Natural Resources Canada's Submission for the Whites Point Quarry and Marine Terminal Project

Presented to the Joint Review Panel

June 12, 2007

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1.0 NATURAL RESOURCES CANADA CONTEXT FOR THE WHITES POINT QUARRY AND MARINE TERMINAL PROJECT

1.1 Introduction

The following written submission presents the Natural Resources Canada (NRCan) review of the Environmental Impact Statement (EIS) and supplementary information provided for the Whites Point Quarry and Marine Terminal Project. NRCan is participating in this environmental review as a federal department with expertise relevant to the project.

NRCan has no regulatory role with respect to the Whites Point Quarry and Marine Terminal Project. The Department's roles and responsibilities in the environmental review of this project stem from its obligations under the *Canadian Environmental Assessment Act* (CEAA). The Department has determined that it does not have a regulatory or decision-making responsibility for this project that would trigger CEAA, but that it was a federal authority in possession of specialist or expert information or knowledge with respect to this project.

NRCan is an economic science-based department with a mandate to promote sustainable development and responsible use of Canada's minerals, energy and forestry resources, and to develop an understanding of Canada's landmass. The Department conducts research and technical surveys to assess Canada's resources, including the geological structure, as well as scientific and economic research related to the energy, forestry, mining and metallurgical industries. NRCan's Earth Sciences Sector (ESS) also has ongoing scientific programs that focus on reducing risks to the environment and human health from potentially hazardous substances in soils and water, and on minimizing the environmental impacts of development in terrestrial and marine settings.

NRCan has reviewed the Environmental Impact Statement filed in April 2006 by Bilcon and the subsequent responses to our comments on the EIS filed with the Joint Review Panel in February 2007. NRCan focused its initial review of the Whites Point Quarry and Marine Terminal EIS on areas of expertise within ESS. ESS scientists from the Geological Survey of Canada's (GSC) Atlantic Division, Quebec Division and Central Division have reviewed the Environmental Impact Statement (EIS) and brought their expertise in: seismicity and seismic hazard assessment; marine geosciences including coastal processes and sea level rise, sediment stability and transport processes, estuarine and marine environments; and, groundwater and hydrogeology.

NRCan's EIS review and participation in the environmental review process have been coordinated through the Strategic Policy Sector's Environmental Assessment Group.

As part of their review of the EIS, geoscience experts at NRCan provided comments on a number of issues relevant to marine geosciences and groundwater/hydrogeology. These comments were transmitted to the Joint Review Panel on August 3, 2006.

While NRCan acknowledges that most of the proponent's responses (dated February 2007) to the Department's comments are satisfactory, a few responses on issues raised by NRCan are inadequate or not completely resolved. In particular, based on the review of the EIS and the responses provided by the proponent on NRCan's comments, NRCan reviewers have identified outstanding issues that they wish to bring to the attention of the Joint Review Panel in the areas of hydrogeology and marine and coastal environments and processes.

NRCan's review, comments, and/or recommendations pertaining to these subject areas are presented below. In addition, for the purposes of the public hearings, the Joint Review Panel requested NRCan's specific expertise in the area of aqueous geochemistry of waste rocks. NRCan's CANMET Mining and Mineral Sciences Laboratories provided this review expertise which is presented below.

NRCan has focused its review on matters directly related to its mandate with an emphasis on the proponent's responses to NRCan's initial comments on the EIS, and is offering comments and recommendations in this submission that it believes will assist the Joint Review Panel in making informed decisions during the preparation of its report and recommendations about the proposed project. This submission will be the basis for the presentations that NRCan intends to make during the public hearings. For the public hearings, NRCan will be presenting in the hydrogeology thematic session on June 22, 2007 and summarizing the Department's remaining comments in the areas of marine geosciences and aqueous geochemistry on June 21, 2007.

2.0 EIS ANALYSIS/SUMMARY AND RECOMMENDATIONS

This section of the submission presents the technical analysis and/or summary of the issues reviewed by NRCan experts along with recommendations arising from the review. The analysis and recommendations provided in this submission are based on the EIS provided by the proponent and on the proponent responses to NRCan comments. Where appropriate, other information available on the public registry, such as the proponent's responses to the Joint Review Panel's information requests, has also been considered for this review. Reference to Reviewers (e.g., Reviewer 2) corresponds to the format of NRCan's initial submission on the EIS (August 3, 2006).

