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Nunalingni Kavamatkunillu Pivikhaqautikkut
Department of Community and Government Services
Ministère des Services communautaires et gouvernementaux

Andrew Keim
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June 5, 2008

**Ref: INAC File No. 3BM-CLY0308, CIDM # 216017:
Clyde River Sewage Lagoon Failure May 23rd, '08**

Dear Mr. Keim,

This letter is a follow-up to my letter to you dated June 2, 2008, and reflects the current status of the repairs and our plans from this date forward.

Current Status:

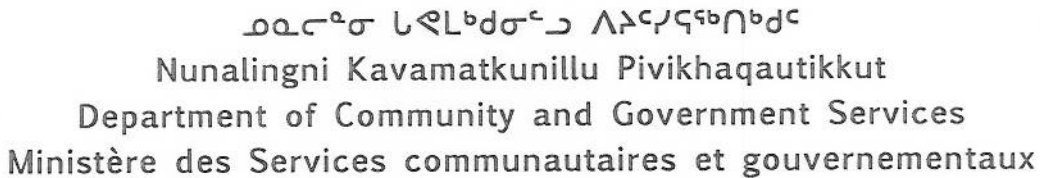
- The hamlet has placed fill to plug the breach as best they could at the time
- I flew in to the community and met with the consulting firm of Trow Associates shortly after the breach occurred. We assessed the situation and began implementing our mitigation strategy. The Trow report dated June 3 is appended to this letter.
- I engaged hamlet residents and 5,000 sand bags were filled and placed to reinforce the existing berm (see Appendix A, Figures 2 and 3 and the five pictures at the end). This was necessary in order to maintain berm integrity until planned civil works occur.
- I have taken samples of the effluent at the end of the spill path and am awaiting the lab results. Parameters to be analyzed are BOD5 and TSS.
- We have sent for 5,000 more poly-bags
- The population of roughly 740 people will generate approximately 67 cubic metres of sewage per day. Over the next four months this amounts to approximately 8,000 cubic metres that must be accommodated.

Next Steps:

- As soon as the additional poly-bags arrive, we will build the containment berm at the end of the effluent spill path (see Trow report dated June 3, and Figure 1 in Appendix A of this letter). The GPS location of the containment berm is indicated on the satellite image in Appendix A. It is to be noted that this containment berm is temporary and will consist of poly-bags so as to best protect the fragile ecosystem of the wetland from heavy equipment damage. Should you require further information about the nature of the berm, we would be happy to provide it through our consultants who designed it.
- The existing berm was never built according to the engineered designs, and, as such, is in danger of failing should the freeboard rise to less than 1 m. Accordingly, Trow Associates have urged that an overflow device be installed to maintain a 1 m freeboard. This will be installed as soon as

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- We have engineered designs in place for a second lagoon cell and for reinforcement and heightening of the existing cell (see Figure 4, Appendix A, and the Trow Report).
- The construction tender documents have been prepared, and the advertisement is in this week's newspaper, closing date June 26. The construction will proceed in two phases:
 - Phase 1 to proceed as soon as permission has been obtained from NIRB for quarrying. This consists of mobilization and preparation and stockpiling of aggregate
 - Phase 2 to proceed as soon as the water license has been granted by the NWB. This phase consists of actual construction and commissioning. The construction will consist of a new engineered cell adjacent to the original one. In addition, the original cell will be reinforced as shown so that it will have the required hydraulic retention capacity and increased height. These specifications are already part of the NWB licensing process – a process that was begun long before the present breach.
- The end-date for public comment for the Nunavut Water Board application was May 21.
- The end-date for public comment for the application for a quarry permit review from NIRB will be June 13.
- As soon as these two regulatory bodies grant permission, we will be able to proceed with the construction contract to make the new cell and improve the existing one. This should take place this summer (again, depending on regulatory approvals).

