AGNICO EAGLE

MELIADINE GOLD PROJECT

Explosives Management Plan

APRIL 2015
VERSION 4
6513-MPS-14

ᓇᐃᓴᖅᓯᒪᔪᖅ

ᖃᖓᑕᖅᑐᓄᑦ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐸᕐᓇᐅᑎ (ᐸᕐᓇᐅᑎ) ᑐᑭᓯᐅᒪᔾᔪᑎᑕᖃᖅᑐᖅ ᖃᖓᑕᖅᑐᓕᐅᖅᑐᓂᒃ, ᐃᒋᕐᕋᔾᔭᒃᑐᓕᕆᔨᓂᒃ, ᑐᖅᑯᖅᓯᒪᕕᖕᓂᑦ, ᐱᓕᕆᐊᖑᓂᖏᓐᓂᒃ, ᐊᒻᒪ ᐊᑐᖅᑕᐅᓂᖏᑦ ᖃᖓᑕᖅᑐᐃᑦ ᐊᓪᓗᕆᒃᑯᓐᓂᑦ. ᑕᒪᑐᒨᖓ ᐱᔾᔪᑎᖃᖅᑐᑦ ᑕᕆᐅᑯᑦ ᐊᐅᓚᖅᑎᑦᑎᖃᑦᑕᕐᓂᕐᒧᑦ ᐊᒻᒪ ᑕᕆᐅᕐᒥᐅᑕᓂᒃ ᐊᓪᓗᕆᒃᑯᑦ ᐊᐅᓚᖅᑎᑦᑎᖃᑦᑕᕐᓂᕐᒧᑦ ᐊᐅᓚᑦᑎᓂᖅ ᐸᕐᓇᐅᑎ-ᖓᓐᓂᑐᖅ (Agnico Eagle 2014a)-ᒥᑦ. ᑲᓇᑕᐅᑉ ᐊᒻᒪ ᓄᓇᕗᑦ ᒪᓕᒐᒍᐊᖓᑦ, ᐅᖃᐅᓯᖃᖅᑐᖅ ᐊᐅᓚᑦᑎᓂᕐᒥᒃ ᐊᒻᒪ ᐊᑐᕐᓂᕐᒥᒃ ᖃᖓᑕᖅᑐᓂᒃ ᐅᑯᐊᕐᔪᑦ: ᑲᓇᑕ – *ᖃᖓᑕᖅᑐᓄᑦ ᐱᕐᑯᔭᖅ ᐊᒻᒪ ᒪᓕᒐᐃᑦ; ᐊᖅᔭᖅᑐᐃᓂᖅ ᐅᓗᕆᐊᓇᖅᑐᓂᒃ ᐱᕐᑯᑎᓂᒃ ᐱᕐᑯᔭᖅ ᐊᒻᒪ ᒪᓕᒐᐃᑦ; ᑲᓇᑕᒥᑦ ᐃᑯᐊᓪᓚᒃᑐᓕᕆᓂᕐᒧᑦ ᓇᑐᓇᐃᑯᑕᖅ* ᐊᒻᒪ *ᑲᓇᑕ;* ᓄᓇᕗᑦ – *ᖃᖓᑕᖅᑐᓂᒃ ᐊᑐᕐᓂᕐᒧᑦ ᐱᕐᑯᔭᖅ* ᐊᒻᒪ *ᐊᖅᔭᖅᑐᐃᓂᖅ ᐅᓗᕆᐊᓇᖅᑐᓂᒃ ᐱᕐᑯᑎᓂᒃ ᐱᕐᑯᔭᖅ ᐊᒻᒪ ᒪᓕᒐᐃᑦ; ᐅᔾᔨᕆᓂᐊᕐᕕᖕᒥᑦ ᐋᓐᓂᐊᖅᑕᖅᑕᐃᓕᒪᓂᖅ ᐊᒻᒪ ᐊᑦᑕᓇᖅᑐᒦᑎᑦᑎᑦᑕᐃᓕᒪᓂᕐᒧᑦ ᐱᕐᑯᔭᖅ* ᐊᒻᒪ *ᒪᓕᒐᐃᑦ;* ᐊᒻᒪ *ᐊᑦᑕᓇᖅᑐᒦᑎᑦᑎᑦᑕᐃᓕᒪᓂᕐᒧᑦ ᐱᕐᑯᔭᖅ* ᐊᒻᒪ *ᒪᓕᒐᐃᑦ.*

ᐊᒡᒍᐃᒃᑯᑦ ᐊᑐᕐᓂᐊᖅᑕᖓᑦ ᒥᑭᑦᑐᒥᒃ ᐃᒪᕐᑲᖅᑐᑦ ᖃᖓᑕᖅᑐᐃᑦ, ᐊᒻᒪ Ammonium Nitrate / ᐅᖅᓱᐊᓗᒃ, ᐊᐅᓚᑦᑐᙱᕐᓂᐊᕐᓗᒍ ᖃᖅᑎᕆᓂᕐᒧᑦ ᐅᖓᑕᐅᑦᑎᓯᒪᓗᐊᖅᑐᓄᑦ ᐅᔭᖅᑲᓄᑦ, ᐊᒃᑕᖁᖅᑕᐅᔪᓄᑦ ᐅᔭᖅᑲᓄᑦ, ᐅᔭᕋᖅᓂᐊᖅᑕᐅᔪᓄᑦ ᓴᓇᔾᔪᑎᒋᔭᐅᔪᑦ ᐅᔭᖅᑲᓄᑦ, ᖁᐊᖅᓯᒪᔪᑦ ᐅᔭᕋᖅᓂᐊᖅᑕᐅᔪᓄᑦ ᑲᑎᓯᒪᔪᑦ, ᐊᒻᒪ ᓯᐅᕋᙳᖅᑎᓯᒪᔪᓄᑦ ᓄᓇᒥᑦ ᐊᒻᒪ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᓴᓇᔭᐅᑎᓪᓗᒍ ᐊᒻᒪ ᐊᐅᓛᖅᑎᓪᓗᒍ ᐱᓕᕆᐊᖅ.

ᑕᒪᐃᓂᓗᒃᑖᖅ ᐱᖁᑎᑦ ᐊᑐᖅᑕᐅᔭᕆᐊᖃᖅᑐᑦ ᖃᖅᑎᕆᓂᕐᒧᑦ ᐊᐅᓚᖅᑎᑕᐅᖃᑦᑕᕐᓂᐊᖅᑐᑦ ᐅᒥᐊᒃᑯᑦ ᖃᑉᐳᓈᓂᑦ ᑲᖏᖅᓱᓂᕐᒧᑦ, ᓯᑲᐅᓄᐊᖅᑕᐅᓗᑎᒃ ᐅᒥᐊᕐᔪᐊᖅ ᑭᓵᖅᓯᒪᕕᖕᖓᓂᑦ, ᐃᑎᕕᐊᓄᐊᕈᔾᔭᐅᓗᑎᒃ. ᓯᑲᐅᑦ ᐅᓯᖏᔭᖅᑕᐅᕌᓂᒃᐸᑕ, ᑐᖅᑯᖅᓯᓯᒪᕖᑦ ᐃᓗᓕᖅᑐᑦ ᑖᑉᑯᓂᙵᑦ ᑐᖅᑯᖅᑕᐅᓯᒪᓚᐅᐱᓪᓚᖅᑲᑦᑕᕐᓂᐊᖅᑐᑦ ᐊᕙᓗᓕᖏᓐᓂᑦ ᐃᑎᕕᐊᓂᑦ ᓄᓇᒃᑰᕈᑎᒃᑯᑦ ᐊᐅᓚᖅᑎᑕᐅᓂᐊᕐᒪᑦ ᐅᔭᕋᖅᓂᐊᕐᕕᖕᒧᑦ, ᐱᙳᕐᑐᑑᓗᑎᒃ ᖃᖓᑕᖅᑐᐃᑦ, boosters, ᐊᒻᒪ ᒪᑐᐃᑦ, ᐅᔭᕋᖅᓂᐊᕐᕕᖕᒧᐊᕈᔾᔭᐅᑕᐃᓐᓇᕐᓂᐊᖅᑐᑦ ᐅᓯᖏᔭᖅᑕᐅᕌᓂᒃᐸᑕ ᓯᑲᐅᓂᑦ. ᑕᒪᒃᑯᐊ ᑐᖅᑯᖅᑕᐅᓯᒪᓚᐅᐱᓪᓕᐊᖅᑲᖅᐸᑕ ᑲᖏᖅᓱᓂᕐᒥᑦ, ᑐᖅᑯᖅᑕᐅᓯᒪᓂᐊᖅᑐᑦ ᑐᖅᑯᖅᓯᒪᕕᖕᖓᓂᑦ ᒪᓕᒡᓗᒋᑦ ᑲᓇᑕᒥᑦ *ᖃᖓᑕᖅᑐᓄᑦ ᐱᕐᑯᔭᖅ* ᐊᒻᒪ *ᒪᓕᒐᐃᑦ.* ᑐᖅᑯᖅᑕᐅᓯᒪᓚᐅᐱᓪᓚᒡᕕᒃ ᖃᐅᔨᓴᖅᑎᑕᖃᐃᓐᓇᕐᓂᐊᖅᑐᖅ ᐊᒡᒍᐃᒃᑯᓐᓂᑦ ᐱᓕᕆᔨᖖᒐᓄᑦ.

ᐅᔭᕋᖅᓂᐊᕐᕕᐅᑉ ᐱᕐᑎᖏᑦ ᖃᖓᑕᖅᑐᓄᑦ ᐃᓚᐅᓂᐊᖅᑐᑦ l) ᒥᑭᔪᓂᒃ ᐃᒪᖃᖅᑐᓕᕆᕕᒃ (ᖃᖓ), ii) ᕗᔪᖃᑖᑦ ᑐᖅᑯᖅᑕᐅᓯᒪᓗᑎᒃ ᖃᖓᑕᖅᑐᐃᑦ ᓰᕐᓗ boosters, ᖃᖅᓯᔾᔪᑎ, Ammonium Nitrate / ᐅᖅᓱᐊᓗᒃ, ᐊᒻᒪ ᐊᕕᒃᑕᐅᖅᖃᖅᑎᓐᓇᒋᑦ ᖃᖓᑕᖅᑐᐃᑦ (ᖃᖓᓂᑦ ᐊᒻᒪ ᓄᓇᐅᑉ ᐊᑖᓂ), iii) ᒪᑐᐃᑦ (ᖃᖓᓂᑦ ᐊᒻᒪ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ), ᐊᒻᒪ iv) ᑐᖅᑯᖅᓯᒪᓂᖏᑦ ᐱᖁᑎᑦ ᐊᑐᖅᑕᐅᔪᑦ ᒥᑭᔪᓂᒃ ᐃᒪᓕᐅᖅᐸᓪᓕᐊᓂᕐᒧᑦ. A 3T ᓄᓇᒃᑰᕈᑎ ᐊᖅᔭᖅᑐᐃᔾᔪᑎ ᖃᖓᑕᖅᓂᒃ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᖅ ᐃᓂᐅᔪᒥᑦ ᐊᖅᔭᖅᓯᓂᕐᒧᑦ ᒥᑭᔪᓂᒃ ᐃᒪᕐᓂᑦ (ᕝᕗᖅᓯᒪᔪᑦ 1.2 t-ᒥᒃ ᐃᓂᑏᑦ) ᒥᑭᔪᓂᒃ ᐃᒪᓕᕆᕕᖕᒥᑦ ᓄᓇᐅᑉ ᐊᑖᓄᑦ ᐅᔭᕋᖅᓂᐊᕐᕕᐅᔪᒧᑦ. ᐃᓗᓕᖃᕈᓐᓇᖅᑐᖅ 10T-ᓂᒃ ᖃᖓᑕᖅᑐᓂᒃ ᓄᓇᒃᑰᕈᑎ ᑕᐃᔭᐅᔪᖅ

Mobile Manufacturing Unit-ᒥᒃ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᖅ ᐊᒡᔭᖅᓯᓂᕐᒧᑦ ᒥᑭᔪᓂᒃ ᐃᒪᕐᓂᑦ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᒧᑦ ᖃᖅᑕᕐᕕᐅᔪᒧᑦ. ᒥᒃᓵᒋᐊᖅᑎᓐᓂᕐᒧᑦ ᐊᓯᐊᔾᕙᓪᓕᐊᓂᖅ ᐊᒻᒪ ᐱᐅᓯᒋᐊᖅᑎᓐᓂᕐᒧᑦ ᐊᑐᕐᓂᖅ ᖃᖅᑕᖅᑐᓂᒃ, ᒥᑭᔪᑦ ᐃᒪᖅ ᐊᑐᖅᑕᐅᓗᐊᕐᓂᐊᖅᑐᑦ ᐊᔪᙱᒻᒪᑕ ᐃᒪᖅᑕᕐᑲᕋᓗᐊᖅᑎᓪᓗᒍ ᐊᖓᔪᓂᑦ. ᐊᑐᖅᑕᐅᖏᑦᑐᑦ ᖃᖅᑕᖅᑐᐃᑦ ᐊᑐᖅᑕᐅᔪᖕᓇᖅᑑᒐᓗᐊᑦ ᐊᔾᔨᒌᖏᑎᑦᑎᑐᐃᓐᓇᕐᓂᐊᖅᑐᖅ, ᒥᒃᓵᒋᐊᖅᑎᑦᑎᓗᓂ ᓴᖏᓐᓂᖓᓂᒃ ᐱᔭᐅᔪᒥᒃ ᓯᕐᑲᓪᓕᑎᓇᓂᕐᒧᑦ ᓯᕐᑲᓪᓕᑎᓇᕖᖕᒥᑦ ᑕᐃᒪᓐᓇᒧᑦ ᐱᐅᓯᒋᐊᖅᓯᓗᓂ ᐊᑐᖅᑕᐅᓂᖏᑦ ᖃᖅᑕᖅᑐᐃᑦ.