2.1 Hydrogeology

2.1.1 NRCan Reviewer 2

Geological Survey of Canada – Québec,
Earth Sciences Sector, NRCan
Area or expertise: hydrogeology

2.1.2 Documents/sections reviewed:

- EIS - Volume III, Volume VI, Chapters 9.1 & 9.2; Volume V; Volume IV; Whites Point Quarry & Marine Terminal – Environmental impact statement, March 2006 ;
- Whites Point Quarry & Marine Terminal - Responses: Plain Language Summary; Chapters 2; 9.1.2; 12.3; 12.4; 12.5, February 2007 ;
- Revised Project Description Whites Point Quarry & Marine Terminal – Environmental impact statement, November 2006. (RPD)

2.1.3 Issue: Impacts of Quarry Operations on Groundwater Levels

Proponent's Conclusions

The Proponent has concluded that quarrying will be done above the water table and operations will have no effects on groundwater levels. The Proponent has depicted graphically the groundwater levels and contours in Figures IR8-1 to IR8-7.

NRCan Review and Conclusion:

Current groundwater levels:

Current groundwater levels are needed in order to estimate the potential impacts of future quarry operations on groundwater and on existing neighbouring wells. Groundwater levels are in dynamic equilibrium resulting from interactions between input and output rates. In general, groundwater levels at topographic heights - recharge areas (such as North Mountain) - are located deeper below the ground surface. There, because of the strong downward gradient, the deeper monitoring wells indicate deeper groundwater levels, whereas shallower wells

show shallower water levels. In contrast, groundwater levels close to the discharge areas (sea shore) are much closer to the ground surface. In this case, shallower wells show lower water levels than deeper wells which can even be flowing (artesian) wells. The higher the anisotropy of the aquifer medium, the higher the discrepancy between measured groundwater levels in two neighbouring wells intercepting different aquifer depths. In low permeability heterogeneous aquifer media, such as the present case, the classical 2D dome shaped water table surface does not really exist. The groundwater flow system rather consists of a network of smaller perched and interconnected units where groundwater levels and flow rates are the result of local transmissivities and ever-changing hydraulic gradients (e.g. wells respond quickly to precipitation events).

The proponent has made a considerable effort to obtain field data for groundwater levels. Measurements have been done in boreholes, monitoring wells, domestic wells. However, the presentation of the results and the inferred water levels lack coherence. Groundwater levels are only schematically depicted in several figures. The inferred water table elevations versus the proposed quarry floor elevation are still not clear, and any comparison between them is difficult. Also a notable discrepancy still exists between the water levels and the quarry contours indicated in Figures IR8-1 through IR8-7 (RPD), and those in Figure 5R-1 (RPD), Figure 5, Figures 6a and 6b, and Figure 7 (EIS Volume III, and/or Volume VI Chapter 9.1). This may simply be due to the different scales used to draw these figures. However, a piezometric map of the expected approximate groundwater levels at the base of the quarry (13 masl) is needed to understand the impact of the future quarry operations on groundwater.

Effects of the quarry operations on groundwater quantity:

The planned quarry operations will also consist of water drainage (see Figure IR-2 and Plan IR-2, Chapter 2 – Maps, pages 28 and 30 respectively; Figure IR8-2 RPD, page 59). Drainage water will consist of precipitation, surface waters, sub-surface runoff waters at the contact between sediments and bedrock, and eventually of groundwater seeping from the quarry floor and from the quarry walls. Besides evacuating water from the site, the operations will affect the current recharge rates occurring on the footprint of the site. The future drainage over the footprint of the quarry will act as a pump with an extraction rate corresponding approximately to the sum of the current infiltration rates (worst case scenario) and the eventual seepage rates to be observed at the quarry floor and walls.

Although the planned quarry operations will be carried out above the water-table, they will necessarily affect the groundwater flow regime. The effects on the groundwater levels and the water availability in neighbouring wells will be experienced on both sides of the supposed groundwater divide. The information currently provided by the proponent does not allow the estimation of the nature and magnitude of these impacts.