BE/ms

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June 3, 2008

Mr. Bhabesh Roy, M.A.Sc., P.Eng.
Municipal Planning Engineer
Community Government Services
Baffin Region, Government of Nunavut
P.O. Box 379, Pond Inlet X0A 0S0

via facsimile:
(867) 899-7328

Sewage Lagoon Failure Clyde River, Nunavut

Dear Mr Roy:

AS per the request of the Department of Community and Government Services (CGS), Government of Nunavut (GN), Mr Steven Burden, P.Eng. and Mr. Surinder Aggarwal, P.Eng. visit the Clyde River sewage lagoon on the afternoon of May 28, 2008 and the morning of May 29, 2008, to gather information regarding the breach of the lagoon berm and subsequent sewage spill. In addition to the information gathered on site, information regarding the failure of the berms was gathered from Mr. Bhabesh Roy of the CGS and Mr. Bill Buckle, Senior Administrative Officer of the Hamlet of Clyde River.

The information gathered indicates that the berm in the southeast corner of the lagoon was overtopped on May 23, 2008. As a result the berm failed over a distance of approximately 10 metres. Temporary repairs were undertaken by the Hamlet of Clyde River comprising of scraping materials from the surface of the berms in the vicinity of the failure and placing in the failed area. As compaction equipment was unavailable, this material could not be compacted, however, we understand that attempts were made to compact material with a frontend loader with limited success. The failure of the berm resulted in the release of approximately 5,000 m³ of sewage on to the tundra.

Based on the site visit and information gathered we recommend the following:

Reinforcement of the Repaired Berm

The site visit revealed that the level of the sewage is approximately 1.15 m below the top of berms. It was observed that a crescent-shaped crack had begun to form in the area of the repaired berm. This crack is located approximately 1.5 metres from the edge of the crest of the berm. This is an indication of incipient failure of this portion of the berm. Once this section of the berm fails, the remainder of the berm may be too weak to support the lateral hydrostatic pressures and may also fail. It is recommended that this portion of the berm be immediately reinforced to prevent failure. It is noted that there is no excavator available in the Hamlet and the ground is still frozen. It is understood that the reinforcement of the berm can be undertaken through the placement of sandbags. A source of sand has been identified within the Hamlet and there are approximately 5,000 sandbags available within the Hamlet.

The sandbag reinforcement should be comprised of widening the berm at the crest level by 1.25 metre and sloping at an inclination approximately equal to 2 horizontal to 1 vertical. It is estimated that the reinforcement will require approximately 2,500 sandbags. The placement of the sandbags should be such to ensure that the bags do not have any voids or gaps and that the joints are staggered.

A preliminary sketch has been provided to the Hamlet to allow for the emergency repairs to begin. The final placement of sand bags was accomplished on June 2, 2008. Details of the repairs are provided in the attached sketch SK1.

Remediation of Sewage Spill

During the site visit the extent of the area contaminated by the sewage spill was delineated with a GPS unit and is shown on sketch SK2. The area extended approximately 450 metres from the lagoon to the south east towards the ocean. It appears that the majority of the sewage released has been absorbed into the soil structure. This is evident through the melting of the snow and the soil structure being partially thawed near the surface. A portion of the contaminated area demonstrates discoloured snow and areas where the underlined snow has been melted, leaving a thin layer of ice on the surface. Generally, beneath this snow and ice there is a layer of moist and thawed soil, once again indicating much of the sewage has been absorbed into the natural vegetation and soil structure. The width of the flow path is between 30 and 60 metres, and as previously mentioned, extends approximately 450 metres along the slope.

It is felt that as the majority of the sewage has been absorbed into the soil structure, natural treatment will occur as the wetlands rejuvenates in the spring. To address containment of any contamination in the snow pack, it is recommended that a containment berm be constructed just past the extent of the sewage spill as shown on sketch SK2. This containment berm will be approximately 2-3 feet high and span across the width of the contaminated, details of the containment berm are shown on sketch SK3. The purpose of this containment berm will be to delay the release of the sewage during the spring melt. The containment berm will be located downstream of the spill area and will be constructed out of sandbags.

Sewage Testing and Decanting

It is noted that the lagoon was designed with 1 m of freeboard. As such when the level of sewage raises above the 1 m of freeboard level, the stability of the berms would be vulnerable and the berm might fail at locations of weakness. Therefore it is recommended that the one metre freeboard be maintained for stability purposes. This would require a continuous or regular decanting process. As part of this process it is recommended that a sampling procedure be undertaken to determine the characteristics of the existing sewage and determine if the sewage can be released uncontrolled into the natural environment, or if further containment is required. Samples from the lagoon have been taken and forwarded to a laboratory in Ottawa for testing. Results should be available on June 5th or 6th, 2008.

