than for seismic exploration. Research conducted by DFO on the impacts of seismic noise on snow crab indicated no acute or mid-term mortality of adult crab, changes to feeding activity in the laboratory, impacts to survival of embryos carried by the female, or impacts to locomotion of larvae after hatch (DFO 2004). Uncertainties related to potential impacts on snow crab hepatopancreas, ovaries and embryo hatch are to be reviewed by DFO in the fall 2006. Effects of seismic noise on lobsters, while not fully understood, are expected to be on a similar scale as effects of seismic noise on snow crab. Nonetheless, a comparison of predicted sound levels during blasting to background noise levels during storms would be useful. This information would better circumscribe what is local and what level of sound is unusual.

Page 3 states, "in a 1998 DFO assessment, less than 10% of lobster landings…were from the waters around Digby Neck." Given the size of the LFA 34 fishery (~ 17000 mt in 2004-05), 10% is still a large quantity of lobster landings (say 1700 mt) with an estimated value of $26 million.

Page 4 – Uncertainties regarding effects of acoustic stimuli and waterborne vibrations on crustaceans in general and lobsters in particular remain, e.g., "in terms of physical and/or behavioural impact of sound energy on decapod crustaceans, research of this nature is also limited".

Page 4 – The conclusion that, "…the quarry would likely have negligible physical effects on the lobsters in the White Cove area," is not fully supported. On page 4, uncertainties are provided regarding the sensitivities of lobster to intense sounds. On pages 4-5, some evidence is presented for effects of seismic noise on snow crab egg viability. No documentation of the likely size of the area affected is provided.

No monitoring or mitigation measures are recommended within the EIS to address aforementioned uncertainties. The proponent should identify a proposed monitoring program for lobsters which would address uncertainties with the potential impacts from blasting. If this project proceeds and impacts are determined through monitoring, one potential mitigation measure would be to work with local lobster fishermen to limit blasting when lobsters are nearshore and when there is fishing activity in the area. In LFA 34, fishing occurs from late Nov through until May 31 but is diminished in the nearshore areas in winter and early spring.

VOLUME V – Reference Document 25

Migration of Inner Bay of Fundy Atlantic Salmon in Relation to the Proposed Quarry in the Digby Neck Region of Nova Scotia

This report contains several inaccuracies. For example, it is not clear that the statistics in Table 4 are correct, and many of the arguments are based on extrapolation from material that may be inappropriate. In addition, the conclusion that salmon do not migrate close to shore is questionable as the weir data apparently show that good numbers do in fact migrate close to shore.

Page 26 – What is the basis for the assumption that fish caught in the Digby Neck area would be from the Annapolis Basin?

VOLUME V – Reference Document 30

Whites Point Hydrologic Budget Analysis, Whites Point Quarry

The report indicates that the project will require additional water for August and September. The proponent should indicate where they will obtain the water shortfall.

APPENDICES

VOLUME III – Appendix 9 – Blasting Plan by Bilcon of Nova Scotia Corporation, May 2005

Page 3 – What does the proponent define as a trained observer for the marine mammal monitoring program?

Page 3 – The document states that monitoring points are found on Map 001 but Map 1 is a general location map, the document should reference Map 31.

Page 3 – The Blasting Protocol states that underwater blast sound levels will be monitored at the margin of the Right Whale Conservation Area during the initial blast. This location should be depicted on the monitoring map.

Page 4 – Who would observe behaviour at the seal colony? What aspect of behaviour would the proponent be looking for specifically?

Page 4 – The document states, "...the size of individual charges will be minimized and decked as required to further reduce effects." What does the proponent mean by "decked as required"? Who would require the charges to be decked and how would this mitigate impacts?

Page 4 – If the initial blast is the only blast proposed to be monitored (DFO recommends additional monitoring), does it represent the "worst case" scenario from the perspective of impact on marine life? In the meeting notes of December 10, 2004, Bilcon of Nova Scotia indicated that the size of the charge would increase as they move away from the water. If

other blasts would potentially increase the potential impacts in the marine environment, these would also have to be monitored or shown to have no effect based on the results of any proposed initial blast and the results of the modeling (i.e., the proponent would have to show that they can reasonably predict the sound propagation from blasts). This may also include monitoring as the quarry blasting progresses from quarry area 1 to quarry area 4. The progression in quarry development may reflect changes in distance from the marine shoreline.