ᐃᑲᔪᐃᓂᕐᒧᑦ ᐊᑦᑕᓇᖅᑐᖅᑕᕐᑲᙱᓪᓗᒍ ᑐᖅᑯᖅᑕᐅᓯᒪᑦᑎᐊᕐᓗᑎᒡᓗ ᐅᖅᓱᐊᓗᐃᑦ, ᐅᓗᓇᐊᓇᖅᑐᑦ, ᐊᒻᒪ ᐅᓗᓇᐊᓇᖅᑐᑦ ᐊᒃᑕᑯᐃᑦ, ᖃᓄᐃᖓᓂᖏᓐᓅᖓᔪᑦ ᐱᕐᑯᐃᑦ ᒪᓕᖕᓂᐊᖅᑐᑦ ᐋᔾᔨᖏᑦᑐᓂᒃ ᒪᓖᒃᑕᐅᔫᒃᓴᓂᒃ ᐋᕿᒃᑕᐅᔪᑦ ᒪᓕᒐᓂᒃ ᑲᒪᔾᔭᐅᔪᓄᑦ. ᒥᑭᔪᓂᒃ ᐃᒪᓕᓇᕕᒃ ᕿᑯᖕᒥᑦ ᓇᑎᖅᑲᕐᓂᐊᖅᑐᖅ ᐊᒻᒪ ᓴᓂᕋᖅᑲᕐᓗᓂ ᑕᒪᐃᓂᒃ ᑯᕕᔪᒃᑖᑦ ᐃᒡᓗᕐᔪᐊᕐᒥᓐᓂᐊᕐᒪᑕ. ᐱᕐᑯᐃᑦ ᖃᖅᑕᖅᑐᓕᖑᐊᖅᑐᑦ ᑐᖅᑯᖅᑕᐅᓯᒪᓂᐊᖅᑐᑦ ᒪᓕᒡᓗᒋᑦ ᒪᓕᒐᐃᑦ. ᑯᕕᔪᕐᑲᖅᐸᑦ, ᑯᕕᔪᓂᒃ ᓂᓇᐅᓇᙳᖏᑦᑐᓕᓇᓂᕐᒧᑦ ᐸᕐᓇᐅᑎ ᐊᑐᓕᖅᑎᑕᐅᓂᐊᖅᑐᖅ ᐊᒻᒪ ᐱᕐᑯᐃᑦ ᑖᑉᑯᓄᙳᒐ ᐊᑐᖅᑕᐅᓗᑎᒃ ᐊᑕᐅᓯᕐᒥᑎᑦᑎᓂᕐᒧᑦ ᑯᕕᔪᓕᓇᔅᔪᐃᑦ. ᖃᓄᐃᓕᑦᑕᐃᓕᒪᑎᑦᑎᓗᒃᑖᑦ ᐊᒻᒪ ᓯᕐᑯᒥᑦᑐᓕᓇᓃᑦ ᐱᓕᓇᐊᖑᓂᐊᖅᑐᑦ ᐊᒻᒪ ᑎᑎᕋᐅᓯᐅᓗᑎᒃ ᒪᓕᒡᓗᒋᑦ ᐊᐅᓚᕐᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᕐᑲᑦᑕᖅᑐᑦ. ᓇᓗᓇᐃᔭᖅᓯᒪᔪᑦ ᑐᐊᕕᓇᖅᑐᓕᓇᓂᕐᒧᑦ ᐅᐸᓗᐊᑲᐅᑎᒋᓂᕐᒧᑦ ᐸᕐᓇᐅᑎ ᑐᓂᔭᐅᓂᐊᖅᑐᖅ ᖃᖅᑕᖅᑐᓂᒃ ᐱᕕᐅᔪᓂᒃ ᐊᒻᒪ ᐃᓚᐅᑎᑕᐅᓂᐊᖅᑐᑦ ᑭᖑᓪᓕᐅᓂᐊᖅᑐᒥᑦ ᑕᒡᕙᓂ ᐸᕐᓇᐅᑎᒥᑦ, ᓴᓇᔭᐅᓂᐊᖕᓵᖅᑎᓪᓗᒋᑦ. ᐱᓕᓇᐊᖅᑲᕐᓂᐊᖅᑐᖅ ᐱᐅᖏᑦᑖᒃᑯᑦ ᐱᓇᔭᖅᑐᒥᑦ, ᓘᕐᓗ ᐱᓂᕐᓗᐊᕿᓂᒃᑯᑦ ᖃᖅᑐᕐᑲᕐᓂᒃᑯᑦ.

ᖃᖅᑎᓇᓂᕐᒧᑦ ᐊᑦᑕᓇᖅᑐᒦᑎᑦᑎᑦᑕᐃᓕᒪᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᔪᑦ ᓯᕐᑯᑉᑎᓇᓂᕐᒧᑦ ᐅᔭᖅᑲᓂᒃ ᐅᕐᑲᐅᓯᐅᔪᑦ ᐸᕐᓇᐅᑎᒥᑦ ᓄᓇᐅᑉ ᖃᖓᓄᑦ, ᐊᒻᒪ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ. ᐊᔪᕈᖕᓃᖅᓴᖅᓯᒪᔪᐃᓐᓇᐃᑦ ᐊᒻᒪ ᓇᓗᓇᐃᑯᑕᖅᑖᖅᓯᒪᔪᑦ ᐃᓄᐃᑦ ᐱᓕᓇᐊᕐᑲᕐᑲᑦᑕᕐᓂᐊᖅᑐᑦ ᖃᖅᑕᖅᑐᓂᒃ. ᖃᖅᑕᖅᑐᓕᓇᕗᑦ ᐊᔪᕈᖕᓃᖅᓴᐃᓂᕐᑲᕐᓂᐊᖅᑐᑦ ᐊᒻᒪ ᐱᓕᓇᓗᑎᒃ-ᐊᔪᕈᖕᓃᖅᓴᓗᑎᒃ ᒪᓕᑦᑎᐊᕐᓂᕐᒧᑦ ᒪᓕᒐᓂᒃ. ᐃᓗᐊᓂᑦ ᖃᐅᔾᔮᐃᓃᑦ ᐊᒻᒪ ᕿᒥᕐᕈᓃᑦ ᑕᒪᐃᓐᓗᒃᑖᖅ ᐃᓚᒋᔭᐅᔪᓂᒃ ᖃᖅᑕᖅᑐᓕᓇᓂᕐᒥᑦ ᐱᓕᓇᐊᖑᖅᑲᑦᑕᕐᓂᐊᖅᑐᑦ ᐊᔪᙱᓐᓂᖅᑲᖅᑐᓄᑦ ᐱᓕᓇᔾᔪᓄᑦ, ᐊᒻᒪ ᖃᓄᐃᖓᓂᐅᔪᑦ ᑎᑎᕋᐅᓯᐅᓗᑎᒃ ᒪᓕᒡᓗᒋᑦ ᖃᓄᐃᓐᓂᐅᔪᓄᑦ ᐊᑦᑕᓇᖅᑐᒦᑎᑦᑎᑦᑕᐃᓕᒪᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᑦ ᐊᐅᓚᖅᑎᑦᑎᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᔪᓂᑦ. ᑕᒪᐃᓂᒃ ᐃᒪᓐᓈᖅᑑᑎᓗᒃᑖᑦ ᖃᓄᐃᓕᐅᖅᑯᔭᐅᓃᓪᓗ ᒪᓕᒐᓂᒃ ᑲᒪᔩᓄᑦ ᐊᒻᒪ ᕿᒥᕐᕈᔩᓄᑦ ᑭᐅᔾᔪᑕᐅᖃᑦᑕᕐᓂᐊᖅᑐᑦ ᐊᒻᒪ ᐱᓕᓇᐊᓇᓗᒋᑦ.

EXECUTIVE SUMMARY

This Explosives Management Plan (the Plan) provides information on the manufacture, transport, storage, handling, and use of explosives at the Agnico Eagle Mines Limited (Agnico Eagle) Meliadine Gold Project (Project). Aspects related to marine shipping and marine mammals are presented in Agnico Eagle's Shipping Management Plan (Agnico Eagle 2014a). The main federal and territorial legislation, which cover the control and use of explosives are: Canada - *Explosives Act* and *Regulations; Transport of Dangerous Goods Act and Regulations; National Fire Code of Canada;* Nunavut - *Explosives Use Act* and *Regulations, Transportation of Dangerous Goods Act* and *Regulations*; *Mine Health and Safety Act* and *Regulations*; *Fire Prevention Act* and *Regulations;* and *Safety Act* and *Regulations*.

Agnico Eagle intends to use emulsion-based explosives, as well as Ammonium Nitrate / Fuel Oil, for controlled blasting of overburden rock, waste rock, ore, construction rock, frozen ore stockpile, and granular material on surface and underground during the construction and operation phases of the Project.

All products required for blasting activities will be shipped by vessel from the south to Rankin Inlet, loaded onto barges at the vessel anchoring location, and transported to Itivia. After the barges are unloaded, sea cans holding the raw products will be temporarily stored in a fenced laydown area at Itivia before being trucked to the mine site, with the only exceptions being explosives, boosters, and caps, which will be transported directly to the mine site after being unloaded from the barge. In the event that these products require temporary storage in Rankin Inlet, they will be stored in appropriate storage magazines meeting federal *Explosives Act* and *Regulations*. The temporary storage magazines will remain under constant surveillance by Agnico Eagle personnel.

Mine infrastructure related to explosives will include an i) Emulsion Plant (surface), ii) Powder Magazines for storage of explosives such as boosters, detonating cord, Ammonium Nitrate / Fuel Oil, and presplitting explosives (surface and underground), iii) Cap Magazines (surface and underground), and iv) storage of raw materials used in the preparation of emulsion. A 3T capacity explosive delivery truck will be used on-site to transport emulsion (in totes of 1.2 t of capacity) from the Emulsion Plant to the underground mining operations. A 10t capacity explosive truck called Mobile Manufacturing Unit will be used to deliver emulsion in the open pit production blastholes. To minimize loss rate and optimize usage of explosives, emulsion will be mostly used since it is efficient regardless the presence of water in boreholes. Unused explosives that are still usable will be returned to storage. The blasting patterns will favor communition, which will reduce energy consumption related to the crushing at the mill therefore optimizing use of explosives.

To assist in the safe and secure storage of fuels, hazardous materials, and hazardous wastes, design criteria of the infrastructure will follow the various guidelines set by regulatory bodies. The Emulsion Plant will be equipped with a concrete floor and walls so that all spills can be wholly contained

within the building. Products entering the composition of explosives will be stored in accordance with regulation. In the event of a spill, the Spill Contingency Plan will be put into operation and appropriate equipment will be used to contain spilled materials. All preventive and breakdown maintenance will be carried out and recorded in accordance with standard operating procedures. A detailed Emergency Response Plan will be provided by the explosives supplier and will be included in the next version of this Plan, prior to construction. It will address worst case scenarios, such as an accidental explosion.

Blasting safety procedures on breaking rock are described in this Plan for surface, as well as underground operations. Only trained and certified persons will work with explosives. The explosives personnel will undertake formal training and on-the-job training to ensure compliance with legislation. Internal audits and inspections of all components related to explosives management will be conducted on a regular basis by qualified personnel, and the results recorded according to quality and safety standard operating procedures. All recommendations and orders made by regulators and inspectors will be responded to and acted upon accordingly.

TABLE OF CONTENTS

TABLES AND FIGURES

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	October 2012			First draft of the Explosives Management Plan	Blandine Arseneault, Env. Superintendent, Agnico Eagle Ryan Vanengen, Biologist, Agnico Eagle
2	March 2013			DEIS re-submission	No change; rebranding
3	April 2014	3.3-3.4	8-9	Added details on best practices and types of explosives	Josée Noël, Env. Coord. Agnico Eagle
		3.5	10	Reduced instantaneous pressure change from 100 to 50 kPa	John Witteman, Env. Consultant, Agnico Eagle
4	April 2015			Update of entire document for submission for Type A Water Licence	François Petrucci, Agnico Eagle

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ANFO	Ammonium Nitrate / Fuel Oil
CCME	Canadian Council of Ministers of the Environment
MMU	Mobile Manufacturing Unit
NIRB	Nunavut Impact Review Board
NWT	Northwest Territories
Nu	Nunavut
PHC	Petroleum Hydrocarbons
Plan	Explosives Management Plan
PVS	Peak Vector Sum
WHMIS	Workplace Hazardous Materials Information System

SECTION 1 • INTRODUCTION

1.1 Overview

Agnico Eagle Mines Limited (Agnico Eagle) intends to use explosives for controlled blasting of overburden rock, waste rock, ore, construction rock, frozen ore stockpile, and granular material on surface and underground during the construction and operations phases of the Meliadine Gold Project (Project).

1.2 Purpose and Scope

This Explosives Management Plan (the Plan) provides information on explosives manufacture, transport, storage, handling, and use at the Project and its conformity with Section 9.4.13 of the *NIRB Guidelines for the Preparation of an Environmental Impact Statement for Agnico Eagle Mines Ltd.'s Meliadine Project (NIRB File No. 11MN034),* and with the Nunavut Water Board's *Mining and Milling: Supplemental Information Guideline for Mine Development*.

1.3 Related Documents

Documents containing information related to this Plan include the following:

- Environmental Management and Protection Plan;
- Risk Management and Emergency Response Plan;
- Spill Contingency Plan;
- Landfill and Waste Management Plan;
- Hazardous Materials Management Plan;
- Borrow Pits and Quarries Management Plan;
- Water Management Plan;
- Occupational Health and Safety Plan (Agnico Eagle 2014b); and
- Oil Pollution Emergency Plan (Agnico Eagle 2014c).

1.4 Applicable Legislation

The control and use of explosives within Canada and Nunavut is covered by existing federal and territorial Acts and Regulations. The Project will put in place operational policies and procedures, which meet or exceed applicable legislation. Applicable Acts, Regulations, and Guidelines are listed in Table 1-1.