It should be noted that the sewage would be released to the filterstrip wetlands, downstream of the sewage lagoon which is part of the proposed sewage treatment facility. Upon receiving test results of the strength of the sewage, an assessment of the wetlands' ability to treat the sewage

will be undertaken. If it is determined the wetlands can not treat the sewage to acceptable levels, further containment may be required and would be provided through the use of sand bags.

Detailed design for the construction of the containment berm will be provided if required.

Rehabilitation of Lagoon Berms

As per our Geotechnical Report on the sewage lagoon berms, dated January 2008, the existing sewage lagoon berms have slope stability issues which is further evident from the recent breach. In addition, the 2003 Dillon Report noted seepage from the southwest corner of the sewage lagoon, which again indicates potential weakness in the berm. Due to the recent failure and other reported issues, we recommend that the berms slopes be stabilized as soon as possible. Our Geotechnical Report recommended that the existing sewage lagoon berms be stabilized by flattening the slopes. Details of our recommendations for slope stabilization are included in the Geotechnical Report and detail design drawings prepared for the Clyde River Sewage Lagoon Rehabilitation and Expansion, and as shown in sketches SK 4 and 5.

As previously mentioned, it is critical that the one metre freeboard be maintained to prevent overtopping and potential washout of the berms. It is recommended as part of the rehabilitation of the existing berms that an overflow device be installed to ensure that the one metre freeboard is always maintained. Details of the overflow device are included in the detail design drawings for the Rehabilitation and Expansion of the Sewage Lagoon.

If you have any questions, or require additional information with regards to the findings of our site visit, or the recommendations put forth in this report, please do not hesitate to contact either Steven Burden, P.Eng. or Surinder Aggarwal, P.Eng. at 613-225-9940.

Yours truly,

Trow Associates Inc.

Surinder K. Aggarwal, M.Sc., P.Eng.
Senior Project Manager
Geotechnical & Materials Engineering Services

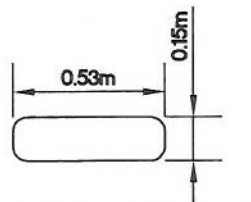
Steven L. Burden, P.Eng.
Senior Project Manager
Infrastructure Division



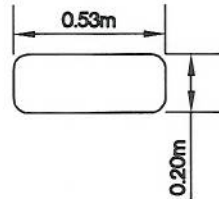
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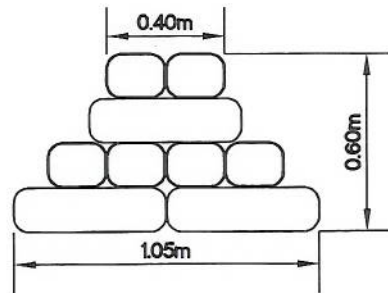
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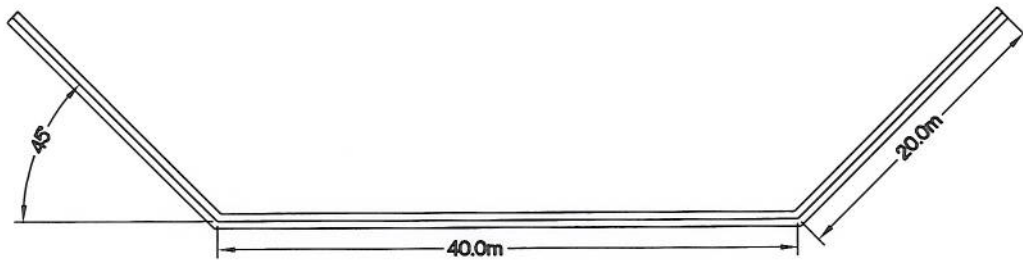
SECTION VIEW
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PLAN VIEW
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SAND BAGS
SCALE 1:25