Page 4 – The proposed delay between charges is not clear. It has been reported as both 25 milliseconds and 8 milliseconds in the EIS.

VOLUME IV – Appendix 40 – Tidal Currents in the Bay of Fundy

Tidal Currents in the Bay of Fundy

The tidal information presented in 'Ocean Tides and Currents' seems appropriate for the purpose. The proponent's analysis indicates that the large tidal heights and the tidal currents are not a problem for their operation. For example, they have designed the marine terminal so that the water flows through the structure and this reduces the impact of the currents on the structure and the structure on the currents.

There are lots of references to tidal currents in relation to the sediment, which are not reviewed here. However, there is an inconsistency on pages 51 and 52. On page 51, the tidal currents are said to dominant sea bed processes at all depths. However on page 52, the tidal currents are not having any impact on the movement of sediment; "No sediment bedforms were visible on the sidescan sonar and photographic data indicating little current movement close to the bottom. Does this mean that all of the fine sediment has already been removed by the currents?

The document mentions sea level rise and considers the potential effect of future sea level rise on operations and the potential environmental impact of the quarry. The following is provided for additional information for the Panel on the latest scientific understanding of sea level rise in the Bay of Fundy.

The proponent quotes a sea level rise expectation of 30 cm/century. This number is based on historical records. Best estimates for Saint John are that the 30 cm per century is made up of 20 cm per century of regional subsidence and 10 cm per century of the ocean rising (Petrie and Loucks, unpublished). However the expectation is that the ocean rising component will increase to about 50 cm per century for the next century (IPCC 2001; the range is approximately 10 to 90 cm per century). In addition the amplitude of the M2 tide is increasing by about 10 cm per century at Saint John (Godin 1992). Thus one can expect that mean sea level at Saint John, and along Digby Neck, will increase by about 40 cm over the next 50 years ((30+50)/2) and that the high water level will increase by about 45 cm over the next 50 years ((30+50+10)/2). The increase in each case could be as much as 60 or 70 cm.

COMMENTS ON THE CONCLUSIONS OF THE EIS

Intertidal Fish Habitat

The statement on subtidal substrate (coarse sands, gravels and mollusc shell fragments) is likely accurate given the field evidence. However, the statement that; "there appears to be little or no infauna," cannot be supported. The field sampling and lab analysis were insufficient to make any claims regarding infauna.

Since there is no infilling planned, it is agreed that disturbance of intertidal fish habitat from construction of conveyor system supports is likely to be short lived and limited in extent.

Suspended Sediments

The overall conclusion that sediment from the quarry will be dispersed is likely correct but the report provided does not support it. Supporting documentation does not conclusively refute the statement of the DFO inspector that sediment was entering the bay from the quarry site, which makes it difficult to use this as the basis for a conclusion of no impact.

Contaminants

The monitoring of water quality of outflow from the sediment retention ponds is insufficient to detect the possible problem of contamination associated with quarrying operation. See "Comments on Mitigation and Monitoring" for more information.

Marine Mammals

The conclusions provided in the EIS regarding collision risk with right whales are generally correct. The increased ship traffic due to the proposed activity, and the proposed route for these vessels, will result in an increase in the probability of vessel-whale interaction along the proposed route, but the increase will not be substantial. The likelihood of collision will still be low in the immediate vicinity of the marine terminal relative to other regions in the Bay of Fundy (such as in the vicinity of the Conservation Zone).

It is reasonable to assume that a couple of bulk carrier transits per week through or close to the Right Whale Conservation Area would not add greatly to average incremental exposures in the Conservation Area itself. However it should be emphasized that for any individual vessel passage the locally observed noise level and any specific animal exposure will be very dependent on the distance to the vessel and also, at increasing ranges, on the water depth and other physical variables.

If applied correctly and with rigour, subject to the recommendations provided above, the proposed mitigation should minimize the risk of direct noise effects to marine mammals.

Sea Turtles

It is agreed that this proposed activity is likely to have no effect on sea turtles; however, this conclusion can not be supported by the text provided.