Table 1-1 Applicable Legislation to Explosives Management

Acts	Regulations	Guidelines
Federal		
Canadian Environmental Protection Act (1999 c.33)	*Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197)* *Environmental Emergency Regulations* (SOR/2003-307) *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301)	*Canadian Council of the Ministers of Environment - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products* Notice with respect to substances in the National Pollutant Release Inventory Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil
Fisheries Act (R.S.C. c. F-14)	*Metal Mining Effluent Regulations* (SOR/ 2002-2222)	Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters
Explosives Act (1985 c.E-17)	*Explosives Regulations* (C.R.C., c. 599) *Ammonium Nitrate and Fuel Oil Order* (C.R.C., c. 598)	Blasting Explosives and Initiation Systems: Storage, Possession, Transportation, Destruction and Sale
National Fire Code of Canada (2010)		
Transport of Dangerous Goods Act (1992, c.34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	
Territorial – Nunavut		
Environmental Protection Act (RSNWT (Nu) 1988, c E-7)	*Spill Contingency Planning and Reporting Regulations* (NWT Reg (Nu) 068-93) *Used Oil and Waste Fuel Management Regulations* (NWT Reg 064-2003)	Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for the Management of Waste
Mine Health And Safety Act (SNWT (Nu) 1994, c 25)	*Mine Health And Safety Regulations* (NWT Reg (Nu) 125-95)	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	*Explosives Regulations* (RRNWT (Nu) 1990 c E-27)	
Fire Prevention Act (RSNWT (Nu) 1988, c F-6)	*Fire Prevention Regulations* (RRNWT (Nu) 1990 c F-12)	
Safety Act (RSNWT 1988, c.S-1)	*General Safety Regulations* (RRNWT (Nu) 1990 c S-1) *Work Site Hazardous Materials Information System Regulations* (RSNWT 1988, C 81 (Supp))	
Transportation Of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c 81 (Supp))	*Transportation Of Dangerous Goods Regulations* (1991, NWT Reg (Nu) 095-91)	

SECTION 2 • MANUFACTURE OF EXPLOSIVES

2.1 Infrastructure

The construction and operation of the Project will require the use of ammonium nitrate/fuel oil (ANFO) and emulsion based explosives. ANFO will be used during construction until the Emulsion Plant begins manufacturing emulsion-based explosives. Presplit explosives will also be used to control the final pit walls, where required. General infrastructure for the management of explosives at the mine site includes the following:

- Emulsion Plant;
- storage of raw materials used in the manufacturing of emulsion;
- Powder Magazines for storage of explosives such as boosters, detonating cord, presplit explosives, and ANFO (surface and underground mining); and
- Cap Magazines (surface and underground).

The Emulsion Plant will operate 7-days a week on a 12-hour per day basis. The explosives truck(s) will be based at the Emulsion Plant. A garage will be included in the building for the maintenance and washing of trucks and equipment used to handle the explosives. The water used for the manufacturing of emulsion will be supplied by truck from the proposed mine site's fresh water tank. Waste water generated inside the Emulsion Plant will be collected and disposed in an appropriate method (remaining solids will be disposed in the same manner as unusable emulsion as described in Section 3.6).

2.2 Location

The Emulsion Plant, raw material storage, and magazines will be safely located away from vulnerable facilities, as stipulated by the federal and territorial *Explosives Use Act* and *Regulations*.

The Emulsion Plant will be located approximately 2 kilometres north-west of the mine site as shown on Figure 2-1. The Surface Powder Magazine area and the Cap Magazines will be located along the road providing access to the Emulsion Plant.

Underground facilities will include Powder Magazines and Cap Magazines. These facilities will be constructed as stipulated in the applicable regulations.

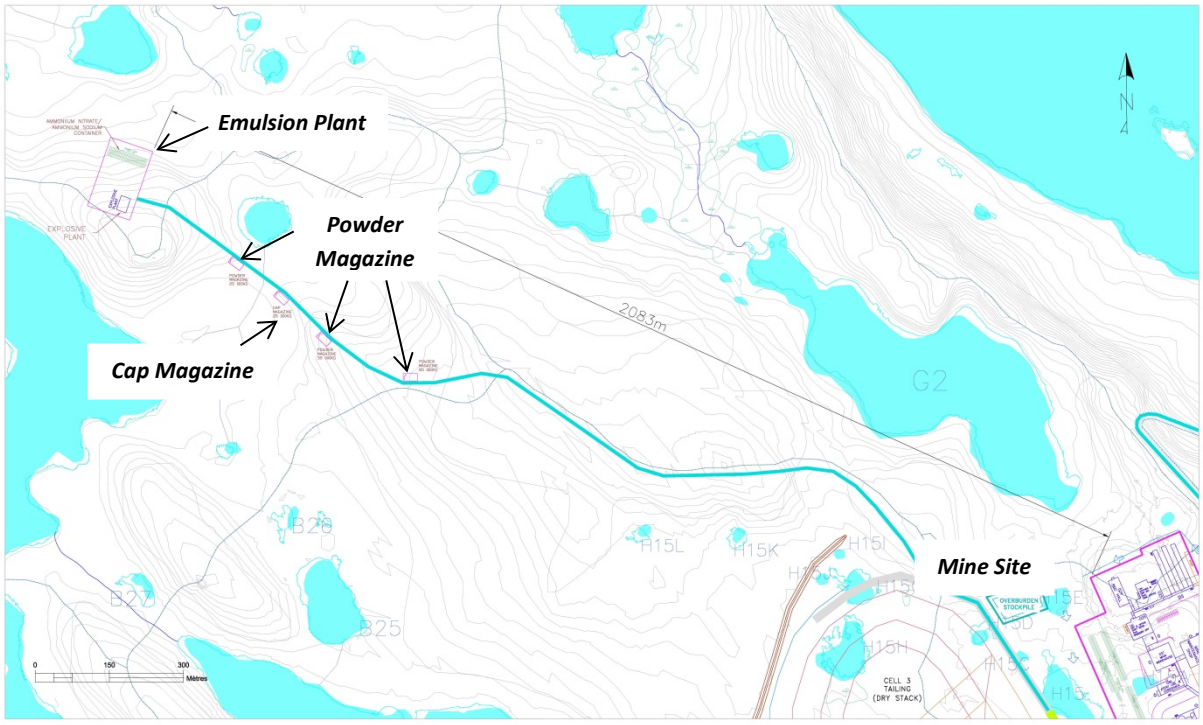

Figure 2-1 Location of Cap Magazine, Powder Magazine, and Emulsion Plant

2.3 Products

The following products will be required for manufacturing emulsion:

- surfactant (highly reacted oil mixture);
- ammonium nitrate;
- sodium nitrate;
- water; and
- microballoons.

The explosive truck (Mobile Manufacturing Unit or MMU) used to deliver emulsion at surface operations (i.e., open pit, quarry, or frozen stockpiles blasting) will use either water or a mixture of water and glycol during freezing conditions to allow for the pumping of the emulsion into the blastholes.

The following products will be required to achieve blasting activities:

- explosives;
- caps;
- boosters;

- detonating cords; and
- glycol (during freezing conditions).

2.4 Emulsion Plant Flow Sheet

The flow sheet of the Emulsion Plant is presented in Appendix B.

2.5 Design Criteria

To assist in the safe and secure storage of fuels, hazardous materials, and hazardous wastes, general design criteria for storage areas and facilities related to explosives will be followed as listed below:

- Design will be in compliance with the *National Fire Code*, where appropriate.
- Compliance with the Canadian Council of Ministers of the Environment (CCME), *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (2003)* will be followed. This CCME code deals with inventory control, inspections, corrosion protection, records, and monitoring. Environment Canada's *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* outlines registration and documentation requirements for storage tanks.
- Emulsion Plant will be adequately signed indicating that hazardous materials/wastes are stored therein.
- Storage locations will be clearly defined and marked to prevent damage to storage drums and containers in the event they are covered by snow.
- Incompatible materials will be segregated by chemical compatibility within the storage area to prevent contact between materials in the event of a release.
- Emulsion Plant will be located at least 31 metres from surface waters.
- Emulsion Plant will be readily accessible for firefighting and other emergency procedures.
- Emulsion Plant will be adequately ventilated to prevent the build-up of noxious or toxic vapors.
- Secondary containment will be installed to allow for the containment of at least 110 % of the largest container or tank volume of any chemical within the contained area.
- Emulsion Plant will be constructed, or provided with barriers, to protect containers from physical damage.
- Adequate spill and emergency response equipment will be installed in each storage area (i.e., spill control, fire protection, etc.).

SECTION 3 • HANDLING OF EXPLOSIVES

3.1 Transport

All products required for blasting activities will be shipped by vessel from the south to Rankin Inlet, loaded onto barges at the vessel anchoring location, and transported to Itivia. The bypass road and All-weather Access Road will be used to truck explosives and raw materials for manufacturing explosives to designated storage locations at the mine site.

The handling of explosives on-site will be carried out by the supplier and by qualified Agnico Eagle staff (blasters and helper-blasters) under a permit to conduct such work.

A 3T capacity explosive delivery truck will be used on-site to transport emulsion (in 1.2 t of capacity totes) from the Emulsion Plant to the underground mining operations. A 10 t capacity explosive truck called MMU will be used to deliver emulsion in the open pit production blastholes.

3.2 Storage

After the barges are unloaded, sea cans holding the raw products will be temporarily stored in a fenced laydown area at Itivia before being trucked to the mine site, with the exception of explosives, boosters, and caps, which will be transported directly to the mine site after being unloaded from the barges. In the event that these products require temporary storage in Rankin Inlet, they will be stored in appropriate storage magazines meeting federal *Explosives Act* and *Regulations*. The temporary storage magazines with remain under constant surveillance by Agnico Eagle personnel while in use.

On the mine site, raw materials such as sodium nitrate and ammonium nitrate used in the preparation of emulsion will be contained in 1.2 t tote bags, and stored in sea cans (capacity of approximately 20,000 kilograms each). Raw materials of different and incompatible types will be stored in separate sea cans to prevent their mixing. Raw materials will also be stored away from any other products as required by explosive regulations. The explosive caps will be stored in enclosed Cap Magazines (surface and underground). The boosters, detonating cord, and explosives used for pre-shearing and ANFO will be stored in an enclosed Powder Magazine. Surface and underground mining activities will require approximately 10 to 20 magazines in total, which will be managed according to the explosive regulations.

3.3 Blasting Activities

Blast frequency will be between two and four blasts per day, including underground and surface activities. Table 2.1 summarizes the blasting information for both the open pit and underground operations. The quarries, and possibly the borrow pits and stockpiles in some instances, will also require the use of explosives.

Table 2.1 Blasting Details – Meliadine Gold Project

Parameters	Values
Open Pit	
Quantity extracted per blast	120,000 t
Blasting area	120 m^2
Number of blasts per day	2 to 4
Underground	
Quantity extracted per blast (stope)	10,000 t
Quantity extracted per blast (development)	250-350 t
Number of blasts per day	2 to 4

The primary blasthole drills for surface mining will be diesel-powered rigs, whereas electric rigs will be used underground. A number of operating procedures will be implemented to adapt blasting to factors that can affect the operations, notably weather in relation to open pit operations. These may include minimizing the delays between the loading and blasting of holes, ensuring that cuttings are mounded around the holes collar after loading to prevent snow drifting into the holes, and utilizing blasthole covers. Emulsion is efficient (i.e., minimized loss rate) regardless of the presence of water. Unused explosives that remain viable will be returned to storage.

Blasting will likely be by electric initiation and will feature current technology with surface and in-the-hole delays to minimize the energy per delay to single hole loads. This will minimize backbreak, fly rock, vibration levels, and will optimize fragmentation and minimize excavation problems. The blasting patterns will favor communition, which will reduce energy consumption related to the crushing at the mill. Usage of explosives will therefore be optimized.

Blasting will be carried out by certified blasters who will follow blasting regulations and safe practices. The responsibility for blasting will be split between appropriately trained mine personnel and the explosives supplier.

Finally, there is often a relationship between ammonia and nitrate levels in surface water runoff and the quantity of ANFO type explosives that haven't detonated during the blast. Well planned blasts and strict control of spillage are keys to reducing ammonia losses. For safety, environmental, and economic reasons, blast designs will be optimized and will include measures that favor complete detonation of all explosives. Drill patterns, explosive loads, and initiation methods will be designed and performed by experienced professionals, and will be adaptively managed to make necessary adjustments should any problems be observed. Also, having a single explosives supplier and trained certified blasters loading the holes and performing blasting activities will ensure the consistency and

efficiency of the activity. Blasters who are conscientious and aware can prevent most spills by adjusting their loading practices.

3.4 Type of Explosives

The explosive composition can also influence ammonia and nitrate leaching rates, which ultimately can have an influence on loss rates. ANFO is less costly than other explosives, but it readily dissolves in water. Therefore, for economical, operational, and environmental reasons, ANFO will not be used when there is an anticipated presence of water. Emulsion releases ammonia and nitrates much more slowly than ANFO. This is in part why, when planning the operation, emulsion explosives will be favored over ANFO whenever possible. Emulsion is a versatile product that can be used in dry and wet conditions. Moreover, pumped emulsion reduces spillage, and with excellent water resistance, minimizes potential nitrate leaching and the resultant environmental impact (ammonia in water). Blasting with a high energy bulk emulsion explosive is planned with a targeted powder factor of 0.0.37 kg/t in ore, and 0.27 kg/t in waste. Emulsion will be produced on-site within an explosive plant operated and maintained by an explosive supplier. The current plan is to use the same emulsion product for both open pit and underground operations to minimize the complexity of the plant (i.e., only one product)

3.5 Blast Monitoring for the Protection of Fish

3.5.1 Objectives

Monitoring to evaluate blast related peak particle velocity and overpressure to protect nearby fish bearing waters will be conducted to ensure blast operations meet the requirements of specific charge weight/delay/set.

