

GQP Global Quarry Products

January 28, 2003

Mr. R. Petrie
District Manager – Yarmouth
Department of Environment and Labour
13 First Street
Yarmouth, Nova Scotia B5A 2S9

RE: White's Cove Quarry Blasting Plan – Addendum 1

Following are our response to the comments from Fisheries and Oceans Canada – Habitat Management division in their letter of December 11, 2002.

General Comment 1 – Third paragraph of referenced letter.

Response – Please refer to Drawing 1 and Figure 1 in our November 20, 2002 Blasting Plan. The horizontal distance between the ordinary high water mark and the closest explosive charge is 73 meters. This dimension is taken from Scotia Surveys Ltd. Plan No. D6153-02 dated September 20, 2002 – Plan of Quarry Site. Since under normal conditions, no or negligible water column would exist at the ordinary high water mark, this distance is twice the distance indicated in your Blasting Guidelines for the proposed weight of explosives [45kg]per delay from potential “fish habitat” as beginning at the original high water mark seaward. Permanent survey markers are located on-site if more specific measurements are required.

The location of the proposed initial blast is adjacent to the White's Cove intertidal zone- see Drawing 1. This is typical of the closest proximity that blasting will be done in relation to potential “fish and spawning” habitat. It should be noted that the White's Cove

Tel: 902-245-2567
Fax: 902-245-5614

Mailing Address:

General Interest:
P.O. Box 2113
Digby, NS
BOV 1A0

Billing :
Suite 282,450 LaHave Street, Unit 17
Bridgewater, NS
B4V 4A3

On-site measurements taken June 4, 2002 indicate an approximate intertidal zone of 91 meters from the original high water mark to low tide elevation. On-site intertidal transects of this particular intertidal zone indicate the upper zonation is primarily cobble substrate with a poorly developed intertidal community of marine organisms. This area lacked a distinct barnacle zone. The mid and lower zones are more stable, composed mainly of bedrock with thick mats of rockweed. Periwinkles, blue and horse mussels, hermit crabs and dog welks were observed in the mid zone with green crabs in the low shore zone. The sub littoral zone was comprised of a dense macroalgal community consisting largely of sugar kelp.

Considering the above, and to provide an added level of conservatism and as a mitigative measure, blasting is proposed to be conducted within 3 hours of low tide. This would provide an approximate 118 meters horizontal distance between the closest point of detonation and potential spawning habitat for most marine organisms. When feasible and considering atmospheric conditions, blasting will be conducted as close to the time of low tide to provide the greatest distance from the tide water column. If the blast can be conducted at low tide, an approximate 164 meters horizontal distance between the closest point of detonation and the water column can be achieved. In either case, the horizontal separation of the blast and potential spawning habitat exceeds the calculated 101 meters separation for the proposed 45 kg weight of explosives per detonation.

Other aspects of mitigation and monitoring of blasts will be addressed as part of the responses to the specific comments as appropriate.

General Comment 2 – Fourth paragraph of referenced letter

Response – The initial blast location is shown on Drawing 1 with details on hole locations, depths and initiation sequence in appendix 1 of the Blasting Plan. The initiation sequence has been revised - see - Proposed Slot 1 Individual sequence attached. This layout and accompanying details is for the proposed initial blast. This initial blast will be monitored for concussion and vibration at locations indicated on Map 2 in the Blasting Plan. Subsequent blasts will be designed based on the information gathered from monitoring the initial blast. Each blast design will likely be different in regard to number of holes, depth of holes, weight of explosives and as blasting moves further away from the marine environment. However, all blasts will be designed to meet or exceed the parameters set forth in your Blasting Guidelines. Again, this initial blast represents the most critical blast in relation to the marine environment and will be closely monitored.

Specific Comment 1 – What is the potential for disruption or harm to the seal colony identified in the report at Crowell's Cove?

Response – The seal colony is approximately 3 km from the blast site. Preliminary identification indicates the seal colony was Harbour Seals [*Phoca vitulina*]. Blasting is presently planned to be conducted through the year with a start-up frequency of once per week and once every two weeks as quarrying progresses. Literature research by our scientific advisor indicates little conclusive data has been published on potential effects

on marine mammals from blasting especially sub lethal effects. Therefore, mitigation will include no blasting within 500 meters of marine mammals or within visual contact from an observer using 7 x 35 power binoculars as stated in your blasting guidelines. Since the seal colony is approximately 3 km from the blast site, a significant, additional separation distance of 2500 meters will exist. The location of the seal colony will be monitored monthly during their breeding season. As indicated in the Blasting Plan, monitoring of concussion and vibration will be conducted for each blast and an onshore observer will be in place to identify the possible presence of marine mammals within 500 meters of the blast site. If marine mammals are sighted within the 500 meters zone, the blast will be delayed until the animals move out of the zone under their own volition as further described on Page 6 of the Blasting Plan.

