Dear Mr. Hanna:

Subject: DRAFT Changes to West Island Design

As discussed on 1 August 2012, Diavik Diamond Mine Inc. (DDMI) is proposing design changes to the Fish Habitat Compensation Project for West Island Stream. The original design called for the installation of rock filled gabion cages. DDMI is proposing the use of natural features such as cobbles and boulders to complete the project. In some circumstances gabions may be required due to the availability of cobbles and boulders, and/or stream conditions.

Background

The University of Alberta (U of A) has been studying the Mainland Lakes (M-Lakes) Fish Habitat compensation project during the summer of 2012 since initial freshet. Based on their initial data, we realize that using rock filled gabion “chevrons” may not be the best design to repeat at the West Island site. The U of A has produced several considerations / suggestions to the current design based on their observations at M-Lakes. DDMI is supportive of these changes as they move beyond the use of gabions and incorporate the use of boulders. Below is a summarized breakdown of the U of A recommended changes.

1. Station: 0+00 to 0+100 (Reach length=100 m and slope=0.15%)

In this channel reach, the channel splits into two channels with the secondary channel ending in a wetland of stagnant standing water. One of our objectives is to confine flows to a single main outlet channel during freshet.

DDMI will close this secondary branch to divert the total flow into main channel.

2. Station: 0+100 to 0+140 (Reach length=40 m and slope=1%)

Golder (2012) proposed 5 step-pool complexes using rock filled gabion baskets for this reach. As the channel slope is mild (1%), the U of A recommends the use of riffle-pool complexes, as proposed by Golder for Station. To avoid riffle-pool complexes constructed from gabion baskets, the U of A suggests a “choke” configuration; similar to that installed at the M2S stream between lakes M1 and M2 in 2011 (Figure 1). The general riffle-pool dimensions proposed by Golder would remain the same, with the following changes:

- reduce the channel width from 3.0m to 2.0m at several locations to construct a “choke” section;
- place boulders at the choke section to reduce the active channel width, and to regulate the water surface elevation of the running section; and,
• place boulders at the downstream end of the pool section to regulate the water surface elevation of the pool.

3. Station: 0+140 to 0+240 (Reach length=100 m and slope=3%)

The U of A recommends replacing the 11 step pools proposed by Golder with 11 “Squeeze and Choke” rock weirs throughout this section as was originally proposed by Dillon Consulting March 2004 (Figure 2).

4. Station: 0+240 to 0+330 (Reach length=90 m)

Minimal excavation is required in this section because of decreased slopes compared to other sections. As proposed by Golder (2012), inlets to side channels will be blocked to concentrate flows within the main channel. In addition, steps will be taken in an attempt to prevent overland flow during freshet.

5. Station: 0+330 to 0+400 (Reach length=70 m, slope=2%)

Golder Associates (2012) proposed riffle pool complexes using rock filled gabion basket deflectors. DDMI is proposing to use the “Choke” method described above in Section 2.

6. Station: 0+400 to 0+435 (Reach length=35 m, slope=4%)

The U of A recommends replacing the step pools proposed by Golder with Ten “Squeeze and Choke” rock weirs throughout this section as described above in Section 3.

7. Station: 0+435 to 0+465 (Reach length=30 m, slope=1%)

For this most downstream part, Golder proposed to change the channel invert elevation by excavation, but did not propose any fish-pass construction. As the channel slope is mild (1%), the U of A recommends to use riffle pool complexes using the “choke” modification, as described above in Section 2.

All of the above noted changes are dependent on field conditions. DDMI, along with the U of A feel that the above noted changes will have a positive impact on the project.

If you have any questions or concerns regarding the above, please do not hesitate to contact the undersigned at your convenience.

Yours sincerely

David Wells
Superintendent, Environment

Cc Tracy Covey – Landuse Inspector, AANDC
Ryan Fequet – Regulatory Mining Specialist, WLWB

Attached: Figures
**Figure 1:** Riffle Pool with Choke Design

- Pool width: 20% larger than average channel width
- Pool is minimum 0.4 m deep
- Rock slope: 45° for 1.5 m, 30° for 1.5 m
- Double stability criteria followed by (Muir et al., 2007)
- Total: 50 g 6.0 m – 30 m

**Figure 2:** Squeeze Rock Weir Design (Dillon, 2004)