The detonation of explosives in or near water produces compressive shock waves that can cause significant impacts to the swim bladders of fish, rupture other internal organs, and/or damage or kill fish eggs and larvae. In addition, the effects of the shock waves can be intensified in the presence of ice. Fisheries and Oceans Canada guidelines developed in 1998 to protect fish and fish habitat from works or undertakings that involve explosives in or near fisheries waters (Wright and Hopky 1998; see Appendix A) have, in part, been superseded by research carried out by Godard et al. (2008). In particular, the recommended maximum instantaneous pressure change has been reduced from 100 to 50 kPa. As a result, Agnico Eagle will adhere to the following guidelines:

- No explosive is to be detonated in or near fish habitat that can produce an instantaneous pressure change greater than 50 kPa in the swim bladder of a fish.
- No explosive is to be detonated that produces a peak particle velocity greater than 13 millimetres per second in a spawning bed during the period of egg incubation (for lakes near the Project, the fisheries window is from August 15 to June 30 for fall spawning fish [e.g., lake trout]).

Peak particle velocity and overpressure monitoring data will be recorded at a minimum of two locations at the Project. The locations will be selected to confirm that the above guidelines are achieved. The data will be routinely reviewed, evaluated as compared to the guidelines, and compiled at the end of the year during annual reporting.

3.5.2 Methods

Blasts will be monitored using a vibration and overpressure monitoring system that is compliant with the international Society of Explosives and Engineers performance specification for blasting seismographs. The monitoring system has three main parts: a monitor, a standard transducer (geophone), and a microphone. The monitor contains the battery and electronic components of the instrument. It also checks the two sensors to be sure that they work properly.

The transducer measures transverse, vertical, and longitudinal ground vibrations with a mechanism called a geophone. Transverse ground vibrations agitate particles in a side-to-side motion. Vertical ground vibrations agitate particles in an up-and-down motion. Longitudinal ground vibrations agitate particles in a back-and-forth motion progressing outward from the event site. The monitoring system calculates the peak particle velocity for each geophone and calculates the vector sum of the three axes. The final result is the Peak Vector Sum (PVS) and is the resultant particle velocity magnitude of the event:

$$PVS = \sqrt{(T^2 + V^2 + L^2)}$$

Where:
T = particle velocity along the transverse plane
V = particle velocity along the vertical plane
L = particle velocity along the longitudinal plane

The transducer will be installed as per the model specifications.

3.6 Disposal of Wastes

Disposal of regular waste will follow the Landfill and Waste Management Plan for the Project.

Any hazardous material that requires disposal will be handled according to the Project's Hazardous Materials Management Plan, submitted as part of the Type A Water Licence application.

Used water generated at the Emulsion Plant will be re-used within the plant when feasible. Any excess used water will be collected and disposed in an appropriate method. Remaining solids will be disposed in the same manner as unusable emulsion as described below.

Any unusable/unused emulsion waste, as well as other explosive products whose expiry date has passed, will be taken to the open pit blast pattern for disposal down the blastholes.

The empty explosive boxes or bags that cannot be reused will be burned on-site according to the conditions stipulated in the permit.

SECTION 4 • SPILLS

4.1 Spill Prevention

The Emulsion Plant will have a concrete floor with channels and sumps so spills are 100 % contained within the building. All facilities related to explosives handling on-site will be secured (locked) and regularly inspected by site security.

More details regarding spill preventive methods are provided in Spill Contingency Plan, submitted as part of the Type A Water Licence Application for the Project. The following is a summary of the main aspects:

- All storage tanks containing products that enter the composition of explosives will be in accordance with the provisions of regulations (e.g., National Fire Code, *Environmental Protection Act*).
- In case of a spill, the Spill Contingency Plan will be put into action and appropriate equipment will be used to contain the liquids or solids spilled.
- All preventive and breakdown maintenance will be carried out and recorded in accordance with standard operating procedures.

4.2 Intervention in Case of a Spill

Table 4-1 summarizes procedures to be applied in case of a leak or a spill of a product used in the manufacture of emulsion. Means of disposal of waste are also included. More details regarding hazardous materials and spill management are provided in the Spill Contingency Plan.

Table 4-1 Procedures in Case of Leaks and Spills of Explosive Products[1]

Product	Description	Spill and Leak Procedures	Waste Disposal
Ammonium Nitrate	Odorless, white to light, tan crystalline solid.	Remove source of heat and ignition. Sweep or shovel spill into a clean, non-combustible container. Wash remaining trace residues with water. Wear rubber gloves and safety glasses to prevent contact with skin and eyes.	Dispose of as-is in approved containers. As much as possible, remove, the spilled material as a solid.
Surfactant	Dyed or pale yellow liquid with petroleum odor.	Eliminate any source of ignition. Prevent spills from entering watercourses or drainage systems. Contain with sand or earth. Recover with pump or inert absorbent material, and place in clean container(s). Wear safety glasses and rubber gloves to prevent contact with eyes and skin.	Dispose as specified in the Hazardous Material Management Plan.
Emulsion	Blasting agent.	Remove all sources of heat and ignition. Prevent spills from entering watercourses or drainage systems. If a large amount of emulsion is involved, contain spill with earth or sand. Recover spilled material with a diaphragm pump. Use of a diaphragm pump also requires an air compressor. Limitation of the pump suction is approximately 2.5 metres, pump discharge is approximately 8 metres. Use a screening device on pump suction hose. Out of area spills will require taking two pumps and extra hose. Transfer the product into a tanker trailer or clean 200 litre drums. If a small amount of emulsion is involved, transfer material into a clean plastic container with a plastic shovel. Label tanker trailer or drums. Wear rubber gloves and rubber boots.	Recycle product, if possible. If not practical, detonate in a blasthole, or if a large amount is involved, demulsify with liquid detergent.
Sodium Nitrate prill	Oxydizing agent, white to light yellow crystals, faint odour.	In the event of a spill or leak, contact the vendor for advice. Wear respirator, protective clothing, and gloves. Vacuuming is the recommended method to clean-up spills. Do not sweep or use compressed air for clean-up. Recover spilled material using non-combustible materials, such as vermiculite. Use non-sparking tools and place in covered containers for disposal. Any recovered material may be used for its intended purpose, depending on contamination.	Dispose of the waste material at an approved hazardous waste treatment/disposal facility in accordance with the Hazardous Material Management Plan.

[1] *Table will be updated on a regular basis considering the WHMIS sheets.*

SECTION 5 • PERSONNEL TRAINING PROGRAM

Only trained and certified persons will work with explosives. The explosives personnel will undertake formal training and on-the-job training to ensure compliance with legislation. Training requirements will include (but will not be limited to) the following:

- specific fire procedures as per the *Federal Explosives Act*;
- first aid;
- Transportation of Dangerous Goods;
- blasting certificate; and
- Workplace Hazardous Materials Information System (WHMIS).

SECTION 6 • BLASTING SAFETY MEASURES

6.1 Surface

Blasting safety procedures for breaking rock and frozen material are as follows for blasting on the surface (open pit and quarry operations):

- No unauthorized person is allowed inside a posted blast area whether the holes have been loaded or not.
- The blasting supervisor and the blaster are responsible for the safe handling, loading, and connection of a blast.
- The shift supervisor is responsible for the evacuation of all personnel and equipment from the blast area and the guarding of the blast.
- The general supervisor is responsible for notifying the appropriate blast personnel, and other departments and personnel who may be affected by a particular blast.
- Guards will be posted prior to blast time, and must remain guarding until they are told verbally by the shift supervisor that they can leave their position.
- Once guards are posted, the blast area must be inspected by the shift supervisor to ensure that no personnel or equipment remain inside the blast area.
- A blast-warning siren will be sounded for one minute; three minutes after this, the blast will be fired.
- The blaster will only fire the blast when given a direct verbal order to do so by the shift supervisor.
- Before firing a shot, the blaster must ensure the immediate area is clear (i.e., aircraft, etc.).
- The shift supervisor and blaster will inspect the fired shot for indications of any problems, such as misfires or cut-offs.
- Areas in which charged holes are awaiting firing shall be guarded or posted against unauthorized entry.
- Vehicles containing explosives shall not be taken to the repair shop or any other building for any purpose, with the exception of the MMU truck containing unused bulk emulsion. At the end of the shift, the MMU will be parked inside the explosive plant for usage the next day. No open flames or welding are to be used for field repairs unless explosives are first removed.
- All loaded patterns, in addition to being marked with blasting signs, will be clearly delineated to outline the pattern when necessary.
- Redrills shall be marked in an appropriate way and be designated by a member of the blasting crew; the marker shall be firmly implanted in the cuttings of the hole to be redrilled. The marker shall be removed by the driller before drilling and inverted in the hole after drilling for pickup by the blasting crew.

- Where redrills are required on loaded patterns, the drill must be guided by the blasting supervisor or blaster or a responsible person designated by them.
- Service vehicles and fuel trucks are not allowed on a loaded pattern; the drill must pull well clear of the loaded holes before any service or maintenance can be done on it. Where the drill cannot be moved and service is required, it may be done only under the direct supervision of the blast supervisor or designate, and all loaded holes must be covered.

6.2 Underground

Blasting safety procedures for breaking rock are as follows for underground operations:

- Underground blasts will occur at approximately the same time during the day.
- All employees working underground must be back on surface and have removed their badges from the presence board.
- Before blasting, the responsible supervisor makes sure that there are no badges remaining on the presence board.

SECTION 7 • INTERNAL AUDIT AND INSPECTION

Internal audits and inspections of all components related to the Explosives Management Plan will be conducted as required by the regulations. Inspections for physical condition and serviceability will be done on a regular basis by qualified personnel, and the results recorded according to quality and safety standard operating procedures. Qualified personnel will perform regular inspections of the Emulsion Plant and of the Powder and Cap magazines storing the boosters, caps, and explosives to ensure that inventory is documented and confirmed.

All recommendations and orders made by Natural Resources Canada Explosives Branch Inspectors, Fire Marshals, and Insurance Inspectors will be responded to and acted upon accordingly.

SECTION 8 • EMERGENCY RESPONSE PLAN

A detailed Emergency Response Plan will be prepared by the explosives supplier, which will address potential incidents involving the manufacturing, transport, handling, and storage of explosives and related products. The supplier's Emergency Response Plan will be provided as an appendix in the next version of this Plan, prior to construction. It will prescribe the actions that supplier and Agnico Eagle employees must take to ensure employee and public safety in the event of an emergency.

The following situations (worse case scenarios) will be addressed relative to explosives in the Emergency Response Plan:

- fire/explosion;
- storage tank failure;
- spills from product delivery trucks;
- spills from raw material delivery trucks;
- process spills;
- shut-down due to weather, floods, lightning, fires, explosions, and other threats to the security and operation of supplier's facilities, equipment and material;
- bomb threats; and
- quantities of spills that are reportable to the supplier and authorities.

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APPENDIX A • GUIDELINES FOR THE USE OF EXPLOSIVES IN OR NEAR CANADIAN FISHERIES WATER

Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters

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1998

Canadian Technical Report of Fisheries and Aquatic Sciences 2107

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

ABSTRACT

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: iv + 34p.

The federal *Fisheries Act* includes provisions for the protection of fish, shellfish, crustaceans, marine mammals and their habitats. The detonation of explosives in or adjacent to fish habitat has been demonstrated to cause disturbance, injury and/or death to fish and marine mammals, and/or the harmful alteration, disruption or destruction of their habitats, sometimes at a considerable distance from the point of detonation.

Within the context of the guidelines and procedures outlined in this report, an explosive is defined as a chemical compound which, when detonated, creates a compressional wave having an almost instantaneous rise time to a very high peak pressure followed by a decay to below ambient pressure by either rapid oxidation or the breaking of high-energy chemical bonds.

The purpose of this report is to provide information to proponents who are proposing works or undertakings that involve the use of confined or unconfined explosives in or near Canadian fisheries waters, and to which the *Fisheries Act*, Sections 32 and 35 in particular, may apply. Guidelines are provided on methods and practices for the conservation and protection of fish, marine mammals, and fish habitat from impacts arising from the destructive forces of explosives. The report describes the suggested application and review procedures and processes for proponents whose use of explosives may result in the destruction of fish, or the harmful alteration, disruption or destruction of fish habitat.

RÉSUMÉ ANALYTIQUE

Wright, D.G. et G.E. Hopky. *Lignes directrices concernant l'utilisation d'explosifs à l'intérieur ou à proximité des eaux de pêche canadiennes,* rapport technique canadien des sciences halieutiques et aquatiques 2107, 1998, iv + 34 p.

La *Loi sur les pêches* fédérale renferme des dispositions relatives à la protection du poisson, des mollusques, des crustacés, des mammifères marins et de leur habitat. Il a été prouvé que la détonation d'explosifs dans l'habitat du poisson ou à proximité perturbe, blesse ou tue des poissons et des mammifères marins ou encore entraîne la détérioration, la destruction ou la perturbation de leur habitat. Il arrive parfois que les dommages se fassent sentir à une distance considérable du point de détonation.

Aux fins des lignes directrices et des procédures énoncées dans le présent rapport, on entend par explosif un composé chimique qui, lorsqu'il explose, crée une vague de compression entraînant presque instantanément un pic de pression extrêmement élevé suivi d'une décroissance sous la pression ambiante soit par oxydation rapide ou par la rupture des liaisons chimiques à haute énergie.

Le présent rapport a pour but de fournir de l'information aux promoteurs qui proposent des ouvrages ou des entreprises nécessitant l'utilisation d'explosifs confinés ou non confinés à l'intérieur ou à proximité des eaux de pêche canadiennes et auxquels la *Loi sur les pêches,* plus précisément les articles 32 et 35, pourraient s'appliquer. Il renferme des lignes directrices concernant les méthodes et pratiques de conservation et de protection du poisson, des mammifères marins et de leur habitat contre les effets découlant de la force destructrice des explosifs. On y décrit les procédures de présentation des demandes et d'examen pour les promoteurs qui prévoient l'utilisation d'explosifs de nature à entraîner la destruction du poisson ou la détérioration, la perturbation ou la destruction de son habitat.