Atlantic Salmon

DFO remains of the opinion that historic fishing, scientific sampling and theoretic modeling indicates that there could be migrating inner Bay of Fundy Atlantic salmon in the Whites Point, Digby Neck area from May until October.

Effects of Noise on Fish

Based on physical modeling, there seems to be minimal cause for concern in terms of lethal effects on fish. It should be kept in mind that the 100 kPa criteria pertains to lethal or obvious sub-lethal injury to fish and not to more subtle behavioural effects, which if they do exist, are likely to be transitory considering the frequency of quarry blasting.

Effects of Noise on Lobster

Sound from blasting appears to be substantially less than that from seismic exploration, but enough uncertainty remains that there should be some monitoring and possible mitigation of potential negative effects to lobster.

Invasives

The potential for introduction of pathogens and other invasives (such as the Asian crab) by this project may be no different than that from existing shipping. While current practices for ballast water management will not eliminate all risk, there is no obvious reason to disagree with the position regarding ballast water control.

COMMENTS ON MITIGATION AND MONITORING

Marine Mammals

Bilcon of Nova Scotia Corporation makes the following commitments:

- North Atlantic right whale sightings in the Whites Cove area will be communicated to the ships captain before the ship exits the inbound shipping lane.

- Blasting will not be carried out if seals are present within 170 metres of the point of detonation or if whales, porpoises or dolphins are within 500 metres of detonations. If

endangered marine mammal species such as right whales, blue whales or fin whales are sighted in the near-shore area of Whites Point the safety radius will be increased to 2500 metres.

These commitments will require monitoring of the area before and during blasting and also before and during ship transit. Details on how the proponent will undertake this monitoring, especially during periods of reduced visibility, should be provided.

Suspended Sediments

It appears that there will be no post-construction monitoring of suspended sediments. No operational triggers are identified should suspended sediments increase. If the project proceeds the proponent should undertake post-construction monitoring for some period of time to ensure that there is no elevation of suspended sediments either from the conveyor and transfer to the ship, or from runoff from the quarry itself.

Blasting/Noise

At 500m range, blast pressure measurements should be made near-bottom rather than at 1m depth where the direct wave and surface reflection will be expected to nearly cancel. Near-bottom, the pressure levels will maximize. These monitoring considerations should be clarified. Far-field monitoring should also be conducted, as recommended in the initial DFO advice on the blasting plan and as discussed above. Monitoring should be conducted at various times of the year to take into account seasonal variation and should continue until reasonable conclusions can be drawn about the accuracy of sound modeling and effects predictions.

If this project were to proceed, it would be advisable to make baseline measurements of bulk carrier noise around the terminal and nearby areas of potential environmental sensitivity.

Monitoring for potential effects of blasting on lobster should be conducted when lobsters are nearshore.

According to the Canadian Wildlife Service's *Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada,* "actual effects on species should be monitored to verify the accuracy of predictions and warn of impending harm to individuals or populations, community degradation or loss of ecosystem function." This could involve, for example, monitoring marine mammal behaviour through visual and/or acoustic observations prior to and after blasting events to verify the conclusion of no adverse behavioural impacts.

Contaminants

It is suggested that lobster, scallop, and crab be assessed for contaminants in addition to other environmental samples within the environmental effects monitoring program.

Fish Habitat

For more detailed information on the monitoring of any compensation project, the report entitled "Benthic Protocol for Lobster Enhancement Projects: Protocol for the choice of a site and sampling of the habitat" is attached.

References

Carver, C.E. and A.L. Mallet. 2003. A preliminary assessment of the risks of introducing non-indigenous phytoplankton, zooplankton species or pathogens/parasites from South Amboy, New Jersey (Raritan Bay) into Whites Point, Digby Neck, Nova Scotia. Submitted to Global Quarry Products, Bridgewater, Nova Scotia.

Chou, C.L., L.A. Paon, J.D. Moffatt, and T. King. 2003. Selection of bioindicators for monitoring marine environmental quality in the Bay of Fundy, Atlantic Canada. Marine Pollution Bulletin 46, 756-762.

COSEWIC, 2003. COSEWIC assessment and update status report on the Atlantic cod *Gadus morhua* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa.

DFO, 2004. Potential impacts of seismic energy of snow crab. Habitat Status Report 2004/003.