Specific Comment 2 – The main explosive to be used is ANFO. The (blasting guidelines) state that ANFO explosives are not to be used in or near water.

Response – ANFO will be used and handled by trained blasters and delivered to the site in 25 kg polyethylene bags. ANFO has no water resistance and cannot be used in water. No blasting in water will be conducted. No loading of explosives will be done in the rain and only be used if the boreholes are dry. Blasting will be done with a minimum 118 meters separation from water. Environmental control structures (drainage channels and sediment retention ponds) will be in place between the blast site and the water. Generally, the explosive is completely consumed by the blast with no residue remaining. However, monitoring of surface water at the outflow from the sediment retention pond will be conducted monthly for general chemistry including nitrates.

Specific Comment 3 – The time delay of multiple explosive charges should be greater than 25 ms [Guidelines p. 9]. The Blasting Plan delay specifies exactly 25 ms between adjacent shot holes.

Response – The blasting guidelines states that the delay of multiple explosive charges should be greater than 25 ms.

The Proponent has engaged Dyno Nobel North America to advise on blasting procedures at White's Cove and they have advised that it is not possible to delay all multiple charges by 25 ms in a multiple row blast. This is because at 25 ms there would be too much time in between rows and ground movement would cut off downlines leaving explosives in the muckpile. Dyno Nobel has advised that they doubt the Department of Environment and Labour would permit such a set up due to the danger involved.

Dyno Nobel is of the opinion that the first blast plan submitted on November 18th 2002 would comply with the requirements of the guidelines.

However, the imitation sequence has been modified (see attached) to create a minimum delay of 8 ms. This figure (8 ms) is the figure used in the industry and is noted in the 17th edition of the ISSE Blaster's Handbook (Chapter 38 page 610) - "It has become a common practice in various regulations, criteria and project specifications to consider the maximum charge weight per delay that which detonates with in any given 8 ms time interval".

It is Dyno Nobel's expert opinion that the sequence attached will comply with Guideline 8- "No explosive is to be detonated in or near fish habitat that produces, or is likely to produce an instantaneous pressure change (i.e. overpressure) greater than 100 kPa (14.5 psi) in the swim bladder of a fish."

Dyno Nobel have calculated that 100.98 kPa would be generated from 50 kgs at a 35 meter distance. The blast in question will be 118 meters distant.

It is also Dyno Nobel's expert opinion that the charge of 45 kg and the sequence attached will comply with Guideline 9- "No explosive is to be detonated that produces, or is likely to produce a peak particle velocity greater than 13mms.s-1 in a spawning bed during the period of egg incubation."

Specific Comment 4 – While the 35.6 m set back criterion (ignoring "beaming" effects above) for the approximate shot weight appears to be met for both the initial detonation site and for the projected region of the quarry. The setback distance for the 13 mms maximum ground velocity criterion for spawning habitat is about 101 m (using a 45 kg charge and interpolating using a square root dependence on charge size and data Guideline Table2) and appears not to be met by the proposed initial blast site using the high water mark located 80 - 85 m distant.

Response – As set forth in the response to General Comment 1, the separation distance, especially in relation to potential spawning habitat has been reassessed. This reassessment has taken into consideration the composition of the intertidal zone and tidal cycles. We therefore propose to increase the separation distance between the blast site and a defined water column. The timing of detonations will be coordinated with tidal cycles. This includes limiting blasting to within 3 hours of low tide and considering the least productive upper tidal zone of the intertidal area. This should provide adequate separation for pelagic and ground fish that require a water column and from potential spawning habitat. This provides an approximate 118 meters separation from the blast site which is greater than the calculated 101 meters separation for a 45 kg weight of explosive per detonation. Additionally, when practical and considering atmospheric conditions, blasting will be conducted as close to the time of low tide as possible to provide the greatest separation from the blast and a defined water column. If the blast can be conducted at low tide, an approximate 164 meters horizontal distance between the closest point of detonation and the water column can be achieved.

As stated in your Blasting Guidelines, little or no data exists concerning effects of blasting on shellfish and crustaceans, either lethal or sub lethal. Also, our literature research indicated published data on the effects of blasting on spawning and nursery habitat in the marine environment is limited. We therefore propose to monitor the initial blast using live lobster and a pelagic fish species with a swim bladder in containers on land or in cages within the water column. This monitoring would be conducted on site in the lower intertidal/subtidal zone or on land.