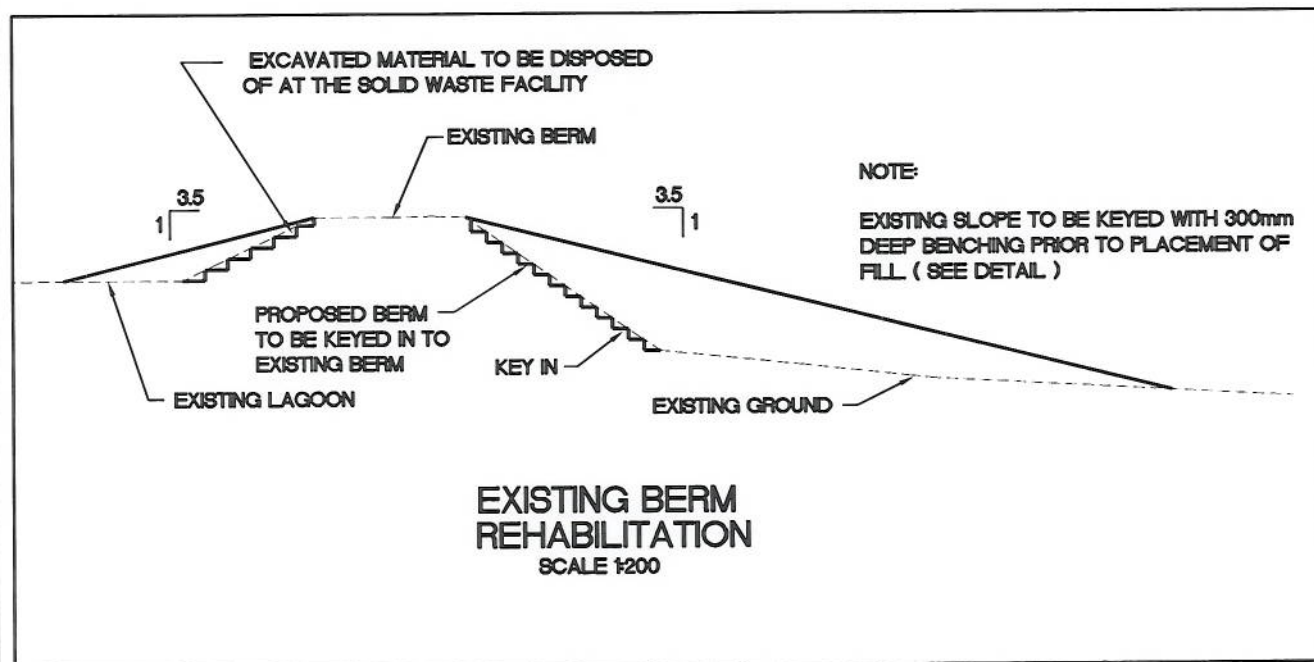
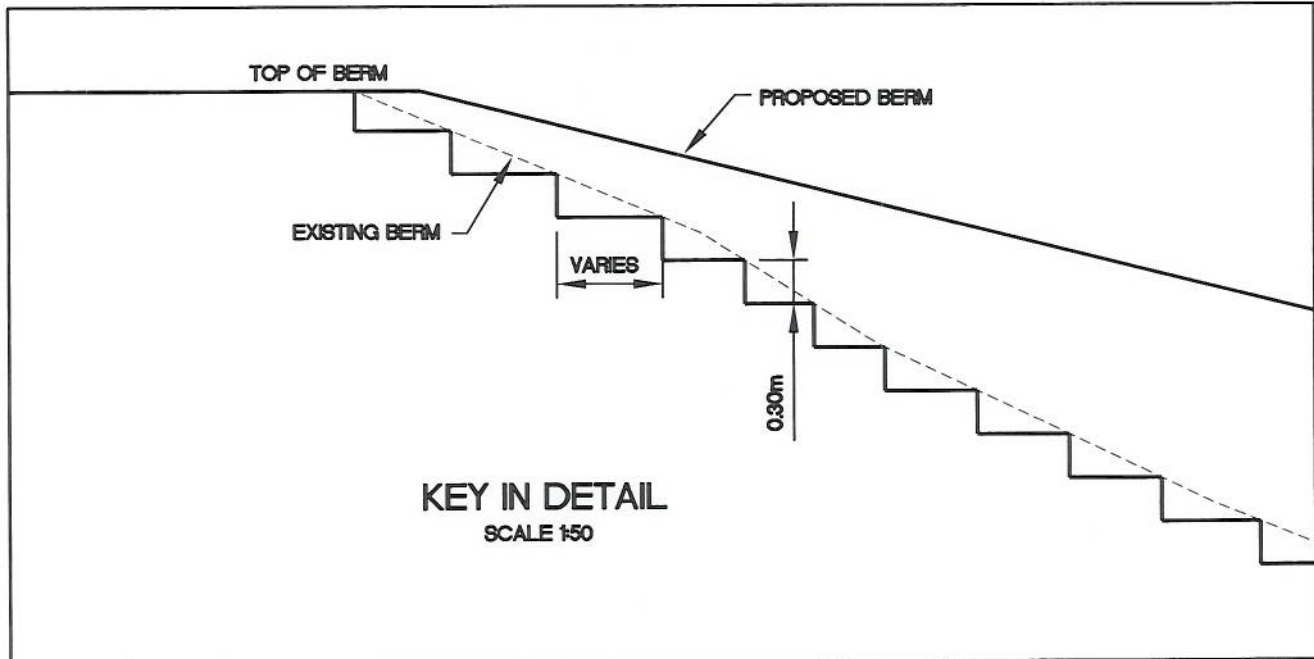
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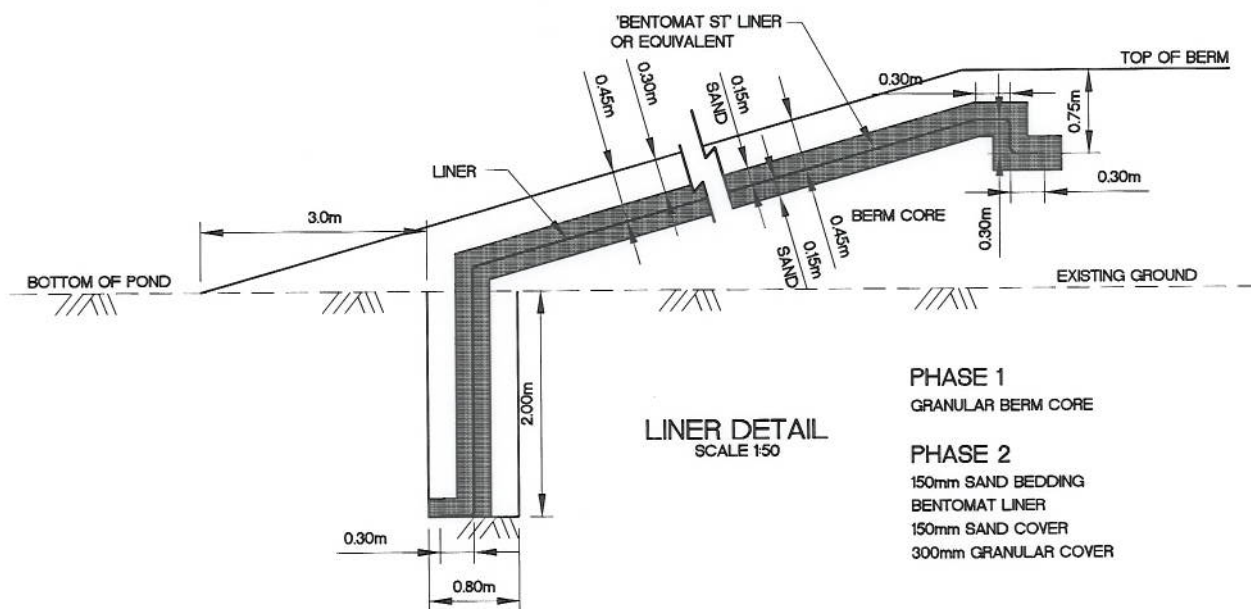
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scale N.T.S.	CLIENT: CGS-GN	project no. OTCD19055A
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Appendix A