Godin G., 1992. Possibility of rapid changes in the tide of the Bay of Fundy, based on a scrutiny of the records from Saint John. Continental Shelf Research 12, 327-338.

Hannay, D. E. and D. Thomson. 2003. Peak Pressure and Ground Vibration Study for White's Cove Quarry Blasting Plan. Victoria, B.C., JASCO Research Ltd. (Aug. 14, 2003).

IPCC, 2001. Climate Change 2001, IPCC Third Assessment Report. Summary for Policy Makers. Available from www.ipcc.ch.

Petrie B. and R. Loucks. Recent Changes in Relative Sea Level in Eastern North America. Draft manuscript. Available from Dr. Brian Petrie, Bedford Institute of Oceanography, Dartmouth, N.S.

Urick, R. J. 1975. Principles of Underwater Sound. New York, McGraw-Hill Book Company.

Wright, D.G. and G.E. Hopky. 1998. Guidelines for the use of explosives in or near Canadian fisheries waters. Can. Tech. Rep. Fish. Aquat. Sci. 2107.

Benthic Protocol for Lobster Enhancement Projects

Protocol for the choice of a site and sampling of the habitat

Prepared by Michel Comeau 14/04/2003 modified 24/06/2003

BACKGROUND

Efforts to enhance lobster populations for increasing harvests through the addition of new (artificial) habitat have been widespread worldwide and controversial (Bannister and Addison 1998). The main reason for this controversy is the lack of measurable data or evidence to show that creating an artificial reef will increase the lobster population as a whole, not solely attract animals from already existing natural reefs surrounding the artificial reefs. Recently, Castro et al. (2001) studied the impact of creating artificial reefs on the lobster density in Narragansett Bay, Rhodes Island. This lobster enhancement program was conducted to mitigate environment damages caused by an oil spill in that area in 1989. They concluded that there was good evidence that the lobster production increases in artificial reefs. Their results clearly showed that after a deployment of the artificial reef on the soft bottom, juvenile and adult lobsters in the surrounding area redistributed and took advantage of the newly created reefs. More importantly, these reefs also increased the presence of new lobster recruit, which settled in the created artificial reefs. Although Castro et al. (2001) mentioned that it is not certain whether newly recruits would have recruited successfully into the natural habitat, it is clear however that the post-settlement larvae observed on the newly created artificial reefs increase the productivity of the area compared to the soft bare bottom observed before the placement of the reef.

In order to determine the effectiveness of a lobster enhancement project, it is paramount to elaborate a sound and complete protocol to study the lobster density and its habitat. Often concrete structures or rocks could be placed as mitigation for habitat destruction due to chemical spill or the construction of new infrastructures, such as wharves or breakwaters. Preliminary results from artificial reef surveys show that the size of the concrete structure deployed or the rock dumped should be between 25 cm and 1 m of diameter with at least one flat surface. What is important while creating an artificial reef for lobster is the total surface area in contact with the substrate. Concrete structures or rocks higher than a meter will not increase the efficiency of the artificial reef. It has been mentioned that the number of recruits is irrelevant if suitable habitat is in short supply for a life cycle stage that is vulnerable to predation such as the early benthic stages or during the molting process since only those able to obtain a shelter will survive (Caddy 1986; Wahle and Steneck 1991). Thus, the addition of these structures could possibly increase shelter availability for lobster and enhance the complexity of the habitat, that has been shown to reduce the predation rate on the lobster early benthic stages (Johns and Mann 1987; Wahle and Steneck 1991) and molting animals. Hence, the creation of artificial reefs could reduce predation pressure and could be a valuable addition to increase the survival rate of lobster.

PROTOCOL TO CREATE AN ARTIFICIAL REEF FOR LOBSTERS AND MONITOR THE LOBSTER DENSITY AND HABITAT CHARACTERISTICS

CHOICE OF A SITE

The choice of a site to deploy the concrete structures and/or dumped crushed rocks is very important and a proper substrate for the placement should be identified. Lobsters are habitat specific and will select a more complex habitat with an assemblage of rocks (boulders) over a softer and mobile substrate (cobbles and gravel that can be mixed with mud and/or sand) (Lawton and Lavalli 1995). Lobsters will take advantage of rocks and excavate a shelter where they spend most of their time. A rocky habitat in shallow (< 8 m) water is especially important during the transition from the pelagic to the benthic stage when larvae (stage IV) settle on a rocky habitat that offers shelter from predators. Hence, by collecting information on the type and size of the material observed on the seafloor and its assemblage, it is possible to characterize the habitat in terms of lobster preferences. For the purpose of this protocol, the following classification is proposed:

Type I: The *optimal lobster ground* is characterized by a complex habitat composed of numerous small to middle size boulders (diameter >25 cm) on a gravel or small cobble substrate, or a mixture of gravel-mud-sand. The presence of macroalgae will enhance this type of habitat for lobster.