SCOPE AND RATIONALE

The federal *Fisheries Act* includes provisions for the protection of fish, shellfish, crustaceans, marine mammals and their habitats. The detonation of explosives in or adjacent to fish habitat has been demonstrated to cause disturbance, injury and/or death to fish and marine mammals, and/or the harmful alteration, disruption or destruction of their habitats, sometimes at a considerable distance from the point of detonation. Therefore, the Department of Fisheries and Oceans (DFO) has prepared this document to provide information to proponents on the conservation and protection of fish, marine mammals, and their habitat from impacts arising from the use of confined or unconfined explosives in or near Canadian fisheries waters. The guidelines, and application and review procedures and processes outlined in this document apply in the context of the legislative and policy framework summarized below.

APPLICABLE LEGISLATION AND POLICY

Fisheries Act

A number of sections of the *Fisheries Act* and its attendant regulations are applicable to the conservation and protection of fish and fish habitat from the destructive forces of explosives.

- Section 2 defines “Canadian fisheries waters" as meaning all waters in the fishing zones of Canada, all waters in the territorial sea of Canada and all internal waters of Canada.

- Section 2 defines “fish" as including shellfish, crustaceans, marine animals and the eggs, sperm, spawn, spat and juvenile stages of fish, shellfish, crustaceans and marine animals.

- Section 32 prohibits the destruction of fish by any means other than fishing, except as authorized by the Minister of Fisheries and Oceans or under regulations made by the Governor in Council under the *Fisheries Act*.

- Subsection 34(1) defines “fish habitat” as meaning spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.

- Subsection 35(1) prohibits any person from carrying on any work or undertaking that results in the Harmful Alteration, Disruption or Destruction (HADD) of fish habitat.

- Subsection 35(2) provides for the alteration, disruption or destruction of fish habitat by any means or under any conditions authorized by the Minister of Fisheries and Oceans or under regulations made by the Governor in Council under the *Fisheries Act*.

- Subsection 36(3) prohibits the deposit of a deleterious substance into waters frequented by fish, unless otherwise permitted by regulation.

- Subsection 58(1) of the *Fishery (General) Regulations* provides for anyone proposing to carry on any work or undertaking likely to result in the HADD of fish habitat, to apply to have the means or conditions of that work or undertaking authorized by the Minister under Subsection 35(2) of the *Fisheries Act*, using the form set out in Schedule VI. Schedule VI includes a section for the applicant to provide details on the proposed use of explosives.

- Subsection 58(2) of the *Fishery (General) Regulations* provides the means for the Department of Fisheries and Oceans to issue Authorizations under Subsection 35(2) of the *Fisheries Act*, using the form set out in Schedule VII.

- Section 7 of the *Marine Mammal Regulations* prohibits disturbance of marine mammals except when fishing for them.

In addition, the Department of Fisheries and Oceans has developed a policy framework to assist in the interpretation and application of the applicable legislation. The most relevant documents are as follows:

- The **Policy for the Management of Fish Habitat** (1986) provides policy direction for interpreting the broad powers mandated in the *Fisheries Act* in a way that is consistent with the concept of sustainable development. To achieve the Policy's goal of fish habitat conservation when reviewing project proposals with the potential to affect fish habitat, DFO's habitat managers apply the No Net Loss (NNL) guiding principle. Under this principle, the Department strives to maintain the existing productive capacity of fish habitats, such that the fish habitat is able to sustain the production of fish suitable for fisheries purposes.

  In summary, in order to meet the NNL guiding principle, the habitat manager's first preference is to avoid or reduce the project's potential for a HADD of fish habitat through the application of appropriate mitigation measures. Avoidance measures, such as project relocation or redesign, can be effectively applied at the project design stage. Failing that, impacts may be further reduced by application of specific mitigation measures, such as use of timing windows during the construction phase. If a HADD is still expected to occur, unavoidable - i.e. residual - losses in habitat productive capacity may be compensated on a case-by-case basis if the manager concludes that compensation is acceptable and feasible.

- The **Directive on the Issuance of Subsection 35(2) Authorizations** (1995) clarifies the circumstances when an Authorization under Subsection 35(2) may be issued, and on providing proponents with letters of advice suggesting means of avoiding HADD of fish habitat.

- The **Habitat Conservation and Protection Guidelines** (1998) is a document for use by DFO's staff in administering the habitat provisions of the *Fisheries Act*. It outlines a standard approach to habitat conservation and protection through the application of the NNL guiding principle.

Canadian Environmental Assessment Act

A decision to issue an Authorization under Section 32 or Subsection 35(2) of the *Fisheries Act* triggers an environmental assessment under the *Canadian Environmental Assessment Act* (CEAA).

IMPACTS

The use of explosives may result in a number of adverse impacts on fish and marine mammals, and their habitats.

Effects on Fish

The detonation of explosives in or near water produces post-detonation compressive shock waves characterized by a rapid rise to a high peak pressure followed by a rapid decay to below ambient hydrostatic pressure. The latter pressure deficit causes most impacts on fish.

The primary site of damage in finfish is the swimbladder, the gas-filled organ that permits most pelagic fish to maintain neutral buoyancy. The kidney, liver, spleen, and sinus venous also may rupture and haemorrhage. Fish eggs and larvae also may be killed or damaged (Wright 1982).

Studies (Wright 1982) show that an overpressure in excess of 100 kPa will result in these effects. The degree of damage is related to type of explosive, size and pattern of the charge(s), method of detonation, distance from the point of detonation, water depth, and species, size and life stage of fish.

Vibrations from the detonation of explosives may cause damage to incubating eggs (Wright 1982, Wright in prep.). Sublethal effects, such as changes in behaviour of fish, have been observed on several occasions as a result of noise produced by explosives. The effects may be intensified in the presence of ice and in areas of hard substrate (Wright 1982, Wright in prep.).

The detonation of explosives may be lethal to marine mammals and may cause auditory damage under certain conditions. The detonation of explosives in the proximity of marine mammals also has been demonstrated to induce changes in behaviour (Wright in prep.).

The number of shellfish and crustaceans killed by the detonation of explosives is believed to be negligible, however, few data are available. Sublethal effects of explosives on

shellfish and crustaceans including behavioural modifications are little known or understood (Wright 1982, Wright in prep.).

Effects on Fish Habitat

The use of explosives in and near fish habitat may also result in the physical and/or chemical alteration of that habitat. For example, sedimentation resulting from the use of explosives may cover spawning areas or may reduce or eliminate bottom-dwelling life forms that fish use for food. By-products from the detonation of explosives may include ammonia or similar compounds and may be toxic to fish and other aquatic biota (Wright in prep.).

GUIDELINES, AND APPLICATION AND REVIEW PROCESSES

The following sections have been prepared to guide proponents proposing works or undertakings that involve the use of confined or unconfined explosives in or near Canadian fisheries waters, and to which the *Fisheries Act*, Sections 32 and 35 in particular, may apply. Confined explosives are those that would be used within a substrate, including ice, while unconfined explosives are those that would be used in open water, or not within a substrate.

Note that the information and guidance provided in these sections pertains to the conservation and protection of fish and fish habitat in the context of the *Fisheries Act*, and to the CEAA requirements that may result. There is no intent to relieve the proponent of responsibilities under any other federal, provincial or municipal legislation. Proponents are encouraged to contact other appropriate regulatory agencies to ensure that the proposed work or undertaking is carried out according to their requirements.

GUIDELINES

This section provides guidelines on methods and practices which, if incorporated into a project proposal, are intended to prevent or avoid the destruction of fish, or any potentially harmful effects to fish habitat that could result from the use of explosives. Implementation of these measures, for this purpose, is at the discretion of the proponent. Use of these guidelines should not be taken to imply approval of the proposed project in accordance with the *Fisheries Act*. Note that should the proponent proceed with the project and the use of explosives results in the destruction of fish and/or the HADD of fish habitat as a result of a change in plans, or failure to implement the measures, contravention of Section 32 and/or Subsection 35(1) of the *Fisheries Act* could occur.

1. Proponents considering the use of explosives are encouraged to consult the appropriate DFO Regional/Area authorities (Appendix I) as early as possible in their planning process to identify possible alternatives to the use of explosives, the biological resources and their habitats at risk, and/or effective mitigation measures.

2. Where provincial or territorial resource management agencies, or aboriginal resource management boards undertake the administration of fisheries, the proponent is encouraged to consult with the relevant authorities.

3. The use of confined or, in particular, unconfined explosives in or near Canadian fisheries waters is discouraged, and proponents are encouraged to utilize other potentially less destructive methods wherever possible.

4. No use of ammonium nitrate-fuel oil mixtures occurs in or near water due to the production of toxic by-products (ammonia).

   Note:

   - The deposit of deleterious substances into waters frequented by fish is prohibited under Section 36(3) of the *Fisheries Act*, unless otherwise permitted by regulation. There is no regulation pursuant to the *Fisheries Act* that permits the deposit of by-products resulting from the use of ammonium nitrate-fuel oil mixtures.

5. After loading a charge in a hole, the hole is to be back-filled (stemmed) with angular gravel to the level of the substrate/water interface or the hole collapsed to confine the force of the explosion to the formation being fractured. The angular gravel is to have a particle size of approximately 1/12th the diameter of the borehole.

6. All “shock-tubes" and detonation wires are to be recovered and removed after each blast.

7. No explosive is to be knowingly detonated within 500 m of any marine mammal (or no visual contact from an observer using 7x35-power binocular).

   Note:

   - Upon review of a proposal, the DFO Regional/Area authority may impose a greater avoidance distance, depending on the size of the charge or other project specific or fishery resource conditions.

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 swimbladder of a fish.

   Notes:

   - For confined explosives, setback distances from the land-water interface (e.g., the shoreline), or burial depths from fish habitat (e.g., from under the riverbed) that will ensure that explosive charges meet the 100 kPa overpressure

guideline are shown in Table 1. Equations to derive these relationships have been adapted from Nicholls et al. (1971) and Anon (1980). The equations are described in Appendix II, and should be used for weights of explosives not covered in Table 1. Sample calculations and examples are illustrated in Appendix Ill.

- If a confined explosive is to be detonated close to the substrate-water interface (such as in trenching or demolition), the set-back distance closely approximates the theoretical lethal range within which 50% of the fish may be killed or injured. Consequently, the 100 kPa guideline is not likely to be met in those situations where, because of the design constraint's of the project, it is also likely not possible or practical to 'adjust' the setback distance as a means to meet the 100 kPa guideline. For example, preparation of a trench for a pipeline crossing typically requires no more than a below grade burial depth of about 2m. Therefore, the weight of explosive charge per delay will have to be adjusted in an effort to meet the 100 kPa guideline. A sample calculation to illustrate a trenching example is given in Appendix III.

- For unconfined explosives, proponents are encouraged to contact the appropriate DFO Regional/Area authorities (Appendix I) for further guidance.

9. No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 $mm \cdot s^{-1}$ in a spawning bed during the period of egg incubation.

Note:

- For confined explosives, setback distances or burial depths from spawning beds that will ensure that explosive charges meet the 13 $mm \cdot s^{-1}$ guideline criteria are shown in Table 2. Equations to derive these relationships have been adapted from Nicholls et al. (1971) and Anon (1980) and are described in Appendix II. Sample calculations and examples are illustrated in Appendix III.

- For unconfined explosives, proponents are encouraged to contact the appropriate DFO Regional/Area authorities (Appendix I) for further guidance.

APPLICATION AND REVIEW PROCESSES

Proponents planning to use an explosive that is likely to destroy fish and/or cause a HADD of fish habitat are subject to certain legal obligations under the *Fisheries Act*, as identified in the preceding 'Applicable Legislation and Policy' section. This section discusses these obligations with respect to the proposed use of explosives, and suggests to proponents how to fulfil them.

Proponents should contact the DFO Regional/Area authorities (Appendix I) as early as possible in their planning process. The purpose is to find out whether the proposed use of

explosives is likely to affect a Canadian fisheries water and whether its use is likely to destroy fish and/or cause a HADD of fish habitat. Depending on the outcome, DFO may also discuss potential issues, specific information requirements, or the next steps and possible outcomes in a further review of the proposal. For example, as summarized in the subsequent 'Review and Decision-making Process' section, possible next steps could include a request for further information, or a recommendation that the proponent seek an authorization pursuant to Section 32 and/or Subsection 35(2). Possible outcomes may include the provision of written advice, the issuance of (an) authorization(s) subject to completion of a CEAA review, or, refusal to issue (an) authorization(s).

Proponents should contact DFO before irrevocable commitments (such as contracts for equipment/services) are made, in order to avoid any unnecessary delays in the application and review process. Note that DFO may become aware of your proposed project through its participation in co-operative arrangements with other governments, agencies, boards, etc.

The following 'Application Procedures' section provides information to assist the proponent in deciding if it should seek Authorization to destroy fish by means other than fishing, and/or Authorization to harmfully alter, disrupt or destroy fish habitat, through the use of explosives and, if so, provides information on procedures for filing, etc.

Note that application for Authorization under Section 32 and/or Subsection 35(2) is voluntary. Proponents are not prohibited from going ahead with their use of explosives without Authorization. But, if as a result of the use of explosives, fish are destroyed and/or there is a HADD of fish habitat, contravention of Section 32 and/or Subsection 35(1) of the *Fisheries Act* could occur and the proponent is liable to prosecution.

Application Procedures

1. Proponents unable to meet the overpressure or peak particle velocity guideline values identified, respectively, in measures 8 or 9 of the preceding 'Guidelines' section, should complete and submit an application for Authorization under Section 32 of the *Fisheries Act*, to destroy fish by means other than fishing. The recommended application form is shown in Appendix IV. However, the proponent should contact the appropriate DFO Regional/Area authority (Appendix I) to verify that this is the appropriate application form to use and/or to identify information requirements.