Recommendations:

- The proponent should produce a single piezometric map of the expected groundwater levels at the base of the quarry (~13 masl) to allow an adequate understanding of the impact of future quarry operations on groundwater. The footprint of the quarry site and terrain elevations extending beyond the surface water divide and Hwy 217 should also be presented on this map. The cross sections given in Figures IR8-1 through IR8-7 should then be extended and related to the piezometric map.

- The proponent should provide worst case scenario estimates of the effects of the drainage activities on groundwater levels based on the observed water levels and measured/anticipated permeabilities.

2.1.4 Summary of the Status of Proponent's Responses to Remaining NRCan Technical Hydrogeology Review Comments/Recommendations:

1. Conduct hydraulic tests in the monitoring wells;
   - Proponent has partially addressed this issue

2. Piezometers have to be installed at the level of the projected quarry base in order to have an idea of the water levels there;
   - Proponent has addressed this issue

3. The proposed pre-quarrying domestic well survey should be more rigorous.
   - Proponent has addressed this issue

2.2 Marine and Coastal Environments and Processes

2.2.1 NRCan Reviewers 3, 4, 5

Geological Survey of Canada - Atlantic Division
Earth Sciences Sector, NRCan
Areas of Expertise: Coastal geomorphology, including shore types, impacts of extreme waves and water levels and impacts of marine oil spills on shoreline stability.

2.2.2 Documents/sections reviewed

This review has focused on the potential impacts of the project on the shoreline morphology and dynamics. March 2006 documents examined included Volume 1 Plain Language Summary, Volume II section 10, Volumes III maps and reference documents. Vol VI 9.1.7 and Vol. VII chapter 11; Reexamined Vol V 7.2.1; Whites Point Quarry and Marine Terminal Responses February 2007 Vol. 2 - 4

2.2.3 Issues

2.2.3.1 Sediment transport and currents

Initial NRCan concerns were about changes in sediment transport and currents in the vicinity of the marine terminal structures. The proponent has provided clearer diagrams and explanations about the sea floor sediment character near the proposed structures and further seabed evidence that sedimentation will not occur at the pilings. They further emphasize the absence of scouring anticipated around the base of the piles and the lack of structure impact anticipated on regional currents.

NRCan Conclusion
Proponent responses are accepted.

2.2.3.2 Impacts of terminal on shoreline and backshore

Initial NRCan concern was on the impacts of the marine terminal structure on the Whites Cove shoreline and its immediate backshore and macroalgal communities. No new evidence was presented but the proponent stated very small changes to the shoreline and no changes to the macroalgal community are expected.

NRCan Conclusion and Recommendation
Proponent comments are acceptable based on the information provided to date; however NRCan recommends that new evidence of any impacts of the terminal on inshore wave propagation and shoreline stability that are discovered during wave modeling planned for the design stage of development be factored into the subsequent design and environmental protection of the area.

2.2.3.3 Landward limit of extreme wave run-up

Initial NRCan concern was on the landward limit of extreme wave run-up during storms and their impact on planned infrastructure. The proponent has provided more information on waves, tides and potential storm surges and how the topic will be addressed during the design phase following approval of the project. NRCan was looking for information on present extreme extent of wave run-up along the area of the proposed quarry development and did not find it. However in Vol V 7.2.1 the proponent specifies that land based components of the quarry infrastructure will be located above the 10 m contour elevation and above the coastal flood plain.

NRCan Conclusion
Response of the proponent is acceptable provided that the proponent can define the elevation of the coastal flood plain which should incorporate the present limit of extreme wave run-up during a 1-2m storm surge.

2.2.3.4 Sea level rise

Initial NRCan concern was that the proponent did not include the predicted rise in sea level over the life span (50 years) of the project which at present is more than the 30 cm/century noted by the proponent. The response of the proponent was that the latest IPCC report has halved its predictions for sea level rise by 2100. The IPCC did suggest a reduced sea level rise of 18-59 cm because they are most

confident of those numbers but they do not take into account local shoreline subsidence in Nova Scotia nor the uncertainty of changes in present global ice sheet dynamics nor the difference between model and observed global sea level changes from the past.

NRCan Conclusion and Recommendation:
The proponents reply is not accepted because of continued uncertainties in modelling of global sea level rise.