Specific Comment 5 – Will fly-rock, potentially hazardous to wildlife, be generated by the blasting?

Response – Fly-rock will be controlled by using good blasting practices including the correct length of collar, proper stemming material (in this case crushed rock), avoiding loading into crevices or incompetent material, measuring proper burden and spacing (especially face holes) with a laser profiler and using proper delay timing. With a four inch- diameter hole, fly-rock should not travel more than 100 feet from the blast site and would be considered normal forward face-rock movement. Upward movement of rock 50 to 75 feet. Since the blast site and surrounding area will be completely cleared of vegetation, direct effects from fly-rock on wildlife are expected to be negligible. Monitoring of blasts will be done with a video camera.

Specific Comment 6 – One should note that the 35.6 m set back criterion is computed for a 100 kPa pressure pulse. Such a pulse has a high probability of lethal effects on swim bladdered fish, especially at shallow water depths. Sub-lethal effects are not considered. This is a very severe criterion and the report has not considered this.

Response – We agree that swim bladdered fish could be present in the intertidal and sub-tidal zone. As previously discussed the separation distance from the blast site has been increased to approximately 118 meters from a defined water column. Mitigation of potential effects on swim bladdered fish will be achieved by limiting blasting to within 3 hours of low tide to ensure no fish are with in the separation zone. Monitoring of effects of blasting on marine organisms is proposed as mentioned in the Response to Specific Comment 4.

Specific Comment 7 – No mention is made of the projected frequency of future blasting (one per day – once per week – sporadic, on demand?) Some quarry operations are both noisy and of a more or less continuous nature, such as drilling shot holes. Have these aspects been assessed? They should have a bearing on the effects to near-by colonies of seabirds or marine mammals.

Response – The projected frequency of blasting is approximately once per week during quarry start-up and approximately once every two weeks as quarrying progresses. Noise from typical quarry operations is restricted to the range of 50 to 65 dB at the property line, e.g. from drilling, rock processing, hauling, loading etc. It should be noted that unattenuated noise from a rural highway could reach approximately 75 dB on clear sunny days. Mitigation of typical quarry noise in relation to the marine environment will be accomplished primarily through attenuation. The actual physical plant location of the quarry is proposed approximately 250 meters from the shoreline. A minimum 30 meters environmental preservation zone is proposed along the shoreline. Also, a phased program of land restoration is proposed to function as noise attenuation buffers as well as wildlife habitat. Studies indicate a “rough grass” buffer can absorb sound at the rate of 0.5 to 3.0 dB, depending upon frequency per 30 meters. In theory, noise from the quarry operation could be conservatively reduced by 5 to 10 dB when it reaches the shoreline.

As stated in the November 20, 2002 Blasting Plan, monitoring of sound and vibration will be conducted for every blast that would include pre and post (background noise) data gathering. It should be noted that during our on land coast line breeding bird survey and

our on water coastal observations, no breeding seabird colonies, heron rookeries, osprey, bald eagles or any provincially designated at risk species were identified along the coastline. As discussed in the Response to Specific Comment 1, the seal colony located 3 km away at Crowell's Cove is not anticipated to be effected by noise from typical quarry operations due to sound attenuation through primarily forested areas. The nearest land based licensed aquaculture site is 2.5 km away in Mink Cove while the nearest water based aquaculture site is 8 km away south of Tiddville.

Specific Comment 8 – Blasting within 500 meters of marine mammal.

Response – As indicated on Page 6 of the Blasting Plan and in accordance with the Blasting Guidelines, no explosives will be knowingly detonated within 500 meters of any observed marine mammal. As a mitigation measure, an onshore observer would be posted 1 hour prior to blasting and be equipped with 7 x 35 power binoculars. If marine mammals are sighted the blast coordinator will be notified and the detonation will not take place until the mammals move out of the 500 meter “safe zone” area under their own volition and an “all clear” call is given. If the mammal / mammals are not sighted a second time, the blast would resume thirty minutes after the last sighting. The observer will conduct monitoring of the area for at least one half hour after detonations are complete. Any distressed mammals sighted during this post detonation time would be reported to the area Department of Fisheries and Oceans.

In summary, the proposed initial and subsequent blasts will be conducted to meet or exceed the separation distances specified in Tables 1 and 2 of the Blasting Guidelines. By meeting or exceeding the separation distances, less than 100 kPa for fish habitat and less than 13 mm *sec⁻¹ for spawning habitat guideline criteria should be achieved. Also, no explosives will be knowingly detonated within 500 meters of any observed marine mammals. Mitigation measures and monitoring would be conducted as previously stated. No blasting is proposed in the water.