2. Proponents who wish to file for Authorization under Subsection 35(2) of the *Fisheries Act* should complete and submit a separate application in accordance with the form prescribed pursuant to Subsection 58(1) of the *Fishery (General) Regulations* (Appendix V). Assistance on filing the application form, and related procedures, may be obtained by contacting the appropriate DFO Regional/Area authorities (Appendix I).

3. Proponents seeking Authorization under both Section 32 and Subsection 35(2) should complete and submit both Section 32 (Appendix IV) and Subsection 35(2) (Appendix V) applications. However, to minimize duplication, the proponent may choose to cross-reference those sections that are the same in each application form, and is expected to only submit one set of the documents requested in the forms, unless otherwise requested by the DFO Regional/Area authority. Contact the appropriate DFO Regional/Area authorities (Appendix I) for further information and assistance.

4. In seeking Authorization, the proponent will be expected to provide the information requested in the application forms. Doing so will expedite the review process.

   In general, the proponent is expected to provide all plans, specifications, studies, procedures, samples or other information required to permit an assessment of the potential impact of the proposed use of explosives on fish and fish habitat, and the mitigation and/or compensation measures proposed to alleviate impacts and/or to compensate for any loss of productive capacity of habitat to produce fish. Typically, the fish and/or fish habitat information requirements include, but may not necessarily be limited to the items summarized below:

   a) A description of the project and the expected effects resulting from the use of explosives on the fisheries resources (including marine mammals) and/or fish habitat, including:

      i) A description of fish and marine mammal species and their habitats likely to be affected by the detonation;
      ii) A description of whether the fish, marine mammals and their habitats contribute, or have the potential to contribute, directly or indirectly, to a fishery - subsistence, commercial or recreational;
      iii) The timing of any seasonal migration of fish and marine mammals;
      iv) The theoretical lethal range (i.e., the range, or distance, over which the overpressure exceeds 100 kPa) of the explosives to be used (from equations provided in Appendix II);
      v) An assessment of potential impacts arising from the proposed use of explosives and a description of proposed mitigation and/or compensation measures; and
      vi) Other matters, such as the proposed contingency plan and monitoring and follow-up program.

   b) The proponent's mitigation plan should include discussion of the following measures that are particularly relevant to alleviating the potential impacts of explosives:

      i) The work or undertaking should be undertaken at the time of least biological activity or biological sensitivity. Proponents should consult with DFO Regional/Area authorities to determine the appropriate timing;

ii) If multiple charges are required, time-delay detonation initiators (blasting caps) should be used to reduce the overall detonation to a series of discrete explosions. Time delays for discrete explosions should be greater than 25 ms; and,
iii) If possible, large charges should be subdivided into a series of smaller discrete detonations or explosions using time-delay detonation initiators (a procedure known as decking) to reduce the overall detonation to a series of smaller discrete detonations or explosions.

In addition to these measures, the proponent should also consider additional mitigation measures including, but not limited to the following:

iv) Deployment of bubble curtains/air curtains to disrupt the shock wave;
v) Deployment of noise generating devices, such as an air compressor discharge line, to scare fish away from the site; or,
vi) Removal or exclusion of fish from the work area before the blast occurs.

5. Proponents should be aware that subsequent to filing the application, DFO may request additional information concerning fish and fish habitat, the mitigation and/or compensation plans, the contingency and monitoring and follow-up programs, and other matters as required to complete the *Fisheries Act* review. If the appropriate information is not already available, it is the proponent's responsibility to provide it and, also, to assure DFO that the proposed mitigation and/or compensation measures will be effective. Should it be necessary to conduct an environmental assessment of the project pursuant to the CEAA, then additional information will be required in order to meet the requirements of the CEAA.

6. The Department of Fisheries and Oceans will undertake to: respond to requests for review, or to referrals, of project proposals or activities; issue Authorizations or provide advice; and/or complete environmental assessments in a manner consistent with Departmental service standards. Generally, DFO will respond to requests for review or to referrals within 30 working days of notification. Timeframes required for the issuance of Authorizations or advice will be discussed with proponents. Proponents should be aware that the length of time required to complete a review can vary greatly, often depending on the type and complexity of project proposed, the fish and fish habitat issues involved, and whether or not an environmental assessment under the CEAA is required. Once again, proponents are encouraged to contact the appropriate DFO Regional/Area authorities (Appendix I) to discuss these issues.

7. If an unforeseen need to use explosives arises, Departmental service standards may be waived and a review completed as expeditiously as possible so as not to unduly delay a project. Further, Departmental service standards are waived in the event of an emergency where lives and/or property are threatened. In such cases, the amount of information required may be reduced due to the urgency of the

situation. Any verbal request for an emergency Authorization will be accepted only on the condition that it is followed by a written confirmation of the project details.

8. If applicable, proponents may be required by the Department of Fisheries and Oceans, Canadian Coast Guard, to issue a "Notice to Mariners" and/or a "Notice to Fishers". The appropriate DFO Area/Regional authorities (Appendix I) are prepared to assist the proponent with contacting the Canadian Coast Guard.

9. Resource management agencies of other governments, departments, or boards that have been established under some aboriginal land claim settlements, may have aquatic resource review requirements and service standards that are different than those described in this document. Proponents should contact those agencies to ensure compliance with any requirements they may have.

Review and Decision-making Process

This section summarizes the approach taken by the Department of Fisheries and Oceans in the review of referrals and of applications for Authorization. Included is a description of the key decisions possible from a review, and the criteria used in making decisions. There is also a brief summary of the linkage between Section 32 and/or Subsection 35(2) Authorizations and the responsibilities of the Department of Fisheries and Oceans to undertake environmental assessments pursuant to the *Canadian Environmental Assessment Act* (CEAA).

Fisheries Act

DFO will review the proponent's application in accordance with the *Fisheries Act* and its supporting policy framework, including this document. Upon receipt of information, notice, a referral, or application for Authorization concerning works or undertakings where the use of explosives is proposed, DFO will normally take the following steps in its review of the proposal:

1. Determine the adequacy of the information provided by the proponent.

2. Using the information provided, assess the extent of risk or potential damage to fish and marine mammals and/or fish habitat and the acceptability of this level of damage in context with the level of protection required.

3. Determine the probable success of proposed mitigation and/or compensation measures and, as appropriate the acceptability of any residual impacts.

4. Where relevant, consult with the appropriate provincial or territorial resource management agencies, and/or aboriginal resource management boards.

5. Note that prior to finalizing its review of the proposal DFO may, among other matters, advise the proponent of the need for more information, re-assess a revised project proposal, suggest that the proponent seek authorization, etc. The

review of a proposal is often an iterative process depending on a number of factors, such as the type of referral received by DFO, is completeness, its potential impacts on fish and/or fish habitat and the potential to mitigate and/or compensate for such impacts. Proponents should discuss this and related aspects of the review process with the relevant DFO/Regional area authority (Appendix I).

6. After examination of the proposal, DFO will make a decision regarding the proponent's application.

- **With respect to Section 32, DFO will either,**

  ⇒ upon determining that implementation of mitigation measures by the proponent is expected to prevent or avoid the destruction of fish, advise the proponent by letter that if such measures are incorporated into the project, Section 32 is not expected to be contravened. A letter of advice should not be taken to imply approval of the project pursuant to the habitat provisions of the *Fisheries Act*, or any other legislation. Note, if the destruction of fish occurs as a result of a change in the plans for the proposed project, or failure to implement the measures identified in the letter of advice, contravention of Section 32 of the *Fisheries Act* could occur.

  OR

  ⇒ upon determining that even with the implementation of mitigation measures the destruction of fish is still expected to occur **and**, because this mortality is acceptable within the context of the fisheries resource, issue a Section 32 Authorization using a letter format.

  OR

  ⇒ upon determining that even with the implementation of mitigation measures the destruction of fish is still expected to occur **but**, because this mortality is not acceptable within the context of the fisheries resource, reject the proposal, and notify the proponent that DFO will not issue a Section 32 Authorization and that a contravention of the *Fisheries Act* could occur should the proponent still choose to proceed as proposed.

- **With respect to Section 35, DFO will either,**

  ⇒ upon determining that implementation of mitigation measures by the proponent is expected to prevent or avoid a HADD of fish habitat, advise the proponent by letter that if such measures are incorporated into the project, Subsection 35(1) is not expected to be contravened. A letter of advice should not be taken to imply approval of the project pursuant to the habitat provisions of the *Fisheries Act*, or any other legislation. Note, if a

HADD of fish habitat occurs as a result of a change in the plans for the proposed project, or failure to implement the measures identified in the letter of advice, contravention of Subsection 35(1) of the *Fisheries Act* could occur.

OR

⇒ upon determining that even with the implementation of mitigation measures a HADD of fish habitat is still expected to occur **and**, because the proposed compensation for the unavoidable net loss of productive capacity of fish habitat is acceptable to DFO, issue a Subsection 35(2) authorization using the form provided in Schedule VII of Subsection 58(2) of the *Fishery (General) Regulations*.

OR

⇒ upon determining that even with the implementation of mitigation measures a HADD of fish habitat is still expected to occur **but**, because the proposed compensation for the unavoidable net loss of fish habitat productive capacity is not acceptable, reject the proposal, and notify the proponent that DFO will not issue a Subsection 35(2) Authorization and that a violation of the *Fisheries Act* could occur should the proponent still choose to proceed as proposed.

Notes:

- The Department of Fisheries and Oceans, in arriving at one of the above noted determinations, will also consider the following criteria:
    - Whether the use of explosives is the only technically feasible means by which to attain the desired objective; and
    - Whether the use of explosives is required to alleviate an emergency situation threatening human safety and/or property.
- Section 32 and/or Subsection 35(2) authorizations come with conditions attached, which among others may include:
    - The proponent may be required to develop, undertake and report on a monitoring program at its expense, typically, to monitor compliance and evaluate effectiveness of the mitigation and/or compensation measures.
    - If, during the course of the works or undertakings, the adverse effects of the explosives were significantly greater than anticipated, the proponent may be required to immediately cease all further use of explosives,

pending review of the situation with Department of Fisheries and Oceans personnel.

- Additional, site-specific terms and conditions as may be required in order to satisfy fishery resource and/or fish habitat protection requirements. For example, the conditions may be more stringent than the measures identified in the preceding 'Guidelines' section.

Canadian Environmental Assessment Act

Section 32 and Subsection 35(2) are included in the *Law List Regulation* of the *Canadian Environmental Assessment Act* (CEAA). Consequently, the Department of Fisheries and Oceans as the Responsible Authority must conduct an environmental assessment of the relevant proposed works or undertakings before an Authorization can be issued. If the result of the environmental assessment is that the work or undertaking will, after taking into account the appropriate measures, not likely result in significant impact that cannot be justified, then authorization(s) will normally be issued pursuant to Section 32 and/or Subsection 35(2) of the *Fisheries Act*. Procedures for coordinating the CEAA review with provincial and aboriginal government review processes vary. Proponents are strongly advised to contact the DFO Regional/Area authorities (Appendix I) to obtain additional information on environmental assessment procedures and requirements.

UPDATING

These guidelines will be reviewed and updated as necessary.

ACKNOWLEDGEMENTS

Many individuals and governmental and non-governmental organizations were consulted in the development of these guidelines. We gratefully acknowledge their interest and contributions. In particular, input from D. Haché, K. Fisher, K. Broughton and R. Drolet, from DFO, and L. Macanuf (Golder-VME) and R. Morin (Explotec Engineering Ltd) is appreciated.

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Table 1. Setback distance (m) from centre of detonation of a confined explosive to fish habitat to achieve 100 kPa guideline criteria for various substrates.

The data in this table is incorrect and should not be used.

Substrate Type	Weight of Explosive Charge (kg)							
	0.5	1	2	5	10	25	50	100
Rock	3.6	5.0	7.1	11.0	15.9	25.0	35.6	50.3
Frozen Soil	2.3	3.2	4.5	7.2	14.3	16	22.6	32
Ice	1.5	2.1	3.0	4.7	6.6	10.5	14.8	21
Saturated Soil	1.5	2.1	3.0	4.8	6.7	10.0	15.1	21.3
Unsaturated Soil	0.7	1.0	1.4	2.2	3.1	4.9	6.9	9.8

Erratum:

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: iv + 34p.

Page 15: Table 1 should be replaced by the following Table:

Table 1. Setback distance (m) from centre of detonation of a confined explosive to fish habitat to achieve 100 kPa guideline criteria for various substrates.

Substrate Type	Weight of Explosive Charge (kg)							
	0.5	1	2	5	10	25	50	100
Rock	3.6	5.0	7.1	11.0	15.9	25.0	35.6	50.3
Frozen Soil	3.3	4.7	6.5	10.4	14.7	23.2	32.9	46.5
Ice	3.0	4.2	5.9	9.3	3.2	20.9	29.5	41.8
Saturated Soil	3.0	4.2	5.9	9.3	13.2	20.9	29.5	41.8
Unsaturated Soil	2.0	2.9	4.1	6.5	9.2	14.5	20.5	29.0

Table 2. Setback distance (m) from centre of detonation of a confined explosive to spawning habitat to achieve 13 mm•sec^{-1} guideline criteria for all types of substrate.