Type II: The *good lobster ground* is also characterized by small to middle size boulders on a soft substrate (such as gravel, sand and mud), but the complex assemblage of small to middle size boulders form reefs that are separated, but that are at close proximity.

Type III: The *marginal lobster ground* is characterized by small to middle size boulders on a soft substrate as described for the good lobster ground, but the reef type formations are far apart. Between these reef formations, a simple habitat composed of soft (gravel, mud and/or sand) or hard bottom substrate, characteristic of a poor lobster ground, is observed.

Type IV: The *poor lobster ground* is characterized by a simple habitat composed of soft material (such as gravel, sand and mud) or hard bottom (cobbles or an unbroken sheet of sandstone or granite) with no boulder size rocks. Lobsters might be seen in this type of habitat in transition between more suitable lobster grounds, but will not permanently utilized the Type IV habitat.

The location of a future artificial reef should consider the presence of a substrate composed of cobbles and gravel that can be mixed with mud and/or sand. The creation of an artificial reef for lobster is recommended in the Type II and/or III habitat. These types of habitat have the basic assemblage of geological characteristic to accommodate the burrowing behavior of lobsters. By adding suitable concrete structures and/or rocks to these types of habitat, it will increase the complexity of the ecosystem and will create shelters or give lobsters the opportunity to build and create adequate shelters. It could be viewed as an enhancement from an already suitable lobster habitat (Types II and III) to a Type I (lobster ground). Placement of concrete structures and/or rocks on Type I habitat could only increase marginally the complexity of an already lobster habitat. It is very unlikely that a Type IV habitat can be enhanced in the long-term. Preliminary results showed that concrete structures placed on this type of habitat sink with time and totally disappear from the habitat that regains its initial state. Lobster enhancement projects should be avoided on habitat that show Type IV habitat.

TYPE OF STUCTURES OF ROCKS TO BE USED IN THE CREATION OF AN ARTIFICIAL REEF FOR LOBSTERS

The selection of appropriate concrete structures or shape and size of rocks to create an artificial reef for lobsters is paramount. Concrete structures with 2 and 4 entries with different height (1, 5, 7 and 10 cm in height) were tested at the Centre Marin in Shippagan N.B. in 1999 (M. Comeau personnel observations). A total of 3 series of observations were done with immature and juvenile lobsters for short (19 to 23 h) and mid to long-term (25 to 75 h) observations. The behavior of the lobsters toward the concrete structures and the intra-specific competition were noted. Based on observations from this aquarium experiment, there was a feared intra-specific competition between lobsters to monopolize a structure. It was noted that structures with large entrances (5 cm to 10 cm) gave the opportunity for small lobsters to hide quickly and start shelter excavation, but at the end of the excavation period the size of burrows excavated offered very little protection. Conversely, at the end of the excavation period for structures with smaller entrances (1 cm to 4 cm), small lobsters were more out of sight, hidden in their burrows. This cryptic behavior is more characteristic of lobster, especially small one. Based on the long-term experiment, after the excavation period a dominant lobster will be the only occupant of a structure. Finally, after excavation the 4 entry structures were very unstable. Hence, based on the result from this aquarium experiment, a concrete structure with a single entrance is acceptable as only 1 lobster per structure was observed in the long-term experiment. The entrance should be approximately 2-3 cm of height to favor excavation, but minimize intra- and possible inter-specific competition. The recommended size for the structures is 40 cm by 40 cm, and a height of no more than 15 cm. If rocks are to be dumped, their diameter should be between 25 cm and 1 m with at least one flat surface. It is also suggested to use a large number of small to medium size boulders instead of large boulders since lobster are territorial and shelter specific. As observed in aquarium experiments, in nature there is only one shelter per boulder that is monopolized by a single lobster. What is important while creating an artificial reef for lobster is the total surface area in contact with the substrate, also referred as the edge effect.

