



Environment Canada Environnement Canada

Environmental Protection Operations
Qimugjuk Building 969
P.O. Box 1870
Iqaluit, NU X0A 0H0
Tel: (867) 975-4639
Fax: (867) 975-4645

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Our File: 4702 025 050 010

Nunavut Water Board
P.O. Box 119,
Gjoa Haven, NT X0B 1J0

Attention: Richard Dwyer

By email

Re: Shear Diamonds Ltd. – Renewal of Water Licence 2AM-JER0410 – Review of Application and Plans

Environment Canada (EC) staff have reviewed the above application and updated plans which fall under our purview, and offer the following comments. Environment Canada's contribution to your request for specialist advice is based primarily on EC's mandated responsibilities under Section 36(3) of the *Fisheries Act*, the *Canadian Environmental Protection Act*, the *Species at Risk Act* and the *Migratory Birds Convention Act*.

Overall, EC was pleased with the detail and clarity presented in the submissions, and would like to commend the proponent for a thorough submission. Specific comments on the content of the plans are provided in the attached table. The plans which were reviewed include: Care and Maintenance Plan; Site Water Management Plan; General Monitoring Plan; Processed Kimberlite Management Plan; the Aquatic Effects Monitoring Plan; C1 Diversion Construction Summary; Landfill Management Plan and Preliminary Landfill Management Design Plan; Landfarm Management Plan and Preliminary Landfarm Design Plan; Wastewater Management Plan; Waste Rock Management Plan; Waste Management Plan and Interim Closure and Abandonment Plan.

The need to ground truth aspects of the information as presented is acknowledged, and EC anticipates that any new information affecting the plans and proposed activities would be provided for review.

Please do not hesitate to contact me at (867) 975-4639 with any questions or comments regarding the foregoing.

Yours truly,

Allison Dunn

cc: Carey Ogilvie (Head, EA-North, EPOD)
Anne Wilson (Water Pollution Specialist, EPOD)

Reference	Comment	Recommendation/Request
PKCA Management Plan		
Page 5, Section 4.3	The first bullet references settling in the deposition cell following flocculation. It is not clear whether flocculants and/or coagulants will be used to promote settling.	Please clarify whether flocculants and/or coagulants will be used in the PKCA, and if so, which ones.
General Monitoring Plan		
Section 5.4	It is stated that lake level records will be compared to the lake bathymetry to determine the percentage of total lake water volume drawn off for mine use. It is not clear whether this refers to historical or future water use. In either case, such attempts to quantify water withdrawals could be confounded by other inputs to the lake.	Clarification on the proposed estimation is sought, including how future withdrawals will be measured directly.
Aquatic Effects Monitoring Plan		
Design, 2.1	Section 2.1 outlines the AEMP approach, and states that triggers for management response will be an increase in water or sediment parameter concentrations followed by a biologically significant effect measured by the AEMP, and linked to mine activities. Actions which would be taken are described on page 4, and these comprise a proactive and thorough response. However, it is not clear here whether these actions would be taken in response to a biological change, or as soon as changes to water or sediment quality are observed.	EC asks that the proponent clarify here what action would be implemented upon observation of abiotic increased parameters, and <u>prior</u> to a biological effect having occurred. It is acknowledged that section 2.6 of the AEMP does confirm this.
3.6.2.1	Re: Laboratory qualification, the accrediting body has changed from CAEAL to CALA.	Minor edit flagged for next version.
3.8 Data Analysis	The Plan indicates that data will be quality checked before formal statistical analysis and outliers identified.	EC seeks clarification as to whether Shear will undertake and report on statistical analyses both with all data in and with outliers removed. To that end, EC also seeks clarification on how outliers will be determined and

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		excluded from the data set.
4.4 Sediment monitoring	Was the proponent able to verify comparability of previous sediment sampling methods and analysis for the sites selected to be used in the updated AEMP?	
4.6.1 Sampling methods	Sediment sampling will be done using an Ekman dredge and the top 5cm will be taken from the top of the grab. Given the extremely low sedimentation rates in Arctic lakes, use of a 5 cm depth would mask changes occurring at the surface of the sediments. Other mines are successfully using core samples and analyzing the top 1cm layers.	Consideration should be given to using core samples such that 1 cm or 2 cm layers can be tested. This may require overlap in sampling methods to determine whether there is any comparability between historical results and core sample results.
7.5.5.2 Benthic – waterbodies	Two mesh sizes (210 um or 500 um) are specified for sieving of sediment samples for benthic invertebrates. When would each size be used, and which would be most consistent with historical samples?	
Landfarm Management Plan		
Section 5.2 and 6.8	The “Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites” may be useful for comparisons.	Please see the attached document for use in evaluating contact water quality.
Section 5.0 Remediation Objectives	The Plan refers to meeting discharge criteria “as defined in the water license” before discharge of contact water to the PKCA. The expiring license does not appear to contain specific criteria.	EC supports the use of current federal and/or provincial guidelines and objectives as criteria for contact water quality prior to discharge to the PKCA; this will allow for the updating of target concentrations as further guidelines are developed. It is suggested that the Plan include a table with current values for the parameters listed in Appendix A.
Preliminary Landfarm Design Plan		
Expiring water license Part G.14 Preliminary Landfarm Design Plan	EC notes that the expiring license requires that all hydrocarbon-contaminated snow and ice be disposed of in a segregated sump in the Coarse Processed Kimberlite stockpile.	EC concurs with the use of a sump in the landfarm once constructed, with remedial measures taken to deal with any residual contamination in the CPK area that may be an issue.