	Weight of Explosive Charge (kg)						
	0.5	1	5	10	25	50	100
Setback distance (m)	10.7	15.1	33.7	47.8	75.5	106.7	150.9

Appendix I
DFO Regional/Area Authorities

Newfoundland Region

Habitat Evaluation Engineer,
Habitat Management Division
Fisheries and Habitat Management Branch
PO Box 5667
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Voice: (709) 772-6157
Fax: (709) 772-4525

Maritime Region

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Nova Scotia

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Laurentian Region

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Fish Habitat and Environmental Science
Maurice-Lamontagne Institute
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Central and Arctic Region

Ontario

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Fisheries Management Branch
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Manitoba, Saskatchewan and Alberta

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Fax: (204) 984-2402

Appendix I (concluded)
DFO Regional/Area Authorities

Central and Arctic Region (continued)

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Western Arctic

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Pacific Region

North Coast

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Yukon

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Appendix II
General Equations to Determine Setback Distance for Confined Explosives to Meet Guideline Criteria of 100 kPa

Equation (A)

Equation (A) describes the transfer of shock pressure from the substrate to the water.

$$P_W = \frac{2(Z_W / Z_R)P_R}{1+(Z_W / Z_R)}$$

where:

P_W = pressure (kPa) in water
P_R = pressure (kPa) in substrate
Z_W = acoustic impedance of water
Z_R = acoustic impedance of substrate

Equation (B)

Equation (B) describes the relationship between acoustic impedance and the density and velocity of the medium through which the compressional wave travels.

$$Z_W/Z_R = \frac{D_W C_W}{D_R C_R}$$

where:

D_W = density of water = 1 g•cm^{-3}
D_R = density of the substrate in g•cm^{-3}
C_W = compressional wave velocity in water
= 146,300 cm•s^{-1}
C_R = compressional wave velocity in substrate in cm•s^{-1}

Appendix II (concluded)
General Equations to Determine Setback Distance for Confined Explosives to Meet Guideline Criteria of 100 kPa

Equation (B) (continued):

The following values are used for D_R and C_R for various substrates:

Substrate	D_R ($g \cdot cm^{-3}$)	C_R ($cm \cdot s^{-1}$)
Rock	2.64	457,200
Frozen Soil	1.92	304,800
Ice	0.98	304,800
Saturated soil	2.08	146,300
Unsaturated soil	1.92	45,700

Equation (C)

Equation (C) describes the relationship between the peak particle velocity (V_R) and the pressure, density and compressional wave velocity in the substrate.

$$V_R = \frac{2P_R}{D_R C_R}$$

Equation (D)

Equation (D) represents the scaled distance relationship and is used to equate the peak particle velocity to charge weight and distance.

$$V_R = 100\,(R/W^{.5})^{-1.6}$$

where:

V_R = peak particle velocity in $cm \cdot s^{-1}$
R = distance to the detonation point in m
W = charge weight per delay in kg

Appendix III
Sample Calculations and Examples for Confined Explosives

SAMPLE CALCULATIONS

Sample Calculation 1: Calculation of Setback Distance Required for a 100 kg Charge Set in Rock to Meet the 100 kPa Guideline.

1. From Equation (B):

$$Z_W/Z_R = \frac{D_W C_W}{D_R C_R}$$

$$= \frac{(1g \bullet cm^{-3})(146{,}300cm \bullet s^{-1})}{(2.64g \bullet cm^{-3})(457{,}200cm \bullet s^{-1})}$$

$$= 0.1212$$

2. From Equation (A):

$$P_W = \frac{2(Z_W / Z_R)P_R}{1+(Z_W / Z_R)}$$

$$P_W = \frac{2(0.1212)P_R}{1+(0.1212)}$$

$$P_W = 0.22\ P_R$$

3. To limit P_W to 100 kPa ($kg \bullet m \bullet s^{-2} \bullet m^{-2}$):

$$P_R = \frac{P_W}{0.22}$$

$$P_R = \frac{100\ kPa}{0.22}$$

$$P_R = 455\ kPa$$

$$P_R = 4.55 \times 10^2\ kPa$$

Appendix III (continued)
Sample Calculations and Examples for Confined Explosives

4. Convert kPa to dynes ($g \cdot cm \cdot s^{-2}$):

$$\text{dynes} = \text{kPa} \times 10^4$$

$$P_R = 4.55 \times 10^2 \times 10^4$$

$$P_R = 4.55 \times 10^6 \text{ dynes } (g \cdot cm \cdot s^{-2})$$

5. From Equation (C):

$$V_R = \frac{2P_R}{D_R C_R}$$

$$V_R = \frac{(2)\left(4.55 \bullet 10^6 \ g \bullet cm \bullet s^{-2}\right)}{\left(2.64 \ g \bullet cm^{-3}\right)\left(457{,}200 \ cm \bullet s^{-1}\right)}$$

$$V_R = 7.54 \ cm \bullet s^{-1}$$

6. From Equation (D):

$$V_R = 100(R/W^{.5})^{-1.6}$$
$$R = (W^{.5})(V_R/100)^{-0.625}$$
$$R = (100kg)^{.5}(7.54cm \bullet s^{-1}/100kg \bullet cm \bullet s^{-1} \bullet m)^{-0.625}$$
$$R = 50.3 \text{ m}$$

Therefore, a 100 kg charge of explosives detonated in rock requires a setback of 50.3 m from fish habitat in order to reduce the overpressure produced by the detonation to less than 100 kPa.

Now, the calculation of the set-back distance required for a 100 kg charge set in rock to meet the peak particle velocity guideline of 13 $mm \bullet sec^{-1}$ is as follows:

Appendix III (continued)
Sample Calculations and Examples for Confined Explosives

From Equation (D):

$$R = (W^{.5})(V_R/100)^{-0.625}$$

When

V_R = 13 mm•sec^{-1} = 1.3 cm•sec^{-1}

and W = 100 kg

$$R = (100^{.5})(1.3/100)^{-0.625}$$
$$R = 150.9 \text{ m}$$

Therefore, a 100 kg charge of explosives detonated in rock requires a setback of 150.9 m from a spawning area in order to reduce the peak particle velocity produced by the detonation to less than 13 mm•sec^{-1}.

Sample Calculation 2: Simplified Calculation of Setback Distance from Fish Habitat.

The calculations to determine the required setback distance to meet the 100 kPa guideline may be simplified. Since the weight of the charge and the distance from the charge to fish habitat are the only variables in the equations, a factor can be developed for substitution in Equation (D).

From Equation (D):

$$V_R = 100(R/W^{.5})^{-1.6}$$
$$R = (W.5)\ (V_R/100)^{-0.625}$$

Therefore:

$$R = W^{.5}(K)$$

By working through the equations of Appendix II and solving for V_R for each substrate

Appendix III (continued)
Sample Calculations and Examples for Confined Explosives

type, the following results are obtained:

SUBSTRATE TYPE	K
Rock	5.03
Frozen Soil	3.2
Ice	2.1
Saturated Soil	2.13
Unsaturated Soil	0.98

Therefore, to determine the setback distance required to meet the peak pressure guideline of 100 kPa, multiply the square root of the charge weight by the appropriate "K" factor.

Sample Calculation 3: Simplified Calculation of Setback Distance from Fish Spawning Habitat.

Similarly, to determine the set-back distance required to meet the peak particle velocity (V_R) guideline of 13 mm•sec^{-1}, a constant can be developed for substitution in Equation (D):

From Equation (D):

$$V_R = 100(R/W^{.5})^{-1.6}$$

$$R = (W^{.5})(V_R/100)^{-0.625}$$

where:

V_R = 13 mm•sec^{-1} = 1.3 cm•sec^{-1}

$$R = (W^{.5})(1.3/100)^{-0.625}$$

$$R = (W^{.5})(15.09)$$

Therefore, to determine the setback distance required to meet the peak particle velocity (V_R) guideline of 13 mm•sec^{-1}, multiply the square root of the charge weight by a factor of 15.09.

Appendix III (continued)
Sample Calculations and Examples for Confined Explosives

EXAMPLES

Example 1: On-shore Setback Distance from Fish Habitat.

A proponent wishes to use explosives to break rock in a quarry near a stream. What is the minimum setback distance from the stream required in order to limit the overpressure in the stream to less than 100 kPa?

Calculate the required set back distance for a 35 kg charges set in rock.

W		=	35 kg
$K_{(rock)}$	=	6.75	
R		=	$(W^{.5})(K)$
R		=	$(35^{.5})$ (5.03)
R		=	29.8 m

Note: It is assumed that the rock formation being quarried extends under the stream. Therefore the K factor for rock is used.

Therefore, the proponent would be required to maintain a set back distance of at least 29.8 m in order to meet the DFO guideline criteria of 100 kPa.

Example 2: Buried Charges for Geophysical Exploration.

A proponent wishes to conduct a geophysical survey beneath a shallow lake. Because of the shallow depth of the lake, it is not possible to use an air gun or other similar non-explosive energy source. To what depth must explosive charges (5 kg) be buried in order to limit the overpressure to less than 100 kPa?

W	=	5 kg
$K_{(sat.\ soil)}$	=	2.13
R	=	$(W^{.5})(K)$
R	=	$(5^{.5})$ (2.13)
R	=	4.8 m

Note: It is assumed that the charges are buried in un-consolidated sediments. Therefore the K factor for saturated soil is used.

Therefore the proponent would be required to bury the charges to a depth of at least 4.8 m below the substrate-water interface in order to limit the overpressure at the interface to less than 100 kPa.

Appendix III (continued)
Sample Calculations and Examples for Confined Explosives

Example 3: In-stream Trench Excavation.

A proponent wishes to use explosives to assist in the excavation of a trench for a pipeline across a trout stream. The right-of-way is located in a cobble bottom riffle area that is used as a feeding area. There is a potential spawning bed located 75 m upstream of the right-of-way. The explosives' parameters are as follows:

Weight of individual charges: 15 kg
# of holes detonated/delay: 5
Weight of charge/delay: 75 kg

Does the proposal meet the DFO guideline criteria for overpressure and peak particle velocity?

a) For the Overpressure Criteria:

$W = 75$ kg
$K_{(rock)} = 5.03$
$R = (W^{.5})(K)$
$R = (75^{.5})\ (5.03)$
$R = 43.6$ m

Note: Since explosives must be used to excavate the trench, it is assumed that the substrate consists of rock or strongly consolidated sediments. Therefore the K factor for rock is used.

Therefore the detonation of 75 kg of explosives could kill or injure fish within a radius of 43.6 m of the right-of-way.

b) For the Peak Particle Velocity Criteria:

To determine the setback distance required to meet the peak particle velocity (V_R) guideline of 13 mm•sec^{-1} in a spawning area, multiply the square root of the charge weight by a factor of 15.09.

$R = (W^{.5})(15.09)$
$R = (75^{.5})\ (15.09)$
$R = 130.7$ m

Therefore, the detonation of 75 kg of explosives would exceed the DFO Guideline for peak particle velocity of 13 mm•sec^{-1} in a spawning bed.

Appendix III (concluded)
Sample Calculations and Examples for Confined Explosives

Therefore, the application for an authorization to use explosives would be denied and major changes in the explosives program would be required in order for the project to be acceptable to DFO.

For example:

If the weight of explosive/delay were reduced to 5 kg by increasing the number of holes in the pattern and detonating each hole separately with 25 msec delays between each hole, the zone of overpressure exceeding 100 kPa would be:

$W = 5$ kg
$K_{(rock)} = 5.03$
$R = (W^{.5})(K)$
$R = (5^{.5})\ (5.03)$
$R = 11.2$ m

Similarly, the distance at which the peak particle velocity in the substrate would not exceed 13 mm•sec^{-1} would be:

$R = (W^{.5})(15.09)$
$R = (5^{.5})\ (15.09)$
$R = 33.7$ m

Therefore, if the weight of explosives per delay were reduced to 5 kg, the spawning area would be protected, as it is further than 33.7m from the detonation area. However, the detonation would still produce over-pressures exceeding 100 kPa to a distance of 11.2 m. Additional mitigation such as undertaking the project at a time of least fish activity or by removing/excluding fish from the area by either physical exclusion or scare tactics may be required.

Appendix IV
Application Form for Authorization to Destroy Fish by Means Other Than Fishing

¾ ¾

APPLICATION FOR AUTHORIZATION TO DESTROY FISH BY MEANS OTHER THAN FISHING

I, the undersigned, hereby request authorization to carry out the works or undertakings described on this application form. I understand that the approval of this application, if granted, is from the Department of Fisheries and Oceans standpoint only and does not release me from my obligation to obtain permission from other concerned regulatory agencies.

If an authorization is granted as a result of this application, I hereby agree to carry out all activities relating to the project within the designated time frames and conditions specified in the authorization.

Applicant's Name (Please Print) _____

Applicant's Business Address _____

_____

_____

_____

Applicant's Telephone Number _____

Applicant's Facsimile Number _____

Applicant's E-Mail Number _____

Date of Application _____

I solemnly declare that the information provided and facts set out in this application are true, complete and correct, and I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath. This declaration applies to all material submitted as part of this application.

Applicant's Signature _____

Appendix IV (continued)
Application Form for Authorization to Destroy Fish by Means Other Than Fishing

¾ ¾

APPLICATION FOR AUTHORIZATION TO DESTROY FISH BY MEANS OTHER THAN FISHING (continued)

Location Details

Name of watercourse or waterbody (including co-ordinates)

_____

_____

Nearest Community _____

County _____

Province/Territory _____

Provide details of proposed activity including reasons as to why explosives must be used (attach additional information as required)

_____

_____

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_____

Appendix IV (continued)
Application Form for Authorization to Destroy Fish by Means Other Than Fishing

¾ ¾

APPLICATION FOR AUTHORIZATION TO DESTROY FISH BY MEANS OTHER THAN FISHING (continued)

Schedule of Operations

Proposed starting date (D/M/Y) _____

Proposed completion date (D/M/Y) _____

The following documents will assist in assessing your application and help expedite its approval. Please check which documents you have attached.