The proponent should continue to incorporate in their design plans a sea level rise of at least 59 cm/century and possibly higher. As more information becomes available, design plans could be better constrained regarding expected extreme limits of wave run-up and sea level.

2.2.3.5 Emergency planning and response

Given the wave -exposed location of the terminal and the lack of shelter for ships the initial concern was on adequate emergency planning and response for marine oil spills. The proponent lists under environmental management that a spill prevention control and countermeasure plan will be put in place for the marine terminal and arrangements will be made for the provision of emergency response with the closest service provider.

NRCan Conclusion
Proponent responses are accepted.

2.3 Aqueous Geochemistry of Waste Rocks

2.3.1 NRCan Reviewer

CANMET Mining and Mineral Sciences Laboratories
Area of Expertise: Aqueous geochemistry of waste rocks

2.3.2 NRCan Review and Conclusions

Upon reviewing the responses of Bilcon of Nova Scotia Corporation and its consultants to the questions raised by the Joint Review Panel and other Authorities on the Whites Point Quarry and Marine Terminal Project at Digby Neck, Nova Scotia, it is apparent that the slightly elevated level of copper in the basalt to be processed, its leachability and potential impact on the local biota have become a matter of concern for the proposed project. The following remarks address a couple of key issues on the topic based on NRCan's expertise in this area.

1. Although the amount of geochemical data presented in the EIS is admittedly sparse, it is doubtful if more data would be necessary to determine if the leachability of the waste rock is a potential concern. In the first place, a high copper concentration in basalt does not necessarily correlate with its leachability. Generally speaking, the form (such as sparingly soluble sulfides

or readily soluble weathering products) in which copper occurs in the basalt has more influence on its leachability than its concentration. This is clearly demonstrated by the results of the four samples subjected to the leach test. Moreover, the leach procedure involved the application of acetic acid to bring the leachate pH down to a value of 4.9. Such a low pH will not be readily realized in a marine environment and the test results can thus be considered as highly conservative. NRCan would tend to agree with the project proponent that monthly monitoring of dissolved copper in the water of the sediment ponds would better determine the mobilization of the contained copper in the basalt than more laboratory testing.

2. Local environmental conditions (such as availability of complexing agents, water hardness, etc.) can greatly affect the ecotoxicity of copper. Previous work with mine tailings enriched in copper (up to an order of magnitude greater than that in the basalt at Digby Neck) that ended up in the marine environment has shown minimum impact on the local biota (Kwong and Hynes, 2003; Veinott et al., 2001 and 2002). Given the relatively low copper concentration in the crushed basalt, the low copper leachability in seawater, the small volume of material that may end up in the marine environment and the relatively high energy setting of the marine terminal site, serious ecological impact from copper is not expected to result from accidental discharges of processed basalt near the project site.

In conclusion, the reviewer considers the responses given by the proponent's consultant to the Review Panel on the copper issue are largely adequate.

2.3.3 References Cited

Kwong, Y.T.J. and Hynes, T.P. (2003): Benefits and risks of submarine tailings disposal – Lessons learnt from two historic mine sites in Newfoundland and other Canadian case studies. Proceedings of the 6th International Conference on Acid Rock Drainage, Cairns, Australia, 14-17 July 2003. The Australian Institute of Mining and Metallurgy, Carlton South, pp.719-724.

Veinott, G., Anderson, M.R., Sylvester, P.J. and Gani, D.O. (2001): Metal concentrations in bivalves living in and around copper mine tailings released after a tailings dam breach. *Bull. Environ. Contam. Toxicol.* 67:282-287.

Veinott, G.T., Hynes, T., Anderson, R., Payne, J., Sylvester, P., Kwong, J., Blanchette, M., Dave, N., Gani, D., Hamoutene, D., Chaulk, J. and Meade, J. (2002): A chemical and ecotoxicological assessment of the impact of marine tailings disposal at two former copper mine sites in Newfoundland. *Can. Tech. Rep. Fish. Aquat. Sci.* 2435: x+58p.

Appendix A

Additional comments on Proponent's responses to NRCan's Review

This appendix details NRCan's review of the responses provided by the proponent on the Department's initial submission on the EIS (August 3, 2006) that are otherwise not discussed under sections 2.1 to 2.3. NRCan noted in its August 3, 2006 submission that the assessment of seismic hazard in the EIS was adequate for the planned facility. Therefore, no further review on this matter is presented in this submission.