BENTHIC SAMPLING

EXPERIMENTAL UNITS

The addition of artificial reefs on lobster density has to be monitor according to a "Before-After-Control-Impact" (BACI) design (Underwood 1991, 1992, 1994). The BACI sampling design consists of a series of samples taken Before and After the treatment (e.g. the placement of artificial reefs) in the Control and Impact experimental units. In order to properly conduct a BACI experiment and statistically detect changes, it is important to use replicas within the impact experimental unit and several control experimental units (Underwood 1994). At least two control units are suggested.

The impact unit is the general area where artificial reefs are created (Fig. 1). Before the placement, a complete survey where artificial reefs would be placed is needed. Furthermore, two replicas adjacent to where the artificial reefs would be created have to be sampled. The Control areas (Fig. 1) would be located at a certain distance from the impact area. Within each Control areas, a complete survey of the two replicas is also needed. All of these areas should be selected with the same type of habitat. This constitute the Before sampling.

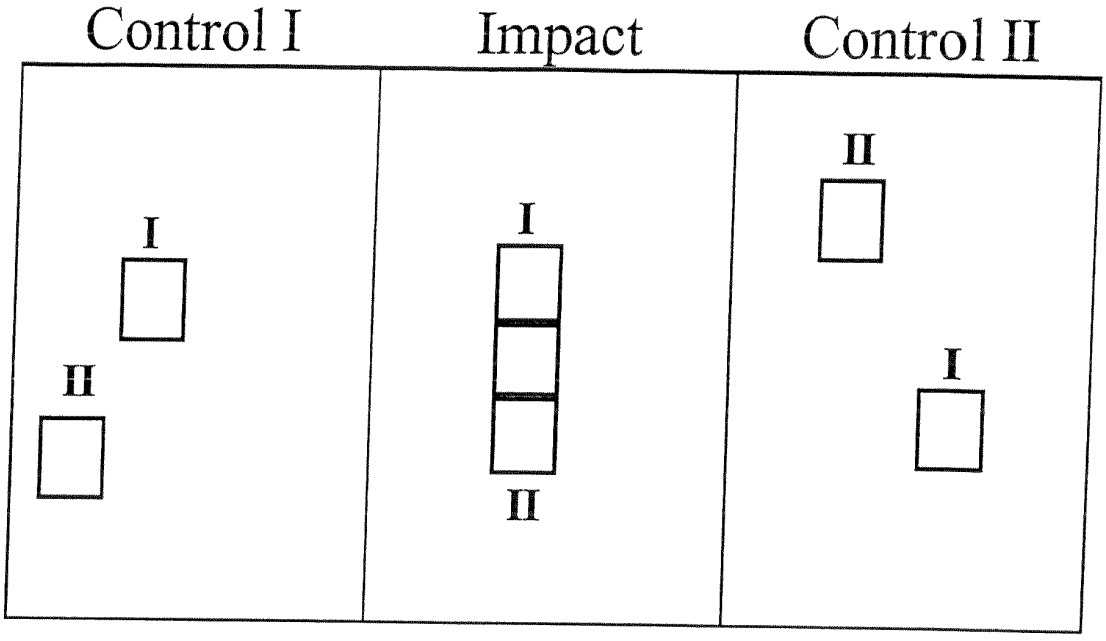

Figure 1. Schematic representation of the experimental units and the replicas (roman numerals) within each experimental units (impact, control I and II). The natural habitat is represented by the white squares and the artificial reef by the checker boxes.

Following the Before survey, a series of After samples is needed to complete the survey of the impact of an enhancement project. The After surveys have to be carried out on a yearly basis for a period of up to ten years. This will cover at least one generation of lobster.

SURVEY TECHNIQUES

Various survey techniques will be used to periodically monitor lobster densities and the associated biota and abiota parameters in the artificial reef site and all the replicas:

- SCUBA visual transect;
- SCUBA visual quadrat;
- SCUBA airlift sampling.