Map indicating location of project	[ ]
Engineering specifications	[ ]
Dimensional drawings	[ ]
Assessment of fish and marine mammal resources	[ ]
Assessment of potential effects of project on fish and marine mammals	[ ]
Measures proposed to mitigate potential damage to fish and marine mammals	[ ]
Other	[ ]

Appendix IV (concluded)
Application Form for Authorization to Destroy Fish by Means Other Than Fishing

¾ ¾

APPLICATION FOR AUTHORIZATION TO DESTROY FISH BY MEANS OTHER THAN FISHING (concluded)

Explosives Contractor (If different from applicant)

Name _____

Address _____

_____

_____

Telephone number _____

Facsimile number _____

Details of Explosives

Type (including trade name) _____

Total weight of explosive to be used (kg) _____

Weight of individual shots/
Weight per delay _____

Shot pattern _____

Detonation depth _____

Delay period (msec) _____

Method of detonation _____

APPENDIX V
Application Form to Harmfully Alter, Disrupt or Destroy Fish Habitat

SCHEDULE VI/ANNEXE VI

(*Subsection 58(1)/paragraphe 58(1)*)

Fisheries and Oceans

Pêches et Océans

_____

Application No./N° de la demande

APPLICATION FOR AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
DEMANDE D'AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON

I, the undersigned, hereby request authorization to carry out the works or undertakings described on this application form. I understand that the approval of this application, if granted, is from the Minister of Fisheries and Oceans standpoint only and does not release me from my obligation to obtain permission from other concerned regulatory agencies.

Je soussigné, demande par les présentes l'autorisation d'exploiter les ouvrages ou entreprises décrits dans la formule. Je comprends que l'approbation de cette demande, le cas échéant, porte sur ce qui relève du ministre des Pêches et des Océans et ne me dispense pas d'obtenir la permission d'autres organismes réglementaires concernés.

If an authorization is granted as a result of this application, I hereby agree to carry out all activities relating to the project within the designated time frames and conditions specified in the authorization.

Si la demande est approuvée, je consens par les présentes à exécuter tous les travaux relatifs à ce projet selon les modalités et dans le laps de temps prescrits dans l'autorisation.

Applicant's Name (Please Print) _____ Nom du requérant (lettres moulées)

Applicant's Business Address _____ Adresse d'affaires du requérant

_____

_____

Applicant's Telephone No./ N° de téléphone du requérant _____ Date_____

I solemnly declare that the information provided and facts set out in this application are true, complete and correct, and I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath. This declaration applies to all material submitted as part of this application.

Je déclare solennellement que les renseignements fournis et les faits énoncés dans cette demande sont véridiques, complets et exacts, et je fais cette déclaration solennelle, la croyant consciencieusement vraie et sachant qu'elle a la même force et le même effet que si elle était faite sous serment. Cette déclaration s'applique à tout document qui est présenté dans le cadre de cette demande.

_____ _____

Applicant's Signature (and corporate seal) Signature du requérant (et sceau de la société)

Name of watercourse or waterbody (give coordinates)
Cours d'eau ou plan d'eau (donner les coordonnées) _____

This watercourse is a tributary of (where applicable)
Cours d'eau tributaire de (le cas échéant)

_____

Nearest community Localité la plus proche	County Comté	Province Province
_____	_____	_____

APPENDIX V
Application Form to Harmfully Alter, Disrupt or Destroy Fish Habitat (continued)

SCHEDULE VI-Continued/ANNEXE VI (suite)

Fisheries and Oceans
Pêches et Océans

Application No./N° de la demande

APPLICATION FOR AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
DEMANDE D'AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON

Type of Activity/Genre d'activité

[ ] Bridge Pont	[ ] Stream Realignment Alignement de cours d'eau	[ ] Gravel Removal Enlèvement du gravier	[ ] Stream Traverse Traversée de cours d'eau
[ ] Culvert Ponceau	[ ] Channelization Canalisation	[ ] Obstruction Removal - Bypass Enlèvement ou contournement d'obstacle	[ ] Seismic Survey Levé sismique
[ ] Dam Barrage	[ ] Wharf - Break water Quai - Brise-lames	[ ] Stream Utilization - Recreation Utilisation récréative du cours d'eau	[ ] Agriculture
[ ] Stream Diversion Dérivation de cours d'eau	[ ] Dewatering Assèchement	[ ] Erosion Control Lutte contre l'érosion	[ ] Other (specify) Autres (préciser)
[ ] Mining Activité minière	[ ] Aquaculture	[ ] Flood Protection Protection contre les inondations	

List of Agencies (Federal, Provincial or Municipal) contacted or notified, or who have initiated contact with the applicant.
Liste des organismes (fédéraux, provinciaux ou municipaux) contactés ou qui ont pris contact avec le requérant.

PROVIDE DETAILS OF PROPOSED ACTIVITY INCLUDING REASONS FOR THE PROJECT AND TYPES OF EQUIPMENT TO BE USED
DONNER DES PRÉCISIONS SUR LES TRAVAUX PROJETÉS Y COMPRIS LA JUSTIFICATION DU PROJET ET LE TYPE D'ÉQUIPEMENT À UTILISER

APPENDIX V
Application Form to Harmfully Alter, Disrupt or Destroy Fish Habitat (continued)

SCHEDULE VI-Continued/ANNEXE VI (suite)

Fisheries and Oceans
Pêches et Océans

Application No./N° de la demande

APPLICATION FOR AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
DEMANDE D'AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON

SCHEDULE/CALENDRIER

	D/J	M/M	Y/A
Proposed Starting Date Date prévue du début des travaux	_____	_____	_____
Proposed Completion Date Date prévue de l'achèvement des travaux	_____	_____	_____

Approximate Timing of Work in shoreline, foreshore, tidal zone, or underwater areas.
Période approximative des travaux sur le rivage et les estrans ainsi que dans les zones àmarées et les zones sous-marines.

	D/J	M/M	Y/A		D/J	M/M	Y/A
From/De	_____	_____	_____	To/A	_____	_____	_____

The following documents will assist in assessing your application and help expedite its approval. Please check which documents you have attached.	**Les documents suivants faciliteront l'évaluation de votre demande et permettront d'accélérer son approbation. Veuillez cochez les documents vous avez joints àvotre demande.**
Map indicating location of project	[ ] Carte indiquant l'emplacement du projet
Engineering Specifications	[ ] Spécifications techniques
Scale Drawings	[ ] Dessins àl'échelle
Dimensional Drawings	[ ] Plans cotés
Assessment of Existing Fish Habitat Characteristics	[ ] Évaluation des caractéristiques existantes de l'habitat du poisson
Assessment of Potential Effects of Project on Fish Habitat	[ ] Évaluation des répercussions possibles sur l'habitat du poisson
Measures Proposed to Offset Potential Damage to Fish Habitat	[ ] Mesures proposées pour compenser les ventuels dommages àl'habitat du poisson
Other	[ ] Autres

ENVIRONMENTAL ASSESSMENT AND REVIEW PROCESS CONSIDERATIONS	**CONSIDIRATIONS CONCERNANT LE PROCESSUS D'IVALUATION ET D'EXAMEN EN MATIORE D'ENVIRONNEMENT**
NOTE: All applications pursuant to section 35 of the Fisheries Act will be assessed in accordance with applicable federal environmental assessment requirements.	REMARQUE : Toute demande en vertu l'article 35 de la Loi sur les pêches sera soumise aux exigences fédérales applicables àl'évaluation environnementale.

APPENDIX V
Application Form to Harmfully Alter, Disrupt or Destroy Fish Habitat (concluded)

SCHEDULE VI-Concluded/ANNEXE VI (fin)

Fisheries and Oceans
Pêches et Océans

Application No./N° de la demande _____

APPLICATION FOR AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
DEMANDE D'AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON

COMPLETE ONLY IF USE OF EXPLOSIVES IS INTENDED
A REMPLIR SEULEMENT EN CAS D'UTILISATION D'EXPLOSIFS

EXPLOSIVES CONTRACTOR (IF DIFFERENT FROM APPLICANT)/RESPONSABLE DES EXPLOSIFS (SI AUTRE QUE LE REQUIRANT)

Name/Nom : _____

Address/Adresse : _____

_____

Telephone No./N° de téléphone : _____

	D/J	M/M	Y/A		D/J	M/M	Y/Y
Anticipated Starting Date Date prévue du début des travaux	_____	_____	_____	Completion Date Date d'achèvement	_____	_____	_____

DETAILS OF EXPLOSIVES/PRÉCISIONS SUR LES EXPLOSIFS

Type (including trade name)
Genre (y compris la marque _____

_____

Weight and configuration (where applicable) _____
Poids et forme (le cas échéant)

_____

_____

Weight of individual shots and shot pattern where multiple charges are used
Poids des coups individuels et déploiement des coups, en cas de charges multiples

_____

_____

Detonation depth (in the rock; note also the depth of water, if applicable)
Profondeur de détonation (dans le roc; indiquer aussi, la profondeur de l'eau, s'il y a lieu)

_____

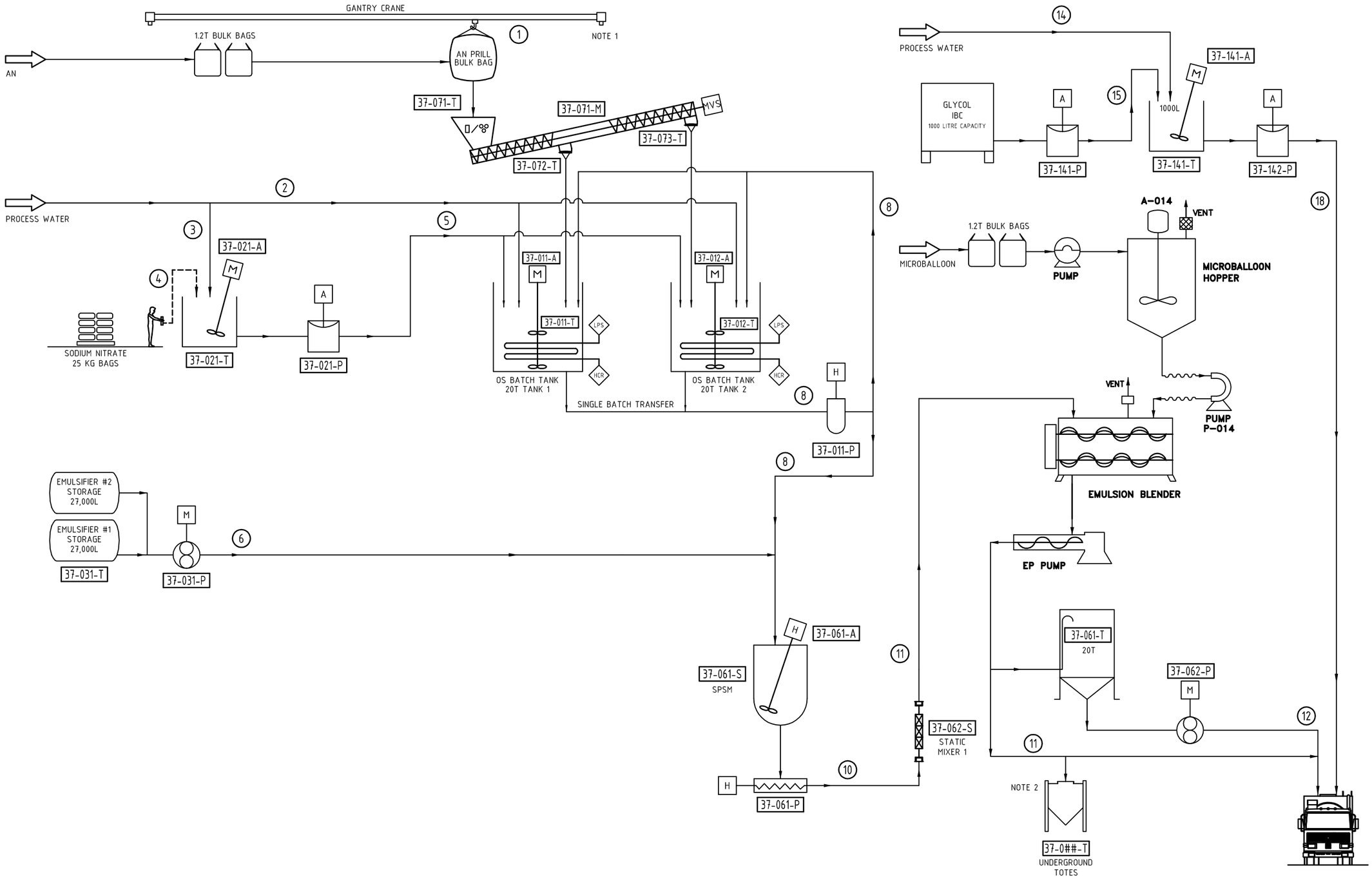
_____

Method of detonation
Méthode de détonation _____

_____

_____

APPENDIX B • FLOW SHEET OF THE EMULSION PLANT



DO NOT SCALE

3RD ANGLE PROJECTION

DIMENSIONS IN MILLIMETRES
TOLERANCES:
(UNLESS OTHERWISE INDICATED)
DECIMAL X.XX = ± 0.05
DECIMAL X.X = ± 0.1
DECIMAL X. = ± 0.5
ANGLE = ± 0.5°
BREAK EDGES = 0.5
SURFACES = 1.6

DRAWING LIST	66517
REFERENCE DRAWINGS	DRAWING No.

NOTES:-

1. SAME GANTRY CRANE IS USED FOR OXIDISER SYSTEM & AN LOADOUT
2. SYSTEM WILL BE DESIGNED TO LOAD UNDERGROUND TOTES WITH ANE MADE WITH BOTH EMULSIFIER #1 AND #2

STATUS
FEASIBILITY STUDY

RELEASED/UNRELEASED
RELEASED

DRAWN	-	DATE -
CHECKED	-	DATE -
PASSED - 1		DATE -
PASSED - 2		DATE -
APPROVED	-	DATE -

ORICA

PLANT: MELIADINE
ORIGINATING OFFICE: -
MASS: -

TITLE:
ANE MANUFACTURING
PFD
PROCESS FLOW DIAGRAM

WORK ORDER No.	SCALE	SIZE	SHEET No.	DRAWING No.	VERSION No.		REV.
8810282-0070	-	A1	-	-	41	03 Jul 14	0