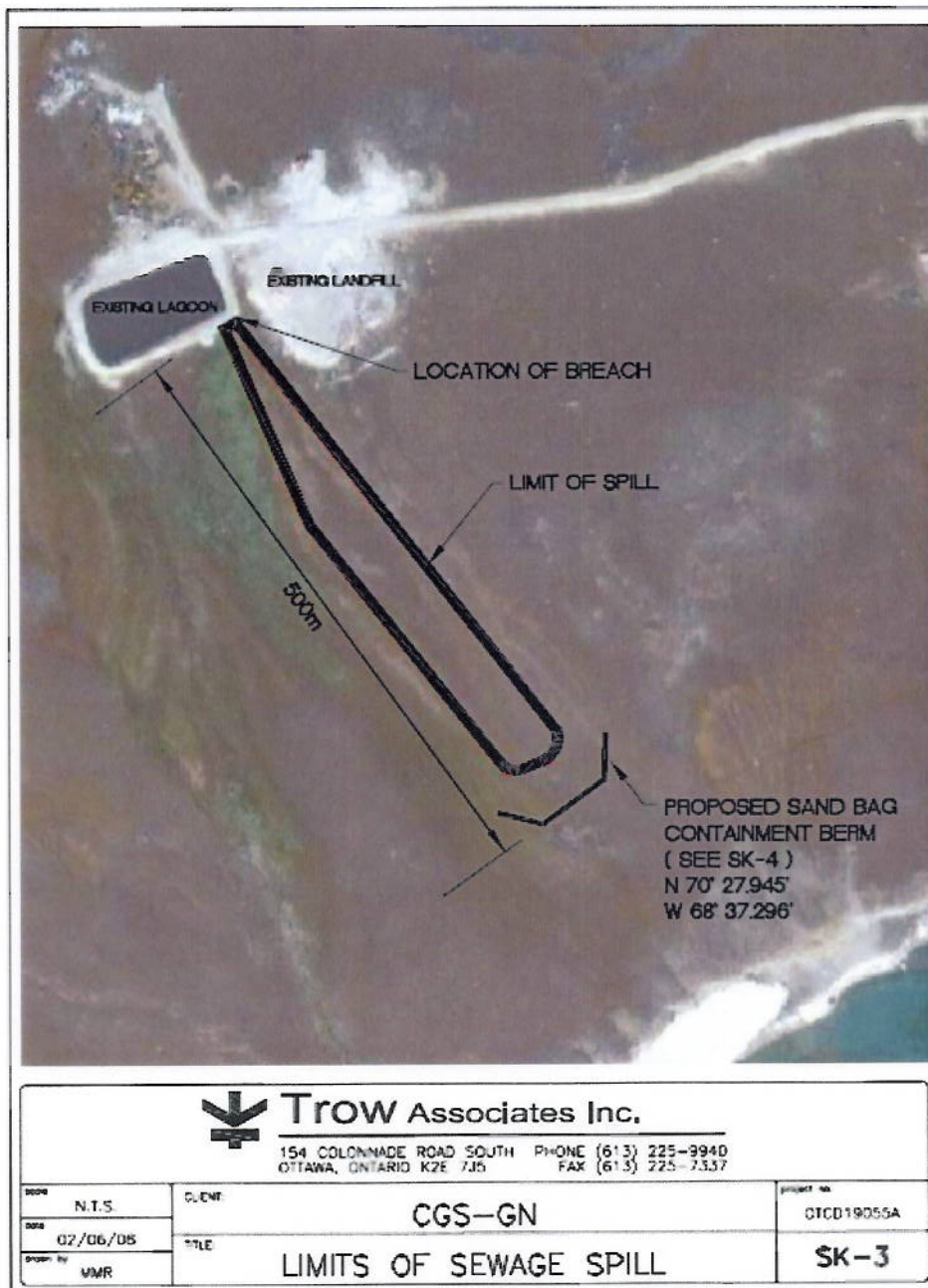


Figure 1

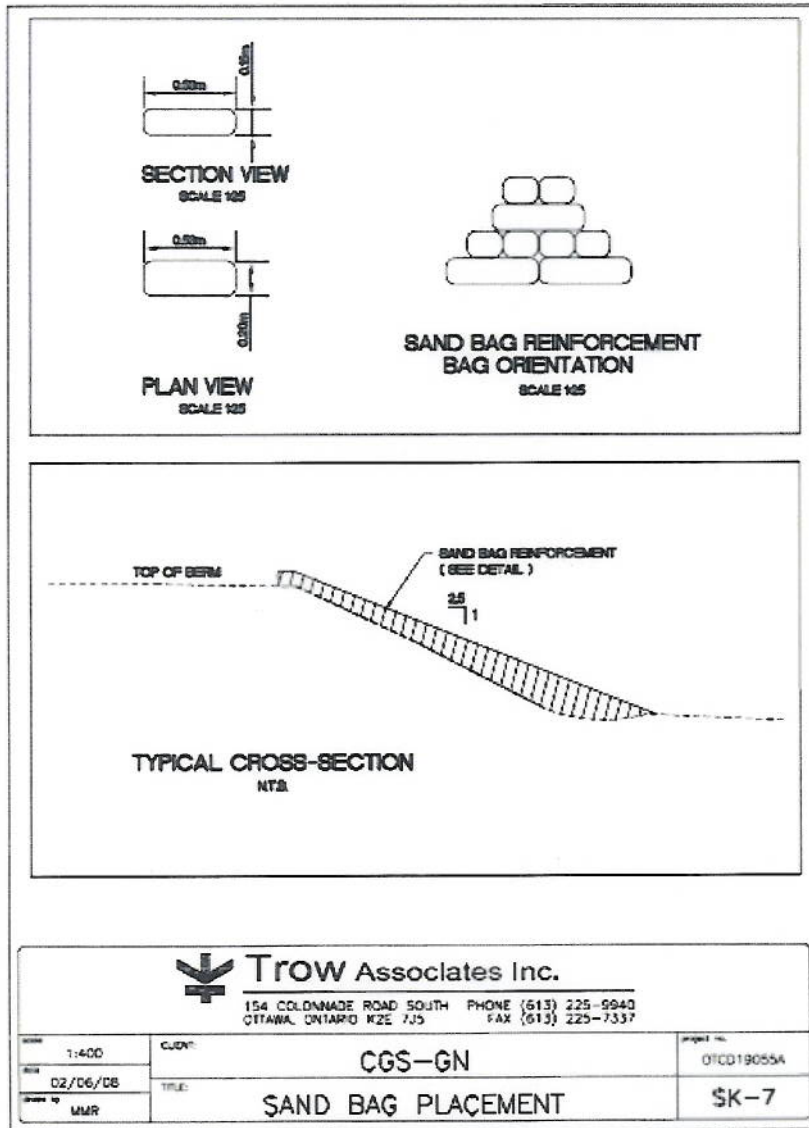