The SCUBA visual transect survey will be conducted with a 100 m transect line marked at every 5 m. The transect will be randomly placed in the site where the artificial reef will be placed and all the replicas, and surveyed by two divers, one on each side. Each diver will sample an area of 2 m wide perpendicular to the transect line for the entire transect length. Therefore, a total of 40 sections covering 10 m^2 each (400 m^2 total) will be surveyed for each transect. A minimum of 20% of the total surface being restored should be sampled on the artificial reef site and all the replicas. Lobsters observed during these transect surveys will be counted, measured, and sexed.

The SCUBA visual quadrat survey will be conducted with a .5 m^2 square quadrat in the rocky area in the site where the artificial reef will be placed and all the replicas. A minimum of 50

randomly placed quadrats over rocky areas within each sub-area will be done. Lobsters within the quadrat sampling area will be counted, measured, and sexed. After the placement, a maximum number of concrete structures should also be visually sampled for lobster activities. As per the quadrates, lobsters associated with each structures should be counted, measured, and sexed.

The SCUBA airlift sampling survey will focused on early benthic stage lobsters, either the recently-settled called young of the year (Stages IV-V) or the larger animals that still show a strong cryptic behavior (Stages VI-XI). The airlift sampler is a 135 cm long 10 cm of diameter plastic tube hooked to a SCUBA tank. By introducing air at the bottom end of the tube, trapped air will rise to the surface creating a vacuum allowing material and organisms from the seafloor to by airlifted to a collecting 2 mm mesh bag at the top of the sampler. One diver operates the air valve controlling the air flow at the bottom of the sampler, while a second diver removed the rocks inside the quadrat. This type of intensive sampling is very important because for the entire first three years of their benthic life lobsters are though to be shelter-restricted (Lawton and Lavalli 1995), and are very hard to sample visually in a complex habitat. Using an airlift sampler, a minimum of thirty randomly selected .5 m^2 quadrats will be sampled in the site where the artificial reef will be placed and all the replicas. An extra 15 concrete structures (artificial reef) should be sampled after their placement. Lobsters gathered in the collecting bags will be measured at the surface onsite. Quadrats and concrete structures sampled using the airlift sampler will only be done once during the entire project since this type of sampling is very destructive

For both the *SCUBA visual* and *airlift* surveys, other benthic and near-bottom animals will be noted, as for the algae coverage within the surface sampled. Collecting bags from the *SCUBA airlift* surveys will be frozen for later identification of their content. Beside from the biota, the abiota characteristics of the habitat will also be investigated. To characterize a habitat it is important to note the type of substrate, the size and aggregation of rocks, and the rock formations. In order to standardize the information collected by divers, the basic sediment size classification developed by Wentworth (1922) and later modified by Pettijohn (1949) will be used. The terminology and basic definition is as follow:

- *Hard sandstone or granite sea floor-* it is related to a solid sheet of sandstone an/or granite with possible ledges (that have to be identified on the sampling sheet).
- *Boulder-* a detached rock larger than a cobble with a minimum of 256 mm.
- *Cobble-* similar to a boulder, but it is restricted in size from 64 mm to 256 mm.
- *Gravel-* for this protocol, gravel will include the size classification of pebble and granule mentioned by Wentworth (1922). It is therefore small rocks between 4 mm and 64 mm.
- *Sand-* for this protocol, sand will include the five size classifications of sand mentioned by Wentworth (1922). Aggregate of mineral or rock grains greater than 1/16 mm and less than 2 mm.
- *Mud-* a somewhat informal term referring to a mixture of silt, clay, and fine sand. This class group anything less than 1/16 mm.

Beside from this classification of rocks and substrate, solid sheet of sandstone and/or granite with possible ledges have to be noted and identified on the sampling sheet. These solid sheets

are also referred as hard-bared seafloor. The sampling complexity of each quadrat will also be noted. This sampling complexity refers to the ability of a diver to efficiently sample a quadrat. It will be identified as simple if a diver could sample a quadrat without missing or underestimating the presence of lobsters, and complex if unable to do so. The complexity of the habitat within a quadrat will be assessed based of the assemblage of different type of rocks and algae within the quadrat. Hence, a quadrat could be identified as complex based on the information related to the habitat, but simple based on the ability of a diver to efficiently sample the quadrat.

