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Nunavut Airports
PO Box 560
Second Floor, Rockland Building
Rankin Inlet, Nunavut, X0C 0G0

Attention: Mr. Felipe Salgado, P.Eng.
Surface Maintenance Engineer

Dear Felipe:

Subject: Drainage Ditch Rehabilitation, Iqaluit Airport, Nunavut

EBA Engineering Consultants Ltd. (EBA) was retained by Nunavut Airports to provide detailed design and tender documents for the "Taxi A Re-Opening & Apron I Rehabilitation" project at the Iqaluit Airport. The drainage ditch along the east side of Apron I routinely floods a portion of the apron each spring due to upstream meltwaters and as such, the rehabilitation of the ditch has been included in the overall project requirements. As this is an ACAP funded project, there is a requirement to protect the investment of the rehabilitated airfield pavements.

This letter is provided as support information on the ditch rehabilitation further to discussions between Nunavut Airports and the Nunavut Water Board, and will focus on the following main items:

- the main function of the ditch and contributing runoff;
- potential contaminates in the ditch; and
- the design and construction specifics of the ditch rehabilitation.

Main Function of the Drainage Ditch and Contributing Runoff

The contributing area to the drainage ditch from airport land is limited to the south leg of Taxi A and a portion of the crowned Apron I surface. Undeveloped land immediately north of the airport as well as the Arctic College and Public Works buildings also contributes runoff to the ditch. Based on a review of air photos, the drainage ditch (west ditch) appears to originate in the North 40 Pit and ends where it connects to a major surface drainage channel (east channel) just south of Apron I (Figure 1). This major drainage channel is located east of the airport and carries a large seasonal volume of meltwater from nearby mountainous terrain to Koojesse Inlet (Figure 2).

Blockages and resultant surcharging of the west drainage ditch along the east side of the airport has resulted in major flooding of Apron I. The main reason for the blockage is sediment build-up in the ditch channel. This sediment has buried existing culverts at the access road and taxiway crossings, and significantly reduced the original cross-sectional area of the ditch. Since the majority of flooding on Apron I occurs during seasonal meltwater periods from upstream mountainous terrain, there is

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significant probability that a large portion of stormwater in the ditch comes from upstream runoff through the North 40 Pit. Based on a review of the air photo, there does not appear to be a direct connection between the main drainage channel and the origin of the drainage ditch at the North 40 Pit; however, it is likely that stormwater during high runoff events could overflow the main drainage channel and enter the ditch.

Our reviews of available design drawings for the ditch indicate it was designed to extend just north of Apron I. The ditch would therefore have been intended as a drainage channel for stormwater runoff from the east portion of Apron I, and for the area immediately north and east of the airport. The ditch would not have been intended to accommodate large flow volumes from upstream sources, or to provide storage of stormwater prior to entering the main drainage channel south of Apron I.

Potential Contaminants in the Ditch

The existing material in the ditch has not been tested for hydrocarbons or other potential contaminants. We believe the potential for hydrocarbons contaminating the sediment material in the ditch is minimal based on the following assumptions:

- Sediment material has been deposited into the ditch bottom from upstream sources and would only be exposed to hydrocarbons due to apron runoff, assuming there were free hydrocarbons on the apron surface.
- Hydrocarbons that may have washed off the east portion of Apron I would be deposited first along the gravel surfaces between the apron and ditch and would then migrate into the ditch through additional surface drainage or groundwater.
- The 1995 Environmental Site Assessment of the Abandoned Hydrant and Distribution System on Apron I concluded that transportation of contaminants in the groundwater is not anticipated to be large due to the short seasonal period when the active permafrost layer has thawed. The report also suggested that the minimal impacted soil and groundwater from the fuel hydrants pose a low level of ecological risk to off-site receptors.
- Assuming that hydrocarbons did in fact reach the ditch through either surface flow or groundwater migration, it would be reasonable to assume that the majority of contaminants would have been washed along the surface of the ditch during stormwater events and the heavy flows experienced in the ditch.
- The exposed surface of the ditch bottom would lend itself to natural degradation of the hydrocarbons between stormwater events.

However, since the constituents of the ditch are unknown at this time, a contaminant-testing program could be initiated under the resident inspection services contract yet to be determined for this project. In the event hydrocarbons are encountered in the ditch material, the airport has a land farm, which may be used to naturally treat contaminated material. The contract documents currently state that all ditch material shall be stockpiled at a location as designated by the Engineer.

In addition, the contractor is required within the contract documents to prepare a detailed 'Construction Drainage Plan' in order to minimize the potential impact on downstream water bodies as a result of the ditch rehabilitation. This plan will indicate the locations and methods to provide temporary drainage and pumping as necessary to keep the excavation free from water and minimize the transport of sediments. The plan will also indicate methods to prevent soil erosion and discharge of water containing suspended materials into watercourses and drainage systems.

Design and Construction Specifics of Ditch Rehabilitation

The original ditch design and rehabilitation specifics are shown on Figure 3 (a reduced copy from the contract documents). The original ditch design was determined from microfiche obtained from the airport manager. The existing utilidor is located on a 2.4 m wide bench approximately 1.5 m to 2 m above the original ditch bottom. The original ditch geometrics consist of a 1.8 m wide bottom with 2:1 side slopes. The bottom of the ditch is currently at or just below the level of the utilidor bench. The existing culverts under the gravel access road and the asphalt taxiway are buried under sediment and stormwater either flows through the abandoned utilidor or over the surface depending on the volume of stormwater.

These conditions are causing the repeated flooding of Apron I.

The proposed method of rehabilitation includes the following:

- excavate the sediment and restore the ditch to the original design;
- transition the regarded ditch to original ground at the north and south limits of rehabilitation;
- remove the existing culvert and install three new culverts at each crossing (the three new culverts will have the same cross-sectional area as the original large diameter culvert);
- remove the abandoned utilidor from the bench; and
- restore the access road and taxiway.

The restored ditch will have the same cross-sectional area and flow characteristics as the original design prior to upstream sediment filling the ditch bottom.

Summary

It is our opinion that the rehabilitation of the existing ditch is only intended to restore the original cross-sectional area and re-establish the flow characteristics of the ditch. Due to the blocked culverts, stormwater currently has the potential to pool and become stagnant – the restored ditch will remove this potential and allow runoff to flow unrestricted.

We believe the potential for contaminants in the ditch sediment are minimal; however, a contaminant-testing program could be established prior to construction activities in the ditch. In addition, the potential for sediment contaminating downstream water bodies will be minimized through a Construction Drainage Plan to be monitored and enforced by the resident engineer.

Closure

The assumptions and opinions presented in this letter are based on information available to EBA and our knowledge of the project. It should be noted that a detailed upstream watershed analysis of the main drainage channel was not completed; however, assumptions on the origin of stormwater flows were determined from air photo interpretation.

Please contact the undersigned should you require additional information or clarification.

Yours truly,

EBA Engineering Consultants Ltd.

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FIGURES