Figure 2

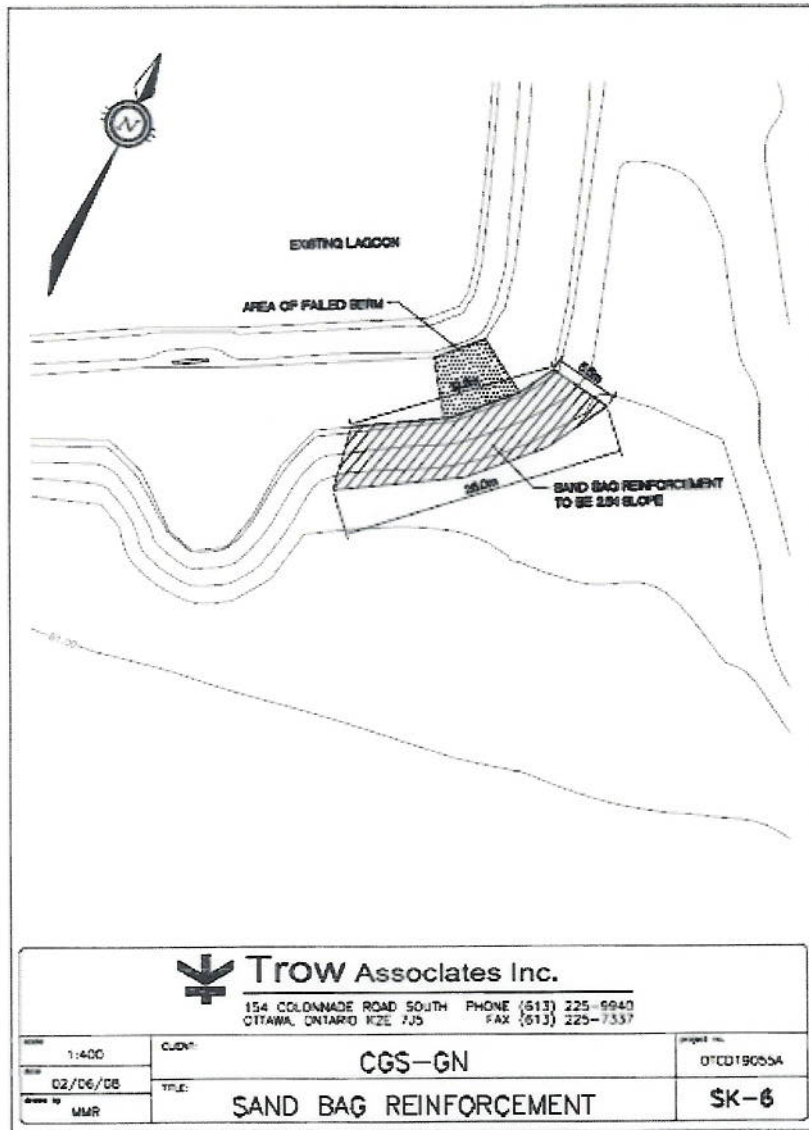
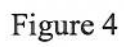