The divers during both the *SCUBA visual* and *airlift* surveys will note these types of lobster habitat. Such observations of both the biota (lobsters and other benthic and near-bottom animals) and abiota (size and aggregate of rocks and substrate) assemblage give a better general view of the ecosystem.

REQUIREMENTS TO CREATE AND MONITOR AN ARTIFICIAL REEF FOR LOBSTER

- Located Type II and III lobster habitat. Avoid Type IV habitat.
- Select appropriate concrete structures or shape of rocks. The size of the concrete structure placed should be 40X40X15 cm with one entrance measuring between 2-3 cm, or the rock dumped should be between 25 cm and 1 m of diameter with at least one flat surface. What is important while creating an artificial reef for lobster is the total surface area in contact with the substrate.
- The lobster density has to be monitored according to a "Before-After-Control-Impact" (BACI) design in order to have a sufficient number of replicas to statistically detect changes. A survey is needed Before the placement, and a series of surveys After in both the Controls and the Impact area. The Impact area is where the artificial reef is placed and the controls are where similar habitats to the Impact area prior to the placement of concrete structures or rocks are found.
- Sampling should be done during the same time period each years.
- A minimum a 20% of the total surface of the artificial reef should be sampled by SCUBA visual transects (100 m transect) each sampling periods (Before and After). The sampling surface of each transect is 400 m^2. Each transect could be divided as 40 quadrats with a total surface of 10 m^2 each.
- The SCUBA visual quadrat (.5 m^2 square quadrat) should be done in the rocky portion of the general area of the artificial reef location. A minimum of 50 randomly placed quadrats over rocky areas should be done. After the placement, a maximum number of concrete structures should also be visually sampled for lobster activities.
- The SCUBA airlift sampler should be used for a minimum of 30 randomly selected .5 m^2 quadrats in the rocky portion of the artificial reef location. In addition, a total of 15 concrete structures randomly selected should be sampled using the airlift sampler. Quadrats and concrete structures sampled using the airlift sampler will only be done once during the entire project since this type of sampling is very destructive.

- For all the surveys, both the biota (benthic and near-bottom animals and algae coverage) and the abiota (habitat characterization in terms of type of substrate, the size and aggregation of rocks and rocks formation) have to be noted.

REFERENCE

Bannister, R.C.A., and J.T. Addison. 1998. Enhancing lobster stocks: a review of recent European methods, results, and future prospects. Bulletin of Marine Science 62(2): 369-387.

Caddy, J.F. 1986. Modeling stock-recruitment processes in crustacean: some practical and theoretical perspectives. Canadian Journal of Fisheries and Aquatic Sciences 43: 2330-2344.

Castro, K.M., J.S. Cobb, R.A. Wahle, and J. Catena. 2001. Habitat addition and stock enhancement for American lobster, *Homarus americanus*. Marine and Freshwater Research 52: 1253-1261.

Johns, P.M.,and K.H. Mann. 1987. An experimental investigation of juvenile habitat preference and mortality among habitats of varying structural complexity. Journal of Experimental Biology and Ecology 109: 275-285.

Lawton, P, and K.L. Lavalli 1995. Postlarval, juvenile, adolescent, and adult ecology. Pp. 47-88 *in* J.R. Factor, *ed.* Biology of the lobster, *Homarus americanus*. Academic Press, New York.

Pettijohn, F.J. 1949. Sedimentary rocks. Harper & Row, New York, 718 p.

Underwood, A.J. 1991. Beyond BACI: Experimental designs for detecting human environmental impacts on temporal variations in natural populations. Australian Journal of Marine and Freshwater Research. 42: 569-587.

Underwood, A.J. 1992. Beyond BACI: the detection of environmental impacts on populations in the real, but variable, real. Journal of Experimental Marine Biology and Ecology 161:145-178.

Underwood, A.J. 1994. On beyond BACI: sampling designs that might reliably detect environmental disturbances. Ecological Applications 4(1): 3-15.

Wahle, R.A., and R.S. Steneck. 1991. Recruitment habitats and nursery grounds of the American lobster *Homarus americanus*: a demographic bottleneck? Marine Ecology Progress Series 69: 231-243.

Wentworth, C.K. 1922. A scale of grade and class terms for clastic sediments. Journal of Geology 30: 377-392.