I trust this answers your questions.

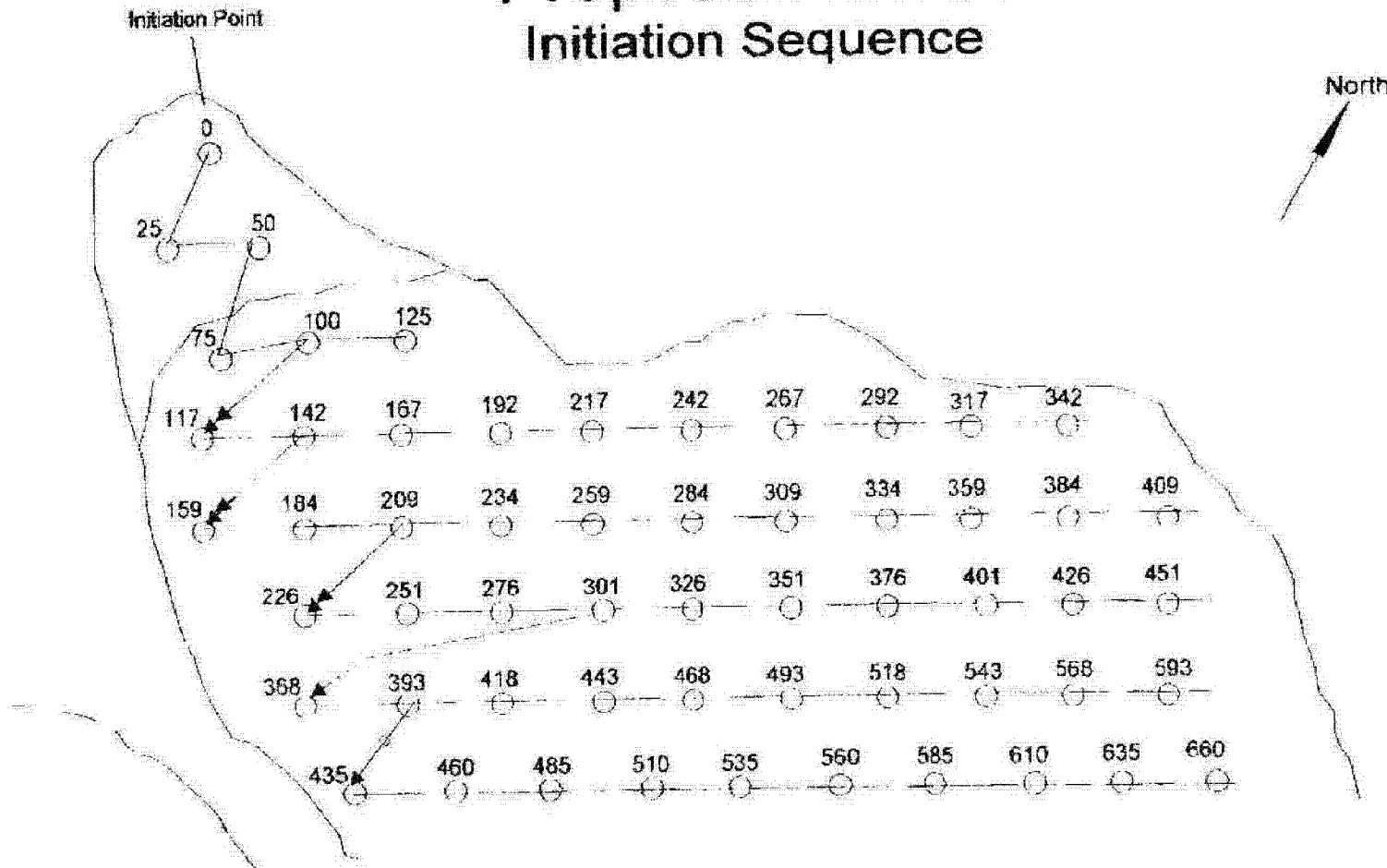
Yours truly



Paul Buxton
Project Manager

cc: Mr. James Ross Section Head
Habitat Management Division Fisheries and Oceans

Proposed Shot 1 Initiation Sequence



Surface timing in milliseconds

- Nonel Snapdet 25/500ms
- ← Nonel Snapline 17ms
- ← Nonel Snapline 42ms
- ← Nonel Snapline 67ms

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