Figure 3



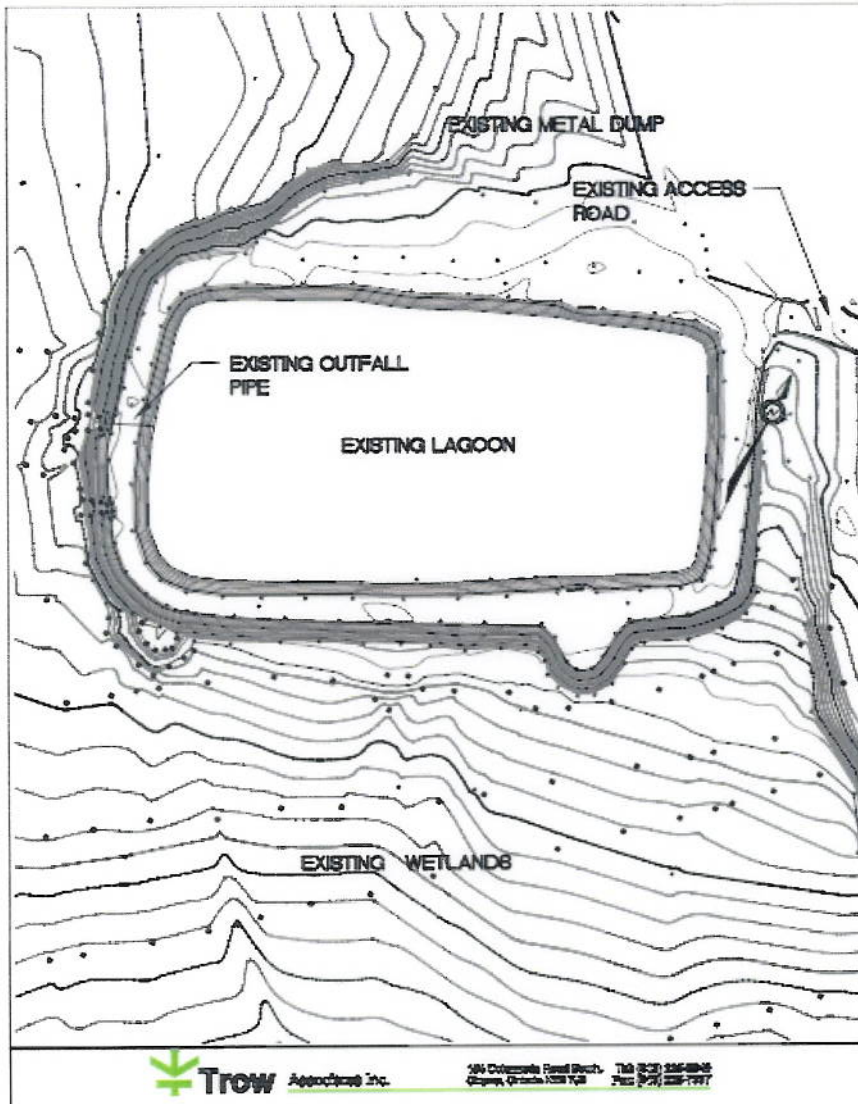


Figure 5