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Section 2.0	The Plan proposes use of the landfarm, rather than a separate area for containment of contaminated snow and ice.	
Landfill Management Plan (LMP) and Preliminary Landfill Design Plan (PLMP)		
LMP, 6.2.1	The Plan indicates that the landfill will be capped with 4.6 m of waste rock to close the facility.	What measures will be taken to ensure the waste rock used for capping is not potentially acid-generating?
Both Plans, 2.0 Regulatory Setting	Note, reference should be made to the <i>Canadian Environmental Protection Act</i>	Minor edit flagged for next version.
Wastewater Treatment Management Plan		
3.2 Oil and Grease Traps	The plan states that Shear will investigate the feasibility of incinerating collected oil and grease on site. It should be noted that incinerating oil and grease in sufficient quantity can damage the incinerator.	Please provide estimated quantities of oil and grease, and whether the incinerator manufacturer states these can be incinerated without damage to the unit.
O&M Section 4.1.4	How will sand and gravel filter materials that are removed be disposed of? At 2150 lbs each change, with approximately annual changes, it is acknowledged this will not represent a substantial volume on an annual basis.	
Tables 3 & 4	Footnote 2 is missing in Table 4, but would refer to the Aerated equalization tank. If BOD ₅ is measured in the aeration tank, will starting values for influent BOD ₅ be understated?	
Waste Management Plan and Appendix A		
Incineration	The Waste Management Plan does not discuss camp waste incineration. Appendix A, Forced Air Incineration System Operating and Maintenance Manual, provides general information on incineration. However, it provides no specific information on incineration activities at the mine site.	The Proponent should develop an incineration management plan that is consistent with the advice provided in the Technical Document for Batch waste Incineration (hereafter referred to as the Technical Document). For reference, this document can be downloaded from the following link: http://www.ec.gc.ca/gdd-mw/default.asp?lang=En&n=F53EDE13-1 . The management plan should include a discussion of the incineration equipment used to burn camp waste. Note that the Technical Document

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		recommends dual chamber controlled air incineration technology. For smaller camps, less than 26 tonnes of waste per year, a single chamber incinerator with an after burner may be acceptable.
Incineration	Appendix A discusses a number of Westland incinerators: the CY-1013-FA, CY-1020-FA, and CY-1050-FA models. These models are single chamber incinerators and are thus inappropriate for burning camp waste. The CY-2020-FA and CY-2050-FA models are single chamber incinerators with afterburners and therefore may be acceptable for small camps.	The management plan should also provide information on the types and quantities of waste to be incinerated, the types of training completed by incinerator operators and maintenance and operational records.
Interim Closure and Reclamation Plan		
Open Pit	It is unclear what the fill sources for the open pit will be. A reference to the open pit being flooded naturally (p. 44) is assumed to mean that the sources are limited to precipitation and seepage from the waste dumps, and that given the local permafrost it is believed there will be no groundwater seepage into the pit (p. 15). If this is the case, the estimated fill time of 20 years is questionable.	EC looks forward to the planned remodeling of the open pit fill rate.
Open Pit	In terms of water quality in the pit, there is concern about the potential implications of weathering of the pit walls while the pit is filling and the impact this could have on water quality.	A discussion of current and predicted ARD or metal leaching for the site as a whole should be added to the Plan, including a focus on the pit walls. Additionally, further discussion of the impacts of the raised blasting residues that are expected to be present in the open pit water, following the flushing of the waste dumps into the pit, should be included.
Open Pit	It is unclear what is meant by in-pit biological treatment (p. 26) or the estimated length of time that treatment would be required.	Given the concerns about the pit water quality, further details on contingency plans for pit water quality are needed.
PKCA	In section 7.4.4, one alternative considered for the	If this alternative is still being considered, the addition of the water

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	closure of PKCA pond water, should it not meet Water License discharge criteria, would be to pump the water to the open pit. It is unclear what the final decision regarding this alternative was.	and its impact on the water quality of the open pit should also be included in the remodeling of the pit fill rate and water quality.
Waste Rock Management Plan		
General	Figures 2-7 were not included in the Plan. The inclusion of these Figures would have assisted the review of this Plan.	When revising the Plan, please include the missing Figures.
Section 9.3.4	It is noted that there is an absence of geochemistry analysis for the recovery circuit rejects. As a mitigation measure, Shear plans to place this material in stockpile 1 which reports to the Processed Kimberlite containment area. The Plan notes that ongoing monitoring and testing of the leachate will determine if there are any long-term ARD and water quality issues related to this material.	EC would like clarification on how frequent this monitoring will be done.