Reviewer 4:

Geological Survey of Canada-Atlantic,
Earth Science Sector, NRCan

Expertise: Estuarine/marine environment and processes; Sediment stability and transport processes in the marine environments.

Documents/sections reviewed: Environmental Impact Statement March 2006, Vol. 1, 5, 6 (s 9.1.4, 9.1.7), Vol. 2, 3, appendices Vol. 3, 4. Whites Point Quarry and Marine Terminal Responses February 2007 vol. 3 (9.1), 2, 4. The comment #s follow the original submission.

Comment 1: Title of V.6, section 9.1.7 EIS
NRCan suggested that the title of Vol. 6 be changed to better reflect the content. The proponent agreed.

Response accepted.

Comment 2: Discharge of sediment
The Summary (p. 29) and V.6 section 9.1.7 - indicated that the discharge of sediment into the Bay of Fundy from this project will not exceed the limits set out by the Nova Scotia Department of Environment and Labour. But the volume, contents and potential effects on local and regional habitats are not provided. The proponent should provide this information and argue that the seabed erosion by the strong Bay of Fundy tidal currents and river discharges provide significant input of silt and clay and that the discharge volume from this project will be insignificant and likely be dispersed into the Bay of Fundy proper by the moderately strong currents off Whites Cove.

Proponent has provided this information and the responses are accepted.

Comment 3: Sediment and habitat disturbance, V.6, 9.1.7

The proponent suggested that marine sediment redistribution during construction is extremely unlikely since pilings for the marine terminal are located on exposed bedrock and that the design of the marine terminal infrastructure on pipe piles allows for

practically unobstructed current and tidal flows (pages 60, 61). Firstly, after reading Map 19B, Ref. V.II Tab9, and Appendix 23, NRCan concludes that the proponent did not provide maps that clearly show the seabed texture type and bottom sediment grain size at the locations of the pipe piles supporting the terminal and the conveyor. Thus the statement that pilings for the marine terminal are located on exposed bedrock cannot be substantiated. Second, the pipe piles will have a thirty-six inch diameter. With the estimated max current speed of 45 cm/s, flow and pipe interaction can cause enhanced currents, turbulence and erosion/suspension of sandy sediment if some of the pipe piles are located on sandy seabed. However, these effects will be local and as the bottom sediments contain little clay and silt, their suspension and advection will probably be minimum.

Proponent responses accepted.

Comment 4: Storm surge protection of the infrastructure and re-claimed land, V.5 chapter 7
Proponent responses are accepted, though NRCan noted that sea-level rise effect is not included in the response. The proponent stated "that all facilities will be designed and constructed to anticipate a sea level rise of 30 cm/century with associated potential change in tidal heights and storm waves". NRCan pointed out that the rate of 30 cm/century was an underestimate – see above comments in section 2.2.3.4.

NRCan suggests that the proponent should include the accelerated rise of sea level in the Data Assembly and Review and Extreme Water Level Assessment in the Revised Project Description in Section 7.0, pages 149 - 153.

Comment 5: Decommissioning, V.5 7.10
Proponent responses accepted.

Reviewer 6:

Geological Survey of Canada-Atlantic,
Earth Science Sector, NRCan

Expertise: marine geophysics, mapping of unconsolidated sediments on the sea floor

Documents/sections reviewed: Environmental Impact Statement Vol. 3 and Reference Documents of March 2006, Whites Point Quarry and Marine Terminal Responses February 2007 vol. 3 (9.1), 2,4. The comment #s follow the original submission.

1: Vol III-14, page 10
Corrections accepted.

2: Vol III-16, page 7

"Berm height" is measured from the general elevation of the sea floor *outside* the iceberg furrow. Berm height is *not* measured from the base (or in the "trough") of the iceberg furrow. Therefore, reference to berm heights based on the latter reference frame of 7 m in the Bay of Fundy is misleading. References in the accepted scientific literature in which Bay of Fundy iceberg furrows are presented should be utilized instead.

Various minor spelling mistakes corrected.

Clarification of phrase "lost to the seabed" is acceptable.

3: Vol III-16, page 8
Corrections accepted.